



# **Radiology Module with DCM4CHEE**

## **Install Guide**

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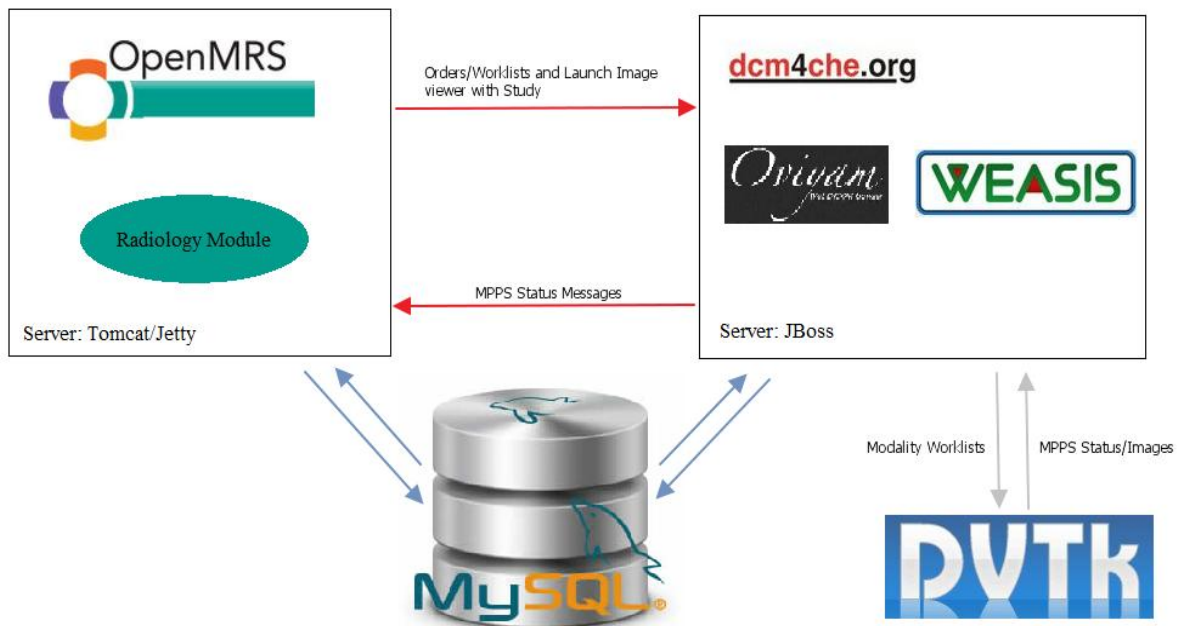
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## Introduction

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. Oviyam 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/openmrs/openmrs-module-radiologydcm4chee>
  - 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.

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### Administration

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### 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\mw  
MPPS entries in: C:\OpenMRS1.9.x\openmrs-core\webapp\mpp

# OpenMRS Radiology Module

OpenMRS  
 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
<input type="checkbox"/> Drug_order	Order of medications for the patient
<input type="checkbox"/> Lab_test	An order by a clinician for a laboratory test
<input type="checkbox"/> Lunch_order so hungry	
<input checked="" type="checkbox"/> Radiology	Order for radiology procedures

[Delete Selected Order Types](#)

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OpenMRS - Role Manager

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
<input type="checkbox"/> Anonymous	Privileges for non-authenticated users.		View Navigation Menu
<input type="checkbox"/> Authenticated	Privileges gained once authentication has been established.		View Relationships , View Privileges ...
<input type="checkbox"/> Provider	All users with the 'Provider' role will appear as options in the default Infopath		Patient Dashboard - View Encounters Section , View Users ...
<input checked="" type="checkbox"/> Radiology: Performing Technician	Radiology: Performing Technician	Provider	
<input checked="" type="checkbox"/> Radiology: Reading physician	Radiology: Reading physician	Provider	
<input checked="" type="checkbox"/> Radiology: Referring physician	Radiology: Referring physician	Provider	
<input checked="" type="checkbox"/> Radiology: Scheduler	Radiology: Scheduler	Provider	
<input type="checkbox"/> Scheduler	Scheduler	System Developer	
<input type="checkbox"/> 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](#)

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## Module Properties/Settings

- Goto Administration→Maintenance→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.
  - **Oviam Local Server Name** is the 'Server Description' of the dcm4chee server in Oviam's settings. This has to be identical to the entry in the oviam 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 Oviam 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.**

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## Settings

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<b>Application Entity Title</b> Title for this application entity	<input type="text" value="RADIOLOGY_MODULE"/>
<b>Application UID</b> You need a application root UID, this will be the prefix of any module DICOM object, the default value serves for debugging purposes	<input type="text" value="1.2.826.0.1.3680043.8.2186"/>
<b>Called Application Entity Title</b> Default application entity for DCM4CHEE. Called Application Entity with respect to OpenMRS	<input type="text" value="DCM4CHEE"/>
<b>Dev Mode</b> On/Off. On to: 1. Set Provider or System developer (if provider does not have privileges) privileges to the roles created by the module	<input checked="" type="checkbox" value="On"/>
<b>Mpps Directory</b> Directory for mpps entries	<input type="text" value="mpps"/>
<b>Mwl Directory</b> Directory for mwl entries. Ex: d:/tmp/mwl or /tmp/mwl	<input type="text" value="mwl"/>
<b>Mwl Mpps Port</b> Port of the DICOM MWL and MPPS server	<input type="text" value="11114"/>
<b>Oviyam Local Server Name</b> Local Server name needed for deploying Oviyam. Must match the local server name created in the Oviyam UI.	<input type="text" value="oviyamlocal"/>
<b>Servers Address</b> IP address of the 2 DICOM servers	<input type="text" value="localhost"/>
<b>Servers Port</b> Port of the dcm4chee Web	<input type="text" value="8081"/>
<b>Specific Character Set</b> DICOM working character set	<input type="text" value="ISO-8859-1"/>
<b>Storage Commitment Port</b> Storage Commitment port that modality uses to confirm a storage of an image	<input type="text" value="11115"/>
<b>Storage Directory</b> Directory for DICOM objects	<input type="text" value="storage"/>
<b>Storage Port</b> Port of the DICOM storage server.	<input type="text" value="11116"/>
<b>Study UID Slug</b> 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)	<input type="text" value="1"/>
<b>Viewer URL Path</b> URL for Oviyam/Weasis. Default for value Oviyam. For Weasis(needs Java Web Start) : */weasis-pacs-connector/viewer.jsp?*	<input type="text" value="/oviyam2/viewer.html?"/>
<input type="button" value="Save"/> <input type="button" value="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.

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### Role Management

**Role** Provider

**Description** All users with the 'Provider' role will appear as options in the default Infopath

**Roles that contain (inherit privileges from) Provider**

[Radiology: Performing Technician](#) [Radiology: Reading physician](#)  
[Radiology: Scheduler](#) [Radiology: Referring physician](#)

**Inherited Roles**

Provider inherits privileges from these roles

<input type="checkbox"/> Radiology: Performing Technician	<input type="checkbox"/> Radiology: Reading physician
<input type="checkbox"/> Radiology: Referring physician	<input type="checkbox"/> Radiology: Scheduler
<input type="checkbox"/> System Developer	<input type="checkbox"/> Scheduler

**Privileges**

*Greyed out checkboxes represent privileges inherited from other roles, these cannot be removed individually.*

<input type="checkbox"/> Add Allergies	<input type="checkbox"/> Add Cohorts
<input type="checkbox"/> Add Concept Proposals	<input type="checkbox"/> Add Encounters
<input type="checkbox"/> Add FormEntry Archive	<input type="checkbox"/> Add FormEntry Error
<input type="checkbox"/> Add FormEntry Queue	<input type="checkbox"/> Add HL7 Inbound Archive
<input type="checkbox"/> Add HL7 Inbound Exception	<input type="checkbox"/> Add HL7 Inbound Queue
<input type="checkbox"/> Add HL7 Source	<input checked="" type="checkbox"/> Add Observations
<input checked="" type="checkbox"/> Add Orders	<input type="checkbox"/> Add Patient Identifiers
<input type="checkbox"/> Add Patient Programs	<input type="checkbox"/> Add Patients
<input type="checkbox"/> Add People	<input type="checkbox"/> Add Problems
<input type="checkbox"/> Add Relationships	<input type="checkbox"/> Add Report Objects
<input type="checkbox"/> Add Reports	<input type="checkbox"/> Add Users
<input type="checkbox"/> Add Visits	<input type="checkbox"/> Configure Visits
<input type="checkbox"/> Delete Cohorts	<input type="checkbox"/> Delete Concept Proposals
<input type="checkbox"/> Delete Encounters	<input type="checkbox"/> Delete FormEntry Archive

