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Annex III

of MedDream USER MANUAL (version 8.3.0)

MedDream PACS functionalities

(version 7.3.1)

The annex describes the usage and configuration of MedDream PACS functionalities.
See the MedDream USER MANUAL document for the general information about the MedDream product, installation requirements and verification, IT security measures.

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MedDream PACS functionalities

The annex describes the usage and configuration of MedDream PACS functionalities.
See the MedDream USER MANUAL document (https://www.softneta.com/files/meddreamviewer/doc/MedDream-User-Manual.pdf) for more information about MedDream product:

- general information about the MedDream product,
- list of applicable standards,
- warnings regarding residual risks,
- installation requirements and verification,
- IT security measures.

Glossary

AE	Application Entity
AET	Application Entity Title
PACS	Picture Archive and Communication System
DICOM	Digital Imaging and Communications in Medicine
DMWL	Dicom Modality Worklist
FSC	File Set Creator
FSR	File Set Reader
HIPAA	Health Insurance Portability and Accountability Act
HL7	Health Level Seven
HTML	Hyper-Text Mark-up Language
HTTP	Hyper Text Transfer Protocol
LDAP	Lightweight Directory Access Protocol
LDAP CN	LDAP Common Name
LDAP DN	LDAP Distinguished Name
LDAP RDN	LDAP Relative Distinguished Name
LTP/LLTP	Lower-Level Transport Protocol
LUT	Look Up Table
PHP	PHP: Hypertext Preprocessor
NEMA	National Electrical Manufacturers Association
NTLM	(NT LanMan) is an authentication process that's used by all members of the Windows NT family of products
SCP	Service Class Provider
SCU	Service Class User
SMTP	Simple Mail Transfer Protocol
SOP	Service-Object Pair
SR	Structured Report
SSL	Secure Socket Layer
TLS	Transport Layer Security
UID	Unique ID
UNC	Universal Naming Convention
DicomWeb RESTful Services	A term applied to the family of RESTful (Representational State Transfer) DICOM services defined for sending, retrieving and querying for medical images and related information

Table 1 Abbreviations

Product information

To view the MedDream PACS functionalities information, open about window by pressing the **About**:

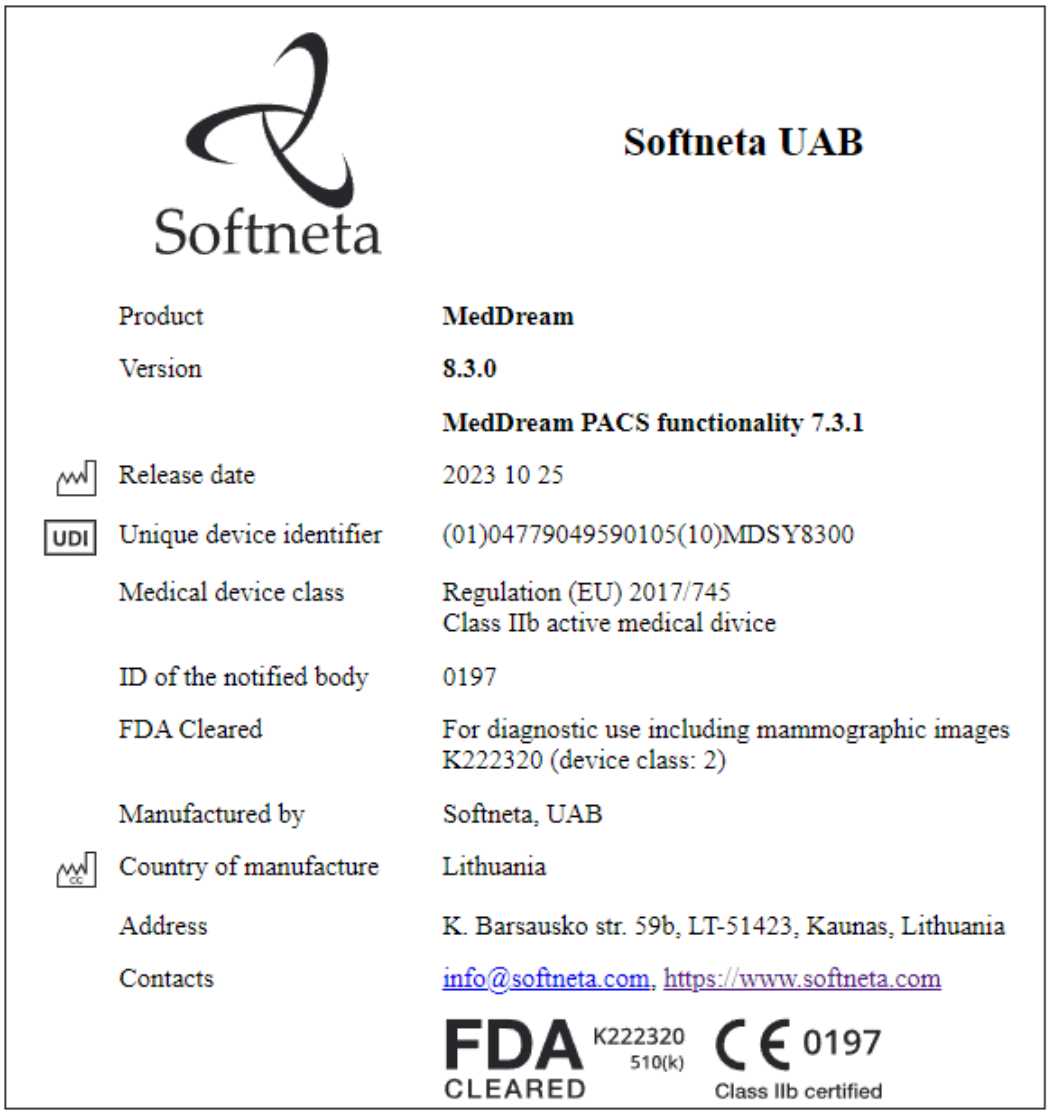


Figure 1 MedDream PACS funtionalities information in About window

The user can view the following information about the product:

- The product group provides the following information about:
  - **Product** provides the official product name;
  - Fields **Version**, and **Release date** holds information about the installed version;
  - The versions' release notes are accessible by clicking the **Release notes** link;
  - The user manual of MedDream PACS functionalities is accessible by clicking the **Instructions for use** link;
- Unique Device Identification number;

- Fields **Medical device class**, **ID of the notified body**, and **FDA cleared mark** holds the products' certification data.
- Fields **Valid to** and **Updates to** indicates dates, until the current license is valid and will receive updates;
- The manufacturer group contains Manufactured by, Country of manufacture, Address, and Contacts fields, that show name and contacts of product manufacturer.

Minimal PACS functionalities hardware requirements

Server-side

Parameter	Requirements
CPU	Intel® Core™ i5, 4 Core, 2.00 GHz
RAM	8+ GB
Storage space	• 20 GB available hard-disk space for installation; • PACS storage calculator for data: https://dicomlibrary.com/dicom/pacs-storage-calculator/ • 0.5 % from calculated storage data for DB storage.
Network Bandwidth	100+ Mbit/s
Operating system	Windows Server 2022 Windows 11 Debian 12, Ubuntu 22.04 LTS, CentOS 7.9-2009, Fedora 37
Database	MySQL Server 8.0

Client-side

The same requirements as MedDream Viewer functionality (excluding mobile).

Installation

MedDream PACS software can be downloaded from the following URL:

https://www.softneta.com/products/meddream-pacs-server/

Refer to the document MedDream PACS Installation Guide for detailed instructions about how to install/upgrade and set up MedDream PACS software.

Managing MedDream PACS User Accounts

After MedDream PACS software has been installed successfully for the first time, there are only two (2) default user accounts created for MedDream PACS:

- The super-user ('**root**' for MySQL or '**SYSTEM**' for Oracle databases), which is the Administrator account required to administrate user accounts and set up privilege levels for all users.
- The **built-in** system user account which you have created during MedDream PACS installation. This account is strictly for MedDream PACS internal use, and it is not recommended to use this account to access the MedDream PACS web user interface since it does not have any associated privilege levels.

Privacy Attributes

In order to be more compliant with Health Insurance Portability and Accountability Act (HIPAA), all patients and studies stored in the MedDream PACS database have one of the two (2) privacy attributes below:

- Public: If a patient's privacy attribute is Public, then all studies of this patient and all images within the studies of this patient can be accessed by any MedDream PACS user account, without any user privilege requirements. If a study's privacy attribute is Public, then all subsequent series of this study and all images within the series of this study can be accessed by any MedDream PACS user account, without any user privilege requirements.
- Private (Default): If a patient's privacy attribute is Private, then all studies of this patient and all images within the studies of this patient can be accessed by only those MedDream PACS user account (s) with the '**View**' privilege, or those user accounts whose Last Name and First Name stored in the user profile match with either the Referring Physician Name or the Reading Physician Name, or those group users whose Group Description matches with the Institution Name of this patient.
- MedDream PACS users without the '**View**' privilege will not be able to access a Private patient or any study or images of the Private patient, unless the user's Last Name and First Name stored in the user profile match with either the Referring Physician Name or Reading Physician Name, or the user belongs to a User Group whose Group Description matches with the Institution Name of the patient.
- If a study's privacy attribute is Private, then all subsequent series of this study and all images within the series of this study can be accessed by only the MedDream PACS user account (s) with the '**View**' privilege, or those user accounts whose Last Name and First Name stored in the user profile match with either the Referring Physician Name or the Reading Physician Name, or those Group Users whose Group Description matches with the Institution Name of this patient
- MedDream PACS users without the '**View**' privilege will not be able to access this Private study or any series or images of this study, unless the user's Last Name and First Name stored in the user profile match with either the Referring Physician Name or Reading Physician Name, or the user belongs to a User Group whose Group Description matches with the Institution Name of this study.
- All patients and studies are stored as Private when they are received by MedDream PACS. Only MedDream PACS users with '**Modify'** privilege can change the privacy attribute of a patient or study from Private to Public or vice versa.
- Changing a patient from Private to Public will implicitly change all studies of the patient to Public, regardless of their previous settings.
- Changing a patient from Public to Private will implicitly change all studies of the patient to Private, regardless of their previous settings.
- Changing a study from Private to Public does not affect the privacy setting of the patient who this study belongs to, except when this study is the only study of the patient. The patient will also be changed from Private to Public if and only if the study being changed is the only study of that patient.

- Changing a study from Public to Private does not affect the privacy setting of the patient who this study belongs to, except when this study is the only study of the patient. The patient will also be changed from Public to Private if and only if the study being changed is the only study of that patient.
- User Access Filters – The Administrator can define optional **User Access Filters** to allow this user access to the specific patient or study with the matching Dicom data element filter values. The following list of Dicom Data Elements is supported as the filtering attribute:

- Source AE Title
- Referring Physician's Name
- Reading Physician's Name
- Institution Name

If multiple filters are defined, then the logical **AND (&&)** operator will be applied for all defined filters

Creating New User Accounts

Only the Administrator/Super-user ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) can create new user accounts, after logging into MedDream PACS by accessing the following URL:

http://{HOSTNAME}/Pacs/home.php

Where: {HOSTNAME} is the name of the machine where MedDream PACS is installed, e.g., localhost. After logging into MedDream PACS successfully, the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) can click on the 'User Administration' link from the menu bar to enter the User Administration page as illustrated below:

Figure 2 User Accounts Administration

Clicking on the '**Add**' button will display the "Add New User" page as illustrated below:

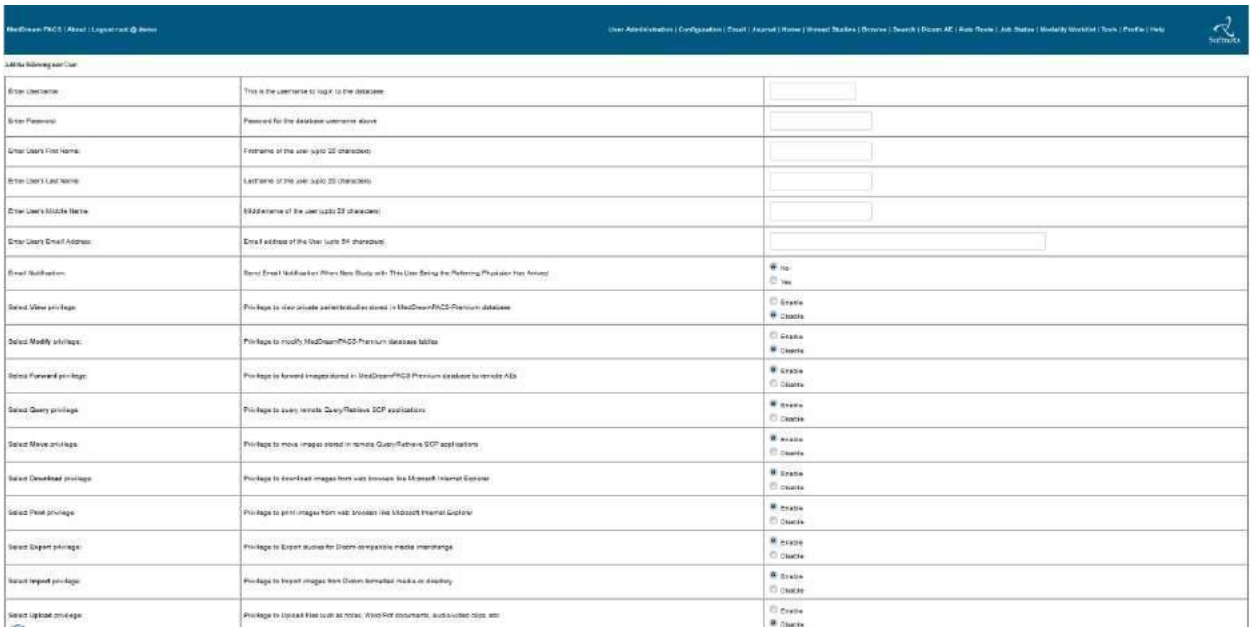


Figure 3 Creating New User Account

For each user, there are 12 privileges that can be administrated separately by the super-user/Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases):

Privilege	Description	Default
View	Required to view private patients/studies	Disabled
Modify	Required to change database attributes	Disabled
Forward	Required to forward images stored in MedDream PACS to a remote SCP	Enabled
Query	Required to query remote Query/Retrieve SCP application entities	Enabled
Move	Required to move images on remote Query/Retrieve SCP application entities	Enabled
Download	Required to download MedDream PACS images from a web browser	Enabled
Print	Required to print images to Dicom printers	Enabled
Export	Required to export images stored in local MedDream PACS Server database to Dicom Standard Part 10 formatted directory and files with DICOMDIR directory information	Enabled
Import	Required to import external Dicom formatted directory and/or raw image files into MedDream PACS Server database	Enabled
Upload	Required to upload text files, PDF/Word documents, audio/video clips, etc. into MedDream PACS Server database	Disabled
Monitor	Required to access system monitoring activities such as system logs, live monitors, etc.	Disabled
Mark Study	Required to mark a study as either Read or Un-read	Disabled
System Administration	Required to access system-level configurations such as Email Server, System Configuration, Journal, or System-level Job Status, etc.	Disabled
Change Storage	Required to move selected Dicom studies to a user-specified storage location	Disabled

Table 2 MedDream PACS User Privileges

⚠ **NOTE!** The Super-user/Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) has all of the above privileges.

With the above privilege levels, there are three (3) categories of users that can be defined for MedDream PACS Server Edition:

Category	Description
Administrator	This is the pre-defined user account '**root'** for MySQL or '**SYSTEM'** for Oracle databases. There is only one (1) such account and it is required to perform all user administration tasks.
System Administrators	These are the user accounts with the '**System Administration**' privilege Enabled by the Administrator. These users can access system-level configuration information such as the Email Server, System Configuration, Journal, or System-level Job Status pages, etc.
Power Users	These are the user accounts with the '**Modify'** and '**View'** privileges Enabled by the Administrator. These users can access all Public and Private patients/studies in the database, and they can also modify and delete existing database records.
Regular Users	These accounts are usually created for the referring physicians or reading physicians. They do not have the '**View'** privilege and can only access the Public patients/studies, or the Private patients/studies whose Referring/Reading Physician Name matches with the Last Name and First Name of the user profile.

Table 3 MedDream PACS Server User Categories

Creating Group User Accounts

Clicking on the '**Add User Group**' button will display the "Add New User Group" page as illustrated below:

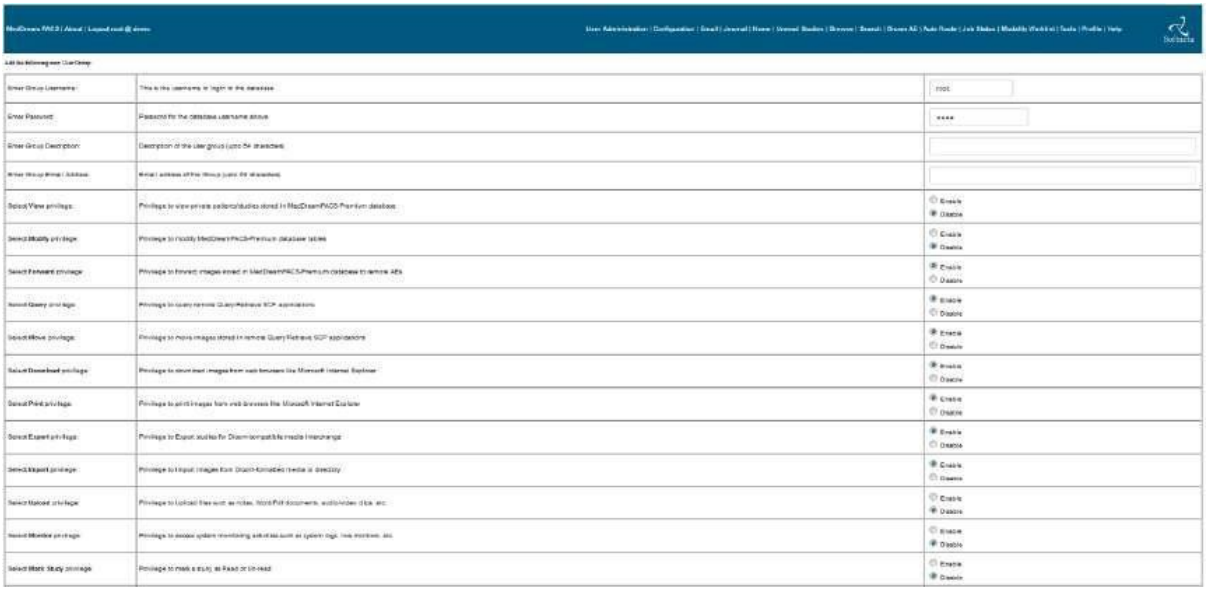


Figure 4 Creating Group User Accounts

A Group User account has almost the same attributes as a normal user account, e.g., username/password, email address, privileges, etc., except that the Group Description of a Group User account is used by MedDream PACS Server to match against the Institution Name of a private patient/study, when determining if the Group User can access that private patient/study. In addition to all the privileges of a regular user account, a Group User has the following configurable options that can be administered only for Group Users:

Option	Description	Default
Group Share	If this privilege is enabled, MedDream PACS Server will check all users of the group and see if any of them has a matching Referring, Reading or	Disabled

	Requesting Physician's Name of a private study, to determine whether users of the group can access that private study. For example, if a user of this group has a matching last name/first name with either the Referring, Reading or Requesting Physician's Name of a private study, and this privilege is enabled for the Group of that user, then all other users of this group can access the same private study.	
Sub-String Group Matching	If this option is enabled, then instead of using **Exact-Matching** method when checking if this group has access to a private patient, MedDream PACS Server will check whether the **Group Description** of this group is a sub-string of the **Institution Name** of that patient.	Disabled

Table 4 Options Specific for Group Users

Deleting Existing User Accounts

Only the Administrator/Super-user ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) can delete existing MedDream PACS user accounts from the User Administration page, by clicking the individual checkbox before the MedDream PACS username (or click the '**Check All**' button to delete all existing users) followed by the '**Delete**' button.

Modifying Existing User Accounts

Only the Administrator/Super-user ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) can modify existing MedDream PACS user accounts from the User Administration page, by clicking the '**Edit**' link for the particular user account that needs to be modified.

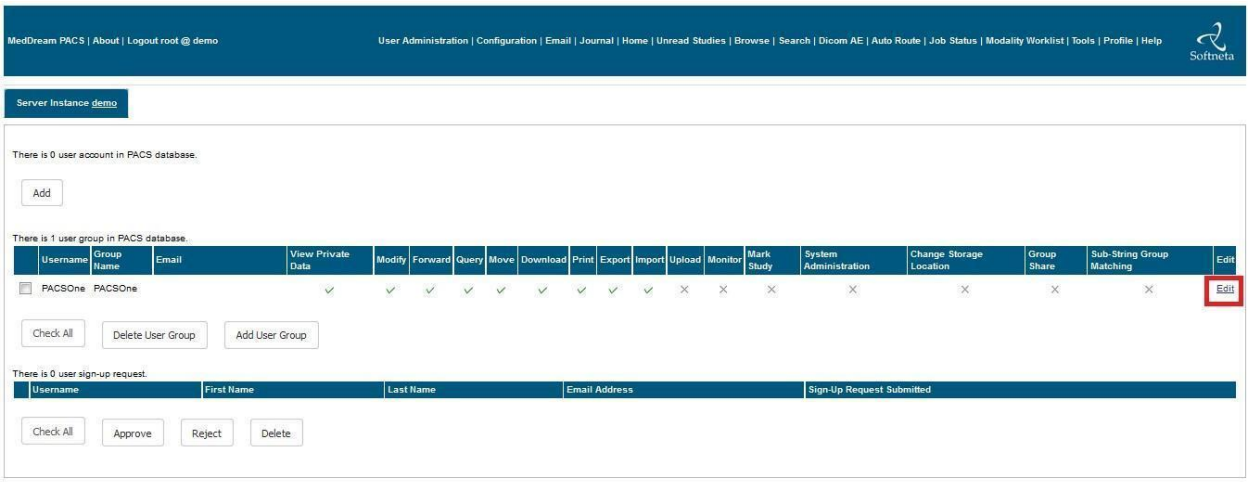


Figure 5 Modifying Existing User Account

The user's password, first name, last name, middle name can be modified, and all of the six (6) privileges can be independently Enabled or Disabled for this user account.

System Configuration

The Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) of MedDream PACS Server can configure the following system parameters by clicking on the **Configuration** link from the **Main Menu** bar:

- Default Short-term Archive Directory – This is the directory where the received images will be stored if there is no specific short-term archive directory defined for the source AE
- Default Archive Directory Format – This parameter controls the directory hierarchy under the designated archive directory. There are five (5) options:

- Flat - Received images are stored under **%Assigned Directory%/YYYY-MM-DD-WEEKDAY/** sub-folders
- Hierarchical - Received images are stored under **%Assigned Directory%/YYYY/MM/DD/** sub-folders
- Study Instance UID - Received images are stored under **%Assigned Directory%/%StudyUid%/** sub-folders, where **%StudyUid%** is the Study Instance UID of the received Dicom studies
- Combination - Received images are stored under %Assigned Directory%/YYYY-MM-DDWEEKDAY/$StudyUid/ sub-folders, where $StudyUid is the Study Instance UID of the received Dicom studies
- PatientID/StudyDate - Received images are stored under %Assigned Directory%/$PatientID/$StudyDate/ sub-folders, where $PatientID is the Patient ID of the Dicom study and $StudyDate is the Study Date when the Dicom study was acquired

- Automatically Age From Default Short-Term Archive Directory To Default Long-Term Archive Directory – If this option is enabled, MedDream PACS Server will automatically move images stored under the default short-term archive directory that were received more than **N** days ago, to the default long-term directory specified by the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases)
- Date and Time Schedule for Automatic Aging from Short-term to Long-term Archive Directory – This parameter controls the schedule when MedDream PACS Server will perform the automatic aging to move images from short-term to long-term directories. The default schedule is every Sunday morning at 01:00 a.m. local time.
- Browser Automatic Logout Period – This parameter controls the timeout/idle period (in minutes) for automatic logging out client browsers. The default value is 10 minutes
- User Password Expiration Period – This parameter controls the time period for automatic user password expiration, users need to select a new password when their passwords expire. The default value is 60 days
- Maximum Upload File Size – This parameter controls the maximum file size limit when users upload files. The default value is 2 MB. The smaller value of this parameter and the **upload_max_filesize** variable in your '**PHP.INI**' file controls the maximum file size limit when users upload files
- Upload Directory – This is the local directory used to store user-uploaded attachments and Dicom Part-10 formatted raw images. The default value is the **'upload'** sub-folder where MedDream PACS Server is installed
- Upload Attachment – Whether MedDream PACS Server should store uploaded attachment into the database table directly, or store them as regular files under the above **'Upload Directory'**. The default is to store attachment into the database table directly
- Directory for Storing Thumbnail JPG/GIF Images – This is the directory used to store the cached thumbnail .jpg/.gif images displayed to the browsers. The default is to store the .jpg/.gif images under the "**php/thumbnails**" sub-folder where MedDream PACS is installed
- Directory for Storing Full-Size JPG/GIF Images – This is the directory used to store the cached full-size .jpg/.gif images displayed to the browsers. The default is to store the .jpg/.gif images under the "**php/images**" sub-folder where MedDream PACS is installed
- Auto-Scan Directory – The Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) can enable or disable this feature, and if enabled, MedDream PACS will automatically scan the configured **Source Directory**, using the configured scan interval:

- Source Directory – If enabled, MedDream PACS Server will automatically scan this local directory for any Dicom Part-10 formatted images with the "***.dcm**" filename extension. If the image are indeed Dicom Part-10 formatted but the image files do not end with the "***.dcm**" filename extension, you can force MedDream PACS Server to scan all files under this source directory, by adding the following Registry value (for Windows users):

  HKEY_LOCAL_MACHINE\Software\RainbowFish
  Software\PacsOne\${AeTitle}\AutoScanAnyFile

  And set the DWORD value to 1.

  For Linux/Mac OS X users, the same configuration can be set by adding the following line to the "${AeTitle}.ini" file under the directory where MedDream PACS is installed:

  AutoScanAnyFile = 1

- Destination Folder – If MedDream PACS Server has found and scanned any Dicom Part-10 formatted image in the **Source Directory**, it will move the image to this **Destination Folder** and parse it into the MedDream PACS Server database
- Scan Interval – Time interval (in seconds) for the period scan of the above **Source Directory**. The default value is 60 seconds and the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) can set it to any value larger than 60 seconds

This Auto-Scan feature is by default **Disabled** and can only be enabled by the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases).

- Administrator's Email Address – This is the email address where the automatically-generated emails (e.g., Statistics Reports, System Journal Logs, etc.) will be delivered to. Multiple email addresses can be entered by using the coma (',') as the separator in between the addresses.
- Path to PHP Runtime Executable – Full path to the PHP runtime executable program ('**php.exe**'). Default is "**C:\php\php.exe**" for Windows platforms, or **"/usr/local/bin/php**" for Linux/MacOS. This is required because MedDream PACS Server uses PHP internally to send outgoing emails.
- Email Notify Users About Failed Jobs – If enabled, MedDream PACS Server will send email notifications to registered user's email address (if defined) about any failed job submitted by that user.

