Radiology Module with DCM4CHEE

Install Guide

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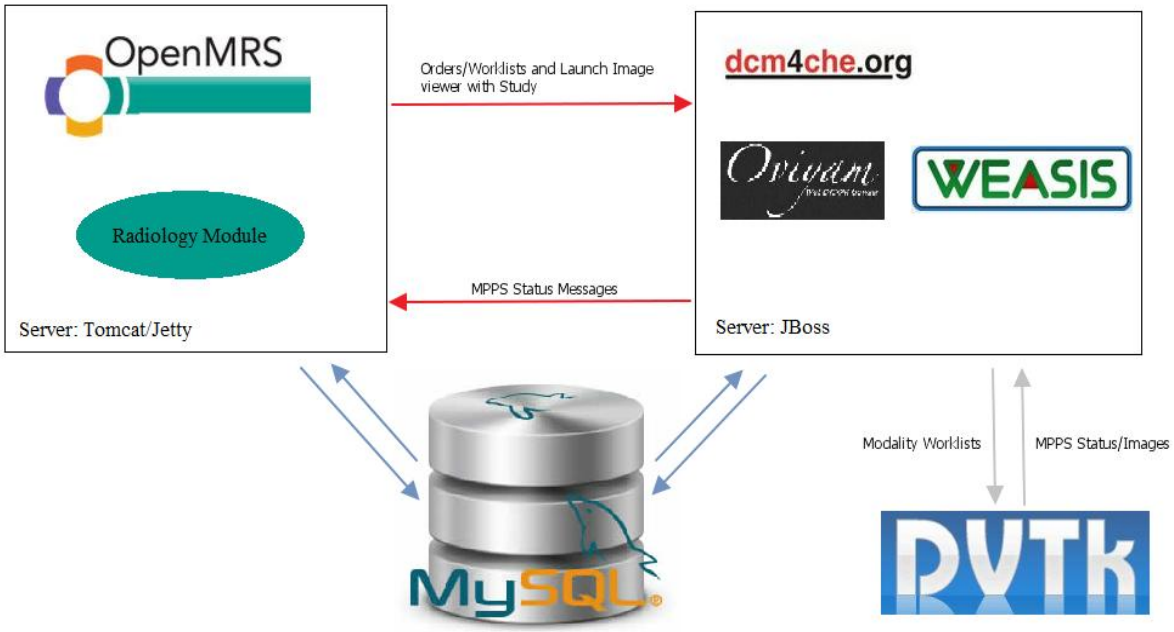
Introduction

This install guide consists of four essential components for the entire module to function properly.

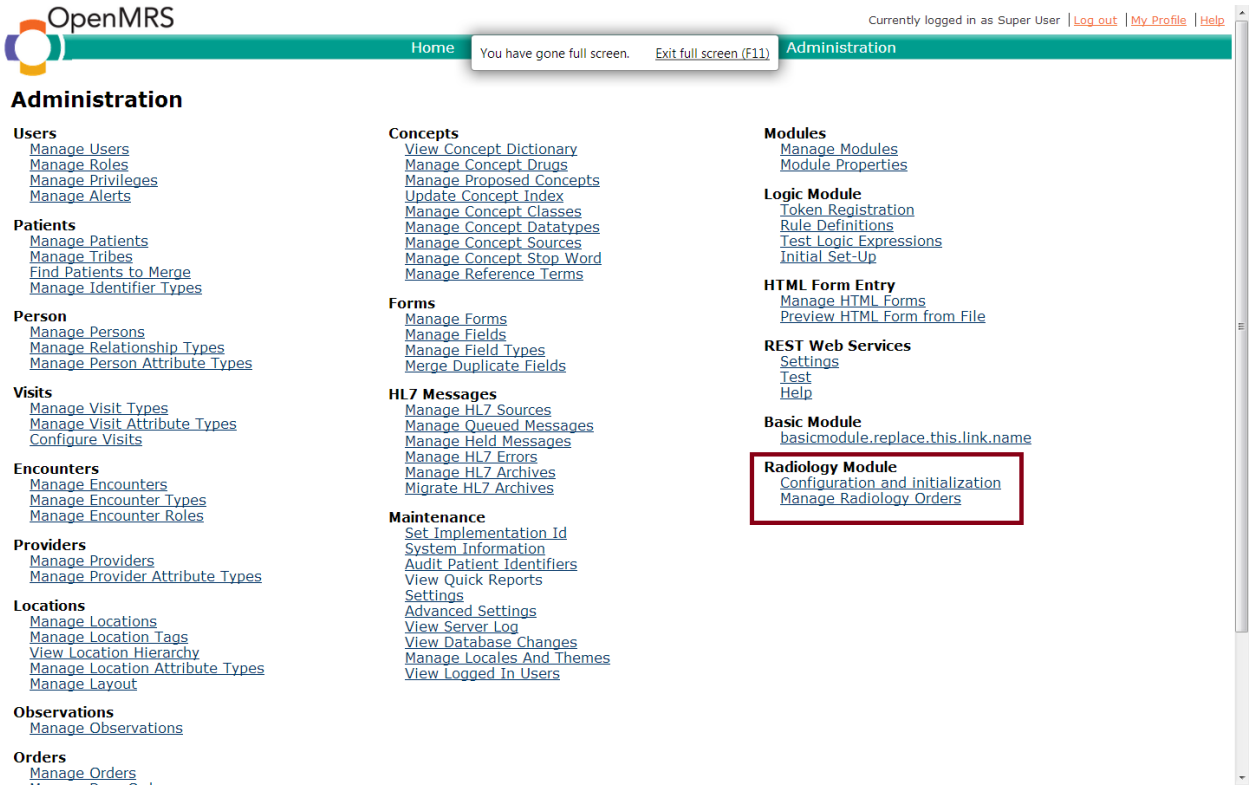
- OpenMRS Radiology Module – Module to place orders/worklists in dcm4chee and reflect the status of the order. Physicians can add radiology orders and specialists can add observations based on the procedure performed. Orders added are stored as modality worklists in dcm4chee.
- DCM4CHEE - A DICOM image and archive manager which can be used as a PACS(Picture Archiving and Communication System) when coupled with a viewer. Also provides features to add modality worklists and update the status of the worklists based on the MPPS(Modality Performed Procedure Step) status messages and forward the status messages to OpenMRS.
- Oviyam/Weasis – DICOM Image Viewer. Oviaym 2.0 is a HTML5 Javascript based DICOM image viewer whereas Weasis is a standalone Java based DICOM image viewer.
- Dvtk Modality Emulator – Emulator to simulate modality functions based on the DICOM standard. Communicates with dcm4chee to retrieve worklists, inform dcm4chee of the status of an initiated procedure and store the images when procedure is completed.

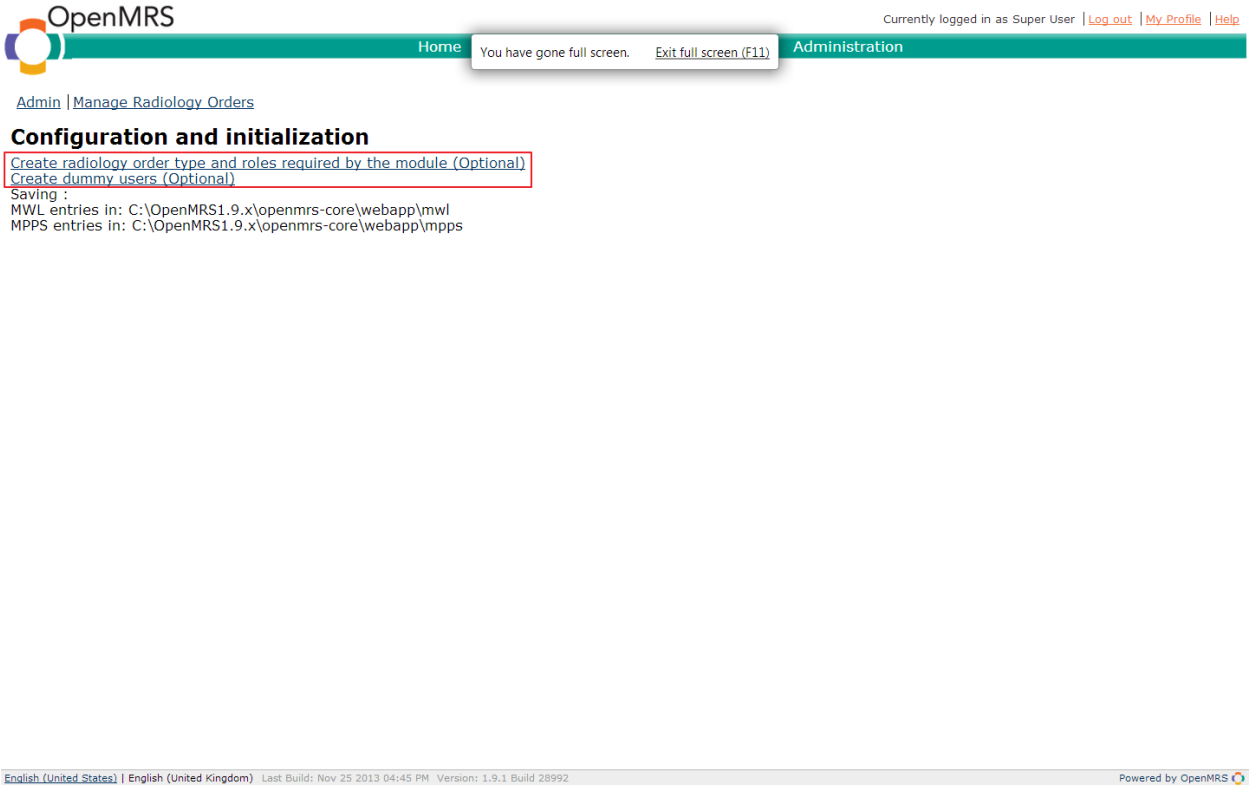


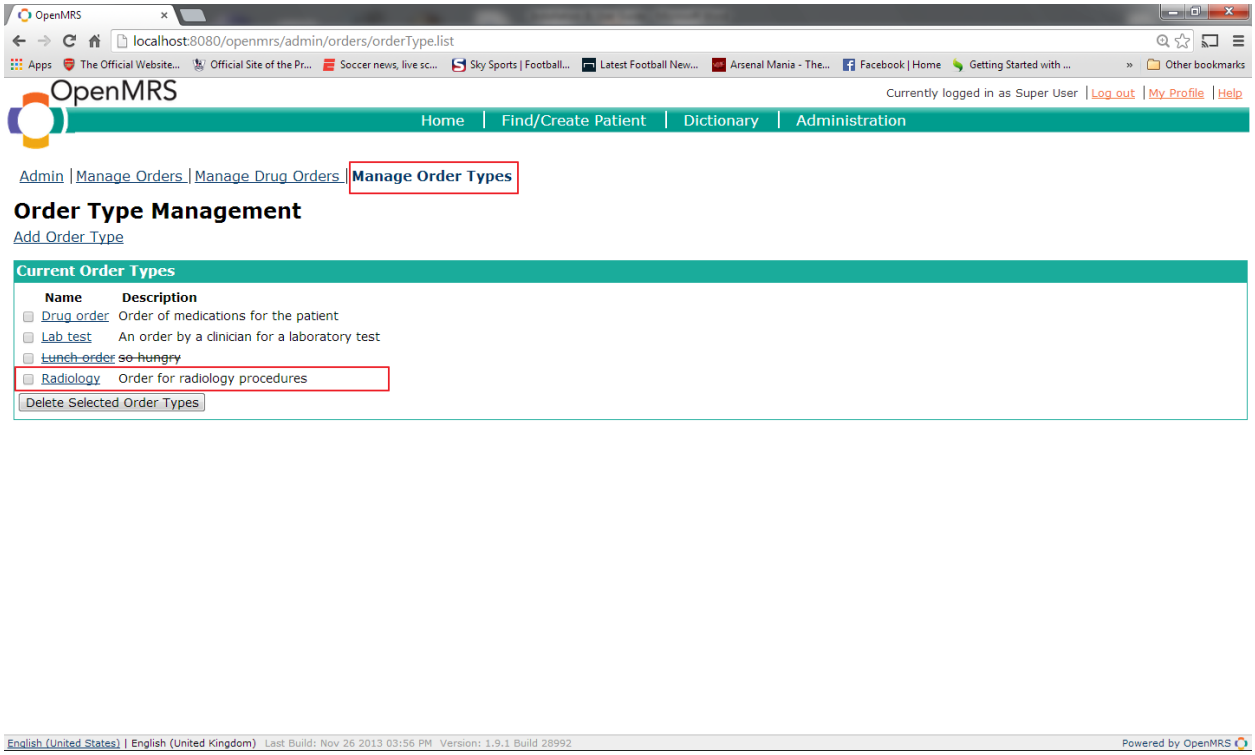
OpenMRS Radiology Module

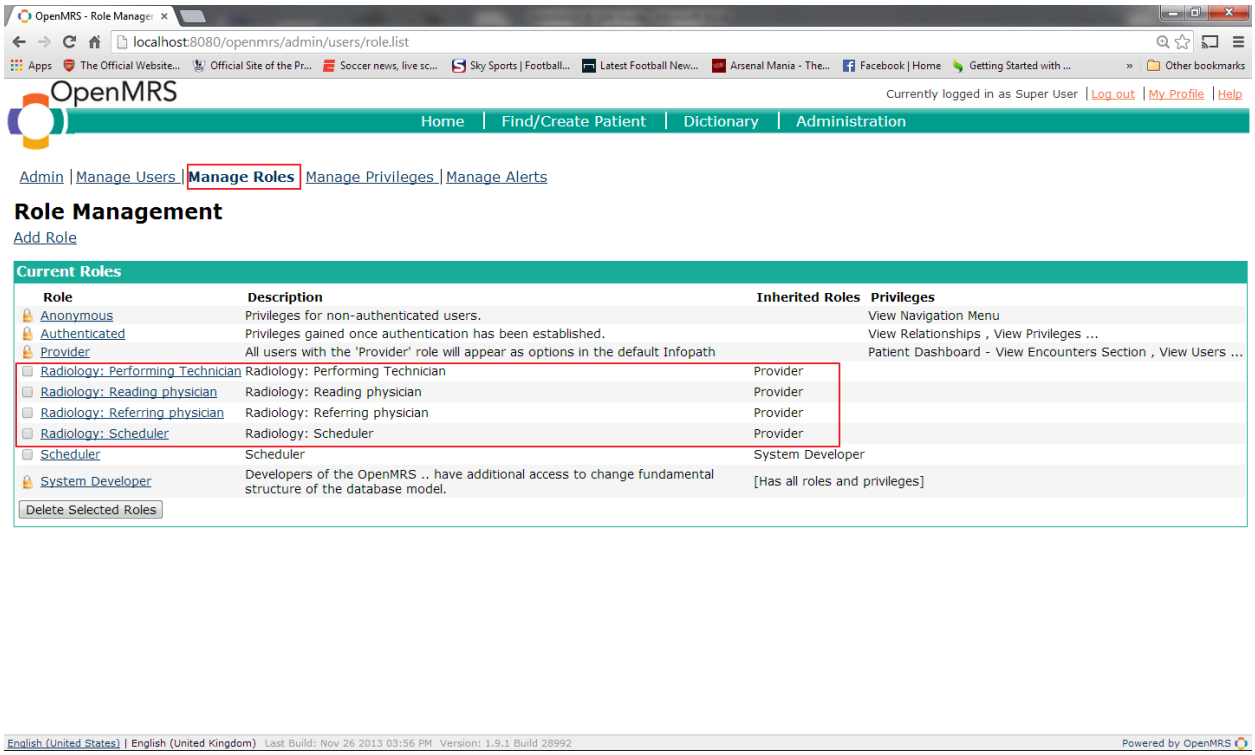
Installation

- Install the Radiology Module OMOD
    - Download : https://github.com/akhilrv/Radiology
    - In "{module folder}/omod/target" : The latest omod will be available.
    - To build again from source, run "mvn clean install" inside the module root folder.
- In the Administration Page,
    - There will be a new section called Radiology Module.
    - Manage Radiology Orders :
        - Referring Physicians can
            - Add orders.
            - View all Radiology orders in the system.
            - Edit orders.
        - Schedulers can schedule the appropriate time for the study (exam) to be performed.
        - Performing Technicians can view orders and update current status of the radiology order.
        - Reading Physicians can
            - View Completed orders with links to launch image viewer.
            - Add observation on the radiology study performed.
    - Configuration and Initialization(Optional: Need not be used if the module started correctly)
        - If module started correctly, a new Order Type called 'Radiology' can be found in Administration→Orders→Manage Order Types
        - If module started correctly, new Roles called 'Scheduler', 'Performing Technician', 'Reading Physician', 'Referring Physician' can be found in Administration→Users→Manage Roles
        - If not, Click on the "Create Radiology Order Type and Roles required by the module" link.
        - If new user needs to be created, click on the "Create Dummy Users" link.