# OpenMRS Radiology Module

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

<input type="checkbox"/> Manage Concept Map Types	<input type="checkbox"/> Manage Concept Name tags
<input type="checkbox"/> Manage Concept Reference Terms	<input type="checkbox"/> Manage Concept Sources
	<input type="checkbox"/> Manage Concept Stop Words
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<input type="checkbox"/> Manage Implementation Id	<input type="checkbox"/> Manage Indicator Definitions
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	<input type="checkbox"/> Manage Locations
<input type="checkbox"/> Manage Modules	<input type="checkbox"/> Manage Order Types
<input type="checkbox"/> Manage Person Attribute Types	<input type="checkbox"/> Manage Privileges
	<input type="checkbox"/> Manage Programs
<input type="checkbox"/> Manage Providers	<input type="checkbox"/> Manage Relationship Types
<input type="checkbox"/> Manage Relationships	<input type="checkbox"/> Manage Report Definitions
<input type="checkbox"/> Manage Report Designs	<input type="checkbox"/> Manage Reports
<input type="checkbox"/> Manage Roles	<input type="checkbox"/> Manage Rule Definitions
<input type="checkbox"/> Manage Scheduler	<input type="checkbox"/> Manage Tokens
<input type="checkbox"/> Manage Visit Attribute Types	<input type="checkbox"/> Manage Visit Types
	<input checked="" type="checkbox"/> Patient Dashboard - View Demographics Section
<input checked="" type="checkbox"/> Patient Dashboard - View Encounters Section	<input checked="" type="checkbox"/> Patient Dashboard - View Forms Section
<input checked="" type="checkbox"/> Patient Dashboard - View Graphs Section	<input checked="" type="checkbox"/> Patient Dashboard - View Overview Section
<input checked="" type="checkbox"/> Patient Dashboard - View Patient Summary	<input checked="" type="checkbox"/> Patient Dashboard - View Radiology Section
<input checked="" type="checkbox"/> Patient Dashboard - View Regimen Section	<input checked="" type="checkbox"/> Patient Dashboard - View Visits Section
<input type="checkbox"/> Pharm add prescription	<input type="checkbox"/> Pharm return prescription
<input type="checkbox"/> Pharm view prescription	<input type="checkbox"/> Purge Field Types
<input type="checkbox"/> Remove Allergies	<input type="checkbox"/> Remove Problems

