VistA Imaging DICOM Gateway
Installation Guide

July 2023 – Revision 35
Department of Veterans Affairs

Office of Information and Technology (OIT)

DICOM Gateway Installation Guide

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VistA Imaging Product Development
Department of Veterans Affairs

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Revision History

14 July 2023	Applied changes to IRISHealth Installation instructions
	Updated Installation section for MAG*3.0*319, and replaced Cache`2014 with IRIS
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	MAG*3.0*218
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	B.4.7.2.1 Adding the Consult to the file C.1 Overview C.2 IP Addresses and Subnet Masks C.2.4 Example 4 - Use Multiple Subnets D.2 IPCONFIG D.3 PING D.5/D.6 NETSTAT/DICOM_Echo D.7 Send_Image G Setting Up the MUMPS-to-MUMPS Broker H.2 TCP/IP Settings I Change Cached Password for Secure Shell
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9 Mar 2000	Original version checked in – REDACTED
30 Aug 2000	Added reviewer comments from Amy Padgett –REDACTED
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Preface

This guide is written to assist in the installation of the VistA Imaging DICOM Gateway. The recommended background of those installing this software includes knowledge of Windows and network component installation.

This guide also provides configuration specifications needed by the commercial DICOM vendors to properly interface their equipment to VistA.

1. Introduction

1.1   Overview

DICOM is an acronym for **D**igital **I**maging and **C**ommunications in **M**edicine standard. DICOM brings open systems technology to the medical imaging marketplace and enables VistA to communicate directly with commercial medical imaging equipment.

DICOM is a set of networked client/server applications that are implemented on top of TCP/IP. DICOM is part of the VistA networked application suite, along with CPRS, JLV, Kernel Broker, MS Exchange, and Windows file servers. Similar networking techniques are used for installing and maintaining these applications.

The VistA Imaging DICOM Gateway is a suite of VA-developed software that facilitates the transmission of DICOM images between the image acquisition modalities and the equipment on which these images are permanently stored. The images and information about them are stored in the VistA database as a part of the patient record. Once images have been stored in the system, they are available for viewing from any VistA clinical or diagnostic workstation.

The software in the VistA Imaging DICOM Gateway is intended to run on one or more servers (per site) that are loosely coupled with the VistA Hospital Information System (HIS).

The gateway has two functional areas that process imaging service requests: the Legacy DICOM Gateway (LDGW) service and the HDIG service.

The LDGW services are written in MUMPS and runs as a set of tasks within a InterSystems IRIS for Health™ system (IRIS). The interface uses the TCP/IP protocol to communicate with commercial DICOM devices and Windows file servers, and the VistA hospital information system (HIS). To operate the system, the IRIS Server needs to be running first. The various subtasks of the VistA Imaging Legacy DICOM Gateway then run invisibly in the background. The LDGW should be installed on all DICOM Gateways. Depending on the purpose of the gateway, several different configuration options can be used: Text Gateway, an Image Gateway, a Routing Processor, or any combination thereof.

The Hybrid DICOM Image Gateway (HDIG) is the newest component of the DICOM Gateway and enables the storage of the newly supported Service Object Pair (SOP) classes.

1.2   Typical configuration

The diagram below shows the most common configuration of a system in which the VistA Imaging DICOM Gateway is deployed.
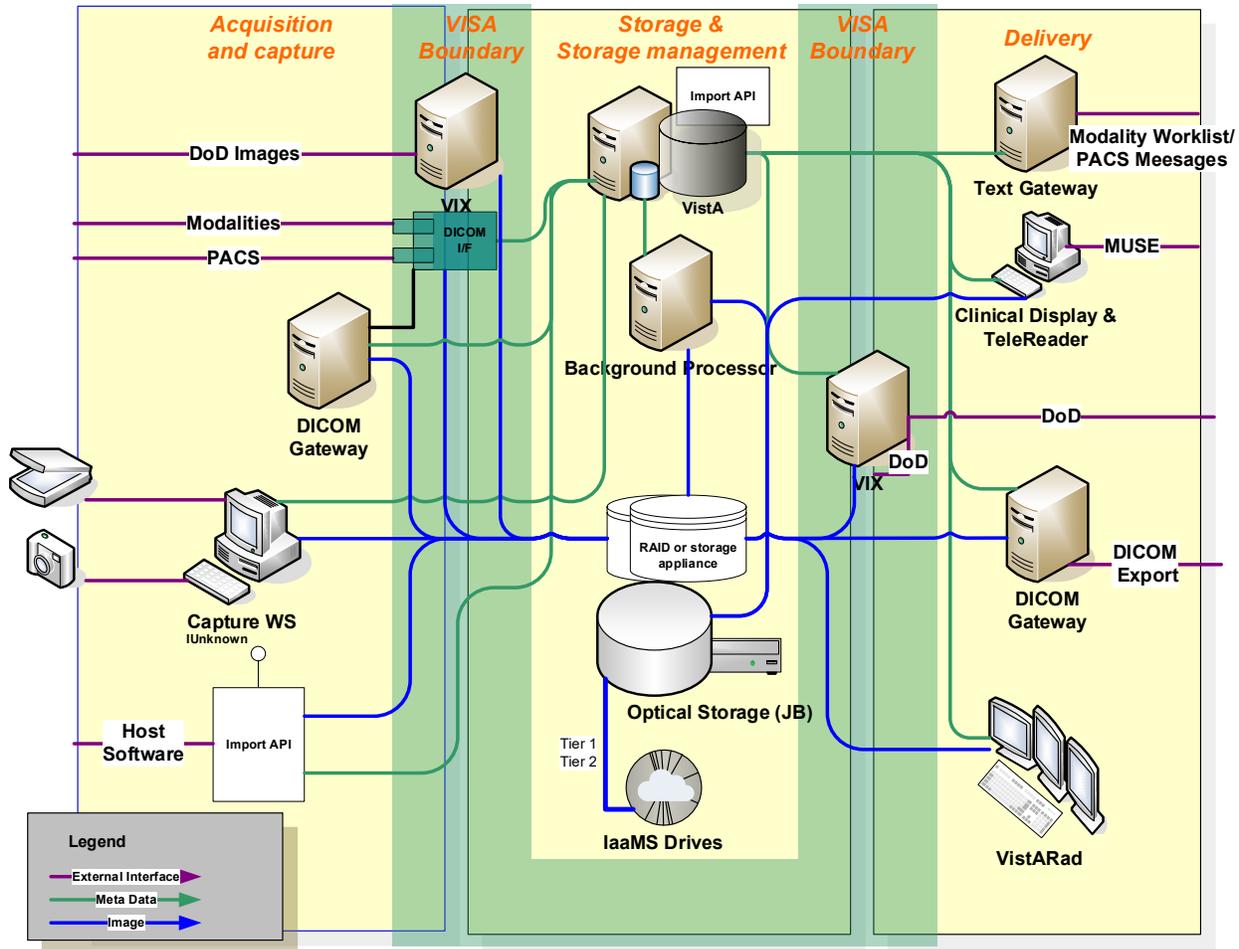
Figure 1 VISA and the DICOM Gateway
(This image is out of date and will be updated with the next patch)

In the previous diagram, each computer has a dedicated function. It is possible to assign any combination of functions to any of these computers.

In theory, one computer could perform all tasks. In practice, however, it is much more efficient to assign specific tasks to specific computers. The typical configuration is one text gateway and one or more image gateways.

No more than one multi-image device (such as a CT or MRI) should be placed on a gateway since every image must go through the IRIS terminal session for processing images on the gateway. In addition to this, other single-image modalities like CR or US can be placed on the same DICOM Gateway.

Note: This document describes the LDGW. All subsequent references to the Image Gateway refer to the Legacy DICOM Gateway and not the Hybrid DICOM Image Gateway (HDIG). For information on the HDIG see the *VistA Imaging Hybrid DICOM Image Gateway (HDIG) Installation Guide* and the *VistA Imaging*

DICOM Gateway User Manual. These documents can be found on the VA Software Document Library (VDL) https://www.va.gov/vdl/application.asp?appid=105.

1.3   Documentation Conventions

The following conventions are used in this manual.

Convention	Description
Bold type	User keyboard entry.
\<Enter>	Return key or Enter key.
\<Control+x>	A keystroke that involves pressing the control-key, keeping it depressed, and then pressing another key.
\<**SHIFT**>	Shift key.
\<**ESC**>	Escape key.
\<**Num Lock**>	Top left key on the numeric keypad (above the 7), may also be labeled Numeric Lock; this makes any keypad key activate the number shown on its surface; it is the equivalent of a SHIFT LOCK for alphabetic keys.

2. Pre-Initialization Instructions

2.1 Hardware and Software Requirements

A site may have one or more servers running the VistA Imaging DICOM Gateway software. It is assumed that a network will be present with sufficient capacity to transport image files in a reasonable amount of time. See *Appendix C* for details about network set-up, which needs to be completed *before* any VistA Imaging DICOM Gateway computer can be installed.

The hardware requirements for each processor are the same.

- The Servers should have enough memory (16+ G RAM) to run the operating system. A 17-inch (or larger) color monitor configured to 1280 x 1024 resolution, and a minimum of 4 virtual processors should be used.

- The DICOM Gateway software from patch MAG*3.0*319 forward is approved to run on Windows Server 2019 based on VA Policies and Procedures at this time.

- Any disks that are permanently mounted on the system must be formatted using the NTFS format (the FAT format is no longer permitted at the VA).

- IRISHealth version 2022.1.0.209.0.21702 or newer

- VA-Mandated, up-to-date, virus protection software. (i.e.: McAfee)

- The installer needs **local administrator privileges** on any machine for the duration of the installation procedure.

It will usually take less than one hour to complete the entire installation process for one server. Configuration and interfacing with DICOM devices will take additional time.

Caution: When performing an installation as an upgrade of the VistA Imaging Legacy DICOM Gateway, review Appendix B.4 for details about master files that may need to be upgraded manually, i.e.: option 4-2-9 Reinitialize All the DICOM Master Files, as a dictionary change might come with the new LDGW patch.

Instructions are provided in Appendix C for setting up the network between the various DICOM related processors and the VistA system.

Instructions for adding a "modality" are described in the .*VistA Imaging DICOM User Manual*

Instructions are provided in Appendix A for creating Terminal sessions to start components of the Gateway software.

2.2 VA Security Policy

VA Security Policy requires that on many computers, specific software be installed to ensure that the machines are running the most up-to-date virus protection software.

While it is acknowledged that any computer that is connected to the network must have adequate virus protection, software must not be installed on a medical device that causes it to reboot while it might be processing essential data. As a result, some software cannot be permitted on any VistA DICOM Gateway. Follow Regional Business Critical Systems policy for obtaining/managing software including McAfee updates and exclusions.

Note: Steps to secure the DICOM Gateway database are outlined in Securing the Gateway and IRIS.

2.3 Sequence of Activities

The correct sequence of activities for most patches is as follows:

1. Perform KIDS install for any Kernel components (e.g., MUMPS-to-MUMPS Broker).

2. Stop all C-Store processes; leave image processing running.

3. If applicable stop HDIG Tomcat Service.

4. Perform KIDS install for Imaging patch on VistA.

5. Perform any updates to user accounts on VistA.

6. Stop all gateway processes.

7. Load Imaging patch on gateways.

8. Configure gateways.

9. Connect to VistA (using MUMPS-to-MUMPS Broker).

10. Test user accounts.

11. Start regular gateway processing.

12. Monitor VistA error trap.

2.4 Master Files and Software Required to Run the DICOM Gateway

Software for the VistA Imaging DICOM Gateway is distributed as a single executable file (named MAG3_0Pnnn_DICOM_SETUP.EXE). This file performs an installation using the tool-set from InstallShield. This file may be downloaded from the VA Software Download server:

https://download.vista.med.va.gov/index.html/SOFTWARE/

When the installation process is completed, all software for the VistA Imaging DICOM Gateway will be installed. When a patch contains components that reside on a DICOM Gateway as well as components that reside inside the VistA Hospital Information System, the distribution will include a VA-Kernel KIDS file, as well as an InstallShield set-up executable.