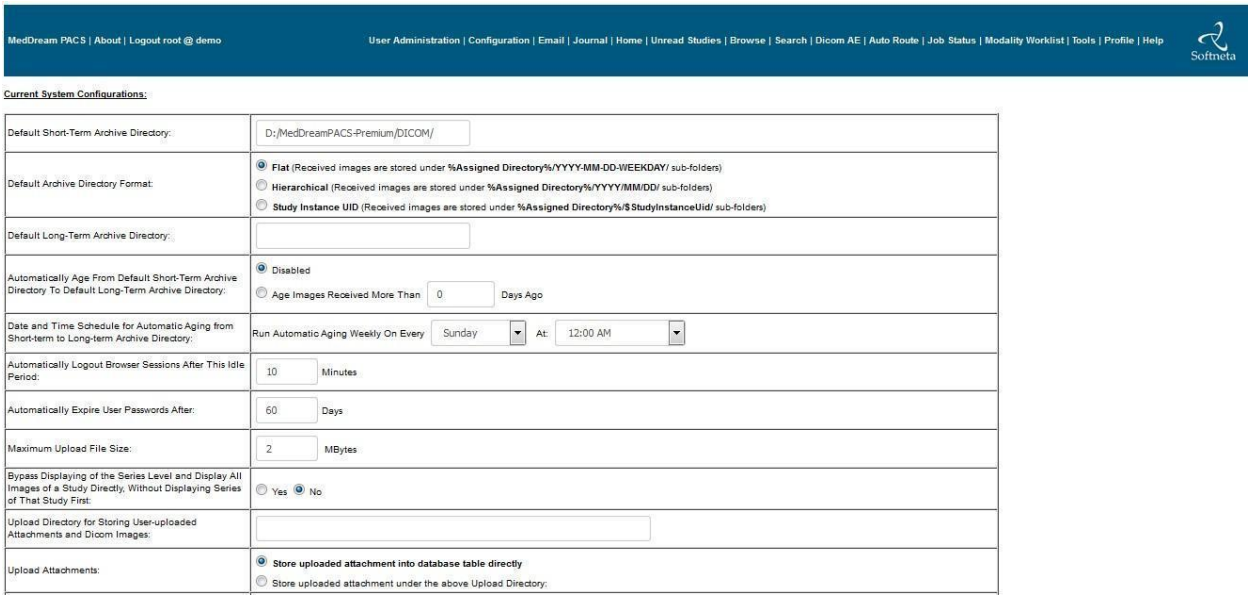


Figure 6 System Configuration Page

- Automatic Patient Reconciliation – If enabled, MedDream PACS Server will use the patient demographics information (Patient ID, Patient Name and Date of Birth) from the Dicom Modality Worklist (DMWL) data or the HL7 Patient Order (ORM) messages to match with the same information contained in the received Dicom studies, and will automatically correct the Patient Name if there is any discrepancy found in the received Dicom studies. For example, if the scheduled DMWL/HL7 ORM data has a patient with the Patient ID of "12345", Patient Name of "Doe^John" and DOB of "2007-10-18", then a Dicom study is received with the same Patient ID and DOB, but different Patient Name of "Doe^Johnny". In this case, if the **Automatic Patient Reconciliation** feature is enabled, MedDream PACS Server will automatically correct the Patient Name in this received Dicom study to "Doe^John" to match with the Patient Name in the DMWL/HL7 ORM data, and log this event to the **Patient Reconciliation** table described in Section 0.

- Automatic Study Reconciliation – If enabled, MedDream PACS Server will use the study related information (Referring Physician's Name, Requesting Physician's Name) from the Dicom Modality Worklist (DMWL) data to match with the same information contained in the received Dicom studies, and will automatically correct the Referring Physician's Name and/or Requesting Physician's Name if there is any discrepancy found in the received Dicom studies. For example, if the DMWL data has a procedure scheduled with the Referring Physician's Name of "Doe^John", then a Dicom study is received with the same Study Instance UID but different Referring Physician's Name of "Doe^Johnny". In this case, if the **Automatic Study Reconciliation** feature is enabled, MedDream PACS Server will automatically correct the Referring Physician's Name in this received Dicom study to "Doe^John" to match with the Referring Physician's Name from the DMWL data
- Auto-Scan Directory for Worklist Data – The Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) can enable or disable this feature, and if enabled, MedDream PACS will automatically scan the configured **Source Directory**, using the configured scan interval:

- Source Directory – If enabled, MedDream PACS Server will automatically scan this local directory for any text files that may contain the Dicom Modality Worklist (DMWL) data. The format of the worklist text file is specified in Section 0.
- Scan Interval – Time interval (in seconds) for the period scan of the above **Source Directory**. The default value is 60 seconds and the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) can set it to any value larger than 60 seconds

This Auto-Scan Worklist feature is by default **Disabled** and can only be enabled by the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases).

- Enable Statistics Report Emails – The Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) can enable or disable the checkboxes for the daily, weekly, or monthly statistics report emails, as well as the monthly journal report emails, that are sent to the Administrator's email address.
- Enable Automatic Conversion of Received Dicom Images into Thumbnail/Full-size JPG/GIF images – If enabled by the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases), MedDream PACS Server will automatically convert received Dicom images into the thumbnail/full-size JPG/GIF images upon reception, so that the converted JPG/GIF images can be loaded much faster by the web browsers when comparing to the case where the JPG/GIF images must be converted on-demand.
    - Annotate converted JPG/GIF images with patient information (e.g., Patient ID, Patient Name, etc) – If this option is enabled, MedDream PACS Server will annotate converted full-size JPG/GIF images with the patient information from the received Dicom studies.
- Convert Received Dicom Video into HTML5 or Flash Video Format – If enabled, MedDream PACS Server will automatically convert received Dicom video object images into the following HTML5/Flash video formats:

- WebM
- MP4
- SWF (Flash) (Discontinued)

- Enable Display of Veterinary Specific Information – If enabled by the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases), MedDream PACS Server will display database columns or information that are specific for veterinary systems, for example, patient species, patient breed, owner, etc.

- Select Specific Character Set – Instead of the Dicom default character set (ISO IR-6), the Administrator can select from the following non-default character sets:

- Simplified Chinese - ISO IR-192/GB18030
- Korean - ISO IR-149
- Japanese JIS X 0201 – ISO IR-13
- Japanese JIS X 0208 – ISO IR-87
- Japanese JIS X 0212 – ISO IR-159
- Unicode - ISO IR-192

- Web Access to DICOM Persistent Objects (WADO) Security Model – MedDream PACS Server requires authentication (username/password) for Web Access to DICOM Persistent Objects (WADO). There are 2 authentication methods supported:

- Use Username/Password from HTTP GET/POST Request or Basic Authentication
- Use Pre-Configured Username/Password

Either method requires the specified username/password to be valid, and should be pre-configured by the Administrator from the "**User Administration**" page described in Section 0.

- Website URL to embed in statistics report emails for external access – This configuration is used to embed website URL in the statistics report emails sent from MedDream PACS Server, so that users can simply click on the embedded URL link in the emails to launch a web browser to access the URL-linked Dicom studies. The website URL should be the external domain name (DNS) or IP address of the web server where MedDream PACS Server database is hosted, e.g., http://192.168.0.100/MedDream_PACS/, etc.
- Enable Remote LDAP Server for User Authentication – If enabled, MedDream PACS Server will use this remote LDAP server for user authentication and management. All user accounts (e.g., usernames, passwords, email addresses, etc) are administered by this LDAP server and MedDream PACS Server will synchronize with this LDAP server on-demand by the Administrator via the "**LDAP User Administration**" page. Once synchronized, the Administrator can then manager the MedDream PACS Server-specific access privileges (e.g., View Private Studies, Download, Upload, etc) for the synchronized user accounts from the "**LDAP User Administration**" page.

- Remote LDAP Server Host - This is either the DNS Hostname or the IP address of the remote LDAP server
- Remote LDAP Server Port - This is the TCP port the remote LDAP server listens to for client connections

- Enable Customized PHP Scripts – If enabled, MedDream PACS Server will check the "php/custom/" sub-folder where MedDream PACS is installed, and run any user-customized PHP scripts under that folder according to the configured daily, weekly or monthly schedule.
- Full Path to Site Specific/Non-default Directory of PHP Scripts – This setting may be configured if users need to run customized PHP scripts as a specific website, instead of the default "pacsone" website with the standard set of scripts under the "php/" sub-folder where MedDream PACS Server is installed.
- Number of Threads in Parallel Processing Thread Pool – When running timeconsuming tasks such as Importing from a very large number of Dicom image files (e.g., > 1 TB), Compressing the Entire Database, Automatic Aging stored Dicom image files from Short-term to Longterm Archive

Directories, etc., MedDream PACS Server will spawn a pool of parallel processing threads and divide the total workload among this pool of threads running in parallel in order to reduce the processing time. This setting controls the total number of threads spawned in this thread pool and the default value is 6. The recommended maximum value for this parallel processing thread pool is the number of logical processors available on the host where MedDream PACS Server is running, which is typically 2x the number of physical CPU cores. For example, if the host has total of 8 physical CPU cores/16 logical processors, then the maximum value for this setting should be 16.

SMTP Server Configuration

The Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) of MedDream PACS Server can configure a SMTP server for sending outgoing emails, by clicking on the **Email** link from the Main Menu, and enter the following information:

- SMTP Server Hostname or IP Address – This is the hostname or IP address of the SMTP server, which can be either the same server (localhost) or a remote host
- Port Number – The TCP port number the SMTP server listens to. Default is 25 if no encryption is used
- Encryption Type – Data encryption used by the SMTP server. There are 3 options supported:

- None – No encryption. The corresponding default SMTP port is 25
- TLS – TLS encryption. The corresponding default SMTP port is 587
- SSL - SSL encryption. The corresponding default SMTP port is 465

- Description – Text description of this SMTP server
- From: Email Address – This is the email address used in the **From:** field in outgoing email messages
- From: Person Name – This is the Person Name used in the **From:** field in outgoing email messages
- Authentication Type **–** SMTP authentication type. Can be set to one of the following:

- None – No other configuration is required
- LOGIN, CRAM-MD5, or PLAIN – A valid username/password pair is required
- NTLM - A valid username/password pair, and the hostname of the NTLM Workstation are required

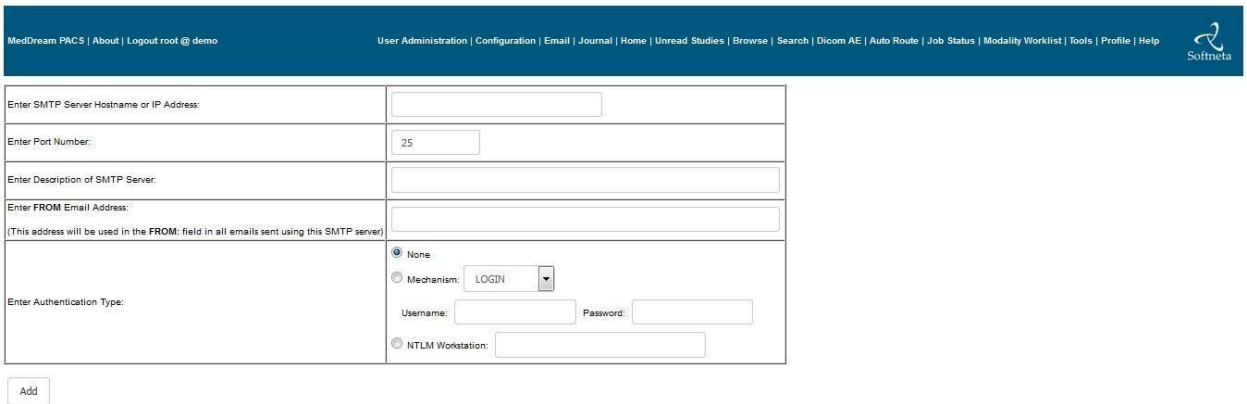


Figure 7 Configuring SMTP Server

System Journal Log

To support HIPAA Auditing requirements, MedDream PACS Server automatically logs all user activities into the **System Journal Log** table, and only the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) can access this table by clicking on the **System Journal** link from the Main Menu. The following information will be displayed from the **System Journal Log**:

- When – The date and time when the event took place
- Username – The username for which the event was logged
- Operation – The operation this user performed for which the event was logged
- Level – The subject level of this event, e.g., Patient, Study, Series, Image, etc.
- UID – The unique ID identifying this event, e.g., Patient ID, Study/Series/Instance UID, etc.
- Details – The details of this event

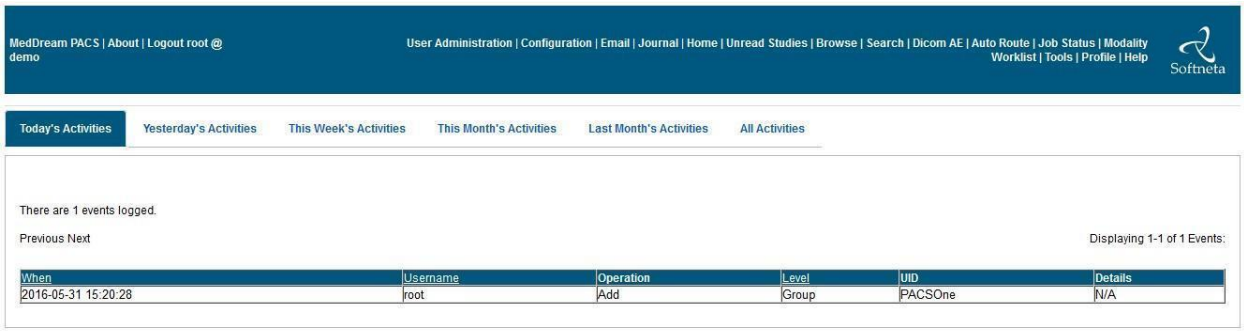


Figure 8 System Journal Log

The Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) can choose from the following time-based views of the events logged in the **System Journal Log**:

- Today's Activities
- Yesterday's Activities
- This Week's Activities
- This Month's Activities
- Last Month's Activities
- All Activities

Automatic Monthly System Journal Log Emails

If a valid SMTP server and the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases)'s email address have been configured (See Section 7 above), then on the first day of every month, MedDream PACS Server will automatically send an email with all events in the **System Journal Log** during the previous month to the configured Administrator's email address.

Automatic Purging Aged System Journal Log

On the first day of every month, MedDream PACS Server will automatically purge older events logged in the **System Journal Log** that occurred before the first day of the previous month.

To change the purge interval for system journal logs from the default 60 days, users can add or modify the following Registry value:

HKEY_LOCAL_MACHINE\Software\Rainbowfish
Software\PacsOne\{AETITLE}\JournalPurgeInterval

Set or change the DWORD value to the Number of Days in which the older system journal logs will be purged.

Application Entity Table

Before MedDream PACS can communicate with other DICOM compliant application entities, they need to be configured properly in the Application Entity table as described below:

Column	Description	SCU or SCP Role	Default
Title	Application Entity (AE) Title. This is the key of this table.	Both	N/A
Hostname	Hostname of the remote AE. This is used to lookup the IP address of the remote AE if the IP address is not defined.	Both	None
IP Address	IP address of the remote AE.	Both	None
Port	TCP port number of the remote AE.	SCP	None
TLS Option	Whether or not the remote AE supports the Dicom TLS option	SCP	No
Database Access	'Enable' or 'Disable' access to MedDream PACS database for this remote application entity. If set to 'Disable', MedDream PACS server will reject any association requests with the specified application entity title.	Both	Disabled
Allow Dicom Commands	Enable or Disable the following individual Dicom commands sent from the remote AE: ● C-FIND ● C-MOVE ● C-STORE ● C-GET ● Modality Worklist - FIND Data element or key-based filters can be defined for each of the above enabled commands. Please refer to Section 0 below about how to configure command filters for SCU application entities.	SCU	Allow C-FIND, C-STORE, C-GET, C-MOVE and Modality Worklist – FIND with no filters
Short-Term Archive Directory	Short-term archive directory path for this AE. This field is required for C-STORE SCU clients. MedDream PACS Server will store received images under this directory based on the **Archive Directory Format** for this AE.	SCU	None

Archive Directory Format	Either **Flat** or **Hierarchical** format for storing images received from this AE. Please refer to Section 0 below for more details.	SCU	Flat format
Long-Term Archive Directory	Long-term archive directory path for this AE. If this field is defined and **Automatic Aging** is enabled for this AE, MedDream PACS will automatically age/move images stored in the Short-Term Archive Directory to this Long-Term Archive Directory.	SCU	None
Send Email Notification	Send email notification to the user registered as the Referring Physician when a new Dicom study from this AE is received.	SCU	No
Compress Received Images	Compress images received from this AE via the selected Dicom compression transfer. Please refer to Section 0 below for more details	SCU	Disabled
Query SCP	Boolean flag indicating whether this remote AE is a DICOM Query/Retrieve SCP or not.	SCP	False
Worklist SCP	Boolean flag indicating whether this remote AE is a DICOM Modality Worklist Management SCP or not.	SCP	False
Print SCP	Boolean flag indicating whether this remote AE is a DICOM Printer or not.	SCP	False
Storage Commitment Report SCP	Boolean flag indicating whether this remote AE is a DICOM Storage Commitment Report SCP or not. If the "**Request Storage Commitment Report for Dicom images sent to this SCP**" option is enabled for this SCP, MedDream PACS Server will request for Storage Commitment Report for any image sent to this SCP.	SCP	False
Maximum Outgoing Sessions	The maximum number of simultaneous outgoing connections MedDream PACS Server will establish with the remote AE.	SCP	10
Preferred Transfer Syntax Tx	Users can define a preferred transfer syntax for this AE, so that MedDream PACS will prefer to use this defined transfer syntax when sending images to this remote AE.	SCP	Use original transfer syntax when image was received
Separate Dicom Presentation Context	If this option is enabled, MedDream PACS Server will propose a separate Dicom Presentation Context for each supported Transfer Syntax when sending images to this destination AE.	SCP	No
Preferred Transfer Syntax Rx	Users can define a preferred transfer syntax for this Source AE, so that MedDream PACS will prefer to use this defined transfer syntax when receiving images from this Source AE.	SCU	None
Mark Retrieved Studies as Read	Mark studies retrieved to this AE as **Read** with the AE Title of this AE.	SCP	No
Job Queue Priority	Job queue priority when processing database jobs with this destination AE (default priority is 0 - Normal. Database jobs with higher priority destination AEs will be processed before those jobs with lower priority destination AEs).	SCP	0
Anonymize Received Studies	Anonymized studies received from this AE via the syntax rules in a pre-defined template. Please refer to Section 0 below for more details.	SCU	Disabled
Assign Dicom Studies Received From This AE To Web Users	Assign Dicom studies received from this Source AE to specified web users.	SCU	Disabled
AE Group Settings	Configure one or more individual Source AEs as a group, so that the group AE can be used as the Destination AE for Automatic Routing. Please refer to Section 0 below for more details.	SCP	No

Convert Person Names to Latin1 (ISO8859-1) Character Set in Dicom Modality Worklist (DMWL) Query Results	Configure one or more individual Source AEs as a group, so that the group AE can be used as the Destination AE for Automatic Routing. Please refer to Section 10.1 below for more details.	SCU	No
Subscribe to Instance Availability Notification (IAN) Messages	Configure Dicom Instance Availability Notification (IAN) subscriptions for this AE. Please refer to Section 10.2.4 below for more details.	SCP	No

Table 5 Application Entity Table

For security purposes, only those users with '**Modify**' privilege can create, modify or delete entries in the Application Entity table. Click on the 'Application Entity' link from the Main Menu bar to view, add, modify or delete entries in the Application Entity table, which is illustrated below:

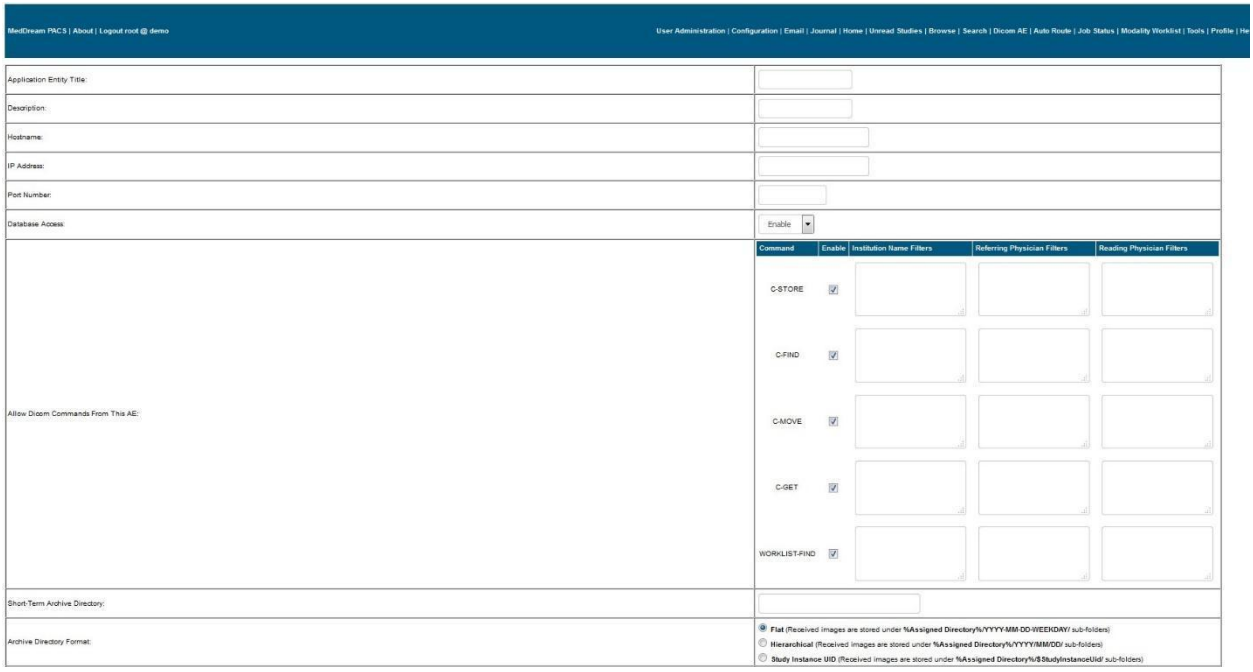


Figure 9 Adding a New Application Entity

The following attributes are common among all Dicom SCU or SCP applications:

- AE Title – Dicom Application Entity (AE) Title string. Maximum of 16 characters with no white-space characters
- Description – Text description of this Dicom AE
- Hostname – Name of the host where this Dicom AE is located
- IP Address – IP address of the host where this Dicom AE is located

Figure 10 Application Entity Table Page

SCU Application Entities

In addition to the columns common to the Application Entity table, i.e., AE Title, Hostname, IP Address, the following SCU specific values will be displayed in the Application Entity Table page if the AE is a SCU:

- Allow Access – Whether to enable or disable access for this AE
- Allow Dicom Commands – Whether to enable or disable Dicom commands (C-STORE, C-FIND, C-MOVE, and Modality Worklist - FIND) sent from this SCU. Additionally for each enabled command, the following data element or key-based filters can be defined to further match the enabled Dicom command:

- Institution Name – (0008,0080)
- Referring Physician's Name – (0008,0090)
- Reading Physician's Name – (0008,1060)

For each of the above filters, a string pattern (including wild-card characters '*' and '?') can be specified to match against the received image or Dicom command messages. For example:

- If the Dicom C-FIND command is enabled for a source AE, and a filter for Institution Name is defined with the string pattern of "Springfield General", then MedDream PACS will allow Dicom Queries (C-FIND) from this source AE, but will only return matching results for those patients with the matching Institution Name of "Springfield General".
- If multiple filters are defined for an enabled command, then the filters will be combined with logical OR ('**||**') operators. For example, if both a filter for Institution Name pattern of "Springfield*", and a filter for Referring Physician's Name pattern of "Dr. Hibbert" are defined for the Dicom C-STORE command, then MedDream PACS will allow Dicom C-STORE command sent from this source AE, but will only accept images that either pattern match with the Institution Name of "Springfield*", or the Referring Physician's Name of "Dr. Hibbert".
- For the same filtering key or data element, multiple string patterns can be specified by using the semicolon ('**;**') as the delimiter. For example, for the same Institution Name filter, if the string pattern of "Springfield* ; Capital City*" is defined for the Dicom C-STORE command, then MedDream PACS will only accept images that either pattern match with the Institution Name of "Springfield*", or the Institution Name of "Capital City*".
- If a Dicom command is enabled for a source AE, but no filter is defined for that command, then MedDream PACS will always accept that Dicom command sent from the source AE without any filtering.

- Short-Term Archive Dir – Short-Term Archive directory for this AE if this AE is a C-STORE SCU.

- On Windows platforms, this directory path can be set to a folder on a local disk, e.g., **C:\Images\CT**, or it can be set to a network-shared path in Windows Universal Naming Convention (UNC) format, e.g., **\\Hostname\Dir\SubDir**.

⚠ **NOTE!** When using network-shared path as archive directories, users must make sure that the Windows local user account (default is '**SYSTEM**') MedDream PACS Server is using has **Full** access to the network-shared path.

- On Linux platforms, both the local disks and the network attached storage paths are accessed via the standard UNIX "/" path specifications, e.g., **/home/images/CT/**.

⚠ **NOTE!** When using network-attached storage path as archive directories, users must make sure that the user account (default is '**root'**) MedDream PACS Server is using has **Read/Write** privileges to the network-attached storage path.

- Archive Directory Format – Users can choose from the following directory layouts:

- Flat – Received images are stored under current-date based (**YYYY-MM-DD-WEEKDAY/**) sub-folders under the assigned archive directory. For example, if today is January 15, 2006, then all images received today are stored under **$AssignedDirectory/2006-01-15-SUN/**.
- Hierarchical – Received images are stored under current-date based (**YYYY/MM/DD/**) sub-folders under the assigned archive directory. For example, if today is January 15, 2006, then all images received today are stored under **$AssignedDirectory/2006/01/15/**.
- Study UID – Received images are stored under the Dicom Study Instance UID sub-folders under the assigned archive directory. For example, if the Study Instance UID of the received Dicom study is " 1.2.840.113674.514.212.200", then all images of that study will be stored under **$AssignedDirectory/ 1.2.840.113674.514.212.200/**.
- Combination – Received images are stored under the current-date based (YYYY-MM-DDWEEKDAY/) and Dicom Study Instance UID sub-folders under the assigned archive directory. For example, if today is January 15, 2006 and the Study Instance UID of the received Dicom study is " 1.2.840.113674.514.212.200", then all images of that study will be stored under $AssignedDirectory/2006-01-15-SUN/1.2.840.113674.514.212.200/
- PatientID/StudyDate - Received images are stored under %Assigned Directory%/$PatientID/$StudyDate/ sub-folders, where $PatientID is the Patient ID of the Dicom study and $StudyDate is the Study Date when the Dicom study was acquired. For example, if the received Dicom study was acquired on January 15, 2006 and the Patient ID is "MRN123456", then all images of that study will be stored under $AssignedDirectory/MRN123456/2006-01-15-SUN/.

- Long-Term Archive Directory – Long-Term Archive directory for this AE. See the **Automatic Aging** option below.
- Automatically Age From Short-Term Archive Directory To Long-Term Archive Directory – If this option is enabled, and the **Long-Term Archive Directory** above is defined, then MedDream PACS will automatically age images stored in the Short-Term Archive Directory to the defined Long-Term Archive Directory, by moving all images stored under the Short-Term Archive Directory that were received prior to the user-defined **Aging Period** (in days) to the defined Long-Term Archive Directory.
- Date/Time Schedule for Automatic Aging – Weekly date/time schedule to perform the Automatic Aging from short-term to long-term archive directories. For example, every Sunday at 12:00 am, etc.
- Directory Usage – Current disk space usage of the Archive Directory if this AE is a C-STORE SCU
- Send Email Notifications When New Study From this AE is received – If this feature is enabled, and a new Dicom study is received from this AE with the Referring Physician's Name matching with one

of the web user's first and last names, MedDream PACS Server will send a notification email to that user's email address (if defined) about the newly received study.