## OpenMRS Radiology Module



**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>
```

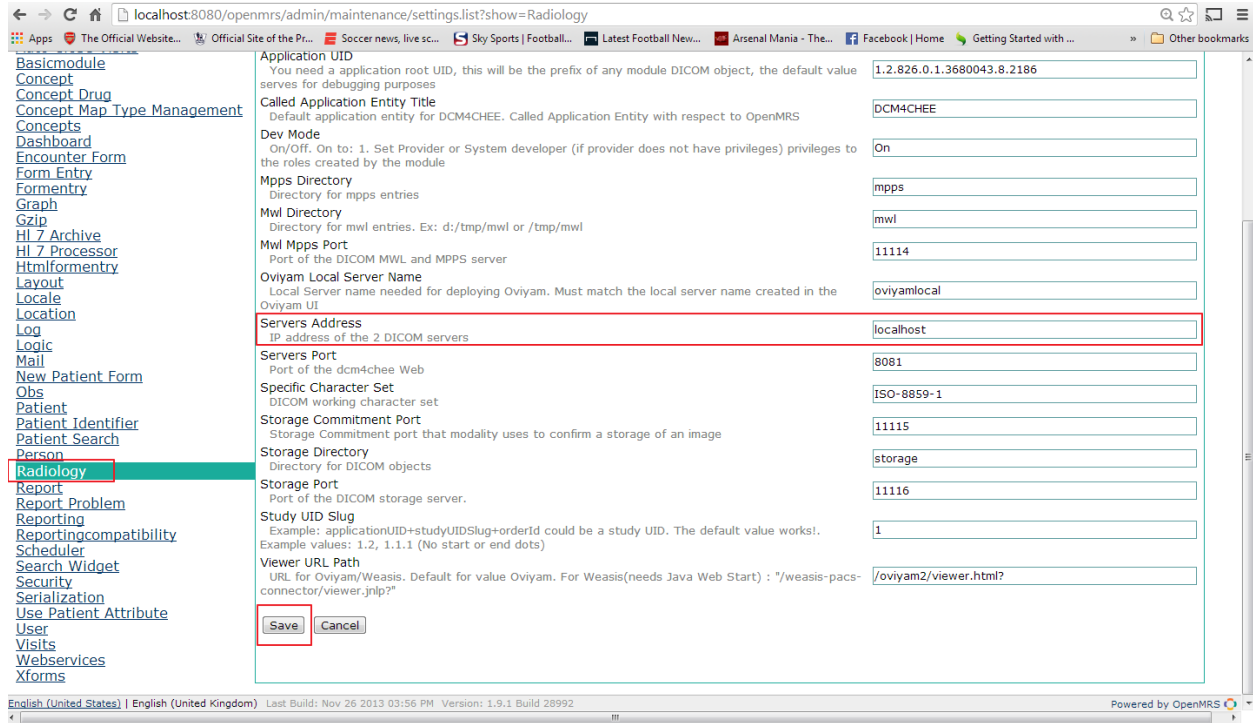
```
mysql> create database pacfdb;
mysql> grant all on pacfdb.* to 'pacs'@'localhost' identified by
'pacs';
mysql> \q
> mysql -upacs -ppacs pacfdb < create.mysql
```

- 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)

## OpenMRS Radiology Module

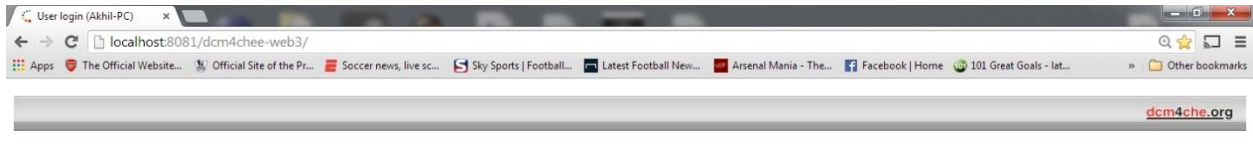
```
D:\Project\dc4chee\dc4chee-mysql\dc4chee-2.17.1-mysql\server\default\deploy\jboss-web\deployer\server.xml - Notepad++
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
pom.xml DcmOF.java Main.java openmrs-runtime.properties om2dcm.xml pom.xml server.xml
1 <Server>
2
3 <!--APR library loader. Documentation at /docs/apr.html -->
4 <Listener className="org.apache.catalina.core.AprLifecycleListener" SSLEngine="on" />
5 <!--Initialize Jasper prior to webapps are loaded. Documentation at /docs/jasper-howto.html -->
6 <Listener className="org.apache.catalina.core.JasperListener" />
7
8 <!-- Use a custom version of StandardService that allows the
9 connectors to be started independent of the normal lifecycle
10 start to allow web apps to be deployed before starting the
11 connectors.
12 -->
13 <Service name="jboss.web">
14
15 <!-- A "Connector" represents an endpoint by which requests are received
16 and responses are returned. Documentation at :
17 Java HTTP Connector: /docs/config/http.html (blocking & non-blocking)
18 Java AJP Connector: /docs/config/ajp.html
19 APR (HTTP/AJP) Connector: /docs/apr.html
20 Define a non-SSL HTTP/1.1 Connector on port 8080
21 -->
22 <Connector port="8081" address="{jboss.bind.address}"
23     maxThreads="250" maxHttpHeaderSize="8192"
24     emptySessionPath="true" protocol="HTTP/1.1"
25     enableLookups="false" redirectPort="8443" acceptCount="100"
26     connectionTimeout="20000" disableUploadTimeout="true" />
27
28 <!-- Define a SSL HTTP/1.1 Connector on port 8443
29 This connector uses the JSSE configuration, when using APR, the
30 connector should be using the OpenSSL style configuration
31 described in the APR documentation -->
32 <Connector port="8443" protocol="HTTP/1.1" SSLEnabled="true"
33     maxThreads="150" scheme="https" secure="true"
34     clientAuth="true" sslProtocol="TLS"
35     ciphers="SSL_RSA_WITH_NULL_SHA,TLS_RSA_WITH_AES_128_CBC_SHA"
36     keystoreFile="{jboss.server.home.dir}/conf/certificates/test_sys_1.p12"
37     keystorePass="secret" keystoreType="PKCS12"
38     truststoreFile="{jboss.server.home.dir}/conf/certificates/mta_certs.jks"
39     truststorePass="secret" truststoreType="JKS"
40     SSLImplementation="org.dcm4chee.audit.tomcat.ATNAImplementation"
41
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154
155
156
157
158
159
160
161
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164
165
166
167
168
169
170
171
172
length: 8600 lines: 172 Ln: 1 Col: 1 Sel: 0|0 UNIX ANSI as UTF-8 INS
Comma separated list of numberinterval pairs
```





- 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

## OpenMRS Radiology Module



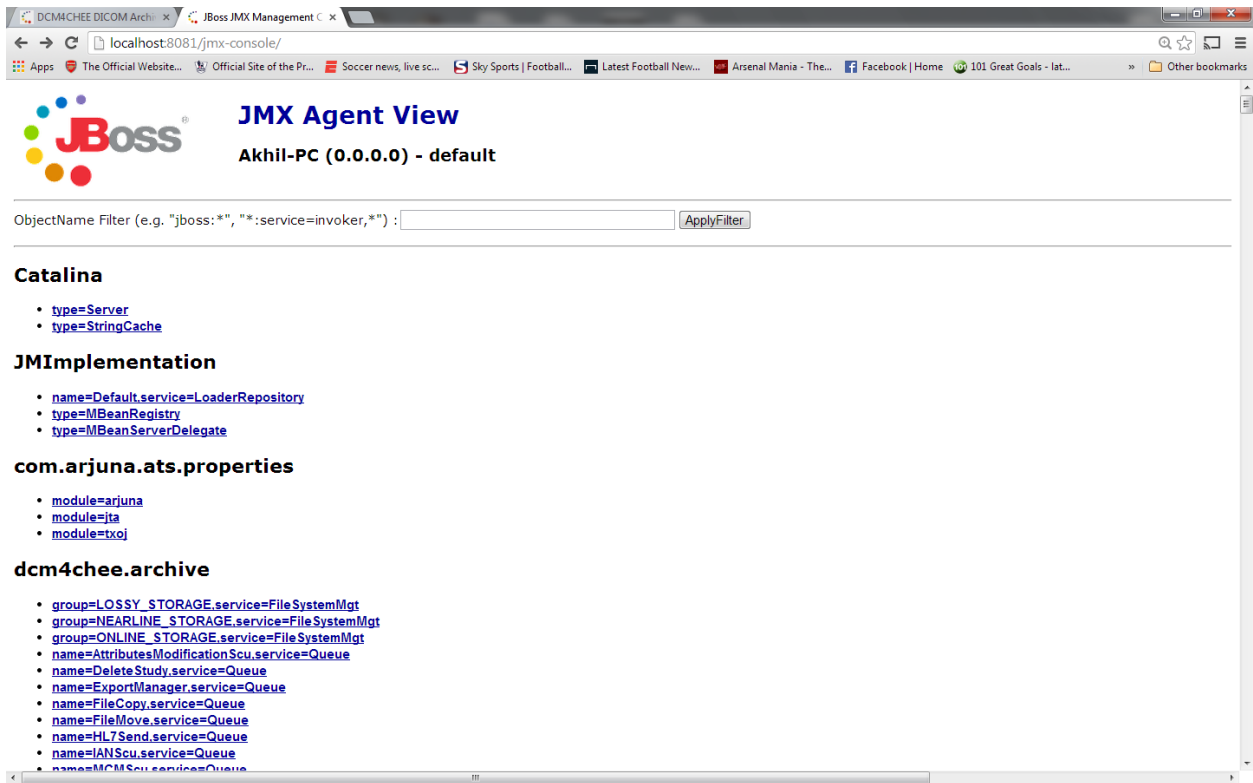
### User login at Akhil-PC

Username:

Password:

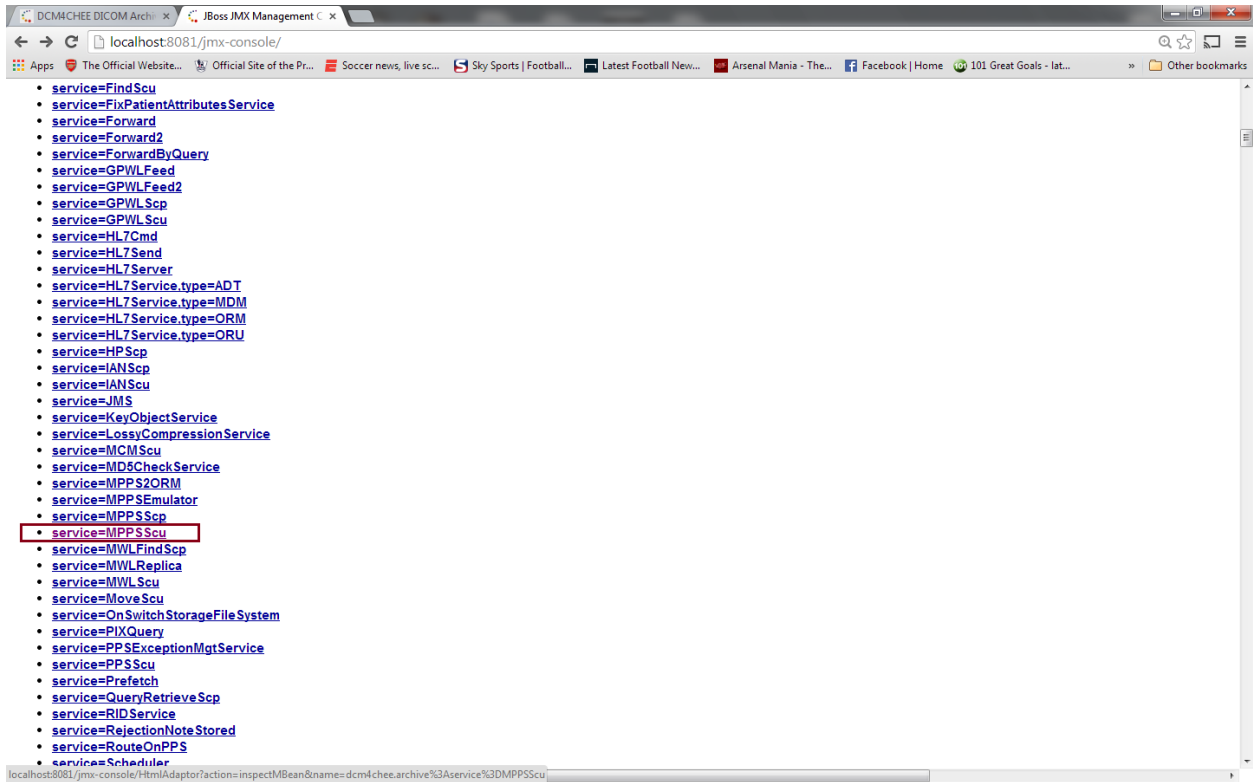
## Setting Up Mpps Forwarding

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



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