Note: **It is recommended that users copy the install file to a local hard drive on the machine before starting. (For example: MAG3_0P319_DICOM_SETUP.EXE)**

2.5   System Configuration and Global Placement

Some global variables are local to the DICOM Gateway, while others are maintained on the VistA system. The global variables that reside on the VistA system are:

Name	Initial Size [MB]	Growth
^MAGD	0.1	Does not grow beyond 0.5 MB
^MAGDAUDT	0	1 MB per 250,000 studies
^MAGDHL7	0[1]	Should be purged when size exceeds 5 MB
^MAGDOUTP	0	Does not grow beyond 0.5 MB

^MAGD is for the "DICOM Correct" application and error handling procedures. It contains information about every image file that fails a patient and study lookup on the main system. When manual corrections are made, the entries are deleted from ^MAGD, so it does not continually grow.

^MAGDAUDT counts the number of different types of messages per day, as well as the number of images acquired from each instrument.

^MAGDHL7 contains all the HL7 messages passed from the HIS/RIS to the DICOM Gateway. The data in it can be periodically deleted, so that it will plateau to some maximum size and then be trimmed back.

^MAGDOUTP contains the requests for DICOM Image transmission from VistA to a remote Application Entity. Since the requests are deleted after being satisfied, the global remains very small.

Note: The global variables ^MAGDHL7 and ^MAGDWLST will be created as the system is being used, ^MAGDHL7 on the main VistA System, and ^MAGDWLST on the VistA DICOM Text Gateway System.

2.6   Resources (unique or unusual) Required for Software Product

The VistA Imaging DICOM Gateway will require a high-speed network capability. Storage of acquired images will require a multi-terabyte storage capability. Refer to <u>Appendix C</u> for more information.

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[1] For VistA installations, the data for ^MAGDHL7 accrues as events happen in the system.

2.7 Sizing Considerations

A typical installation uses about 4GB of disk space in the C drive for the IRIS system, and the various supporting files. As images are acquired, disk space will be used temporarily, until the images have been processed by the DICOM Gateway application and moved to their permanent storage. When a site acquires a new modality and images cannot be processed until parameters are set up properly to support that modality, the temporary image storage may grow to several gigabytes.

2.8 Recommendations for Software Installation and Testing

The installation procedure described in the following chapters involves the following steps.

2.8.1 For an "initial" installation

To install the VistA Imaging DICOM Gateway on a new server, perform the following steps:

1. Create a number of files and directories on the target system. (e.g.: C:\DICOM, C:\ C:\InterSystems …etc.)

2. Create a number of processing icons on the target system.

3. Create IRIS environment.

4. Establish master files containing site-specific information on common network share(lists of modalities, instruments, port numbers, and so forth).

5. Load master file information into IRIS database.

6. Create the shortcuts for the various instruments.

7. Establish IRIS logon security.

Most of these steps can be executed in an automated fashion using the scripts from Chapter 3.

2.8.2 Software to be installed in the main VistA System

In addition to software to be installed on the DICOM Gateway server(s), there is also a KIDs file to be installed in the main VistA system. See Appendix I.

3. Installing the VistA Imaging DICOM Gateway

This chapter provides instructions for installing the VistA Imaging Legacy DICOM Gateway (LDGW).

3.1   Prerequisites for Getting Started

1. Fully patched Windows operating system is installed on the target server.

2. Suitable up-to-date virus protection software has been installed and exclusions configured.

3. The VistA Imaging KIDS package must be installed. See the *VistA Imaging Installation Guide* for details.

4. The DICOM Gateway installation MAG3_0Pnnn_DICOM_SETUP.EXE file has been downloaded from the VA SOFTWARE download site

   https://download.vista.med.va.gov/index.html/SOFTWARE/

   and is placed on the local drive of the target server LDGW.

5. Local administrator rights to the target computer (not domain admin user rights).

6. If either the image directory or the master files directory will reside on network drives, these drives should be mapped consistently on the target computer (with the same drive letters). Any existing DICOM\DICT master files should be backed up and saved before the new installation.

3.2   Setting Up the Operating Environment

The following steps will generally make the use of the system easier.

1. Complete the installation of Microsoft Windows as the **local administrator** and not the VHAxxxIA account.

2. Apply the latest approved Service Packs for Microsoft Windows operating system.

3. The system/server should be part of the va.gov domain.

4. When VistA Imaging is first installed, ensure a user account has been added to the master domain (the VISN's domain) named VHAvv\VHAxxxIA, where xxx are the three letters that identify the site and vv is the identification of the VISN (usually two digits). If this user is not yet set up, see the VistA Imaging Installation Guide for details on creating this user.

5. On each gateway/server add the **VHAvv\VHAxxxIA user** to the local **Administrators** group.

6. Configure the Network Interface for TCP/IP. **Do not** use Microsoft's DHCP to assign any addresses. For each system, use a static IP address, a default gateway address, and a subnet mask.

7. Make sure that the DNS information is defined according to the VA's national mandates. Contact your local LAN Administrator with any questions about the settings.

8. If a local Domain Name Server (DNS) system is being used, make sure this local DNS is the first DNS server in the list.

9. From this point forward, login as **VHAvv\VHAxxxIA** to perform the rest of the installation.

10. If any new disk-drives are installed, they must be formatted using the NTFS format.

3.3   Map a Network Drive for Dictionary Files

When only a single computer is to be installed at a site and this computer will perform all DICOM Gateway tasks, this step may be skipped. However, in a networked configuration with multiple DICOM Gateways, it is usually beneficial to use a shared drive to store the dictionary files and master files, so that all processors on the network can share the same resources. This will also make future maintenance a lot easier. In the examples throughout this manual, the assumption is made that the "dictionary drive" is mapped as drive "**F:**".

3.4   Installing the Software

Before you install the DICOM Gateway:

- Check to ensure the logon user (with local admin right) has a
  `...\[Administrator]\Local Settings\Temp` folder. If the Temp folder does not exist, create it, and then ensure that the logon user has all the privileges to access that folder.
- Review the Patch Description for patch-specific instructions.

3.4.1   Installing the DICOM Gateway

Note: The screenshots are provided as a representation and the actual screenshots may show different patch numbers, path locations and other details.

1. If you have not already done so, login as **VHAvv\VHAxxxIA**.
2. Right click `MAG3_0P319_DICOM_setup.exe` to **run as administrator** to start the InstallShield wizard and wait until the installation procedure is extracted. This may take a few minutes.
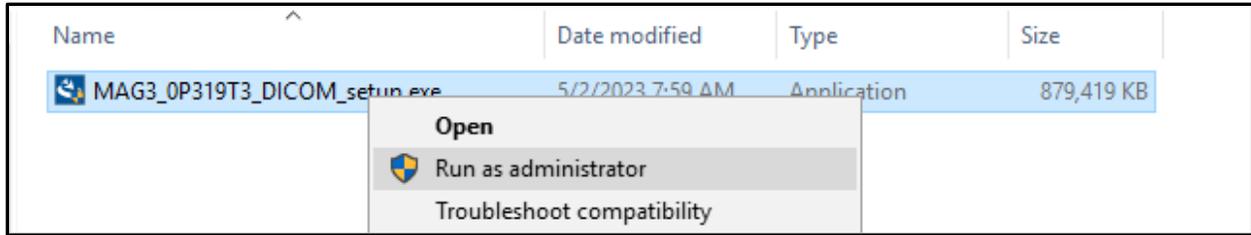
NOTE: Some newer systems may take several minutes and then be presented with this screen:
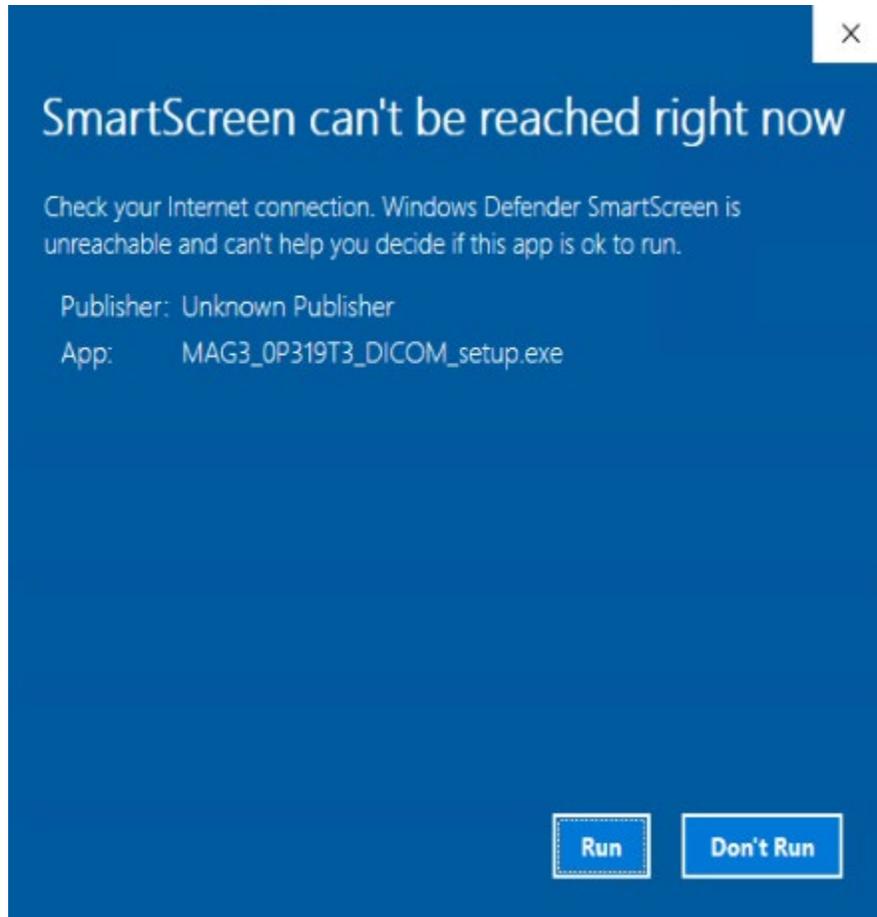
3. When the User Account Control window appears, click **Yes.**
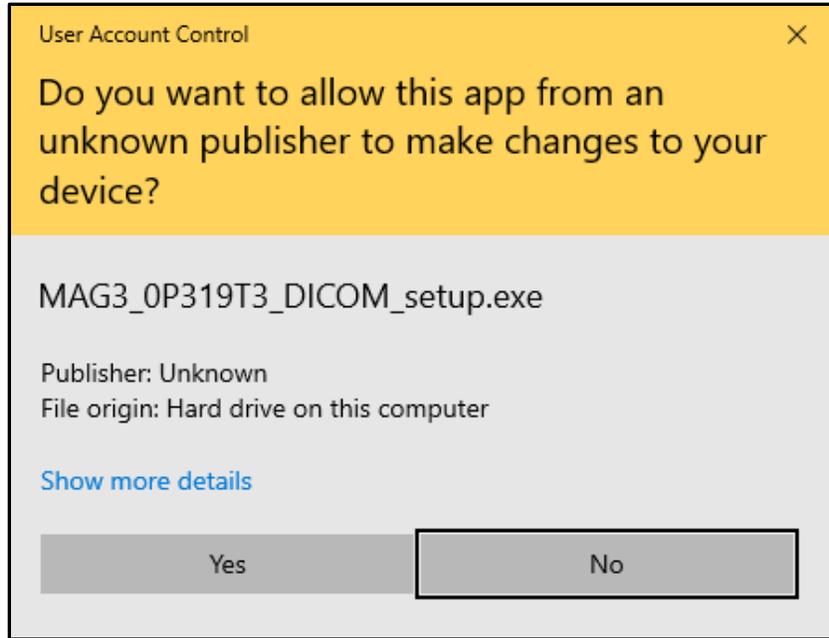
4. A Preparing to Install window will appear. No user action required.
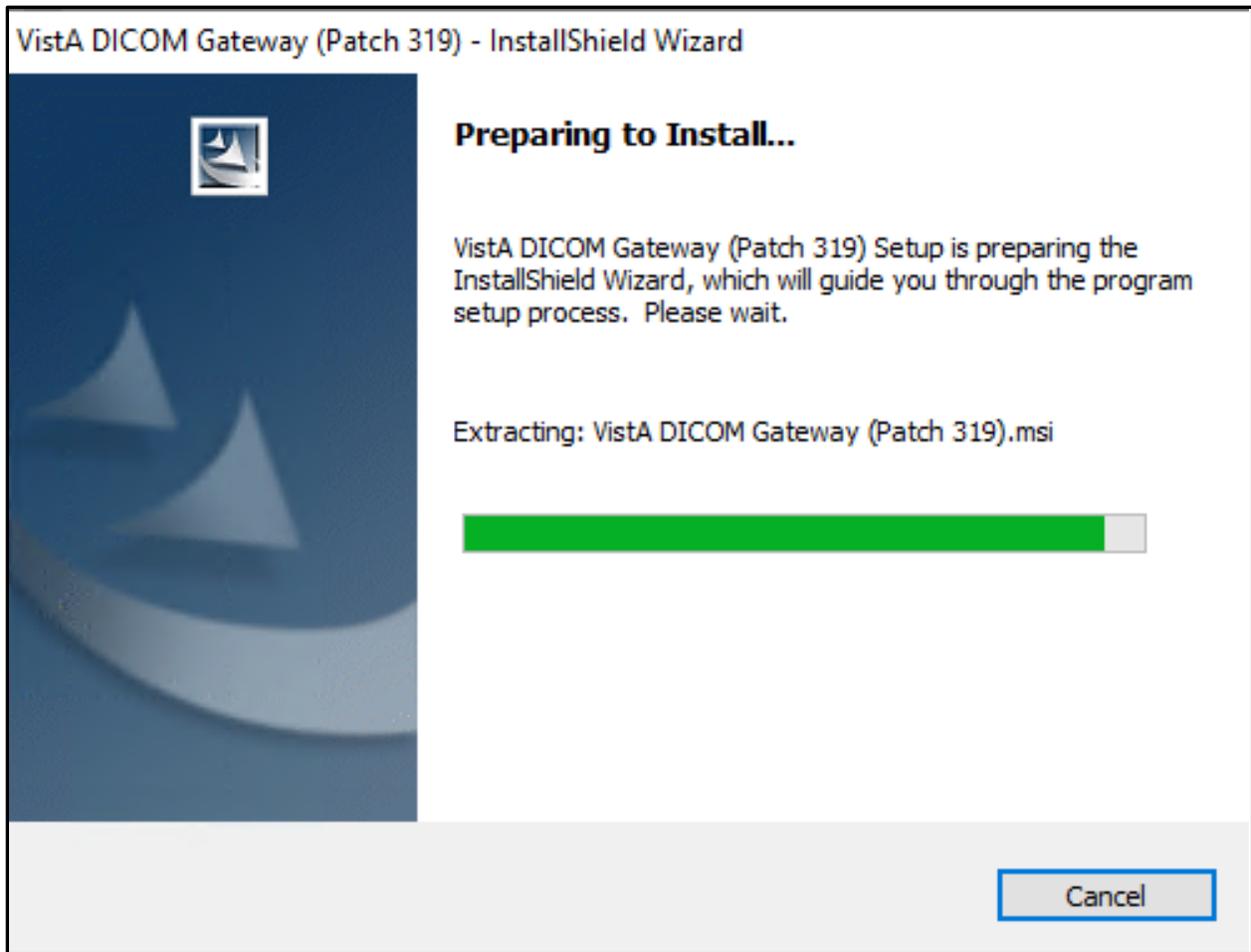
5. When the Text Data Directories dialog box displays, verify that the correct number of Text Data Directories is indicated. Then click **Next.** On systems that are already function as Text Gateways, the proper number of data directories will be detected automatically.
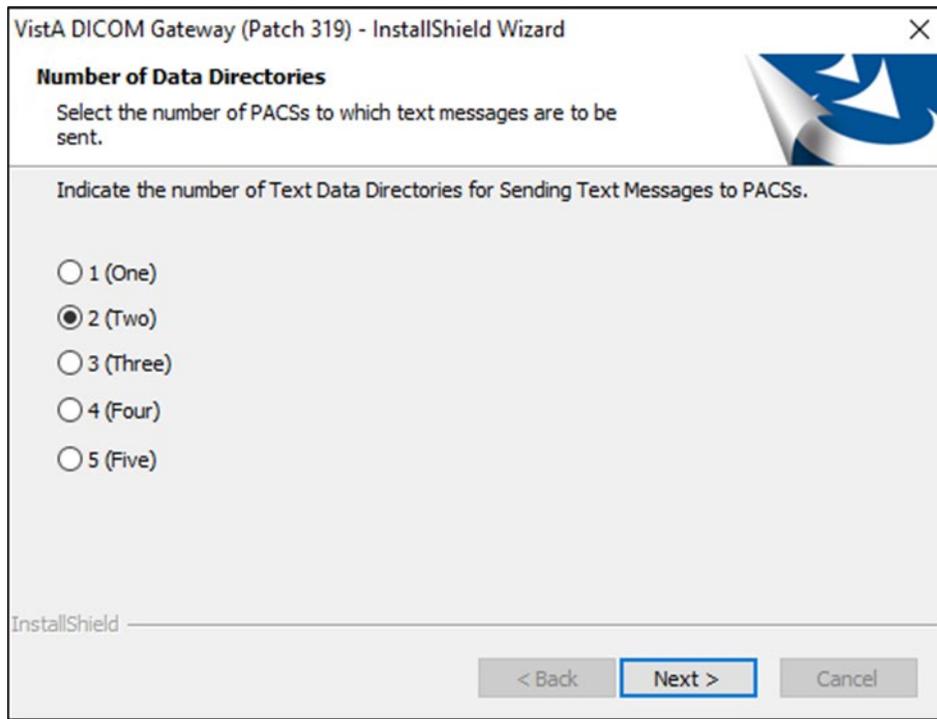
For most other systems, you can use the default number – 2 (Two). (Only one data directory is needed.)