- Compress images received from this AE – If a Dicom compression transfer syntax is defined for this AE, MedDream PACS Server will automatically compress any uncompressed Dicom images received from this AE using the defined Dicom compression transfer syntax, so that the compressed Dicom images can be delivered to the web viewers than the uncompressed images (Please see Section 0 for more details about this feature).
- Anonymize studies received from this source AE – If this option is enabled, MedDream PACS Server will anonymize Dicom studies received from this source AE by the syntax rules pre-defined in a template selected by the user (Please see Section 0 for more details about this feature).
- Anonymize studies when sending to this destination AE – If this option is enabled, MedDream PACS Server will anonymize Dicom studies when sending them to this destination AE by the syntax rules pre-defined in a template selected by the user (Please see Section 0 for more details about this feature).
- When Receiving Images from this Source AE Do Not Modify the Patient and Study Tables – If this option is enabled, MedDream PACS will not update the PATIENT and STUDY tables with the information from the newly received Dicom study. This option is useful when you want MedDream PACS to function as a Write-Once PA.
- Fetch Prior Studies of the Same Patient When A New Study Is Received From This Source AE – If this option is enabled MedDream PACS will query/retrieve the pre-configured remote Dicom Query/Retrieve SCP and fetch all prior studies of the same patient.
- Assign Dicom Studies Received From This AE To Web Users – The Administrator can enable this option and assign one or more web users to a Source AE defined in the **Application Entity** table, so that the web users assigned to this Source AE can access all Dicom studies received from this Source AE, even if the assigned web users do not have the '**View**' privilege to access private studies, or their registered last and first names do not match with either the **Referring Physician's Name** or the **Reading Physician's Name** of the received Dicom study.
- Use Transcription Template for Dicom Studies Received from this AE – If this option is enabled, MedDream PACS Server will assign the selected transcription template for any Dicom study received from this source AE, so that the web users can download the Microsoft Word document template with the pre-configured bookmarks automatically filled-in with information from that Dicom study. (Please see Section 0 for more details about this feature).
- Convert Person Names to Latin1 (ISO-8859-1) Character Set in Dicom Modality Worklist (DMWL) Query Results – When returning the DMWL query results to this client AE and this option is enabled, PacsOne Server will convert/transliterate non-Latin1 person names (e.g., Patient Name, Referring Physician's Name, Requesting Physician's Name, Performing Physician's Name, etc) to Latin1 (ISO8859-1) texts. The following Dicom character sets (non-Latin1) are currently supported: Cyrillic/ISO-8859-5 – Dicom ISO_IR 144 Character Set TIS-620/ISO-8859-11 – Dicom ISO_IR 166 Character Set (Thai language) Lithuanian Unicode/UTF-8 – Dicom ISO_IR 192 Character Set Thai Unicode/UTF-8 – Dicom ISO_IR 192 Character Set (requires Python Run-time Environment which can be downloaded/installed from https://www.python.org/downloads/)

SCP Application Entities

In addition to the columns common to the Application Entity table, i.e., AE Title, Hostname, IP Address, the following SCU specific values will be displayed in the Application Entity Table page if the AE is a SCP:

- Verify Connection – Clicking on the **Ping** link will verify if the remote SCP can accept DICOM association requests by sending a C-ECHO request to the specified TCP port number. If the C-ECHO is accepted successfully, a pop-up message box will be displayed to indicate confirmation for the C-ECHO request. Otherwise, an error page will follow with any possible source or reason for the failure.
- Remote Exams – Clicking on the **Query/Retrieve** link will display the Search Remote PACS Database page as illustrated below:

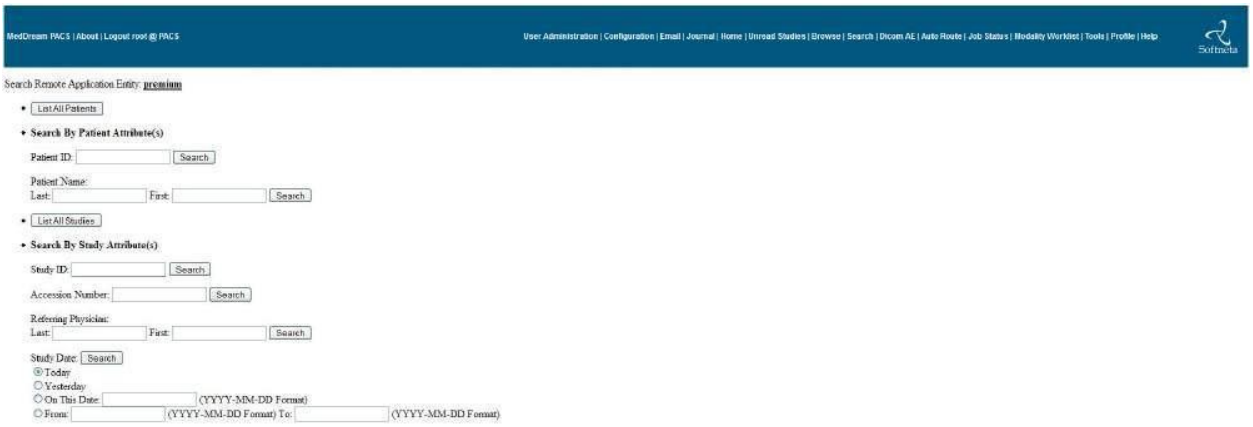


Figure 11 Search Remote PACS Database

Where you can search by using the following criteria:

- List All Patients – Selecting this option will send a Patient-Root Information Model C-FIND request with **Universal Matching** for the Patient ID attribute to the remote Query/Retrieve SCP.
- Search By Patient Attributes – You can search either by Patient ID or Patient Name attribute, wild-card characters '*****' (one or more characters) and '**?**' (Any single character) are supported. If wild-card characters are used, then a C-FIND request with **Wild-Card Matching** for either the Patient ID or Patient Name attribute will be sent to the remote Query/Retrieve SCP. Otherwise**, Single Value Matching** will be used instead.
- List All Studies – Selecting this option will send a Study-Root Informational Model C-FIND request with **Universal Matching** for the Study UID attribute to the remote Query/Retrieve SCP.
- Search By Study Attributes – You can search by Study ID, Accession Number, Referring Physician's Name or Study Date. Wild-Card characters are supported for searching by Study ID, Accession Number or Referring Physician's Name. **Wild-Card Matching** will be used in the C-FIND request if wild-card characters are used when searching for Study ID, Accession Number or Referring Physician's Name, **Single Value Matching** will be used otherwise. **Single Value Matching** will be used when searching by Study Date for Today, Yesterday or a particular fixed date; **Range Matching** will be used otherwise when searching by Study Date.
- Search By Series Attributes – You can search by Modality or Series Date. Wild-Card characters are supported for searching by Modality. **Wild-Card Matching** will be used in the C-FIND request if wild-card characters are used when searching for Modality, **Single Value Matching** will be used otherwise. **Single Value Matching** will be used when searching by Series Date for Today, Yesterday or a particular fixed date; **Range Matching** will be used otherwise when searching by Series Date.

- Modality Worklist – Clicking on the **Get Worklist** link will initiate a DICOM Worklist-FIND command to the remote Worklist SCP and display any worklist item(s) retrieved from the remote AE.

- Printer Properties – Clicking on the **Printer Properties** link will initiate a DICOM N-GET command to the remote Dicom printer and retrieve the properties and current status information of the remote printer.

Modality Worklist SCP Application Entities

If the '***WorklistScp***' attribute is set to '***True***' for a specified AE in the Application Entity table, MedDream PACS Server will poll the corresponding Worklist SCP periodically to retrieve worklist items using a pre-defined interval. The default polling interval is 10 minutes, and this interval is configurable by modifying the following Windows Registry value:

HKEY_LOCAL_MACHINE\Software\Rainbowfish Software\PacsOne\{AETITLE}\WorklistPollInterval

Where:

{AETITLE*}* is the Application Entity Title you have assigned for MedDream PACS Server during installation.

Additionally, if MedDream PACS Server receives DICOM N-EVENT-REPORT **Study Scheduled** event notifications from remote Detached Study Management SCP applications, MedDream PACS will query any defined Modality Worklist SCP application entity (s) for the relevant study information contained in the **Study Scheduled** event report notification.

By default, MedDream PACS Server queries the remote Worklist SCP with the **Scheduled Procedure Start Date** filter of **Today's Date**, i.e., MedDream PACS will query the remote Worklist SCP for all procedures that are scheduled to start today or later. If you want MedDream PACS to also query for procedures scheduled for the last N days as well, you can add or set the following Windows Registry value:

HKEY_LOCAL_MACHINE\Software\Rainbowfish Software\PacsOne\{AETITLE}\ WorklistPollPeriod

Where:

{AETITLE*}* is the Application Entity Title you have assigned for MedDream PACS Server during installation.

Set the DWORD value to N if you want MedDream PACS to include the procedures scheduled in the last N days when it queries the remote Worklist SCP. If you want MedDream PACS to query for all scheduled worklist data from the remote Worklist SCP, you can set this DWORD value to 0xFFFFFFFF (-1).

Pre-Fetching of Dicom Studies for Scheduled AE Station

When MedDream PACS Server retrieves worklist information for a scheduled patient, and the scheduled AE station is defined in the Application Entity table of MedDream PACS Server, then MedDream PACS will automatically push any pre-existing studies of this patient of the same modality information to the scheduled AE station, so that the scheduled AE station won't have to fetch them manually from MedDream PACS if it wants to access prior studies of the scheduled patient.
This Pre-Fetching feature is enabled by default. To disable it, the following Registry DWORD value must be defined:

HKEY_LOCAL_MACHINE\Software\Rainbowfish Software\PacsOne\{AETITLE}\PrefetchStudiesFromWorklist

Where:

{AETITLE*}* is the Application Entity Title you have assigned for MedDream PACS Server during installation. The above DWORD value must be explicitly set to 0 in order to disable the Pre-Fetching feature.

Query/Retrieve SCP Application Entities

If the '***Query/Retrieve Scp***' attribute is set to '***True***' for a specified AE in the Application Entity table, users can optionally enable the Remote Study Synchronization feature by choosing from one of the following option boxes:

- Do Not Synchronize Remote Studies – This feature will be disabled.
- Synchronize Remote Studies On the Following 24 Hour Schedule – Users can choose up to 24 hourly schedules for MedDream PACS Server to synchronize remote studies stored on this remote AE. Users can further choose from the following synchronization methods:

- Synchronize All Remote Studies – MedDream PACS Server will query (**C-FIND**) this remote AE and find all studies that are not currently in the local MedDream PACS Serve database, MedDream PACS Server will then fetch (**C-MOVE**) those studies from this remote AE.
- Synchronize Remote Studies Received within the Last [N] Days – MedDream PACS Server will query (**C-FIND**) this remote AE and find all studies that were recently received within the last N days, MedDream PACS Server will then fetch (**C-MOVE**) those studies from this remote AE.
- Update Existing Studies If Already Exist – If this checkbox is selected, MedDream PACS Server will retrieve studies stored in this remote AE, even if they already exist in the current MedDream PACS Server database.

Users can visit the '**Job Status**' page to check the status of these scheduled remote synchronizations on a daily basis.

- Mark Retrieved Studies as Read – If this feature is enabled, MedDream PACS Server will mark a study as **Read** after it has been retrieved or moved to this destination AE.
- Job Queue Priority – This is the priority when processing database jobs for this destination AE. The default value is 0 which means **Normal** priority. Database jobs with higher priority destination AEs will be processed before those jobs with lower priority destination AEs.

AE Group Settings

If an Application Entity (AE) is configured as an AE Group with one or more application entities as members, then this group AE can be used as a round-robin distribution group when it's configured as the Destination AE for an automatic routing rule with the "**Wait N Minutes and Forward the Entire Study**" option enabled. For example, if an AE group consists of 3 individual member AEs: AE#1, AE#2 and AE#3 and this AE group is configured as the Destination AE for an automatic routing rule with the "**Wait N Minutes and Forward the Entire Study**" option enabled, then the 1st matching study received will be forwarded to AE#1, the 2nd matching study received will be forwarded to AE#2, the 3rd matching study received will be forwarded to AE#3, the 4th matching to AE#1, the 5th to AE#2, the 6th to AE#3, etc. So in summary, the AE group serves as the round-robin distribution method to forward matching studies received to all member AEs.

Instance Availability Notification (IAN) Subscriptions:

If enabled, PacsOne Server will send Dicom Instance Availability Notification (IAN) messages to this AE depending on the following configuration: Notify this AE when Dicom images are received from any source AE – PacsOne Server will send IAN messages to this AE when a Dicom image is received from any source AE. NOTE: This option will result in a large number of Dicom IAN messages being sent from PacsOne Server to this AE, so make sure this AE can handle such kind of load and also your network can sustain heavy Dicom traffic if there are multiple AEs with this option enabled. Notify this AE when Dicom images are received from the following source AEs – Instead of sending a Dicom IAN message for every image received from any source AE, this AE can subscribe to only a list of interested source AEs so that PacsOne Server will send the IAN message only if a Dicom image is received from a source AE on the subscribed list.

HL7 Applications (optional)

This page will be displayed if the optional HL7 Message Listener module is installed along with MedDream PACS Server Edition, where the users can add, modify or delete defined HL7 applications:

- Application Name - Name of this HL7 application. This name is used as the key to the HL7 Application table, so multiple HL7 applications cannot share the same name.
- Facility - Facility of this HL7 application.
- Description - Description of this HL7 application.
- Hostname - Name of the host where this HL7 application is running.
- IP Address - If DNS hostname is not configured above, then a static or dynamic IP address can be configured here.
- Port Number - TCP port this HL7 application listens to for incoming connections.
- Maximum Number of Simultaneous Connections - The maximum number of simultaneous connections that MedDream PACS Server will establish with this HL7 application at any time. Default value is 10.
- Enable ORU Report Notification Message for Newly Received Dicom Studies - If this option is enabled, MedDream PACS Server will send a HL7 ORU message to this HL7 application with the URL for accessing newly received Dicom studies when they are received for the very first time.

Figure 12 HL7 Applications (optional)

Searching MedDream PACS Database

Clicking on the '**Search**' link from the Main Menu bar will display the 'Search Local MedDream PACS Database' page, which is similar to the 'Search Remote PACS Database' page above, where users can search by patient, study, series or image attributes, or Dicom Modality Worklist (DMWL) records.

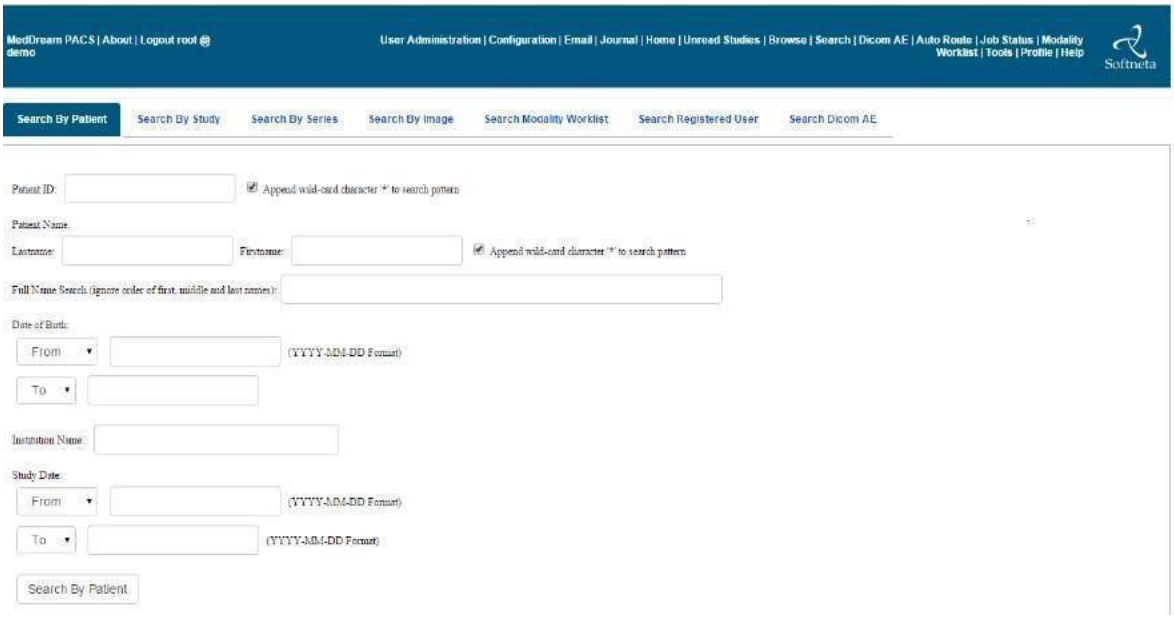


Figure 13 Search MedDream PACS Server Database

Search Registered User (Administrator Only)

The System Administrator can also search for a registered web user from the Search menu, by one or more of the following search criteria:

- Username – Wildcard characters such as '*' are supported
- Last name – Wildcard characters such as '*' are supported
- First name – Wildcard characters such as '*' are supported
- Email address – Wildcard characters such as '*' are supported

Search Dicom AE (Administrator Only)

The System Administrator can also search for a defined Dicom Application Entity (AE) from the Search menu, by one or more of the following search criteria:

- AE Title – Wildcard characters such as '*' are supported
- Description – Wildcard characters such as '*' are supported
- Hostname – Wildcard characters such as '*' are supported
- IP address – Wildcard characters such as '*' are supported
- Port number – Wildcard characters such as '*' are supported

Navigating MedDream PACS Web User Interface

After a MedDream PACS user account has been created successfully by the Administrator/Super-user ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) in Section 0, the user can access the MedDream PACS web user interface from any web browser, by logging into MedDream PACS from the URL below:

http://{HOSTNAME}/MedDream_PACS/home.php

⚠ **NOTE!** {HOSTNAME} is the name of the machine where MedDream PACS is installed.

Login Page

Before any of the MedDream PACS web user interface pages can be accessed, the user needs to be authenticated through the Login Page below, where a valid MySQL username and password must be specified:

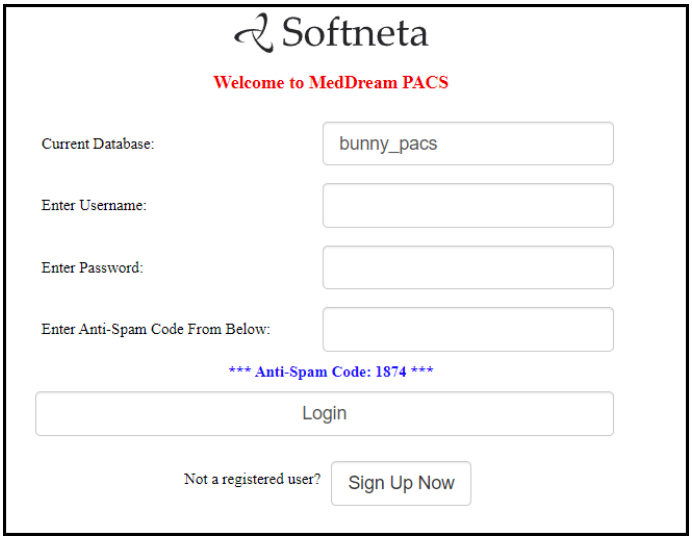


Figure 14 Login Page

Home Page (Today's Study Page)

After the user has been authenticated by the Login Page, the Home Page will be displayed below which contains a list of accessible studies received today:

Figure 15 Home Page (Today's Study Page)

Main Menu Bar

This navigation menu bar is displayed at the top of every MedDream PACS user interface, with the left side displaying the current logged-in user and right side displaying the following navigational links:

- User Administration – This link is displayed only if the current user is the Administrator/Super-user ('**root**' for MySQL or '**SYSTEM**' for Oracle databases), clicking on this page will display the main User Administration page described in Section 0 above.
- Configuration – This link is displayed only if the current user is the Administrator/Super-user ('**root**' for MySQL or '**SYSTEM**' for Oracle databases), clicking on this page will display the main System Configuration page described in Section 0 above.
- Email – This link is displayed only if the current user is the Administrator/Super-user ('**root**' for MySQL or '**SYSTEM**' for Oracle databases), clicking on this page will display the main SMTP Server Configuration page described in Section 0 above.
- Journal – This link is displayed only if the current user is the Administrator/Super-user ('**root**' for MySQL or '**SYSTEM**' for Oracle databases), clicking on this page will display the main System Journal Log page described in Section 9 above.
- Home – Clicking on this link will display the Today's Study page described in Section 13.2 above.
- Browse – Clicking on this link will display a list of all accessible patients in the database. See Section 13.4 below.
- Search – Clicking on this link will display the Search Local MedDream PACS Server Database page described in Section 12 - Searching MedDream PACS Database above.
- Dicom AE – Clicking on this link will display the Application Entity Table page described in Section 10 above.
- HL7 Applications (optional) – Clicking on this link will display the HL7 Application Table page described in Section 11 above.
- Auto Route – Clicking on this link will display the Automatic Routing page described in Section 15 below.
- Job Status – Clicking on this link will display the current scheduled database job status for the current user, which is described in Section 17 below.
- Modality Worklist – Clicking on this link will display the Modality Worklist Table described in Section 10.2 above.
- Tools – Clicking on this link will display the Tools page described in Section 13.13 above.
- Profile – Clicking on this link will display the User Profile page described in Section 13.14 above.
- Help – Clicking on this link will display this document.
- Logout – Clicking on this link will logout current user and go back to the MedDream PACS Login page.

Unread Studies Page

This page displays the current list of unread studies in the MedDream PACS Server database. Note that studies displayed in this page are high-lighted with the **Un-read** color background.

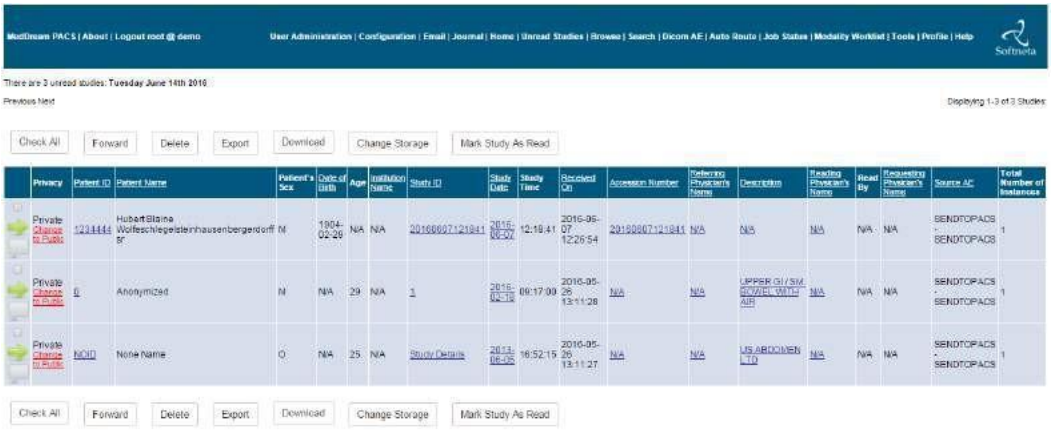


Figure 16 Unread Studies Page

Browse Page

This page displays a list of accessible patients for the current user, with the following patient-specific information depending on the privilege level of the current user:

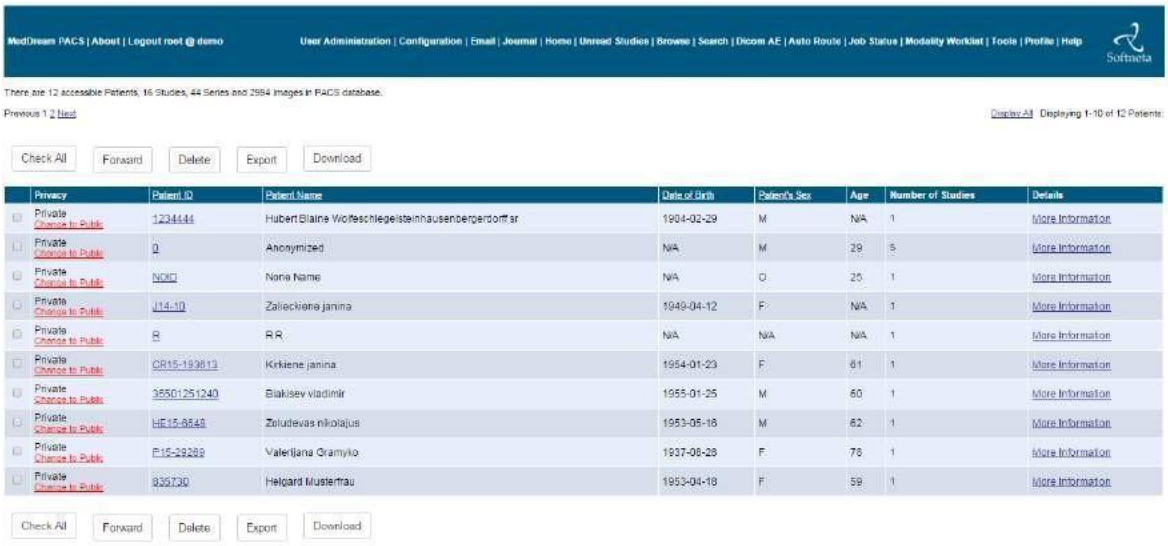


Figure 17 Browse Page

- Public/Private – This is the privacy attribute of the patient (s). This column is displayed only if the current user has the '**Modify**' privilege 'Enabled'. Clicking on the 'Change to Public' or 'Change to Private' will toggle the privacy setting for the patient.
- PatientID – Patient ID. Clicking on this link will display the Study page described below in Section 0, for all studies belong to this patient.
- PatientName – Name of the patient.
- BirthDate – Patient's Birth Date.
- Sex – Patient's sex.

- Age – Patient's age.
- Details – Clicking on the 'Display' link will display further detailed information about this patient.
- Download – This link is 'Enabled' only if the current user has the '**Download**' privilege is 'Enabled'. Clicking on this link will download all images of this patient compressed into a ZIP file to the web browser.
- Check All/Uncheck All – This button is displayed only if the current user has the '**Modify**' privilege 'Enabled'. Clicking on the 'Check All' or 'Uncheck All' button toggles between selecting all patients and un-selecting all patients.
- Forward – This button is displayed only if the current user has the '**Modify**' privilege is 'Enabled'. Clicking on this button will display the 'Forward Images' page, which is described in Section 0 below for forwarding all images of the selected patient (s) to a remote SCP.
- Delete – This button is displayed only if the current user has the '**Modify**' privilege is 'Enabled'. Clicking on this button will pop-up a message box asking for confirmation to delete the selected patient (s) from the MedDream PACS Server database. If confirmed, the selected patient (s) will be removed from the MedDream PACS database.
- Print – This button is displayed only if the current user has the '**Print**' privilege is 'Enabled'. Clicking on this button will print the selected patients to the destination printer and printing format selected by the user.
- Export – This button is displayed only if the current user has the '**Export**' privilege is 'Enabled'. Clicking on this button will export the selected patients into a destination folder specified by the user, using the Dicom standard Part 10 directory format (**DICOMDIR**) for media interchange.

Study Page

Figure 18 Study Page

This page displays a list of accessible studies of a patient for the current user, with the following study-specific information depending on the privilege level of the current user:

- Public/Private – This is the privacy attribute of the study (s). This column is displayed only if the current user has the '**Modify**' privilege 'Enabled'. Clicking on the 'Change to Public' or 'Change to Private' will toggle the privacy setting for the study.
- ID – Study ID. Clicking on this link will display the Series page described below in Section 0, for all series belong to this patient.
- Date – Study date.
- Time – Study time.