OpenMRS
Currently logged in as Super User | Log out | My Profile | Help
Home
You have gone full screen. Exit full screen (F11)
Administration
Administration
Users
Manage Users
Manage Roles
Manage Privileges
Manage Alerts
Patients
Manage Patients
Manage Tribes
Find Patients to Merge
Manage Identifier Types
Person
Manage Persons
Manage Relationship Types
Manage Person Attribute Types
Visits
Manage Visit Types
Manage Visit Attribute Types
Configure Visits
Encounters
Manage Encounters
Manage Encounter Types
Manage Encounter Roles
Providers
Manage Providers
Manage Provider Attribute Types
Locations
Manage Locations
Manage Location Tags
View Location Hierarchy
Manage Location Attribute Types
Manage Layout
Observations
Manage Observations
Orders
Manage Orders
Concepts
View Concept Dictionary
Manage Concept Drugs
Manage Proposed Concepts
Update Concept Index
Manage Concept Classes
Manage Concept Datatypes
Manage Concept Sources
Manage Concept Stop Word
Manage Reference Terms
Forms
Manage Forms
Manage Fields
Manage Field Types
Merge Duplicate Fields
HL7 Messages
Manage HL7 Sources
Manage Queued Messages
Manage Held Messages
Manage HL7 Errors
Manage HL7 Archives
Migrate HL7 Archives
Maintenance
Set Implementation Id
System Information
Audit Patient Identifiers
View Quick Reports
Settings
Advanced Settings
View Server Log
View Database Changes
Manage Locales And Themes
View Logged In Users
Modules
Manage Modules
Module Properties
Logic Module
Token Registration
Rule Definitions
Test Logic Expressions
Initial Set-Up
HTML Form Entry
Manage HTML Forms
Preview HTML Form from File
REST Web Services
Settings
Test
Help
Basic Module
basicmodule.replace.this.link.name
Radiology Module
Configuration and initialization
Manage Radiology Orders

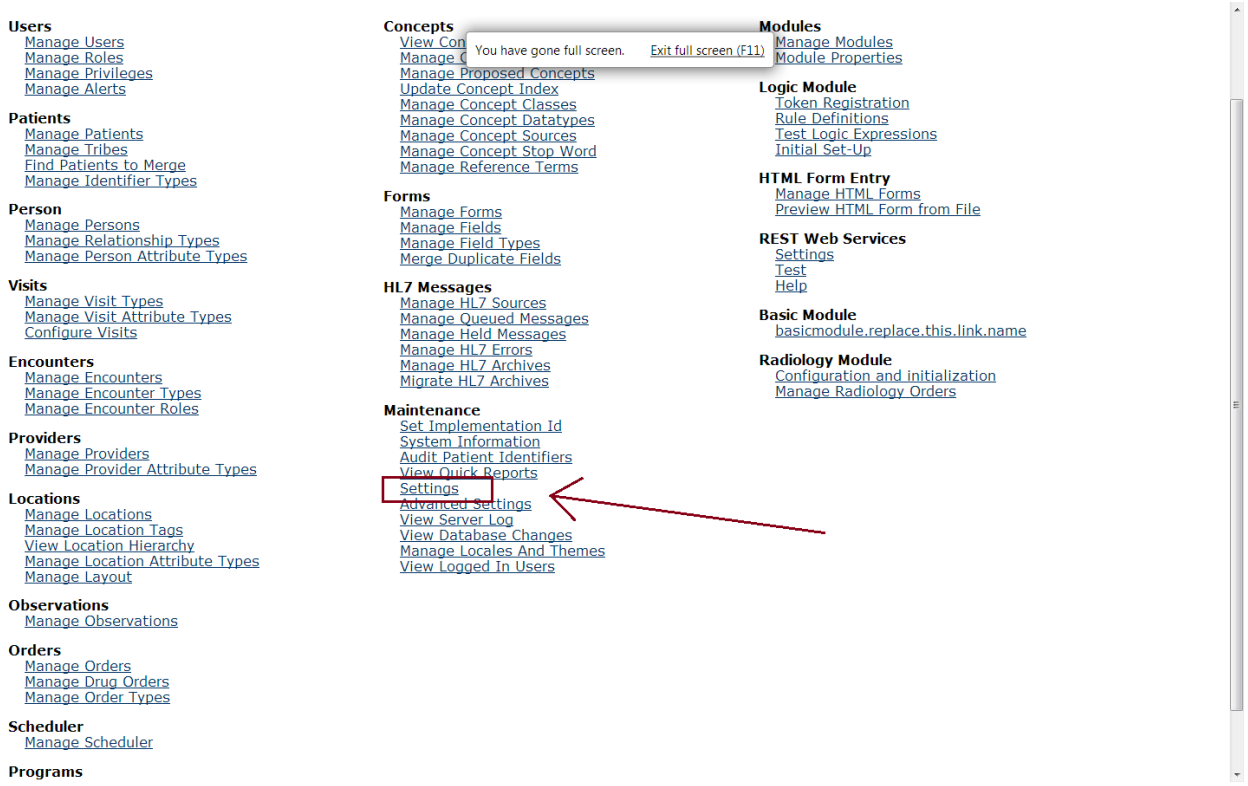

OpenMRS
Currently logged in as Super User | Log out | My Profile | Help
Home
You have gone full screen. Exit full screen (F11)
Administration
Admin | Manage Radiology Orders
Configuration and initialization
Create radiology order type and roles required by the module (Optional)
Create dummy users (Optional)
Saving :
MWL entries in: C:\OpenMRS1.9.x\openmrs-core\webapp\mwl
MPPS entries in: C:\OpenMRS1.9.x\openmrs-core\webapp\mpps
English (United States) | English (United Kingdom) Last Build: Nov 25 2013 04:45 PM Version: 1.9.1 Build 28992
Powered by OpenMRS

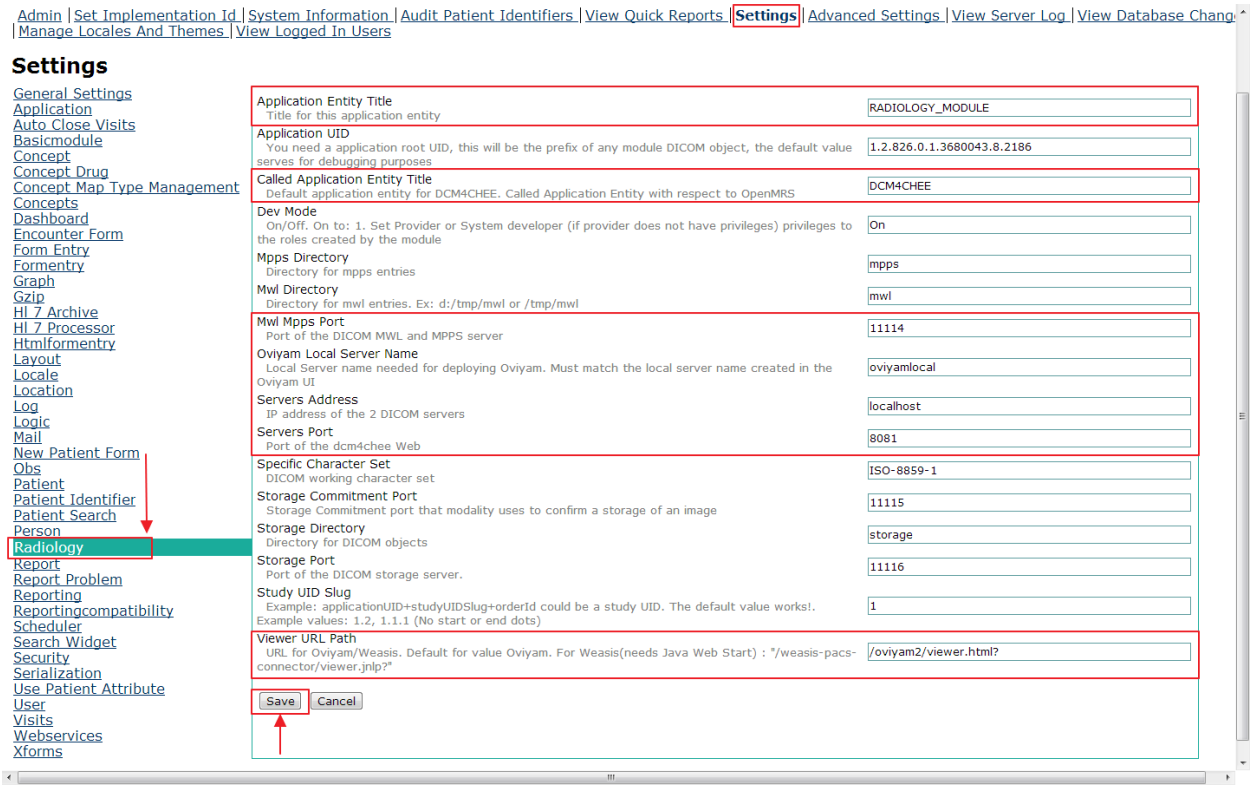

OpenMRS
localhost:8080/openmrs/admin/orders/orderType.list
Currently logged in as Super User | Log out | My Profile | Help
Home | Find/Create Patient | Dictionary | Administration
Admin | Manage Orders | Manage Drug Orders | Manage Order Types
Order Type Management
Add Order Type
Current Order Types
Name
Description
Drug order
Order of medications for the patient
Lab test
An order by a clinician for a laboratory test
Lunch order
so hungry
Radiology
Order for radiology procedures
Delete Selected Order Types
English (United States) | English (United Kingdom) Last Build: Nov 26 2013 03:56 PM Version: 1.9.1 Build 28992
Powered by OpenMRS


OpenMRS - Role Manager
localhost:8080/openmrs/admin/users/role.list
Currently logged in as Super User | Log out | My Profile | Help
Home | Find/Create Patient | Dictionary | Administration
Admin | Manage Users | Manage Roles | Manage Privileges | Manage Alerts
Role Management
Add Role
Current Roles
Role
Description
Inherited Roles
Privileges
Anonymous
Privileges for non-authenticated users.
View Navigation Menu
Authenticated
Privileges gained once authentication has been established.
View Relationships , View Privileges ...
Provider
All users with the 'Provider' role will appear as options in the default Infopath
Patient Dashboard - View Encounters Section , View Users ...
Radiology: Performing Technician
Radiology: Performing Technician
Provider
Radiology: Reading physician
Radiology: Reading physician
Provider
Radiology: Referring physician
Radiology: Referring physician
Provider
Radiology: Scheduler
Radiology: Scheduler
Provider
Scheduler
Scheduler
System Developer
System Developer
Developers of the OpenMRS .. have additional access to change fundamental structure of the database model.
[Has all roles and privileges]
Delete Selected Roles
English (United States) | English (United Kingdom) Last Build: Nov 26 2013 03:56 PM Version: 1.9.1 Build 28992
Powered by OpenMRS

Module Properties/Settings

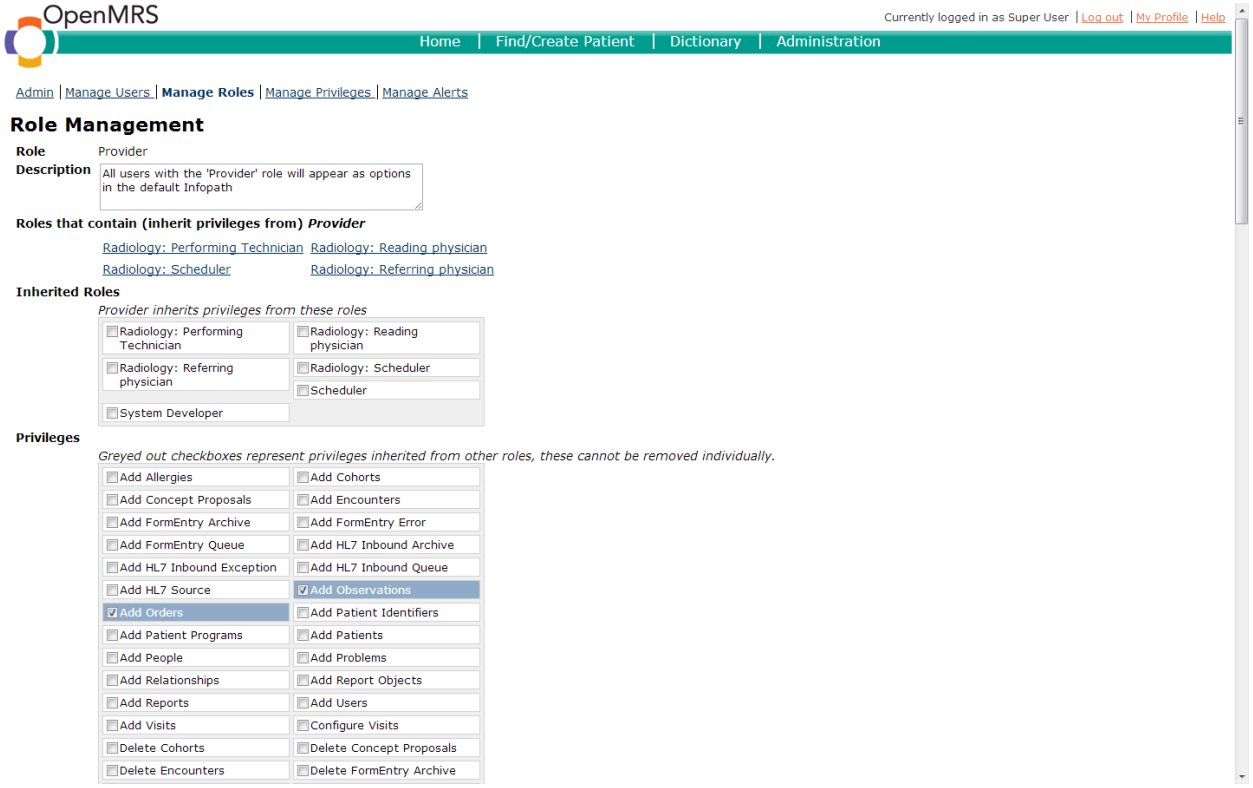
- Goto Administration→Maintainence→Settings→Radiology
    - **Application Entity Title** is the application entity title of the radiology module which is used by dcm4chee to forward status updates of various studies (radiology orders). This has to be identical to the Application Entities mentioned in the Application Entities Console of the dcm4chee Web Application. It should also be the Application Entity mentioned in the forwarding rules of the MPPSScu service in the JMX-Console.
    - **Called Application Entity Title** is the application entity title of dcm4chee which is used for communication which is DCM4CHEE by default.
    - **Mwl MPPS Port** is the port the Radiology Module is listening to for status updates from dcm4chee.
    - **Oviyam Local Server Name** is the 'Server Description' of the dcm4chee server in Oviyam's settings. This has to be identical to the entry in the oviyam settings as its used to build the URL to view the image.
    - **Servers Address** is the ip address of the dcm4chee server. 'localhost' is the default value.
    - **Servers Port** is the port in which the web application of dcm4chee is accessed. This is the port through which images is accessed.
    - **Viewer URL Path** is the designated path for DICOM image viewer. Default set for Oviyam 2.0 but can be configured to Weasis as well.
- **If any of the settings are changed in Radiology Settings, the module needs to be restarted for the new settings to take effect.**

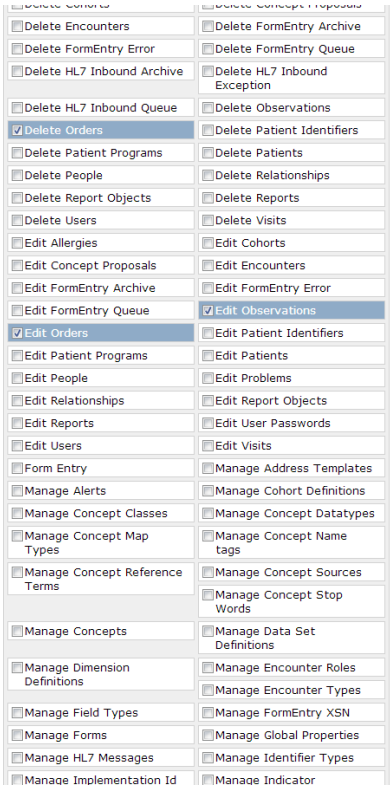

Users
Manage Users
Manage Roles
Manage Privileges
Manage Alerts
Patients
Manage Patients
Manage Tribes
Find Patients to Merge
Manage Identifier Types
Person
Manage Persons
Manage Relationship Types
Manage Person Attribute Types
Visits
Manage Visit Types
Manage Visit Attribute Types
Configure Visits
Encounters
Manage Encounters
Manage Encounter Types
Manage Encounter Roles
Providers
Manage Providers
Manage Provider Attribute Types
Locations
Manage Locations
Manage Location Tags
View Location Hierarchy
Manage Location Attribute Types
Manage Layout
Observations
Manage Observations
Orders
Manage Orders
Manage Drug Orders
Manage Order Types
Scheduler
Manage Scheduler
Programs
Concepts
Manage Proposed Concepts
Update Concept Index
Manage Concept Classes
Manage Concept Datatypes
Manage Concept Sources
Manage Concept Stop Word
Manage Reference Terms
Forms
Manage Forms
Manage Fields
Manage Field Types
Merge Duplicate Fields
HL7 Messages
Manage HL7 Sources
Manage Queued Messages
Manage Held Messages
Manage HL7 Errors
Manage HL7 Archives
Migrate HL7 Archives
Maintenance
Set Implementation Id
System Information
Audit Patient Identifiers
View Quick Reports
Settings
Advanced Settings
View Server Log
View Database Changes
Manage Locales And Themes
View Logged In Users
You have gone full screen.
Exit full screen (F11)
Modules
Manage Modules
Module Properties
Logic Module
Token Registration
Rule Definitions
Test Logic Expressions
Initial Set-Up
HTML Form Entry
Manage HTML Forms
Preview HTML Form from File
REST Web Services
Settings
Test
Help
Basic Module
basicmodule.replace.this.link.name
Radiology Module
Configuration and initialization
Manage Radiology Orders


Admin | Set Implementation Id | System Information | Audit Patient Identifiers | View Quick Reports | Settings | Advanced Settings | View Server Log | View Database Chang
| Manage Locales And Themes | View Logged In Users
Settings
General Settings
Application
Auto Close Visits
Basicmodule
Concept
Concept Drug
Concept Map Type Management
Concepts
Dashboard
Encounter Form
Form Entry
Formentry
Graph
Gzip
HI 7 Archive
HI 7 Processor
Htmlformentry
Layout
Locale
Location
Log
Logic
Mail
New Patient Form
Obs
Patient
Patient Identifier
Patient Search
Person
Radiology
Report
Report Problem
Reporting
Reportingcompatibility
Scheduler
Search Widget
Security
Serialization
Use Patient Attribute
User
Visits
Webservices
Xforms
Application Entity Title
Title for this application entity
RADIOLOGY_MODULE
Application UID
You need a application root UID, this will be the prefix of any module DICOM object, the default value serves for debugging purposes
1.2.826.0.1.3680043.8.2186
Called Application Entity Title
Default application entity for DCM4CHEE. Called Application Entity with respect to OpenMRS
DCM4CHEE
Dev Mode
On/Off. On to: 1. Set Provider or System developer (if provider does not have privileges) privileges to the roles created by the module
On
Mpps Directory
Directory for mpps entries
mpps
Mwl Directory
Directory for mwl entries. Ex: d:/tmp/mwl or /tmp/mwl
mwl
Mwl Mpps Port
Port of the DICOM MWL and MPPS server
11114
Oviyam Local Server Name
Local Server name needed for deploying Oviyam. Must match the local server name created in the Oviyam UI
oviyamlocal
Servers Address
IP address of the 2 DICOM servers
localhost
Servers Port
Port of the dcm4chee Web
8081
Specific Character Set
DICOM working character set
ISO-8859-1
Storage Commitment Port
Storage Commitment port that modality uses to confirm a storage of an image
11115
Storage Directory
Directory for DICOM objects
storage
Storage Port
Port of the DICOM storage server.
11116
Study UID Slug
Example: applicationUID+studyUIDSlug+orderId could be a study UID. The default value works!. Example values: 1.2, 1.1.1 (No start or end dots)
1
Viewer URL Path
URL for Oviyam/Weasis. Default for value Oviyam. For Weasis(needs Java Web Start) : "/weasis-pacs-connector/viewer.jnlp?"
/oviyam2/viewer.html?
Save
Cancel

User Privileges

- The new roles added to the system inherit properties from the default role 'Provider' as well as their privileges.
- The privileges needed by users/roles using the module are :
    - Add,Edit,Delete,View Orders.
    - Add,Edit,Delete,View Observations.
    - Patient Dashboard – View Radiology Section.
    - View Users.
    - View Encounters.
    - View Concepts.
    - View Patients.
    - View Administration Functions.