6. The InstallShield Wizard Dialog will open, click **Next**.
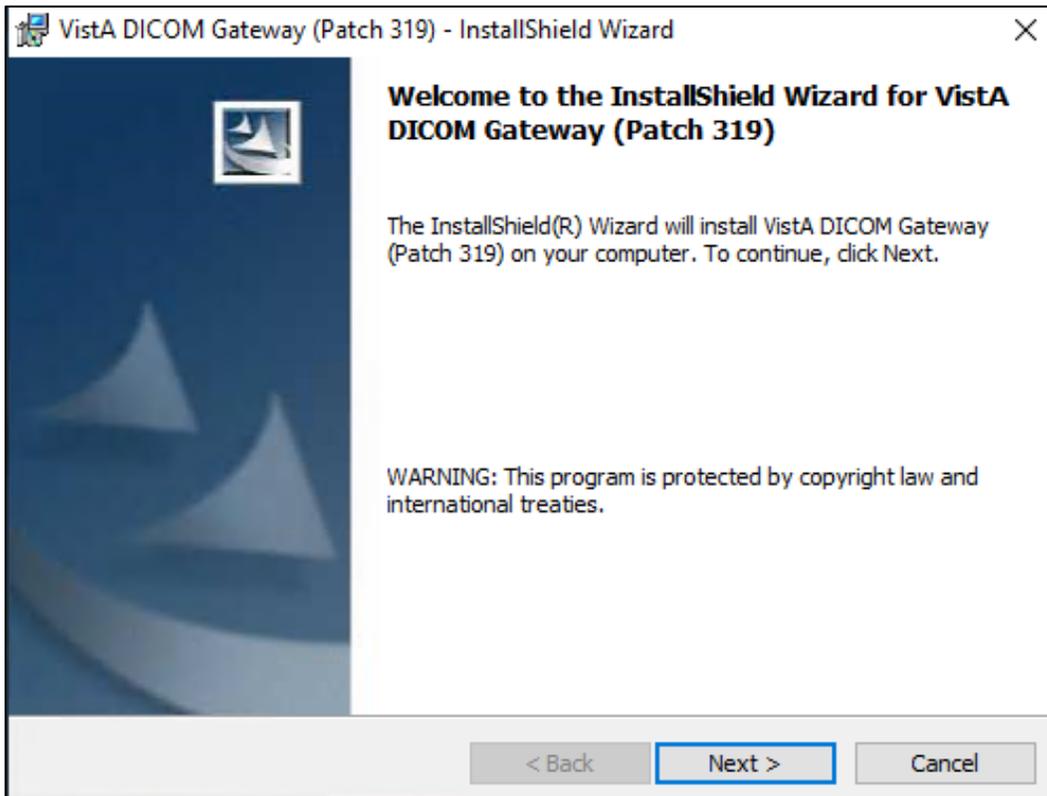
7. In the License Agreement dialog box displays, review the terms of the license agreement, click **I accept the terms of this license agreement**, and then click **Next**.
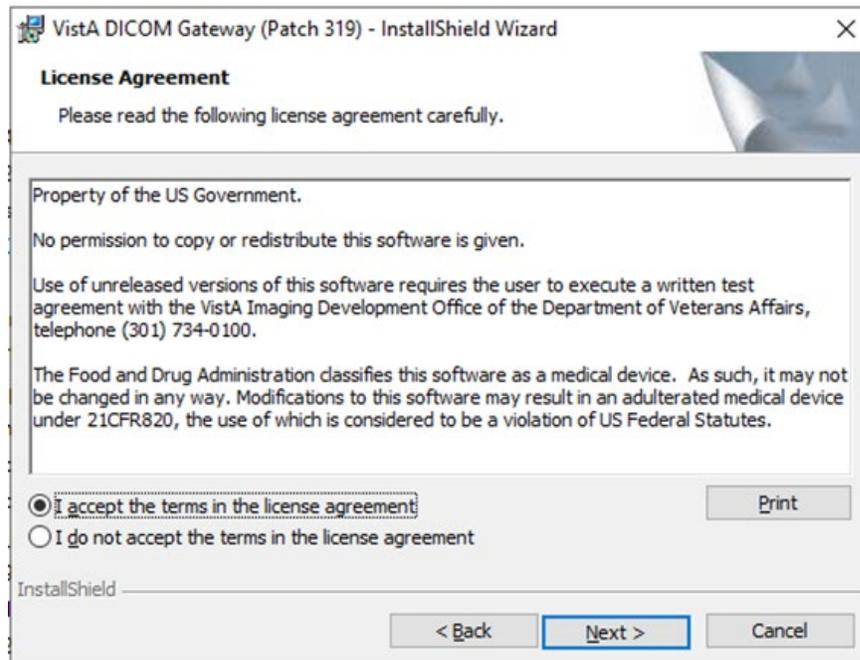
8. Specify the environment which you are installing the DICOM Gateway when prompted by selecting the appropriate agency option: VA (Department of Veterans Affairs) or IHS (Indian Health Services) Click **Next,**
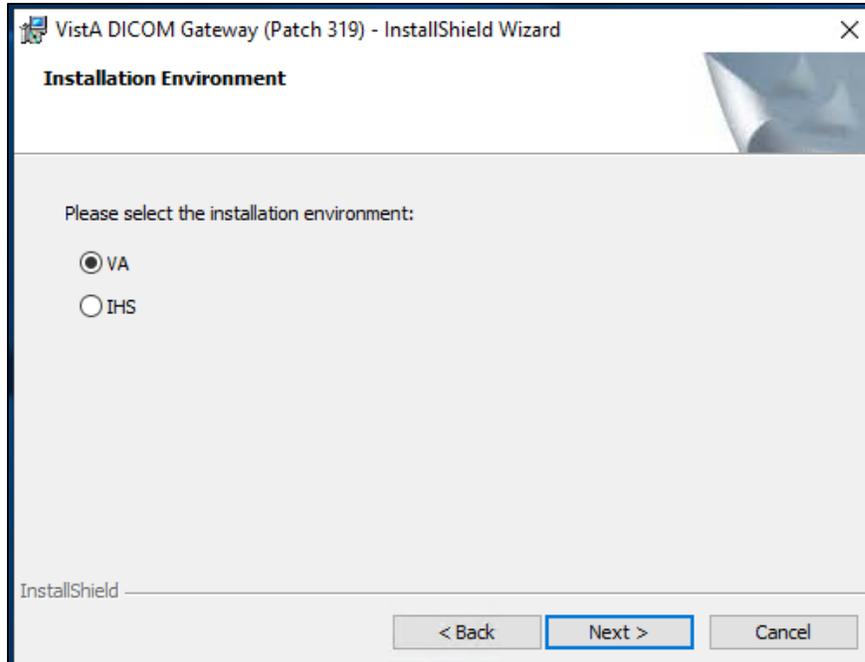
9. When InstallShield prompts you to specify the destination folder (the folder in which the Legacy DICOM Gateway software is installed), make sure that the installation program is pointing to the `c:\` drive (local system drive). The installation will likely fail if you choose an alternate path Click **Next.**
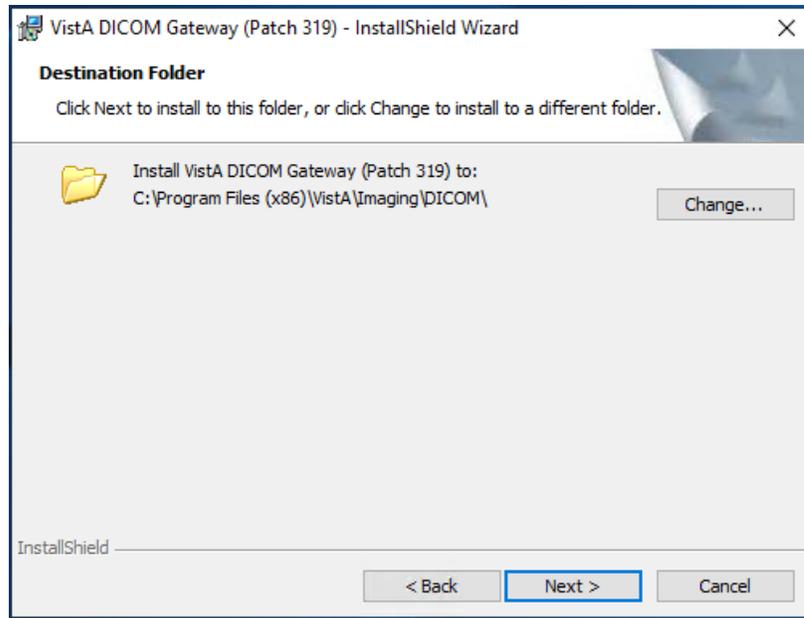
10. Choose either **Custom** or **Complete** setup, depending on your needs. If dictionary files already exist on a shared drive, chose **Custom.** Then, click **Next**.
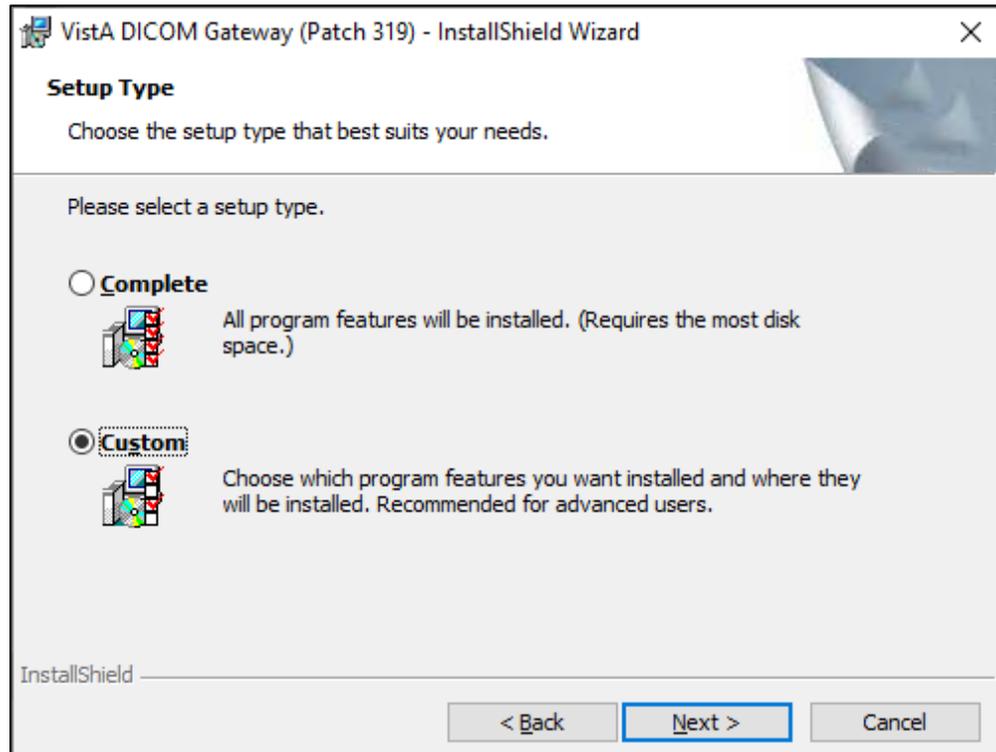
a. The **Custom** setup allows you to change the default location of the folders for the images (`Image_Data`) and the dictionary files (`DICOM_Dictionaries`). This is convenient if you want the images to be stored on a different drive (not the default, which is `C`). You must use the **Custom** option if you want the dictionary files to be installed on a network drive. If you choose **Custom**, continue with step c.