- Accession Number – Accession Number.
- Modalities – A list of modalities in the study.
- Referring Physician – Name of the referring physician.
- Description – Study description.
- Reading Physician – Name of physician reading the study.
- Admitting Diagnoses – Admitting diagnoses.
- Interpretation Author – Name of the interpretation author.
- Download – This link is 'Enabled' only if the current user has the '**Download**' privilege is 'Enabled'. Clicking on this link will download all images of this study compressed into a ZIP file to the web browser.
- Check All/Uncheck All – This button is displayed only if the current user has the '**Modify**' privilege 'Enabled'. Clicking on the '**Check All**' or '**Uncheck All**' button toggles between selecting all studies and un-selecting all studies.
- Forward – This button is displayed only if the current user has the '**Modify**' privilege is 'Enabled'. Clicking on this button will display the 'Forward Images' page, which is described in Section 10 below for forwarding all images of the selected study (s) to a remote SCP.
- Delete – This button is displayed only if the current user has the '**Modify**' privilege is 'Enabled'. Clicking on this button will pop-up a message box asking for confirmation to delete the selected study (s) from MedDream PACS database. If confirmed, the selected patient (s) will be removed from the MedDream PACS database.
- Print – This button is displayed only if the current user has the '**Print**' privilege is 'Enabled'. Clicking on this button will print the selected studies to the destination printer and printing format selected by the user.
- Export – This button is displayed only if the current user has the '**Export**' privilege is 'Enabled'. Clicking on this button will export the selected studies into a destination folder specified by the user, using the Dicom standard Part 10 directory format (**DICOMDIR**) for media interchange.

Series Page

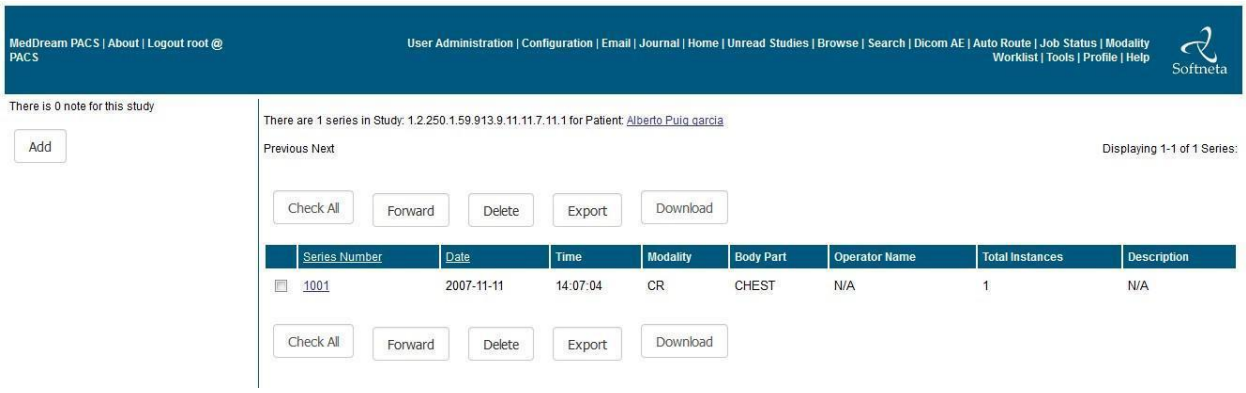


Figure 19 Series Page

This page displays a list of series of the selected study for the current user, with the following series-specific information depending on the privilege level of the current user:

- Series Number – Series Number. Clicking on this link will display the Image page described below in Section 0, for all images belong to this series.
- Date – Series date.
- Time – Series time.
- Modality – Modality of the series.
- Body Part – Body part.
- Total Instances – Total number of images in this series.
- Description – Series description.
- Download – This link is 'Enabled' only if the current user has the '**Download**' privilege is 'Enabled'. Clicking on this link will download all images of this series compressed into a ZIP file to the web browser.
- Check All/Uncheck All – This button is displayed only if the current user has the '**Modify**' privilege 'Enabled'. Clicking on the '**Check All**' or '**Uncheck All**' button toggles between selecting all series and un-selecting all series.
- Forward – This button is displayed only if the current user has the '**Modify**' privilege is 'Enabled'. Clicking on this button will display the 'Forward Images' page, which is described in Section 0 below for forwarding all images of the selected series to a remote SCP.
- Delete – This button is displayed only if the current user has the '**Modify**' privilege is 'Enabled'. Clicking on this button will pop-up a message box asking for confirmation to delete the selected series from MedDream PACS database. If confirmed, the selected series will be removed from the MedDream PACS database.
- Print – This button is displayed only if the current user has the '**Print**' privilege is 'Enabled'. Clicking on this button will print the selected series to the destination printer and printing format selected by the user.
- Export – This button is displayed only if the current user has the '**Export**' privilege is 'Enabled'. Clicking on this button will export the selected series into a destination folder specified by the user, using the Dicom standard Part 10 directory format (**DICOMDIR**) for media interchange.

This page also displays a list of user notes about the subject study on the Left Panel, where the logged-in user can add discussion notes about this study by clicking on the '**Add**' button.

Study Notes Page

This page is used for registered users to exchange discussion notes about a subject study. Users can add, modify or delete notes with a subject headline and detailed text notes as bulletin-board style discussions about the subject study. Users with '**Upload**' privilege can also upload text files, zip files, PDF/Word documents, as well as audio/video clips as attachments to the related study notes.

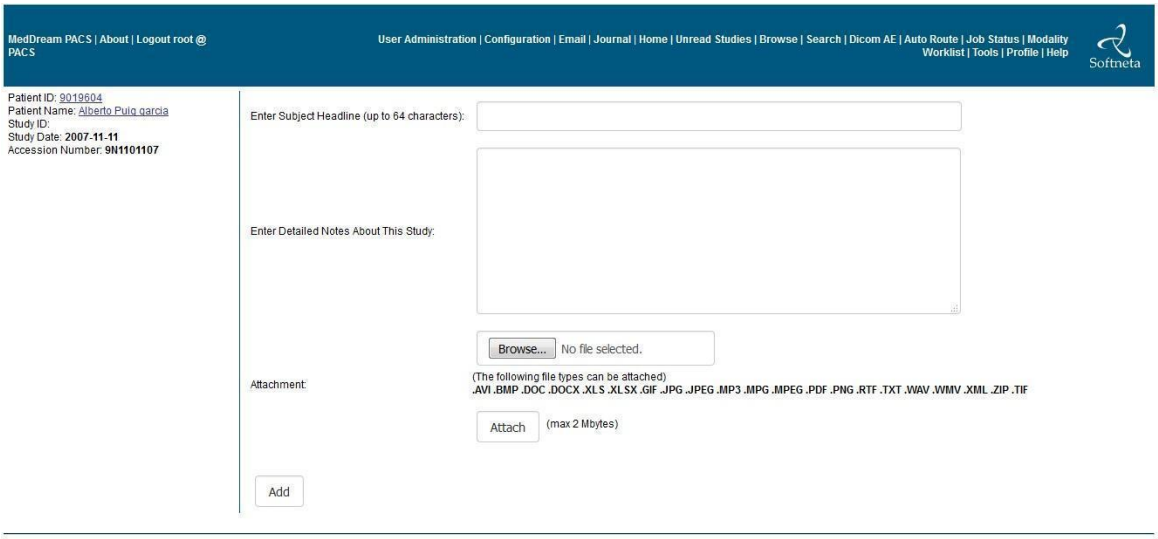


Figure 20 Add Study Notes

From the "Add Study Notes" page above, users can enter discussion notes about this study, and each note consists of the following information:

- Subject Headline – Any text of up to 64 characters
- Details Notes – Any text of up to 512 characters
- Attachments – If the logged-in user has the '**Upload**' privilege enabled, users can upload additional files such as text files, PDF/Word documents, zip files, audio/video clips, etc. of maximum file size allowed for file uploads. This limit is controlled by the smaller value of the following two variable:

- **$MAX_UPLOAD_LIMIT** system configuration variable described in Section 7 - System Configuration
- upload_max_filesize variable in your 'PHP.INI' file

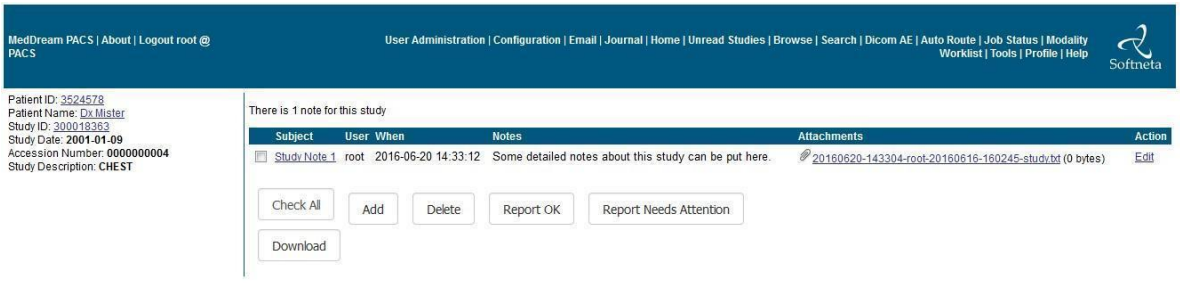


Figure 21 Study Notes Page

This page is the where all the discussion notes about this subject study are listed. If the logged-in user has the '**Modify**' privilege enabled, the user can delete any notes on this page. Otherwise, the user can only delete those notes entered by the user himself/herself. The user can also modify any note which was previously entered by himself/herself by clicking on the '**Edit**' link.

Structured Reports

If the selected study contains any DICOM Structured Report (**SR**), they will also be displayed as separate series along with the regular imaging series of the selected study.

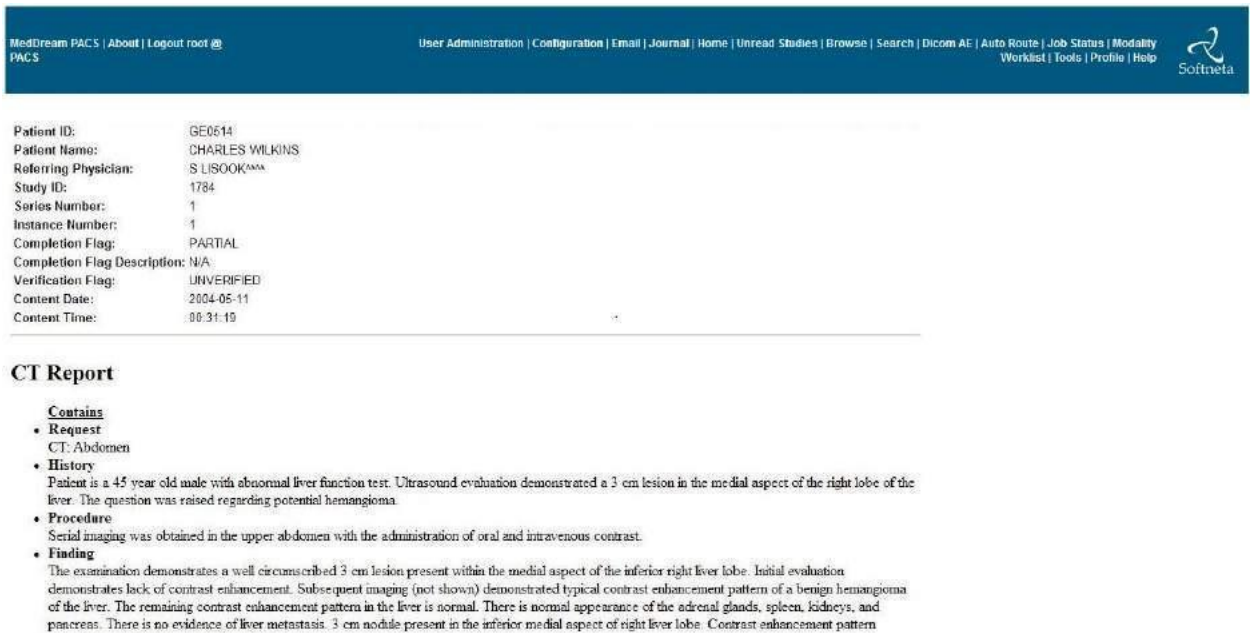


Figure 22 Structured Report Page

If the structured report document contains reference(s) to any image instances and they are accessible in the MedDream PACS database, a URL link to each referenced image instance will be displayed instead of the plain instance UID string.

Image Page (Thumbnail)

Figure 23 Image Page (Thumbnail)

This page displays a list of images of a selected series for the current user, with the following image-specific information depending on the privilege level of the current user:

- Thumbnail Image – Clicking on the thumbnail image will display the 'Full Size Image' page which is described in Section 0 below, instead of the thumbnail image displayed in the current page.
- Instance # – Clicking on this link will display all the Dicom attributes (tags) encoded in the raw image file.
- Check All/Uncheck All – This button is displayed only if the current user has the '**Modify**' privilege 'Enabled'. Clicking on the '**Check All**' or '**Uncheck All**' button toggles between selecting all images and un-selecting all images.
- Delete – This button is displayed only if the current user has the '**Modify**' privilege is 'Enabled'. Clicking on this button will pop-up a message box asking for confirmation to delete the selected image(s) from MedDream PACS database. If confirmed, the selected image(s) will be removed from the MedDream PACS database.
- Download – This button is 'Enabled' only if the current user has the '**Download**' privilege is 'Enabled'. Clicking on this button will download the selected images compressed into a ZIP file to the web browser.
- Show – If the Java Applet MedDream Viewer is installed properly, this button will be displaying and clicking on this button will launch the Java Applet Viewer application.
- Tag/Un-Tag – Clicking on the '**Tag**' button will mark the selected images as key images, while clicking on the '**Un-Tag**' button will un-mark the selected images as key images.
- Print – This button is 'Enabled' only if the current user has the '**Print**' privilege is 'Enabled'. Clicking on this button will download print the selected images to a Dicom printer
- Export – This button is 'Enabled' only if the current user has the '**Export**' privilege is 'Enabled'. Clicking on this button will export the selected images into a Dicom Part-10 formatted destination folder.

Image Page (Full Size)

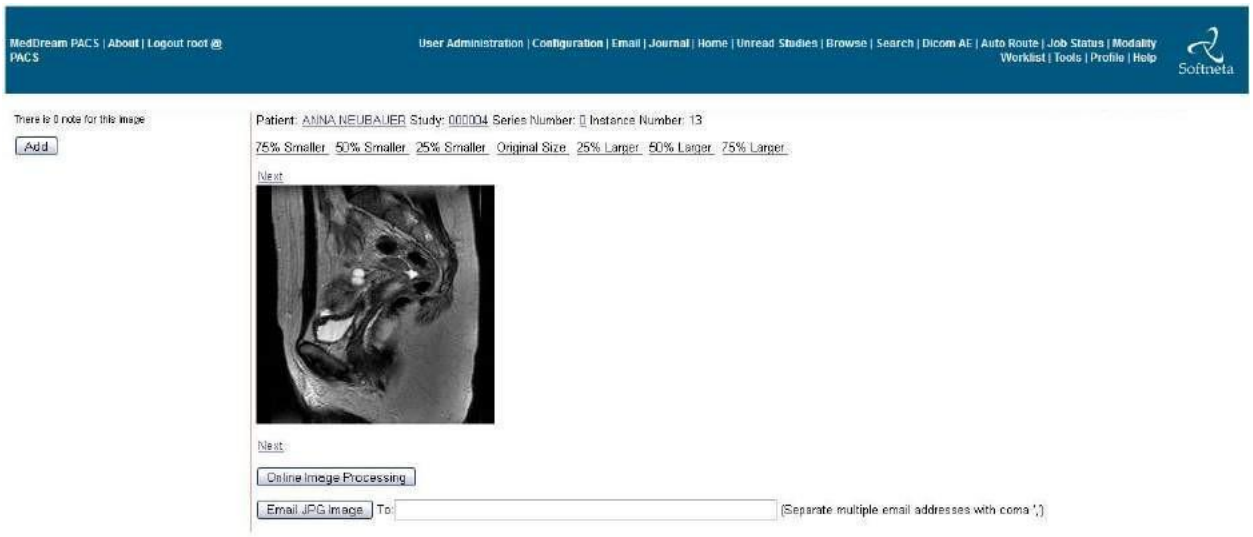


Figure 24 Image Page (Full Size)

This page displays the selected image in its original size, with the following navigation links:

- Previous – This link will be displayed if there is an image within the same series with a smaller instance number than the currently displayed image. Clicking on this link will scroll **backward** to display the image with the largest instance number lower than the current instance.
- Next – This link will be displayed if there is an image within the same series with a bigger instance number than the currently displayed image. Clicking on this link will scroll **forward** to display the image with the smallest instance number higher than the current instance.
- Previous Series – This link will be displayed if there is another series within the same study with a smaller series number than the currently displayed series. Clicking on this link will scroll **backward** to display the series with the largest series number lower than the current series.
- Next Series – This link will be displayed if there is another series within the same study with a bigger series number than the currently displayed series. Clicking on this link will scroll **forward** to display the series with the smallest series number higher than the current series.
- Online Image Processing – Clicking on this button will display the 'Online Image Processing' page, which is described in Section 0 - Online Image Processing Page below.
- Email JPG Image – Clicking on this button will send the converted JPG or GIF image being displayed to the registered email address of the current user. Users can also enter the destination email address in the "**To:**" field, and multiple email addressed can be entered by using the coma ("**,**") as the separator.

This page also displays a list of user notes about the subject image on the left panel, where the logged-in user can add discussion notes about this image by clicking on the '**Add**' button.

Image Notes Page

This page is used for registered users to exchange discussion notes about a subject image. Users can add, modify or delete notes with a subject headline and detailed text notes as bulletin-board style discussions about the subject image. Users with '**Upload**' privilege can also upload text files, PDF/Word documents, as well as audio/video clips as attachments to the related image notes.

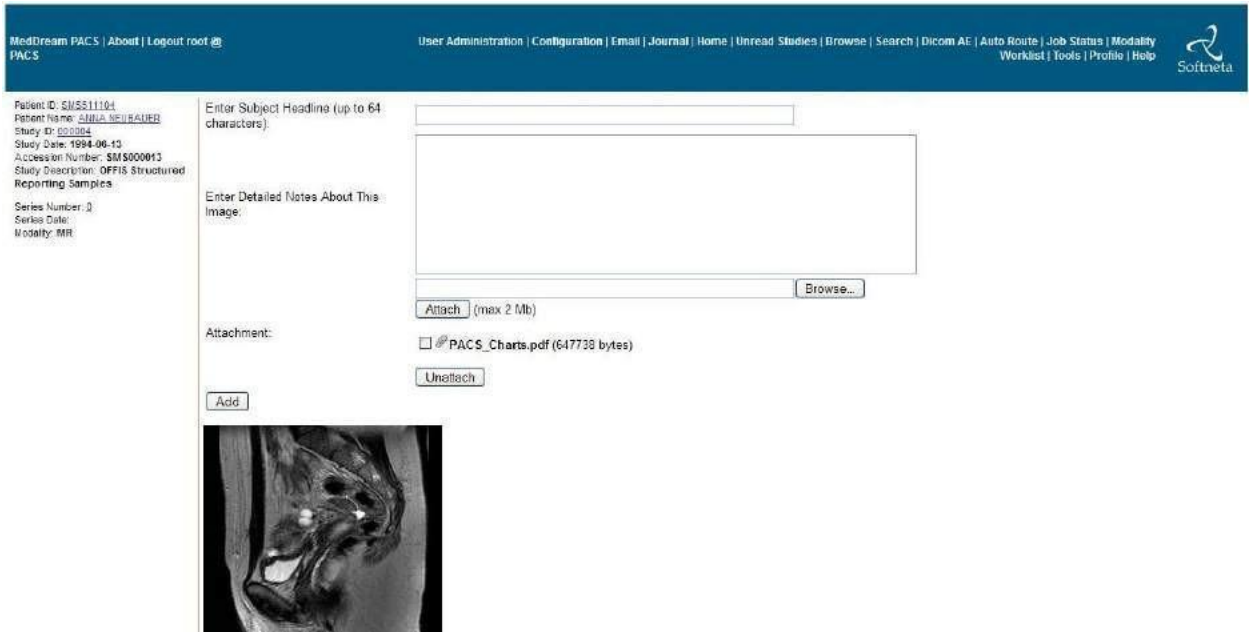


Figure 25 Add Image Notes

From the "Add Image Notes" page above, users can enter discussion notes about this image, and each note consists of the following information:

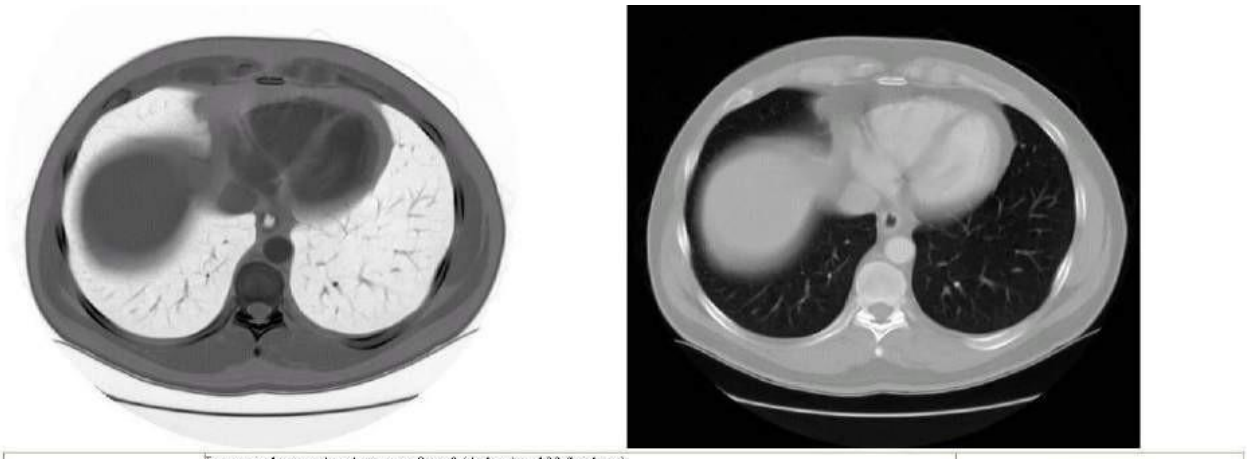
- Subject Headline – Any text of up to 64 characters
- Details Notes – Any text of up to 512 characters
- Attachments – If the logged-in user has the '**Upload**' privilege enabled, users can upload additional files such as text files, PDF/Word documents, zip files, audio/video clips, etc. of maximum file size allowed for file uploads. This limit is controlled by the smaller value of the following two variable:

- **$MAX_UPLOAD_LIMIT** system configuration variable described in Section 7 - System Configuration
- upload_max_filesize variable in your 'PHP.INI' file

Figure 26 Image Notes Page

This page is the where all the discussion notes about this subject image are listed. If the logged-in user has the '**Modify**' privilege enabled, the user can delete any notes on this page. Otherwise, the user can only delete those notes entered by the user himself/herself. The user can also modify any note which was previously entered by himself/herself by clicking on the '**Edit**' link.

Online Image Processing Page



Window/Level	Image pixel grayscale values range from 0 (darkest) to 100 (brightest) Window size: 100 from 1 to 100 Level: 50 from 0 to 100	Window/Level
Gamma Correction	Gamma correction value: 1.5 typical range from 0.8 to 2.3	Gamma
Contrast	(•) Increase ( ) Decrease	Contrast
Edge Enhancement	Select radius from 1 to 10 pixels: 2	Enhance
Resize Image	(•) Width: 512 Height: 512 ( ) 2x Zoom	Resize
Enhance Image	Apply digital filtering to improve the quality of a noisy image	Image Enhancement
Equalize Image	Apply histogram equalization to the image	Equalize
Invert Image	(•) Invert only grayscale values within the image ( ) Invert all grayscale values	Invert
Normalize Image	Enhance contrast of images by normalizing pixel grayscale values	Normalize
Rotate Image	Rotate 90 degrees (•) Clockwise ( ) Counter-clockwise	Rotate
Original Image	Display the stored original image	Original Image

Figure 27 Online Image Processing Page

This page offers the following set of image processing tools, with the processed image displayed on the left and a reference image (original) displayed on the right:

- Window/Level
- Gamma Correction
- Contrast
- Edge Enhancement
- Resize Image – Resize image in absolute pixels or simple 2x zoom
- Enhance Image – Remove image noise
- Equalize Image – Apply histogram equalization to the image
- Invert Image
- Normalize Image – Normalize grayscale values of image pixels
- Rotate Image
- Original Image – Switch back to the original image

Modality Worklist Page

This page displays the Dicom Modality Worklist (DMWL) data that is currently stored in the MedDream PACS Server database, which contains the following tabbed pages:

- Today's Worklist – This page displays the worklist data for all procedures scheduled today
- Yesterday's Worklist – This page displays the worklist data for all procedures that were scheduled yesterday
- This Week's Worklist – This page displays the worklist data for all procedures scheduled this week
- This Month's Worklist – This page displays the worklist data for all procedures scheduled this month
- Last Month's Worklist – This page displays the worklist data for all procedures that were scheduled last month
- Enter New Worklist – This page allows the user to enter the Dicom Modality Worklist data manually into the database

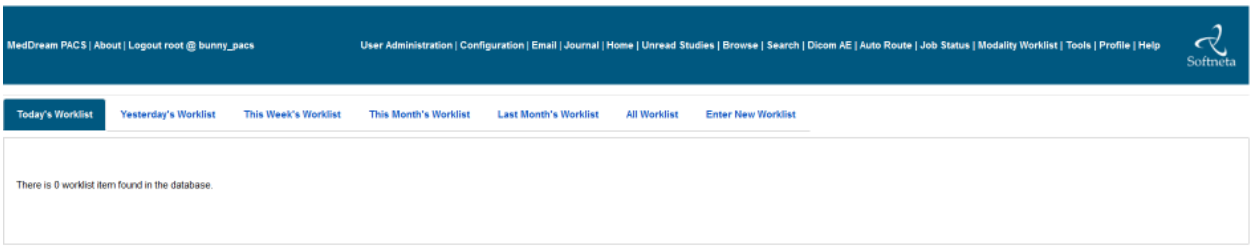


Figure 28 Modality Worklist Page

Enter New Worklist Page

This page allows the user to enter the Dicom Modality Worklist (DMWL) data manually into the database, so that they can be served by MedDream PACS Server to the DMWL querying clients such as the input modalities.