Delete Encounters
Delete FormEntry Archive
Delete FormEntry Error
Delete FormEntry Queue
Delete HL7 Inbound Archive
Delete HL7 Inbound Exception
Delete HL7 Inbound Queue
Delete Observations
Delete Orders
Delete Patient Identifiers
Delete Patient Programs
Delete Patients
Delete People
Delete Relationships
Delete Report Objects
Delete Reports
Delete Users
Delete Visits
Edit Allergies
Edit Cohorts
Edit Concept Proposals
Edit Encounters
Edit FormEntry Archive
Edit FormEntry Error
Edit FormEntry Queue
Edit Observations
Edit Orders
Edit Patient Identifiers
Edit Patient Programs
Edit Patients
Edit People
Edit Problems
Edit Relationships
Edit Report Objects
Edit Reports
Edit User Passwords
Edit Users
Edit Visits
Form Entry
Manage Address Templates
Manage Alerts
Manage Cohort Definitions
Manage Concept Classes
Manage Concept Datatypes
Manage Concept Map Types
Manage Concept Name tags
Manage Concept Reference Terms
Manage Concept Sources
Manage Concept Stop Words
Manage Concepts
Manage Data Set Definitions
Manage Dimension Definitions
Manage Encounter Roles
Manage Encounter Types
Manage Field Types
Manage FormEntry XSN
Manage Forms
Manage Global Properties
Manage HL7 Messages
Manage Identifier Types
Manage Implementation Id
Manage Indicator


Manage Concept Map Types
Manage Concept Name tags
Manage Concept Reference Terms
Manage Concept Sources
Manage Concept Stop Words
Manage Concepts
Manage Data Set Definitions
Manage Dimension Definitions
Manage Encounter Roles
Manage Encounter Types
Manage Field Types
Manage FormEntry XSN
Manage Forms
Manage Global Properties
Manage HL7 Messages
Manage Identifier Types
Manage Implementation Id
Manage Indicator Definitions
Manage Location Attribute Types
Manage Location Tags
Manage Locations
Manage Modules
Manage Order Types
Manage Person Attribute Types
Manage Privileges
Manage Programs
Manage Providers
Manage Relationship Types
Manage Relationships
Manage Report Definitions
Manage Report Designs
Manage Reports
Manage Roles
Manage Rule Definitions
Manage Scheduler
Manage Tokens
Manage Visit Attribute Types
Manage Visit Types
Patient Dashboard - View Demographics Section
Patient Dashboard - View Encounters Section
Patient Dashboard - View Forms Section
Patient Dashboard - View Graphs Section
Patient Dashboard - View Overview Section
Patient Dashboard - View Patient Summary
Patient Dashboard - View Radiology Section
Patient Dashboard - View Regimen Section
Patient Dashboard - View Visits Section
Pharm add prescription
Pharm return prescription
Pharm view prescription
Purge Field Types
Remove Allergies
Remove Problems

IMPORTANT : Make sure the server has *Ownership and Write Permissions* to write files and folders. The module creates XML entries of each order in DICOM standard and MPPS DICOM files are written to disk when it receives MPPS status messages from DCM4CHEE.

On Linux

#Change ownership and permission for CATALINA_HOME and CATALINA_BASE
sudo chgrp -R tomcat6 /etc/tomcat6
sudo chmod -R g+w /etc/tomcat6
sudo chgrp -R tomcat6 /var/lib/tomcat6 # CATALINA_BASE
sudo chmod -R g+w /var/lib/tomcat6

On Windows

#User access control may restrict reading and writing of new files by the server
#To get around this, run the server as an administrator by Right Click on Tomcat-->Run as Administrator
#Or Run-->MSCONFIG-->Tools-->Disable UAP-->Launch

OpenMRS Installation Notes/Tips

- OpenMRS Standalone package comes with tomcat and mysql prepackaged.
- If installing Tomcat and MySql manually, these are some notes useful to help setup the environment quickly.

Tomcat Notes

On Linux
#Install via Debian package on Ubuntu
sudo apt-get install tomcat6
sudo apt-get install tomcat6-admin

#Add users and their roles to tomcat-users.xml
sudo vi /etc/tomcat/tomcat-users.xml
<user name="admin" password="admin" roles="tomcat,admin,manager,manager-gui"/>

#Turn off the Tomcat security flag
sudo vi /etc/init.d/tomcat6
TOMCAT6_SECURITY=no ##from yes to no

IMPORTANT
#Change ownership and permission for CATALINA_HOME and CATALINA_BASE
sudo chgrp -R tomcat6 /etc/tomcat6
sudo chmod -R g+w /etc/tomcat6
sudo chgrp -R tomcat6 /var/lib/tomcat6 # CATALINA_BASE
sudo chmod -R g+w /var/lib/tomcat6

#Create and provide appropriate permissions for OpenMRS properties folder in CATALINA_HOME
sudo mkdir /usr/share/tomcat6/.OpenMRS
sudo chown -R tomcat6:root /usr/share/tomcat6/.OpenMRS

#Restart the server
sudo /etc/init.d/tomcat6 restart

#Install manually from package
#Download the zip archive of Tomcat 6.0.29
#Unpack the zip file to a suitable location such as /opt on Linux or /Library on Mac OSX
# Add ownership and provide permissions for appropriate folders
sudo useradd tomcat6
cd /opt
sudo tar zxvf apache-tomcat-6.0.29.tar.gz

```
sudo ln -s apache-tomcat-6.0.29 tomcat6
sudo chown tomcat6.tomcat6 apache-tomcat-6.0.29

#Add users and their roles to tomcat-users.xml
sudo vi /etc/tomcat/tomcat-users.xml
<user name="admin" password="admin" roles="tomcat,admin,manager,manager-gui"/>

### Useful Linux commands ###
sudo find / -name . “openmrs-runtime.properties”
netstat –tap
netstat –tln
```

```
### On Windows ###
#Use the Windows installer to install tomcat
#User access control may restrict reading and writing of new files by the server
#To get around this, run the server as an administrator by Right Click on Tomcat-->Run as
Administrator
#Or Run-->MSCONFIG-->Tools-->Disable UAP-->Launch
```

```
### Deploy OpenMRS ###
#Add OpenMRS in tomcat manager
http://localhost:8080/manager/html
## Upload OpenrMRS.war

#Run OpenMRS and upload module
http://localhost:8080/openmrs/index.htm
```

Mysql Notes

```
### On Linux ###
#Install using debian package
sudo apt-get install mysql-server
#Configure root password

# Stop/Start/Restart Mysql
sudo /etc/init.d/mysql start/stop/restart
```

```
### On Windows ###
#Use default windows installer and configure root password
```

DCM4CHEE

Installation

- **Requirements :** A supported database must be installed for dcm4chee. The list of supported databases are,
    - PostgreSQL 8.1+
    - MySQL 4.1+
    - Oracle 9i+
    - SQL Server 2000+
    - DB2 8.1+
    - Firebird 2.1+

  Note: This guide is based on MySql 5.5

  http://dev.mysql.com/downloads/mysql/

- For detailed instructions on installing dcm4chee : http://www.dcm4che.org/confluence/display/ee2/Installation
- Download the binary distribution for dcm4chee from sourceforge and extract it : The below link is the binary for MySQL http://sourceforge.net/projects/dcm4che/files/dcm4chee/2.17.1/dcm4chee-2.17.1-mysql.zip/download
- Download the binary distribution package of JBoss Application Server 4.2.3.GA: http://www.jboss.org/jbossas/downloads
- Copy files from JBoss to dcm4chee:
    - Dcm4chee consists of components that run within the JBoss application server platform. This step will copy the JBoss runtime files to the dcm4chee directory.
    - Go to the dcm4chee-2.17.1-xxx/bin directory and execute the install_jboss.bat or install_jboss.sh script, as appropriate for your operating system, with the path of your JBoss as installation directory as a parameter.
    - For example:
    - `C:\apps\dcm4chee-2.17.1-psql\bin>install_jboss.bat c:\apps\jboss-4.2.3.GA`

- **Create the dcm4chee database**

- Create and initialize the dcm4chee database.

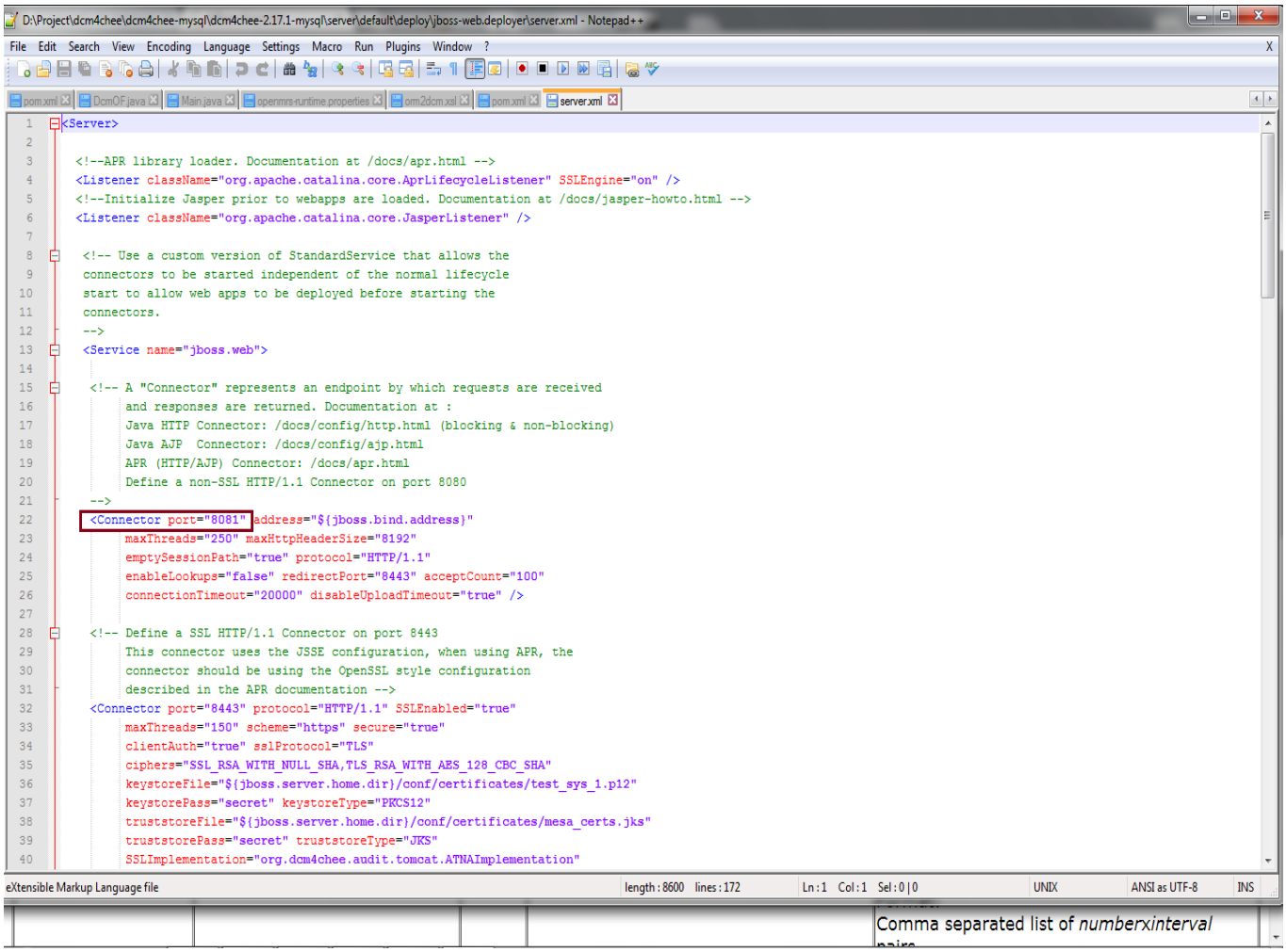
- The file `create.mysql` can be found at `<installation folder>/dcm4chee-<x.xx.x>-mysql/sql/create.mysql`, where <x.xx.x> is the dcm4chee version number.

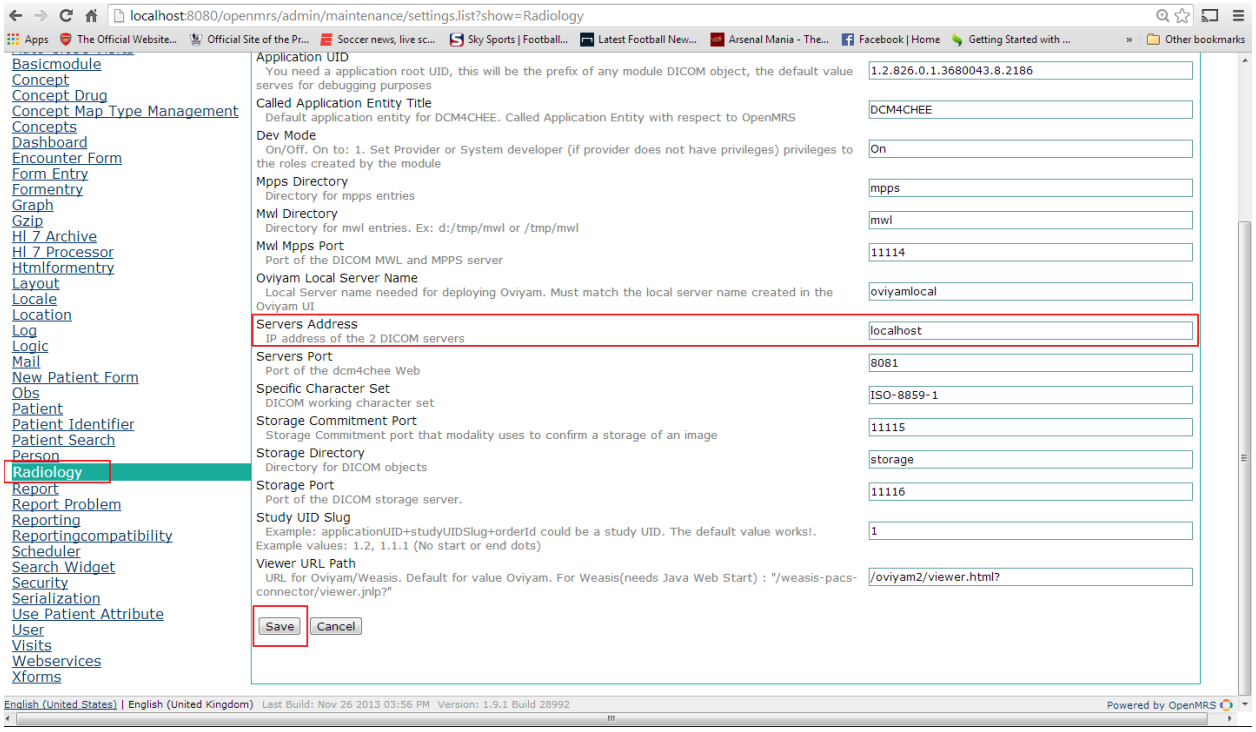
- The file create.mysql contains SQL instructions that populate the database with empty tables.

```
> mysql -uroot -p<root password>
```

