

RSNA Image Sharing Edge Server Installation/User Manual

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1. Introduction: RSNA Edge Appliance

The Edge Appliance is the gateway device to enable the Image Sharing Network. This partnership of the RSNA with the NIH aims to deliver on 3 primary use cases:

- a) patient initiated sends of their own imaging studies to the Clearing House for subsequent pickup by the patient via their PHR vendor (i.e. Microsoft HealthVault or <http://www.lifeimage.com/>)
- b) clinician initiated sends of identified studies to another care center in the performing site's Affinity Domain
- c) researcher initiated sends of anonymized studies from a source site, via the Clearing House, to a core lab in a multi-site research program

The last use case is not addressed with this release of the Edge manual. The next figure illustrates the workflow in the patient centric use case.

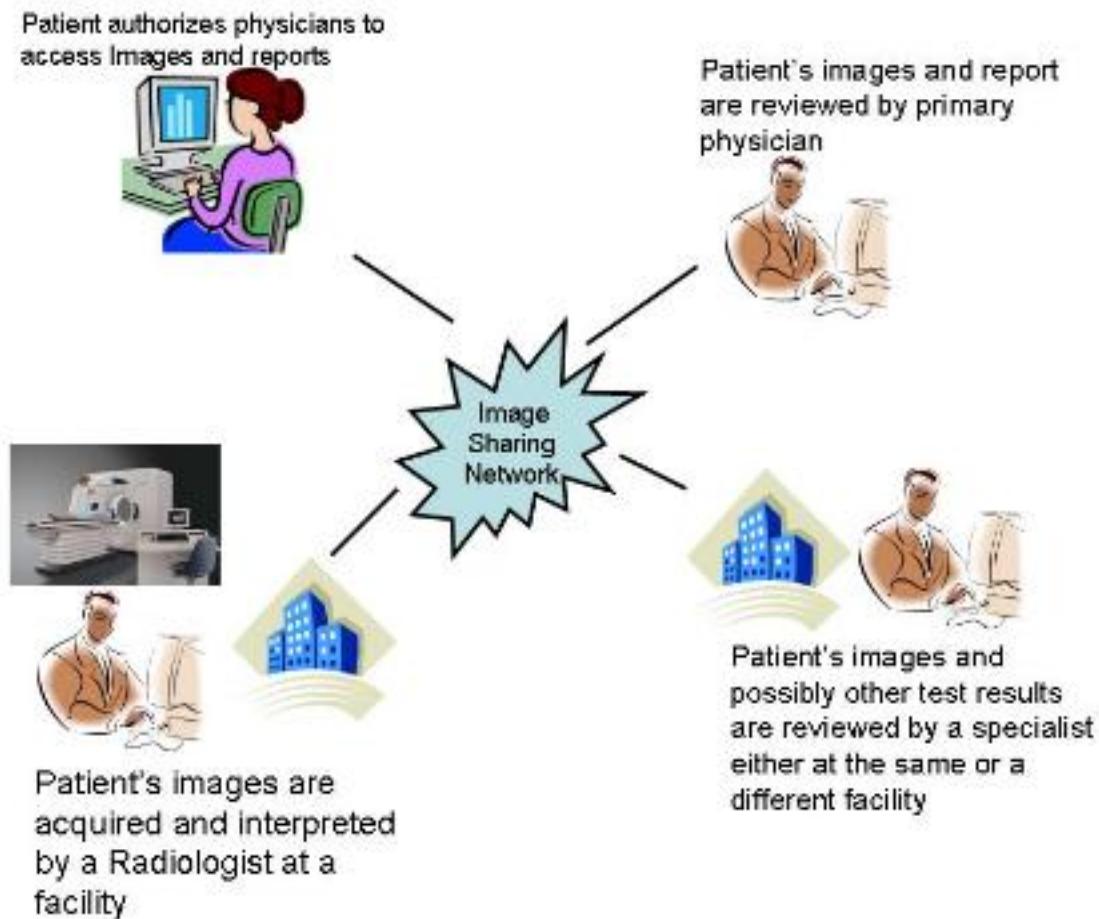


Figure 1-1: Image Sharing Workflow: Patient-centric Use Case

1.1 Intended Audience

This document is intended for users who are either installing Edge Server Version 2.0 from scratch, or are upgrading a V1.1 installation to 2.0. If you are in the latter camp, refer to Appendix C before reading the rest of this manual. For the former group, proceed to Chapter 2.

2. Hardware Requirements

The Edge Appliance software has been developed to run on standard desktop class PC hardware. However, experience will have to guide the provisioning of a system in any particular case. It is unlikely that the configuration for a 50 bed rural hospital performing 50,000 imaging studies per year would be adequate for a tertiary care center performing a million plus exams per year. There are also two possible methods to deploy the Edge software: a site may elect to download a Virtual Machine instance of the Edge Appliance (this is the easiest path for a site that already has a suitable virtual host) or it may also choose to deploy the software on a physical machine. In either case, a base-line configuration should contain:

- a) at least a dual core, 2 GHz CPU
- b) 4 GB of RAM
- c) a 100 Mbps networking card
- d) A 40 GB system disk and preferably a second data disk of 60 GB or more

3. Software Requirements

Networking

The Edge Appliance will need to communicate with several devices within the medical center (e.g. RIS and PACS). For these devices to “see” the appliance in predictable location, the Appliance will need at the very least a static IP address, and perhaps also a DNS name. Make sure these values are available at the time that the Appliance is being installed.

Fixed IP Address:

DNS Name:

Router/Gateway:

Net mask:

Virtual

As previously mentioned the Edge Appliance can be downloaded in a Virtual Machine (VM) format for running on a suitable environment. This is the least troublesome route to setting up a working Edge device. If a site lacks the required virtual environment, the following physical machine requirements come into play.

Physical

Operating System

Currently only Ubuntu Server 10.04 LTS (32 bit version) has been vetted for this Edge release
site <http://www.ubuntu.com>

Java

Currently Java 1.6 is required for this Edge release. We have vetted this release using *only* the official Oracle JRE (formerly Sun) version “1.6.0_24”
site: <http://www.oracle.com/technetwork/java/javase/downloads>

PostgreSQL

Currently version 8.4.7 is required for this Edge release
site: <http://www.postgresql.org>

4. Build Instructions

4.1 Virtual

Download the latest Edge VM (in OVF format) from here

xxxxxxxxxx

Use your VM environment’s OVF import tool to convert the OVF package into a VM on your current virtual host system. The following VM environments have been tested:

- VMWare Server, 2.0
- VMWare ESXi Server 4.x
- VMWare Workstation 7.x
- Xen Products using Hypervisor >V3.4,

Other OVF compliant hypervisors (such as Sun/Oracle VirtualBox) may also work. The default accounts/password for Ubuntu are:

```
root    JGK7@@ba
rsna   FT39bp#!
```

The default PostgreSQL account/passwords are:

postgres	N3K647A
mirth	1947JAT\$
edge	d17bK4#M

The system will initially boot using DHCP for it’s network address. This should be reassigned to the static IP and DNS name that was reserved for the Edge Appliance in Chapter 3. Change the network configuration for your environment from the Ubuntu menu System/Preferences/Network-Connections. Also, change the host entry in etc/hosts and make sure the IP matches the static IP assigned above. You can now continue to section 4.1 (Registering the Edge Server Certificate with the Clearing House).

4.2 Physical

If for some reason you cannot choose the virtual machine path, the following route must be taken.

4.2.1 Installing Ubuntu

1. You will perform the first step using a desktop or other system that is not your edge system. Use a web browser on your desktop to connect to the Ubuntu web site: <http://www.ubuntu.com>
2. Select the **Download** control and then **Download and install**
3. Select the 10.04 LTS release as shown in Figure 4-1. Download and save the ISO from the Ubuntu web site.
4. Follow the instructions provided on the Ubuntu web site for creating a DVD and installing the operating system.
5. Starting here, you will use the DVD to install the Ubuntu operating system on your hardware. These instructions assume you are starting with a blank system that will first boot from a DVD and then the hard drive. If your system does not default to the DVD or already has an operating system, you will need to modify the BIOS or boot sequence to boot from the Ubuntu installer DVD.
6. The DVD contains a bootable system. Load the DVD on the edge server hardware and boot from the DVD.
7. Continue through the installation. Make sure you use the Ubuntu documentation for your initial system load and configuration.
8. The Ubuntu installer will ask you to create at least one user account. At a minimum, create an account with the login name “rsna” with an appropriately secure password. That account will also have sudo privileges (can become root to perform administrative tasks).
9. Other user accounts will be added later as follows.
 - a. The PostgreSQL installation will add a postgres account.
 - b. The Edge Server installation will add an edge account.

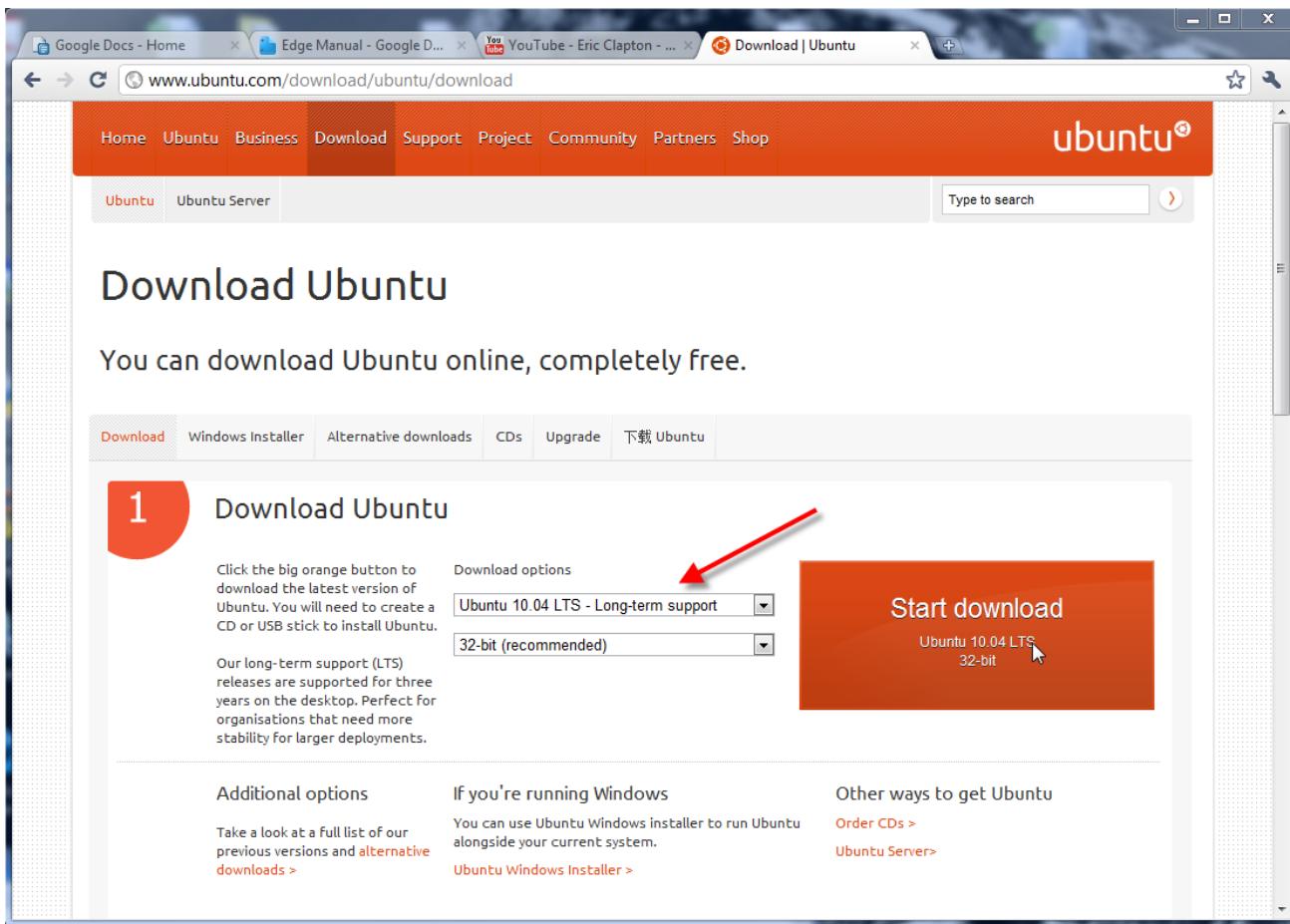


Figure 4-1: Ubuntu Download Page: Select Ubuntu 10.04 LTS

Installing Ubuntu Desktop

After you complete the base installation of Ubuntu Server, you will not have a desktop environment. You will need a desktop environment for installing the Edge Server. Login to the console using the **rsna** account you created during the installation process. You will then install the Ubuntu desktop:

```
sudo su - root  
apt-get install ubuntu-desktop
```

Change the root password to match your local security requirements. When you type the command below, you will be prompted for a new root password. Type the command exactly as listed:

```
sudo passwd root
```

Reboot the system. This will enable the desktop software:

```
sudo reboot
```

4.2.2 Installing Java

Do not use the Java packages that are managed by the Ubuntu Software Manager. Manually download the Sun Java Runtime Engine (JRE) found at <http://www.oracle.com/technetwork/java/javase/downloads/index.html>. We specify and test with the SE version of the Sun JRE; you do not need the EE version. Also, be sure to install the appropriate Java for the version of Ubuntu you have (64 bit versus 32 bit).

We install the JRE in **/usr/local** on the server; for example: /usr/local/jre_1.6.0_24. You may choose a different location. You will need to use the path to the JRE in configuration steps below for setting environment variables for the operating system (section 4.2.4)

4.2.3 Installing PostgreSQL

Install PostgreSQL using one of the two methods below.

1. From the command line (as root): **apt-get install postgresql-8.4**

or

2. **Recommended:** Graphical User Interface (Ubuntu):

- a. Run the Ubuntu Software Center (see Figure 4-2 below)
- b. In the left tab, select Get Software (see Figure 4-3 below)
- c. In the search window (upper right corner of window), search for **postgres**
- d. Select and install **object-relational SQL database, version 8.4 server** (see Figure 4-4 below)

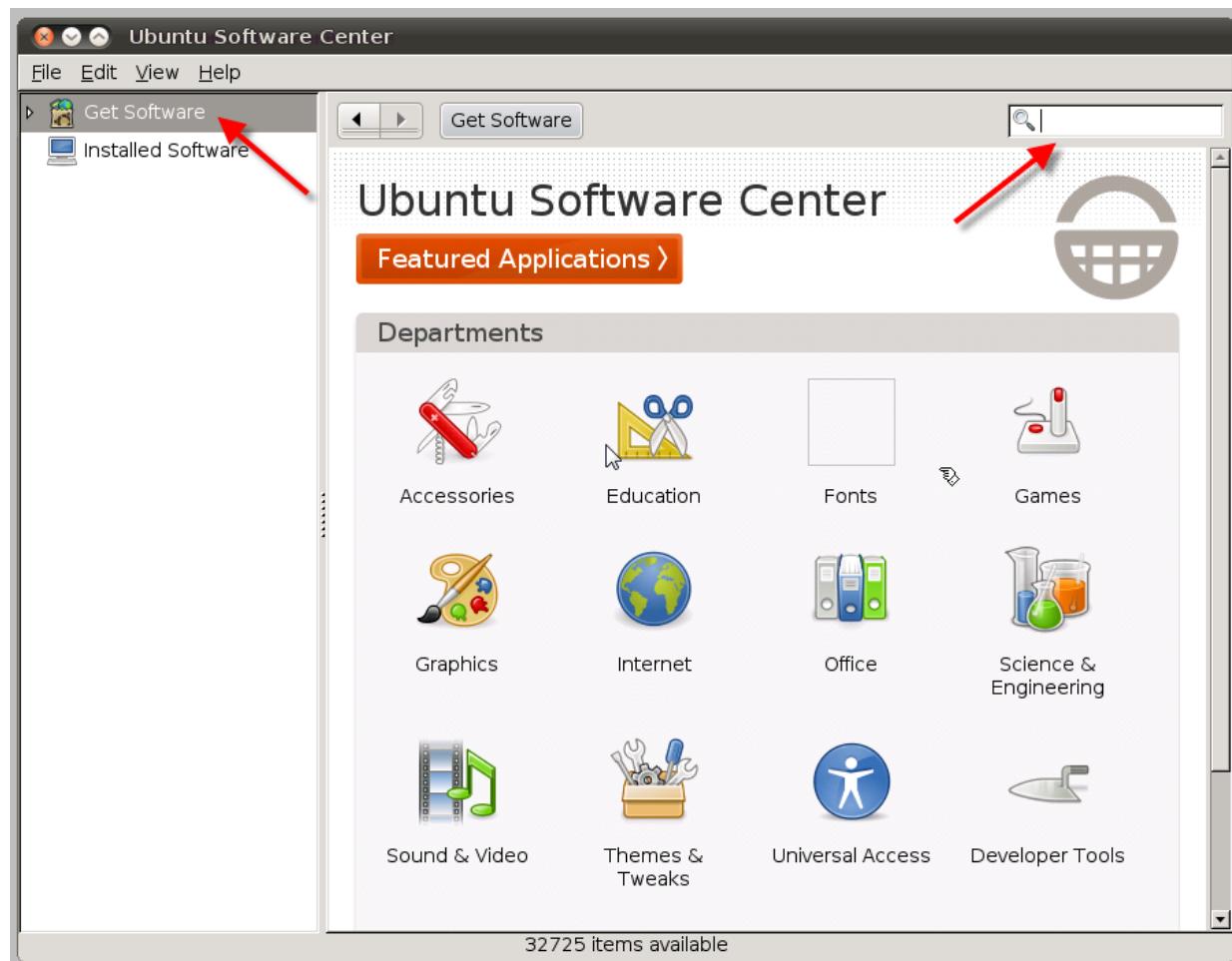


Figure 4-3: Ubuntu Software Center: Front Page

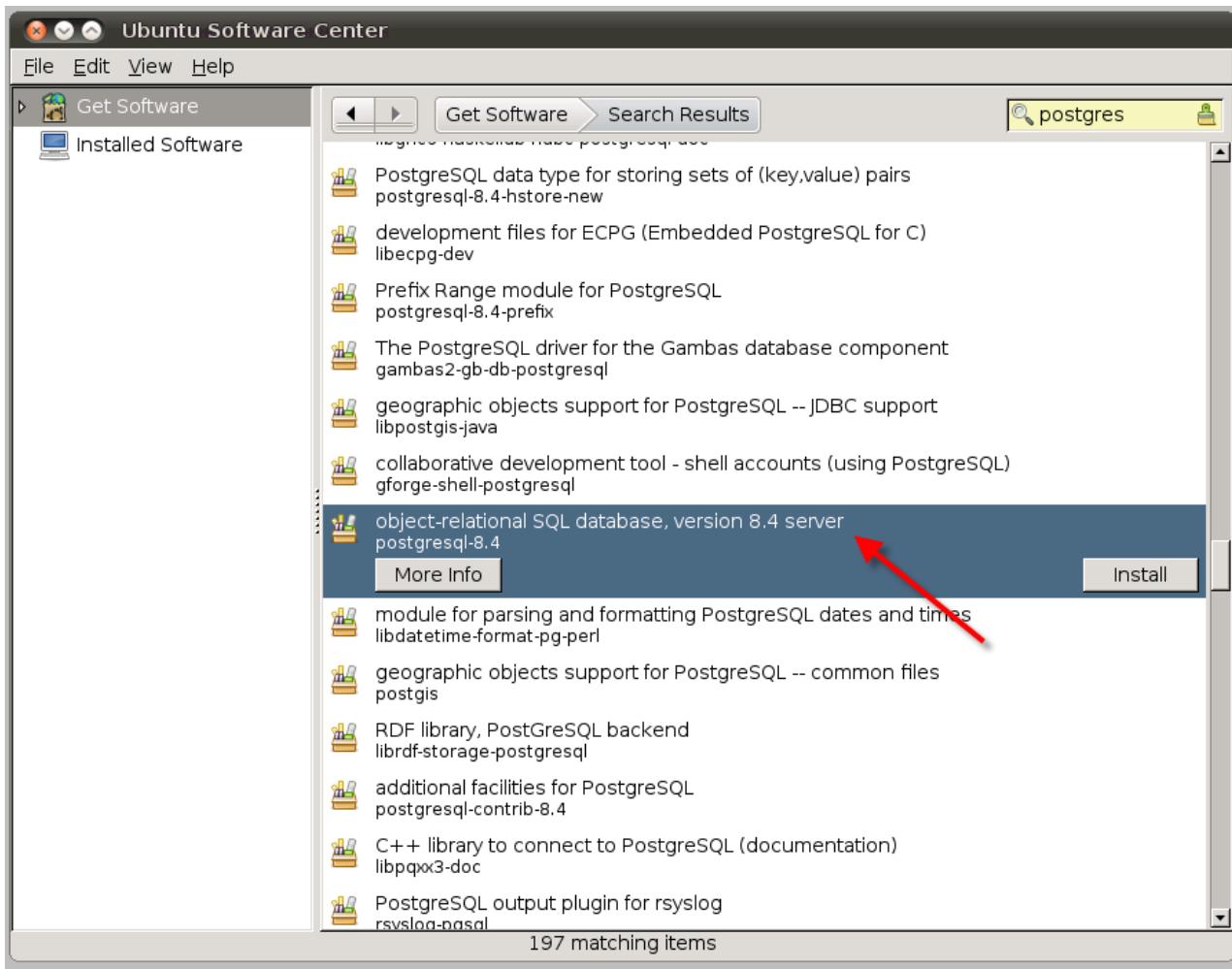


Figure 4-4: Ubuntu Software Center: Search for Postgres

After installation, create a password in `postgres` for the super user account. This account is typically the “`postgres`” account. Use a terminal window and run this command:

```
sudo -u postgres psql postgres
```

The command above puts you in the `postgres` interpreter. In the interpreter, type:

```
\password postgres
```

You will be prompted for the password. You are encouraged to choose a secure password; you will need to record the value for use when installing the Edge Software (section 4.2.5).

4.2.4 Operating System Environment

The default shell for the root account is `/bin/bash`. The RSNA-Edge Installer will add the user account `edge` configured to use `/bin/sh`. You need to change some system-wide settings to properly support the installer.