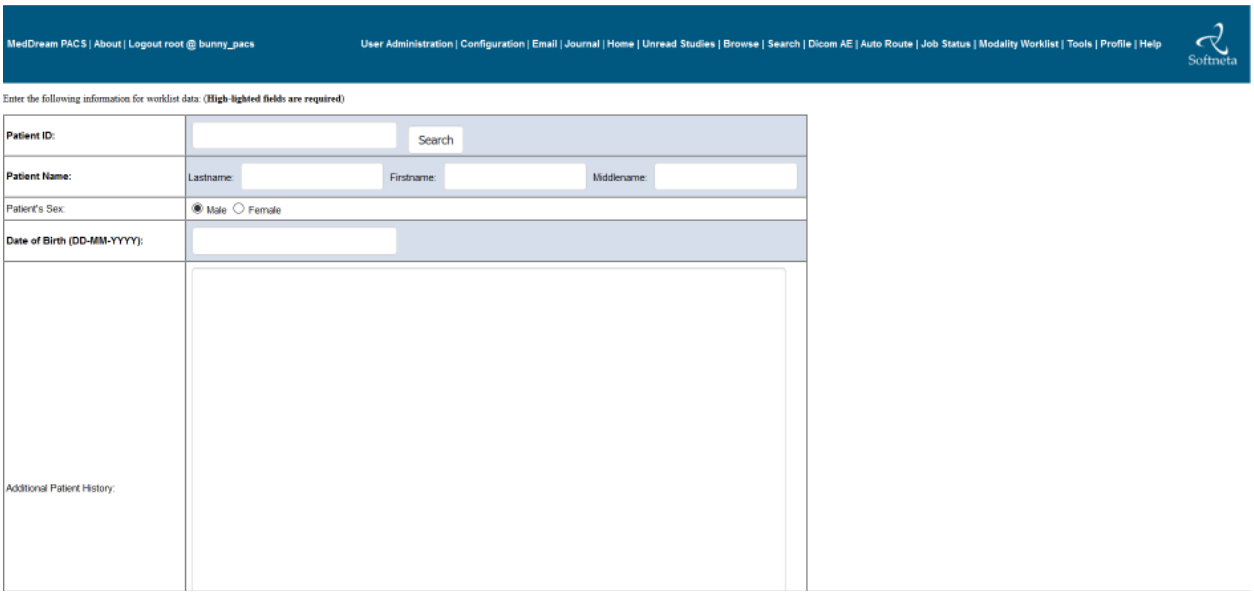


Figure 29 Enter New Worklist Page

Tools Page

Figure 30 Tools Page

This page contains the following useful utilities that enhance the functionalities of MedDream PACS Server Edition:

Custom Data Element Coercion

This tool allows MedDream PACS users to define a custom data element coercion pattern for images received from a source AE. The following data elements can be coerced based on the specified coercion pattern:

- Patient ID (0x00100020)
- Modality (0x00080060)
- Institution Name (0x00080080)
- Accession Number (0x00080050)
- Ethnic Group (0x00102160)

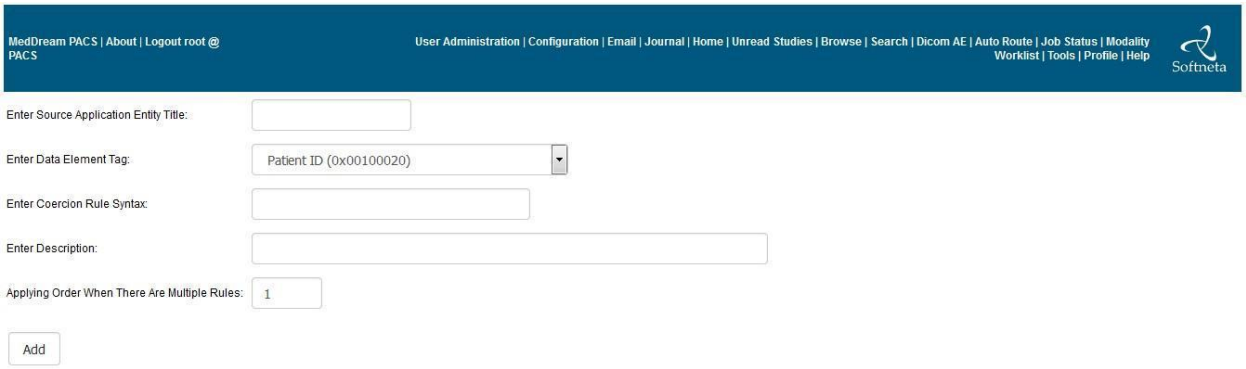


Figure 31 Data Element Coercion Page

There are 2 matching methods supported:

- By Source AE Title - the Data Element Coercion rule will be applied if the Source AE Title matches with the defined pattern string (wild-card characters '*****' and '**?**' are supported)
- By Key Attribute - the Data Element Coercion rule will be applied if the received images contain the key attribute which matches with the defined pattern string (wild-card characters '*****' and '**?**' are supported)

The coercion rule syntax specifies the pattern string to be coerced into the value of the data element, and wild-card characters '*****' and '**?**' are supported.

Example#1: If users want to have a prefix string "ABC" inserted to the Patient ID data element for images received from a source AE "XYZ", before the images are stored in the MedDream PACS Server database. They can add a data element coercion rule with the following fields:

- Source Application Entity Title - It will be set to "XYZ" in this example
- Data Element Tag - Select Patient ID from the Drop-down list box
- Coercion Rule Syntax - It will be set to "ABC*" in this example meaning to insert the prefix "ABC" before the received Patient ID string
- Description - This field is for display purpose only and can be set to any text string

With the above example coercion rule, an image received from source AE "XYZ" with the Patient ID of "12345" will be received and stored in MedDream PACS Server database with the Patient ID of "ABC12345". But images received from source AE "TUV" with the Patient ID of "12345" will not be coerced and therefore will be stored in MedDream PACS Server database with the original Patient ID of "12345".

Example#2: If users want to have a prefix string "ABC" inserted to the Patient ID data element for images received with the Institution Name (0008,0080) of "XYZ", before the images are stored in the MedDream PACS Server database. They can add a data element coercion rule with the following fields:

- Institution Name (0008,0080) - Select Coerce by this Key Attribute
- Key Attribute Matching Pattern - It will be set to "XYZ" in this example
- Data Element Tag - Select Patient ID from the Drop-down list box
- Coercion Rule Syntax - It will be set to "ABC*" in this example meaning to insert the prefix "ABC" before the received Patient ID string
- Description - This field is for display purpose only and can be set to any text string

With the above example coercion rule, an image received with the Institution Name (0008,0080) key attribute value of "XYZ" and Patient ID of "12345" will be received and stored in MedDream PACS Server database with the Patient ID of "ABC12345". But images received with the Institution Name (0008,0080) key attribute value of "TUV" and Patient ID of "12345" will not be coerced and therefore will be stored in the MedDream PACS Server database with the original Patient ID of "12345".

To delete a specific data element, you can define a Data Element Coercion rule with the corresponding data element tag, and the coercion rule syntax of "***->**", so that MedDream PACS Server will remove the defined data element from the received images from that source AE. Here are some details examples about the coercion rules:

Pattern	Meaning	Example
123-*	Add prefix "123-" to the existing/received value	With the "123-*" pattern defined as Patient ID coercion rule, the received Patient ID "ABCDE" becomes "123-ABCDE"
*-123	Add suffix "-123" to the existing/received value	With the "*-123" pattern defined as Patient ID coercion rule, the received Patient ID "ABCDE" becomes "ABCDE-123"
*->12345	Replace existing/received value with the fixed string "12345"	With the "*->12345" pattern defined as Patient ID coercion rule, the received Patient ID "ABCDE" becomes "12345"
*->	Delete the existing value	With the "*->" pattern defined as Accession Number coercion rule, the received Accession Number "ABCDE" will be deleted
*->{0-9}	Keep only the numbers (0-9) within the received value string	With the "*->{0-9}" pattern defined as Accession Number coercion rule, the received Accession Number "ABCDE12345" becomes "12345"
*->{A-Z}	Keep only the alphabetic characters ('A'-'Z') within the received value string	With the "*->{A-Z}" pattern defined as Accession Number coercion rule, the received Accession Number "ABCDE12345" becomes "ABCDE"
$TRIMWS$	Remove all white-space characters (e.g., space, tab, newline, etc) from the received value string	With the "$TRIMWS$" pattern defined as Patient ID coercion rule, the received Patient ID "ABCDE 12 34 5" becomes "ABCDE12345"

Table 6 Data Element Coercion Rule Patterns

Exporting Patients/Studies

This utility allows users to export patients/studies stored in MedDream PACS Server database to a local directory, using DICOM Media Storage Format (with DICOMDIR directory record). The content of the directory can later be burned into a CD-R/RW, DVD-R/RW/RAM or DVD+R/RW for media interchange.

Users need to enter the following information to export patients/studies:

- Export Media Type – Users can choose from CD, DVD or Dual-Layer DVD as media type for export destination. This field is used to determine the sub-directory name for the local export directory, as well as the media storage capacity (650 Mbytes CD, 4.7 GB DVD or 8.5 GB Dual-Layer DVD) when the exported studies need to be split into multiple volumes.
- Export Directory – This filed defaults to the '**export**' sub-directory where MedDream PACS Server is installed.
- Media Label – This field is limited to 16 characters and is the media label applied to the DICOMDIR directory record when it is written to the final destination media. In case the exported studies require multiple volumes, the volume number will automatically be appended to the media label for each volume. For example, if the specified media label is "LABEL", the selected media type is CD, and the total exported studies span across three volumes, there will be three sub-directories named '**vol1**' through '**vol3**' under the specified destination export directory, with the media label set to "**LABEL-1**" through "**LABEL-3**" accordingly.
- Compress exported content into ZIP file – Clicking on this checkbox will compress the exported content into ZIP files, which can be downloaded directly from the **Job Status** page when the Export job is completed.

- Include External Viewer Program Files From Folder – Selecting this checkbox will make MedDream PACS Server include all files as well as sub-directories from the specified folder as part of the export to the destination directory.
- Include Dicom Attributes in Exported Directory Hierarchy – Selecting this checkbox will make PacsOne Server use Dicom attributes as sub-folder names in the exported directory hierarchy content, e.g., "ExportDir/VOL1/$PatientID_$StudyDate_$Modality", etc.

⚠ **NOTE!** Use caution when selecting this option and be sure not to include the wrong external viewer directory that contains too many files and/or sub-folders, since MedDream PACS Server will copy **recursively** all files and sub-directories under this viewer directory to the destination folder.

- Update – This button is used to update the current page with the calculated total number of selected studies and the total file storage space required to export the selected studies.
- Export Studies – After users have entered the destination directory for selected media type and the media label, they can click on this button to select from a list of patients/studies to export:

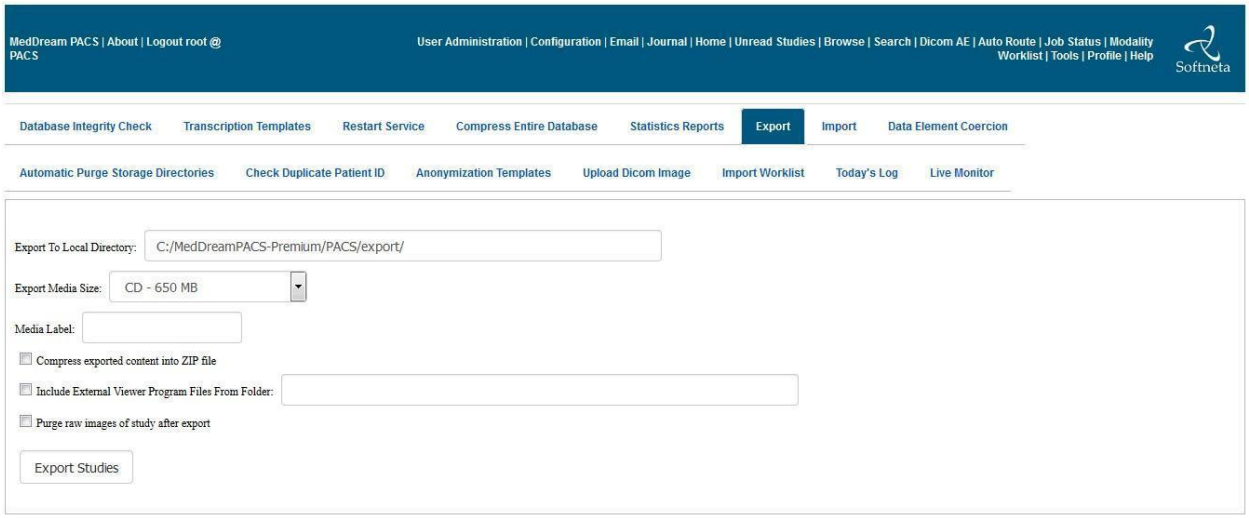


Figure 32 Export Patients/Studies Page

Users can select the interested patients/studies by clicking the checkbox at the beginning of each listed study, and click on the '**Update**' button to obtain the total number of studies selected and the total storage space required for exporting the selected studies. After selecting the interested patients/studies for export, the users can click on the '**Export**' button to start the export, MedDream PACS Server will assign a database job to perform the export in the background so that it will not tie up the user interface. Users can check the progress of the export job at any time by visiting the 'Job Status' page, using the assigned job ID.

Importing External Patients/Studies

This utility allows users to import external patients/studies stored in DICOM Media Storage Format compliant (with or without **DICOMDIR** directory record) CD/DVD media into the MedDream PACS Server database.

Users need to enter the following information to import external patients/studies into the MedDream PACS Server database:

- Source Media Type – This can either be a Local Directory written in the DICOM Media Storage Format (with or without **DICOMDIR** directory record), or a local CD/DVD media drive.

- If the source media type is a DICOM Media Storage Formatted local directory, MedDream PACS Server will read the **DICOMDIR** directory record if it is present, parse any raw image file(s) encoded in DICOM Part 10 format recursively under the specified directory into the MedDream PACS Server database. The database records are linked to the raw image files in the specified directory, so the raw image files do not need to be copied.
- If the source media type is a local CD/DVD media drive, MedDream PACS Server will read the DICOMDIR directory record, parse the directory into the MedDream PACS Server database, and copy the raw image files on the removable media into a destination local directory specified by the user.

⚠ **CAUTION!** The system shows warning before launching the import of the DICOM files from the external source, if the DICOMDIR file with the directory content is not present in the source media.

- Destination Directory – If the specified source media type is a local CD/DVD drive, users will also need to specify a local destination directory to copy the raw images files on the local media to.
- Import Studies – After user has entered the information above, user can click on this button to start the import.

When importing external images from a local directory but there is no **DICOMDIR** directory record present in the specified directory, MedDream PACS Server will display a warning message below before trying to parse recursively any DICOM Part 10 encoded image files stored in the directory into the MedDream PACS Server database.

Figure 33 Warning Message for Importing without DICOMDIR

MedDream PACS Server will assign a database job to perform the import in the background so that it will not tie up the user interface. Users can check the progress of the import job at any time by visiting the 'Job Status' page, using the assigned job ID.

Statistics Reports

This feature allows the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) or users with '**View**' privilege to query statistics reports for studies received during different time periods:

- Studies Received Yesterday
- Studies Received This Week
- Studies Received This Month
- Studies Received This Year
- Studies Received During a [**From, To**] date window
- Studies Received From a Specific Source AE

- Studies Received From Each Source AE defined in the "**Dicom AE**" page

The Statistics Report page will be displayed after user clicks on the Get Report button. In addition to the study information displayed, the following attributes will be displayed for each study:

- The date the study was received
- The Source AE Title from where the study was received
- The total number of images currently in this study
- The total size of the raw images file currently in this study

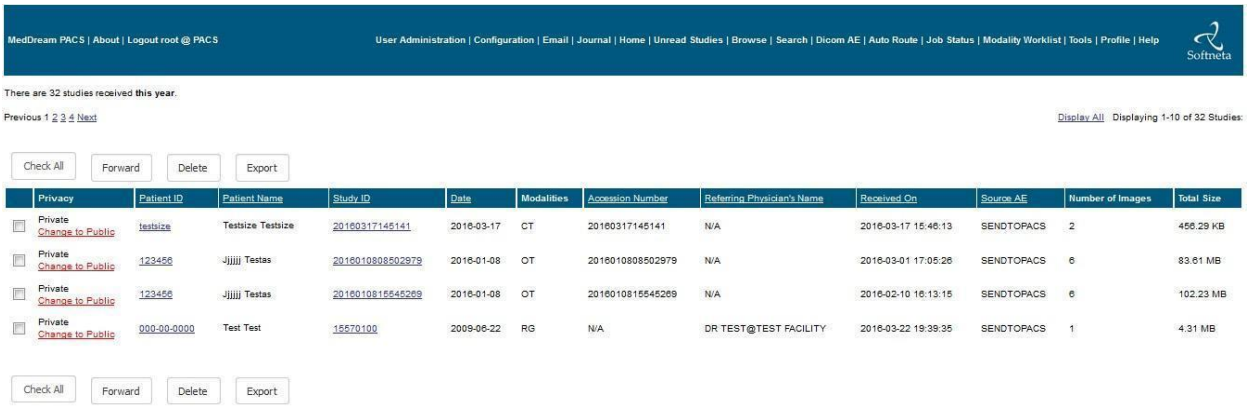


Figure 34 Statistics Report Page

Automatic Statistics Reports via Email

If a valid SMTP server and the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases)'s email address have been configured (See Section 7 above), then MedDream PACS Server will send statistics report emails to the Administrator's email address based on the following schedule:

- Daily Reports – MedDream PACS Server will send statistics report for studies received during the previous day at 12:00 am local time every day
- Weekly Reports - MedDream PACS Server will send statistics report for studies received during the previous week at 12:00 am local time on every Sunday
- Monthly Reports - MedDream PACS Server will send statistics report for studies received during the previous month at 12:00 am local time on the first day of every month

Automatic Purging Archive Directories

This feature is useful when the storage resources are limited on the server where MedDream PACS Server is installed, and the Administrators want to have MedDream PACS Server automatically purge older studies stored in the MedDream PACS Server database, by pre-defining a set of rules or parameters for automatic purging.

For Administrators (Users with '**Modify**' privilege), they can click on the **Automatic Purge Storage Directories** link from the **Tools** page to define the following set of parameters MedDream PACS Server:

- Low Water Mark – This field is defined in terms of disk free space percentage ranging from 0 to 100. For each defined archive directory, MedDream PACS Server will examine the disk usage information for the disk where the archive directory is located. If the disk free space percentage is lower than this

defined **Low Water Mark**, MedDream PACS Server will start purging older studies stored on this disk.

- High Water Mark - This field is defined in terms of disk free space percentage ranging from 0 to 100. This field must be greater than the value defined for the **Low Water Mark** above. When the disk free space percentage drops below the **Low Water Mark** defined above, MedDream PACS Server will start to purge older studies stored in the corresponding archive directory. MedDream PACS Server will sort the list of studies stored in this archive directory by the **Date** the studies were received, with the oldest study being the top of the list. MedDream PACS Server will purge studies in the sorted list (removing the oldest study first) one at a time, until the disk free space percentage rises above the defined **High Water Mark**, at which point the automatic purging operation is then complete.
- Purge by Study Received Date (when study was received) – If this option is selected, MedDream PACS Server will purge all older studies that were received more than N days ago.
- Purge by Study Date (when study was acquired or created) – If this option is selected, MedDream PACS Server will purge all older studies with Study Date of more than N days ago.
- Purge by Source AE Title – If this option is selected, MedDream PACS Server will purge all studies received from the specified Source AE Title.
- Schedule – Automatic purging schedule defined in terms of the 24-hour interval. MedDream PACS Server will perform automatic purging **only** on this scheduled hour of the day, and will not perform another automatic purging for the same rule until the next 24-hour schedule.

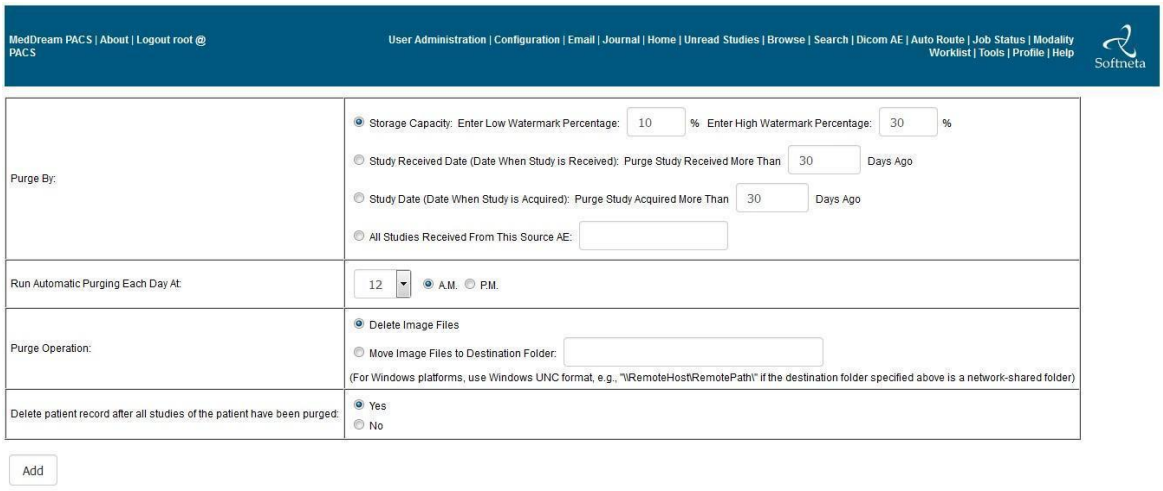


Figure 35 Automatic Purging Archive Directories

- Purge Option – When purging aged studies, user can select whether to:

- Permanently delete the aged studies
- Move them to a user-defined destination folder, for example: a shared network drive, so that they are still accessible but do not consume any more online storage resources. Note: For Windows platforms, any shared network path must be entered in the Windows UNC format as \\RemoteHost\RemotePath\, instead of the mapped drive path such as Z:\LocalPath

⚠ **NOTE!** Caution must be taken when defining the Low/High Water Marks for the automatic purging operation, as MedDream PACS Server will remove all series and images of the purged study. Make sure a reasonable set of numbers is chosen for the Low/High Water Marks. By default, the Low Water Mark is set to 5 (percent) and High Water Mark set to 10 (percent). It is recommended to disable this feature if there are enough storage resources available.

Automatic Purging By Dicom Data Element Filters

Users can also define individual Dicom data element filter with wild-card patterns, so that MedDream PACS Server will automatically purge the matching Dicom studies based on the user-defined aging period and schedule.

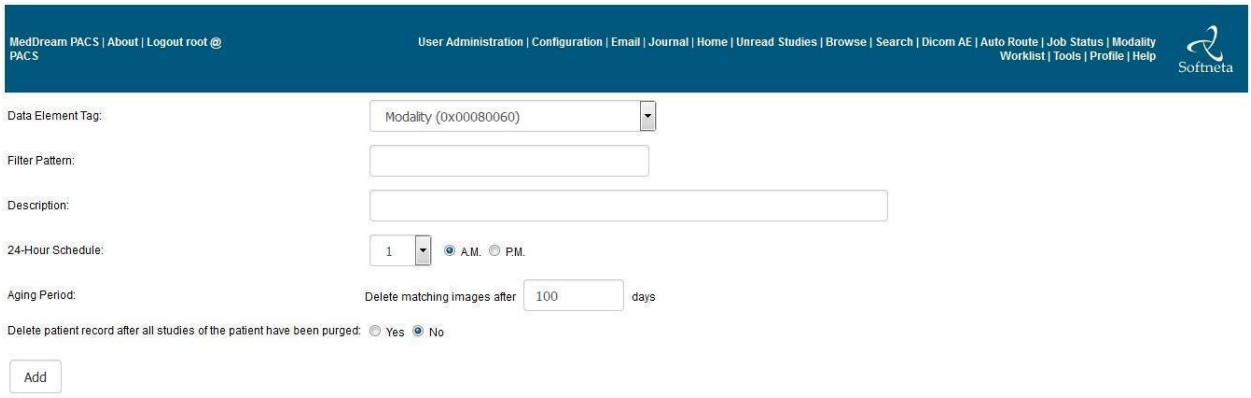


Figure 36 Automatic Purging By Dicom Data Element Filter

- Data Element Tag – Currently the following Dicom data elements are supported:

- Modality (0008,0060)
- Institution Name (0008,0080)
- Referring Physician's Name (0008,0090)
- Study Description (0008,1030)
- Reading Physician's Name (0008,1060)
- Patient Name (0010,0010)

- Filter Pattern – This is the filtering pattern that will be used to match against the Dicom studies stored in the MedDream PACS Server database. Wild-card characters '*' and '?' are supported.
- Description – Brief description which described the defined filtering pattern.
- 24-Hour Schedule – The schedule when MedDream PACS Server should run the Automatic Purging by the defined Dicom data element filtering rule.
- Aging Period – The time period in number of days. MedDream PACS Server will purge any matching Dicom study if the study was received before the defined aging period. The default value is 100 days.

For example, users can define the following Automatic Purging By Dicom Data Element rule:

- Data Element Tag – Modality (0008,0060)
- Filter Pattern – CT
- Description – Purge all CT studies received more than 100 days ago
- 24-Hour Schedule – 1:00 AM
- Aging Period – 100 Days

With the above Automatic Purging rule, MedDream PACS will purge all CT studies stored in the database received more than 100 days ago every night at 1:00 AM local time.

Check Duplicate Patient IDs

Clicking on this URL link will display a list of duplicate patient IDs which have conflicts with existing patient IDs. All duplicate patient IDs will have the string format of **"$ID[$SourceAeTitle-$TimeStamp]",** where:

- $ID – The existing patient ID which has a different patient name from the duplicate
- $SourceAeTitle – The AE Title from which the images were received from
- $TimeStamp – The Date and Time stamp (in 'YYYYMMDDhhmmss' format) of when the duplicate patient ID was received

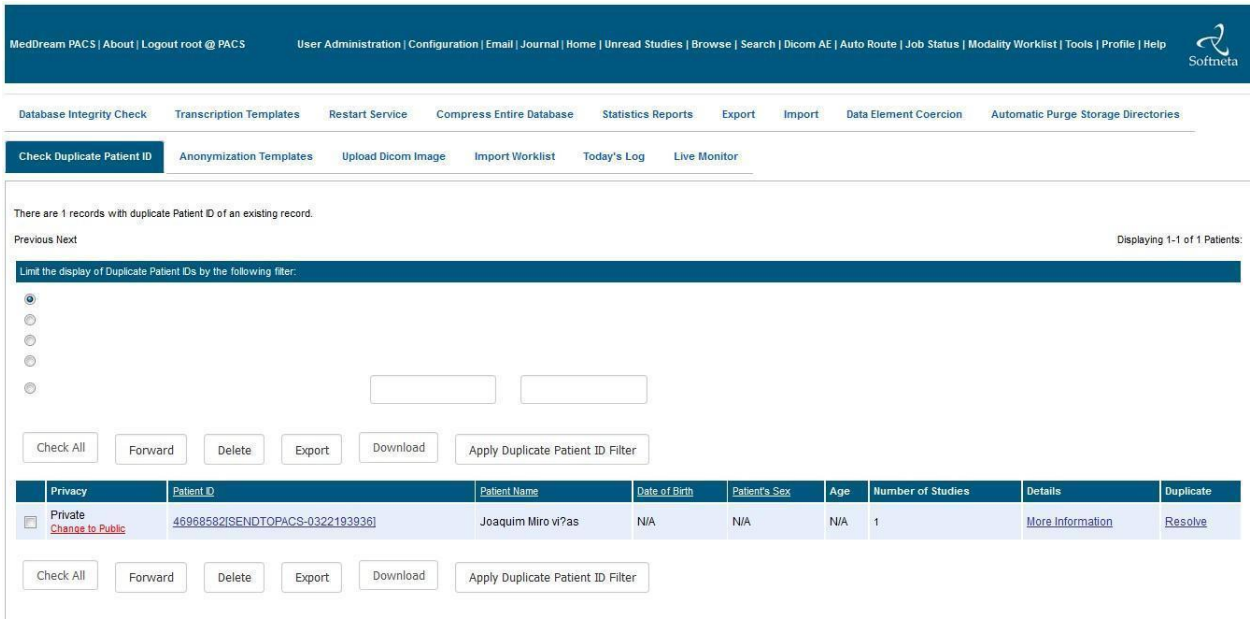


Figure 37 Checking Duplicate Patient ID

For example, there is an existing patient: "Phillip B. Osterman", with an empty patient ID string. A new study is sent by the AE 'DICOM_TEST' to MedDream PACS Server with the same empty string as the patient ID, but with a different patient name: "Elaine J. Silverman". In this example, MedDream PACS will save the new study under a duplicate patient ID: '[DICOM_TEST-1106164654]' and flag this as a duplicate patient ID. The user can resolve this duplicate patient ID by clicking the '**Resolve**' link and select one of the following options:

Figure 38 Resolving Duplicate Patient ID

- Keep Existing Patient ID and Use the Existing Patient Name – If this option is selected, the images labeled with the duplicate patient ID will be saved under the existing patient ID, and the existing patient name will be used. In the above example, the new study will be saved under the existing patient name of “Phillip B. Osterman”.
- Keep Existing Patient ID and Use the New Patient Name – If this option is selected, the images received with the duplicate patient ID will be saved under the existing patient ID, and the new patient name will be used. In the above example, the new study will be saved under the new patient name of “Elaine J. Silverman”.
- Save Duplicate Using a New Patient ID – If this option is selected, the images labeled with the duplicate patient ID will be saved under the newly assigned patient ID, and the new patient name will be used. In the above example, the new study will be saved under the new name of ‘Elaine J. Silverman’ but with a newly assigned patient ID.
- Use Patient Names From Modality Worklist Record – If MedDream PACS Server finds a Modality Worklist Record with the existing Patient ID, this option will be displayed to let users choose the Patient Names from the Modality Worklist Record, MedDream PACS Server will then save both the existing and duplicate Patient IDs with the Patient Names from the Modality Worklist Record.