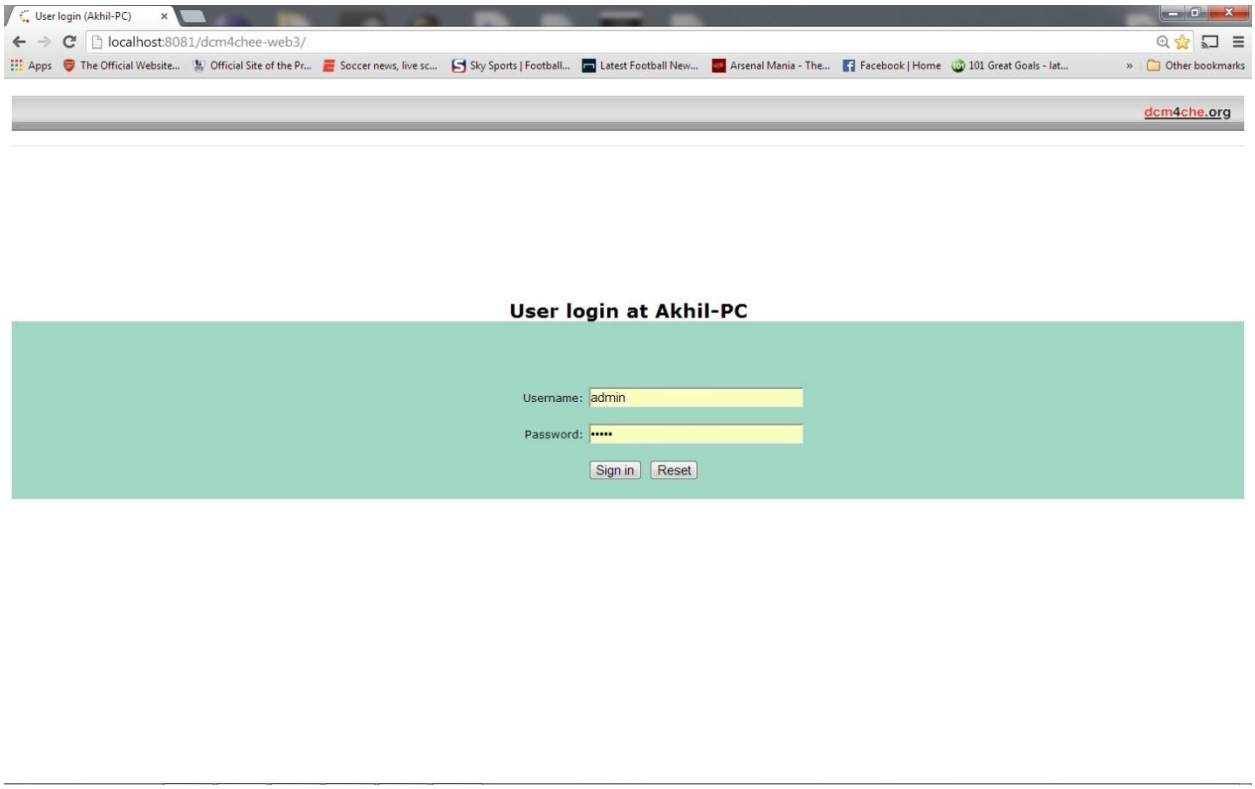
```
mysql> create database pacsdb;
mysql> grant all on pacsdb.* to 'pacs'@'localhost' identified by
'pacs';
mysql> \q
> mysql -upacs -ppacs pacsdb < create.mysql
```

- Change Port for dcm4chee WebApp (optional)
    - Default port on which dcm4chee webapp is deployed is 8080.
    - To avoid clashes with the OpenMRS server, it is recommended to change the port.
    - Go to {install folder}\dcm4chee-2.17.1-mysql\server\default\deploy\jboss-web.deployer\server.xml
    - Change the connector port tag from port=8080 to a custom port.
    - **Note:** OpenMRS Standalone uses port 8081 by default.
    - **IMPORTANT: The module depends on the port that is set here for viewing images. The value used by the module is 8081 by default. If you choose to use any other free port, remember to change the port in**
      OpenMRS→Administration→Settings→Radiology→Servers Port
      After saving the change in port value, you will need to restart the module.
      (See figures below)


D:\Project\dcm4chee\dcm4chee-mysql\dcm4chee-2.17.1-mysql\server\default\deploy\jboss-web.deployer\server.xml - Notepad++
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
pom.xml DcmOF.java Main.java openmrs-runtime.properties om2dcm.xsl pom.xml server.xml
<Server>
<!--APR library loader. Documentation at /docs/apr.html -->
<Listener className="org.apache.catalina.core.AprLifecycleListener" SSLEngine="on" />
<!--Initialize Jasper prior to webapps are loaded. Documentation at /docs/jasper-howto.html -->
<Listener className="org.apache.catalina.core.JasperListener" />
<!-- Use a custom version of StandardService that allows the
connectors to be started independent of the normal lifecycle
start to allow web apps to be deployed before starting the
connectors.
-->
<Service name="jboss.web">
<!-- A "Connector" represents an endpoint by which requests are received
and responses are returned. Documentation at :
Java HTTP Connector: /docs/config/http.html (blocking & non-blocking)
Java AJP Connector: /docs/config/ajp.html
APR (HTTP/AJP) Connector: /docs/apr.html
Define a non-SSL HTTP/1.1 Connector on port 8080
-->
<Connector port="8081" address="${jboss.bind.address}"
maxThreads="250" maxHttpHeaderSize="8192"
emptySessionPath="true" protocol="HTTP/1.1"
enableLookups="false" redirectPort="8443" acceptCount="100"
connectionTimeout="20000" disableUploadTimeout="true" />
<!-- Define a SSL HTTP/1.1 Connector on port 8443
This connector uses the JSSE configuration, when using APR, the
connector should be using the OpenSSL style configuration
described in the APR documentation -->
<Connector port="8443" protocol="HTTP/1.1" SSLEnabled="true"
maxThreads="150" scheme="https" secure="true"
clientAuth="true" sslProtocol="TLS"
ciphers="SSL_RSA_WITH_NULL_SHA,TLS_RSA_WITH_AES_128_CBC_SHA"
keystoreFile="${jboss.server.home.dir}/conf/certificates/test_sys_1.p12"
keystorePass="secret" keystoreType="PKCS12"
truststoreFile="${jboss.server.home.dir}/conf/certificates/mesa_certs.jks"
truststorePass="secret" truststoreType="JKS"
SSLImplementation="org.dcm4chee.audit.tomcat.ATNAImplementation"
eXtensible Markup Language file
length : 8600 lines : 172
Ln : 1 Col : 1 Sel : 0 | 0
UNIX
ANSI as UTF-8
INS
Comma separated list of *numberxinterval*

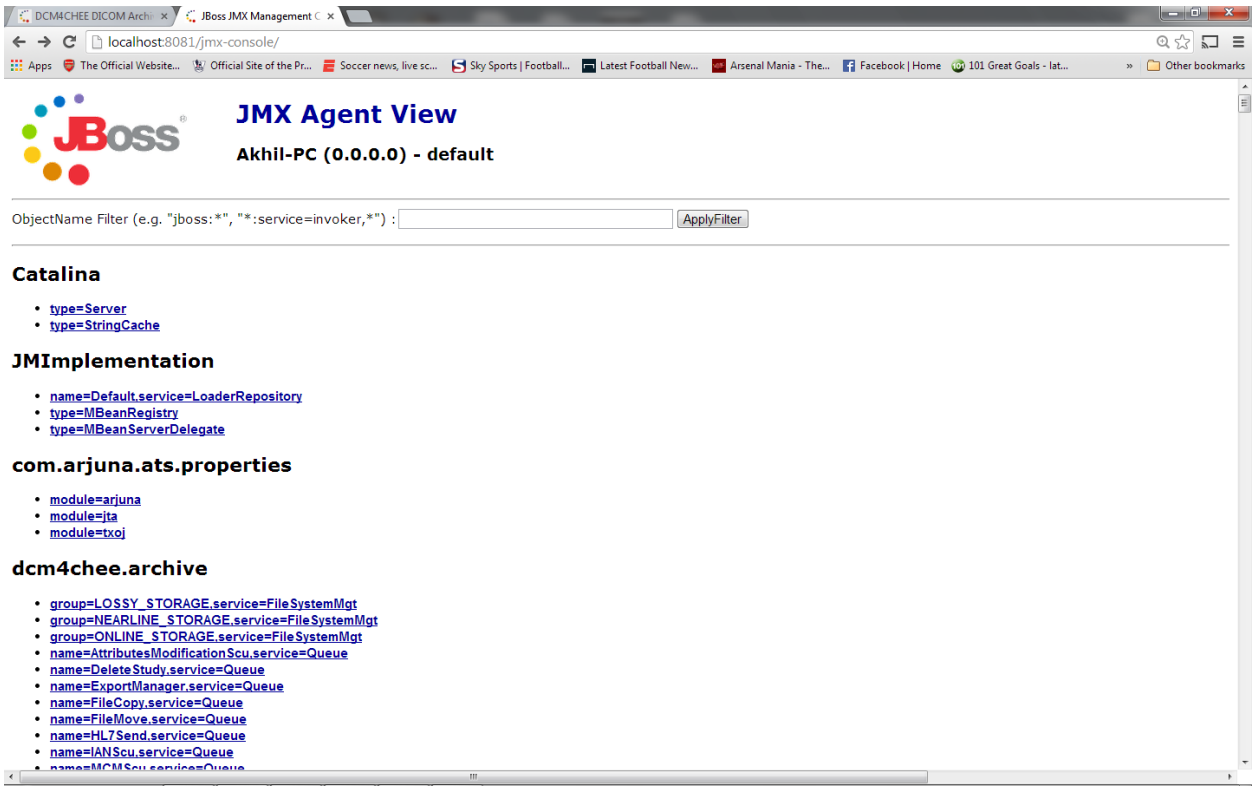


- Note : For MAC Users,
    - Because there are no native codecs (compression/decompression) for these platforms, it is necessary to edit configuration to disable the loading of the native codecs. These platforms are not able to take advantage of compression/decompression. The only default loading of the codecs is in the WADO service. You can either edit the property within the JMX Console web user interface, or edit the configuration files directly.
- In {install folder}\dcm4chee-2.17.1-mysql\bin
  Execute 'run.bat' to start the server ('run.sh' in Linux)
  (Ctrl-c to shut the server)
- Login to dcm4chee from a browser at http://localhost:8081/dcm4chee-web3
- Login credentials User:admin Password:admin

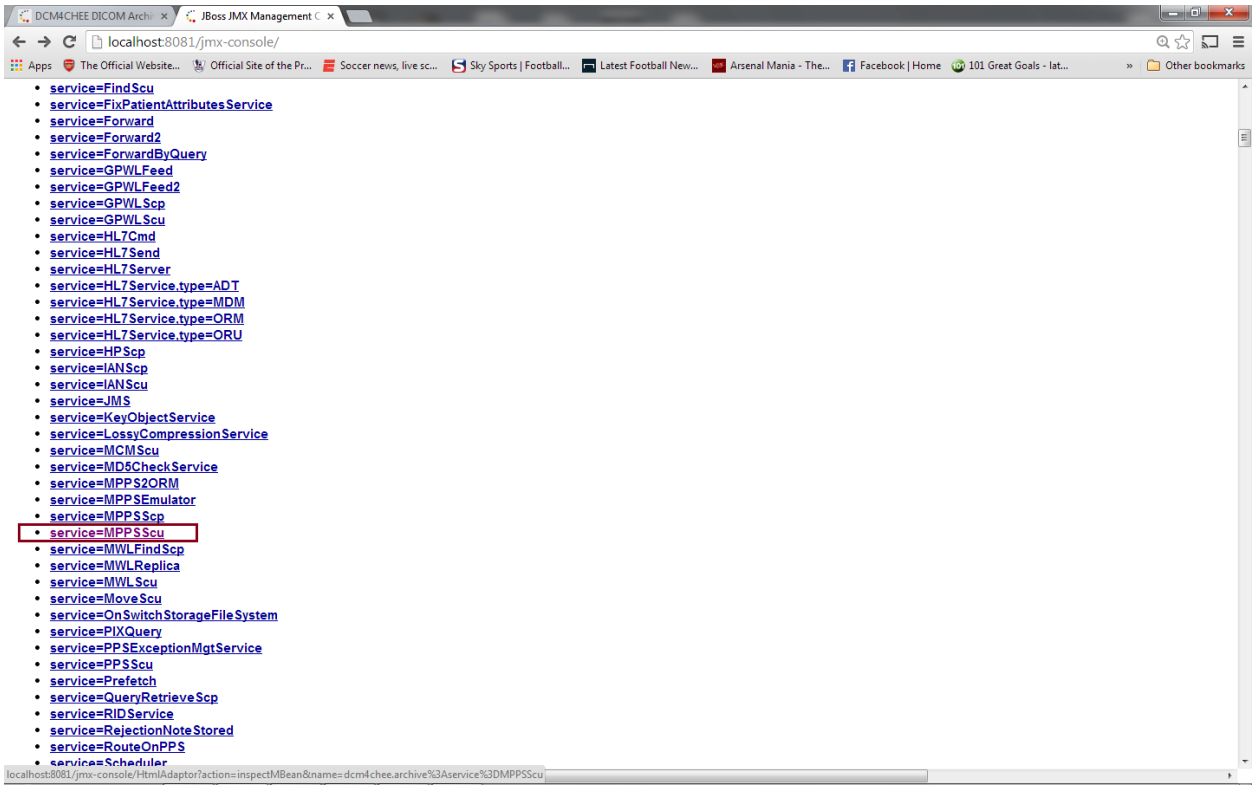

User login (Akhil-PC)
localhost:8081/dcm4chee-web3/
dcm4che.org
User login at Akhil-PC
Username: admin
Password:
Sign in
Reset

Setting Up Mpps Forwarding

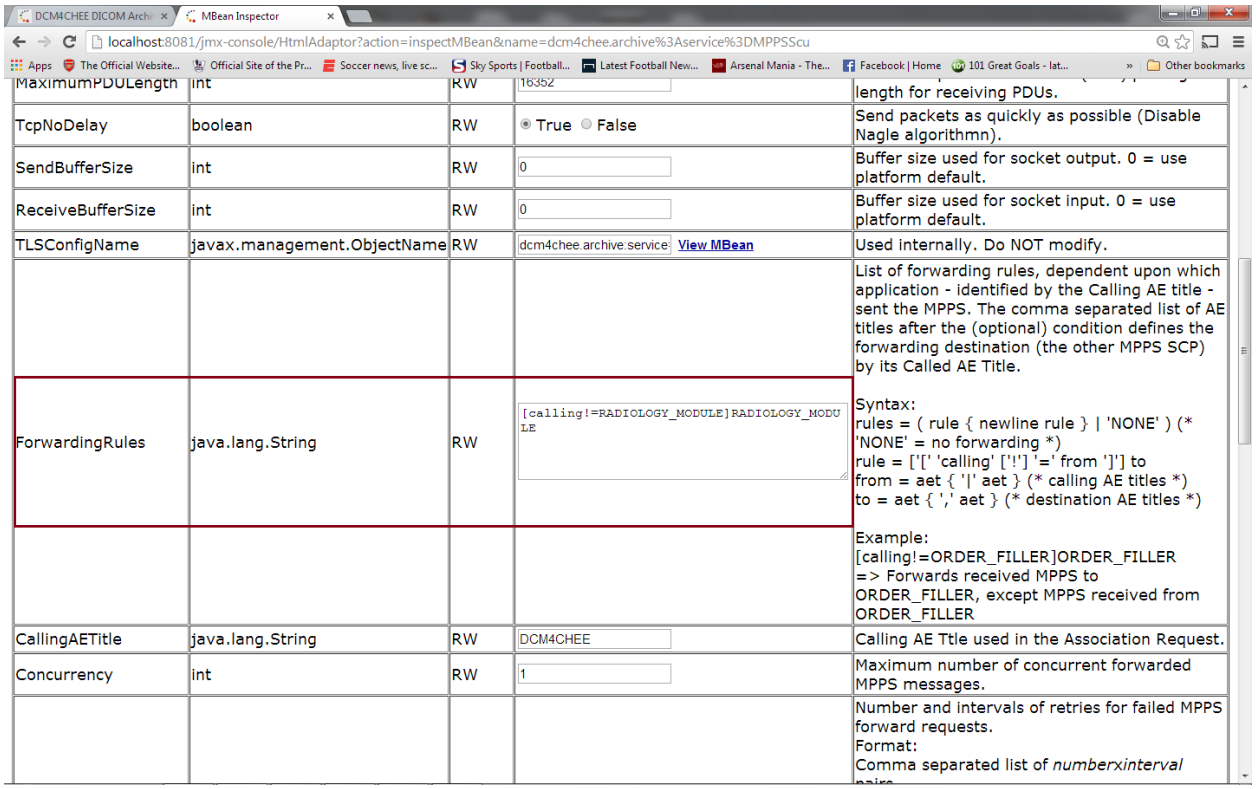
- In a new tab , open http://localhost:8081/jmx-console/



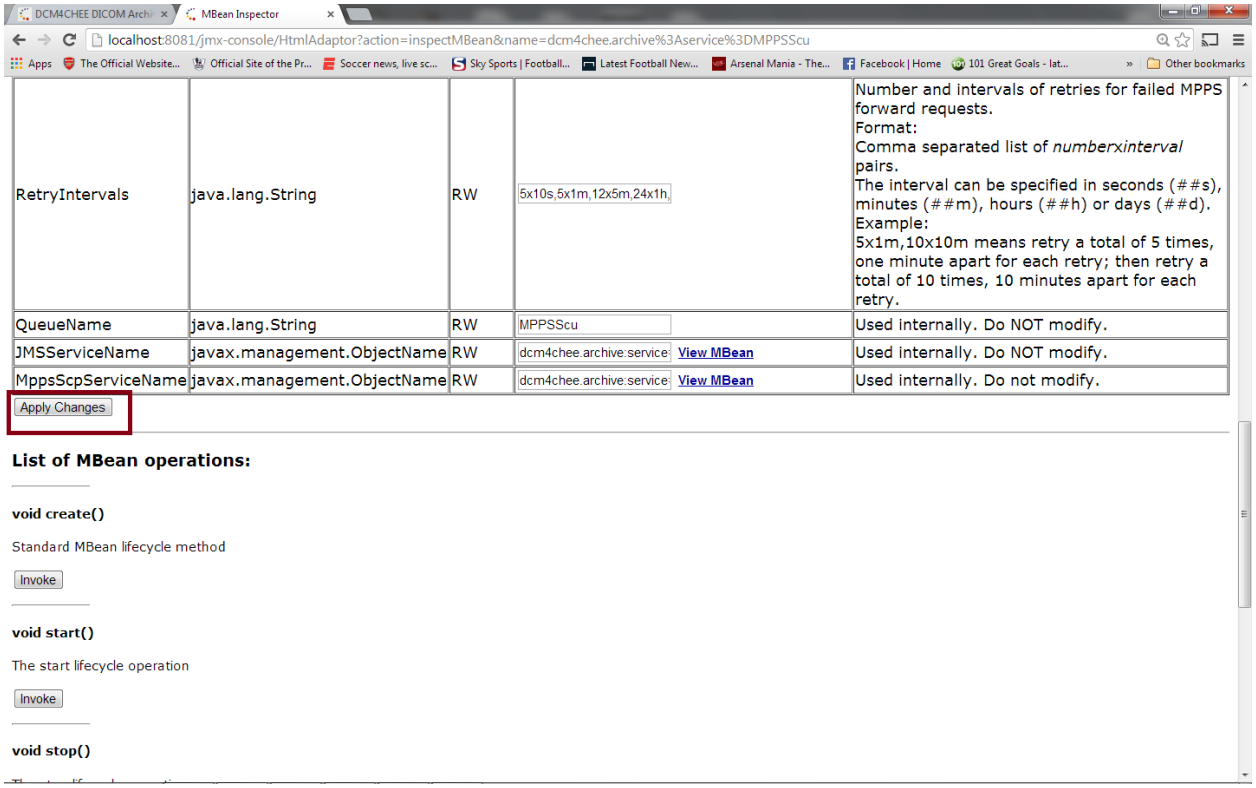
- Search or navigate to ‘service=MppsScu’ and click on it