1. Edit the file `/etc/environment`. If you have a new installation of Ubuntu Server, that file will contain one line that configures the PATH variable. Add the path to the java executable to this PATH variable. If you use the suggested installation folder `/usr/local/jre1.6.0_24` (section 4.2.2), the entry would be as follows:
 - o `PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/usr/games:/usr/local/jre1.6.0_24/bin"`
2. In the same environment file, add a variable that points to the installation folder for the Java Runtime

Environment. If you use the suggested installation folder /usr/local/jre1.6.0_24 (section 4.2.2), the entry would be as follows:

- JAVA_HOME="/usr/local/jre1.6.0_24"
3. In section 4.2.5 of this document, you will select a folder for the installation of the Edge software; see Figure 4-6. We recommend that you choose "/usr/local/edgeserver". In the same environment file (/etc/environment), add a variable for the path of the Edge installation. For example, if installing the Edge server to /usr/local/edgeserver:
- RSNA_ROOT="/usr/local/edgeserver"
4. Edit the file **/etc/login.defs**. Find the two PATH lines that start **ENV_SUPATH** and **ENV_PATH**. Add the path to the java executable to the end of both PATH variables. Examples from a running system are:
- ```
ENV_SUPATH PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/local/jre1.6.0_24/bin
ENV_PATH PATH=/usr/local/bin:/usr/bin:/bin:/usr/local/games:/usr/games:/usr/local/jre1.6.0_24/bin
```
5. Reboot the computer to publish these variables throughout the system.

#### **4.2.5 Running the RSNA Edge Installer**

Once you have built the physical server to this point you need to obtain the RSNA Edge installer. This can be obtained using the following URL:

<https://github.com/downloads/RSNA/Image-Sharing-Network-Edge-Server/edgeserver-2.0.0-standard.jar>

When running the installer, you will be asked for configuration information:

Database Superuser Password: The password you entered for postgres above  
 Password for RSNA Database user: Choose a (different) secure value for this user account  
     For example: d17bK4#M  
 Password for Mirth Database user: Choose a separate, secure database password for Mirth  
     For example: 1947JAT\$

Make sure that **JAVA\_HOME** points to the installation folder of the Java JRE. Open a terminal emulator, change to the folder that contains the downloaded jar file and execute this command:

```
$JAVA_HOME/bin/java -jar edgeserver-2.0.0-standard.jar
```

The installer initially launches with a splash screen (Figure 4-5):

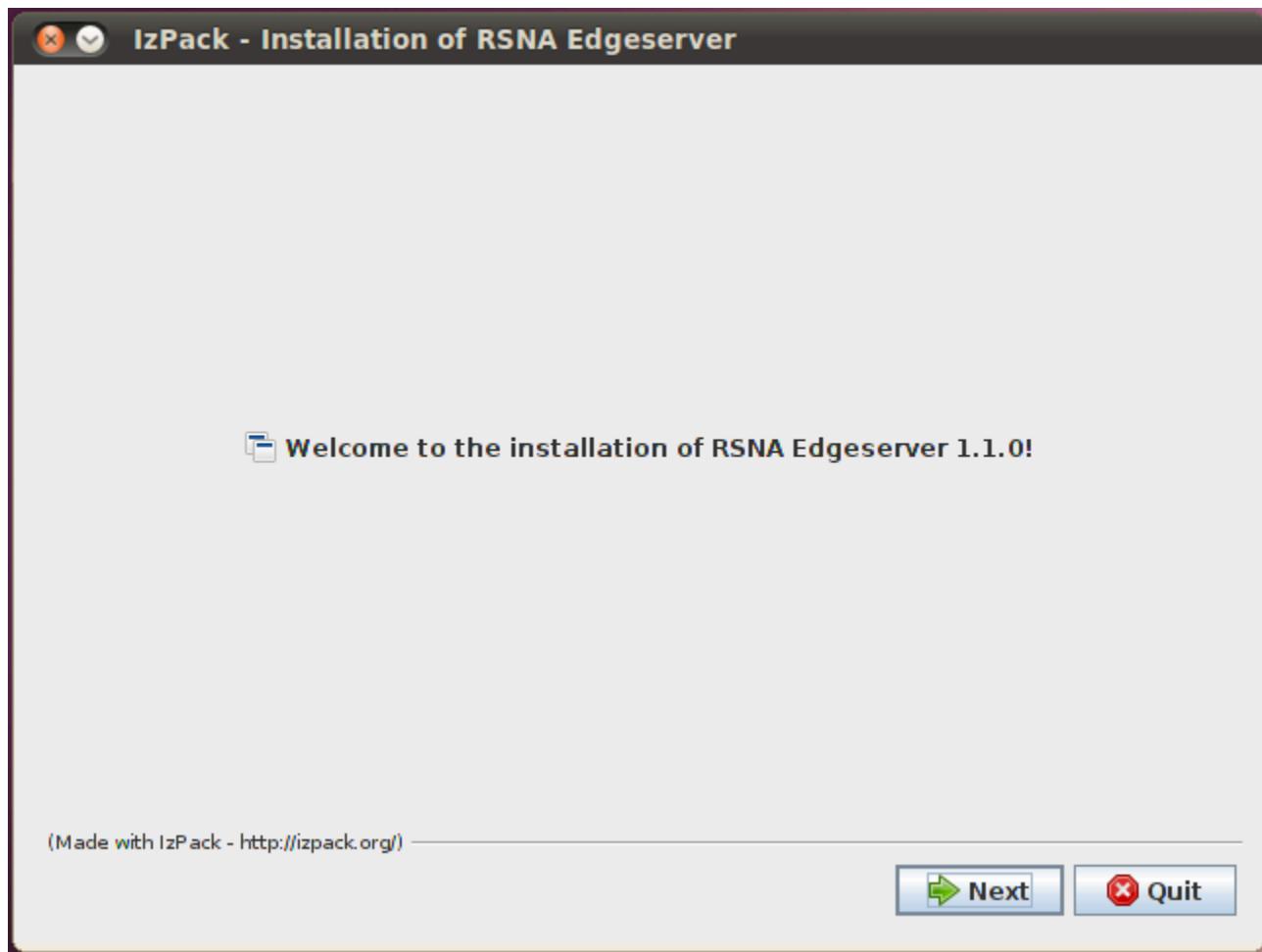


Figure 4-5: Installer splash screen

After the splash screen, you are prompted to select the installation path for the software (Figure 4-6):

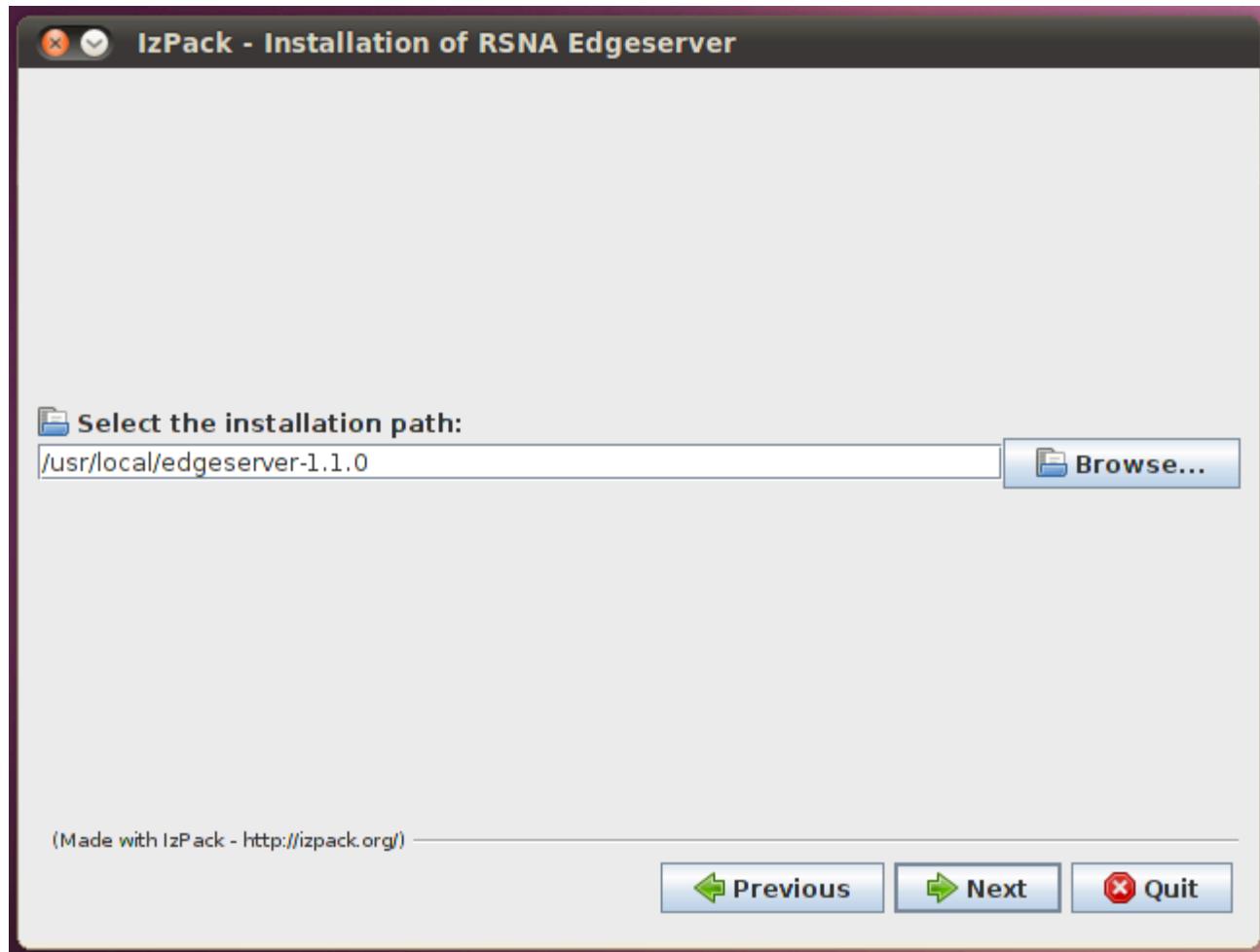


Figure 4-6: Installation Path

Next you will be prompted about which components to install (Figure 4-7). For new installations, the default options of all components should remain selected. For upgrade installations (see Chapter 8: Upgrades), you can safely de-select Glassfish, Mirth, and Generate Client Certificate.

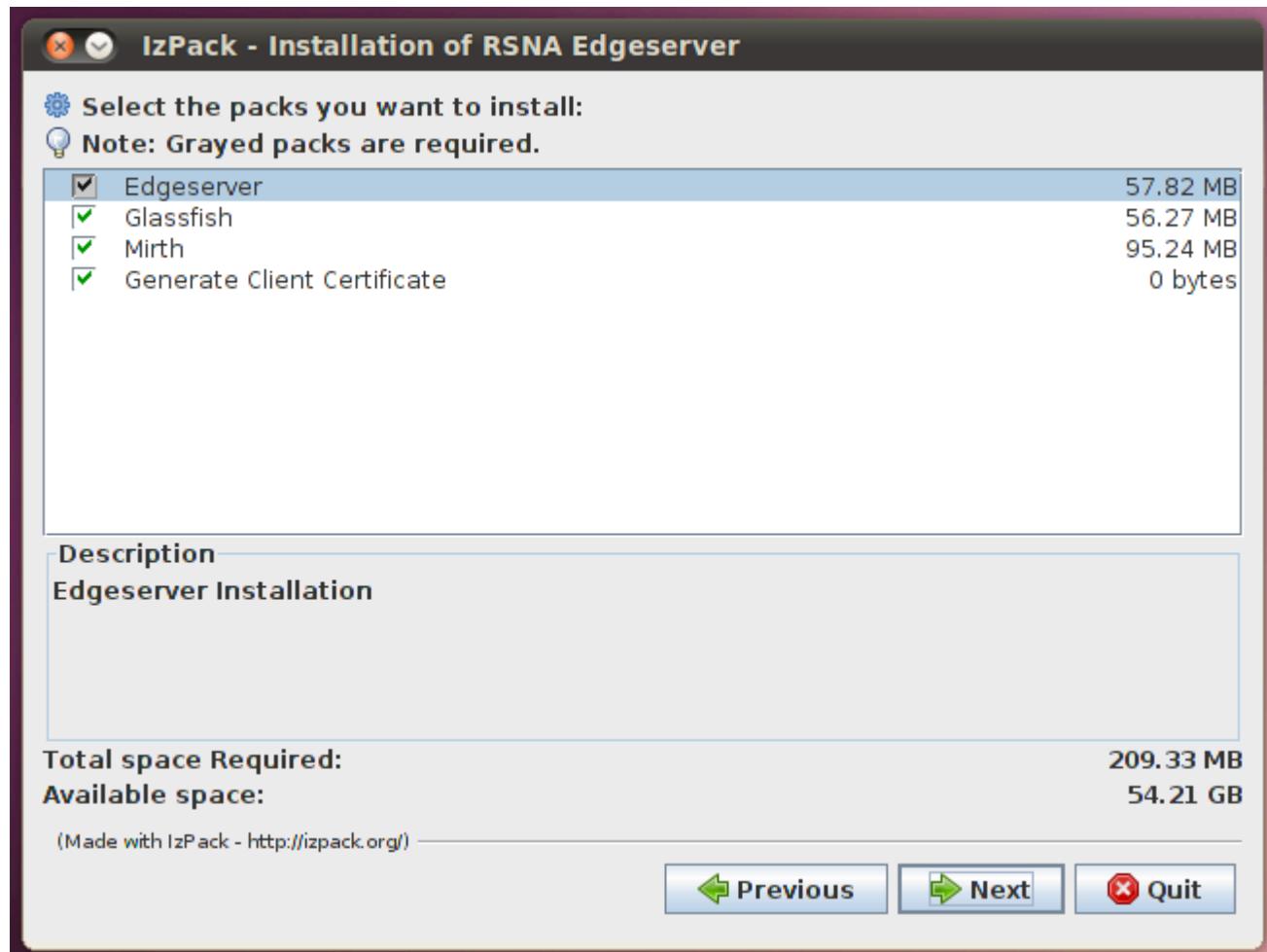


Figure 4-7: Component selection

Configure the database connection as shown in (Figure 4-8). For the Host, Port and Database Superuser Name, use the default values presented by the installer. For *Database Superuser Password*, enter the password created for the postgres account in Section 4.2.3. The edge account is also referred to as the RSNA Database user. For the *Password for RSNA Database user*, enter the password you selected for the edge account; this is the first time you enter that password in the system.

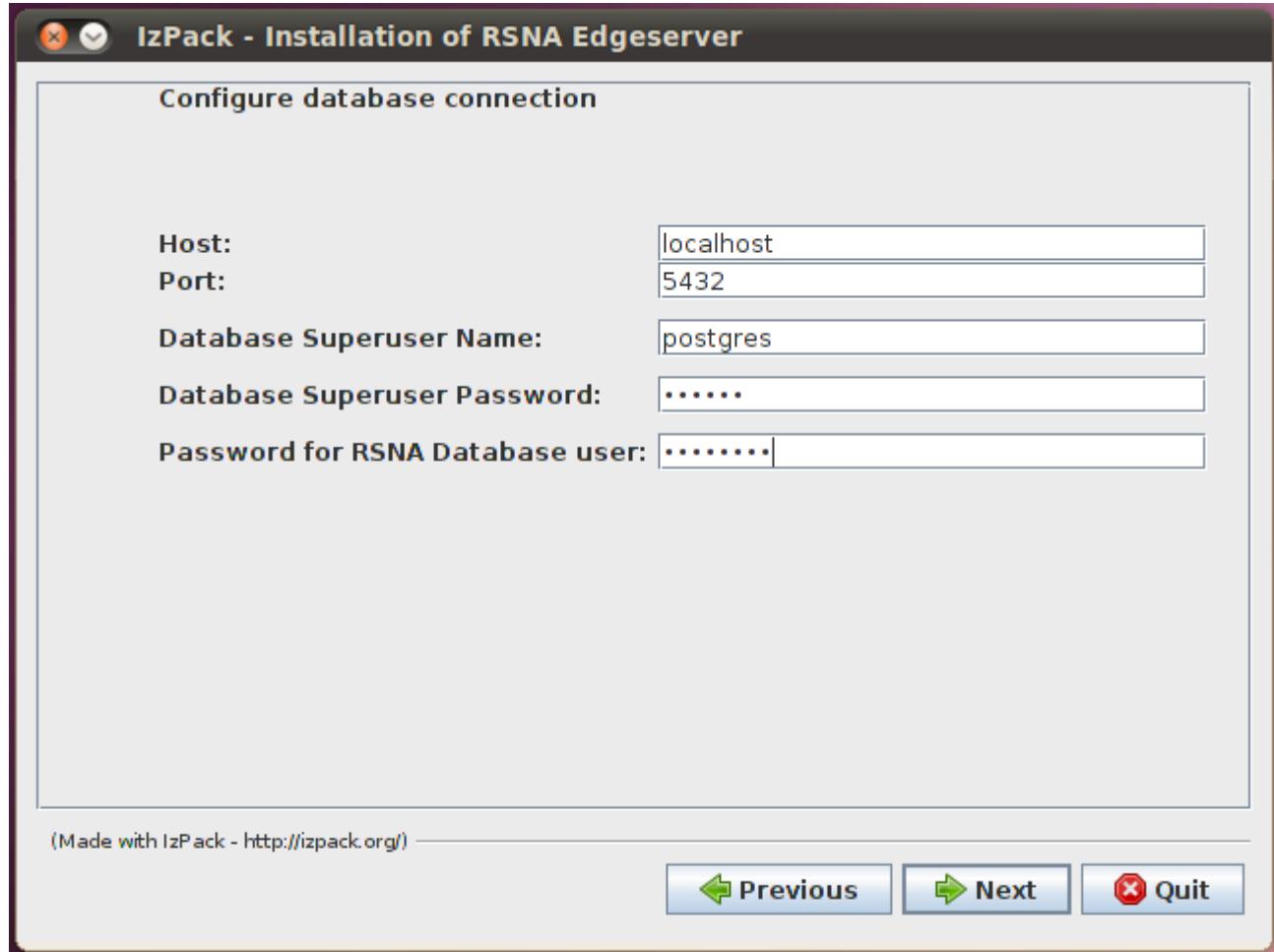


Figure 4-8: Application database configuration

You will enter a password for Mirth on an initial installation but not during an upgrade.

Figure 4-9 shows the screen for adding the password for the Mirth software. You will only need to enter a value in the last line: *Password for Mirth Database user*. Enter the value you chose previously; this is the first time you enter it in the system.

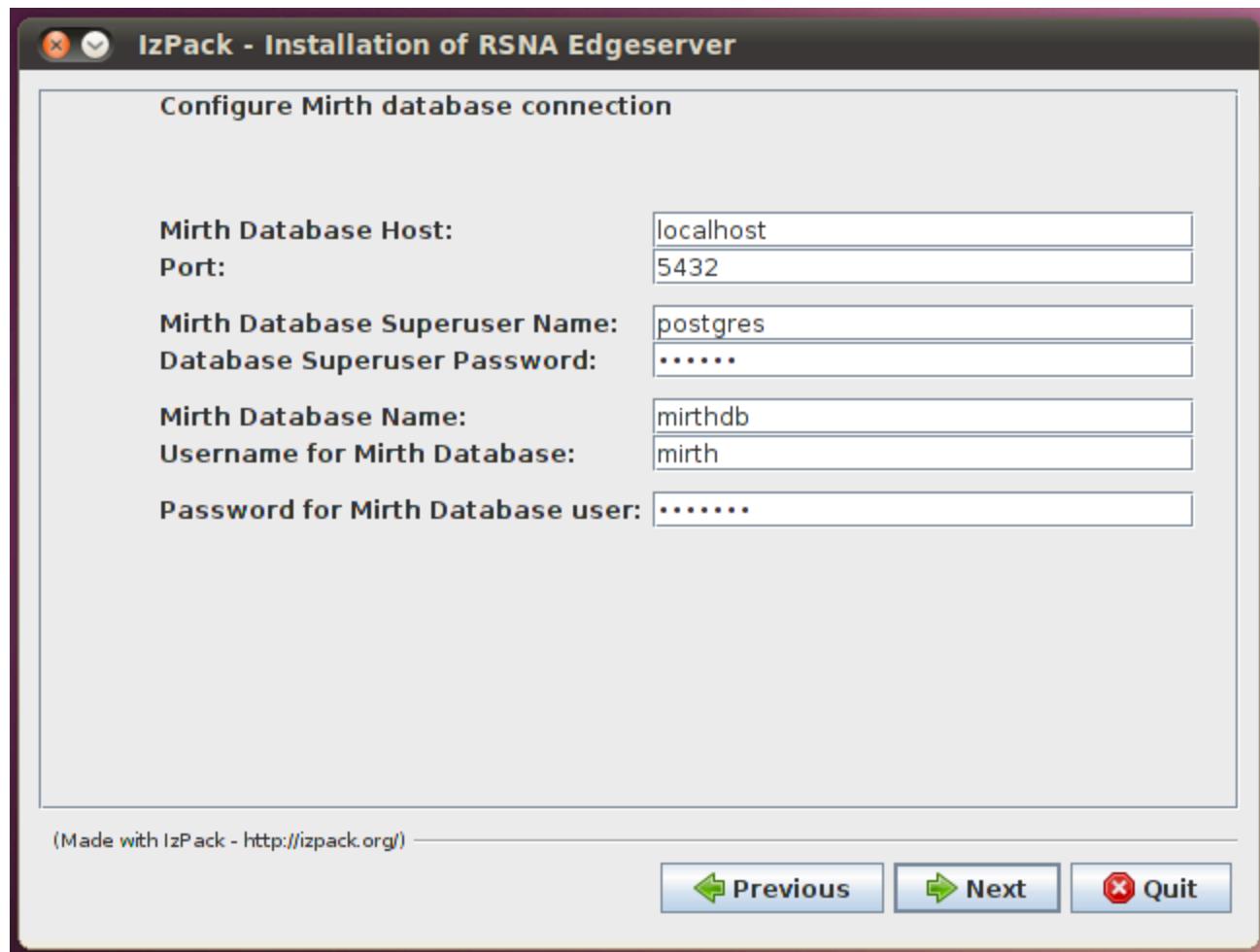


Figure 4-9: Mirth database configuration

You will create a digital certificate on the initial installation but not for an upgrade.