## OpenMRS Radiology Module



- 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.

## OpenMRS Radiology Module

MaximumPDULength	int	RW	16382	length for receiving PDUs.
TcpNoDelay	boolean	RW	<input checked="" type="radio"/> True <input type="radio"/> False	Send packets as quickly as possible (Disable Nagle algorithm).
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: <a href="#">View MBean</a>	Used internally. Do NOT modify.
ForwardingRules	java.lang.String	RW	[calling!=RADIOLOGY_MODULE]RADIOLOGY_MODULE	<p>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.</p> <p>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 *)</p> <p>Example:  [calling!=ORDER_FILLER]ORDER_FILLER  =&gt; Forwards received MPPS to ORDER_FILLER, except MPPS received from ORDER_FILLER</p>
CallingAETitle	java.lang.String	RW	DCM4CHEE	Calling AE Title 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 <i>numberinterval</i> pairs.

RetryIntervals	java.lang.String	RW	5x10s,5x1m,12x5m,24x1h	<p>Number and intervals of retries for failed MPPS forward requests. Format: Comma separated list of <i>numberinterval</i> pairs. The interval can be specified in seconds (<i>#s</i>), minutes (<i>##m</i>), hours (<i>##h</i>) or days (<i>##d</i>). 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.</p>
QueueName	java.lang.String	RW	MPPSScu	Used internally. Do NOT modify.
JMSServiceName	javax.management.ObjectName	RW	dcm4chee.archive.service: <a href="#">View MBean</a>	Used internally. Do NOT modify.
MppsScpServiceName	javax.management.ObjectName	RW	dcm4chee.archive.service: <a href="#">View MBean</a>	Used internally. Do not modify.

[Apply Changes](#)

### List of MBean operations:

#### void create()

Standard MBean lifecycle method

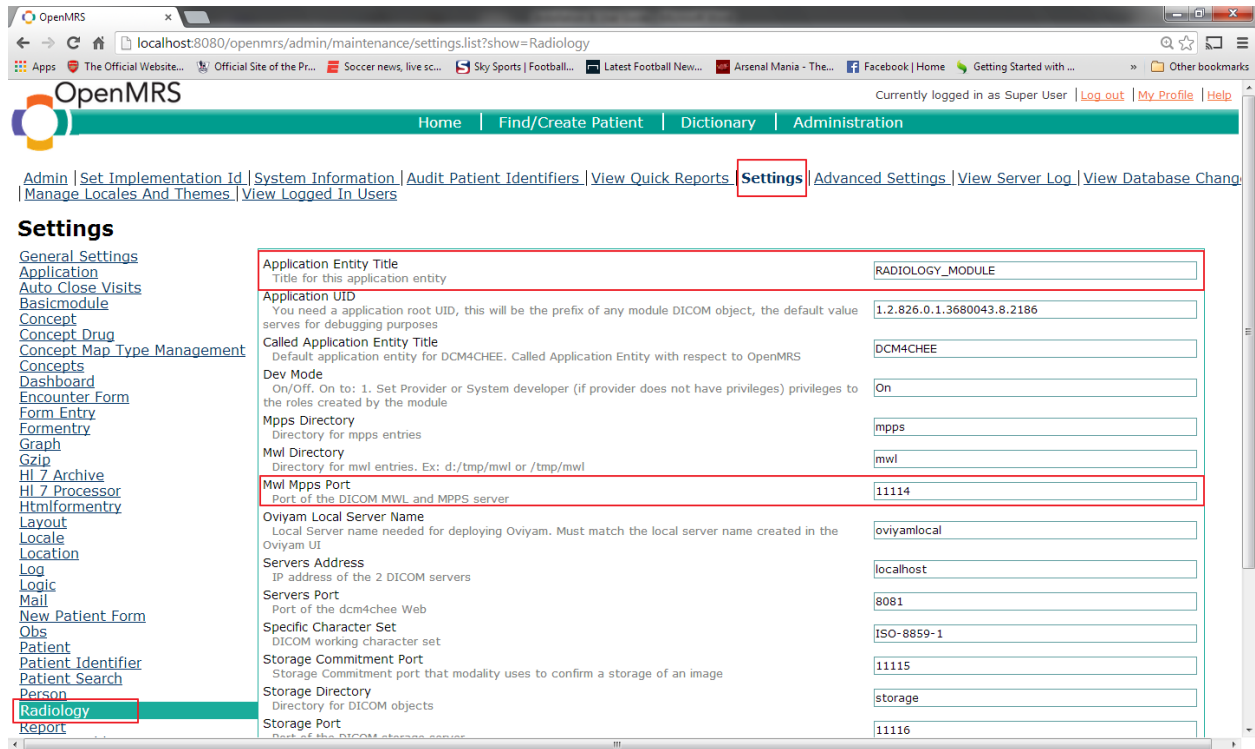
[Invoke](#)

#### 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

# OpenMRS Radiology Module

The screenshot shows the 'Application Entities' page in the dcm4chee web interface. The browser address bar shows 'localhost:8081/dcm4chee-web3/?wicketinterface=:0:'. The page has a navigation menu with 'Application Entities' selected. Below the menu, there are tabs for 'AETs' and 'AE Groups'. A 'New AET' button is highlighted with a red box. Below it is a 'Filter by:' dropdown. The main content is a table with the following data:

Title	Type	Host	Port	Description	TLS	MPPS	Station name	Institution	Department
CDRECORD		localhost	10104	Media Creation Server (part of dcm4chee)	<input type="checkbox"/>	<input type="checkbox"/>			
DCM4CHEE		localhost	11112	This dcm4chee archive instance	<input type="checkbox"/>	<input type="checkbox"/>			
RADIOLOGY_MODULE	-	localhost	11114		<input type="checkbox"/>	<input type="checkbox"/>		OpenMRS	

The screenshot shows the 'Edit AET' dialog box. The 'Title' field is highlighted with a red box and contains the text 'RADIOLOGY\_MODULE'. Other fields include 'Type' (dropdown), 'Hostname' (localhost), 'Port' (11114), 'Ciphersuite #1', 'Ciphersuite #2', 'Ciphersuite #3' (dropdowns), 'Description', 'Issuer of Patient ID', 'Issuer of Accession Number', 'Filesystem Group ID' (dropdown), 'Wado URL', 'User Id' (admin), 'Password' (masked), 'Station Name', 'Institution' (OpenMRS), 'Department', 'Installed' (checkbox), 'Emulate MPPS' (checkbox), and 'Delay time for MPPS emulation' (text input). At the bottom are 'Save', 'Cancel', and 'Echo' buttons.