- Goto the ForwardingRules section and enter the entry.
  [calling!=RADIOLOGY_MODULE]RADIOLOGY_MODULE
  And click 'Apply Changes' at the bottom of the table.
- **IMPORTANT : The 'RADIOLOGY_MODULE' Application Entity title corresponds to the Application Entity title in the module's settings.**
- **IMPORTANT: The 'MWL MPPS Port' corresponds to the port of the 'RADIOLOGY_MODULE' Application Entity in dcm4chee.**



MaximumPDULength	int	RW	16352	length for receiving PDUs.
TcpNoDelay	boolean	RW	True False	Send packets as quickly as possible (Disable Nagle algorithmn).
SendBufferSize	int	RW	0	Buffer size used for socket output. 0 = use platform default.
ReceiveBufferSize	int	RW	0	Buffer size used for socket input. 0 = use platform default.
TLSConfigName	javax.management.ObjectName	RW	dcm4chee.archive:service View MBean	Used internally. Do NOT modify.
				List of forwarding rules, dependent upon which application - identified by the Calling AE title - sent the MPPS. The comma separated list of AE titles after the (optional) condition defines the forwarding destination (the other MPPS SCP) by its Called AE Title. Syntax: rules = (rule { newline rule } | 'NONE') (* 'NONE' = no forwarding *) rule = ['[' 'calling' ['!'] '=' from ']'] to from = aet { '|' aet } (* calling AE titles *) to = aet { ',' aet } (* destination AE titles *)
ForwardingRules	java.lang.String	RW	[calling!=RADIOLOGY_MODULE]RADIOLOGY_MODULE	
				Example: [calling!=ORDER_FILLER]ORDER_FILLER => Forwards received MPPS to ORDER_FILLER, except MPPS received from ORDER_FILLER
CallingAETitle	java.lang.String	RW	DCM4CHEE	Calling AE Ttle used in the Association Request.
Concurrency	int	RW	1	Maximum number of concurrent forwarded MPPS messages.
				Number and intervals of retries for failed MPPS forward requests. Format: Comma separated list of *numberxinterval*



RetryIntervals	java.lang.String	RW	5x10s,5x1m,12x5m,24x1h	Number and intervals of retries for failed MPPS forward requests. Format: Comma separated list of *numberxinterval* pairs. The interval can be specified in seconds (##s), minutes (##m), hours (##h) or days (##d). Example: 5x1m,10x10m means retry a total of 5 times, one minute apart for each retry; then retry a total of 10 times, 10 minutes apart for each retry.
QueueName	java.lang.String	RW	MPPSScu	Used internally. Do NOT modify.
JMSServiceName	javax.management.ObjectName	RW	dcm4chee.archive:service View MBean	Used internally. Do NOT modify.
MppsScpServiceName	javax.management.ObjectName	RW	dcm4chee.archive:service View MBean	Used internally. Do not modify.

Apply Changes

List of MBean operations:

void create()

Standard MBean lifecycle method

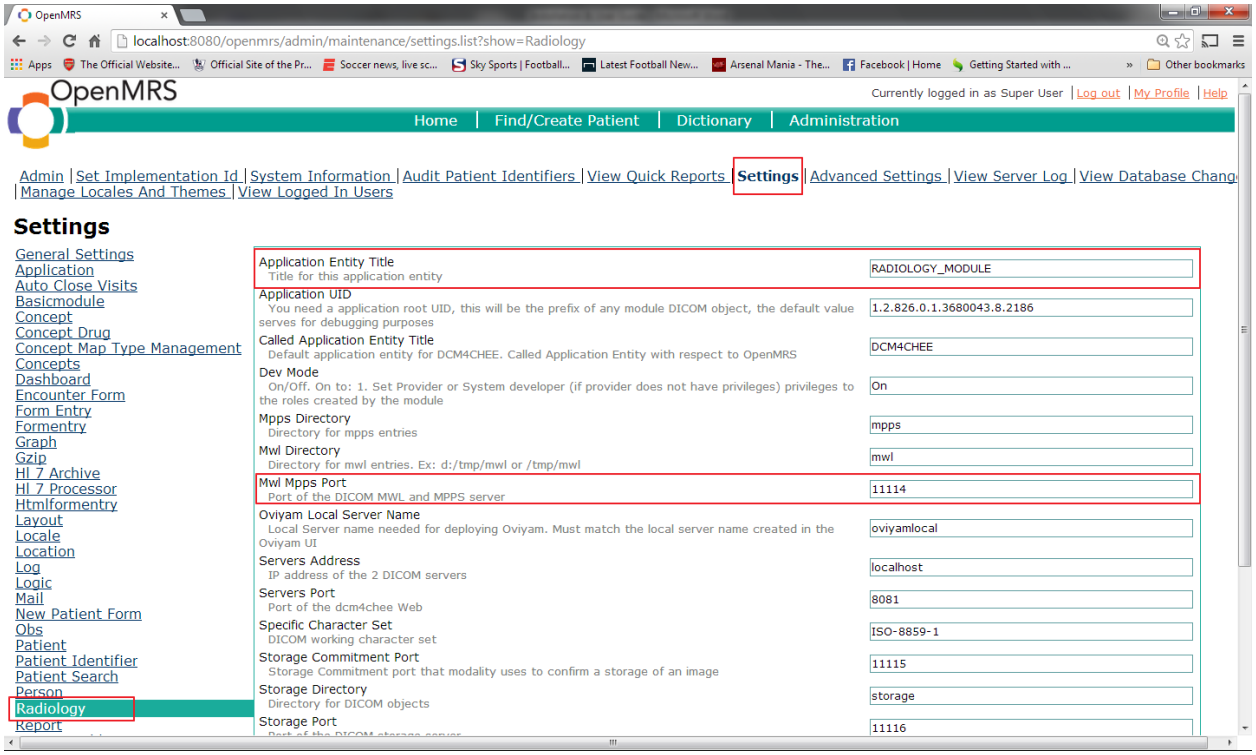
Invoke

void start()

The start lifecycle operation

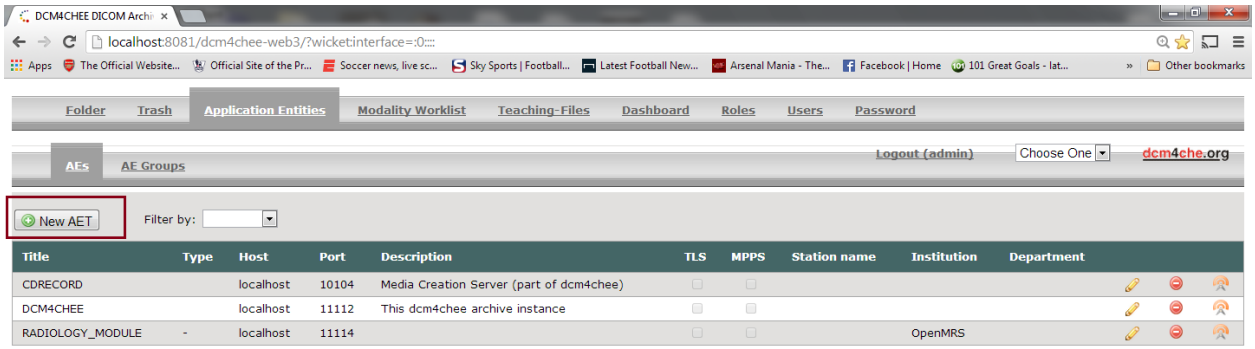
Invoke

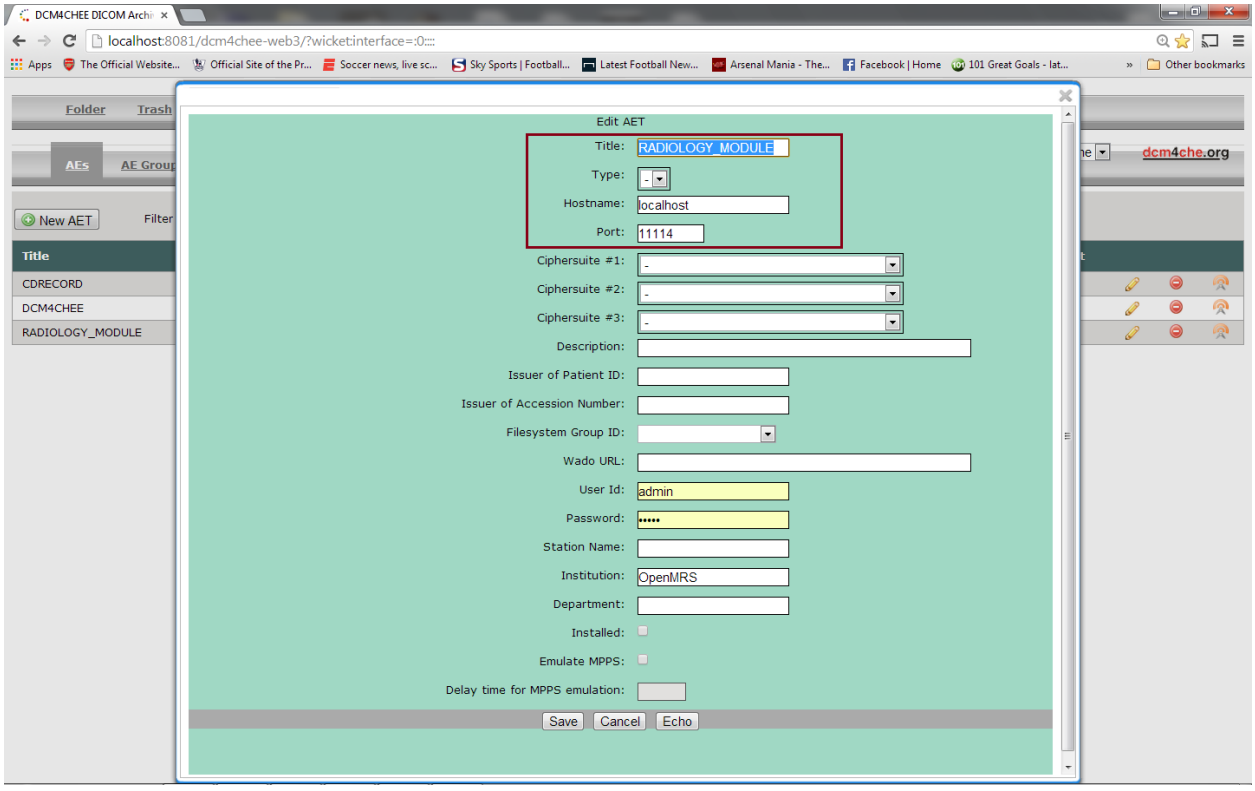
void stop()



Adding Radiology Module AET to dcm4chee

- Click on the “Application Entities” tab.
- Click on “New AET”
- Enter these details which are currently default in the module and click save.
  - Title : RADIOLOGY_MODULE
  - Host : localhost {or ip of where OpenMRS is deployed }
  - Port : 11114

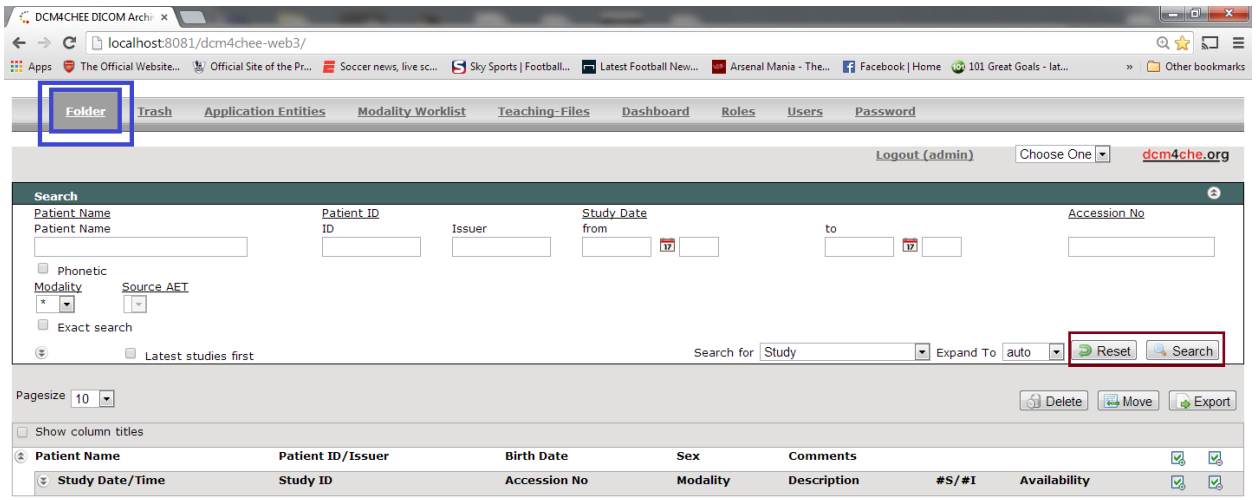

DCM4CHEE DICOM Archi
localhost:8081/dcm4chee-web3/?wicket:interface=:0:::
Folder
Trash
Application Entities
Modality Worklist
Teaching-Files
Dashboard
Roles
Users
Password
AEs
AE Groups
Logout (admin)
Choose One
dcm4che.org
New AET
Filter by:
Title
Type
Host
Port
Description
TLS
MPPS
Station name
Institution
Department
CDRECORD
localhost
10104
Media Creation Server (part of dcm4chee)
DCM4CHEE
localhost
11112
This dcm4chee archive instance
RADIOLOGY_MODULE
localhost
11114
OpenMRS

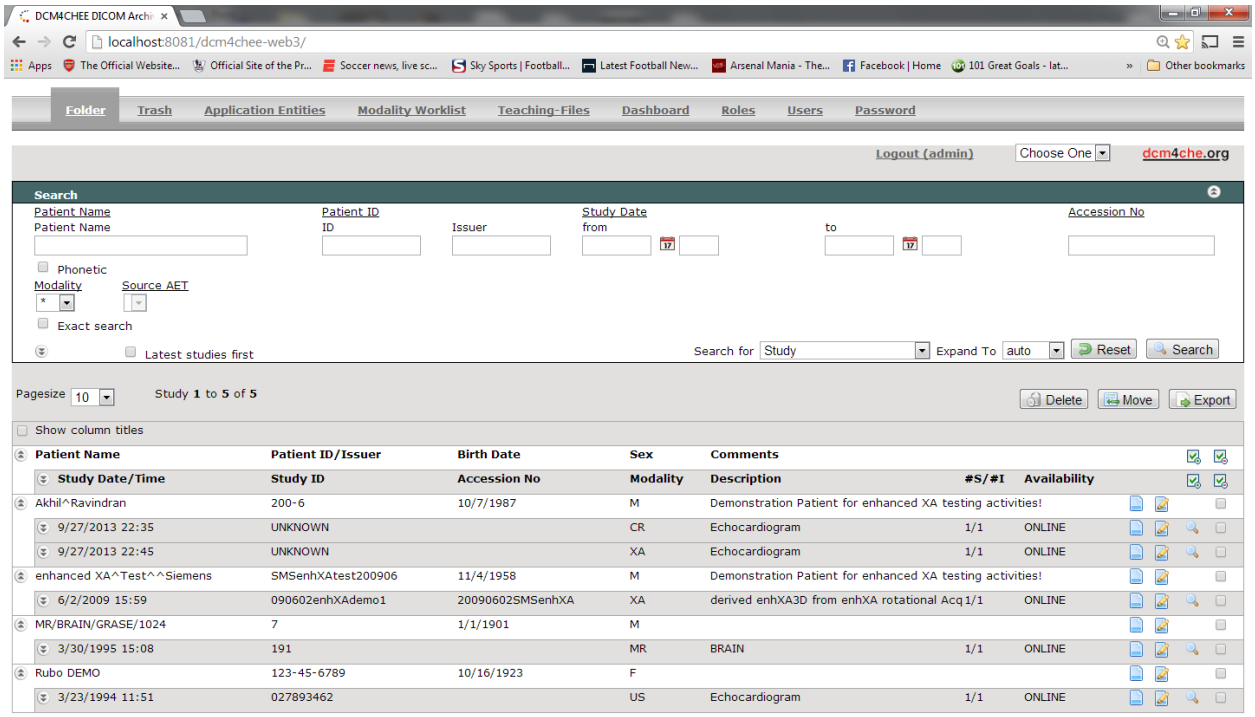

Edit AET
Title:
RADIOLOGY_MODULE
Type:
Hostname:
localhost
Port:
11114
Ciphersuite #1:
Ciphersuite #2:
Ciphersuite #3:
Description:
Issuer of Patient ID:
Issuer of Accession Number:
Filesystem Group ID:
Wado URL:
User Id:
admin
Password:
Station Name:
Institution:
OpenMRS
Department:
Installed:
Emulate MPPS:
Delay time for MPPS emulation:
Save
Cancel
Echo