If creating a certificate, fill out the certificate subject information (Figure 4-10). This will create a certificate, which is necessary to communicate with the Clearing House, and place it in the root application directory (specified above as the install path). We make these recommendations:

- For *Full server name*, enter the fully qualified hostname for the server
- For *Number of days the certificate is valid*, enter 1095 (equivalent to three years)

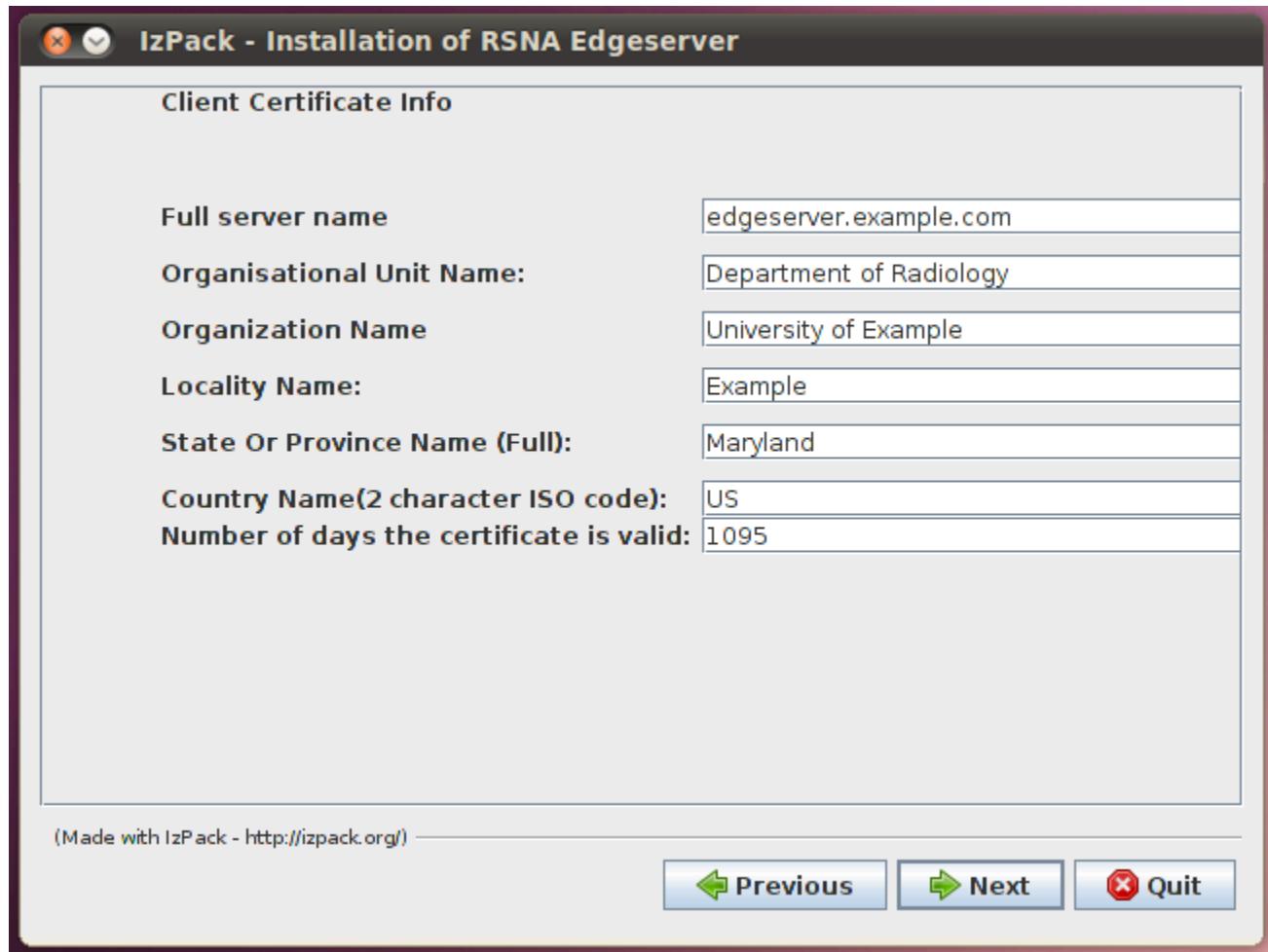


Figure 4-10: Certificate creation information

Before the installer begins to execute it's tasks, it presents a summary screen of what will be installed (Figure 4-11) and where, giving you one last chance to revise configuration settings before install.

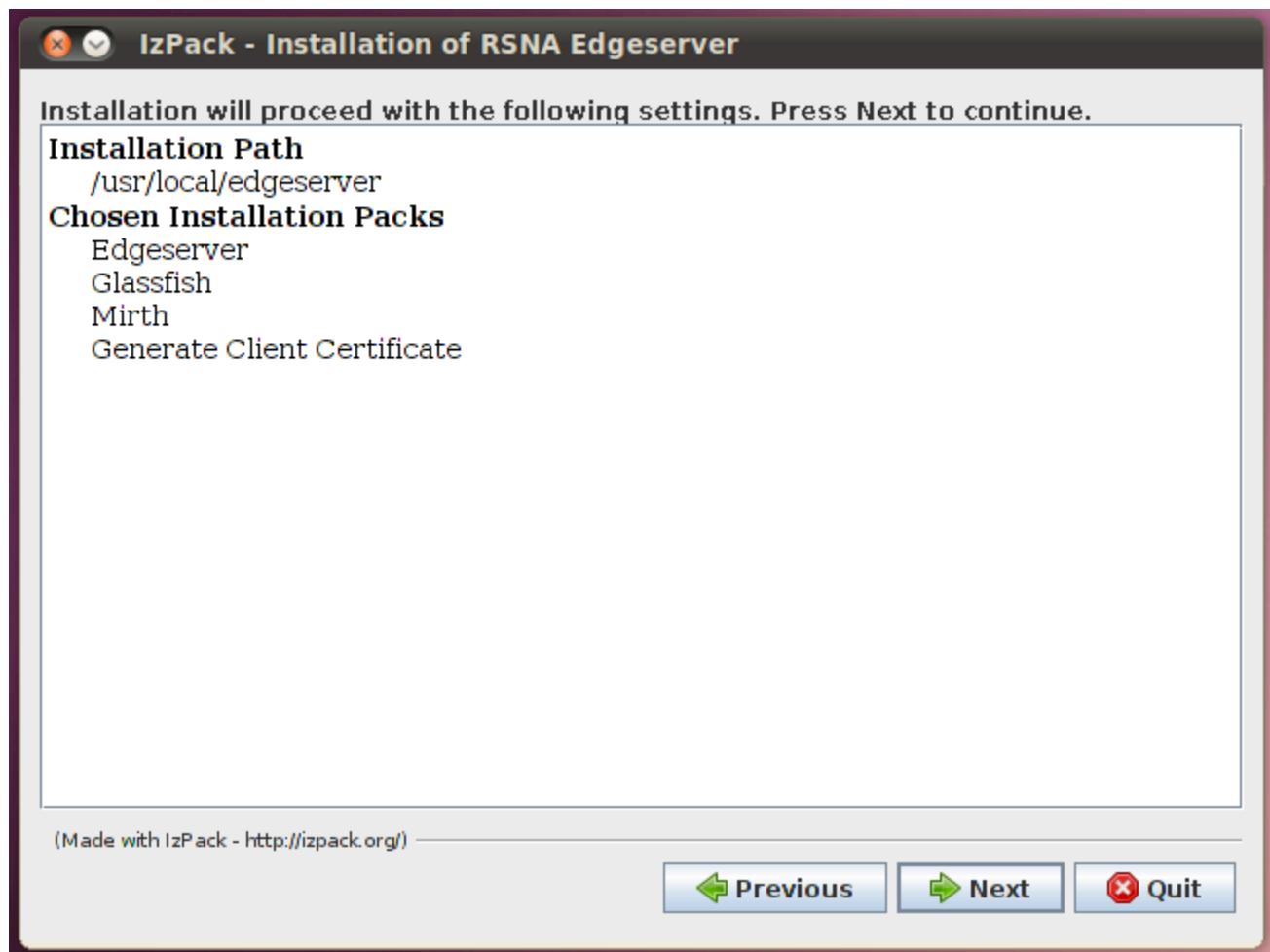


Figure 4-11: Pre-installation task summary

The installer will run through several screens, first setting up the Edge application (Figure 4-12) and then support applications (Figure 4-13). The final screen after installation has a “Done” button to click (Figure 4-14) which closes the installer.

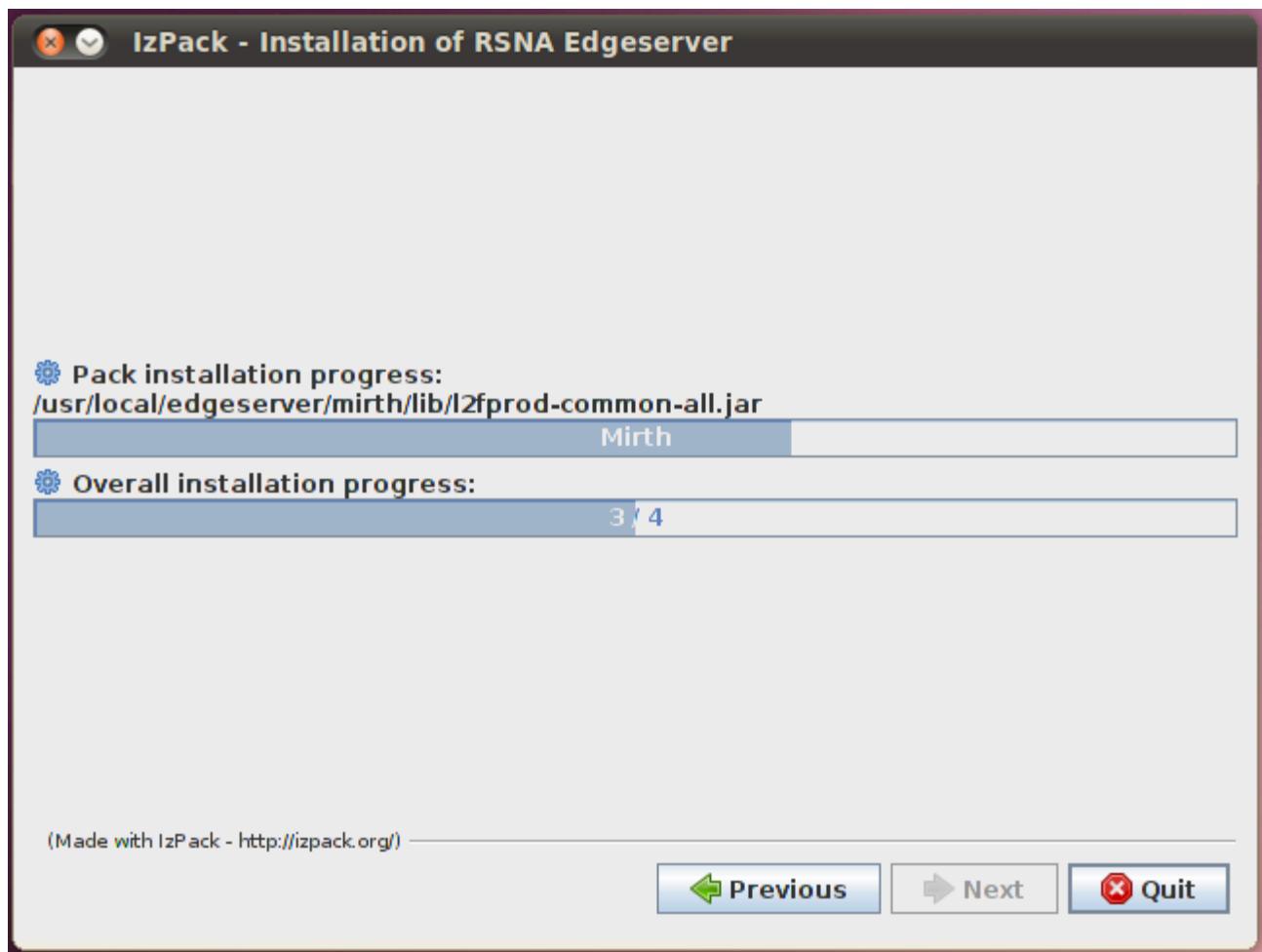


Figure 4-12: Edge server installation progress

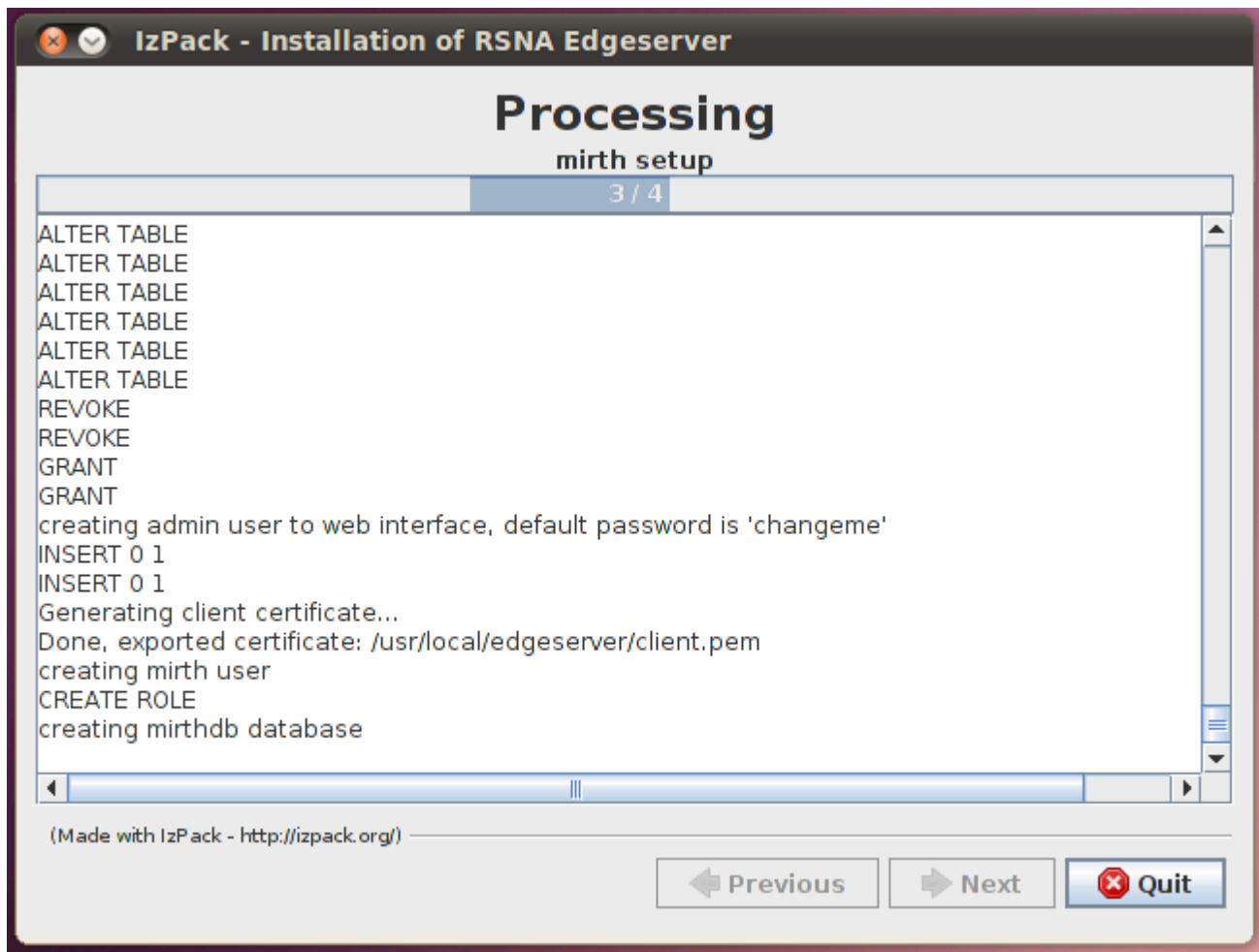


Figure 4-13: Application install progress

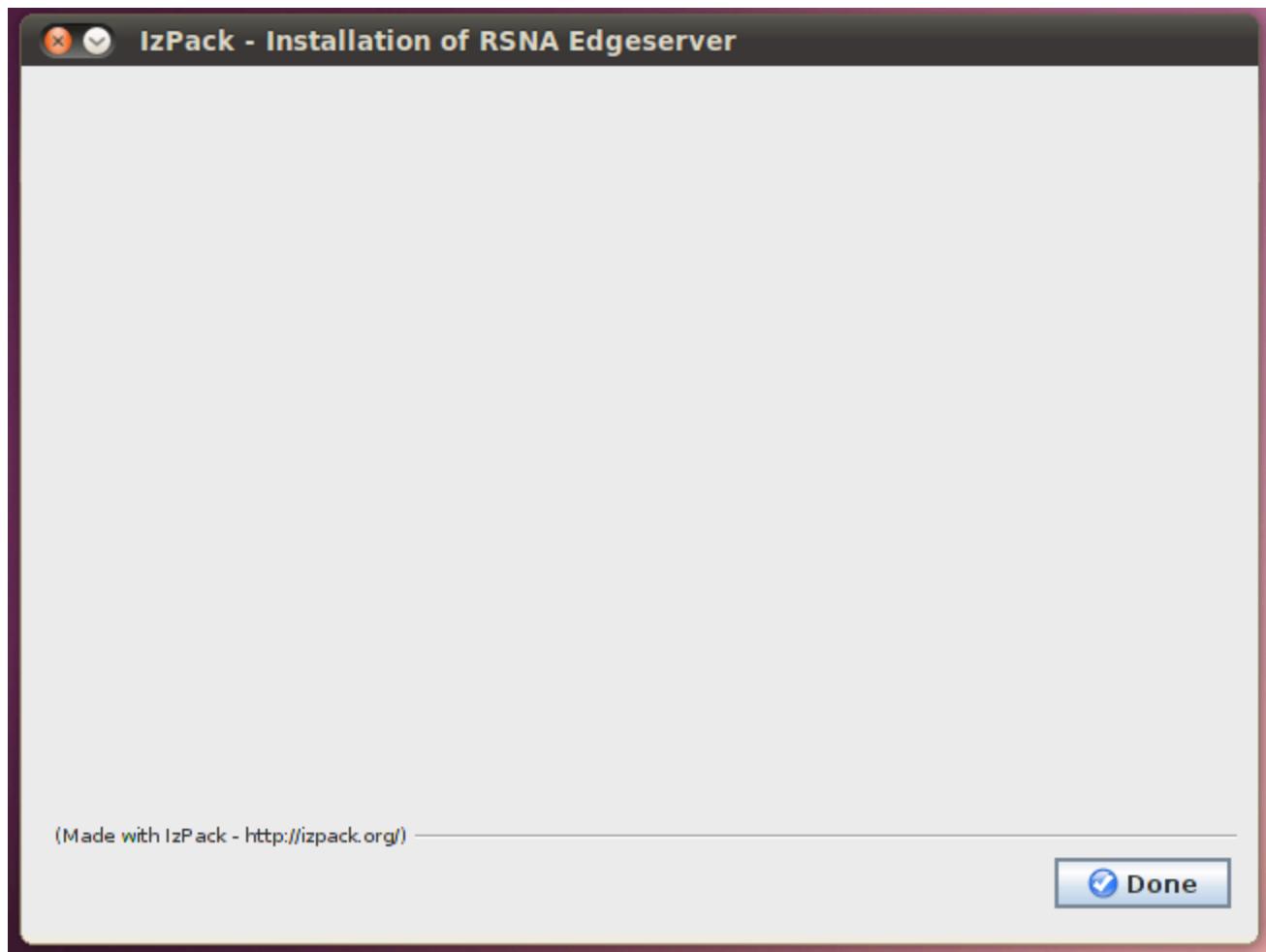


Figure 4-14: Installation complete

#### **4.2.6 Configure the RSNA-Edge Device as an Ubuntu Service**

From your command line window, run this command as root:

```
update-rc.d edge-server defaults
```

Reboot the system. All Edge Server services should now be running. You can now continue to section 4.3 (Registering the Edge Server Certificate with the Clearing House).

## 4.3 Registering the Edge Server Certificate with the Clearing House

In order for your institution's RSNA Edge Server to communicate with the lifeIMAGE Clearinghouse, SSL security certificates must be exchanged between your institution and lifeIMAGE. *Please note: it is assumed your institution has established a HIPAA BAA (Business Associates Agreement) with LifeIMAGE. If not, please contact David Wilkins ([dwilkins@lifeimage.com](mailto:dwilkins@lifeimage.com)) to get the process started.*

A copy of the lifeIMAGE's certificate is preinstalled in the \$RSNA\_ROOT/conf/truststore.jks file To complete the exchange, you will need to send lifeIMAGE a copy of your site's edge server certificate. If you ran the installer (i.e. followed the Physical build process) then the certificate has already been generated (Figure 4-10) and you can skip to section 4.3.2: *Exporting and registering the certificate*. However, if you are using a virtual machine (VM) you will need to generate the certificate manually (see section 4.3.1)

### 4.3.1 Generating a certificate (VM users only)

To generate the certificate you will need to use the Java keytool utility. If you haven't already done so, start by logging into the edge server as the "rsna" user and opening a command line window. You need to assume the role of the edge account to be able to write into the Edge software folder. At the prompt, type:

```
sudo - edge
```

You will be prompted for the rsna password. Then, on one line:

```
$JAVA_HOME/bin/keytool -genkey -alias edge -keyalg RSA -keypass edge1234 -
storepass edge1234 -validity <days> -keystore $RSNA_ROOT/conf/keystore.jks
```

where **<days>** is the number of days you want the certificate to be valid, e.g. 3650 for 10 years. Once the keytool utility starts, it will prompt you for information about your certificate. Note: FQDN means "Fully Qualified Domain Name" like edge.hospital.com. At the prompts enter the following (making sure to put the appropriate values in the brackets):

```
What is your first and last name?: <FQDN of edge server>
What is the name of your organizational unit?: <Lab or department name>
What is the name of your organization?: <University or Company name>
What is the name of your City or Locality? <Your city (no abbreviations)>
What is the name of your State or Province? <Your state or province (no
abbreviations)>
What is the two-letter country code for this unit? <Your country code, enter "US"
(no quotes) for the United States>
```

When asked, verify the information you've entered is correct by typing "**yes**". Enter "**no**" if you need to go back and reenter anything. At this point the keytool will generate the certificate and save it in \$RSNA\_ROOT/conf/keystore.jks. You can now continue to section 4.1.2 (Exporting and registering the certificate).

### 4.3.2 Exporting and registering the certificate

To send LifeIMAGE the edge server certificate, you will first need to export it and convert it to a format LifeIMAGE can understand. If you haven't already done so, log into the edge server as the "rsna" user and open a command line window. At the prompt, type:

```
sudo - edge
```

You will be prompted for the rsna password. Then, on one line:

```
$JAVA_HOME/bin/keytool -export -alias edge -storepass edge1234 -file client.der -keystore $RSNA_ROOT/conf/keystore.jks
```

You should have a file called “client.der” in your current directory. This file contains the certificate in DER (Distinguished Encoding Rules) format. In order for LifeIMAGE to accept the certificate, it must be converted to PEM (Privacy-enhanced Electronic Mail) format. To convert the certificate run the following command:

```
openssl x509 -inform DER -in client.der -outform PEM -out client.pem
```

At this point you should have a file called “client.pem” in the current directory. You will need to email this file to David Wilkins ([dwilkins@lifeimage.com](mailto:dwilkins@lifeimage.com)) and [support@lifeimage.com](mailto:support@lifeimage.com). You have now completed the installation of the edge server software and can continue to Chapter 5: Setting up MIRTH.