## 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

The screenshot shows the DCM4CHEE web interface in a browser window. The address bar shows 'localhost:8081/dcm4chee-web3/'. The navigation menu includes 'Folder' (highlighted with a blue box), 'Trash', 'Application Entities', 'Modality Worklist', 'Teaching-Files', 'Dashboard', 'Roles', 'Users', and 'Password'. The search form contains fields for 'Patient Name', 'Patient ID', 'Issuer', 'Study Date' (with 'from' and 'to' sub-fields), and 'Accession No'. There are also checkboxes for 'Phonetic', 'Exact search', and 'Latest studies first', along with dropdowns for 'Modality' and 'Source AET'. The search form has 'Reset' and 'Search' buttons (the 'Search' button is highlighted with a red box). Below the search form, there are 'Delete', 'Move', and 'Export' buttons. A table of results is displayed with columns: 'Patient Name', 'Patient ID/Issuer', 'Birth Date', 'Sex', 'Comments', 'Study Date/Time', 'Study ID', 'Accession No', 'Modality', 'Description', '#S/#I', and 'Availability'. The table has two rows of data, each with a green checkmark in the 'Availability' column.



# OpenMRS Radiology Module

Search

Patient Name   
  Patient ID   
  Issuer   
  Study Date from  to    
  Accession No

Phonetic   
 Modality    
 Source AET

Exact search   
 Search for    
 Expand To    
    

Pagesize     Study 1 to 5 of 5           

⊖ Patient Name	⊖ Study Date/Time	⊖ Study ID	⊖ Accession No	⊖ Birth Date	⊖ Sex	⊖ Description	⊖ #S/#I	⊖ Availability	<input type="checkbox"/>	<input type="checkbox"/>
⊖ Akhil^Ravindran	9/27/2013 22:35	200-6	UNKNOWN	10/7/1987	M	Demonstration Patient for enhanced XA testing activities!	1/1	ONLINE	<input type="checkbox"/>	<input type="checkbox"/>
⊖ enhanced XA^Test^Siemens	6/2/2009 15:59	SMSenhXATest200906	090602enhXAdemo1	11/4/1958	M	Demonstration Patient for enhanced XA testing activities!	1/1	ONLINE	<input type="checkbox"/>	<input type="checkbox"/>
⊖ MR/BRAIN/GRASE/1024	3/30/1995 15:08	7	191	1/1/1901	M	derived enhXA3D from enhXA rotational Acq1/1	1/1	ONLINE	<input type="checkbox"/>	<input type="checkbox"/>
⊖ Rubo DEMO	3/23/1994 11:51	123-45-6789	027893462	10/16/1923	F	BRAIN	1/1	ONLINE	<input type="checkbox"/>	<input type="checkbox"/>
⊖						Echocardiogram	1/1	ONLINE	<input type="checkbox"/>	<input type="checkbox"/>

Modality Worklist

Search

Patient name   
  Patient ID   
  Issuer   
  Start Date from  to    
  Accession No

Phonetic   
 Modality    
 Station AET    
 Station Name    
 Status

Latest items first   
   

Pagesize

Patient Name	Birthdate	SPS Description	Modality	SPS Status	Start date	Station AET	Station Name	Accession number
--------------	-----------	-----------------	----------	------------	------------	-------------	--------------	------------------

# OpenMRS Radiology Module

Logout (admin) Choose One dcm4chee.org

**Search**

Patient Name  Patient ID  Issuer  Start Date from  to  Accession No

Modality  Station AET  Station Name  Status

Reset Search

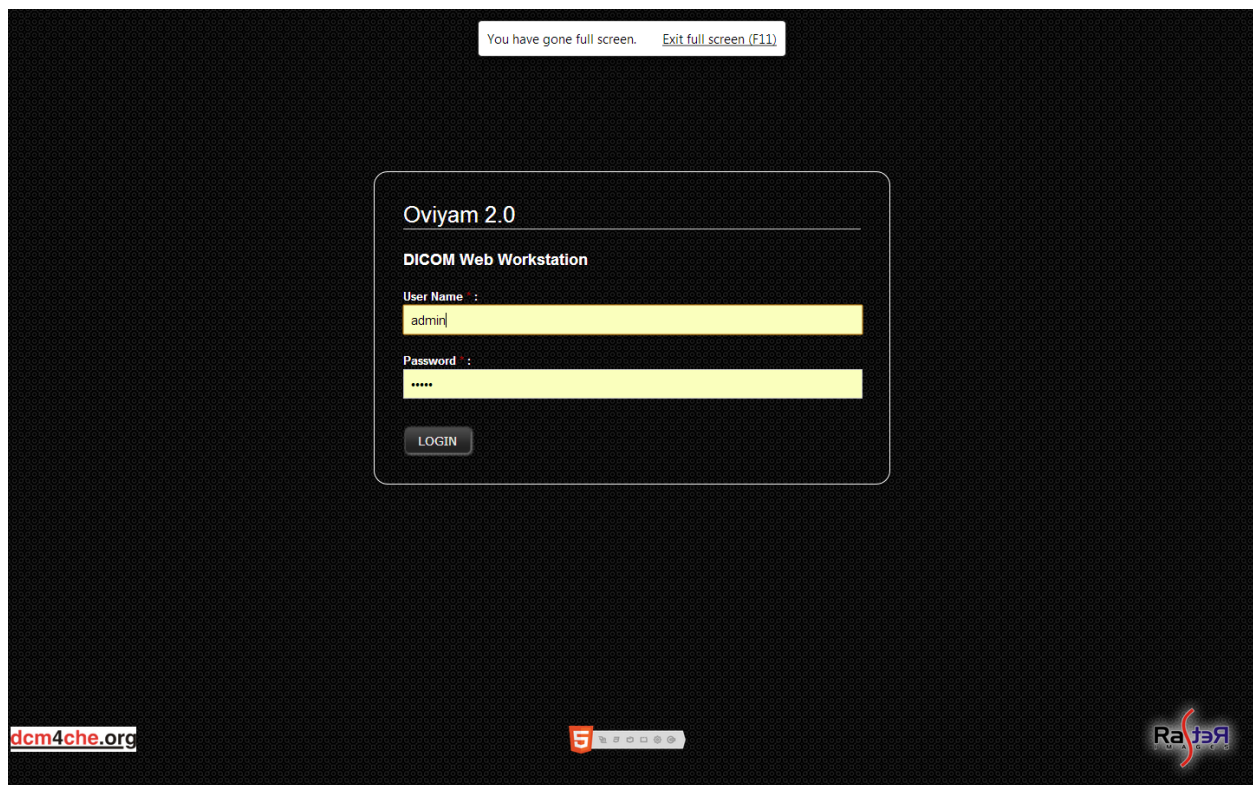
Pagesize 10 Entry 1 to 3 of 3

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

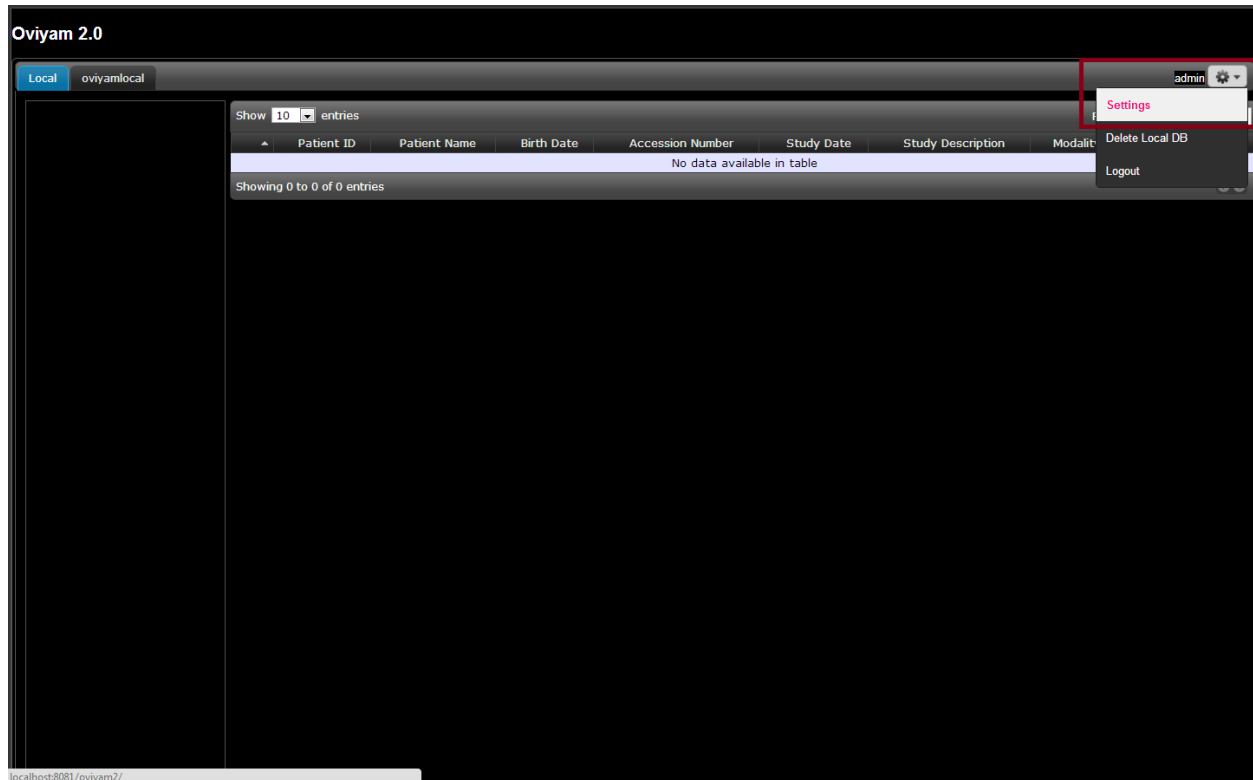
### Installation

- 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

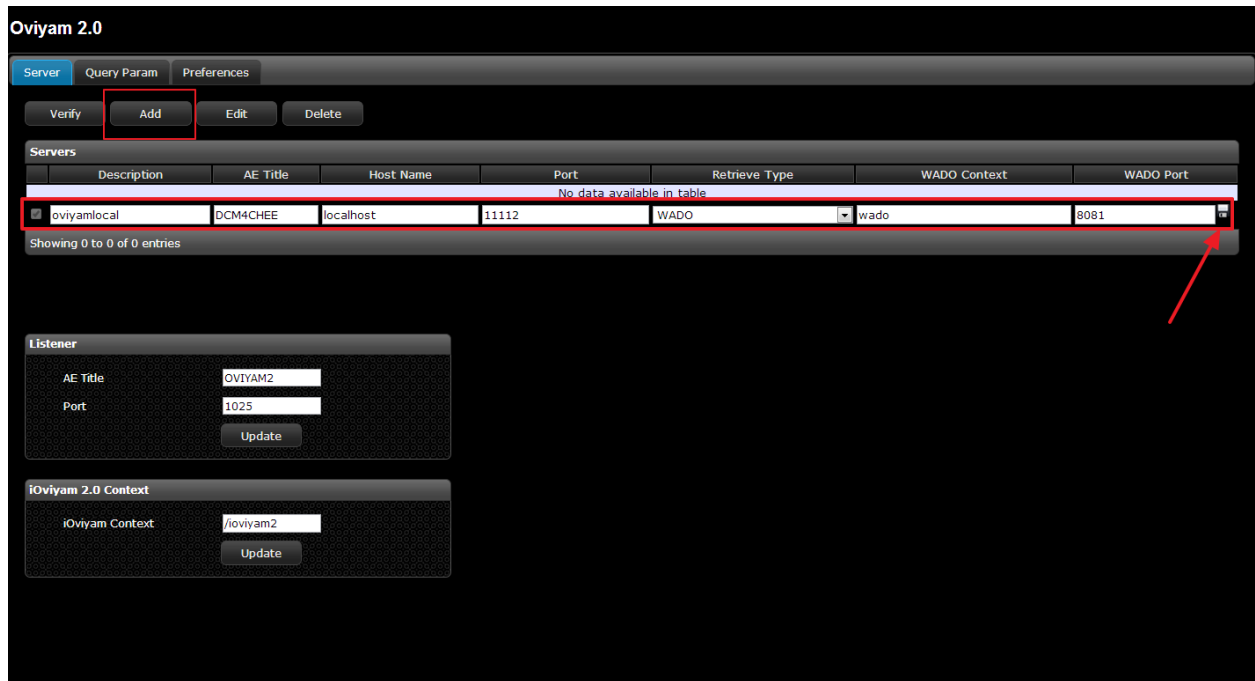


### Server Configuration

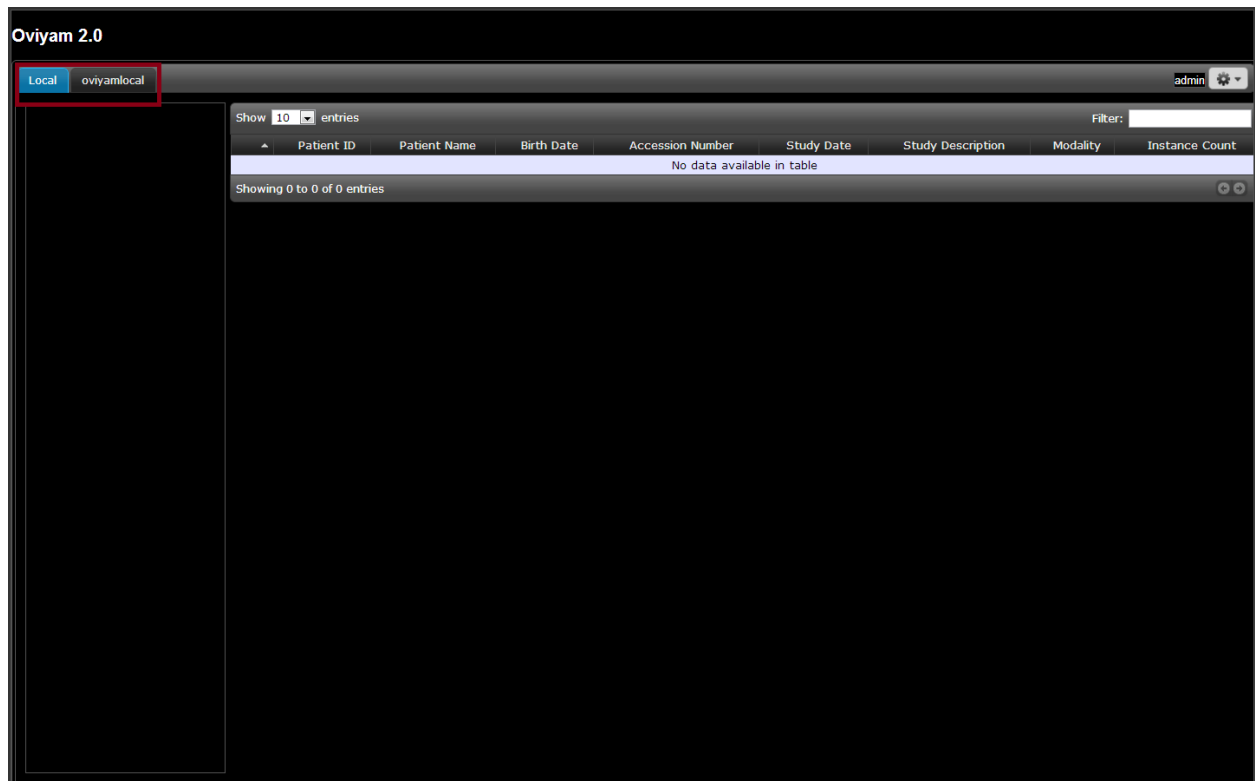
- Go to the Admin → Settings



- 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).