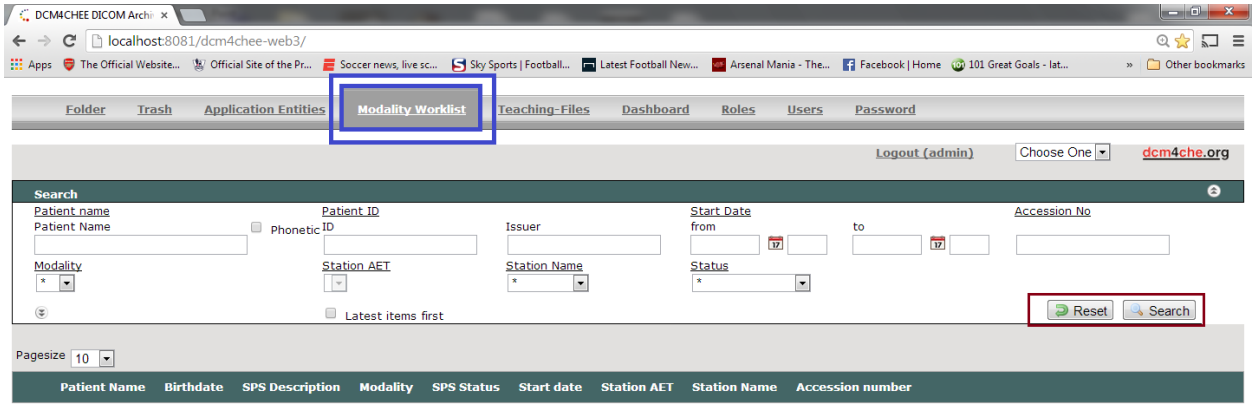
Notes about DCM4CHEE

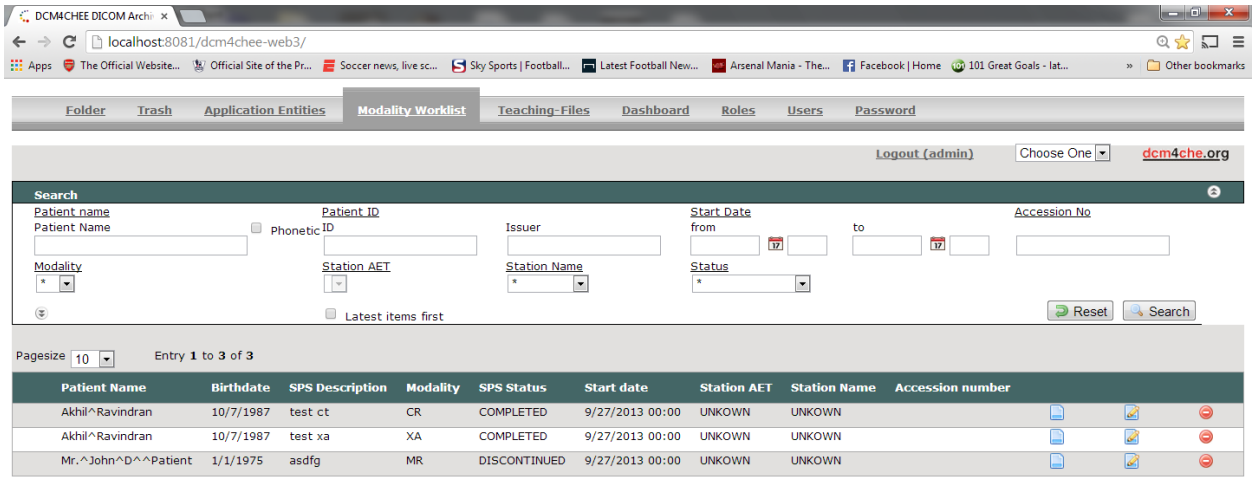
- The default screens in the image archive and Worklist tabs are always empty.
- You will need to run a search to pull up relevant results.
- A search with no parameters will pull all the entries in the database.
- Resetting the search parameter and running the search will retrieve all entries.

a




DCM4CHEE DICOM Archi
localhost:8081/dcm4chee-web3/
Folder
Trash
Application Entities
Modality Worklist
Teaching-Files
Dashboard
Roles
Users
Password
Logout (admin)
Choose One
dcm4che.org
Search
Patient Name
Patient ID
Issuer
Study Date
from
to
Accession No
Phonetic
Modality
Source AET
Exact search
Latest studies first
Search for
Study
Expand To
auto
Reset
Search
Pagesize
10
Study 1 to 5 of 5
Delete
Move
Export
Show column titles
Patient Name
Patient ID/Issuer
Birth Date
Sex
Comments
Study Date/Time
Study ID
Accession No
Modality
Description
#S/#I
Availability
Akhil^Ravindran
200-6
10/7/1987
M
Demonstration Patient for enhanced XA testing activities!
9/27/2013 22:35
UNKNOWN
CR
Echocardiogram
1/1
ONLINE
9/27/2013 22:45
UNKNOWN
XA
Echocardiogram
1/1
ONLINE
enhanced XA^Test^^Siemens
SMSenhXAtest200906
11/4/1958
M
Demonstration Patient for enhanced XA testing activities!
6/2/2009 15:59
090602enhXAdemo1
20090602SMSenhXA
XA
derived enhXA3D from enhXA rotational Acq
1/1
ONLINE
MR/BRAIN/GRASE/1024
7
1/1/1901
M
3/30/1995 15:08
191
MR
BRAIN
1/1
ONLINE
Rubo DEMO
123-45-6789
10/16/1923
F
3/23/1994 11:51
027893462
US
Echocardiogram
1/1
ONLINE

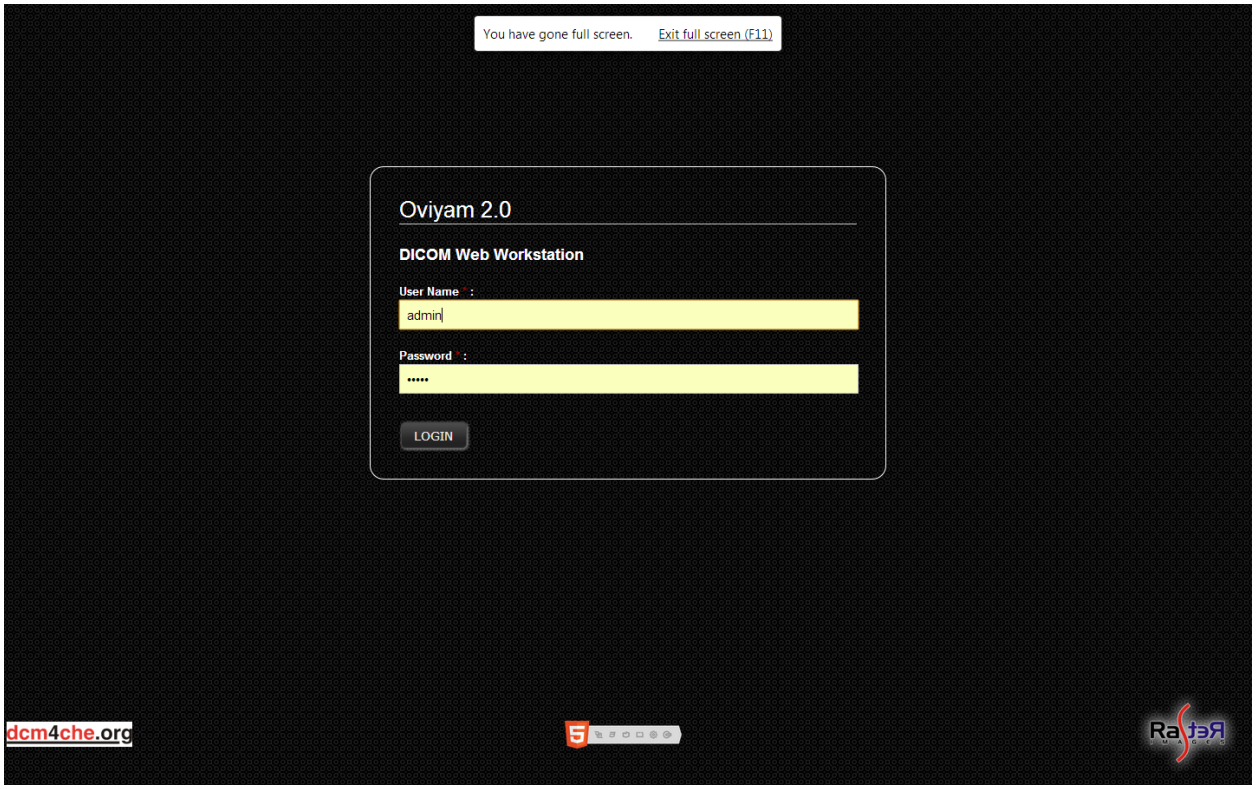

DCM4CHEE DICOM Archi
localhost:8081/dcm4chee-web3/
Folder
Trash
Application Entities
Modality Worklist
Teaching-Files
Dashboard
Roles
Users
Password
Logout (admin)
Choose One
dcm4che.org
Search
Patient name
Patient Name
Phonetic
Patient ID
ID
Issuer
Start Date
from
to
Accession No
Modality
Station AET
Station Name
Status
Latest items first
Reset
Search
Pagesize
10
Patient Name
Birthdate
SPS Description
Modality
SPS Status
Start date
Station AET
Station Name
Accession number


DCM4CHEE DICOM Archi
localhost:8081/dcm4chee-web3/
Folder
Trash
Application Entities
Modality Worklist
Teaching-Files
Dashboard
Roles
Users
Password
Logout (admin)
Choose One
dcm4che.org
Search
Patient name
Patient Name
Phonetic
Patient ID
ID
Issuer
Start Date
from
to
Accession No
Modality
Station AET
Station Name
Status
Latest items first
Reset
Search
Pagesize 10
Entry 1 to 3 of 3
Patient Name
Birthdate
SPS Description
Modality
SPS Status
Start date
Station AET
Station Name
Accession number
Akhil^Ravindran 10/7/1987 test ct CR COMPLETED 9/27/2013 00:00 UNKOWN UNKOWN
Akhil^Ravindran 10/7/1987 test xa XA COMPLETED 9/27/2013 00:00 UNKOWN UNKOWN
Mr.^John^D^^Patient 1/1/1975 asdfg MR DISCONTINUED 9/27/2013 00:00 UNKOWN UNKOWN

Oviyam

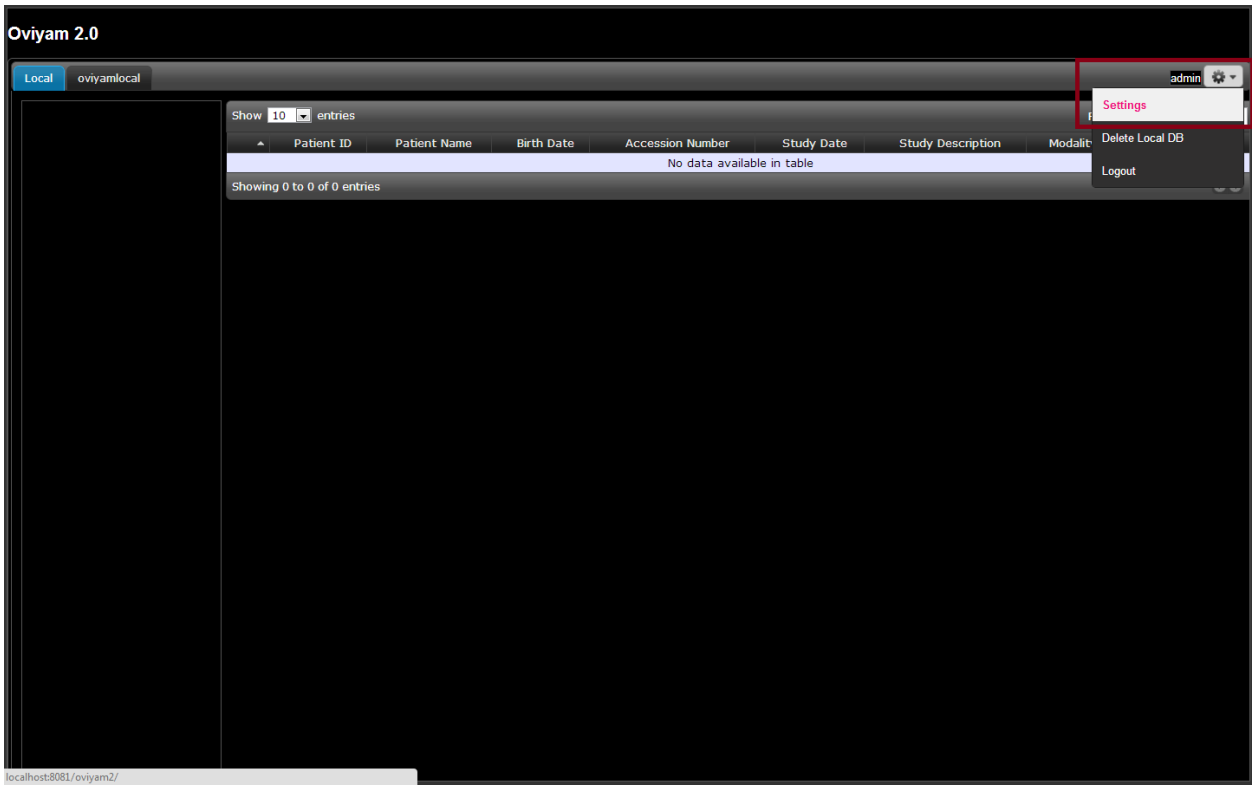
Installation

- Download the package from http://sourceforge.net/projects/dcm4che/files/Oviyam/2.0/Oviyam-2.0-bin.zip/download
- Extract the package and copy the war file in to {install folder}\dcm4chee-2.17.1-mysql\server\default\deploy\
- Restart or start the server.
- **IMPORTANT: Google Chrome is the recommended browser to use Oviyam.**
- Oviyam can be viewed directly through the link http://localhost:8081/oviyam2/
- The login credentials are the same as dcm4chee
  User : admin Password: admin

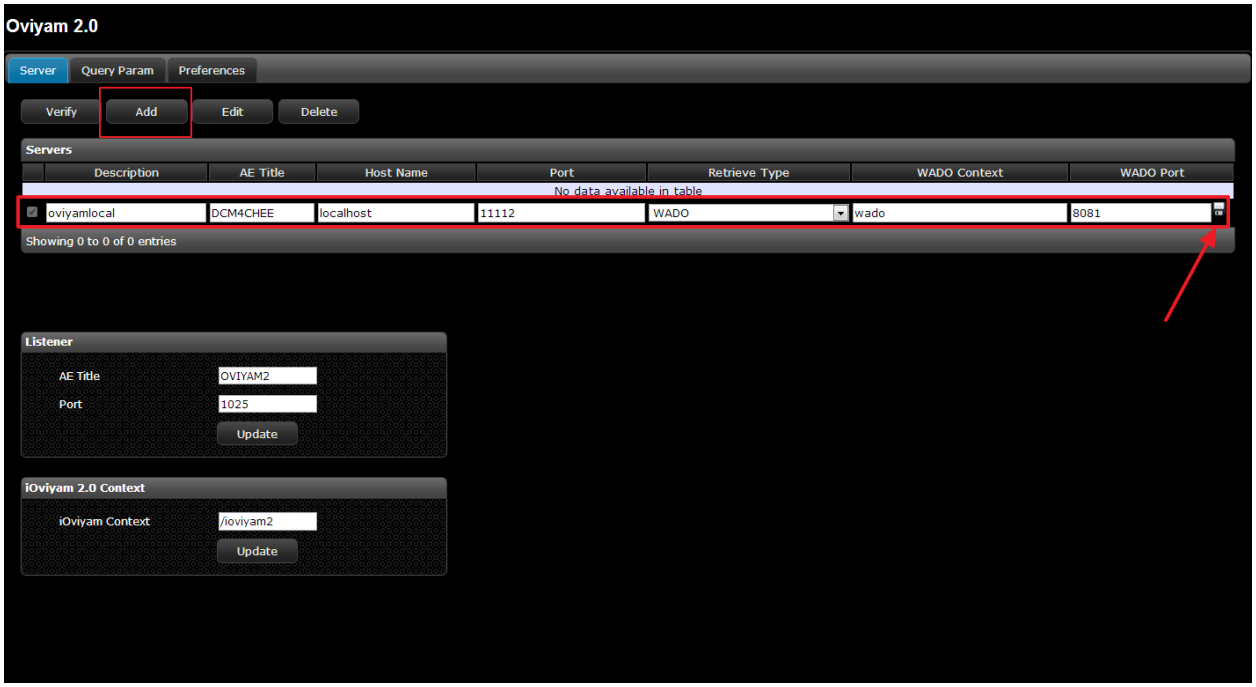


Server Configuration

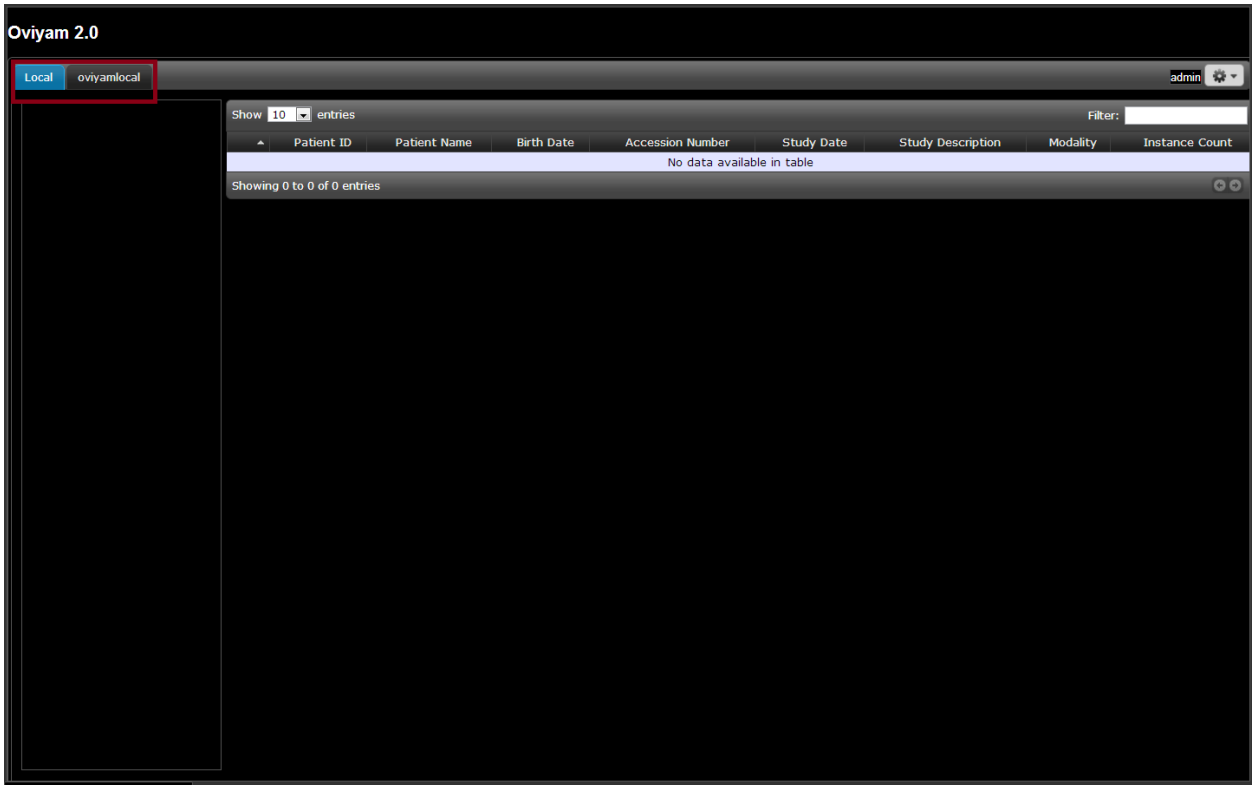
- Go to the Admin→ Settings



- Add the dcm4chee server configuration.
    - Description : oviyamlocal
    - AETitle: DCM4CHEE
    - Host: localhost {It is on the same ip address as dcm4chee}
    - Port: 11112
    - Retrieve Type :WADO
    - WADO Context: wado
    - WADO Port: 8081 {same as the dcm4chee-web3 port}
- Click the save button on the right and click Verify to check if all the settings are correct, if they are correct a green popup will display showing the verification was successful.