b. If you choose the **Complete** setup, you will not be able to **change** the default location (`C:\DICOM\`) for the folders for the images and the dictionary files. If you choose **Complete**, continue with step 13.

   If you selected the Custom setup type, the Custom Setup dialog box displays.

c. In the **Custom** Setup dialog box, click the item (not the icon, but the actual item name) in the list and verify that the **Install To** area shows the correct folder for the installation.

   For the Image_Data and DCF Runtime items, the location of these directories should NOT be changed.
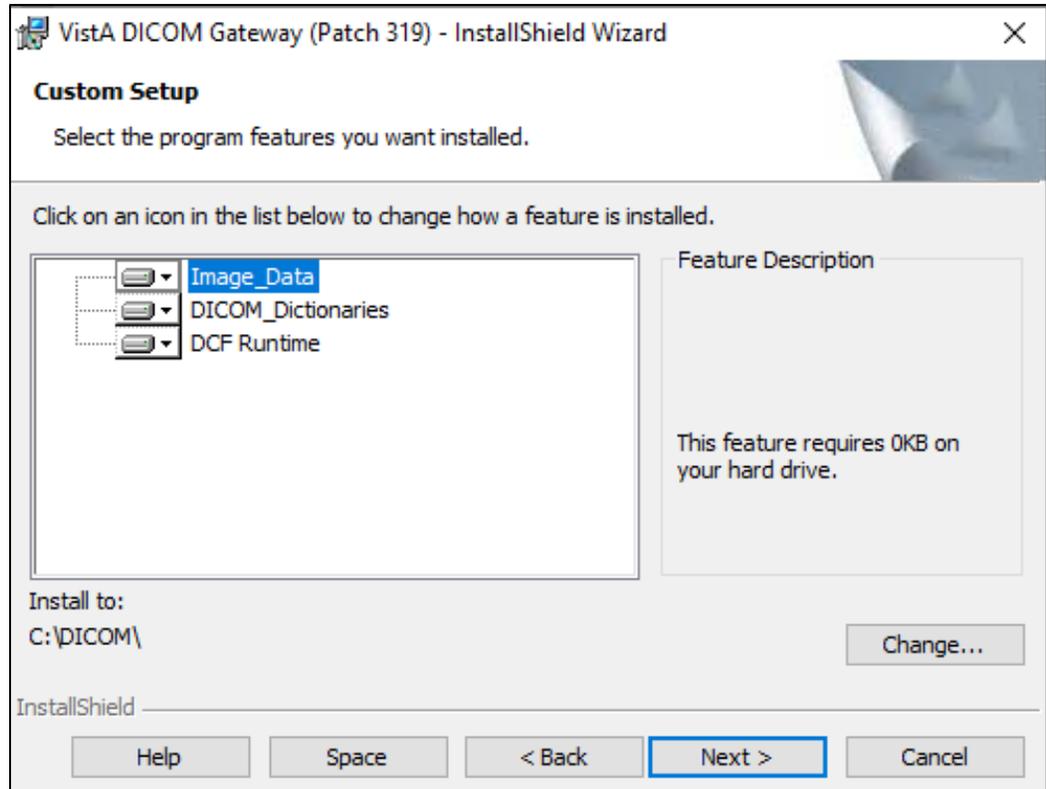
d. For the **DICOM_Dictionaries** (the master file directory), if you need to change the location of this directory, click **Change** and then use the dialog box that displays to select the appropriate location.
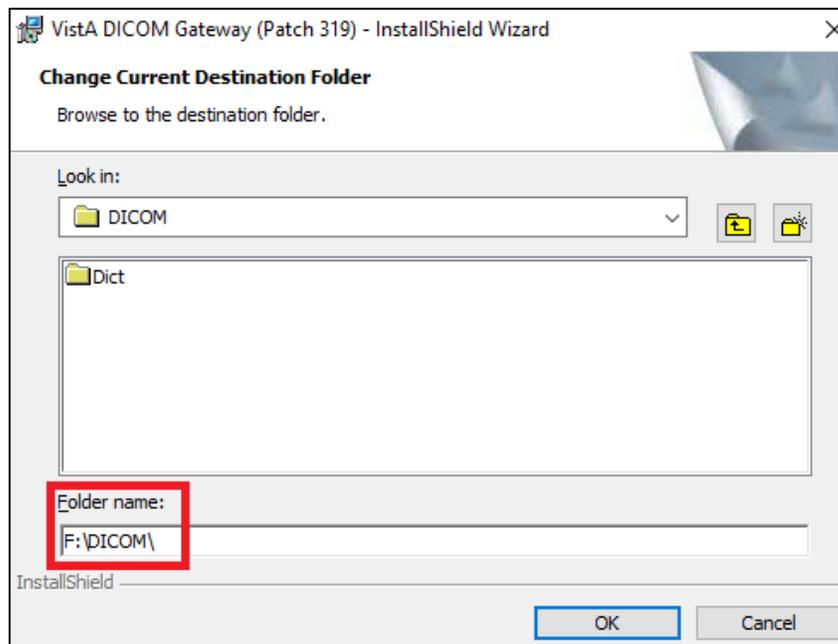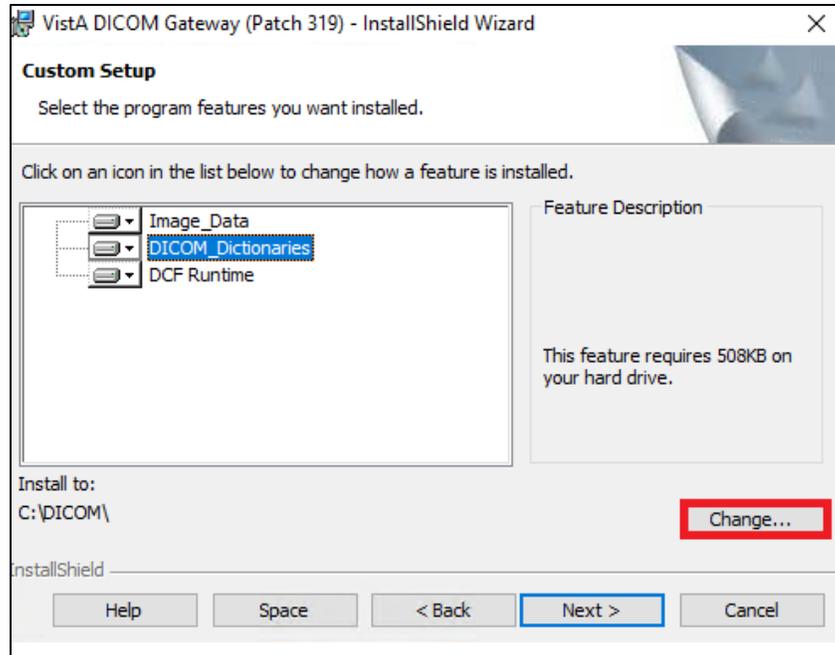
Note: The DICOM dictionary directory is usually on a shared network system and is used to hold DICOM master files. F:\DICOM is typically the DICOM dictionary directory. You may select any other device letter or Fully Qualified Domain Name (FDQN) with shared network drive (i.e.: \\VHAxxxclu10a...\GW_dic_files), however.

    e. In a typical installation, `DICOM_Dictionaries` are installed in the `\DICOM\Dict` directory on a network drive and `Image_Data` and `DCF Runtime` is installed on

the C: drive. **The installation process does not overwrite site-configurable master files.**

    f. For site configurable master files, like AE_TITLE.DIC, the installation first copies the matching sample file (AE_TITLE.SAMPLE in this example) to the master files directory. If the master file does not already exist, the installation renames the sample file and makes it a master file. In the example, it will rename AE_TITLE.SAMPLE to AE_TITLE.DIC. If the master file exists, the installation keeps the sample file in the master files directory for reference.

    g. Site-configurable master files include AE_Title, Instrument, Modality, Portlist, Route, SCU_List, and Worklist.