In most cases, the duplicates are created by human input error when entering patient names. For example, “John Doe” vs. “Jane Doe”, and these duplicates can be resolved by selecting either the existing patient name or the new patient name and keep the same patient ID. However, in rare cases, the duplicate patient IDs do belong to two distinct patients with truly different identities. In this case, assigning a new patient ID may help temporarily, but the ultimate solution is to fix the problem at the source, which is where the patient ID gets assigned at the local RIS/HIS systems.

Today's Log File

Clicking on this link will display the MedDream PACS Server log file from today to the browser.

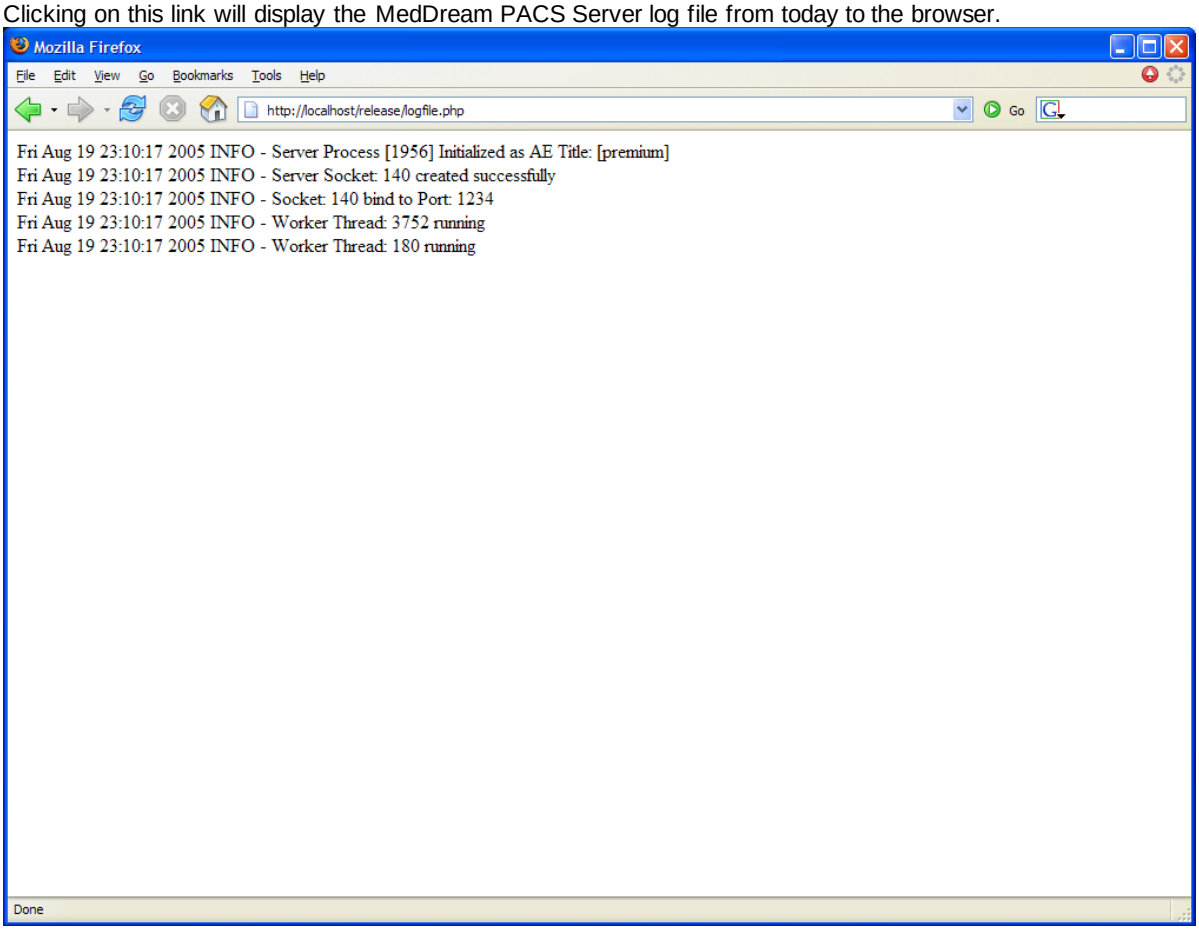


Figure 39 Today's Logfile Page

Upload Dicom Image

Users with **'Upload'** privilege enabled can click on this tab to upload Dicom Part-10 formatted raw images into the MedDream PACS Server database:

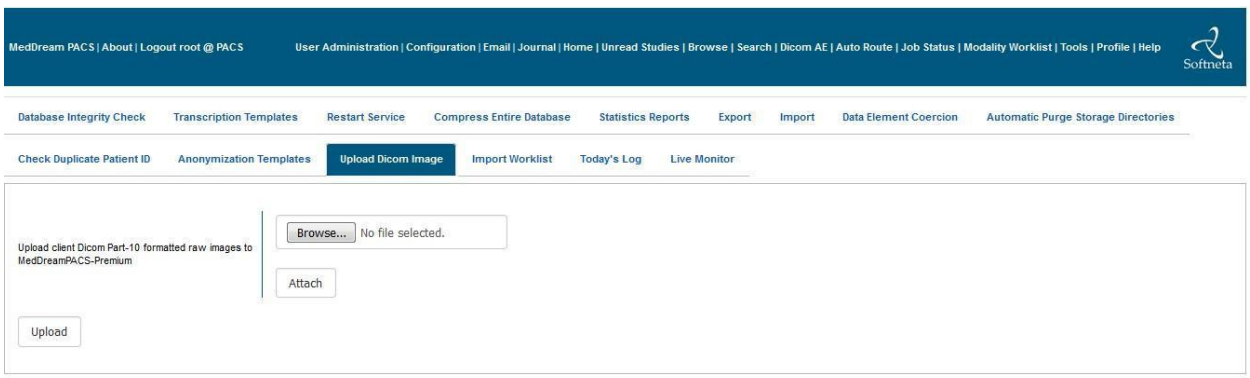


Figure 40 Upload Dicom Image Page

Matching ORM Message (Optional)

This feature is available to users who have purchased the optional HL7 Message Listener module to enable MedDream PACS Server to receive and send HL7 messages. This tool can be used to select one of the received ORM (General Order) messages and match it with one or more received Dicom studies.

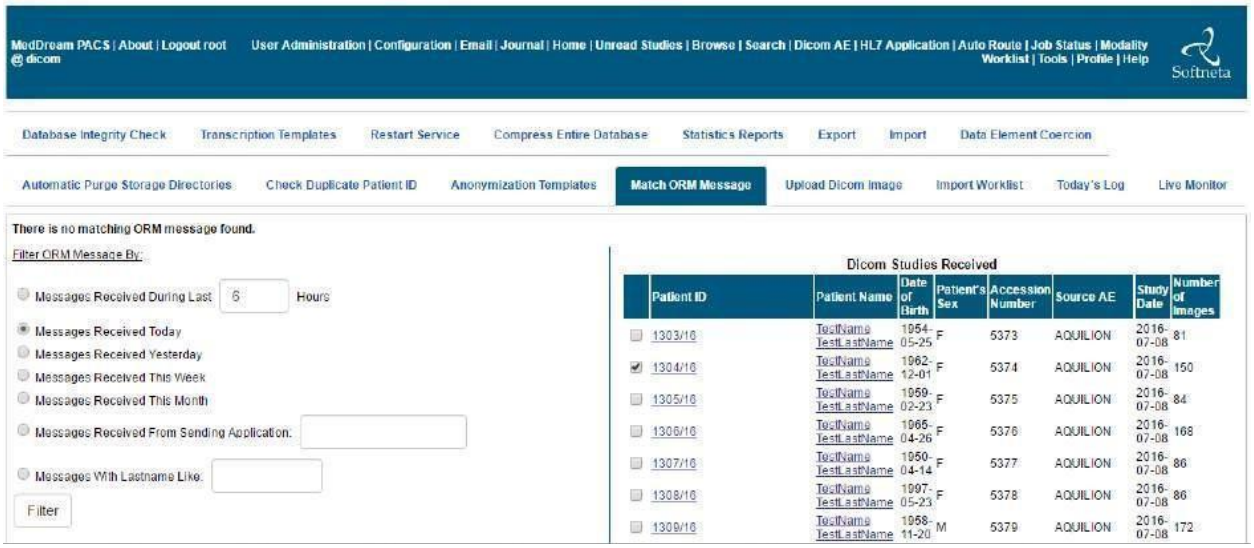


Figure 41 Matching ORM Message (optional)

After the user has matched the ORM message with one of more received Dicom studies, MedDream PACS Server will modify the **Accession Number** and **Patient ID** of the matching Dicom studies, with the information contained in the matching ORM message. Users can also optionally select a destination Dicom AE for MedDream PACS Server to send the modified Dicom studies, by selecting the destination AE from the drop-down list and checking the '**Forward modified Dicom studies to this destination AE**' checkbox.

Database Integrity Check

This feature will make MedDream PACS run an internal database integrity check where it will scan the IMAGE table of the MedDream PACS Server database, and verifies that for each record in the IMAGE table, the corresponding raw Dicom image file does exist and is not empty. MedDream PACS Server will report any missing or empty raw Dicom image file found from the integrity check.

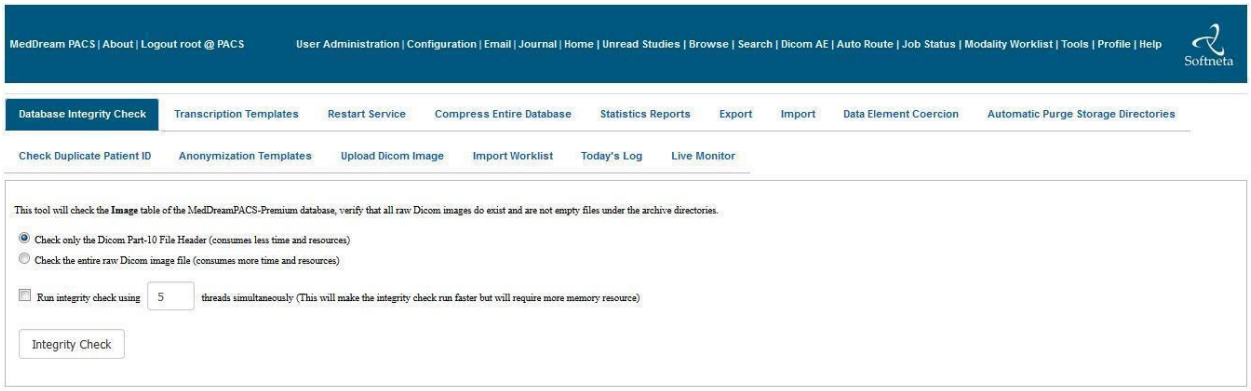


Figure 42 Database Integrity Check

Import Worklist

This feature will make MedDream PACS import worklist records from a text file encoded in the Windows .INI format, and the imported worklist records will be inserted into the **WorkList** table in the MedDream PACS Server database. Then any Dicom Modality Worklist (DMWL) client can query MedDream PACS Server for the worklist data stored in the database.

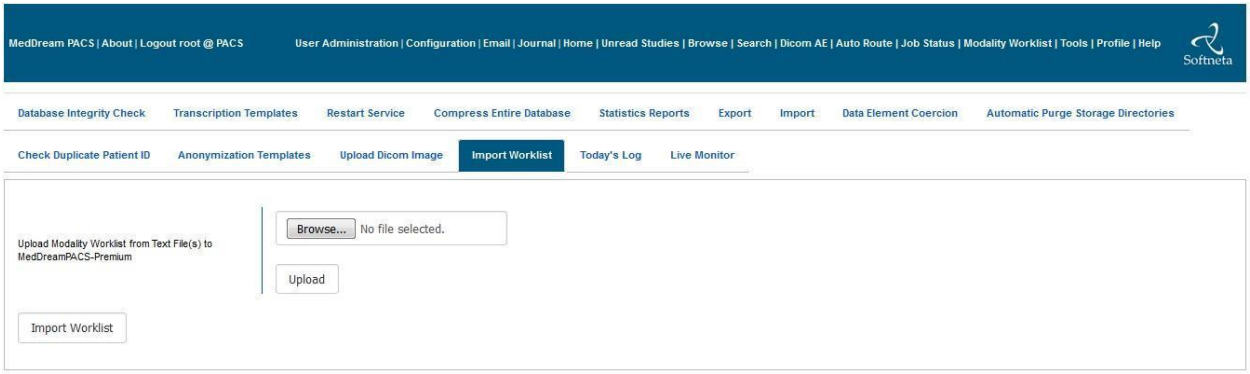


Figure 43 Import Worklist

The worklist text file should be formatted according to the following Windows .INI styles:

[RecordNum1]

Patient Name = Maximum 64 characters
Patient ID = Maximum 64 characters
Date of Birth = YYYY-MM-DD
Patient's Sex = Maximum 16 characters
Accession Number = Maximum 16 characters
Referring Physician's Name = Lastname^Firstname^Middlename^Prefix^Suffix (Maximum 64 characters)
Requesting Physician's Name = Lastname^Firstname^Middlename^Prefix^Suffix (Maximum 64 characters)

Requested Procedure ID = Maximum 16 characters
Requested Procedure Description = Maximum 64 characters
Requested Procedure Priority = Maximum 16 characters

Scheduled AE Station = Maximum 16 characters
Modality = Maximum 16 characters
Scheduled Start Date = YYYY-MM-DD
Scheduled Start Time = HH:mm
Performing Physician's Name = Lastname^Firstname^Middlename^Prefix^Suffix (Maximum 64 characters)
Scheduled Procedure ID = Maximum 16 characters
Scheduled Procedure Description = Maximum 64 characters
Scheduled Procedure Location = Maximum 16 characters
Scheduled Procedure Pre-Medication = Maximum 64 characters
Scheduled Procedure Contrast Agent = Maximum 64 characters

Procedure Code Value = Maximum 16 characters
Procedure Code Meaning = Maximum 64 characters
Procedure Code Scheme = Maximum 16 characters
Procedure Code Scheme Version = Maximum 16 characters

Protocol Code Value = Maximum 16 characters

Protocol Code Meaning = Maximum 64 characters
Protocol Code Scheme = Maximum 16 characters
Protocol Code Scheme Version = Maximum 16 characters

Live Monitor (for System Administrator only)

When logged-in as the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases), clicking on this tool will display a list of active Dicom connections (both incoming and outgoing) with MedDream PACS Server:

Figure 44 Live Monitor page

Patient Reconciliation

If the **Automatic Patient Reconciliation** feature is enabled by the Administrator ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) (described in Section 0), MedDream PACS Server will log automatic patient reconciliation events in the table shown below, which contains the following information for each event:

- When – Date and time of when the event took place
- Patient ID – Patient ID of the subject patient
- Date of Birth – DOB of the subject patient
- Original Patient Name – Original patient name before the event took place
- Modified Patient Name – Modified patient name after the event took place

Figure 45 Patient Reconciliation Page

Anonymization Templates

For some client sites, e.g., clinical trials, users may want to anonymize all the patient demographics information, e.g., Patient Name, Patient ID, Date of Birth, etc., to meet the HIPAA Patient Privacy requirements. In such cases, users can pre-define a template with a set of specific syntax rules for MedDream PACS Server to anonymize the corresponding Dicom data elements in the received studies, by clicking on the **Tools->Anonymization Templates** page from the Main Menu to add or modify a template for anonymization of the received Dicom studies.

The following Dicom data elements can be defined in the Anonymization Template:

- **Patient Name** (0x00100010)
- **Patient ID** (0x00100020)
- **Date of Birth** (0x00100030)
- **Gender** (0x00100040)
- **Patient's Age** (0x00101010)
- **Study ID** (0x00200010)
- Referring Physician's Name (0x00080090)
- Study Description (0x00081030)
- Series Description (0x0008103E)

The following macros can be used to define the anonymization syntax for the Dicom **Patient ID** (0x00100020)data element:

- **$MD5$ -** MedDream PACS Server will anonymize the Dicom Patient ID data element with the MD-5 hash string of the original value. The resulting new Patient ID will be a fixed 32-char hex number string.
- **$STUDYUID$ -** MedDream PACS Server will replace the value of the Dicom Patient ID data element with the current value of the **Study Instance UID (0020,000D)** data element.

⚠ **NOTE!** This anonymization implies that every anonymized study will be stored under a different Patient ID, which is the same as the Study Instance UID of that study.

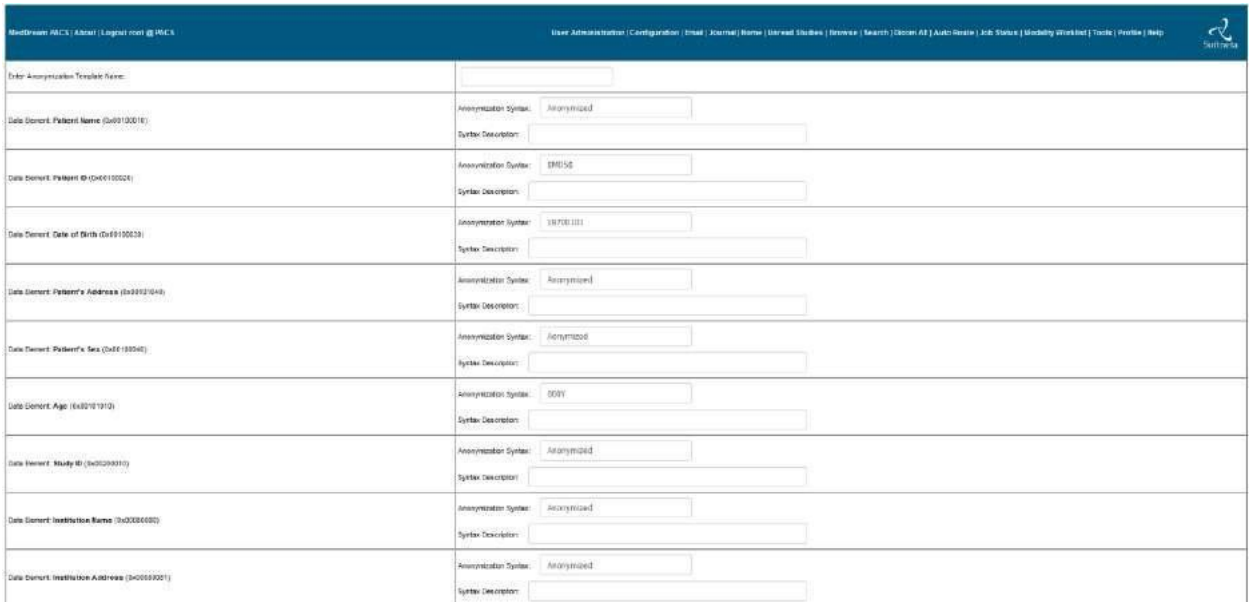


Figure 46 Anonymization Templates

Once the anonymization templates are defined, the users can select which template to use for anonymizing Dicom studies received from a source AE, or for anonymizing Dicom studies when sending them to a destination AE, from the "**Edit**" menu of the Application Entity page (see Section 0 for more details).

Transcription Templates (Windows platforms only)

For Windows platforms, the Administrator can upload Microsoft Word document templates with pre-configured bookmarks (and/or with company letterhead) and assign this pre-defined template to a particular Source AE, so that when the web users are entering study notes for a subject Dicom study received from that Source AE, they can download this pre-defined Word document template with the pre-configured bookmarks automatically filled-in by MedDream PACS Server with the corresponding information from the Dicom study.

For example, the following bookmarks in the Anonymization Template Microsoft Word document can be pre-configured to be automatically filled-in by MedDream PACS Server with the corresponding information from the Dicom study:

- **PatientName** – This bookmark will be auto-filled with the Patient Name (0x00100010) information from the subject Dicom study
- **PatientID** – This bookmark will be auto-filled with the Patient ID (0x00100020) information from the subject Dicom study
- **DateOfBirth** – This bookmark will be auto-filled with the Date of Birth (0x00100030) information from the subject Dicom study
- **StudyDate** – This bookmark will be auto-filled with the Study Date (0x00200010) information from the subject Dicom study
- **ReferDoc** – This bookmark will be auto-filled with the Referring Physician's Name(0x00080090) information from the subject Dicom study

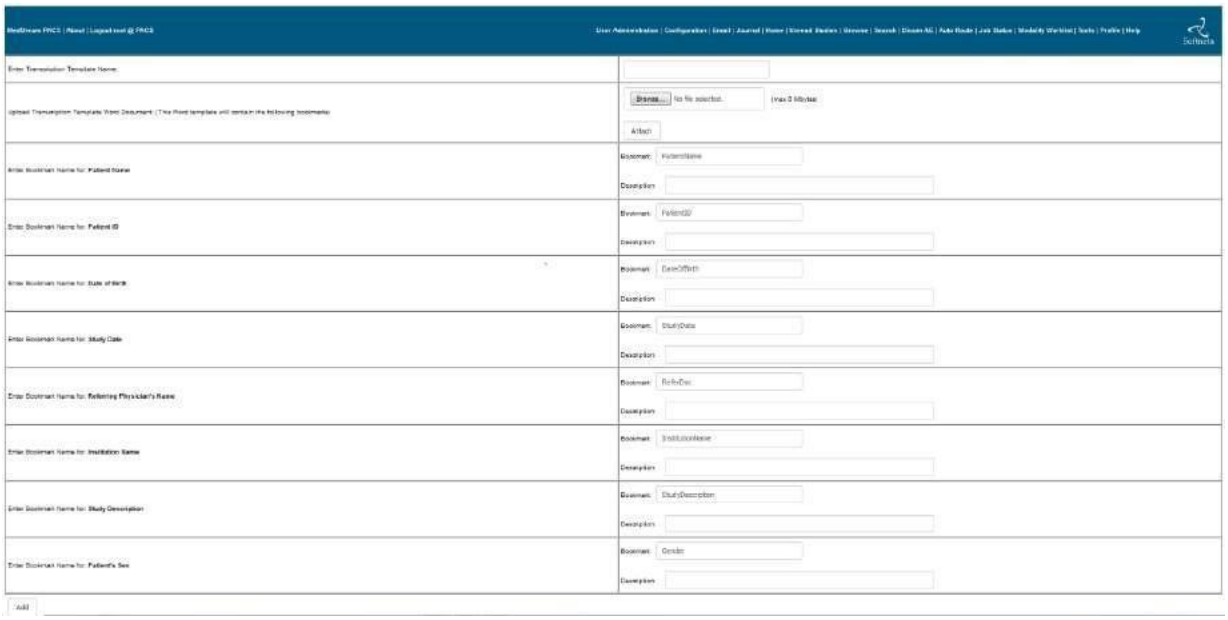


Figure 47 Transcription Template (Windows platforms only)

Restart Service

For users with the **System Administration** privilege enabled, this page will be displayed to allow the System Administrators to restart the Dicom Server component as well as the optional HL7 Interface of MedDream PACS Server (if enabled). However, the <**Restart**> button will be available only if there is no active connection to/from MedDream PACS Server, i.e., if there is any active connection to/from MedDream PACS Server, the list of active connections will be displayed instead of the <**Restart**> button.

Compress Entire Database

For users with the **System Administration** privilege enabled, this page will be displayed to allow the System Administrators to compress all images stored in the existing MedDream PACS Server database via one of the Dicom lossless transfer syntaxes below:

- RLE Lossless - UID 1.2.840.10008.1.2.5
- Explicit VR, JPEG Lossless, Non-hierarchical, First-order prediction (Process 14) - UID 1.2.840.10008.1.2.4.70
- JPEG-LS Compression, Lossless Mode - UID 1.2.840.10008.1.2.4.80
- JPEG 2000 Compression, Lossless Mode - UID 1.2.840.10008.1.2.4.90

JPEG2000 Lossless Mode compression is recommended for this tool, because of the lack of color-space information in the legacy JPEG Lossless compression, and less popularity/support for the RLE Lossless/JPEG-LS Lossless compression transfer syntaxes.

⚠**NOTE!** Depending on the size of the existing MedDream PACS Server database and the CPU/memory resources available on the server where MedDream PACS is running, it may take quite some time (e.g., hours or maybe even days) to compress the entire database. So please run this tool only during off-hours, e.g., nights or weekends, in order to have minimum impact on normal workflows during regular business hours.