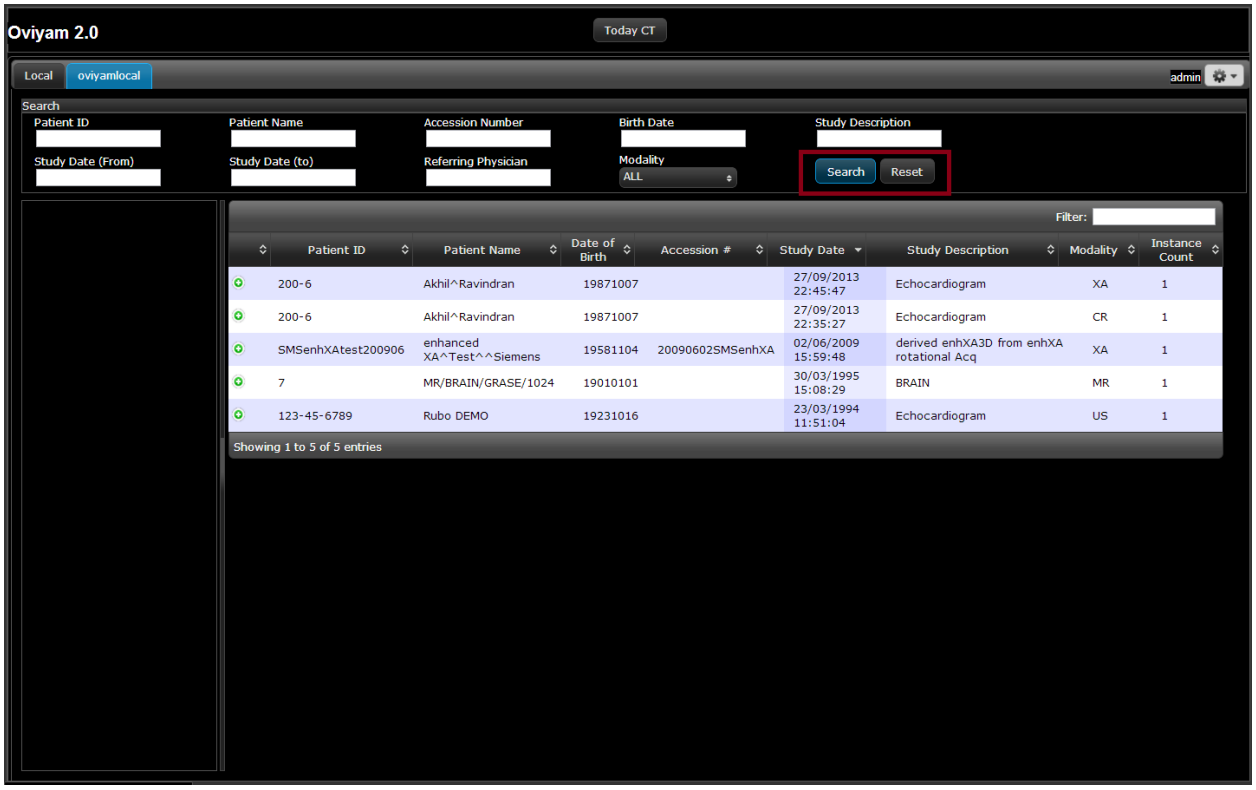


- The Home screen for oviyam should display the new server.



Oviyam Notes

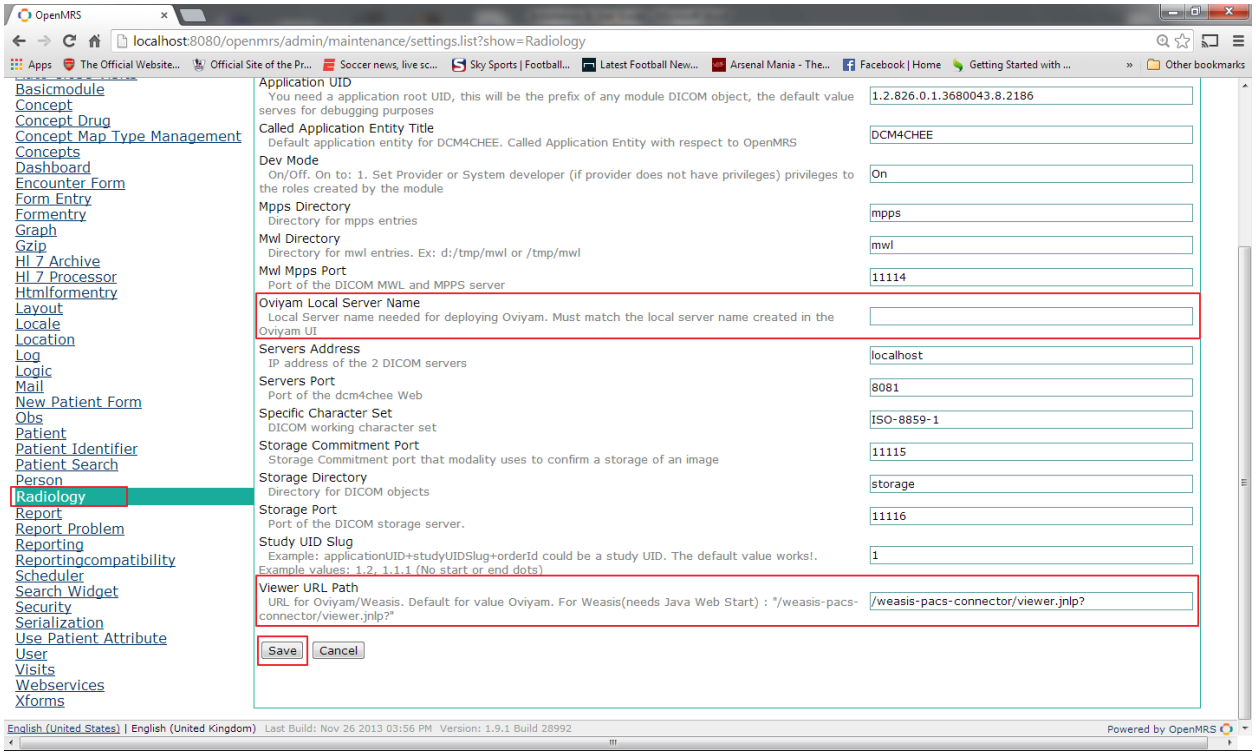
- Click on the “oviyamlocal” tab and run an empty search(if there are any images).



Weasis

Installation

- Alternative Dicom viewer to Oviyam 2.0.
- Java Based DICOM image viewer.
  http://www.dcm4che.org/confluence/display/WEA/Home
- Integrates within dcm4chee server.
- **Requires JAVA Web Start to be installed/enabled to launch from the browser.**
- Installation instructions
  http://www.dcm4che.org/confluence/display/WEA/Installing+Weasis+in+DCM4CHEE
- After the required WAR files have been deployed on the dcm4chee server, two of the module’s settings/properties need to be altered to launch Weasis from OpenMRS.
  - **Oviyam Local Server Name :** {leave empty}
  - **Viewer URL Path:** /weasis-pacs-connector/viewer.jnlp?


OpenMRS
localhost:8080/openmrs/admin/maintenance/settings.list?show=Radiology
Basicmodule
Concept
Concept Drug
Concept Map Type Management
Concepts
Dashboard
Encounter Form
Form Entry
Formentry
Graph
Gzip
HI 7 Archive
HI 7 Processor
Htmlformentry
Layout
Locale
Location
Log
Logic
Mail
New Patient Form
Obs
Patient
Patient Identifier
Patient Search
Person
Radiology
Report
Report Problem
Reporting
Reportingcompatibility
Scheduler
Search Widget
Security
Serialization
Use Patient Attribute
User
Visits
Webservices
Xforms
Application UID
You need a application root UID, this will be the prefix of any module DICOM object, the default value serves for debugging purposes
1.2.826.0.1.3680043.8.2186
Called Application Entity Title
Default application entity for DCM4CHEE. Called Application Entity with respect to OpenMRS
DCM4CHEE
Dev Mode
On/Off. On to: 1. Set Provider or System developer (if provider does not have privileges) privileges to the roles created by the module
On
Mpps Directory
Directory for mpps entries
mpps
Mwl Directory
Directory for mwl entries. Ex: d:/tmp/mwl or /tmp/mwl
mwl
Mwl Mpps Port
Port of the DICOM MWL and MPPS server
11114
Oviyam Local Server Name
Local Server name needed for deploying Oviyam. Must match the local server name created in the Oviyam UI
Servers Address
IP address of the 2 DICOM servers
localhost
Servers Port
Port of the dcm4chee Web
8081
Specific Character Set
DICOM working character set
ISO-8859-1
Storage Commitment Port
Storage Commitment port that modality uses to confirm a storage of an image
11115
Storage Directory
Directory for DICOM objects
storage
Storage Port
Port of the DICOM storage server.
11116
Study UID Slug
Example: applicationUID+studyUIDSlug+orderId could be a study UID. The default value works!.
Example values: 1.2, 1.1.1 (No start or end dots)
1
Viewer URL Path
URL for Oviyam/Weasis. Default for value Oviyam. For Weasis(needs Java Web Start) : "/weasis-pacs-connector/viewer.jnlp?"
/weasis-pacs-connector/viewer.jnlp?
Save
Cancel
English (United States) | English (United Kingdom) Last Build: Nov 26 2013 03:56 PM Version: 1.9.1 Build 28992
Powered by OpenMRS

Modality Configuration

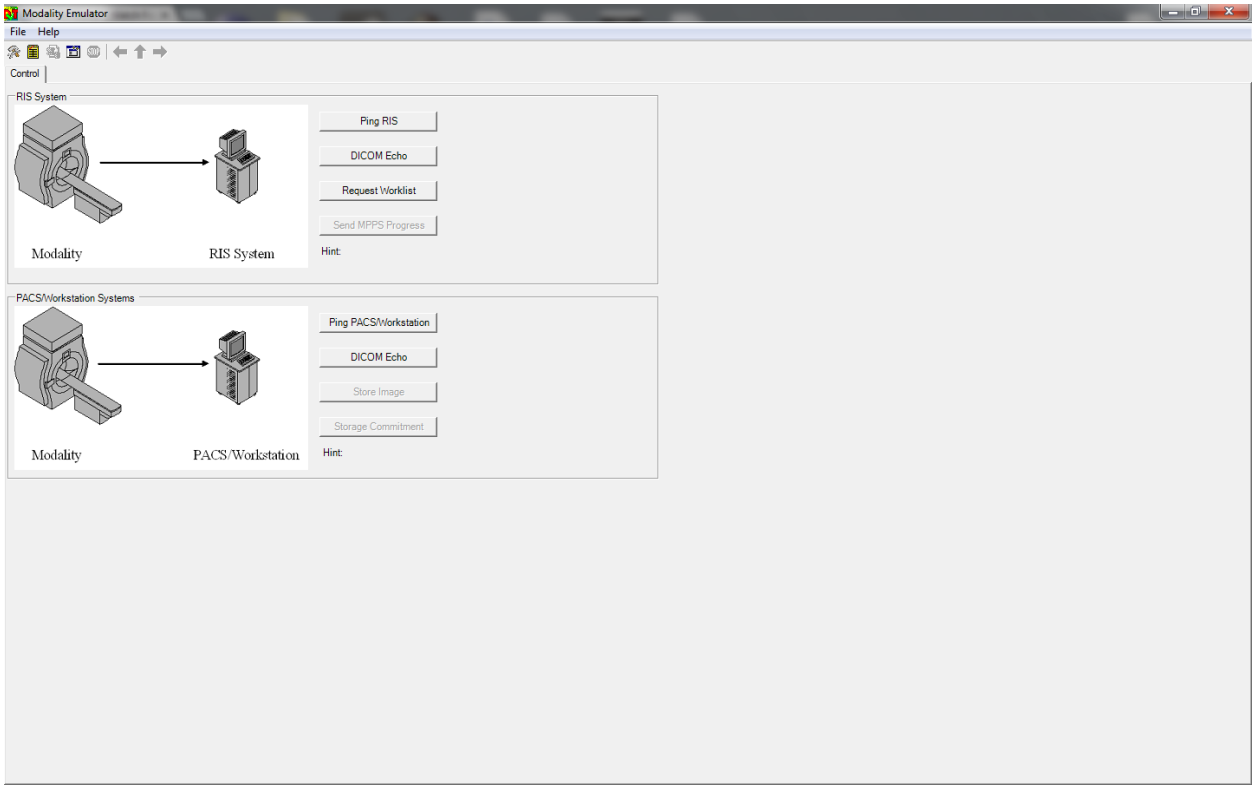
Configuration settings for Modalities

- RIS System
    - IP Address : localhost (IP address of dcm4chee server)
    - Remote Port: 11112
    - AE Title: DCM4CHEE
- MPPS Manager
    - IP Address : localhost (IP address of dcm4chee server)
    - Remote Port: 11112
    - AE Title: DCM4CHEE
- PACS/Workstation Systems
    - IP Address : localhost (IP address of dcm4chee server)
    - Remote Port: 11112
    - AE Title: DCM4CHEE
- Store Commit Config
    - IP Address : localhost (IP address of dcm4chee server)
    - Remote Port: 11112
    - AE Title: DCM4CHEE

Dvtk Modality Emulator

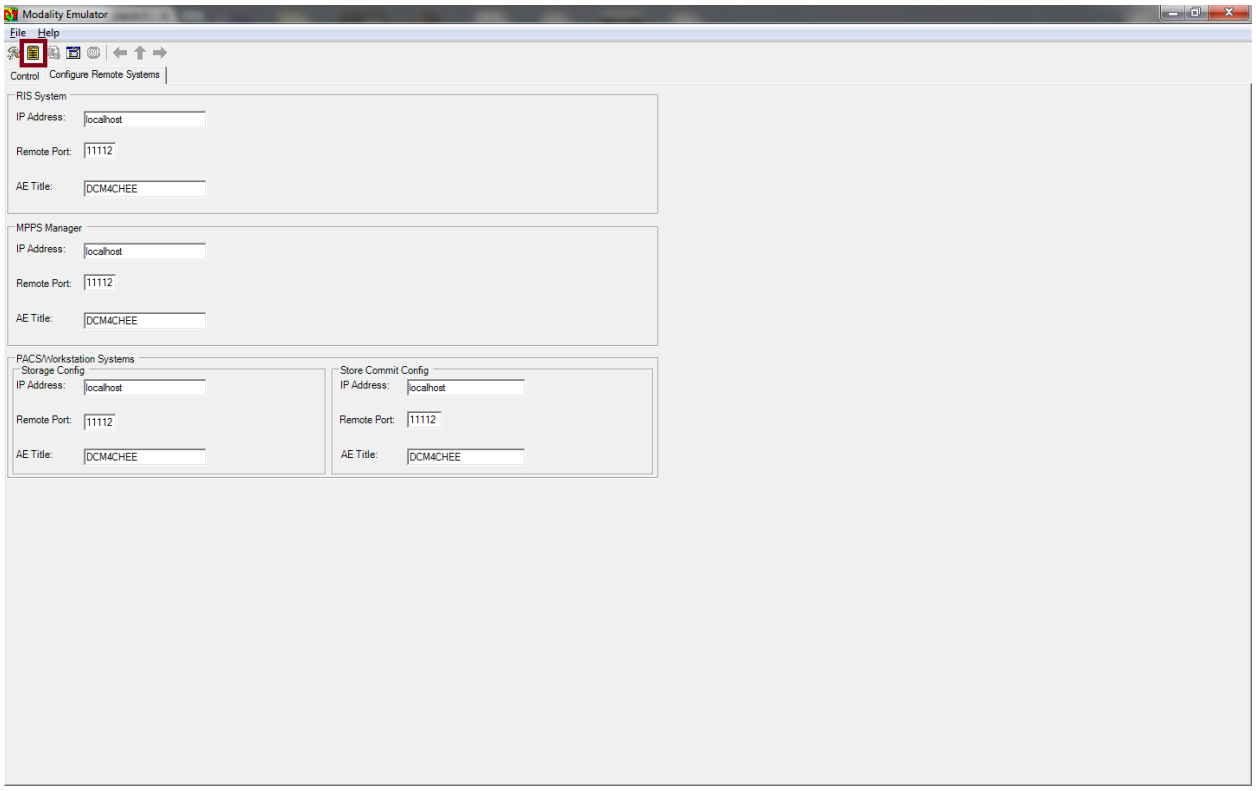
Installation

- **IMPORTANT:** This emulator is available only on Windows.
- Install the Modality Emulator from this link. http://dicom.dvtk.org/modules/wiwimod/index.php?page=Download+Modality+Emulator&cmenu=downloads
- **IMPORTANT:** Install the DICOM definition files from this link before you run the emulator. http://dicom.dvtk.org/modules/wiwimod/index.php?page=Download+DICOM+Definition+Files
- Run the emulator(there should be an icon for modality emulator in the start menu).
- **IMPORTANT : In the emulator, a file or setting is selected if the value is highlighted.**