11. Click the names of all components to verify that they are set to be installed onto the correct disk drive.

12. After verifying that all components are set to be installed in their appropriate destinations, click **Next** in the Custom Setup dialog box.

13. If you want to change any of the installation settings or if you are not sure about the value of a parameter, you can click **Back** to go back to the window where that setting may be modified. Otherwise, click **Install** to begin the installation process.
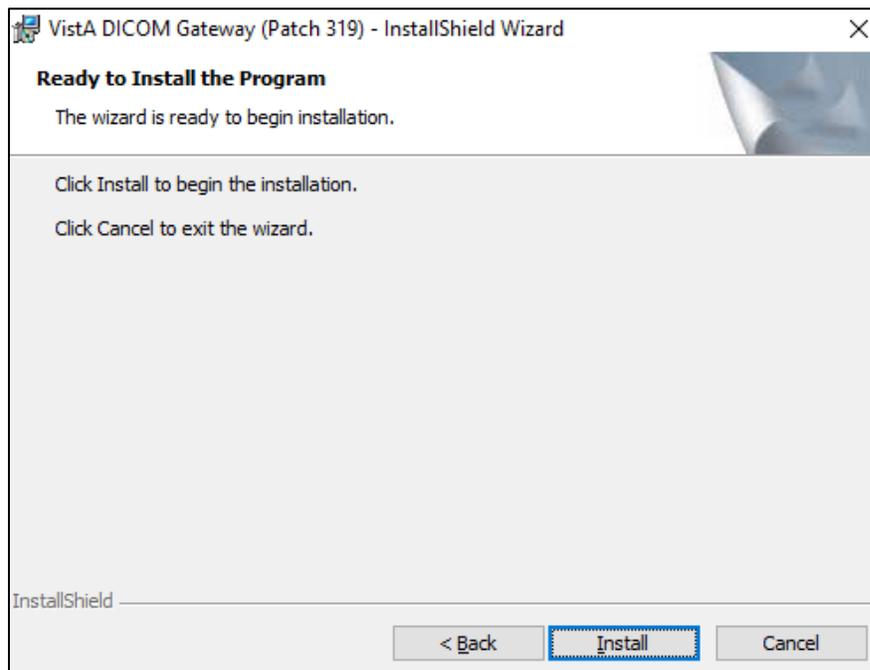
While the installation is proceeding, the status of the installer will be displayed in a progress window. Do not click any buttons while this window is visible (the only button available is **Cancel** and clicking it will discontinue the installation).

As the installation proceeds, a progress bar will be displayed. Several message boxes will pop up and disappear throughout the install process. When the reminder window "Don't forget to run 'Install IRIS' located on your desktop." appears, click **OK.**
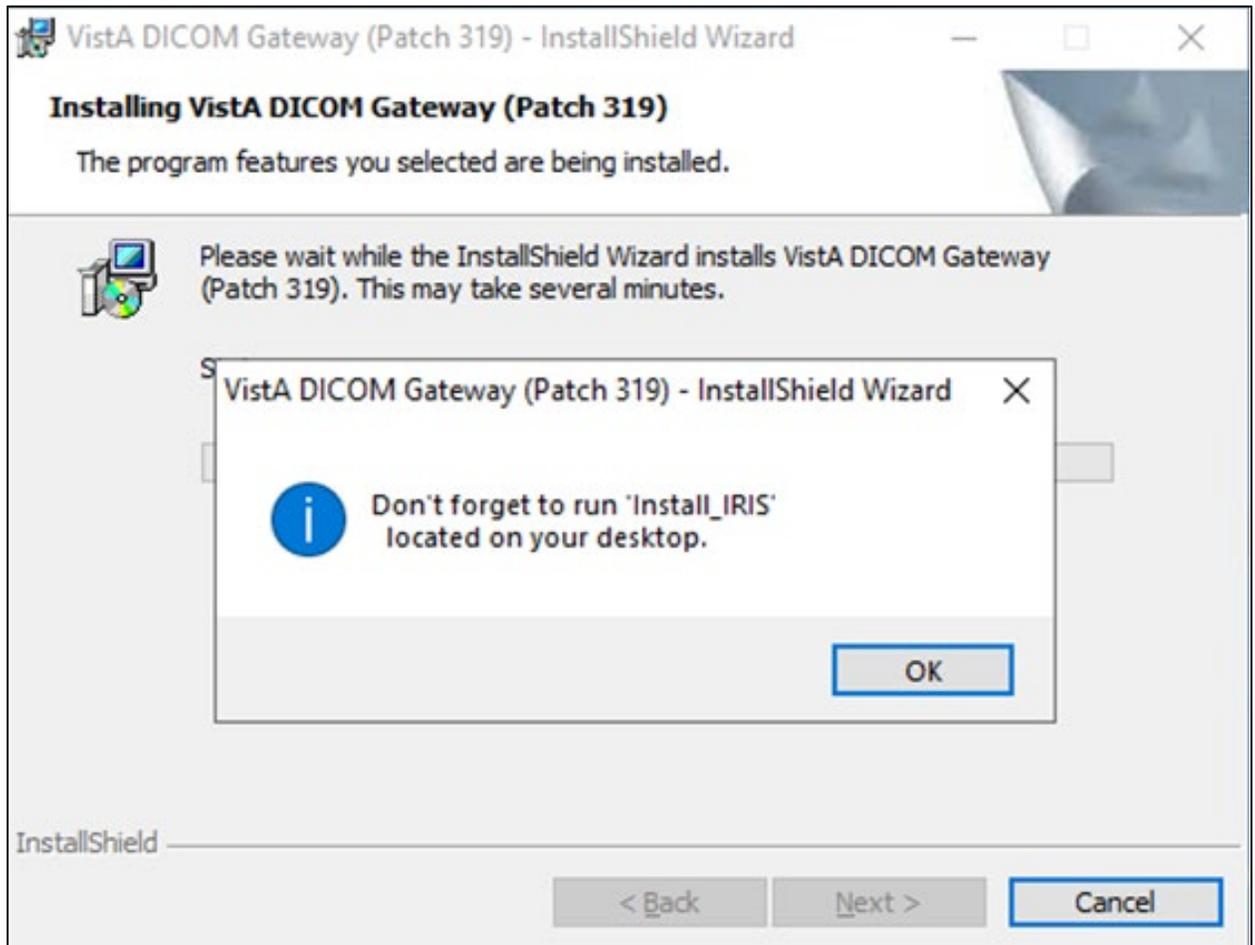
14. When the installation is complete, the last window displays. Click **Finish** to complete the 1st part of installation of the new DICOM Legacy Gateway software.
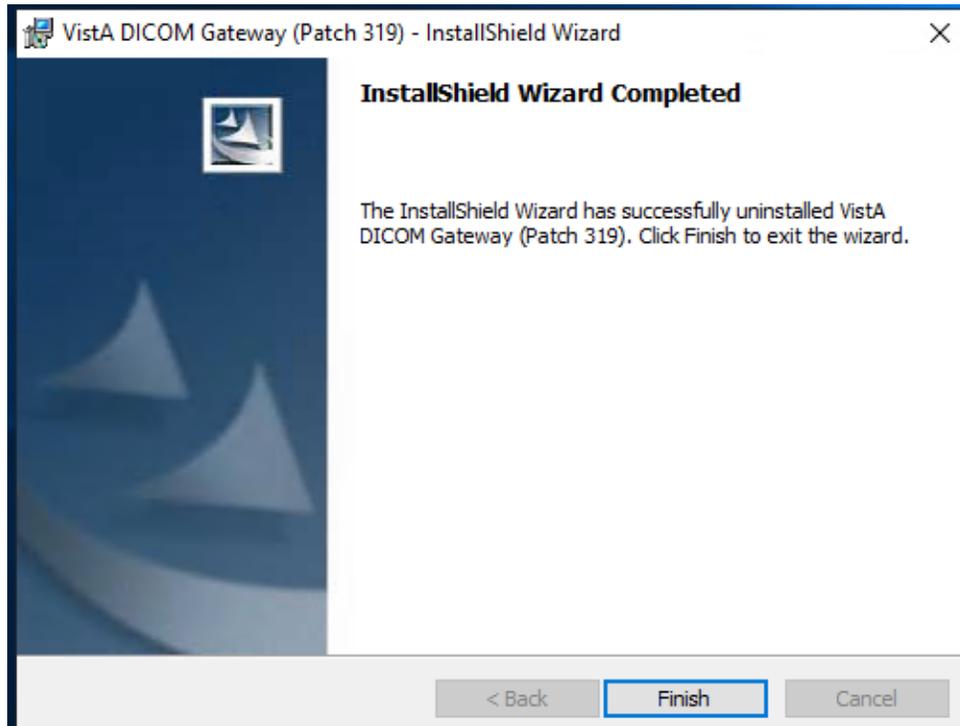
In some cases, there may be additional tasks that you must perform. In this scenario, a message box will be displayed that indicates the remaining installation steps.

3.4.2   Installing IRIS for Health

Once you install the DICOM Gateway you will see a DICOM Install_**IRIS** icon (short cut) on

your desktop.

To install IRIS:

1. Right-click the **Install_IRIS** icon on your desktop and then select "**Run as Administrator**". (This icon was created when you installed the DICOM Gateway in the preceding steps.)
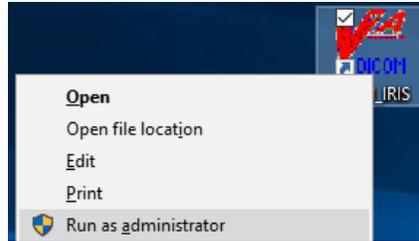
If prompted "Do you want to allow this app to make changes to your device" click **YES**.
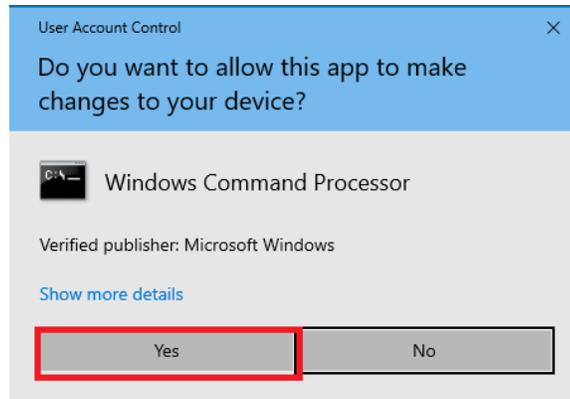
2. The installation program opens a command prompt window on the Task Bar. Click on the command prompt window on the Task Bar to see the full command prompt window.
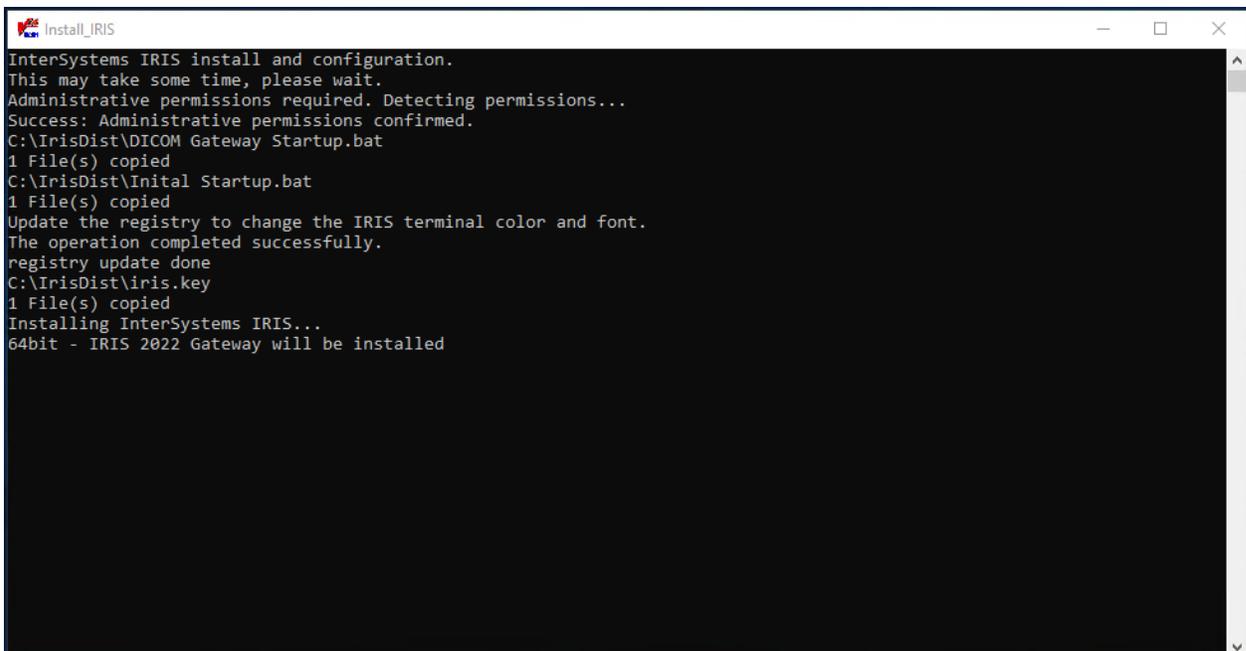
3. During the installation of IRIS, a Setup message box will appear and disappear.