*Please note: it is strongly recommended you send some test exams to the clearinghouse after completing the configuration of the edge server (Chapters 5 & 6). If you choose to send test exams, make sure to send LifeIMAGE the DOB, token and password for the job set as well as information on the exams included (e.g. modality, study date/time, image count). They will need this information to verify receipt by the clearinghouse.*

# 5. Setting up MIRTH

## Assumptions:

1. You have either run the edge server installer (Chapter 4, Physical) or installed and configured the edge server VM (Chapter 4, Virtual).
2. You have defined your HL7 message format and determined how they map to the edge server's database columns (see mappin spreadsheet).
3. That the edgeserver Web services are running. If you do not see the web page shown below, you may have to start the web services manually by typing “>/etc/init.d/edge-server start”

## Setup:

1. MIRTH configuration is accomplished via a web interface; the web browser can be on either a remote machine or local on the Edge server. If remote, open the browser (IE 8 is best avoided) and navigate to: <http://<address of edge server>:8080>. If local, open FireFox and navigate to: <http://localhost:8080>. You should see a page similar to the one pictured below:



---

## Mirth Connect Administrator - Java Web Start

### Overview of Web Start

Java Web Start is a framework developed by Sun Microsystems that enables launching Java applications directly from a browser. Unlike Java applets, Web Start applications do not run inside the browser.

Click the big green button below to launch the Mirth Connect Administrator using Java Web Start.

[Launch Mirth Connect Administrator](#)

Figure 5-1: The Mirth Administrator Java Web Start page

2. Click the “Launch Mirth Connect Administrator” button. [Note: The first time this is done on the Edge server’s local browser the path to the Java Web Start application is unknown. When FireFox asks what to use to open the file, select “other” on the drop down and navigate to <Filesystem:/usr/local/jre-1.6-xx/javaws/javaws>]. A Java Web Start app should launch and you should see the dialog pictured below:

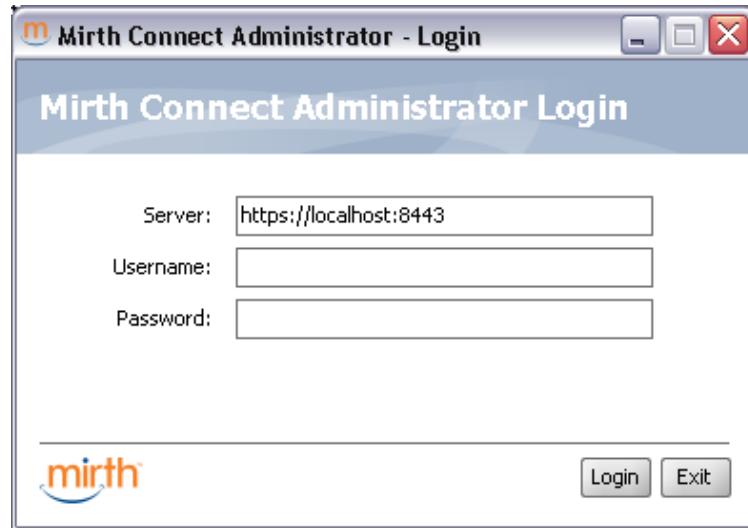


Figure 5-2: The Mirth Administrator login dialog

3. Login using username = "admin", password = "admin". After logging in you should see a screen similar to:

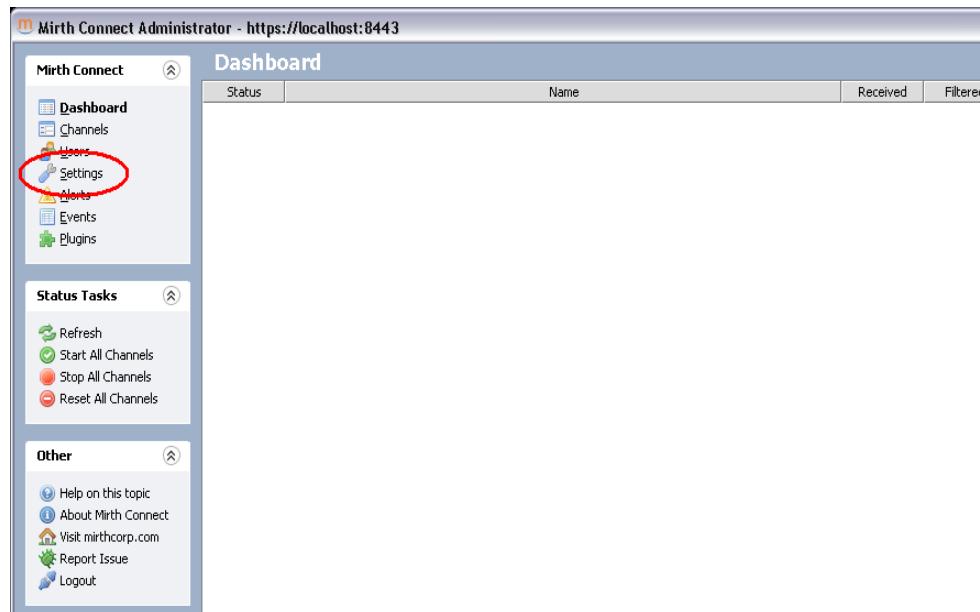


Figure 5-3: Mirth Administrator

4. You will first need to initialize the base Mirth setup. In the left column, click on the "Settings" link. You should see a screen similar to:

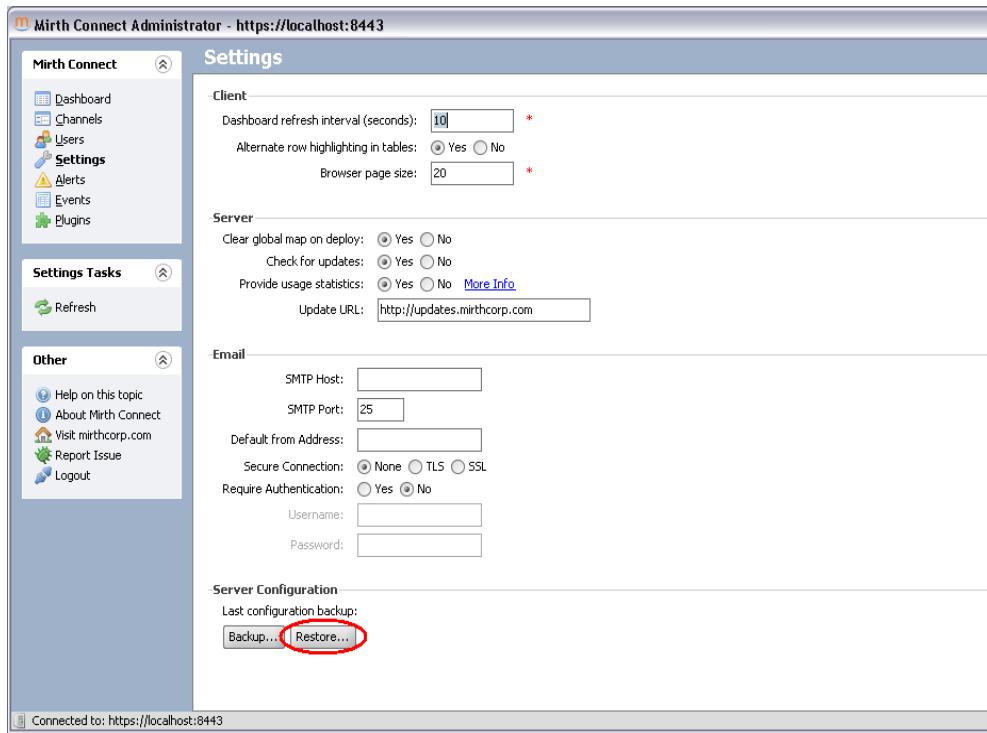


Figure 5-4: Installing the default Mirth configuration

5. Click the “Restore...” button at the bottom of the page and select the “Mirth Backup.xml” file located in the edge server installation directory (see Figure 4-7). You should get a message saying your configuration was successfully restored.
6. You will now need to configure the database connection password. To do so first switch “Channels” under the Mirth Connect heading on the left, then click the “Edit Code Templates” link under the “Channel Tasks” heading.
7. Then open the “Get Database Connection” template by double clicking on its entry. You should see the screen below.

The screenshot shows the 'Code Templates' section of the Mirth Connect Administrator. A new template named 'Get Database Connection' is being created. The code template is defined as a 'Function' with 'Global' context. The description is 'Returns a connection to the RSNA results database'. The function code is as follows:

```

1 // modify function_name and parameters as you wish.
2 // one function per template is recommended. i.e.) create a new code template for each new funct:
3 function getConnection() {
4 var con = DatabaseConnectionFactory.createDatabaseConnection('org.postgresql.Driver',
5 'jdbc:postgresql://localhost:5432/rsnadb','edge01');
6
7 return con;
8 }
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

```

Figure 5-5: Configuring database connection parameters

8. Replace the fourth parameter with the password you defined for the RSNA database user.
9. Now switch to the channels page by click the “Channels” link in the left column. You should see the screen pictured below:

The screenshot shows the 'Channels' section of the Mirth Connect Administrator. There are two channels listed:

| Status  | Protocol | Name                          | Id                                   | Description |
|---------|----------|-------------------------------|--------------------------------------|-------------|
| Enabled | DICOM    | RSNA Edge Appliance DICOM SCP | 1b6b5460-0d59-4099-9ce0-0c386ac6b661 |             |
| Enabled | HL7 v2.x | Edge Server HL7 Receiver      | 20873abb-9dd8-4e32-9167-f3a87fd99fbc |             |

Figure 5-6: Configuring Mirth channels

10. Double click the DICOM channel to open it for editing. You'll see the page below:

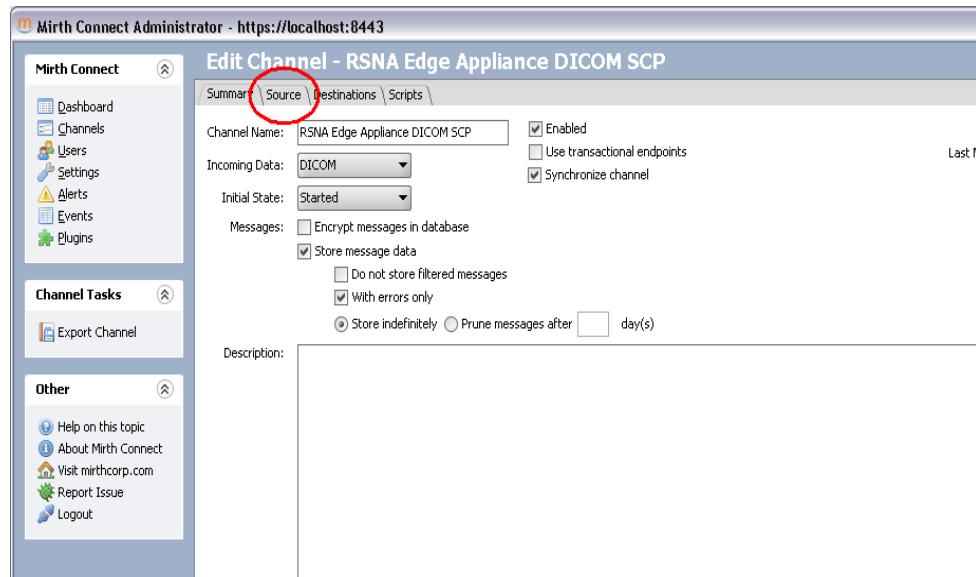


Figure 5-7: Configuring the DICOM channel

11. Click the “Source” tab and you’ll see the configuration for the edge server SCP:

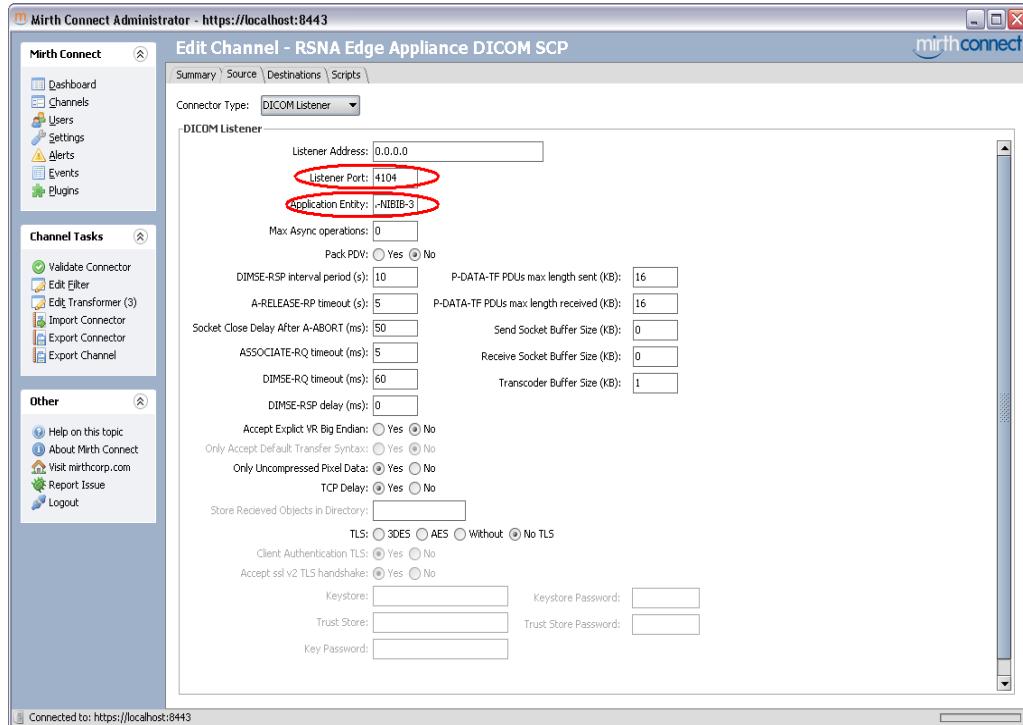


Figure 5-8: Configuring the DICOM SCP network parameters

12. Set the the Listener Port and Application Entity configurations to the appropriate values for your installation (e.g. 104 and RSNA-ISN). *Note: the AET and port should match the value you have configured for the ““scp-ae-title” parameter in the edge server database “configurations” table (see Figure 6-7).* You can also tweak the other parameters as needed.
13. Now switch to the Destinations tab and select the “File Output” destination.
14. You will need to set the directory where the incoming DICOM objects will be saved. This is done by modifying the directory field (see picture below). The path must start with the location of the RSNA directory you configured during the installation procedure and end with “/dcm/\${patientId}/\${accessionNumber}/” (no quotes). For example if your RSNA directory was at “/usr/local/edgeserver-1.0-SNAPSHOT” then the directory path would be “/usr/local/edgeserver-

1.0-SNAPSHOT/dcm/\${patientId}/\${accessionNumber}”.

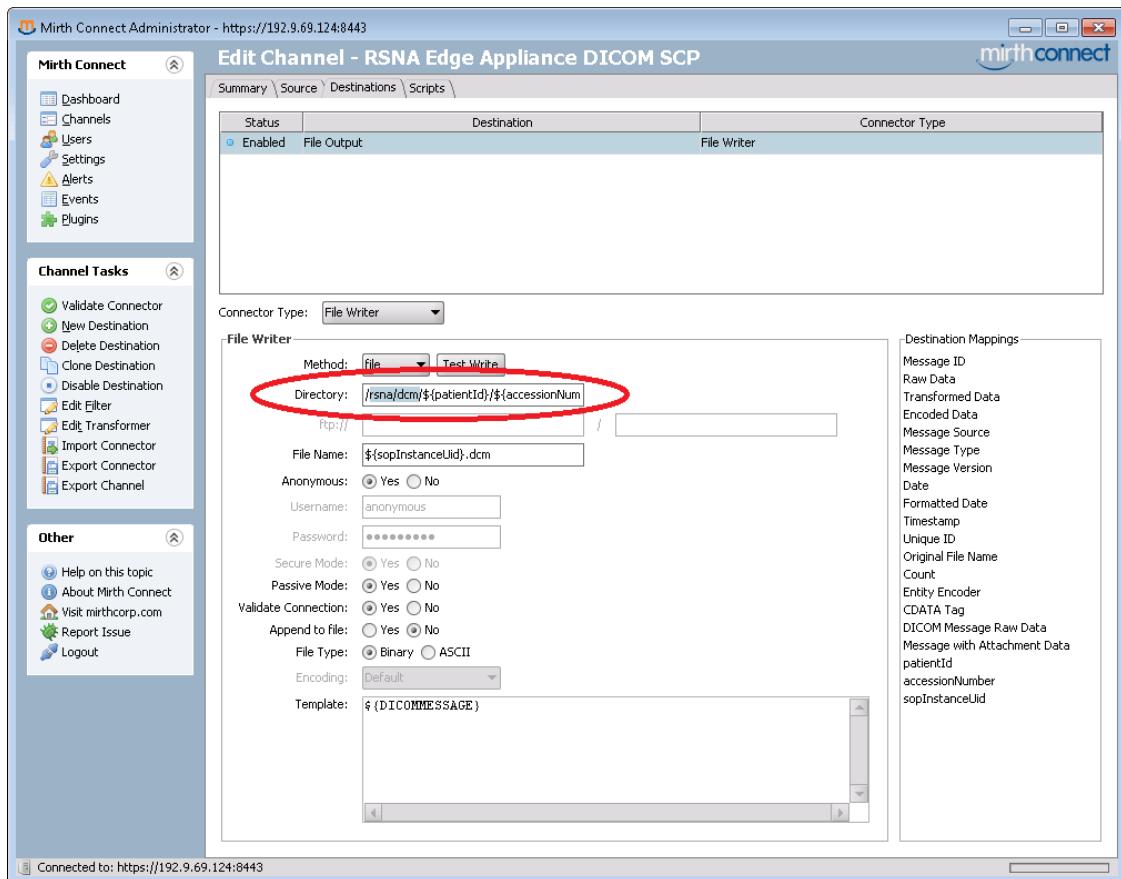


Figure 5-9: Modifying the image directory location

15. When you are done click the “Save Changes” link in the left column and switch back to the Channels panel.
16. Now double click on the HL7 channel to edit it. You’ll see the page below:

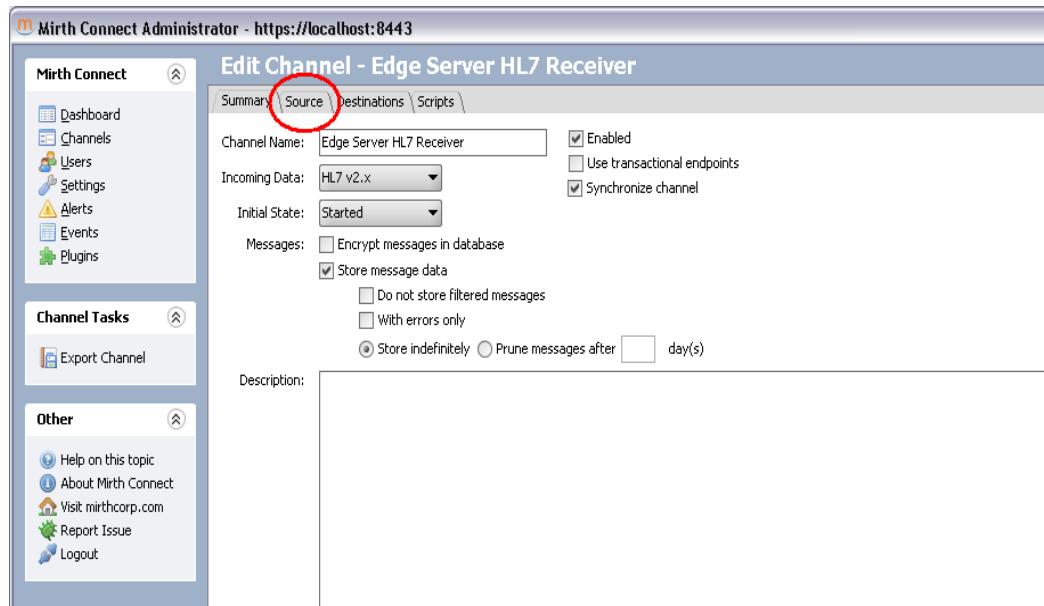


Figure 5-10: Configuring the HL7 channel

17. Click on the Source tab and you will see the screen below:

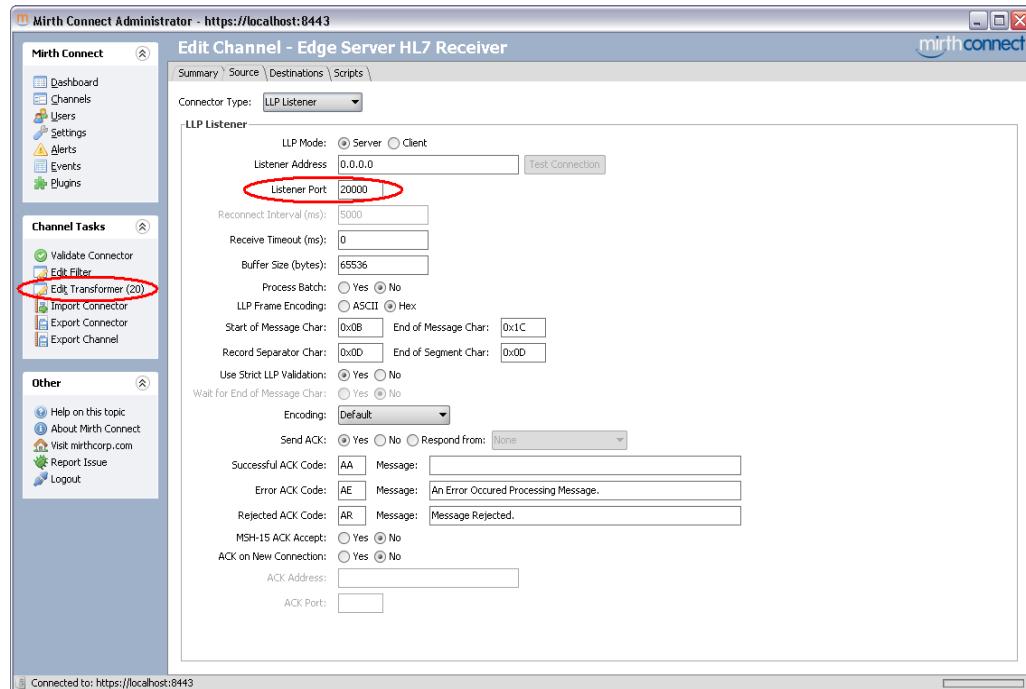


Figure 5-11: Configuring the HL7 network parameters

18. Set the Listener Port value to the appropriate value for your installation.

19. After you are done, click the “Edit Transformer” link in the left column. You will see the screen pictured below:

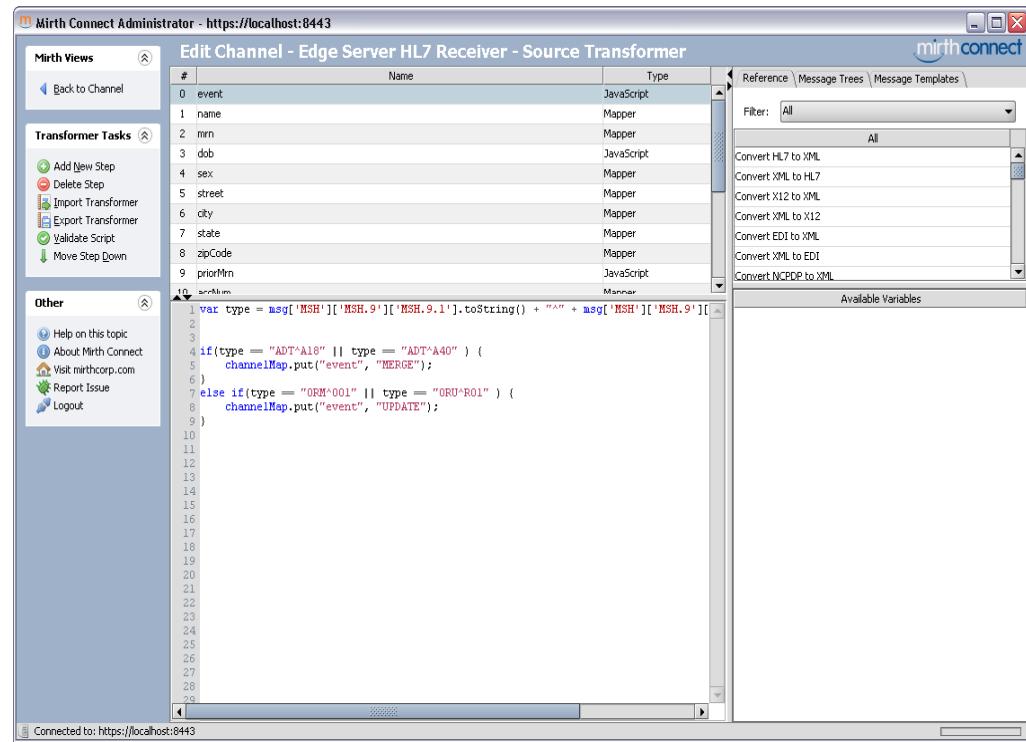


Figure 5-12: Configuring the HL7 channel variables

20. You will need to adjust the mapping between your HL7 messages and the channel variables used to populate the edge server database. The following variables require customization:

| Variable | Notes                                                                |
|----------|----------------------------------------------------------------------|
| event    | Type of event associated with the incoming message. Permitted values |

|                                   |                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | <p>are:</p> <p style="padding-left: 40px;">UPDATE</p> <p style="padding-left: 40px;">MERGE</p> <p>Determines whether the incoming message is for an exam status UPDATE or a patient MERGE.</p>                                                                                                                                                      |
| name ("patients")                 | The patient's name. Must not be blank.                                                                                                                                                                                                                                                                                                              |
| mrn ("patients")                  | The patient's medical record number. This value will uniquely identify the patient on the edge server and is used to retrieve images from the site's PACS. Must not be blank.                                                                                                                                                                       |
| dob ("patients")                  | The patient date of birth. Cannot be null. Value must be of type java.sql.Date                                                                                                                                                                                                                                                                      |
| sex ("patients")                  | The patient's sex. Must not be blank.                                                                                                                                                                                                                                                                                                               |
| street ("patients")               | The street component of a patient's address. Used by the token app to help site staff verify a patient's identity before their images are queued for transmission.                                                                                                                                                                                  |
| city ("patients")                 | The city component of a patient's address. Used by the token app to help site staff verify a patient's identity before their images are queued for transmission.                                                                                                                                                                                    |
| state ("patients")                | The state component of a patient's address. Used by the token app to help site staff verify a patient's identity before their images are queued for transmission.                                                                                                                                                                                   |
| zipCode ("patients")              | The zip code component of a patient's address. Used by the token app to help site staff verify a patient's identity before their images are queued for transmission.                                                                                                                                                                                |
| priorMrn ("patient_merge")        | Used when merging 2 patients. Should be populated for a patient merge message.                                                                                                                                                                                                                                                                      |
| accNum ("exams")                  | The exam's accession number. This value will uniquely identify an exam on the edge server and is used to retrieve images from the site's PACS.                                                                                                                                                                                                      |
| studyDescription ("exams")        | The exam description.                                                                                                                                                                                                                                                                                                                               |
| status ("reports")                | <p>The exam status. Sites need to map their exam status codes to the following values:</p> <ul style="list-style-type: none"> <li>ORDERED</li> <li>SCHEDULED</li> <li>IN-PROGRESS</li> <li>COMPLETED</li> <li>DICTATED</li> <li>PRELIMINARY</li> <li>FINALIZED</li> <li>REVISED</li> <li>ADDED</li> <li>CANCELED</li> <li>NON-REPORTABLE</li> </ul> |
| statusChangeTimestamp ("reports") | The timestamp of the exam status change. Cannot be null. Value must be of type java.sql.Timestamp.                                                                                                                                                                                                                                                  |

|                        |                                                                                                                                                                                                                                                                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| report ("reports")     | Full text of the report. <i>The value must be plain text and cannot contain any formatting character sequences.</i><br>To convert from RTF to plain text, use Mirth's built-in FileUtils.rtfToPlainText method. Other formats will require the development of site specific conversion methods, which are beyond the scope of this document. |
| signer("reports")      | The report signer.                                                                                                                                                                                                                                                                                                                           |
| dictator("reports")    | The report dictator.                                                                                                                                                                                                                                                                                                                         |
| transcriber("reports") | The report transcriber.                                                                                                                                                                                                                                                                                                                      |

21. When you are done click the “Save Changes” link in the left column and switch back to the Channels panel.

22. Right click on the list of channels and select “Deploy All” from the context menu.

23. You will then see the Dashboard panel pictured below. Verify that both channels are listed as “Started”.

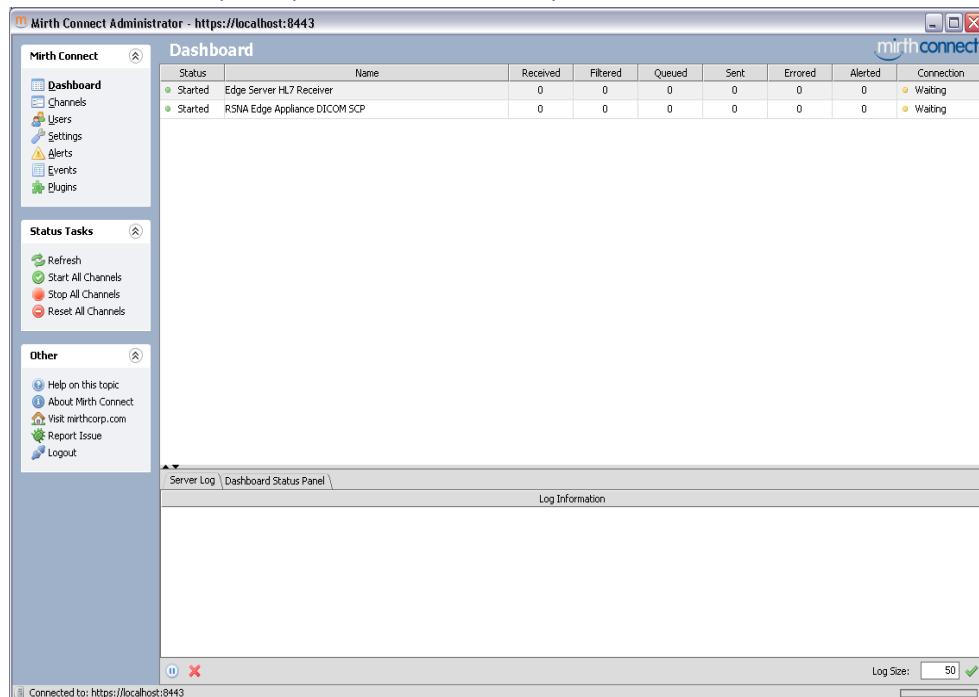


Figure 5-13: The Mirth Administrator dashboard for monitoring channel status

# 6. The Web UI

## Initial Login and Account Management:

As in Chapter 5, configuration is done via a web browser which can be local to the Edge appliance or remote. Currently the supported browsers are:

- a) Firefox versions > V3.5
- b) Google Chrome (latest version)
- c) Internet Explorer > V7.0
- d) Safari (latest version)

If you are local on the Edge server, one can use the URL **http://localhost:3000**, if remote use **http://edge-hostname-or-ip:3000/** and enter the initial login credentials:

- Username: **admin**
- Password: **changeme**

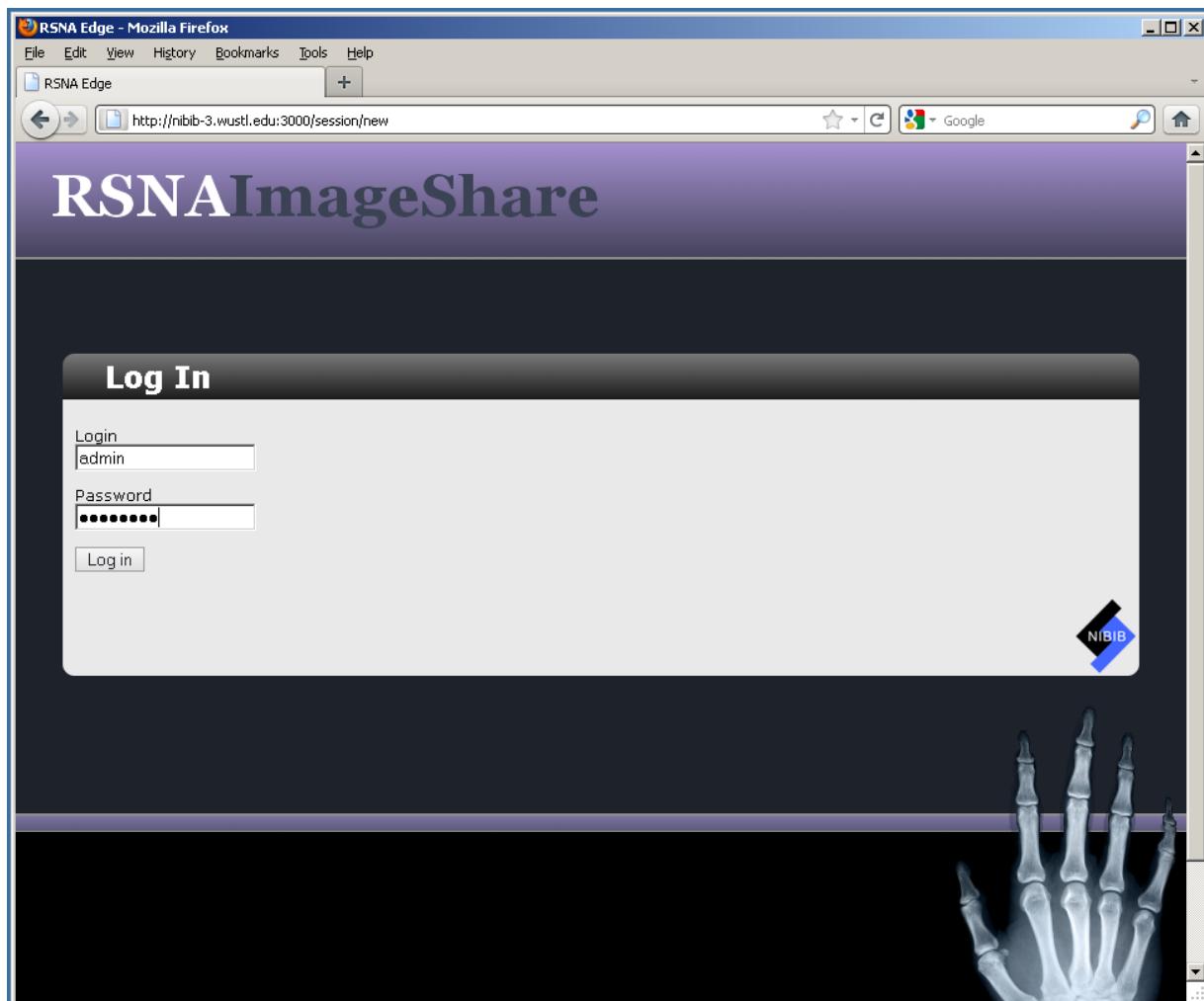


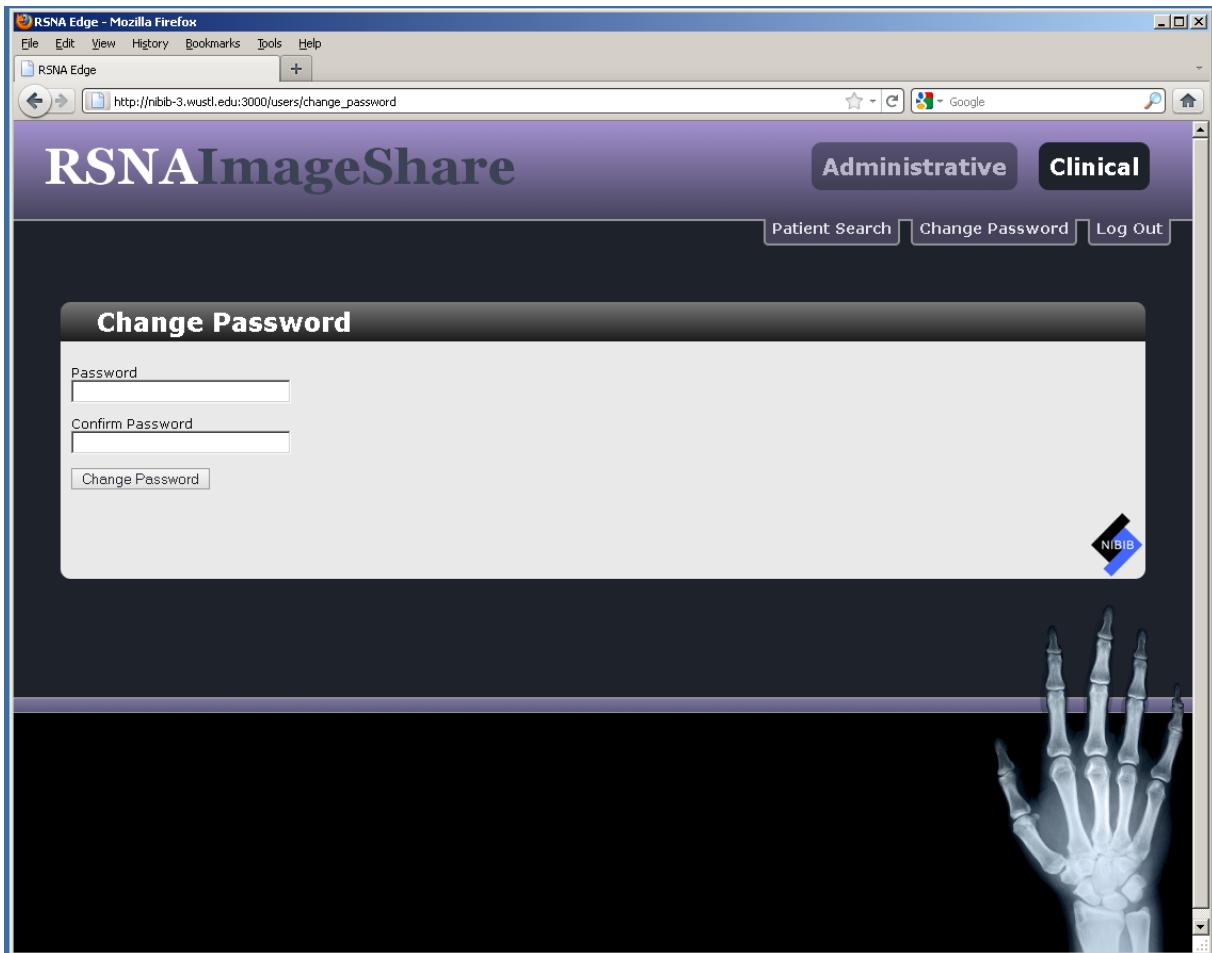
Figure 6-1: Login Screen

The initial landing page is the patient search interface. For security reasons, it is suggested your first activity is to

change the administrator password, so click the “Change Password” button to change your password.



Figure 6-2: Successful Login and Patient Search



**Figure 6-3: Changing Password**

The **admin** user has full privileges, including the ability to create other users, change system configuration options, and view logs. To create a new user, click the "Administrative" button, then click the "New User" button.



Figure 6-4: Creating a new user

When creating the user, note that there are 3 roles to choose from:

- **Administrator:** create/delete/edit users, modify devices and site config, view jobs (all privileges)
- **Super User:** same as user, with ability to view all jobs
- **User:** look up patients and create RSNA IDs, reset PINs, submit jobs, and view their own jobs

These roles can always be adjust by clicking the "User Roles" buttons.

The screenshot shows a Mozilla Firefox browser window titled "RSNA Edge - Mozilla Firefox". The address bar displays the URL "http://nibib-3.wustl.edu:3000/users/roles". The main content area is titled "RSNAImageShare" with "Administrative" and "Clinical" tabs. Below the tabs is a navigation menu with links: Audit Trail, Logs, Devices, Configuration, New User, User Roles, and Log Out. The "User Roles" link is highlighted. A sub-section titled "Roles" lists users and their roles. The columns are "Name", "Login", and "Role". The "Role" column contains radio buttons for "Super User" and "Admin". The list includes:

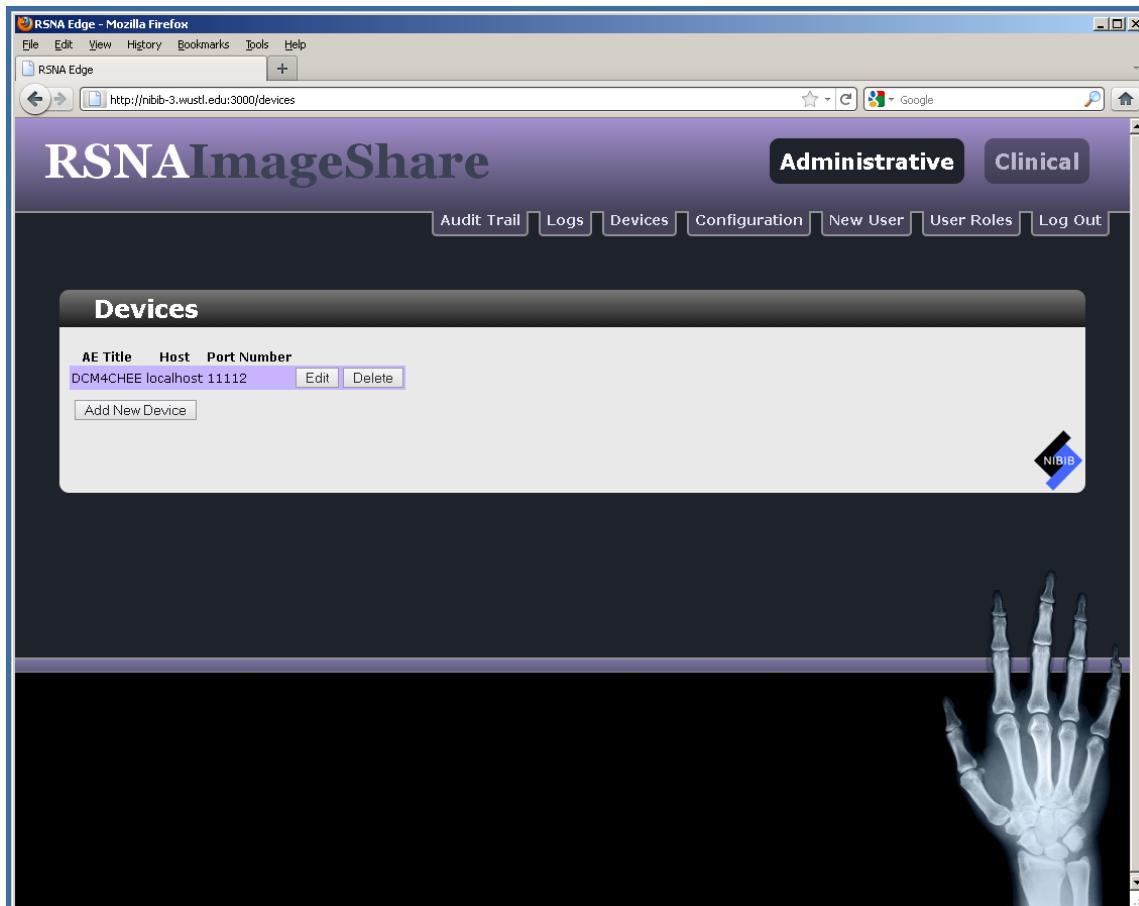
| Name          | Login    | Role                                                                                                             |
|---------------|----------|------------------------------------------------------------------------------------------------------------------|
| Max Warnock   | mwarnock | User: <input type="radio"/> Super User: <input checked="" type="radio"/> Admin: <input checked="" type="radio"/> |
| admin         | admin    | User: <input type="radio"/> Super User: <input checked="" type="radio"/> Admin: <input type="radio"/>            |
| Femi Oyesanya | femi     | User: <input type="radio"/> Super User: <input checked="" type="radio"/> Admin: <input type="radio"/>            |
| Wyatt Tellis  | wtellis  | User: <input type="radio"/> Super User: <input checked="" type="radio"/> Admin: <input type="radio"/>            |
| Daly, Mark    | mdaly    | User: <input type="radio"/> Super User: <input checked="" type="radio"/> Admin: <input type="radio"/>            |
| Zhu, Wendy    | wzhu     | User: <input type="radio"/> Super User: <input checked="" type="radio"/> Admin: <input type="radio"/>            |
| steve moore   | smoore   | User: <input type="radio"/> Super User: <input checked="" type="radio"/> Admin: <input type="radio"/>            |
| steve         | sglanger | User: <input type="radio"/> Super User: <input checked="" type="radio"/> Admin: <input type="radio"/>            |

The background features a watermark of a hand X-ray and the NIBIB logo.

Figure 6-5: Adjusting User Roles

#### Configuration Options:

The Administrative interface can be used to configure information about the DICOM device by clicking the "Devices" link.



**Figure 6-6: DICOM Device Configuration**

In addition, other system settings can be adjusted by clicking the "Configuration" button.