Profile Page

This page allows users to modify their profile information, which include:

- User's names, password and email address information
- Preferred import source directory
- Preferred import source media drive
- Preferred import destination folder
- Preferred export directory
- Whether or not to share notes about a subject Dicom study or image
- Customizable study view columns to be displayed in study list pages
- Customizable patient view columns to be displayed in patient list pages
- Number of records to be displayed in multi-page web user interface pages (default is 10)

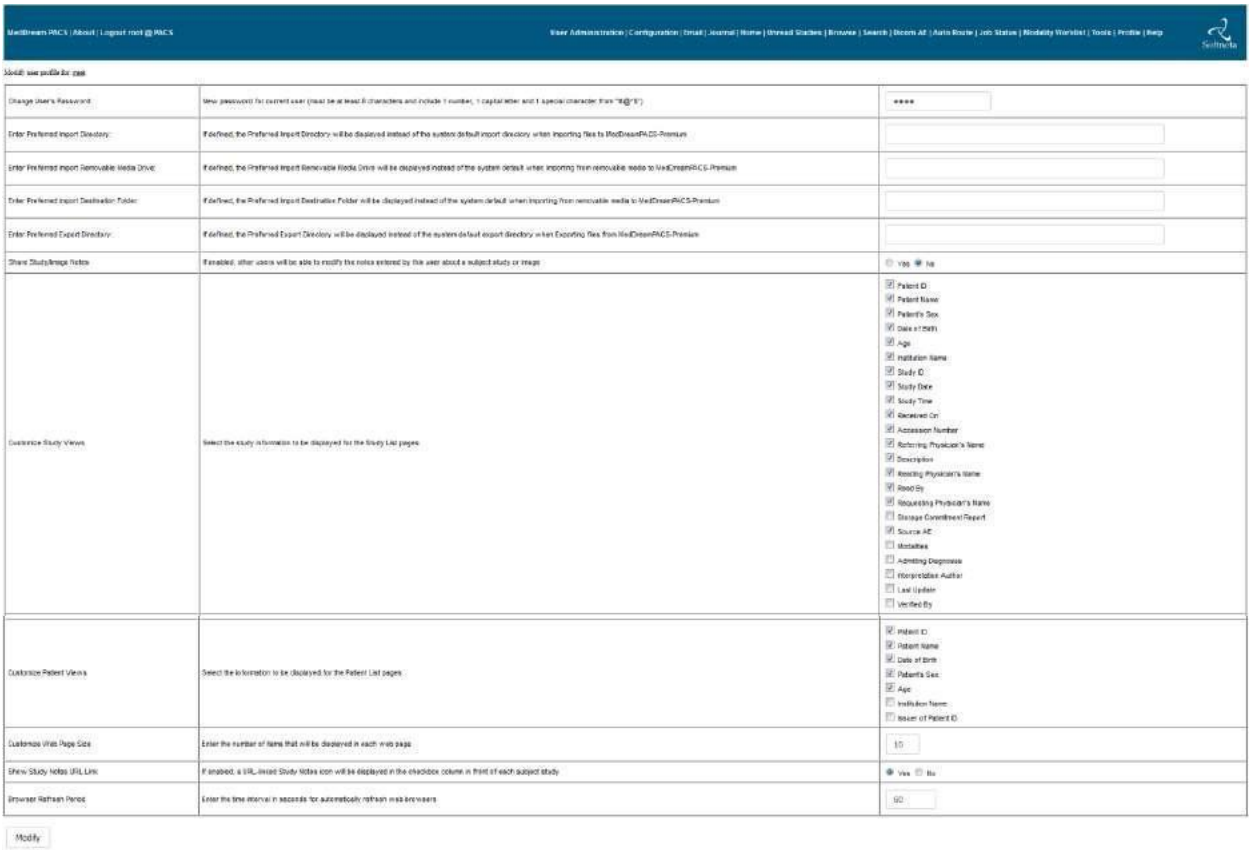


Figure 48 User Profile Page

Forwarding Images

When navigating through the patients, studies, series and images stored in the MedDream PACS database, if the current user has the '**Forward**' privilege enabled, a '**Forward**' button will be displayed to allow current user to forward the selected patients, studies or series to a remote destination C-STORE SCP application entity (AE):

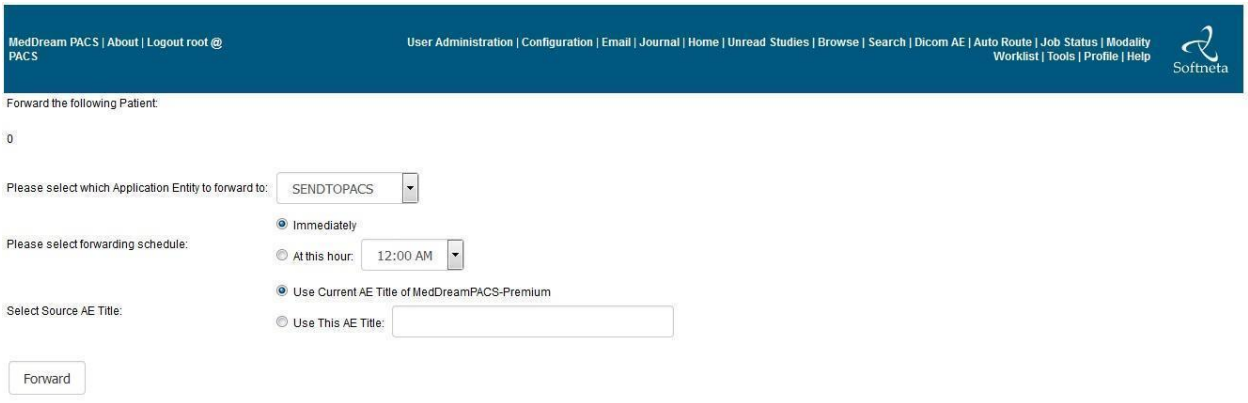


Figure 49 Forwarding Images

Users can select the destination AE from the drop-down list of remote SCP's., which are defined in the Application Entity Table described in Section 0 above. Clicking on the '**Forward**' button will schedule a database job to forward the selected patient(s), study(s) or series to the selected destination AE. The scheduled database job will then be processed by the MedDream PACS DICOM Server component, where all stored images of the selected patient(s), study(s) or series are transmitted to the destination AE.

To find out if the selected patient(s), study(s) or series have been successfully forwarded to the destination AE, the user can click on the 'Job Status' link in the Main Menu bar, which is described in detail in the Job Status Page below.

Post-Receive Image Compression

When delivering Dicom images to remote web browser (e.g., Java Applet viewers or Active-X plug-in), especially via a WAN connection, users often find the need for speeding up the image transfer between the MedDream PACS and the remote browsers. If this is the case, the Administrator can enable the Post-Receive Image Compression feature of MedDream PACS for each source AE, by selecting one of the Dicom compression transfer syntaxes from the list below:

- JPEG Lossless Transfer Syntax – If this value is selected, MedDream PACS Server will compress any received image using the Dicom JPEG Lossless Compression (Selection Value 1, Process 14) transfer syntax (UID 1.2.840.10008.1.2.4.70), and will save the compression image with the ".ls" filename extension.
- JPEG Lossy Transfer Syntax – If this value is selected, MedDream PACS Server will compress any received image using the Dicom JPEG Baseline Lossy Compression transfer syntax (UID 1.2.840.10008.1.2.4.50) for 8-bit images, and the Dicom JPEG Extended Lossy Compression transfer syntax (UID 1.2.840.10008.1.2.4.51) for 12-bit images. Both types of compressed images will be saved with the ".ly" filename extension. The image quality of the lossy compression is controlled by the following setting for each source AE if this transfer syntax is selected:

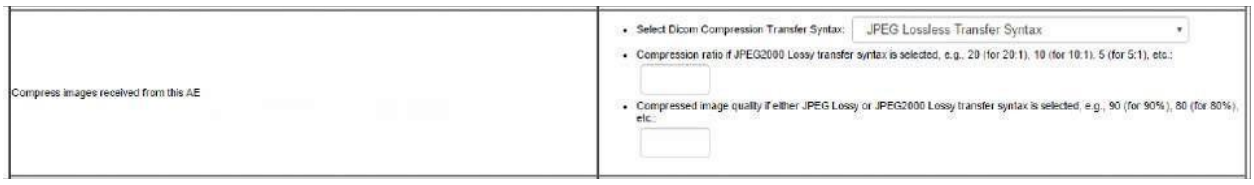


Figure 50 Compression Setting for JPEG Lossy Transfer Syntax

The quality can be set to 1 (worst quality, best compression ratio) to 100 (best quality, least compression ratio). The default value of 90 (percent) will be used if the above setting is absent.

- Runtime Length Encoding (RLE) Transfer Syntax – If this value is selected, MedDream PACS Server will compress any received image using the Dicom RLE compression transfer syntax (UID 1.2.840.10008.1.2.5), and will save the compression image with the ".rle" filename extension.
- JPEG2000 Part-1 Lossless Only Transfer Syntax – If this value is selected, MedDream PACS Server will compress any received image using the Dicom JPEG2000 Part-1 Lossless Only transfer syntax (UID 1.2.840.10008.1.2.4.90), and will save the compression image with the ".j2k" filename extension.
- JPEG2000 Part-1 Lossless Or Lossy Transfer Syntax – If this value is selected, MedDream PACS Server will compress any received image using the Dicom JPEG2000 Part-1 Lossless Or Lossy transfer syntax (UID 1.2.840.10008.1.2.4.91), and will save the compression image with the ".j2k"

filename extension. The compression ratio or image quality of the JPEG2000 lossy compression are controlled by the following settings for each source AE if this transfer syntax is selected:

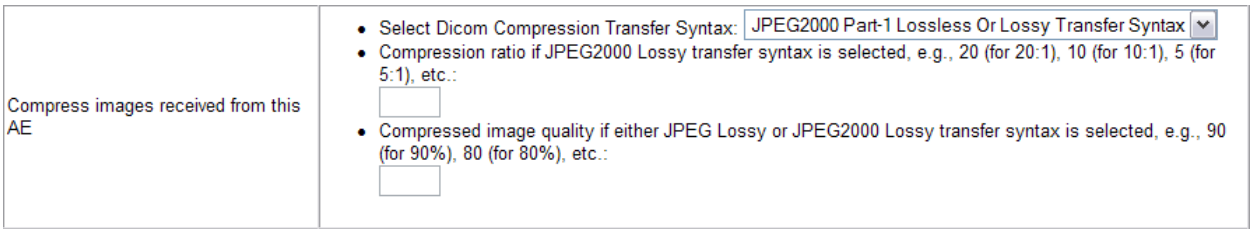


Figure 51 Compression Setting for JPEG2000 Part-1 Lossless or Lossy Transfer Syntax

The compression ratio can be set to 20 (20:1), 10 (10:1), 5 (5:1), etc. with higher compression ratio generally leading to lesser image quality. The image quality can be set to 1 (worst quality, best compression ratio) to 100 (best quality, least compression ratio), and the default quality is 90 (percent).

With the above Post-Receive Image Compression feature enabled, MedDream PACS Server will first check if any of the compressed images is available when delivering Dicom images to the web browsers, and will prefer the compressed images over the original images when transferring the images to the remote browsers. By default, MedDream PACS Server uses the Lossless mode of the JPEG2000 Lossless or Lossy compression if both of the above Registry settings are absent.

Automatic Routing

Dicom Image Routing

In addition to forwarding patient(s), study(s) or series manually from the MedDream PACS web user interface, users can define automatic routing table entries to forward images automatically based on the following criteria:

- Source AE Title – This is the AE title from where the images are received. If the **Route By Source AE Title** option is selected and an image is received from the matching source AE title, MedDream PACS Server will route the received image to the defined destination AE automatically, according to the routing schedule defined below.
- Key Attribute Tag – Currently the following list of Dicom attributes are supported:

- Institution Name - (0008,0080)
- Referring Physician Name - (0008,0090)
- Patient ID - (0010,0020)
- Protocol Name - (0018,1030)
- Performing Physician's Name (0008,1050)
- Reading Physician's Name (0008,1060)
- Operator's Name (0008,1070)
- Study Description (0008,1030)
- Series Description (0008,103E)

- Accession Number (0008,0050)
- Modality (0008,0060)
- Modalities In Study (0008,0061)
- Requesting Physician's Name (0032,1032)
- Date of Birth (0010,0030)
- Study Date (0008,0020)
- Series Date (0008,0021)

If the **Route By Key Attribute** option is selected, users can define a **Key Matching Pattern** string (may include wild-card characters including '*' and '?') to match against received image attribute tags. If the key attribute tag in the received image matches with the specified matching pattern string, MedDream PACS Server will route the received image to the defined destination AE automatically, according to the routing schedule defined below.

- By Applying the Logical AND Operator (**&&**) to Both Criteria Above – If this option is selected, MedDream PACS Server will apply both the **Source AE Title** and **Key Attribute Tag** criteria using the logical AND (&&) operator, i.e., the received images must match **both** the defined **Source AE Title** and **Key Attribute Tag** pattern before they can be forwarded to the defined Destination AE.
- By Applying the Advanced Logical Expressions – Users can configure advanced logical expressions for the automatic routing rule, which consists of one or more key matching patterns against the routing key attributes above, as well as logical operators such as **AND** (**&&**), **OR** (||). Users can also specify the priority for applying multiple logical expressions by using the round brackets "()", i.e., logical expressions enclosed within the round brackets will be applied first, before those expressions outside of the round brackets. For more information about this feature, please refer to the advanced logical expression example below.
- Destination AE Title – This is the AE title where the images will be sent.
- Copy To Destination Folder – If this option is selected, MedDream PACS Server will copy received images into the specified destination folder, instead of forwarding them to a destination AE.
- Hourly Schedule – Automatic forwarding schedule by the 24-hour clock, which can be either '**Immediately'**, a **[From,To]** spread window, a specified 24-hour clock interval, a Delayed until **[From,To]** window, or a**[From,To]** immediate-filter window.
- Weekly Schedule – Automatic forwarding schedule by the 7-weekday daily schedule. The weekly schedule is combined with the hourly schedule above to determine when or if MedDream PACS should forward the received images.
- Priority – The higher priority an Automatic Routing Rule is defined, the higher priority the resulting automatic routing jobs will be assigned. So if there are multiple automatic routing rules defined with the same delivery schedule, the routing jobs resulting from the highest-priority rule will be processed before those jobs resulting from the lower-priority rules. Default priority is 0 for normal or low priority rules.
- Purge After Routing – Whether or not MedDream PACS Server should purge the received images automatically after they have been routed successfully to the destination AE.
- Forward Existing [n] Oldest Studies To Destination AE – If this checkbox is selected, MedDream PACS Server will also forward the [**n**] existing oldest studies to the destination AE, in addition to the newly received study. If a negative number (e.g., "-1") is entered, MedDream PACS Server will forward the [**n**] existing newest/latest studies to the destination AE, in addition to the newly received study.
- Wait [n] minutes for all instances of the study to be received, and forward the entire study instead of individual images – If this checkbox is selected, MedDream PACS Server will wait the specified **[n]**

minutes for all images of the study to be received, then forward the entire study via a single Dicom association to the destination AE and transfer all images of the study.

- Wait [n] minutes for all instances of the series to be received, and forward the entire series instead of individual images – If this checkbox is selected, MedDream PACS Server will wait the specified **[n]** minutes for all images of the series to be received, then forward the entire series via a single Dicom association to the destination AE and transfer all images of the series.
- Retry Interval for retrying failed automatic routing jobs – This time interval (in hours) specify the amount of delay MedDream PACS Server will wait before attempting to retry a failed job. The default value is 0, which means MedDream PACS Server will attempt to retry any failed job as soon as it fails.
- Do not use the AE Title assigned to MedDream PACS Server – If this checkbox is selected, MedDream PACS Server will use either the Original/Source AE Title from the source AE, or the User-specified AE Title (instead of using the AE Title configured for MedDream PACS Server) when sending images to the destination AE.

When specifying the AE titles for automatic routing entries, the source and destination AE titles are used as keys to the routing table, which implies that one source AE can have one (uni-cast) or more (multi-cast) destination AE (s) associated with the routing entry. In other words, received images from the same source AE can be forwarded to multiple destinations AE (s) if there are more than one destination AE (s) defined for the source AE.

- If '**Immediately**' is specified as the schedule for the automatic routing table, then images will be forwarded to the destination AE (s) as soon as they are received.
- If a '**From**' and '**To**' Spread Window is specified as the schedule for the automatic routing table, then MedDream PACS will forward any received images to the destination AE (s) if the local time is within the specified [**From**, **To**] window, by choosing an hourly schedule that is evenly distributed across the specified [**From**, **To**] Spread Window. This scheduling option is useful when users want to spread the automatic routing jobs evenly across the [**From**, **To**] window, thus avoid making any hour particularly busy with too many routing jobs.
- If a fixed 24-hour clock interval is used, then the received images will be forwarded at the specified hour. For example, if the schedule is set to 9:00 P.M., then the received images will not be forwarded to the destination AE (s) until the local time is 9:00 P.M. If there are any images received between 9:00 P.M. and 9:59 P.M., they will be forwarded immediately, and images received after 9:59 P.M. will be forwarded the next day from 9:00 P.M. to 9:59 P.M.
- If a '**From**' and '**To**' Immediate-Filter Window is specified as the schedule for the automatic routing table, then images will be forwarded to the destination AE (s) immediately if the local time is within the specified [**From**, **To**] Immediate-Filter Window.
- If the Delayed Until Local Time is within '**From**' and '**To**' Window is specified as the schedule for the automatic routing table, then images will be forwarded later to the destination AE (s) when the local time is within the specified [**From**, **To**] delayed-forwarding Window.

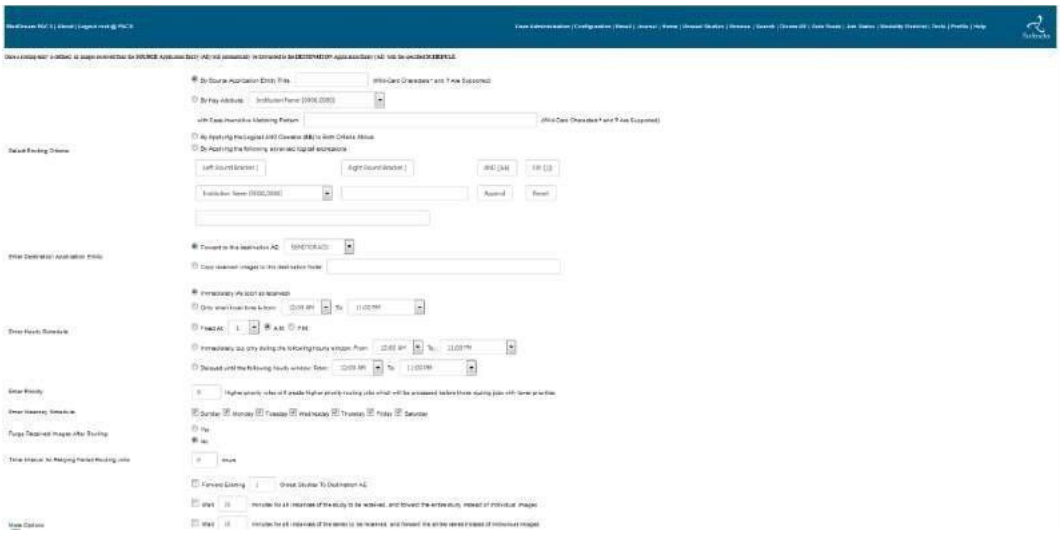


Figure 52 Automatic Dicom Image Routing

Example routing rules:

- Route By Source AE Title – Users can click on the **By Source Application Entity** option and enter the following parameters:

Source AE Title	-	Scanner
Destination AE Title	-	eFilm
Hourly Schedule	-	Immediately
Weekly Schedule	-	Any day
Auto Purge	-	No

With the above routing rule, all images received from the AE “Scanner” will be automatically routed to AE “eFilm” as soon as they are received. The received images will be kept in MedDream PACS database after they are routed to the destination AE “eFilm”.

- Route By Key Attribute – Users can click on the **By Key Attribute** option and enter the following parameters:

Key Attribute Tag	-	Referring Physician’s Name (0008,0090)
Matching Pattern	-	John D*
Destination AE Title	-	DCMTK
Hourly Schedule	-	1:00 A.M.
Weekly Schedule	-	Tuesday
Auto Purge	-	Yes

With the above routing rule, all images received with the Referring Physician’s Name such as “John Doe” or “John David” will be automatically routed to AE “DCMTK” at 1:00 A.M local time on Tuesdays. (However, received images with Referring Physician’s Name such as “Dr. John Doe” or “Mr. John David” do not match with the defined routing pattern string and therefore will not be routed.) The received images will be purged after they have been routed successfully to the destination AE “DCMTK”.

- Route By Date-based Key Attributes – When specifying matching pattern for date-based key attributes, e.g., Date of Birth (0010,0030), Study Date (0008,0020), Series Date (0008,0021), etc, users can use the following logical operators (default is the Equal or ‘=’ operator) for comparing date value:

- >= dates newer than or equal to the specified value. For example, matching pattern of ">= 2000-01-01" means any date on or after January 1, 2000.
- > dates newer than the specified value. For example, "> 2000-01-01" means any date after January 1, 2000.
- <= dates earlier than or equal to the specified value. For example, matching pattern of "<= 2000-01-01" means any date on or before January 1, 2000.
- < dates earlier than the specified value. For example, matching pattern of "< 2000-01-01" means any date before January 1, 2000.
- != dates not equal to the specified value. For example, matching pattern of "!= 2000-01-01" means any date except January 1, 2000.

    - Route By Advanced Logical Expressions – Users can use the following button tools to build the advance logical expression pattern string:

- Left Round Bracket – Clicking on this button will append "**(**" to the logical expression pattern.
- Right Round Bracket – Clicking on this button will append "**)**" to the logical expression pattern.
- AND (&&) – Clicking on this button will append " && " to the logical expression pattern.
- OR (||) – Clicking on this button will append " **||** " to the logical expression pattern.
- Key Attribute Tag – Supported routing key Dicom attribute tag, e.g. , Referring Physician's Name (0008,0090).
- Matching Pattern – Pattern string to be matched with the current value of the key attribute above. Wild-card characters such as '*****' and '**?**' are supported. If the pattern is prefixed by the '**!**' character, then the logical NOT ('**!**') operator will be applied for the pattern string defined for this Dicom key attribute.
- Append – Clicking on this button will append the "%**$tag**=**$pattern**%" string above to the current logical expression, where **$tag** is the Dicom key attribute tag and **$pattern** is the matching pattern specified above.
- Reset – Clicking on this button will clear or reset the current logical expression pattern string.

For example, the logical expression "(%00080090=smith*% OR %00100020=12345*) AND %00080060=ct%" will match the received Dicom studies with the following criteria:

- Any Referring Physician's Name (0008,0090) beginning with "smith" or Patient ID (0010,0020) beginning with "12345", **AND**
- Modality (0008,0060) is CT

So a received Dicom CT study with the Referring Physician's Name of "Smith^John" would match with this routing rule, while a MR study with the Patient ID of "123456" would not match.

To find out if the statuses of the automatically routed images and check whether they have been successfully sent to the destination AE(s), the user must login as the Administrator/Super-user account ('**root**' for MySQL or '**SYSTEM**' for Oracle databases) and click on the 'Job Status' link in the Main Menu bar. This is because the automatic routing jobs are internal system-level properties and do not belong to any particular user, therefore they should be maintained only by the System Administrator.

If for any reason (e.g., no receiving application is accepting images at the destination AE) the automatically routed images cannot be delivered successfully, MedDream PACS Server will retry up to a maximum of three (default) attempts to deliver the failed images to the destination AE. This **Maximum Retries** parameter is configurable by modifying the following Windows Registry value:

HKEY_LOCAL_MACHINE\Software\Rainbowfish Software\PacsOne\{*AETITLE*}\MaximumRetries

Where:

{AETITLE} is the Application Entity Title you have assigned for MedDream PACS Server during installation.

Dicom Modality Performed Procedure Step Message (MPPS) Routing

Very similar to routing received Dicom images, users can define automatic routing table entries to forward Dicom MPPS messages (N-CREATE-RQ/N-SET-RQ) to one or more destination AEs automatically based on the following criteria:

- Source AE Title – This is the AE title from where the MPPS messages are received. If the **Route By Source AE Title** option is selected and a MPPS message is received from the matching source AE title, MedDream PACS Server will route the received MPPS message to the defined destination AE automatically, according to the routing schedule defined below.
- Key Attribute Tag – Currently the following list of Dicom attributes are supported:

- Study ID (0020,0010)
- Accession Number (0008,0050)
- Modality (0008,0060)
- Scheduled Procedure Step ID (0040,0009)
- Requested Procedure ID (0040,1001)
- Performed Procedure Step ID (0040,0253)
- Performed Station Name (0040,0242)
- Performed Location (0040,0243)
- Performed Station AE Title (0040,0241)
- Performed Procedure Step Start Date (0040,0244)
- Performed Procedure Step Start Time (0040,0245)
- Performed Procedure Step End Date (0040,0250)
- Performed Procedure Step End Time (0040,0251)
- Performed Procedure Step Status (0040,0252)
- Performing Physician's Name (0008,1050)

If the **Route By Key Attribute** option is selected, users can define a **Key Matching Pattern** string (may include wild-card characters including '*' and '?') to match against received MPPS message attribute tags. If the key attribute tag in the received MPPS message matches with the specified matching pattern string, MedDream PACS Server will route the received MPPS message to the defined destination AE automatically, according to the routing schedule defined below.

- By Applying the Logical AND Operator (**&&**) to Both Criteria Above – If this option is selected, MedDream PACS Server will apply both the **Source AE Title** and **Key Attribute Tag** criteria using the logical AND (&&) operator, i.e., the received images must match **both** the defined **Source AE Title** and **Key Attribute Tag** pattern before they can be forwarded to the defined Destination AE.
- Destination AE Title – This is the AE title where the images will be sent.

- Hourly Schedule – Automatic forwarding schedule by the 24-hour clock, which can be either '**Immediately'**, a **[From,To]** spread window, a specified 24-hour clock interval, a Delayed until **[From,To]** window, or a**[From,To]** immediate-filter window.
- Weekly Schedule – Automatic forwarding schedule by the 7-weekday daily schedule. The weekly schedule is combined with the hourly schedule above to determine when or if MedDream PACS should forward the received images.
- Priority – The higher priority an Automatic Routing Rule is defined, the higher priority the resulting automatic routing jobs will be assigned. So if there are multiple automatic routing rules defined with the same delivery schedule, the routing jobs resulting from the highest-priority rule will be processed before those jobs resulting from the lower-priority rules. Default priority is 0 for normal or low priority rules.
- Retry Interval for retrying failed automatic routing jobs – This time interval (in hours) specify the amount of delay MedDream PACS Server will wait before attempting to retry a failed job. The default value is 0, which means MedDream PACS Server will attempt to retry any failed job as soon as it fails.
- Do not use the AE Title assigned to MedDream PACS Server – If this checkbox is selected, MedDream PACS Server will use either the Original/Source AE Title from the source AE, or the User-specified AE Title (instead of using the AE Title configured for MedDream PACS Server) when sending images to the destination AE.

When specifying the AE titles for automatic routing entries, the source and destination AE titles are used as keys to the routing table, which implies that one source AE can have one (uni-cast) or more (multi-cast) destination AE (s) associated with the routing entry. In other words, received MPPS messages from the same source AE can be forwarded to multiple destinations AE (s) if there are more than one destination AE (s) defined for the source AE.

- If '**Immediately**' is specified as the schedule for the automatic routing table, then images will be forwarded to the destination AE (s) as soon as they are received.
- If a '**From**' and '**To**' Spread Window is specified as the schedule for the automatic routing table, then MedDream PACS will forward any received images to the destination AE (s) if the local time is within the specified [**From**, **To**] window, by choosing an hourly schedule that is evenly distributed across the specified [**From**, **To**] Spread Window. This scheduling option is useful when users want to spread the automatic routing jobs evenly across the [**From**, **To**] window, thus avoid making any hour particularly busy with too many routing jobs.
- If a fixed 24-hour clock interval is used, then the received images will be forwarded at the specified hour. For example, if the schedule is set to 9:00 P.M., then the received images will not be forwarded to the destination AE (s) until the local time is 9:00 P.M. If there are any images received between 9:00 P.M. and 9:59 P.M., they will be forwarded immediately, and images received after 9:59 P.M. will be forwarded the next day from 9:00 P.M. to 9:59 P.M.
- If a '**From**' and '**To**' Immediate-Filter Window is specified as the schedule for the automatic routing table, then images will be forwarded to the destination AE (s) immediately if the local time is within the specified [**From**, **To**] Immediate-Filter Window.

Example routing rules:

- Route By Source AE Title – Users can click on the **By Source Application Entity** option and enter the following parameters:

Source AE Title	-	Scanner
Destination AE Title	-	RIS
Hourly Schedule	-	Immediately

Weekly Schedule - Any day

With the above routing rule, all MPPS messages received from the AE “Scanner” will be automatically routed to AE “RIS” as soon as they are received.

- Route By Key Attribute – Users can click on the **By Key Attribute** option and enter the following parameters:

Key Attribute Tag - Performing Physician's Name (0008,1050)
Matching Pattern - John D*
Destination AE Title - DCMTK
Hourly Schedule - 1:00 A.M.
Weekly Schedule - Tuesday

With the above routing rule, all MPPS messages received with the Performing Physician's Name such as “John Doe” or “John David” will be automatically routed to AE “DCMTK” at 1:00 A.M local time on Tuesdays. However, received MPPS messages with Performing Physician's Name such as “Dr. John Doe” or “Mr. John David” do not match with the defined routing pattern string and therefore will not be routed.

To find out if the statuses of the automatically routed MPPS messages and check whether they have been successfully sent to the destination AE(s), the user must login as the Administrator/Super-user account (‘**root**’ for MySQL or ‘**SYSTEM**’ for Oracle databases) and click on the ‘Job Status’ link in the Main Menu bar. This is because the automatic routing jobs are internal system-level properties and do not belong to any particular user, therefore they should be maintained only by the System Administrator.

If for any reason (e.g., no receiving application is accepting messages at the destination AE) the automatically routed MPPS messages cannot be delivered successfully, MedDream PACS Server will retry up to a maximum of three (default) attempts to deliver the failed messages to the destination AE. This **Maximum Retries** parameter is configurable by modifying the following Windows Registry value:

HKEY_LOCAL_MACHINE\Software\Rainbowfish
Software\PacsOne\{*AETITLE*}\MaximumRetries

Where:

{*AETITLE}* is the Application Entity Title you have assigned for MedDream PACS Server during installation.