This box indicates the progress of the installation; you do not need to do anything while this message box is visible.

2. Once install has finished click on the command prompt. Wait until you see the 'Install Complete' message on the command prompt window. Then, press any key or click in the window to close it.
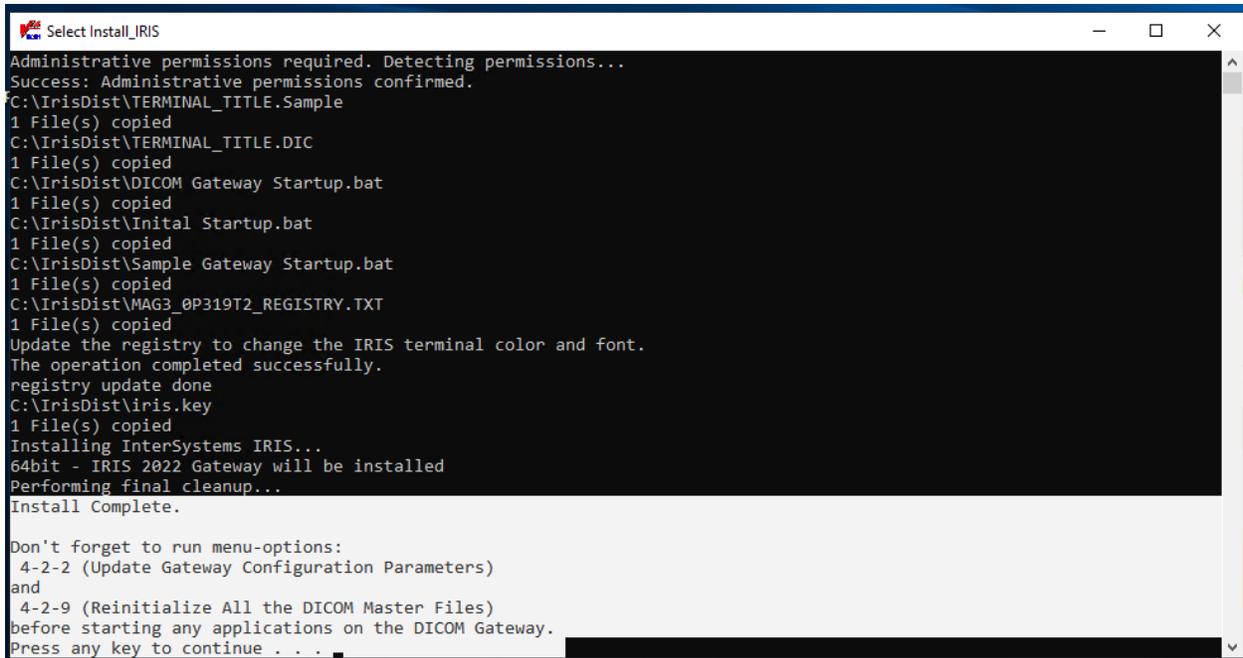
3.4.3   Verifying IRIS Installation

After installing IRIS, verify that it is properly installed. There is an IRIS launcher icon in the system tray (usually located on the lower right side of the display) that gives access to the various management functions for IRIS. This document will refer to the IRIS launcher as the "IRIS ICON."

When IRIS for Health is inactive, this icon is grey:
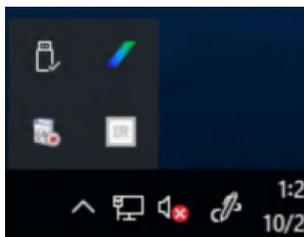
When IRIS for Health is active, this icon has color blue/white:
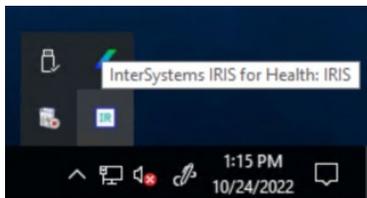
To verify that IRIS is installed:

1. Right-click the IRIS icon located in the system tray.
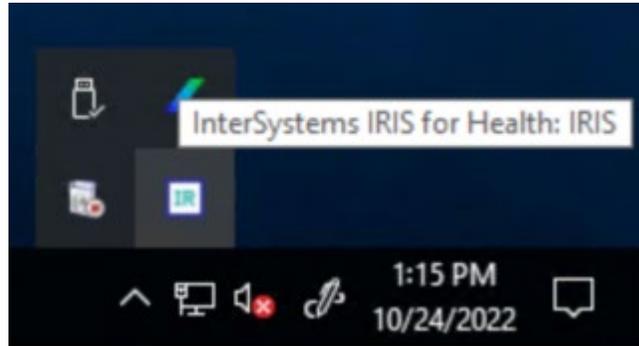
2. Click **About**. If IRIS is installed, the following About screen displays. The most current IRIS version is displayed.
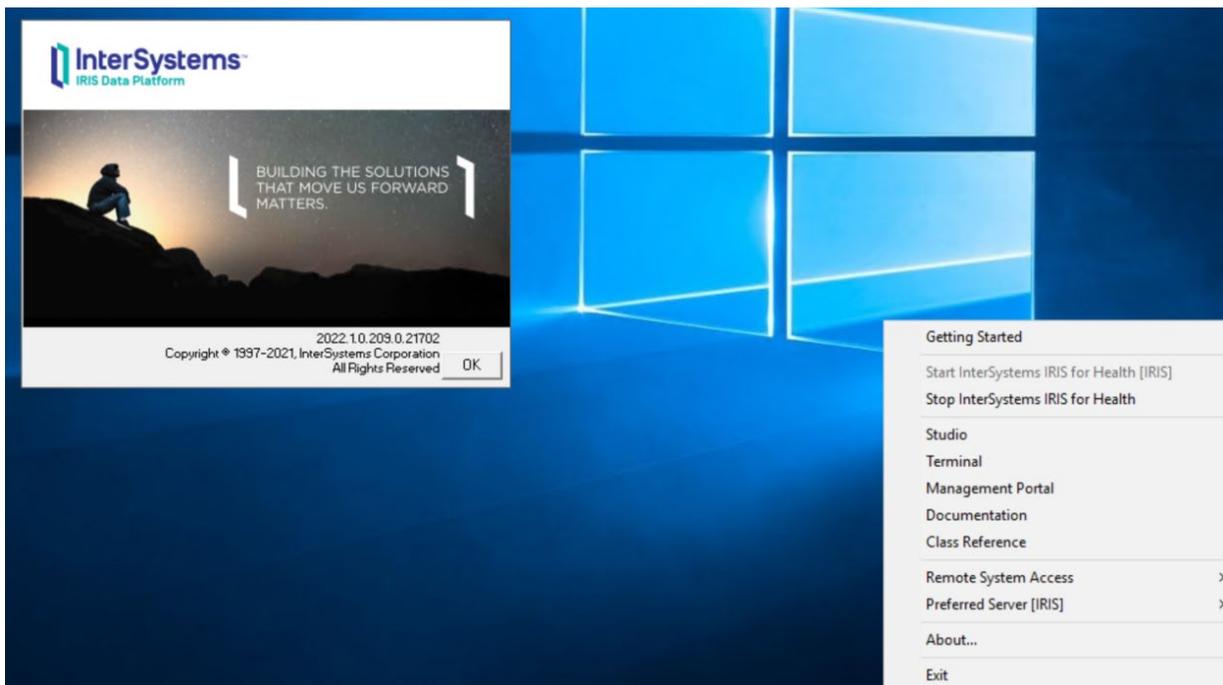
Note: Once IRIS has been installed using the automated procedure shown in the previous sections, it will automatically start each time the computer is re-booted. Under normal circumstances, the end user will not have to act to start or stop the IRIS system. Additional

processes, such as listener and IRIS terminal sessions, must be started to make the gateway fully operational.

The various options related to configuration of the IRIS system are described in the documentation that comes with the IRIS system and are provided through the menu that is shown above. Some configuration options are accessed through the menu option labeled **Management Portal**.

3.4.4   Setting up IRIS Service Network Account and Password

To finally complete the IRIS installation, set up the IRIS Service with Imaging Administrator (IA) Network Account and Password. **The username and password for IRIS must be set using the IRISinstall.exe from the Command Prompt for the LDGW to function properly.**