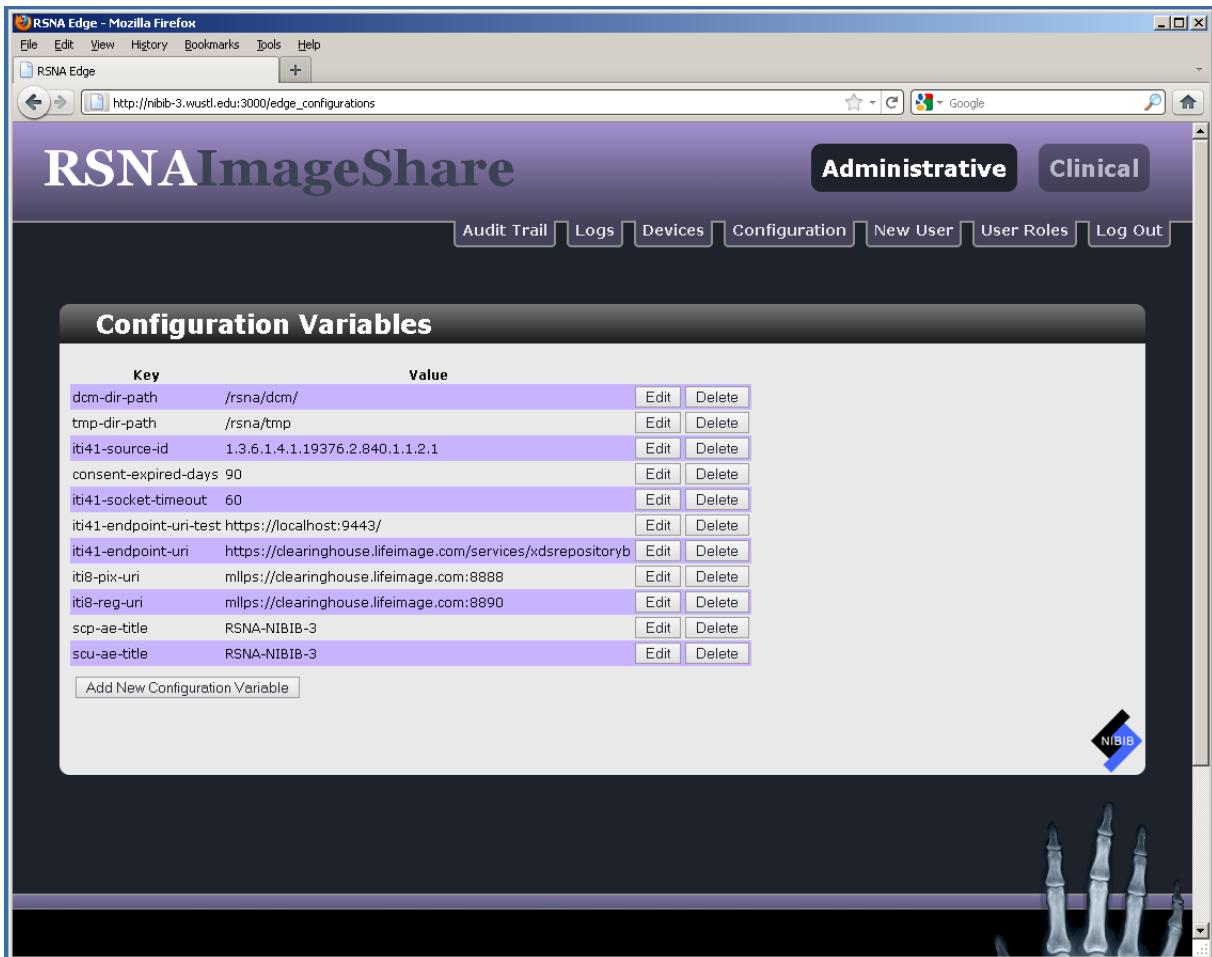


Figure 6-7: System Configuration Options

### Configuration:

The edge server relies on several variables specified in the database and editable using the Administrative configuration page. To get there click on the “Administrative” menu and then “Configuration”. One variable that should be set by each site is the “help\_desk\_message” variable. This value will appear on the printout given to patients. The default message is: “Please contact helpdesk@imsharing.org or call 1-855-IM-SHARING (467-4274) for support”. Another variable which should be considered is the “delay\_in\_hrs” variable. Setting this variable will override the default 72 hour delay.

### Administrative Overview:

The Administrative interface also provides audit and application log views by clicking the “Audit Trail Button” and the “Logs” buttons.

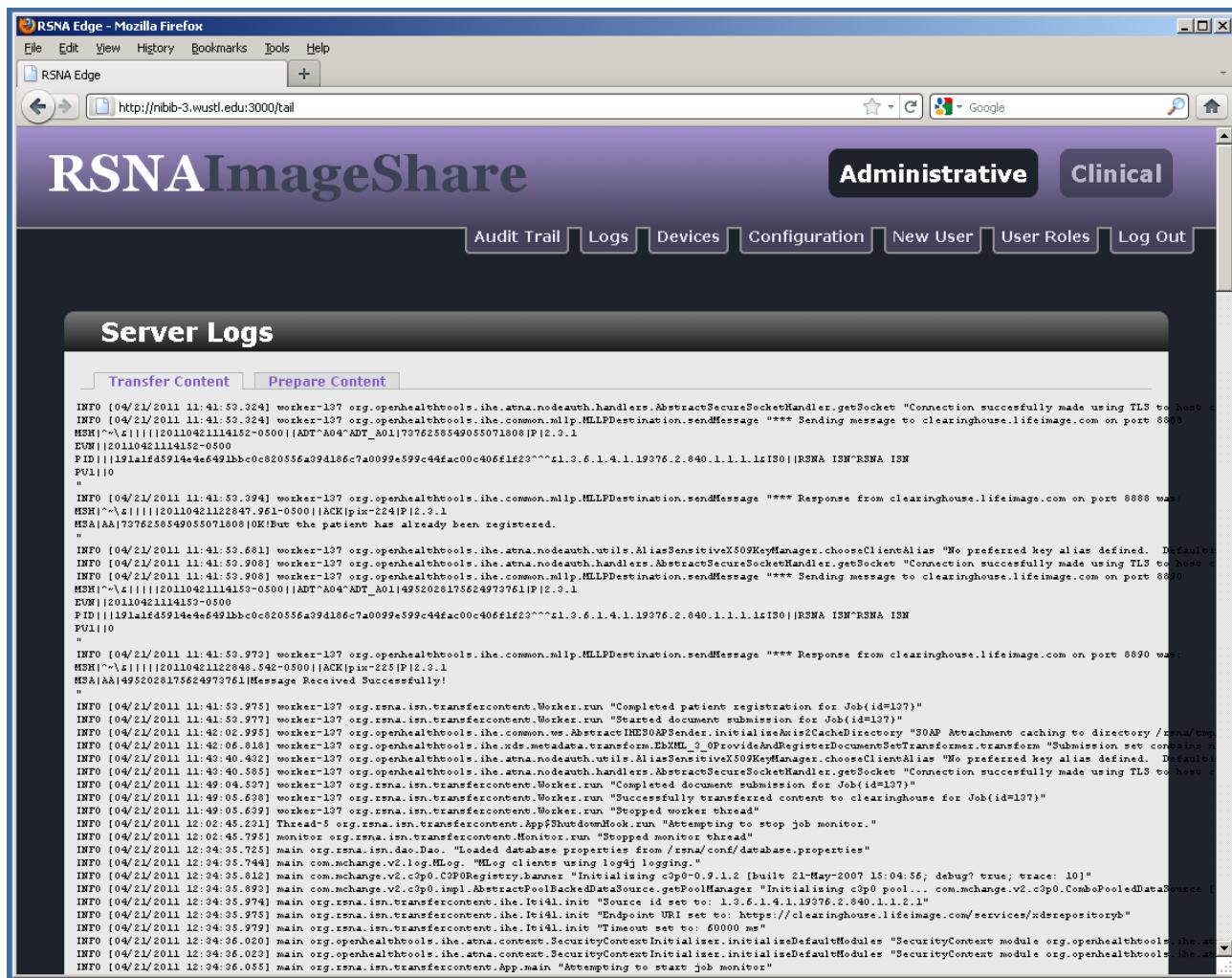
| MRN     | Accession # | Patient Name   | Single Use Patient ID                                            | Job ID | Delay in Hours | Status Code | Status Message                        | Last Transaction        | Submitted By    |
|---------|-------------|----------------|------------------------------------------------------------------|--------|----------------|-------------|---------------------------------------|-------------------------|-----------------|
| 1527773 | 7741370     | NEISSER, JARED | 82c8c0b5cba32de59c632cfe7b7928ffd995c4026ed9e5b3c4bcc7f63d7dc1ac | 166    | 72             | 1           | Waiting to retrieve images and report | January 03, 2012 13:38  | downcase test 6 |
| 1527773 | 7741698     | NEISSER, JARED | 6ce2310c06b392dd828856ba878aa58e14dfc244d1704efc04ede48e30645d   | 163    | 0              | 1           | Waiting to retrieve images and report | December 16, 2011 10:31 | Admin User      |
| 1837841 | 7741550     | HALL, RICHARD  | 83a9e8dc87fe8a8bc055f60690a6ee57ed8fdf39e217b537ec5db8a5bd7a6d7  | 165    | 0              | 1           | Waiting to retrieve images and report | December 15, 2011 12:20 | Admin User      |
| 1527773 | 7741370     | NEISSER, JARED | a51134121eb7739359802f434e426ec5b46cb6fec4643ac2f6ef686191cedf0  | 164    | 144            | 1           | Waiting to retrieve images and report | December 15, 2011 12:18 | Admin User      |
| 1527773 | 7741370     | NEISSER, JARED | d7c02008131544cd4e08ee3385f50889d5f2b6551d14c2e2df1bd80b1b27c1a  | 162    | 144            | 1           | Waiting to retrieve images and report | December 13, 2011 15:50 | Admin User      |
| 1527773 | 7741370     | NEISSER, JARED | 92b8057131a476bb5169101e09269a0e6df8362a5f54207c1b9c0bb366084e   | 161    | 144            | 1           | Waiting to retrieve images and report | December 13, 2011 15:48 | Admin User      |
| 1527773 | 7741370     | NEISSER, JARED | e620c470bf059752a10edff0068d08044d35f13cd6ea4477a662073ebe393b   | 160    | 144            | 1           | Waiting to retrieve images and report | December 13, 2011 15:46 | Admin User      |
| 1527773 | 7741698     | NEISSER, JARED | 0327757407bca8cathe639ab58971878545c9cabf31a7b8344eadb0d4fe043   | 159    | 144            | 1           | Waiting to retrieve images and report | December 13, 2011 15:44 | Admin User      |
| 1527773 | 7741698     | NEISSER, JARED | c2531339e9a4e0b1db2fb4e17e93923609e7bb7ef5c31dd0077c9aa921256d6  | 158    | 144            | 1           | Waiting to retrieve images and report | December 13, 2011 15:37 | Admin User      |
| 1527773 | 7741370     | NEISSER, JARED | db3b1075a8d61a94353ba5e52d16933cd2c3e6677aa9bf17ea41be211049035  | 157    | 72             | 1           | Waiting to retrieve images and report | December 13, 2011 15:33 | Admin User      |

Figure 6-8: Audit Trail Interface

If a job has failed (indicated by status code < 0), a “Retry Job” button will appear on the Audit Details screen. Pressing this button will create a new transaction for the job with status code “1” and comments “Retry”. The screen will refresh and the new transaction details will display in the Audit Trail.

| Transaction ID | Status Code | Status Message                        | Comments | Modified                |
|----------------|-------------|---------------------------------------|----------|-------------------------|
| 16154          | 1           | Waiting to retrieve images and report | Queued   | January 31, 2012 12:40  |
| 16155          | -20         | Failed to prepare content             |          | February 16, 2012 10:45 |

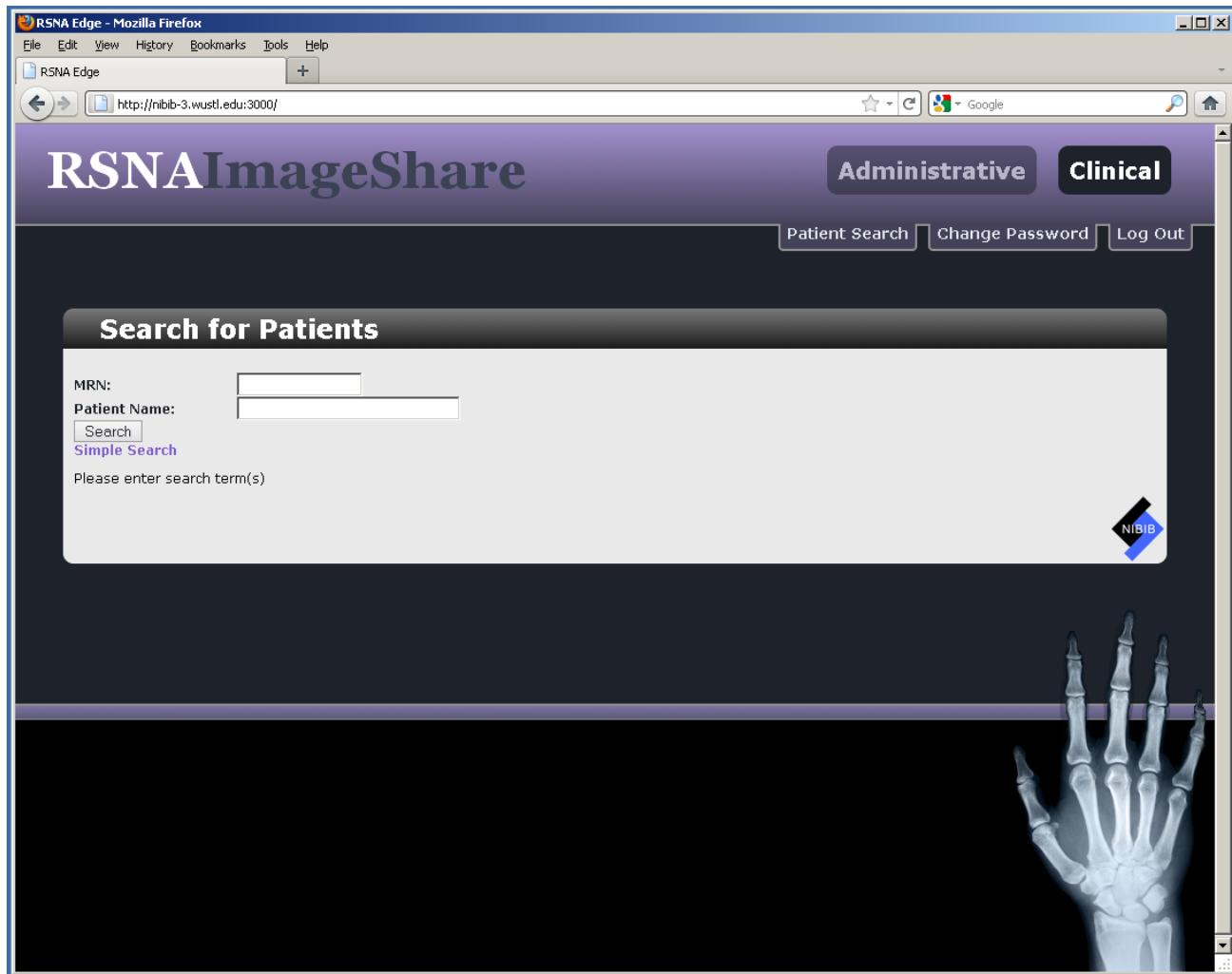
Figure 6-9: Retry Failed Jobs



**Figure 6-10: Application Logs**

### Normal Usage:

Normal workflow is to search for a patient under the Clinical interface by clicking the “Patient Search” button. There is also an Advanced Search link you can use on this page.



**Figure 6-11: Advanced Patient Search**

Once you search for a patient, results are presented and you can choose a patient. This prompts for a patient confirmation and consent acknowledgement. After the confirmation is acknowledged, a list of the selected patients exams are presented. These exams are added to a “shopping-cart” style interface.

RSNA Edge - Mozilla Firefox

File Edit View History Bookmarks Tools Help

RSNA Edge +

http://nibib-3.wustl.edu:3000/ Google

# RSNAImageShare

Administrative Clinical

Patient Search Change Password Log Out

## Search for Patients

MRN:

Patient Name:

[Simple Search](#)

|        | Name      | MRN       | Sex | Date of Birth    |
|--------|-----------|-----------|-----|------------------|
| Select | TEST, TWO | 491486446 | M   | February 1, 1946 |
| Select | TEST, SIX | 373025874 | M   | February 1, 1946 |
| Select | TEST, ONE | 860107532 | M   | February 1, 1946 |

NIBIB



Figure 6-12: Search Results

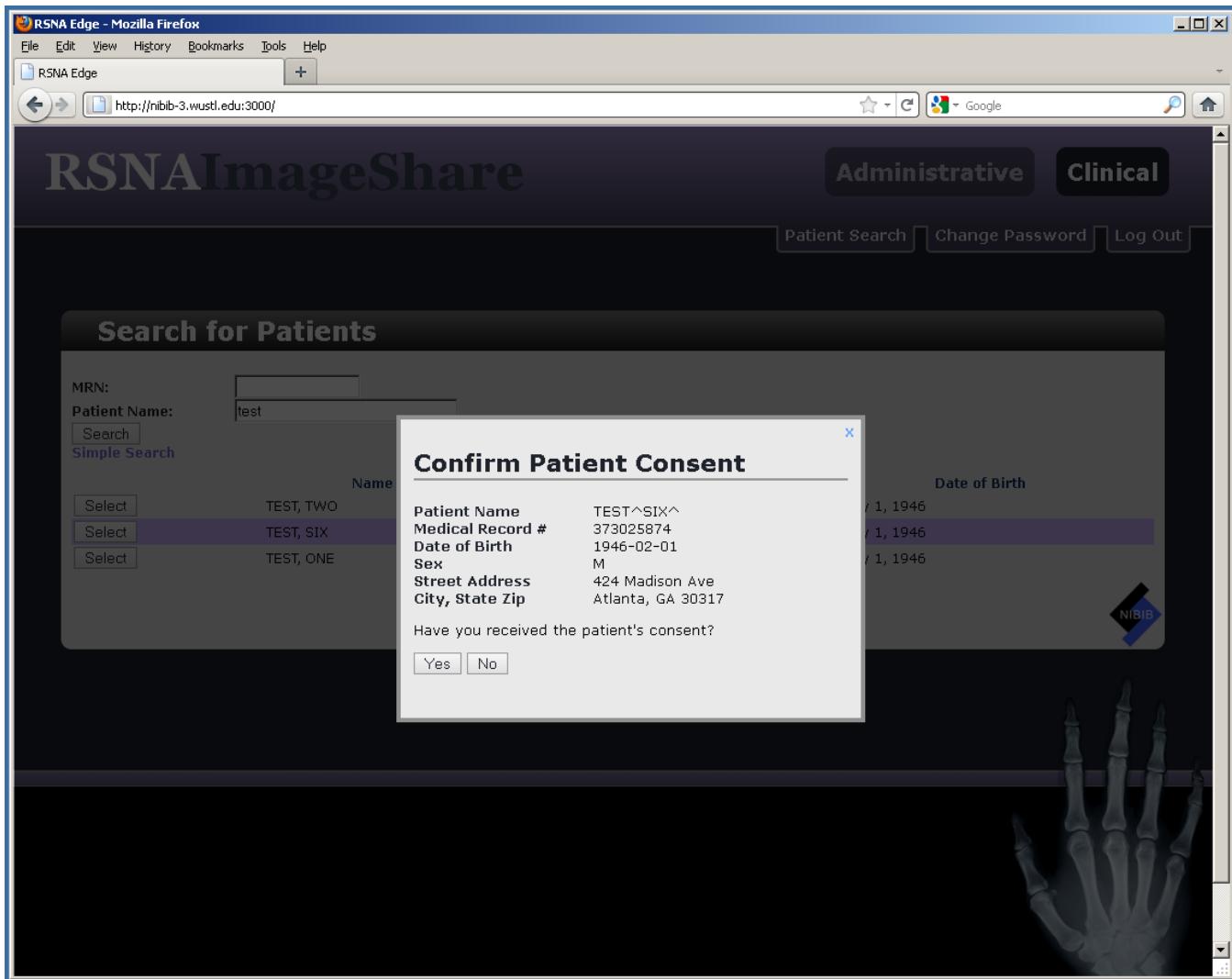


Figure 6-13: Patient Confirmation and Consent Acknowledgment

RSNA Edge - Mozilla Firefox

File Edit View History Bookmarks Tools Help

RSNA Edge +

http://nibib-3.wustl.edu:3000/exams

Google

# RSNAImageShare

Administrative Clinical

Patient Search Exams View Cart (0) Change Password Log Out

## Exams for TEST, SIX

Filter

Filter the exams below by the exam description

|             | Accession #  | Exam Desc | Exam Date            | Status    |
|-------------|--------------|-----------|----------------------|-----------|
| Add to Cart | IHE416633.23 | DTI-002   | April 22, 2011 23:55 | FINALIZED |
| Add to Cart | IHE416633.24 | MR Knee   | April 24, 2011 04:17 | FINALIZED |

NIBIB



Figure 6-14: Exam Selection

The screenshot shows a Mozilla Firefox browser window titled "RSNA Edge - Mozilla Firefox". The address bar displays the URL "http://nibib-3.wustl.edu:3000/exams". The main content area is titled "RSNAImageShare" with "Administrative" and "Clinical" tabs. Below the tabs are buttons for "Patient Search", "Exams", "View Cart (1)", "Change Password", and "Log Out". A sub-header "Exams for TEST, SIX" is displayed above a table. The table has columns: "Accession #", "Exam Desc", "Exam Date", and "Status". It contains two rows: one for IHE416633.23 (DTI-002) on April 22, 2011 at 23:55, and another for IHE416633.24 (MR Knee) on April 24, 2011 at 04:17, both marked as "FINALIZED". A "Filter" button is located above the table. A "View Cart (1)" button is visible on the left. On the right side of the table, there is a small NIBIB logo. Below the table, a large X-ray image of a hand is partially visible.

| Accession #  | Exam Desc | Exam Date            | Status    |
|--------------|-----------|----------------------|-----------|
| IHE416633.23 | DTI-002   | April 22, 2011 23:55 | FINALIZED |
| IHE416633.24 | MR Knee   | April 24, 2011 04:17 | FINALIZED |

Figure 6-15: Selected Exams in the Cart

Clicking the "Send Cart" button will prompt for creation of an RSNA ID. After creation, the job is put in the queue and the user is prompted to print the RSNA ID for the patient. **Please note that pop-up blockers are popular in modern browsers and an exception will need to be made to allow the PDF printout to appear.**