The screenshot shows the Oviyam 2.0 web interface. At the top, there's a 'Today CT' button and a user profile 'admin'. Below that, there's a search form with fields for Patient ID, Patient Name, Accession Number, Birth Date, Study Description, Study Date (From), Study Date (to), Referring Physician, and Modality. A red box highlights the 'Search' and 'Reset' buttons. Below the search form is a table with columns: Patient ID, Patient Name, Date of Birth, Accession #, Study Date, Study Description, Modality, and Instance Count. The table contains 5 entries. A filter input is visible at the top right of the table area.

Patient ID	Patient Name	Date of Birth	Accession #	Study Date	Study Description	Modality	Instance Count
200-6	Akhil^Ravindran	19871007		27/09/2013 22:45:47	Echocardiogram	XA	1
200-6	Akhil^Ravindran	19871007		27/09/2013 22:35:27	Echocardiogram	CR	1
SMSenhXAtest200906	enhanced XA^Test^Siemens	19581104	20090602SMSenhXA	02/06/2009 15:59:48	derived enhXA3D from enhXA rotational Acq	XA	1
7	MR/BRAIN/GRASE/1024	19010101		30/03/1995 15:08:29	BRAIN	MR	1
123-45-6789	Rubo DEMO	19231016		23/03/1994 11:51:04	Echocardiogram	US	1

Showing 1 to 5 of 5 entries

## 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 Radiology Module

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  
HL 7 Archive  
HL 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 an 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.jsp?\*/weasis-pacs-connector/viewer.jsp?

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*

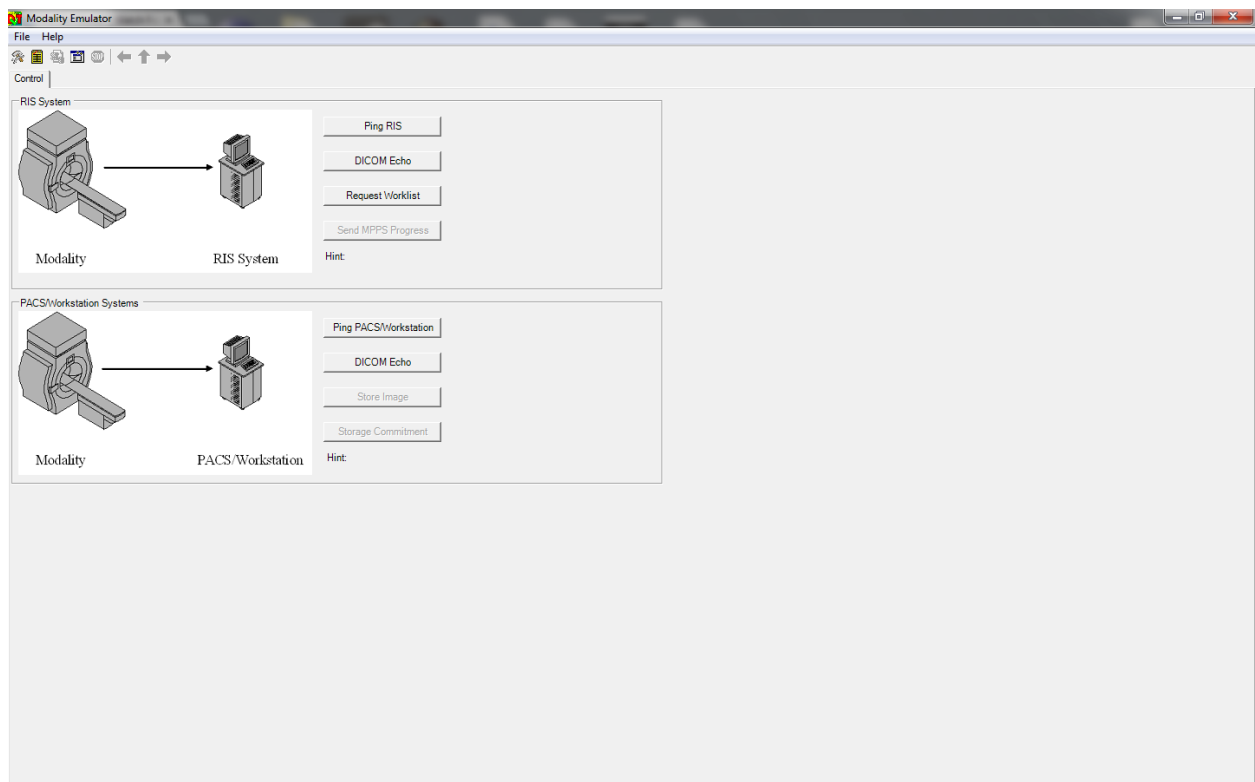
- RIS System
  - IP Address : localhost (IP address of dcm4chee server)
  - Remote Port: 11112
  - AE Title: DCM4CHEE
- MPPS Manager
  - IP Address : localhost (IP address of dcm4chee server)
  - Remote Port: 11112
  - AE Title: DCM4CHEE
- PACS/Workstation Systems
  - IP Address : localhost (IP address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

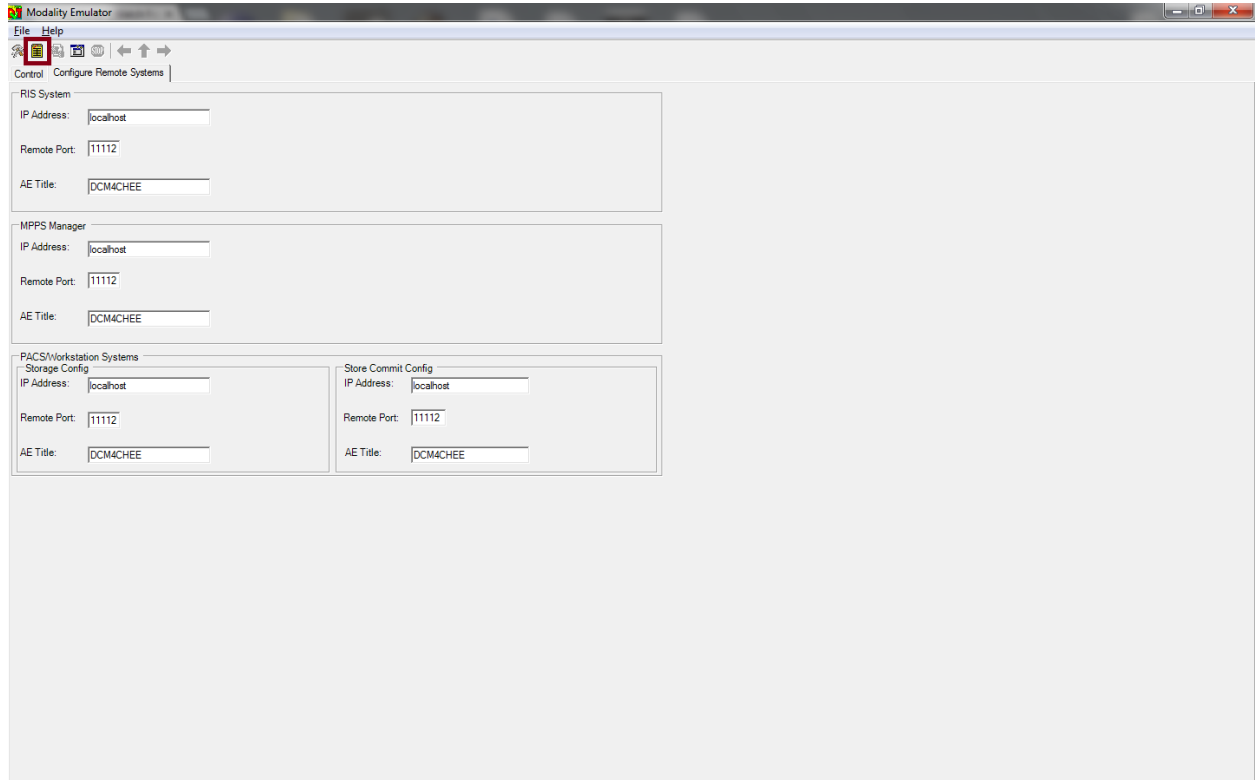
### Installation

- **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.

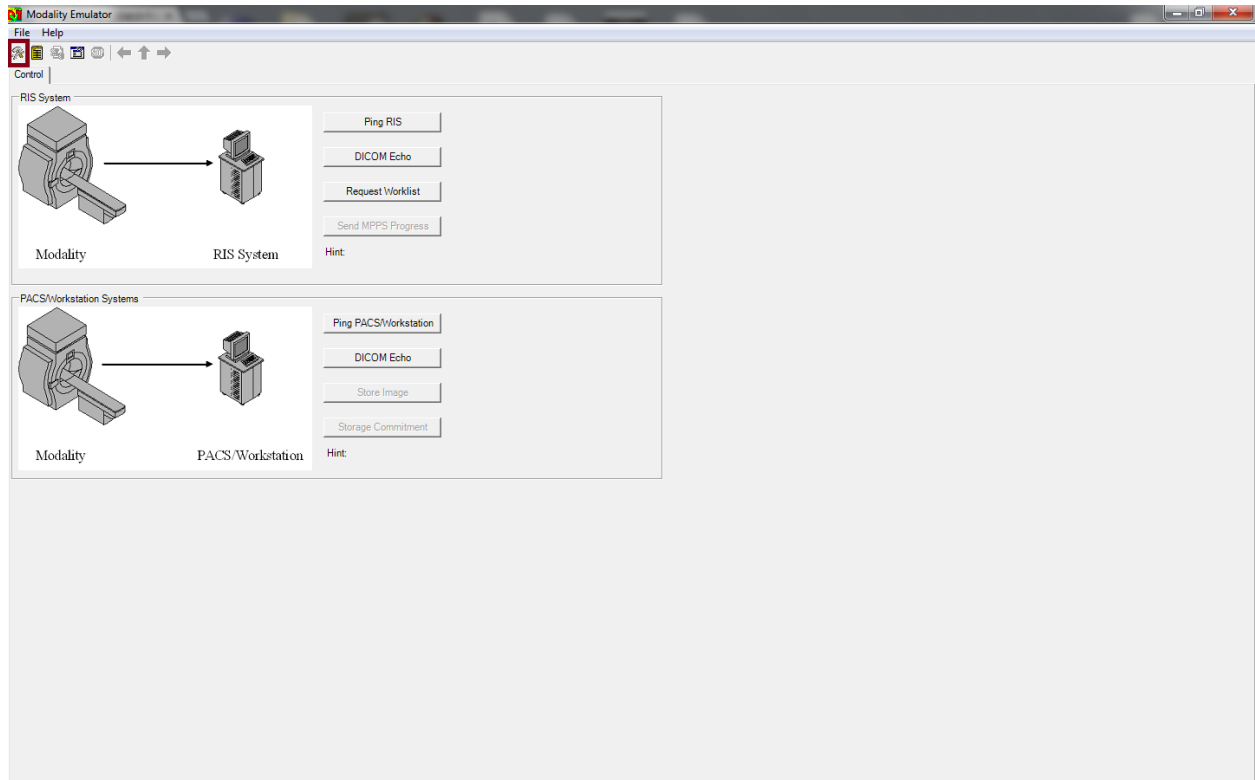


## Configure the Emulator

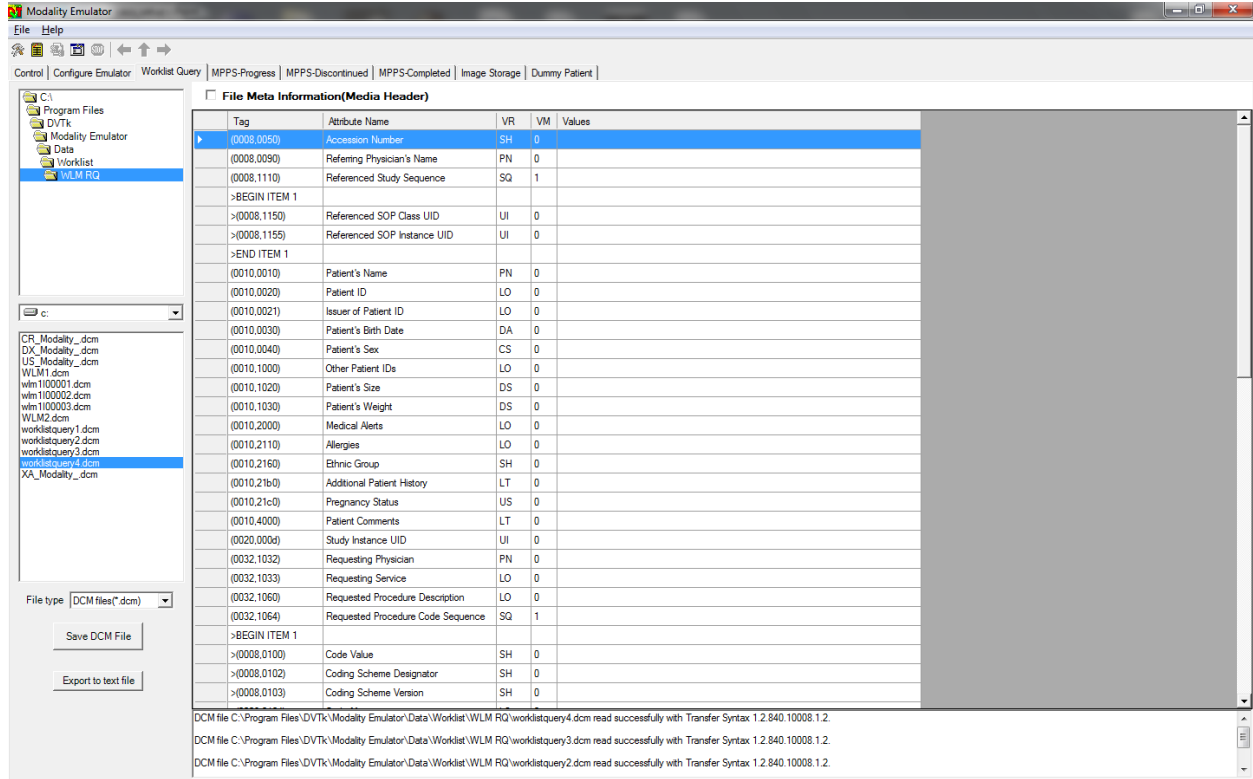
- Click on the “Configure Remote Systems Button.”
  - The IP Address, Remote Port and AE Title are the same for all the different systems.
  - IP Address : localhost (or ip of dcm4chee server)
  - Remote Port : 11112
  - AE Title : DCM4CHEE



- 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.

# OpenMRS Radiology Module

The screenshot shows the Modality Emulator application window. The main area displays the 'File Meta Information(Media Header)' for a selected DICOM file. The interface includes a menu bar (File, Help), a toolbar, and a tabbed workspace with tabs for 'MPPS-Progress', 'MPPS-Discontinued', 'MPPS-Completed', 'Image Storage', and 'Dummy Patient'. The left sidebar shows a file tree with 'C:\Dicom Samples' expanded, listing various DICOM files, with 'MRBRAIN DCM' selected. Below the file tree is a 'File type' dropdown set to 'DCM files(.dcm)' and buttons for 'Save DCM File' and 'Export to text file'. The main table lists DICOM tags, attribute names, VR, VM, and values.

Tag	Attribute Name	VR	VM	Values
(0008,0005)	Specific Character Set	CS	1	ISO_IR 100
(0008,0008)	Image Type	CS	5	ORIGINAL;PRIMARY;OTHER;VR
(0008,0012)	Instance Creation Date	DA	1	19960823
(0008,0013)	Instance Creation Time	TM	1	093801