1) Run **Administrator Command Prompt**

Note: To open the Administrator: Command Prompt by **Run** with 'CMD'- then select 'Run as Administrator' on Windows server 2019.
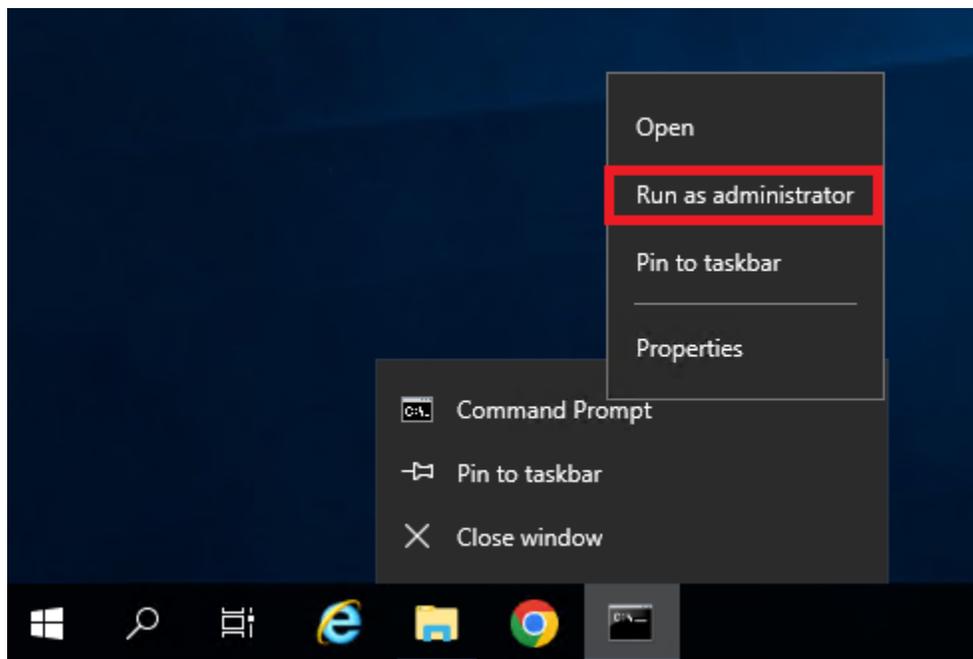
2) A User Access Control window will appear, click **Yes**
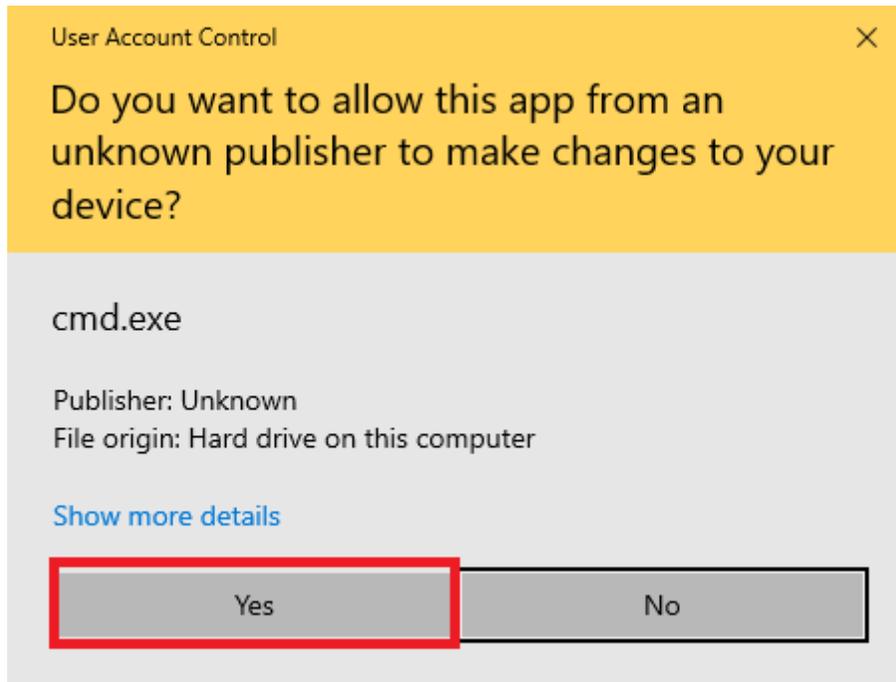
3) Enter the following one-line command:

C:\InterSystems\IRISHealth\bin**IRISinstall.exe setserviceusername IRIS** "{*IA network service account username(*"vhann\vhaxxxia")*}*" "{*IA network service account password}*"

Note: there is a space between IRIS, "username" and "password". Example C:\InterSystems\IRISHealth\bin\IRISinstall.exe setserviceusername IRIS "vhann\vhaxxxia" "password"

Then press \<Enter\>

After seeing 'service Username and Password Set', Reboot the DICOM Gateway server for the IA network service account come into effect.

3.4.5   Verifying IRIS Service Account Installation

When IRIS is restarted after the server reboot. Check the Windows Services to make the IA service account is set in InterSystems IRIS Controller service.

1   From the Windows Start Menu, click **Start** | **Administrative Tools** | **Services, or Server Manager | Tools | Services**.

2   Right-click **InterSystems IRIS Controller for IRIS.**

3   Select **Properties**.
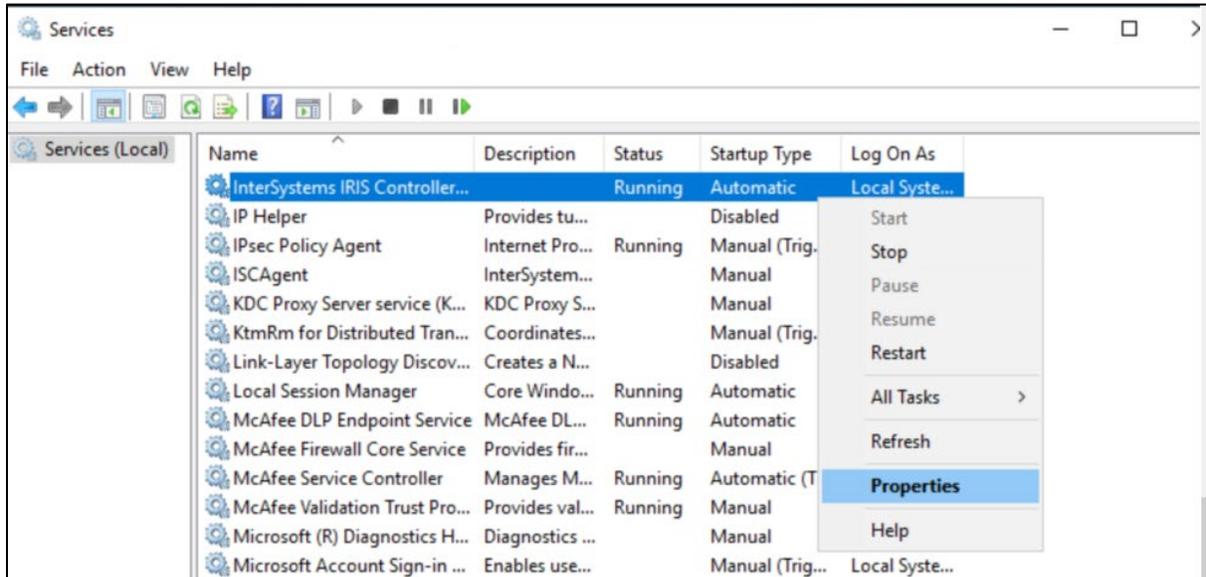
4 On the logon tab, verify that IA Account is being used.
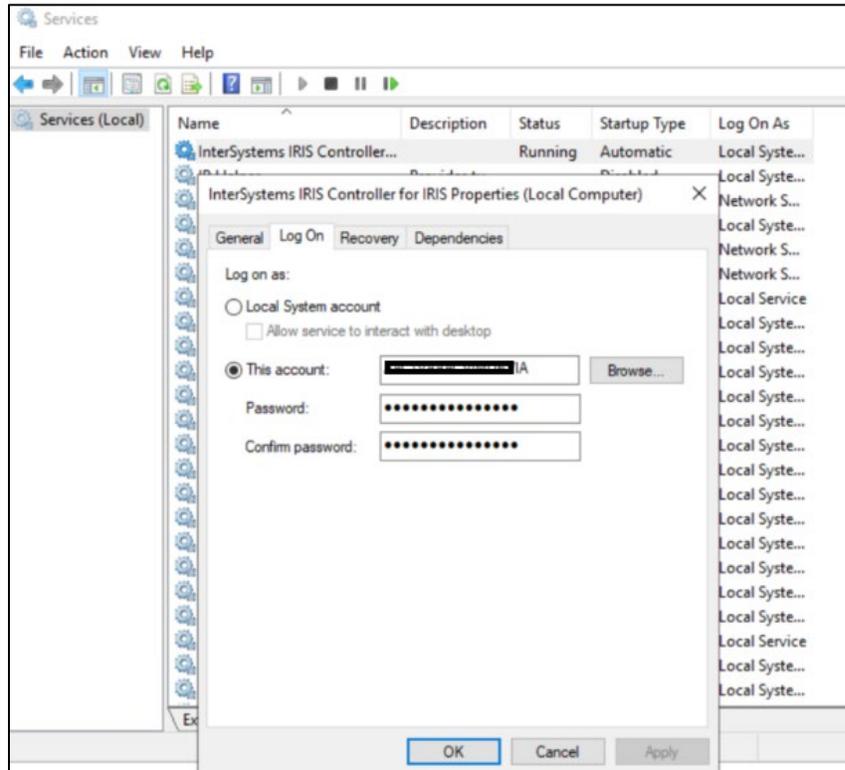
4. Securing the Gateway and IRIS

This section highlights some general issues that are relevant during the installation of the VistA Imaging DICOM Gateway software. Detailed information about security issues related to the VistA Imaging DICOM Gateway is documented in the VistA Imaging Security Manual.

4.1 Security updates in IRIS Management Portal

After you install MAG3_0Pnnn_DICOM_setup.exe on the Gateway with IRIS, perform the following steps to secure the gateway database. All the Legacy DICOM Gateway (LDGW) short-cut/Menu tree options will still depend on VistA user authentication (access/verify code).

4.1.1 Login to the IRIS Management Portal

1. From the Windows Task Bar, click on the up arrow, click on the IRIS icon and then select Management Portal. The IRIS login screen is displayed.

   Note: If your machine does not have a web browser installed, access the Management Portal on your local machine. Below is a sample URL syntax.
   http://servername:52773/csp/sys/UtilHome.csp

2. Enter the IRIS username and password.

   Note: If this is a fresh LDGW server installation, at the first time you login to the Management Portal , use the default user name '**_system**' and password '**SYS**' to login Management Portal. Then change the Telnet configuration/Security setting accordingly.

4.1.2 Disable Telnet

To disable Telnet service on the DICOM Gateway follow the steps below:

1. Click on **System Administration**, then click on **Security**, then click on **Services**.
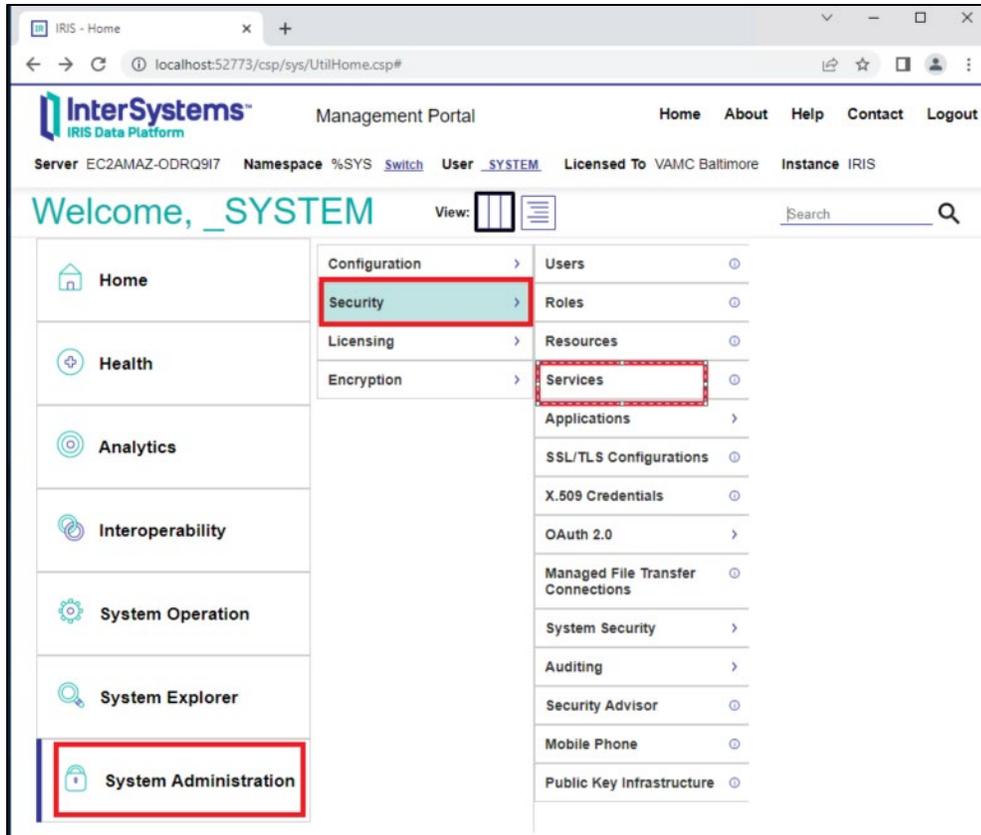
2. Select the %Service_Telnet link.
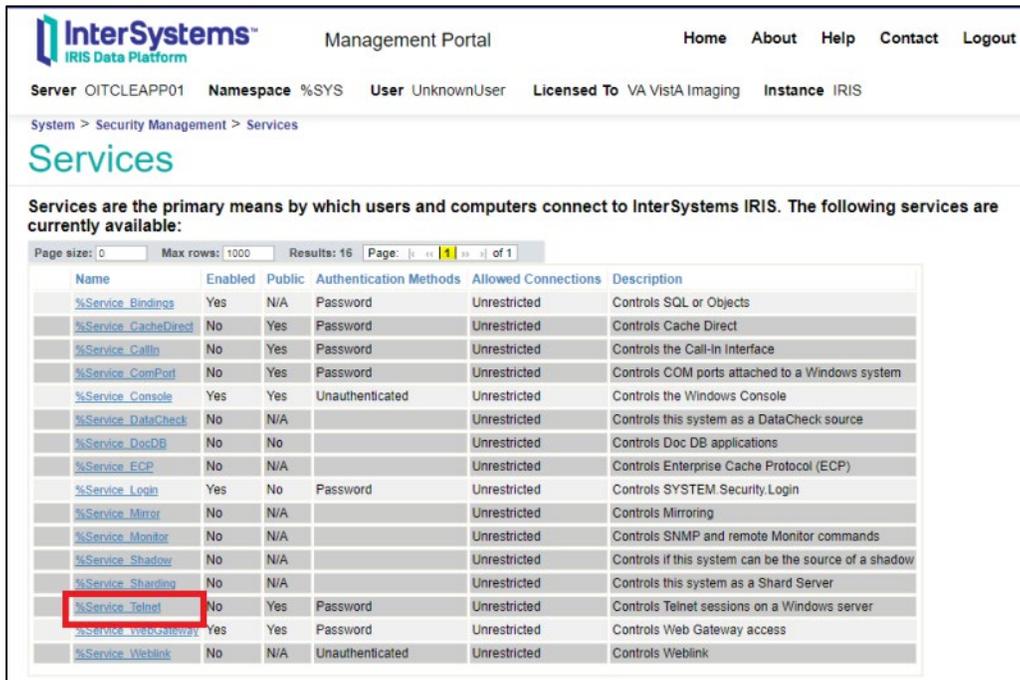
3. Uncheck **Service Enabled**, select the **Save** button.