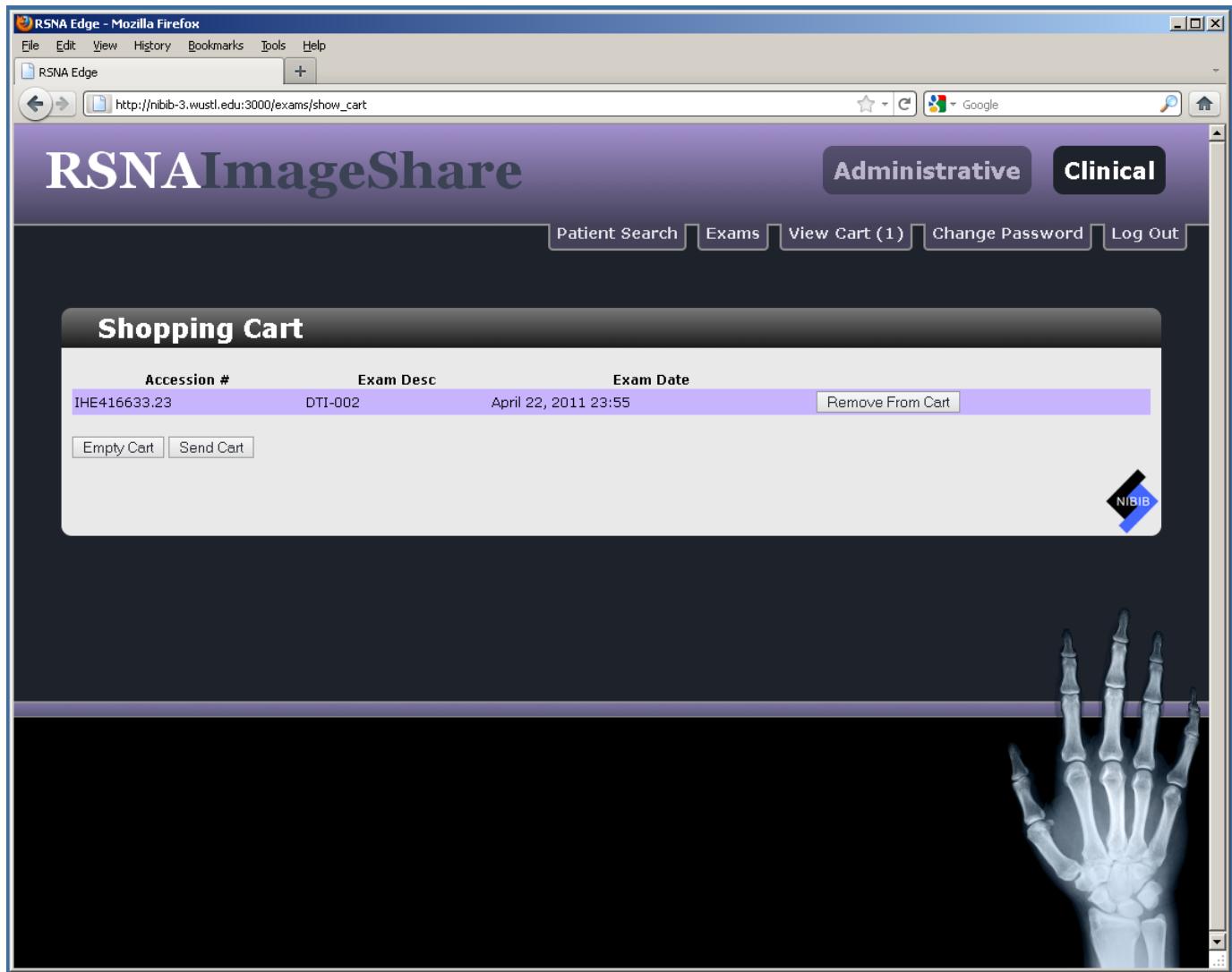


Figure 6-16: Sending Cart

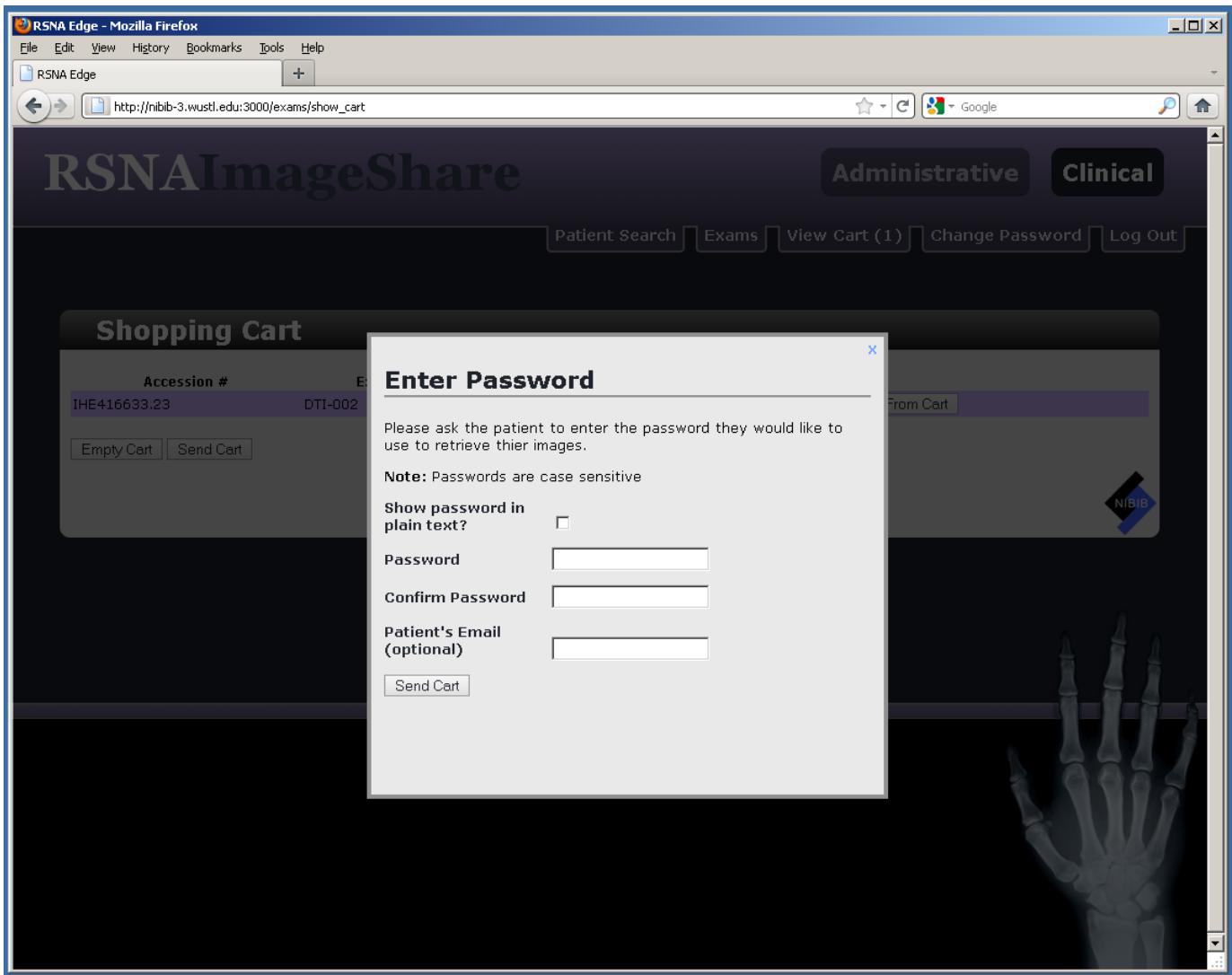


Figure 6-17: Creating the RSNA ID

## Shopping Cart

| Accession # | Exam Desc              |
|-------------|------------------------|
| 7741370     | XR CHEST 2 VIEWS PA\LT |

[Empty Cart](#) [Send Cart](#)

### Send Cart

By choosing this option each exam will be subject to a delay period before it is sent. This gives the doctor a chance to speak with the patient before he or she get the results.

[Send Cart Normally](#)

By choosing this option each exam will be sent as soon as its final report is available. This means that the doctor may not have a chance to speak with the patient before he or she get the results.

[Send Cart with Override](#)[Remove From Cart](#)

**Figure 6-18: Option to override send delay**

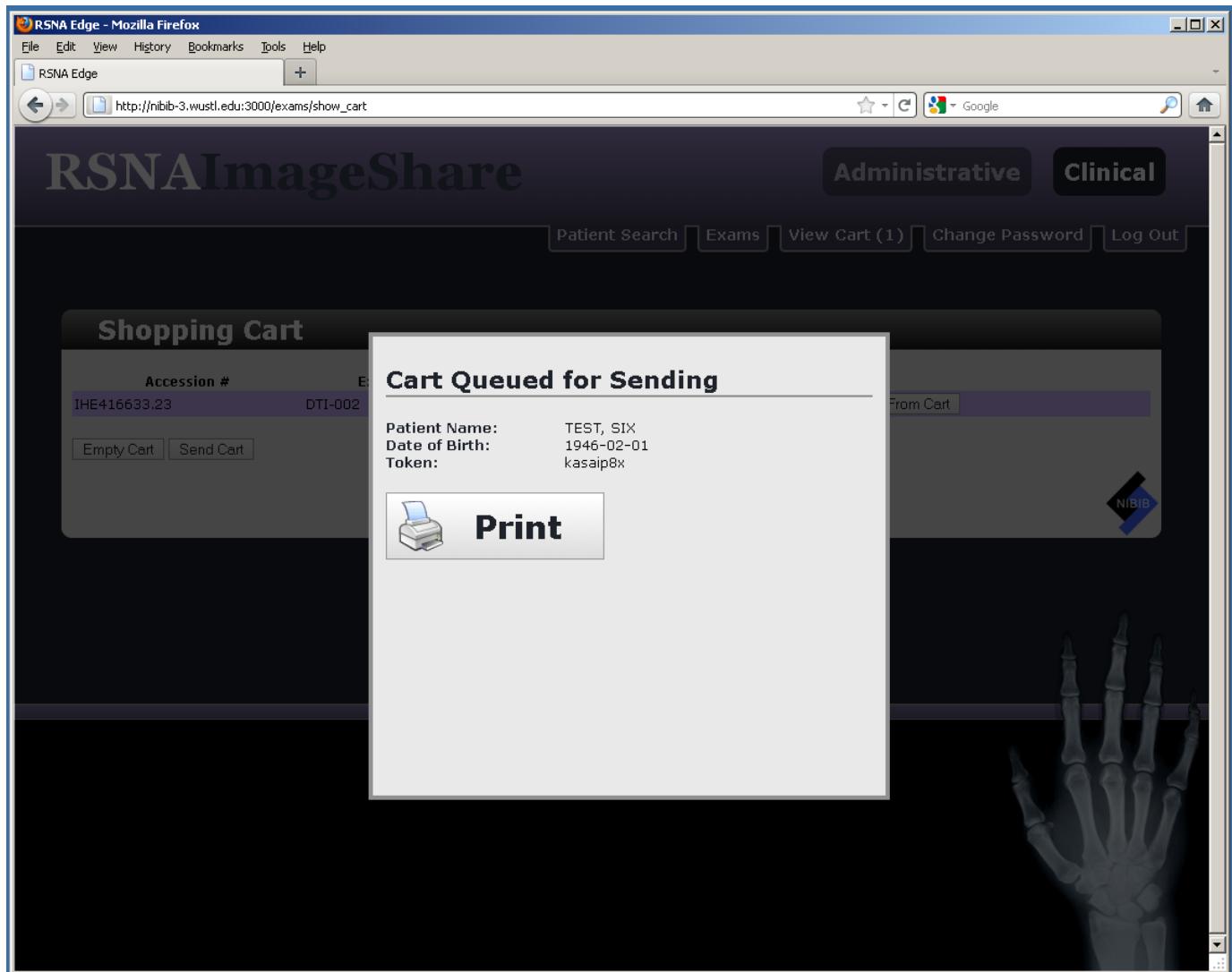


Figure 6-19: Exam Queued to be Sent, Print Dialog Prompt for RSNA ID

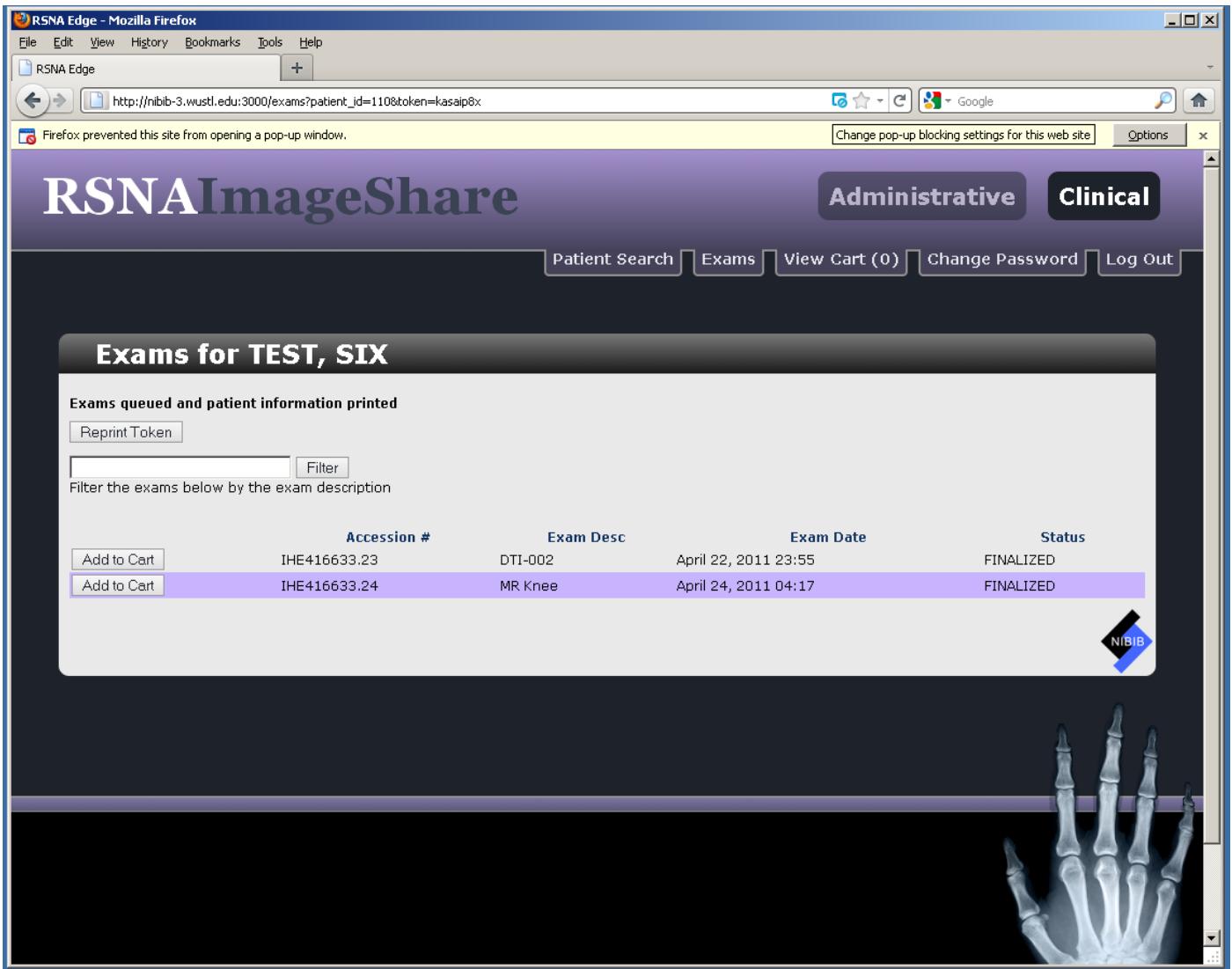
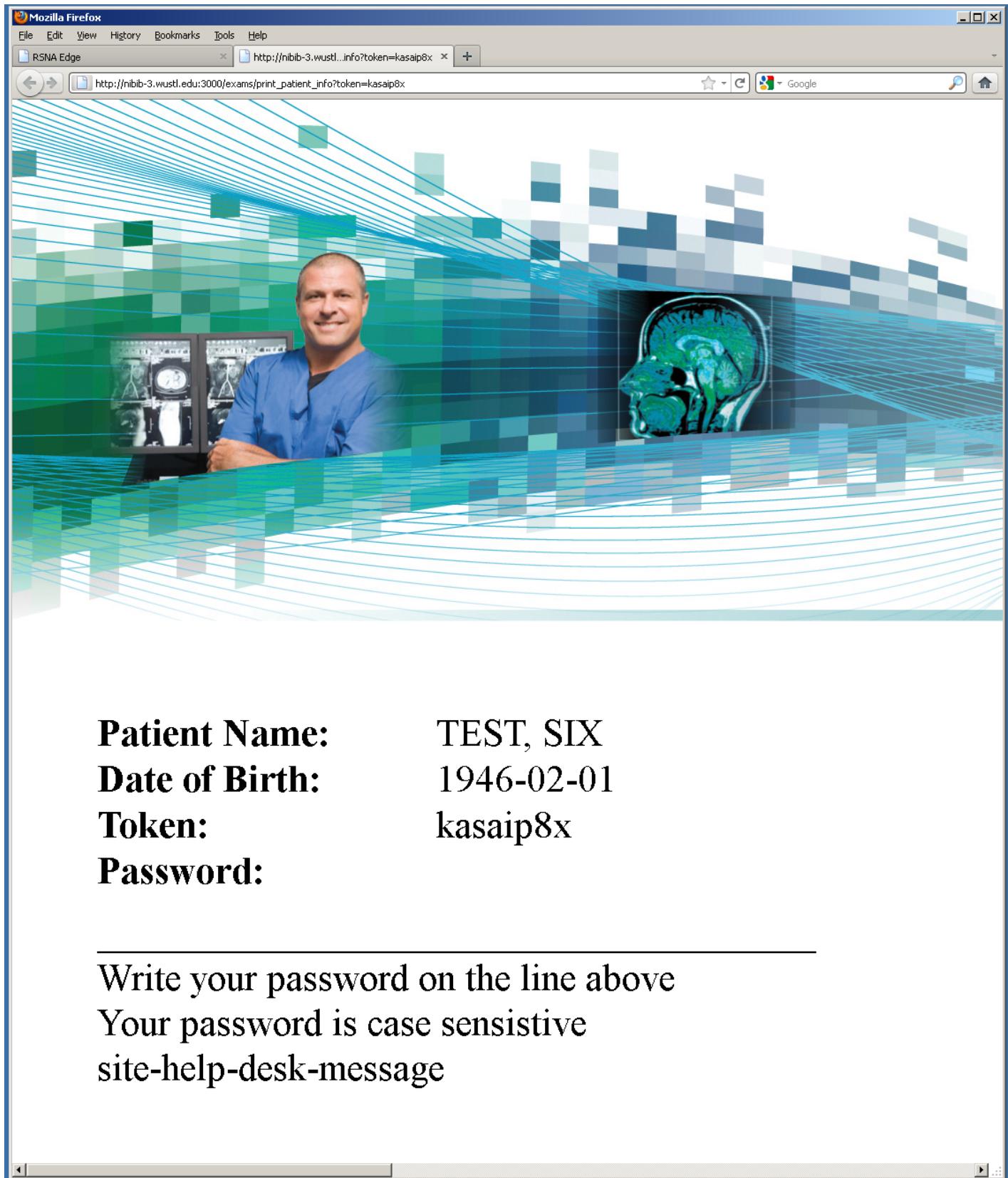


Figure 6-20: Pop-up blockers will prevent the RSNA ID from printing



|                       |            |
|-----------------------|------------|
| <b>Patient Name:</b>  | TEST, SIX  |
| <b>Date of Birth:</b> | 1946-02-01 |
| <b>Token:</b>         | kasaip8x   |
| <b>Password:</b>      |            |

---

Write your password on the line above  
Your password is case sensitive  
site-help-desk-message

Figure 6-21: Sample RSNA ID PDF print out

# 7. Retrieve Content Application

In addition to the preceding software, V2.0 of the RSNA Edge appliance adds a new component to enable retrieval of studies that have been previously sent to the RSNA Clearing House [<https://clearinghouse.lifeimage.com>], enabling transfer of cases from site to site without a patient's Personal Health Record account. This chapter covers this new component.

## 7.1 Installation:

Note: This section assumes a clean V2.0 install, if you are upgrading from V1.1 refer to Appendix C, and then skip to 7.2 for usage instructions.

### 7.1.1 Edge Server:

If you are running the Retrieve Content application from a V2.0 Edgeserver, the application should already be installed.