(0008,0014)	Instance Creator UID	UI	1	1.3.46.670589.11.0.5
(0008,0016)	SOP Class UID	UI	1	1.2.840.10008.5.1.4.1.1.4
(0008,0018)	SOP Instance UID	UI	1	1.3.46.670589.11.0.4.1996082307380006
(0008,0020)	Study Date	DA	1	19960330
(0008,0021)	Series Date	DA	1	19960330
(0008,0030)	Study Time	TM	1	150829.0000
(0008,0031)	Series Time	TM	1	155614.6300
(0008,0050)	Accession Number	SH	0	
(0008,0060)	Modality	CS	1	MR
(0008,0070)	Manufacturer	LO	1	Philips
(0008,0080)	Institution Name	LO	1	OTM4 R4.5
(0008,0090)	Referring Physician's Name	PN	0	
(0008,1030)	Study Description	LO	1	BRAIN
(0008,103e)	Series Description	LO	1	Brain STIR GR 512 TRA GraSE 4415 64
(0008,1090)	Manufacturer's Model Name	LO	1	T5
(0010,0010)	Patient's Name	PN	1	MR/BRAIN/GRASE/1024
(0010,0020)	Patient ID	LO	1	7
(0010,0030)	Patient's Birth Date	DA	1	19010101
(0010,0040)	Patient's Sex	CS	1	M
(0010,1030)	Patient's Weight	DS	1	90
(0018,0020)	Undefined	CS	1	IR
(0018,0021)	Undefined	CS	1	OTHER
(0018,0022)	Undefined	CS	0	
(0018,0023)	Undefined	CS	1	2D
(0018,0050)	Undefined	DS	1	6.000000
(0018,0080)	Undefined	DS	1	4414.826172

DCM file C:\Dicom Samples\MRBRAIN DCM read successfully with Transfer Syntax 1.2.840.10008.1.2.1.

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

## MPPS In Progress

The screenshot shows the Modality Emulator application window. The main area displays a table of File Meta Information (Media Header) for a DICOM file. The table has columns for Tag, Attribute Name, VR, VM, and Values. The file is identified as 'mpps-inprogress2.dcm' in the file list on the left. The status of the procedure step is 'IN PROGRESS'.

Tag	Attribute Name	VR	VM	Values
(0008,0000)	Undefined	UL	1	44
(0008,0005)	Specific Character Set	CS	1	ISO_IR 100
(0008,0060)	Modality	CS	1	DX
(0008,1032)	Procedure Code Sequence	SQ	1	
(0008,1120)	Referenced Patient Sequence	SQ	1	
(0010,0000)	Undefined	UL	1	98
(0010,0010)	Patient's Name	PN	1	DICOM2 Validation^NR 1
(0010,0020)	Patient ID	LO	1	PA2
(0010,0021)	Issuer of Patient ID	LO	1	Issuer of Patient ID1
(0010,0030)	Patient's Birth Date	DA	1	19710101
(0010,0040)	Patient's Sex	CS	1	M
(0018,0000)	Undefined	UL	1	8
(0018,115e)	Image and Fluoroscopy Area Dose Pro...	DS	0	
(0020,0000)	Undefined	UL	1	22
(0020,0010)	Study ID	SH	1	Procedure ID1
(0040,0000)	Undefined	UL	1	187
(0040,0241)	Performed Station AE Title	AE	1	DVT
(0040,0242)	Performed Station Name	SH	0	
(0040,0243)	Performed Location	SH	0	
(0040,0244)	Performed Procedure Step Start Date	DA	1	20060719
(0040,0245)	Performed Procedure Step Start Time	TM	1	134937
(0040,0250)	Performed Procedure Step End Date	DA	0	
(0040,0251)	Performed Procedure Step End Time	TM	0	
(0040,0252)	Performed Procedure Step Status	CS	1	IN PROGRESS
(0040,0253)	Performed Procedure Step ID	SH	1	1605.0
(0040,0254)	Performed Procedure Step Description	LO	0	
(0040,0255)	Performed Procedure Type Description	LO	0	
(0040,0260)	Performed Protocol Code Sequence	SQ	1	
(0040,0270)	Scheduled Step Attributes Sequence	SQ	1	
>BEGIN ITEM 1				

DCM file C:\Program Files\DVTK\Modality Emulator\data\mpps\mpps-inprogress2.dcm read successfully with Transfer Syntax 1.2.840.10008.1.2

## MPPS Completed

The screenshot displays the Modality Emulator application window. The main area shows a table titled "File Meta Information(Media Header)" with columns for Tag, Attribute Name, VR, VM, and Values. The table contains various DICOM tags related to the procedure, including sequence numbers, dates, times, and status. The status is marked as "COMPLETED".