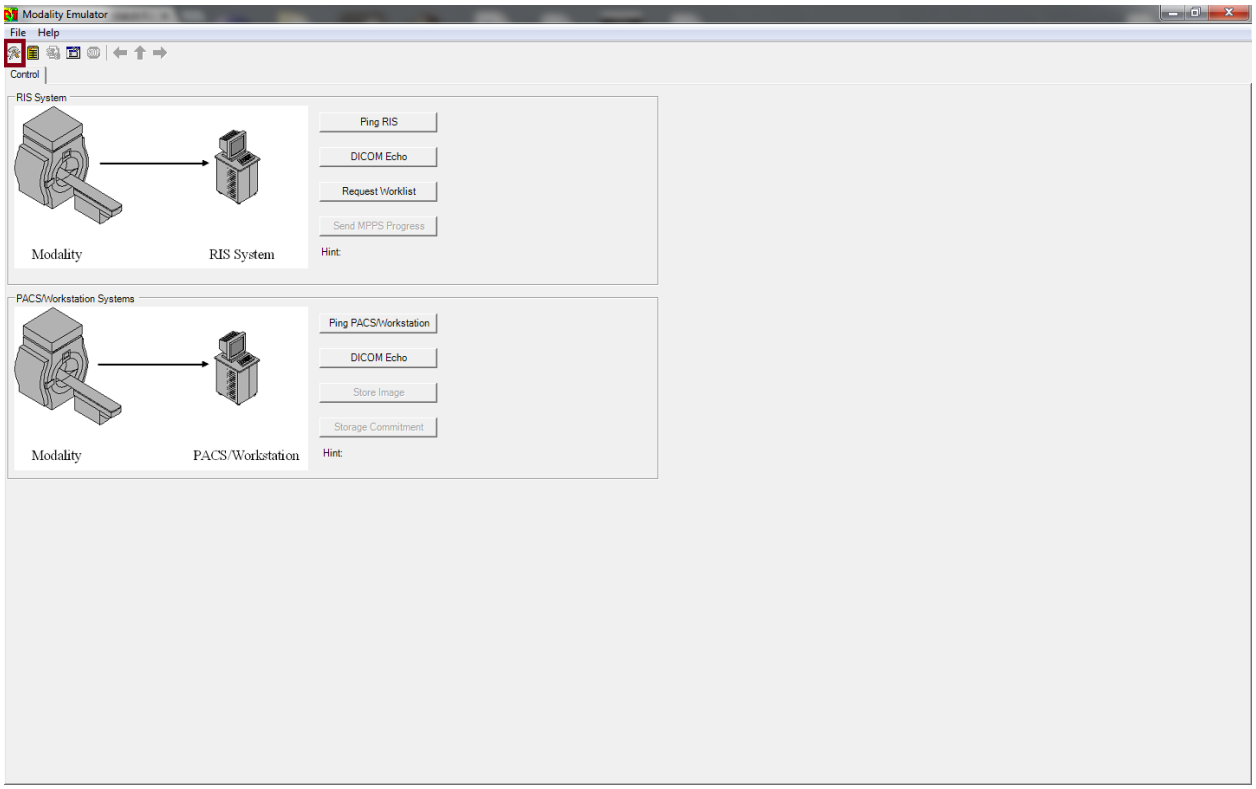


Configure the Emulator

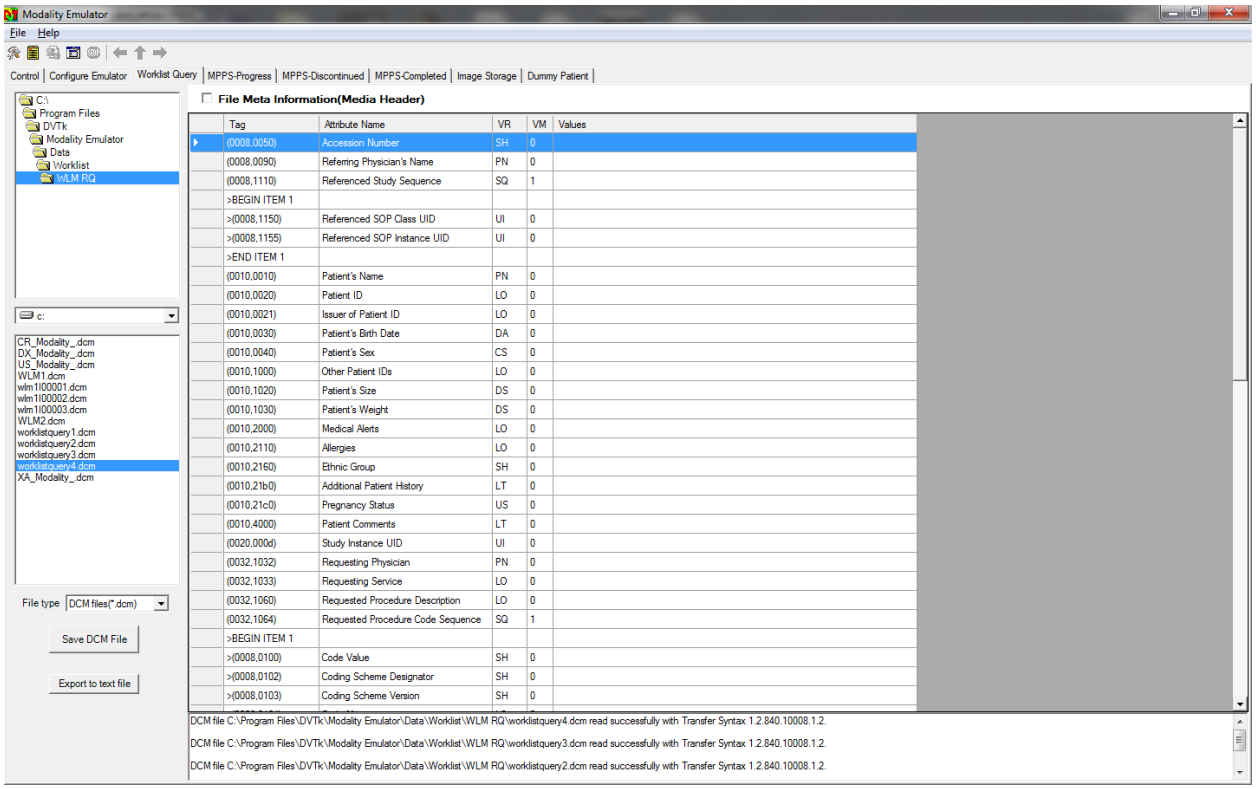
- Click on the “Configure Remote Systems Button.”
    - The IP Address, Remote Port and AE Title are the same for all the different systems.
    - IP Address : localhost (or ip of dcm4chee server)
    - Remote Port : 11112
    - AE Title : DCM4CHEE



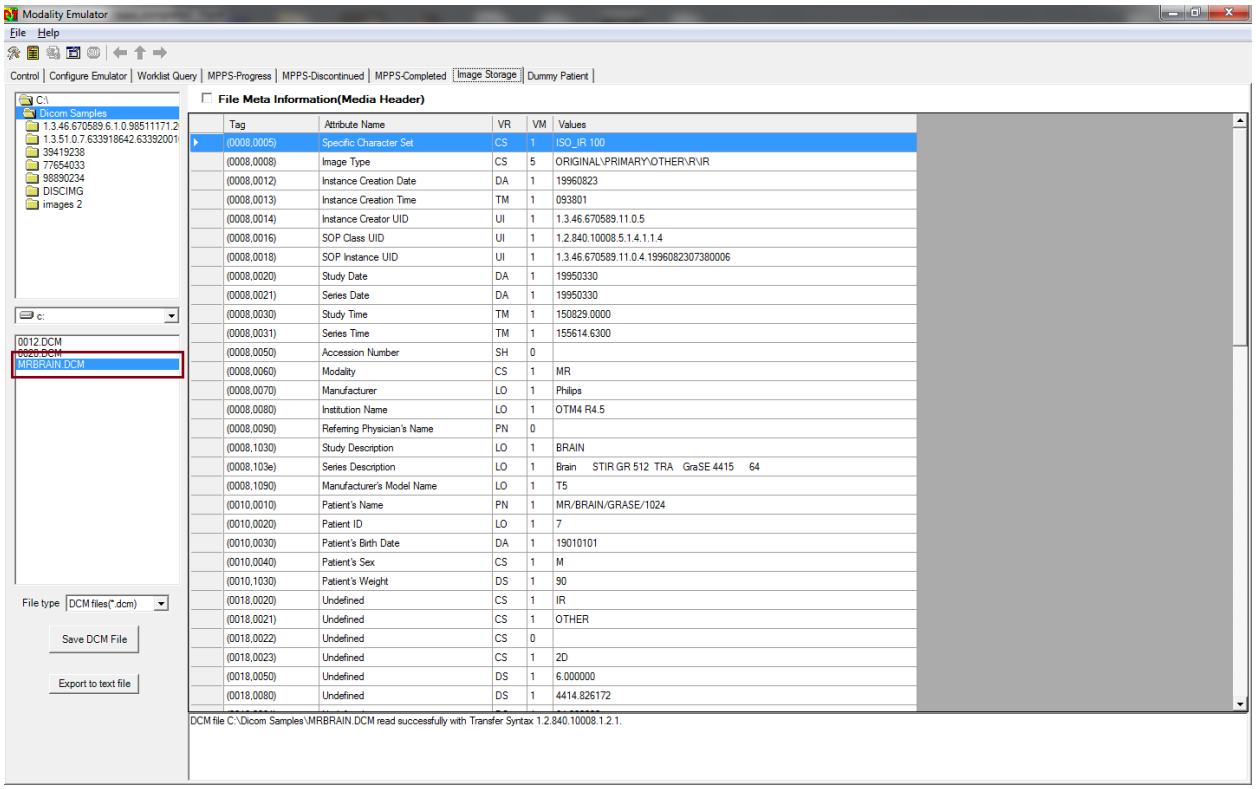
- Click on the Configure Emulator button, a number of tabs will be visible.



- Click on the Worklist query Tab.
    - In the bottom left dialog box, choose the file **"worklistquery2.dcm"**.
    - In the right side where all the attributes are displayed, scroll down to the Code Meaning "Scheduled Procedure Step Start Date" and delete the value. (The worklistquery2.dcm is an empty query with only that field having a value).
    - Save the completely empty query to another file called "worklistquery4.dcm" and select it.

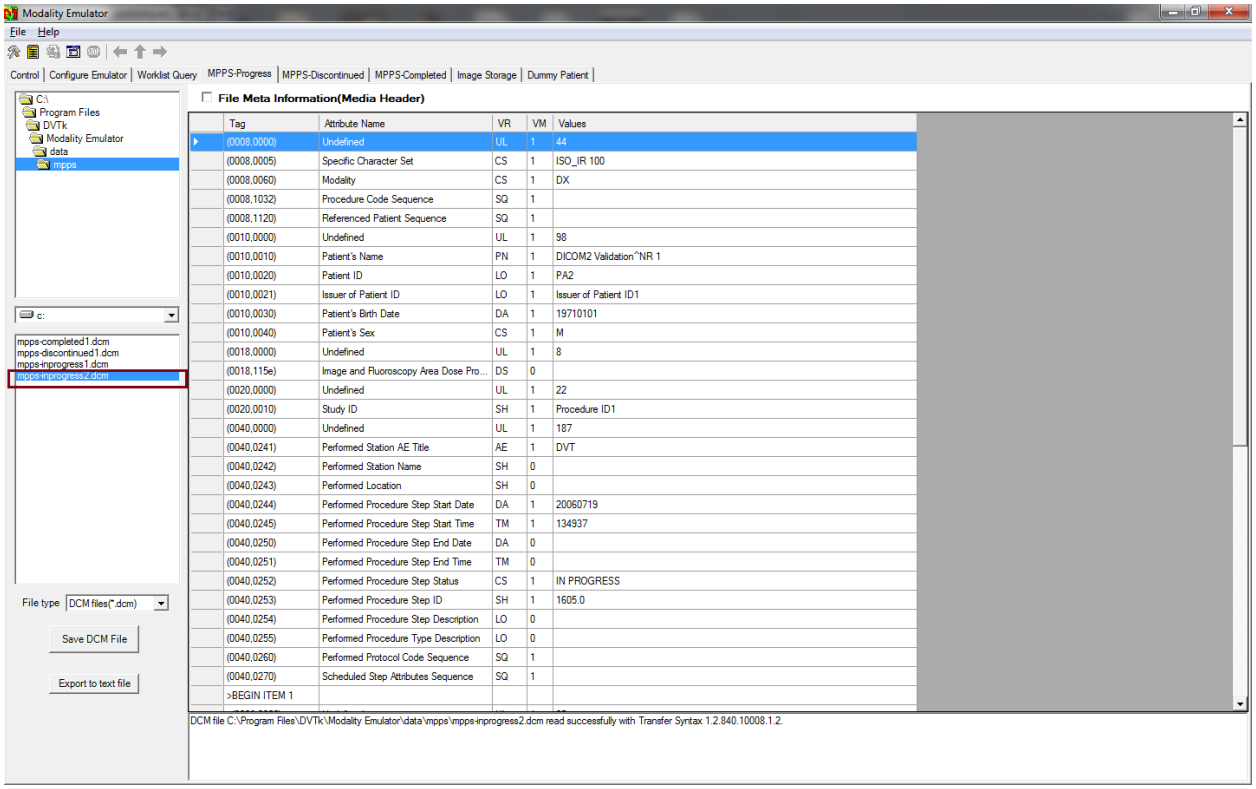


- In the Image Storage tab, select the images on the left panel using the directory structure for the imaged you wish to send. If a file is highlighted within a folder, it is the file that is selected by the emulator.

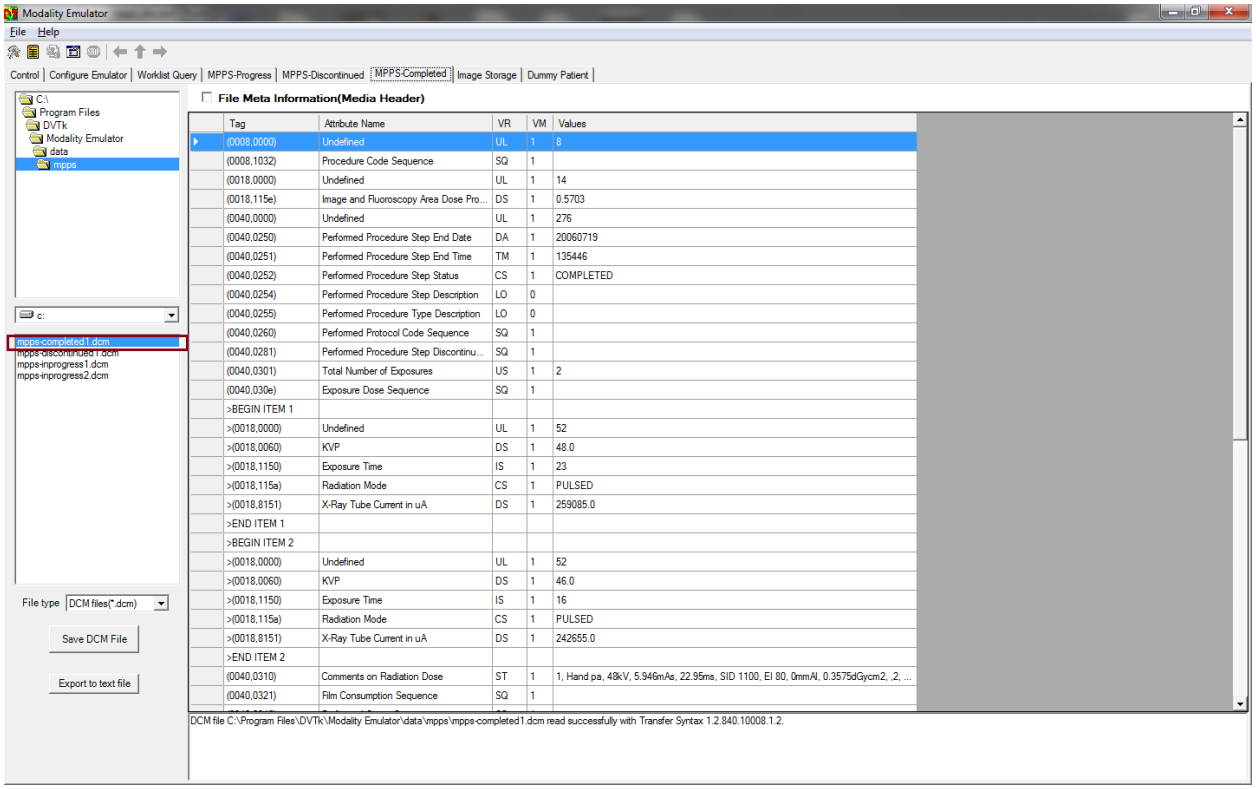


- Make sure the MPPS In Progress, MPPS Discontinued and MPPS Complete Tabs are set correctly with the right MPPS file selected.

MPPS In Progress



MPPS Completed



MPPS DISCONTINUED