HL7 Message Routing (optional)

If the HL7 Message Listener option is installed, users can define automatic routing table entries to forward received HL7 messages automatically based on the following criteria:

- Source Application Name – This is the HL7 application from where the messages are received. If the **Route By Source Application Name** option is selected and a message is received with the matching “**Sending Application**” field in the **MSH** Message Header, MedDream PACS Server will route the received messages to the defined destination HL7 application automatically, based to the routing schedule defined below.
- Key in Message Header – Currently the following keys are supported:

- Message Type
- Receiving Application
- Receiving Facility
- Sending Facility

If this option is selected, users can define a **Key Matching Pattern** string (may include wild-card characters such as '*' or '?') to match against the **MSH** message header in the received HL7 messages. If the key attribute in the received messages matches with the specified matching pattern, MedDream PACS Server will route the received messages to the defined destination HL7 application automatically, according to the routing schedule defined below.

- Destination Application – This is the destination HL7 application where the received messages will be sent.
- Schedule – Automatic forwarding schedule, which can be either '**Immediately'**, a **[From,To]** 24-hour clock window, or a specified 24-hour clock interval:

- Immediately - Messages will be forwarded to the destination HL7 application (s) as soon as they are received.
- '**From**' and '**To**' Schedule Window - Messages will be forwarded to the destination HL7 application (s) when the current time is within the specified [**From**, **To**] Schedule Window.
- Fixed 24-hour clock interval - Messages will be forwarded at the specified hour. For example, if the schedule is set to 9:00 P.M., then the received messages will not be forwarded to the destination HL7 application (s) until the local time is 9:00 P.M. If there are any messages received between 9:00 P.M. and 9:59 P.M., they will be forwarded immediately, and messages received after 9:59 P.M. will be forwarded the next day at 9:00 P.M.

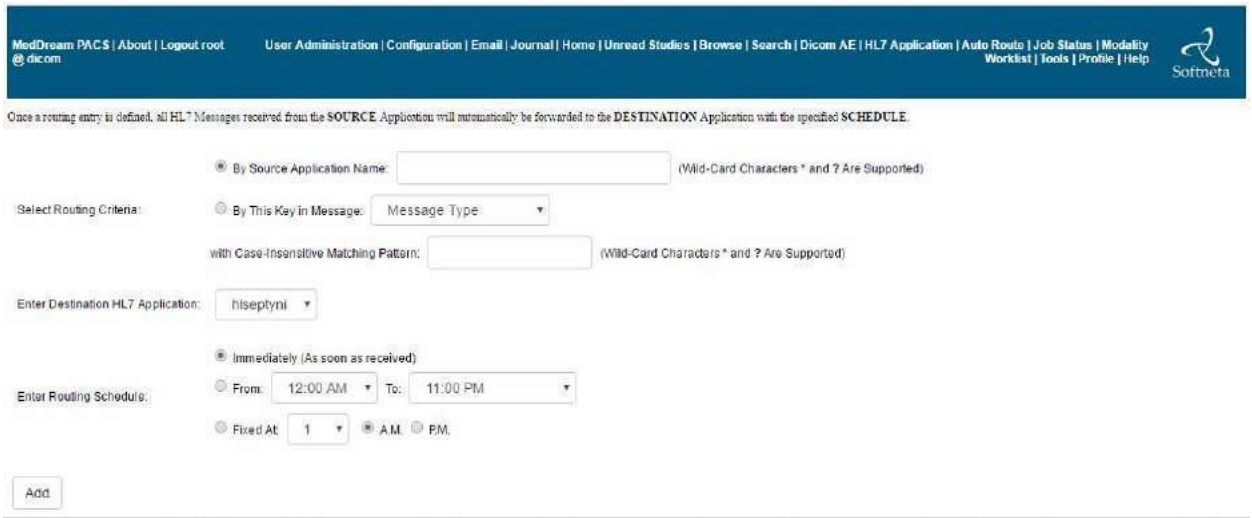


Figure 53 Automatic HL7 Message Routing (optional)

Printing Images

When navigating through the patients, studies, series and images stored in the MedDream PACS database, if the current user has the '**Print**' privilege enabled, a '**Print**' button will be displayed to allow current user to print the selected patients, studies or series to a remote destination Dicom Printer/Print SCP:

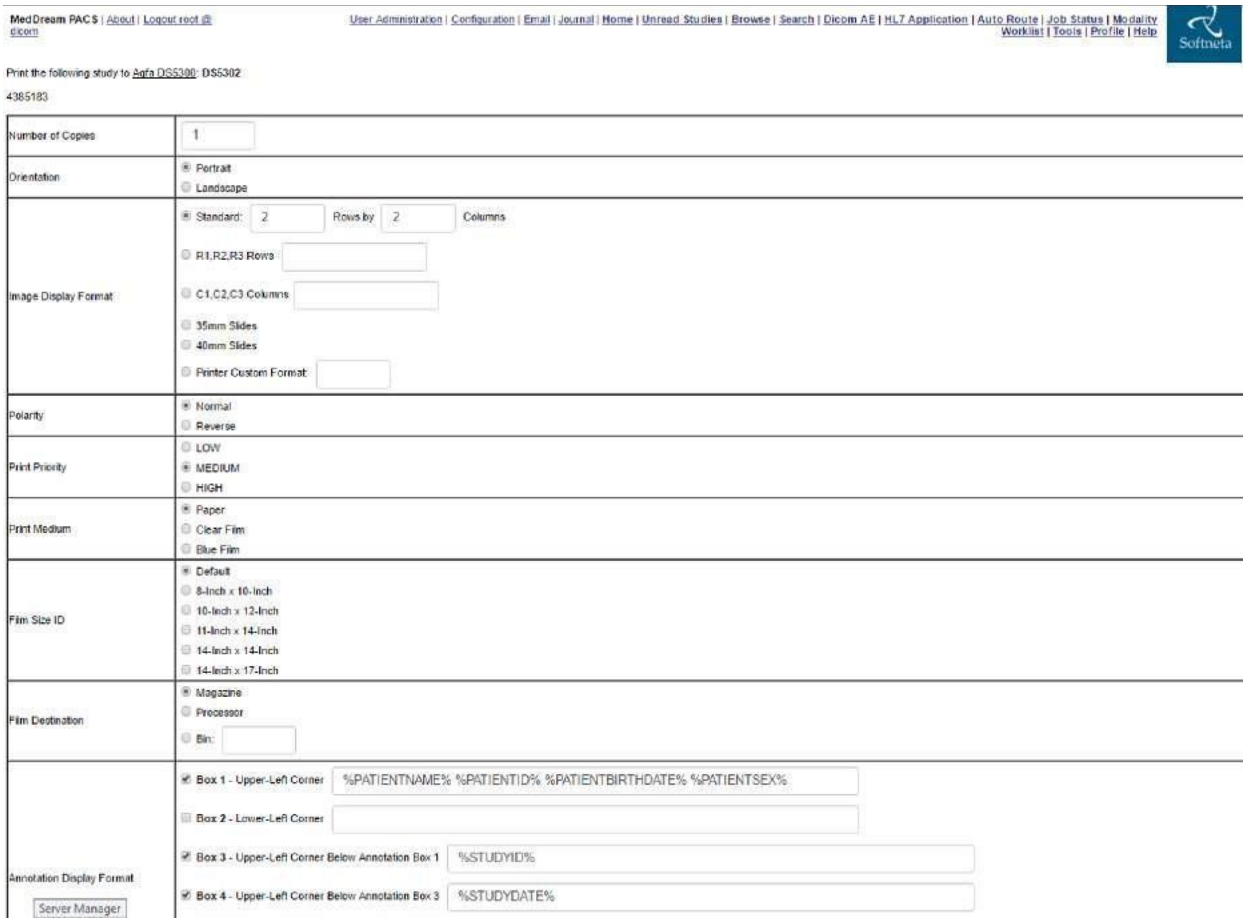


Figure 54 Printing to Remote Dicom Printer

From the above **Print** menu page, users can select the destination Dicom printer and choose the following printing parameters:

- Number of copies
- Film orientation
- Image display format (can be printer specific)
- Print priority (if supported by remote printer)
- Print medium
- Film destination
- Convert color images to grayscale (if applicable) – If the images being printed are a mixture of both color and grayscale images, users can choose whether or not to convert all color images to grayscale before sending them to the Dicom printer which may not support printing color images

Job Status Page

The current status of all database jobs submitted by the current user are displayed by clicking on the 'Job Status' link of the Main Menu bar in the Job Status page, with the 'Completed' jobs displayed first followed by 'Failed' database jobs.

If the current logged-in user has the '**Modify**' privilege, then there will be a '**Retry**' button as well as a '**Delete**' button displayed in this page if there is any failed job. User can select the job (s) to delete or retry by clicking on the checkbox in front of the job ID column and pressing either the '**Delete**' button or the '**Retry**' button.

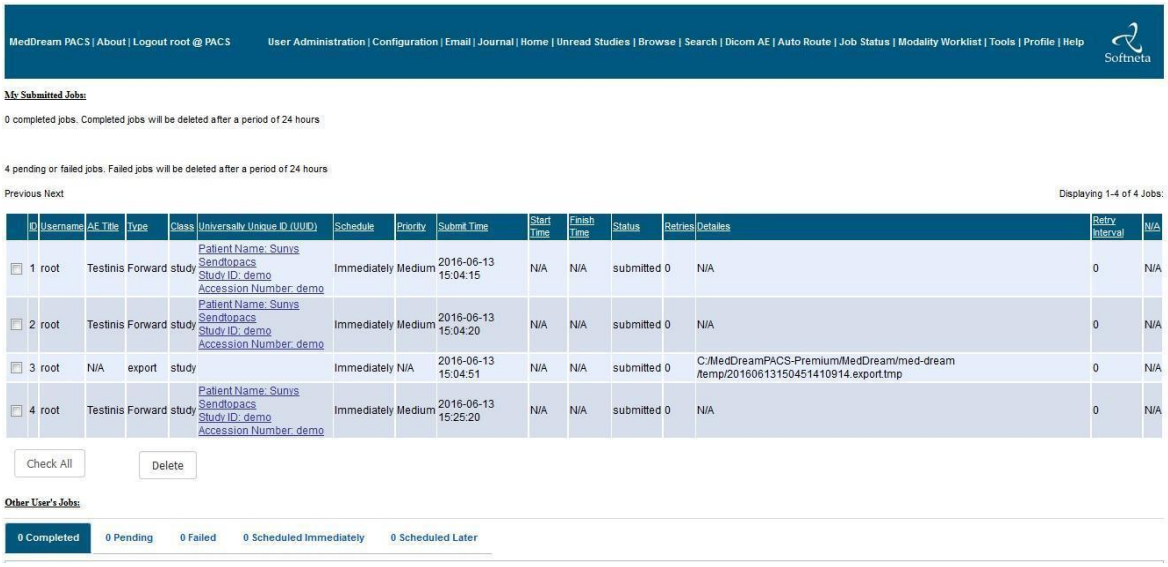


Figure 55 Job Status Page

- Id – Job ID which is generated automatically by the MySQL database
- User – The username which created the database job
- AeTitle – Destination AE title
- Type – Job type, e.g., 'Forward', 'Print', etc.
- Level – Hierarchy level, e.g., 'Patient', 'Study', 'Series', etc.
- UID – Unique ID in the hierarchy level, e.g., patient ID, study UID, series UID, etc.
- SubmitTime – Timestamp on when the database job is submitted
- StartTime – Timestamp on when the database job starts processing
- FinishTime – Timestamp on when the database job finishes processing
- Status – Success or Failure
- Details – Any detailed errors if the database job has failed

DicomWeb RESTful Services

DicomWeb is intended to provide a light-weight mobile device and web browser friendly mechanism for accessing Dicom images, which can be implemented by developers who have minimal familiarity with the DICOM standard and which uses consumer application friendly mechanisms like http, JSON and media types (like "image/jpeg") to the maximum extent possible. The standard is formally defined in DICOM PS3.18 Web Services.

The DICOMweb services are distinguished from other DICOM web services by the suffix "-RS", indicating their RESTful nature. The family consists primarily of:

- WADO-RS for retrieval of DICOM PS3.10 files, meta data in XML or JSON forms, bulk data separated from the meta data and rendered consumer format images
- STOW-RS for storage (sending) of DICOM PS3.10 files or separated meta data and bulk data
- QIDO-RS for querying collections (databases, registries) of DICOM objects

DicomWeb QIDO-RS (Query based on ID for DICOM Objects by RESTful Services)

Web service address: protocol://server/MedDream_PACS/qidors.php/query_parameters

where:

- protocol - either http or https
- server - either fully-qualified DNS name or IP address of the host where MedDream PACS Server is running
- query_parameters - standard HTTP query string which may consists of various key attributes for different query levels, e.g., studies, series or instances. For example

- studies[?query]
- studies/{StudyInstanceUID}/series[?query]
- series[?query]
- studies/{StudyInstanceUID}/series/{SeriesInstanceUID}/instances[?query]
- studies/{StudyInstanceUID}/instances[?query]
- instances[?query]

The supported Key Attributes and Return Attributes are listed for each querying level below, and the following querying parameters are not yet supported/ignored:

- FuzzyMatching
- TimezoneOffsetFromUTC

QIDO-RS Client Authentication

Requesting clients must include valid HTTP/HTTPS Basic Authentication (POST) data which include a *Username*/*Password* pair. The *Username* must be registered in the "**User Administration**" page of MedDream PACS Server, and query results are filtered by the privilege levels of this username, i.e., the QIDO-RS queries will be applied to only those patients/studies for which this username has access to.

For example, if the registered *Username* has the "**View Private**" privilege enabled, then the QIDO-RS queries from this *Username* will be applied to all the public and private patients/studies. But if the registered *Username* does NOT have the "**View Private**" privilege enabled, then the QIDO-RS queries from this *Username* can only access those public patients/studies, plus any private patients/studies that *Username* has access to (e.g., the registered *Username* matches with the Referring Physician's Name of a private study, etc).

If no HTTP/HTTPS Basic Authentication data is included with the QIDO-RS request, or the submitted username/password information is invalid, then the request will be denied with the HTTP 401 status code ("Not Authorized").

QIDO-RS Client Request Parameters Supported

The following table lists the QIDO-RS request parameter supported by MedDream PACS Server:

Parameter	Specifications
Media Types	'multipart/related; type=application/dicom+xml' or 'application/json'
Limit and Offset supported	Yes
Relational Queries Supported	No
Person Name Matching	Literal, case insensitive.

Table 7 QIDO-RS Request Parameters

QIDO-RS Matching Methods

The following table lists the types of matching methods that can be used for QIDO-RS searches:

Matching Method	Description
S	Single Value Matching
U	Universal Matching
*	Wild-card Character Matching, i.e., '*' and '?'
R	Range Matching
L	List of UID Matching

Table 8 QIDO-RS Matching Methods

QIDO-RS Search for Studies

The following table lists the key attributes and the matching methods supported for QIDO-RS search for studies:

Attribute Name	Tag	Matching Methods	Return Attributes
Study Date	(0008,0020)	S,*,U,R	Yes
Study Time	(0008,0030)	S,*,U,R	Yes
Accession Number	(0008,0050)	S,*,U	Yes
Instance Availability	(0008,0056)	N/A	Yes
Modalities in Study	(0008,0061)	S,*,U	Yes
Referring Physician's Name	(0008,0090)	S,*,U	Yes
Study Description	(0008,1030)	S,*,U	Yes if included in the 'includefield' query parameter
Retrieve URL	(0008,1190)	N/A	Yes
Patient Name	(0010,0010)	S,*,U	Yes
Patient ID	(0010,0020)	S,*,U	Yes
Patient's Birth Date	(0010,0030)	S,*,U,R	Yes
Patient's Sex	(0010,0040)	S,*,U	Yes
Study Instance UID	(0020,000D)	S,U,L	Yes
Study ID	(0020,0010)	S,*,U	Yes

Number of Study Related Series	(0020,1206)	N/A	Yes
Number of Study Related Instances	(0020,1208)	N/A	Yes

Table 9 QIDO-RS Study Search Attributes

QIDO-RS Search for Series

The following table lists the key attributes and the matching methods supported for QIDO-RS search for series:

Attribute Name	Tag	Matching Methods	Return Attributes
Series Date	(0008,0021)	S,U,R	Yes
Series Time	(0008,0031)	S,U,R	Yes
Instance Availability	(0008,0056)	N/A	Yes
Modality	(0008,0060)	S,U	Yes
Series Description	(0008,103E)	S,U	Yes
Retrieve URL	(0008,1190)	N/A	Yes
Series Instance UID	(0020,000E)	S,U,L	Yes
Series Number	(0020,0011)	S,U	Yes
Number of Series Related Instances	(0020,1209)	N/A	Yes

Table 10 QIDO-RS Series Search Attributes

QIDO-RS Search for Instances

The following table lists the key attributes and the matching methods supported for QIDO-RS search for instances:

Attribute Name	Tag	Matching Methods	Return Attributes
Instance Creation Date	(0008,0012)	N/A	Yes if included in the 'includefield' query parameter
Instance Creation Time	(0008,0013)	N/A	Yes if included in the 'includefield' query parameter
SOP Class UID	(0008,0016)	S,U,L	Yes
SOP Instance UID	(0008,0018)	S,U,L	Yes
Instance Availability	(0008,0056)	N/A	Yes
Retrieve URL	(0008,1190)	N/A	Yes
Instance Number	(0020,0013)	S,U	Yes
Samples per Pixel	(0028,0002)	N/A	Yes if included in the 'includefield' query parameter
Photometric Interpretation	(0028,0004)	N/A	Yes if included in the 'includefield' query parameter
Number of Frames	(0028,0008)	N/A	Yes
Number of Rows	(0028,0010)	N/A	Yes
Number of Columns	(0028,0011)	N/A	Yes
Bits Allocated	(0028,0100)	N/A	Yes
Bits Stored	(0028,0101)	N/A	Yes if included in the 'includefield' query parameter
Pixel Representation	(0028,0103)	N/A	Yes if included in the 'includefield' query parameter

Table 11 QIDO-RS Instance Search Attributes

QIDO-RS Response Status Codes

The following table lists the HTTP response status codes that may be returned for QIDO-RS searches:

Code	Message Text	Description

200	Success	The query completed and any matching results are returned in the message body.
400	Bad Request	This error status means there is certain invalid query parameter which the server does not understand, and therefore cannot process the client request.
401	Unauthorized	The requesting client did not include HTTP/HTTPS Basic Authentication data, or the username/password information supplied by the client is invalid.
500	Internal Server Error	The server encountered an unexpected condition which prevented it from fulfilling the request.

Table 12 QIDO-RS Response Status Codes

DicomWeb WADO-RS (Web Access to DICOM Objects by RESTful Services)

Web service address: protocol://server/MedDream_PACS/wadors.php/query_parameters

where:

- protocol - either http or https
- server - either fully-qualified DNS name or IP address of the host where MedDream PACS Server is running
- query_parameters - standard HTTP query string which may consists of various key attributes for different query levels, e.g., studies, series or instances. For example

- studies/{studyUID} - Retrieve entire study
- studies/{studyUID}/series/{seriesUID} - Retrieve entire series
- studies/{studyUID}/series/{seriesUID}/instances/{instanceUID} - Retrieve instance
- studies/{studyUID}/metadata - Retrieve study metadata
- studies/{studyUID}/series/{seriesUID}/metadata - Retrieve series metadata
- studies/{studyUID}/series/{seriesUID}/instances/{instanceUID}/metadata - Retrieve instance metadata
- studies/{StudyUID}/series/{seriesUID}/instances/{instanceUID}/frames/{FrameList} - Retrieve frames
- {bulkdataReference} - Retrieve bulk data

WADO-RS Client Authentication

Requesting clients must include valid HTTP/HTTPS Basic Authentication (POST) data which include a *Username*/*Password* pair. The *Username* must be registered in the "**User Administration**" page of MedDream PACS Server, and query/retrieve results are filtered by the privilege levels of this username, i.e., the WADO-RS query/retrieve operations will be applied to only those patients/studies for which this username has access to.

For example, if the registered *Username* has the "**View Private**" privilege enabled, then the WADO-RS queries from this *Username* will be applied to all the public and private patients/studies. But if the registered *Username* does NOT have the "**View Private**" privilege enabled, then the WADO-RS queries from this *Username* can only access those public patients/studies, plus any private patients/studies that *Username* has access to (e.g., the registered *Username* matches with the Referring Physician's Name of a private study, etc).

If no HTTP/HTTPS Basic Authentication data is included with the WADO-RS request, or the submitted username/password information is invalid, then the request will be denied with the HTTP 401 status code ("Not Authorized").

WADO-RS Client Request Accept Types

The following table lists the supported Accept Type in the HTTP header from the WADO-RS client requests:

Retrieve Option	Accept Type
RetrieveStudy	'application/dicom' or 'application/octet-stream'
RetrieveSeries	'application/dicom' or 'application/octet-stream'
RetrieveInstance	'application/dicom' or 'application/octet-stream'
RetrieveFrames	'application/octet-stream'
RetrieveMetadata	'application/dicom+json' or 'application/dicom+xml'
RetrieveBulkdata	'application/octet-stream'

Table 13 WADO-RS Client Request Accept Types

WADO-RS Response Status Codes

The following table lists the HTTP response status codes that may be returned for WADO-RS searches:

Code	Message Text	Description
200	Success	The query/retrieve operation has been completed and requested data has been returned in the message body.
204	No Content	No match found and an empty dataset is returned.
400	Bad Request	This error status means there is certain invalid query parameter which the server does not understand, and therefore cannot process the client request.
401	Unauthorized	The requesting client did not include HTTP/HTTPS Basic Authentication data, or the username/password information supplied by the client is invalid.
500	Internal Server Error	The server encountered an unexpected condition which prevented it from fulfilling the request.

Table 14 WADO-RS Response Status Codes

DicomWeb STOW-RS (Store Over the Web by RESTful Services)

Web service address: protocol://server/MedDream_PACS/stowrs.php/query_parameters

where:

- protocol - either http or https
- server - either fully-qualified DNS name or IP address of the host where MedDream PACS Server is running
- query_parameters - standard HTTP query string which may consists of various key attributes for different query levels, e.g., studies, series or instances. For example

- studies[/{StudyInstanceUID}]

STOW-RS Client Authentication

Requesting clients must include valid HTTP/HTTPS Basic Authentication (POST) data which include a *Username*/*Password* pair. The *Username* must be registered in the "**User Administration**" page of MedDream PACS Server.

If no HTTP/HTTPS Basic Authentication data is included with the STOW-RS request, or the submitted username/password information is invalid, then the request will be denied with the HTTP 401 status code ("Not Authorized").

STOW-RS Response Status Codes

The following table lists the HTTP response status codes that may be returned for STOW-RS searches:

Code	Message Text	Description
200	Success	All images have been stored successfully and result has been returned in the message body.
202	Accepted	This error status means at least 1 of the images have been stored successfully, but at least 1 of the images have failed.
400	Bad Request	This error status means there is certain invalid query parameter which the server does not understand, and therefore cannot process the client request.
401	Unauthorized	The requesting client did not include HTTP/HTTPS Basic Authentication data, or the username/password information supplied by the client is invalid.
406	Not Acceptable	The Content Type information in the HTTP header from the STOW-RS request is invalid/not-supported
409	Conflict	All images have failed to be stored
500	Internal Server Error	The server encountered an unexpected condition which prevented it from fulfilling the request.

Table 15 STOW-RS Response Status Codes

Sample Client Configuration (OHIF Viewer)

Here's a sample client configuration for the DicomWeb RESTful services of MedDream PACS Server from the OHIF Viewer (https://github.com/OHIF/Viewers/wiki):

- Server Type - Dicom Web
- WADO URI root - protocol://server/MedDream_PACS/wado.php, where:
- protocol - either http or https
- server - either fully-qualified DNS name or IP address of the host where MedDream PACS Server is running

- WADO root - protocol://server/MedDream_PACS/wadors.php, where:
- protocol - either http or https
- server - either fully-qualified DNS name or IP address of the host where MedDream PACS Server is running

- Image Rendering - WADO URI
- QIDO root - protocol://server/MedDream_PACS/qidors.php, where:
- protocol - either http or https
- server - either fully-qualified DNS name or IP address of the host where MedDream PACS Server is running

- Authentication - A valid username/password registered in the "***User Administration***" page of MedDream PACS Server (Section "Managing MedDream PACS User Accounts")

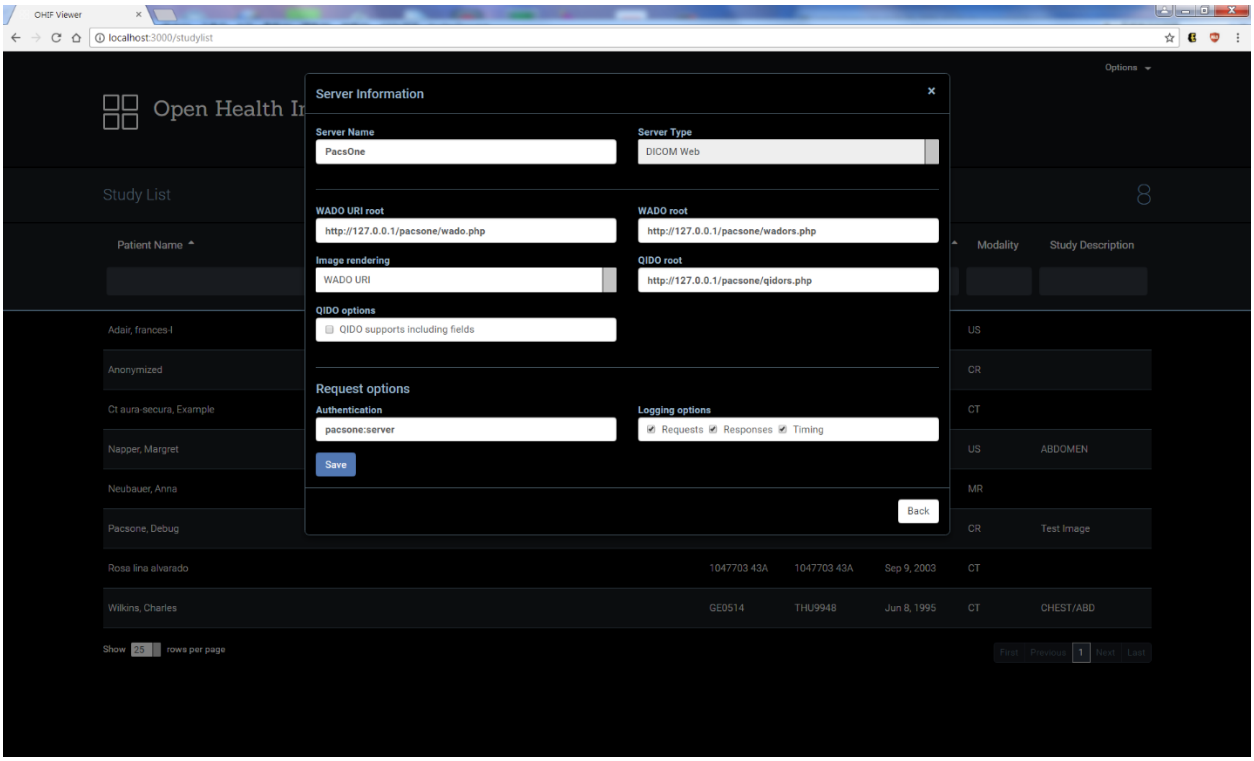


Figure 56 OHIF Viewer Configuration for DicomWeb RESTful Services of MedDream PACS Server

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