Tag	Attribute Name	VR	VM	Values
(0008,0000)	Undefined	UL	1	8
(0008,1032)	Procedure Code Sequence	SQ	1	
(0018,0000)	Undefined	UL	1	14
(0018,115e)	Image and Fluoroscopy Area Dose Pro...	DS	1	0.5703
(0040,0000)	Undefined	UL	1	276
(0040,0250)	Performed Procedure Step End Date	DA	1	20060719
(0040,0251)	Performed Procedure Step End Time	TM	1	135446
(0040,0252)	Performed Procedure Step Status	CS	1	COMPLETED
(0040,0254)	Performed Procedure Step Description	LO	0	
(0040,0255)	Performed Procedure Type Description	LO	0	
(0040,0260)	Performed Protocol Code Sequence	SQ	1	
(0040,0281)	Performed Procedure Step Discontin...	SQ	1	
(0040,0301)	Total Number of Exposures	US	1	2
(0040,030e)	Exposure Dose Sequence	SQ	1	
>BEGIN ITEM 1				
>(0018,0000)	Undefined	UL	1	52
>(0018,0060)	KVP	DS	1	48.0
>(0018,1150)	Exposure Time	IS	1	23
>(0018,115a)	Radiation Mode	CS	1	PULSED
>(0018,8151)	X-Ray Tube Current in uA	DS	1	259085.0
>END ITEM 1				
>BEGIN ITEM 2				
>(0018,0000)	Undefined	UL	1	52
>(0018,0060)	KVP	DS	1	46.0
>(0018,1150)	Exposure Time	IS	1	16
>(0018,115a)	Radiation Mode	CS	1	PULSED
>(0018,8151)	X-Ray Tube Current in uA	DS	1	242655.0
>END ITEM 2				
(0040,0310)	Comments on Radiation Dose	ST	1	1, Hand pa, 48kV, 5.946mAs, 22.95ms, SID 1100, EI 80, 0mmA, 0.3575dGycm2, 2, ...
(0040,0321)	Film Consumption Sequence	SQ	1	

DCM file C:\Program Files\DVTR\Modality Emulator\data\mpps\mpps-completed1.dcm read successfully with Transfer Syntax 1.2.840.10008.1.2

# MPPS DISCONTINUED

The screenshot shows the Modality Emulator application window. The main area displays a table titled "File Meta Information(Media Header)" with columns for Tag, Attribute Name, VR, VM, and Values. The table contains various DICOM metadata fields, including procedure codes, dates, times, and exposure parameters. The status of the procedure is noted as "DISCONTINUED".

Tag	Attribute Name	VR	VM	Values
(0008,0000)	Undefined	UL	1	8
(0008,1032)	Procedure Code Sequence	SQ	1	
(0018,0000)	Undefined	UL	1	14
(0018,115e)	Image and Fluoroscopy Area Dose Pro...	DS	1	0.5703
(0040,0000)	Undefined	UL	1	278
(0040,0250)	Performed Procedure Step End Date	DA	1	20060719
(0040,0251)	Performed Procedure Step End Time	TM	1	135446
(0040,0252)	Performed Procedure Step Status	CS	1	DISCONTINUED
(0040,0254)	Performed Procedure Step Description	LO	0	
(0040,0255)	Performed Procedure Type Description	LO	0	
(0040,0260)	Performed Protocol Code Sequence	SQ	1	
(0040,0281)	Performed Procedure Step Discontin...	SQ	1	
(0040,0301)	Total Number of Exposures	US	1	2
(0040,030e)	Exposure Dose Sequence	SQ	1	
>BEGIN ITEM 1				
>(0018,0000)	Undefined	UL	1	52
>(0018,0060)	KVP	DS	1	48.0
>(0018,1150)	Exposure Time	IS	1	23
>(0018,115a)	Radiation Mode	CS	1	PULSED
>(0018,8151)	X-Ray Tube Current in uA	DS	1	259085.0
>END ITEM 1				
>BEGIN ITEM 2				
>(0018,0000)	Undefined	UL	1	52
>(0018,0060)	KVP	DS	1	46.0
>(0018,1150)	Exposure Time	IS	1	16
>(0018,115a)	Radiation Mode	CS	1	PULSED
>(0018,8151)	X-Ray Tube Current in uA	DS	1	242655.0
>END ITEM 2				
(0040,0310)	Comments on Radiation Dose	ST	1	1, Hand pa, 48kV, 5.946mAs, 22.95ms, SID 1100, EI 80, 0mmA, 0.3575dGycm2, 2, ...
(0040,0321)	Film Consumption Sequence	SQ	1	

DCM file C:\Program Files\DVTR\Modality Emulator\data\mpps\mpps-discontinued1.dcm read successfully with Transfer Syntax 1.2.840.10008.1.2