### 7.1.2 Installing to Another Machine:

On the Edge server web application (see Chapter 6) there is a tab for "Retrieve Content Application". This tab will show a link to download a .zip file containing

- a) RetrieveContent.jar, the lib folder, retrieve-log4j.properties and retrieve-content.properties with application configuration settings
- b) the certificates needed to authenticate to the Clearing House (copies of those used by Edge server)

For convenience, the install instructions are reproduced here:

In order to run this tool, you'll need following setup:

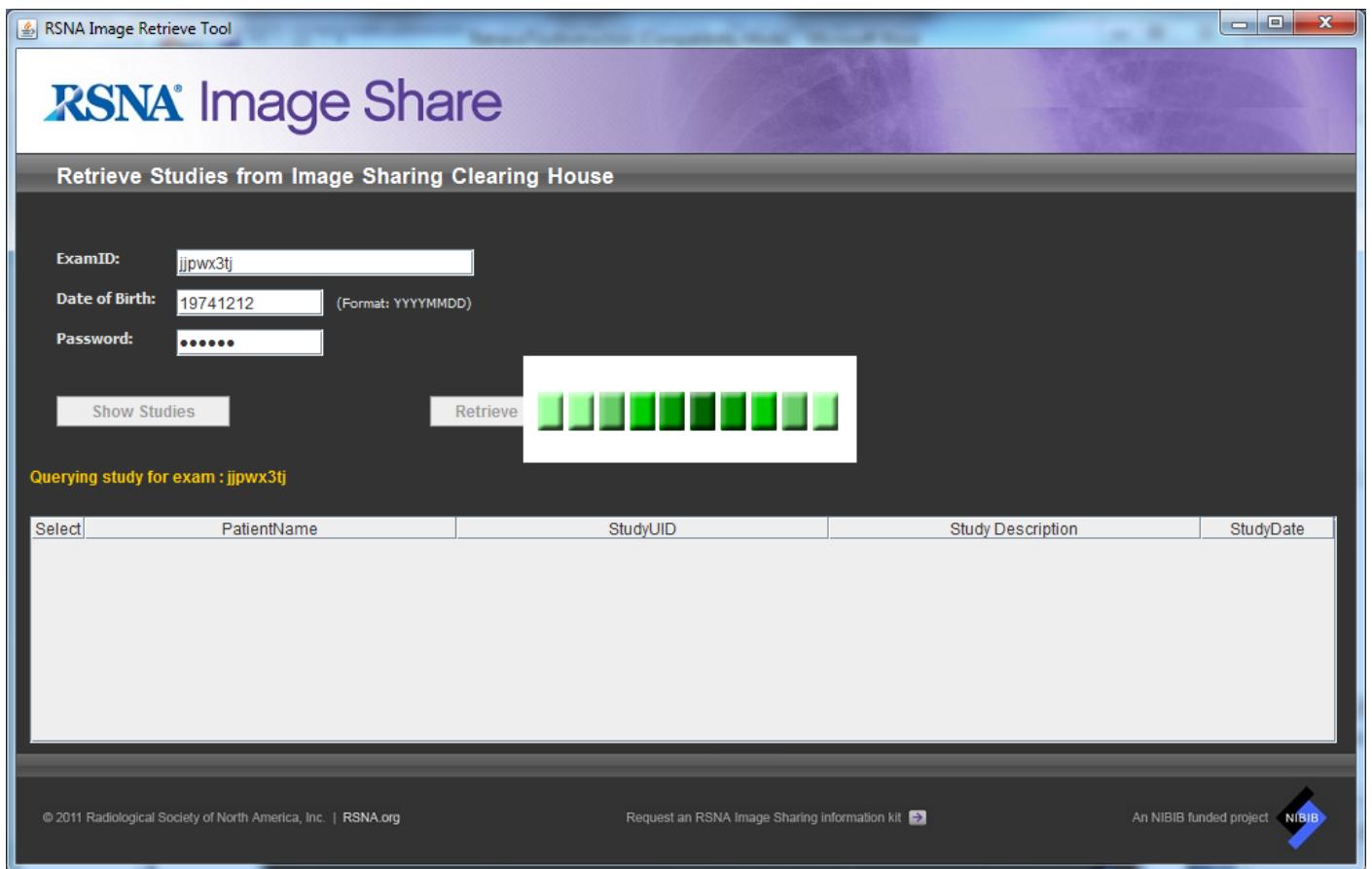
- JRE installed.
- Define and set system environment variable \$RSNA\_ROOT
- Create subfolder /conf under \$RSNA\_ROOT if not exist
- Put lib folder and RetrieveContent.jar under \$RSNA\_ROOT folder
- Put retrieve-content.properties, retrieve-log4j.properties, keystore.jks and truststore.jks under \$RSNA\_ROOT/conf.
- Also verify the log file location in retrieve-log4j.properties which should be under logs folder.
- The user account need writable privilege to \$RSNA\_ROOT folder so that the application can auto create folders that it need during runtime.

## 7.2 Running on Edge Server:

You will start the Retrieve Application from a terminal emulator. You will need to be in the folder where the jar file exists to reference properties files. You also need to make sure you and others can share folders. Use these commands:

```
> cd $RSNA_ROOT
> umask 0
> java -Xmx1024M -jar RetrieveContent.jar
```

When the application starts you should see a window like this.



### Search Studies:

After user inputs the retrieve criteria (the once used patient's ID hash that was written on the paper form created by the Edge Server job creation GUI) and clicks the Show Studies button, the tool will get the KOS and report files from Clearing House and save the retrieved document sets into /usr/local/RetrieveContent/imagedir folder, which location is configured in imageretrieve.properties. You'll notice a subfolder with patient name was created under that folder. **Note: at this point the documents are not in DICOM format.**

### Retrieve Studies:

Then user selects the needed studies and clicks Retrieve Study button. Once images are retrieved, they will be saved in /usr/local/RetrieveContent/imagedir/[patient name]/StudyUID where the StudyUID(s) are the folders corresponding to the studies downloaded for that patient.

Application log file can be found in /usr/local/RetrieveContent/logs.

# 8. Maintenance

## 8.1 Backups:

There are multiple levels of backups. The entire system (i.e. system level backups) or just sub-components (i.e. the MIRTH configuration and database). Taking each in turn:

### 8.1.1 System:

the site can always use any standard backup tools they normally have. Or if there is no preference an excellent free choice is CloneZilla at <http://clonezilla.org/>

### 8.1.2 MIRTH:

To backup Mirth you will need to backup both the Mirth database in PostgreSQL as well as the Mirth installation. To backup the Mirth database, open a command shell within Ubuntu and make a dump of the database by typing the following (these commands will prompt for the mirth database password):

```
pg_dump -h 127.0.0.1 -U mirth -W -C -f mirthdb.sql mirthdb
```

Note: the above syntax creates a .sql file that contains both the database schema and the data. The -C option assures that the .sql file can recreate the named database (as long as a placeholder of the same name exists on PostgreSQL). If one desires only the schema and no data (yet still have creation ability) one can use:

```
pg_dump -h 127.0.0.1 -U mirth -W -C -s -f mirthdb.sql mirthdb
```

To restore the Mirth database to PostgreSQL use the following command:

```
psql -h 127.0.0.1 -U mirth -W -d mirthdb < mirthdb.sql
```

Note: the above command will recreate the named database as long as the database name exists in PostgreSQL (owner Edge)

To backup the Mirth installation, you will need to make a copy of the following directory:

```
/usr/local/edgeserver-1.0-SNAPSHOT/mirth
```

### 8.1.2 RSNA Database:

Within Ubuntu open a command shell. To make a dump of the RSNA database in PostgreSQL type (this command will prompt for the edge database password):

```
> pg_dump -h 127.0.0.1 -U edge -W -C -f rsnadb.sql rsnadb
```

To restore the rsnadb to PostgreSQL use

```
> psql -h 127.0.0.1 -U edge -W -d rsnadb < rsnadb.sql
```

## **8.2 Update/Upgrade**

Not applicable to this release.

## **8.3 Help Desk:**

If at any time you need assistance with the RSNA Edge Appliance feel free to email [helpdesk@imgsharing.org](mailto:helpdesk@imgsharing.org) or call 1-855-IM-SHARING (467-4274).

If you would like to escalate support you may also call (203) 981-0195

# Appendix A. Edge Server Error Codes

The following errors are reported by the RSNA Edge-Server software.

| Code | Description                                    | Explanation                                                                                                                                                                                                                                                                                      |
|------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -20  | Failed to prepare content                      | Indicates a general error with retrieving images and/or reports. Consult the associated stack trace (in the RSNA dbase “transactions” table) for specific error information.                                                                                                                     |
| -21  | Unable to find images                          | Indicates the edge server was unable to find any images under the job’s MRN/acc # combo. Verify that the MRN/acc # combo is correct and that all remote PACS are configured in the devices table (see Figure 6.6)                                                                                |
| -23  | DICOM C-MOVE failed                            | Indicates an error with the C-MOVE operation used to retrieve a job’s images. Possible causes include network or protocol errors. Consult the associated stack trace for more information.                                                                                                       |
| -30  | Failed to transfer to clearinghouse            | Indicates a general error with a job’s submission to the clearinghouse. Consult the associated stack trace for specific error information.                                                                                                                                                       |
| -32  | Failed to generate KOS                         | Indicates an error within the KOS generation process. Possible causes include invalid DICOM objects and disk errors. Consult the associated stack trace for more information.                                                                                                                    |
| -33  | Failed to register patient with clearinghouse. | Indicates an error within the ITI-8 transaction with the clearinghouse. Consult the associated error comment for more information. For assistance with diagnosing the cause, please contact David Wilkins ( <a href="mailto:dwilkins@lifeimage.com">dwilkins@lifeimage.com</a> )                 |
| -34  | Failed to submit documents to clearinghouse    | Indicates an error within the ITI-41 transaction with the clearinghouse. Consult the associated error comment and Appendix B for more information. For assistance with diagnosing the cause, please contact David Wilkins ( <a href="mailto:dwilkins@lifeimage.com">dwilkins@lifeimage.com</a> ) |

# Appendix B. Clearinghouse Error Codes

The following codes are reported by the clearinghouse when there is an error with the ITI-41 transaction. For assistance with diagnosing the cause, please contact David Wilkins ([dwilkins@lifeimage.com](mailto:dwilkins@lifeimage.com)).

## 1. Registry Error Codes

| Code      | Description                                                                          |
|-----------|--------------------------------------------------------------------------------------|
| E01000001 | The XDS Registry does not support action or transaction                              |
| E01000002 | The Patient Global ID cannot be found in the XDS Metadata.                           |
| E01000003 | The Patient Global ID is not registered in XDS registry.                             |
| E01000004 | Database access error                                                                |
| E01000005 | The slot parameter of this method must not be null.                                  |
| E01000006 | The ValueList of slot must not be null.                                              |
| E01000007 | The Values of slot must not be null.                                                 |
| E01000008 | The ValueList size must not be zero                                                  |
| E01000009 | The StoredQuery with multiple parameters must start with "(" and end with ")" .      |
| E01000010 | The StoredQuery with string parameters must start with ' and end with '.             |
| E01000011 | The StoredQuery parameter of type "string" must start with the '!                    |
| E01000012 | The StoredQuery parameter of type "string" must end with the '!                      |
| E01000013 | The StoredQuery Slot valueList must not be null.                                     |
| E01000014 | The StoredQuery Slot valueList values must not be null.                              |
| E01000015 | The StoredQuery Slot valueList values must not be null.                              |
| E01000016 | The AdhocQueryRequest must not be NULL.                                              |
| E01000017 | The AdhocQuery element of the AdhocQueryRequest must not be NULL.                    |
| E01000018 | The ID attribute of the AdhocQuery element must not be NULL.                         |
| E01000020 | The DocumentEntry metadata should not be null.                                       |
| E01000021 | This ExtrinsicObjectType provided in the metadata is not identified to DocumentEntry |
| E01000022 | The ExtrinsicObject ID must not be null.                                             |
| E01000023 | The ExtrinsicObject status must not be null.                                         |
| E01000024 | The DocumentEntry must be of a valid ExtrinsicObject type.                           |
| E01000025 | The docData of DocumentEntryExtractor must not be null.                              |
| E01000026 | If authorPerson Info is provided then the value should not be null.                  |
| E01000027 | If authorPerson Info is provided then there should only be one attribute value.      |
| E01000028 | The Slot name should not be null.                                                    |
| E01000029 | The Slot name should not be blank.                                                   |
| E01000030 | The creationTime Slot ValueList should not be null.                                  |
| E01000031 | The creationTime Slot Value Elements should not be null.                             |
| E01000032 | The creationTime Slot Value Elements must not be less than one value.                |
| E01000033 | The creationTime Slot Value Elements must not be more than one value.                |
| E01000034 | The creationTime Slot Value must not be the right format.                            |
| E01000035 | The serviceStartTime Slot ValueList should not be null.                              |
| E01000036 | The serviceStartTime Slot Value Elements should not be null.                         |
| E01000037 | The serviceStartTime Slot Value Elements must not be less than one value.            |
| E01000038 | The serviceStartTime Slot Value Elements must not be more than one value.            |

|           |                                                                                 |
|-----------|---------------------------------------------------------------------------------|
| E01000039 | The serviceStartTime Slot Value must not be the right format.                   |
| E01000040 | The serviceStopTime Slot ValueList should not be null.                          |
| E01000041 | The serviceStopTime Slot Value Elements should not be null.                     |
| E01000042 | The serviceStopTime Slot Value Elements must not be less than one value.        |
| E01000043 | The serviceStopTime Slot Value Elements must not be more than one value.        |
| E01000044 | The serviceStopTime Slot Value must not be the right format.                    |
| E01000045 | The sourcePatientInfo Slot ValueList should not be null.                        |
| E01000046 | The sourcePatientInfo Slot Value Elements should not be null.                   |
| E01000047 | The metadata of document entry must not be null.                                |
| E01000048 | The Folder metadata should not be null.                                         |
| E01000049 | The Folder status should not be null.                                           |
| E01000050 | The registryObject is not identified to the folder                              |
| E01000051 | The Folder metadata must not be null.                                           |
| E01000052 | The SubmitObjectsRequest to extractMetadata must not be null.                   |
| E01000053 | Submit objects list must not be null.                                           |
| E01000055 | The ObjectType Attribute of the ExtrinsicObjectType should not be null.         |
| E01000057 | The Patient Global Id is not consistent in the Submit metadata.                 |
| E01000058 | The ObjectType Attribute of the ExtrinsicObjectType should be the correct value |
| E01000059 | The ID Attribute of the RegistryPackageType should not be null.                 |
| E01000060 | The XDS.b Registry does not support the ObjectType in the SubmitObjectsRequest. |
| E01000061 | The Classification object must be provided to classify the SubmissionSet        |
| E01000063 | The Classification object must be provided to classify the Folder               |
| E01000065 | The patient info must be provided in the Metadata.                              |
| E01000066 | The Patient Global ID is not provided                                           |
| E01000067 | This RegistryPackageType should not be null.                                    |
| E01000068 | The SubmissionSet ID should not be null.                                        |
| E01000069 | The SubmissionSet status should not be null.                                    |
| E01000070 | This object is not a RegistryPackageType.                                       |
| E01000071 | The submissionset metadata must not be null.                                    |
| E01000072 | The submissionTime Slot ValueList should not be null.                           |
| E01000073 | The submissionTime Slot Value Elements should not be null.                      |
| E01000074 | There must be at least one value in the submissionTime Slot Value Elements      |
| E01000077 | The submissionTime Slot Value is the incorrect format                           |
| E01000078 | The metadata for the submissionset does not comply with the IHE xds.b profile.  |
| E01000079 | The old Patient ID must not be null.                                            |
| E01000080 | The new Patient ID must not be null.                                            |
| E01000081 | The existing Patient ID not exist when updating the Patient ID                  |
| E01000082 | An exception when fetching the new Patient ID from ResultSet encounter          |
| E01000083 | An exception when querying for the new Patient ID                               |
| E01000086 | The old Patient ID not exist.                                                   |
| E01000105 | The UUID is unknown                                                             |

## 2. Repository Error Codes

| Code      | Description                            |
|-----------|----------------------------------------|
| E02000003 | Submission set meta data is incorrect. |

|           |                                                                                            |
|-----------|--------------------------------------------------------------------------------------------|
| E02000004 | The SubmissionSet UniqueId is not provided                                                 |
| E02000005 | The DocumentEntry UniqueId is not provided                                                 |
| E02000006 | The Folder UniqueId is not unique!                                                         |
| E02000007 | Database Connection Encountered Error – When submitting documents.                         |
| E02000010 | Database Connection Encountered Error – When fetching the repository UniqueId              |
| E02000013 | Database Connection Encountered Error - When fetching document content from the database   |
| E02000014 | Database Connection Encountered Error - When fetching documents                            |
| E02000015 | The DocumentEntry metadata is null.                                                        |
| E02000016 | This ExtrinsicObjectType is not a valid DocumentEntry.                                     |
| E02000017 | The ExtrinsicObject ID is null.                                                            |
| E02000018 | The ExtrinsicObject type is null.                                                          |
| E02000019 | This RegistryPackageType is null.                                                          |
| E02000020 | The SubmissionSet ID is null.                                                              |
| E02000021 | SubmitObjectsRequest in ProvideAndRegisterDocumentSetRequest is null                       |
| E02000022 | The Document Element SubmitObjectsRequest in ProvideAndRegisterDocumentSetRequest is null. |
| E02000024 | RegistryObjectList in SubmitObjectsRequest is null                                         |
| E02000025 | The Document Element RegistryObjectList in SubmitObjectsRequest is null.                   |

# Appendix C: Manually upgrading from Version 1.1 to 2.0

Assumptions: There is no change in the database schema. The only objectives are to

- a) update the send\_content and prep\_content apps
- b) install the retrieve\_content app
- c) update the web GUI

After completing the following steps, you may jump back to Chapters 6 and 7 to learn about the new features in this release.

## a) Updating prep-content and transfer-content apps

- Login to the edge server as root and open a terminal window.
- Make sure all the services are shutdown by running:
  - /etc/init.d/edge-server stop
- Create a directory under /usr/local called upgrade-2.0 by running:
  - mkdir /usr/local/upgrade-2.0
- Download the app-upgrade.zip archive from [ftp://ftp.ihe.net/image\\_sharing/1.1\\_to\\_2.0\\_upgrade](ftp://ftp.ihe.net/image_sharing/1.1_to_2.0_upgrade) to the /usr/local/upgrade-2.0 directory.
- Unzip the archive by running the following commands:
  - cd /usr/local/upgrade-2.0
  - unzip app-upgrade.zip
- In the /usr/local/upgrade-2.0 you should see a folder called ext and two jar files: *prep-content-2.0.0.jar* and *transfer-content-2.0.0.jar*
- Backup the existing v1.1 apps using the following commands:
  - cd /usr/local/upgrade-2.0
  - mv \$RSNA\_ROOT/prep-content-1.2.3-SNAPSHOT.jar prep-content-1.2.3-SNAPSHOT.jar.backup
  - mv \$RSNA\_ROOT/transfer-content-1.2.2.jar transfer-content-1.2.2.jar.backup
  - mv \$RSNA\_ROOT/ext ext-backup
- Switch to the edge user by running:
  - su edge
- Copy the v2.0 apps to the \$RSNA\_ROOT directory using the following commands:
  - cd /usr/local/upgrade-2.0
  - cp prep-content-2.0.0.jar \$RSNA\_ROOT/prep-content-2.0.0.jar
  - cp transfer-content-2.0.0.jar \$RSNA\_ROOT/transfer-content-2.0.0.jar
  - cp -r ext \$RSNA\_ROOT/ext
- You can delete the /usr/local/upgrade-2.0 directory after you have completed the all upgrade steps and verified the edge server is functional (see “Normal Usage” section of Chapter 6).

## b) Installing Retrieve Content App

V2.0 of the RSNA Edge appliance adds a new component to enable retrieval of studies that have been previously sent to the RSNA Clearing House [<https://clearinghouse.lifeimage.com>], enabling transfer of cases from site to site without using a patient's Personal Health Record account. This chapter covers this new component and it's manual installation on a RSNA V1.1 Edge Server. Chapter 7 describes use.

### - Installation:

- As root, edit the file **/etc/environment**. Add an entry to define the variable RSNA\_ROOT. It should point to the folder that has the installation of the Edge Server software.
- As the root user, download RetrieveContentInstall.zip from [ftp://ftp.ihe.net/image\\_sharing/1.1\\_to\\_2.0\\_upgrade](ftp://ftp.ihe.net/image_sharing/1.1_to_2.0_upgrade) to the /usr/local/upgrade-2.0 directory.
- Switch to the edge user by running:
  - su - edge
- Unzip the archive by running the following commands:
  - cd \$RSNA\_ROOT
  - unzip /usr/local/upgrade-2.0/RetrieveContentInstall.zip
- You will see following contents in \$RSNA\_ROOT folder:
  - RetrieveContent.jar
  - sub folder lib
  - retrieve-content.properties
  - retrieve-log4j.properties
- Move property files to conf folder by running the following commands:
  - mv retrieve-content.properties conf/retrieve-content.properties
  - mv retrieve-log4j.properties conf/retrieve-log4j.properties
- Create folders needed by the application and change folder settings to allow different users to have access. Execute these commands:
  - mkdir images temp report
  - chmod 1777 logs images temp report

## c) Updating the Web GUI

### - Installation:

- As the root user, download token-app-2.0.war from [ftp://ftp.ihe.net/image\\_sharing/1.1\\_to\\_2.0\\_upgrade](ftp://ftp.ihe.net/image_sharing/1.1_to_2.0_upgrade) to the /usr/local/upgrade-2.0 directory.
- Switch to the edge user by running:
  - su - edge
- Backup the existing 1.1 token app:

```
$ cp $RSNA_ROOT/token-app.war $RSNA_ROOT/token-app.war-backup_1.1
```

- Replace \$RSNA\_ROOT/token-app.war:

```
$ cp /usr/local/upgrade-2.0/token-app-2.0.war $RSNA_ROOT/token-app.war
```

- Restart the edge-server services (as root, not edge)

- /etc/init.d/edge-server start
- Redeploy the token app using the Glassfish control panel:
  - Point your browser to <http://localhost:4848>
  - Click “List Deployed Applications” under Deployment
  - Click “Redeploy” under the “Action” column on the token-app row
  - Select “Packaged File to Be Uploaded to the Server” and browse to select \$RSNA\_ROOT/token-app-2.0.war
  - Click “OK” in the upper-right corner
  - Click “token-app” and confirm that Context Root value is set to / (it may have defaulted to /token-app)

#### - Database Configuration:

Moving forward, newly created token-app logins are being forced to lowercase. Previously existing logins must be set manually to lowercase. As user edge, connect to the rsnadb database:

```
$ psql -h 127.0.0.1 rsnadb
```

Run the following query at the psql prompt:

```
rsnadb=> update users set user_login = lower(user_login);
```

# Appendix D: Unix Hints

## Unix Shell

This is taken directly from Wikipedia ([http://en.wikipedia.org/wiki/Unix\\_shell](http://en.wikipedia.org/wiki/Unix_shell)). It is a reasonable introduction:

The most generic sense of the term *shell* means any program that users employ to type commands. A shell hides the details of the underlying operating system with the shell interface and manages the technical details of the operating system *kernel* interface, which is the lowest-level, or ‘inner-most’ component of most operating systems. In Unix-like operating systems users typically have many choices of command-line interpreters for interactive sessions. When a user logs in to the system, a shell program is automatically executed. The login shell may be customized for each user. In addition, a user is typically allowed to execute another shell program interactively.

The Unix shell was unusual when it was introduced. It is both an interactive *command language* as well as a *scripting programming language*, and is used by the operating system as the facility to control (*shell script*) the execution of the system. Shells created for other *operating systems* than Unix, often provide similar functionality.

On systems with a *windowing system*, some users may never use the shell directly. On Unix systems, the shell is still the implementation language of system startup scripts, including the program that starts the windowing system, the programs that facilitate access to the *Internet*, and many other essential functions.

Graphical user interfaces for Unix, such as *GNOME*, *KDE*, and *Xfce* are often called *visual* or *graphical* shells.

## Root or Administrative Account

Linux (and Unix) systems are designed with an administrative account known as *root*. The account name is literally *root*, and the password will be under your control. When you login with this account, you will have system / administrative privileges.

Linux users will say or write “become root”; by this they mean to login as root or to assume the role of root. There are several ways to assume this role from a terminal emulator if you are logged in with a normal Linux account:

```
su - root
```

The *su* command will invoke a shell with a different user ID. You want to type the command as typed (*su <dash> root*). You will be prompted for the password of the root account. You can also assume other roles by using a different account name.

```
sudo "command"
```

The *sudo* command allows you to execute a command as another user. In the default mode, that other user is the root account. You will be prompted for your password, not the password of the other account. This is a way to give users administrative privileges without giving them the password of the root account. In order for this to work, the administrator must add your account to a list of trusted accounts in the file */etc/sudoers*.