4.1.3   Set the username and password for Management Portal Users

This process configures the Management Portal and Studio to require password authentication (also known as the "IRIS login") and not to allow unauthenticated access. **DO NOT** check the Remember Password box for the security policy.

1. Click on **System Administration**, then click on **Security**, then click on **Users**.
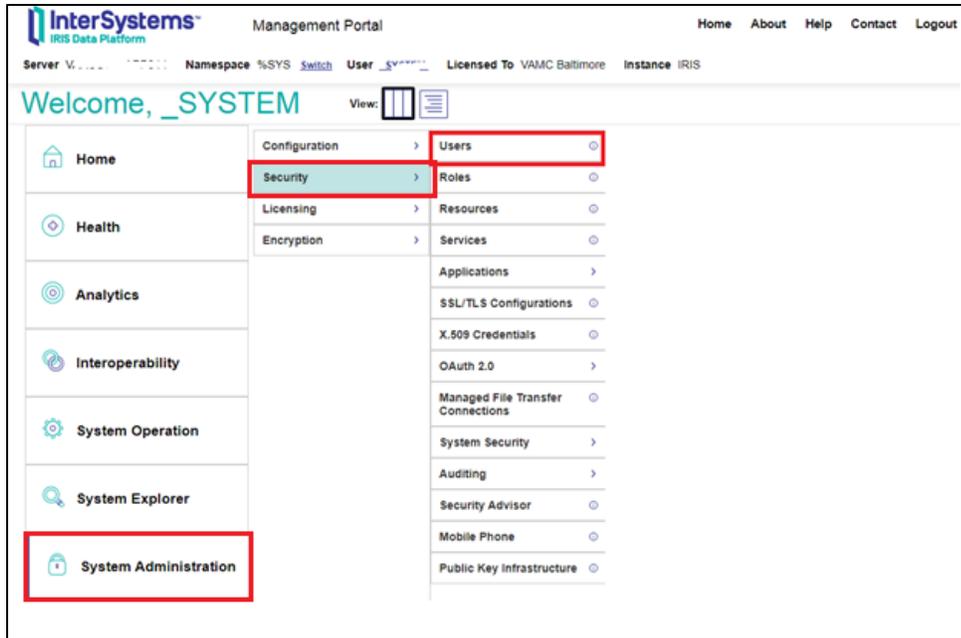
3. The System – Security Management – Users page is displayed.
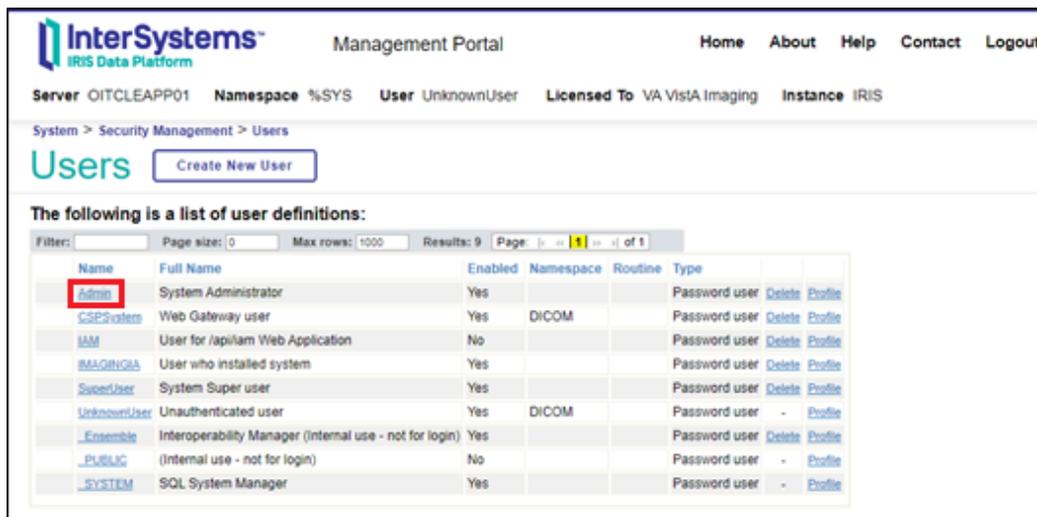
4. On the **Users** page click on the **Admin** user to modify/reset password. This displays the [General] tab of the **Edit User** page for configuring users.

5. On the **Edit Definition for user Admin** page, click on "Enter new password" radio button

6. Set values for only the following user properties:

•Password (required) — Enter new password value.

> **NOTE:** The Veterans Administration recommends no fewer than 16 characters to include 1 uppercase, 1 lowercase, 1 number and 1 special character.

•Confirm Password (required) — Enter new password value to confirm.

Make note of the new password.

7. Click the **Save** button to save the password.

> **NOTE:** If the two passwords do not match, an error message will pop up prompting the user to reenter the passwords.

8. Click on Users in the breadcrumb trail to go back to the System – Security Management – Users page.

9. Repeat steps 1 through 7 to create a password for the following users:
   - _SYSTEM
   - CSPSystem
   - SuperUser

4.1.4   Configure Management Portal to Require Credentials for Login

This process configures Management Portal services to require password authentication and not to allow unauthenticated access. Once you finish modifying the %Service items and CSP Applications, the user will be required to enter their username and password to access the Management Portal and CSP relative features.

4.1.4.1 %Service

1. Click on **System Administration**, then click on **Security**, then click on **Services.**
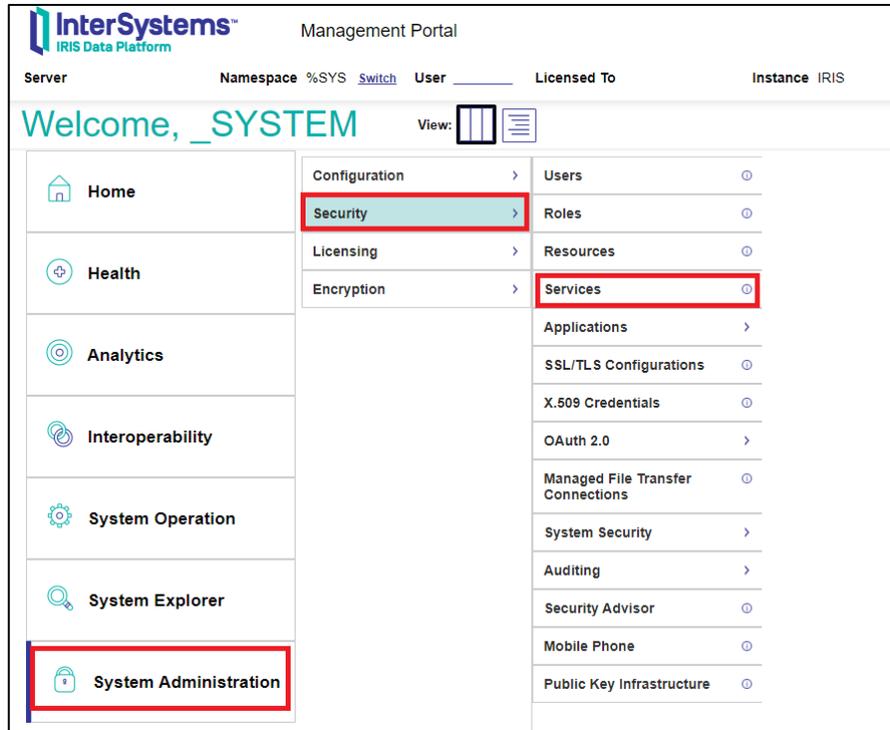
2. The System - Security Management – Services page is displayed.
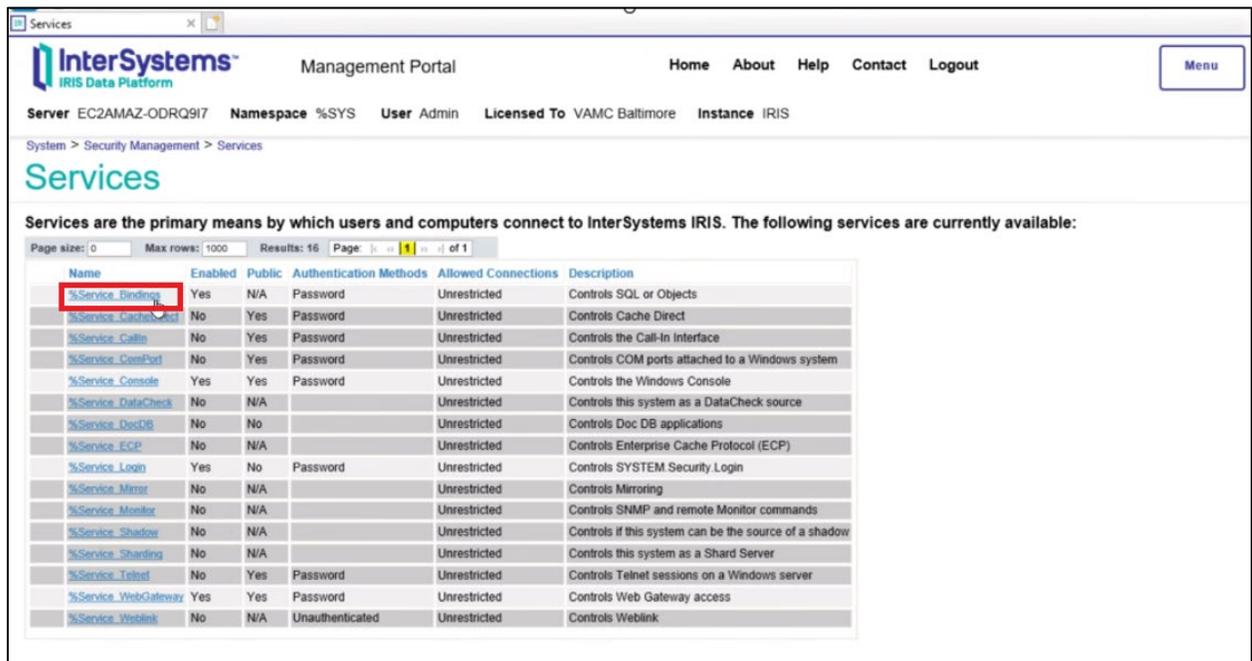
3. On the Services page, select %Service_Console from the Name column to edit. This displays the Edit Definition for service %Service_Console to configure the authentication method. In the Definition window, verify that both the Service Enabled and Unauthenticated check boxes are checked.
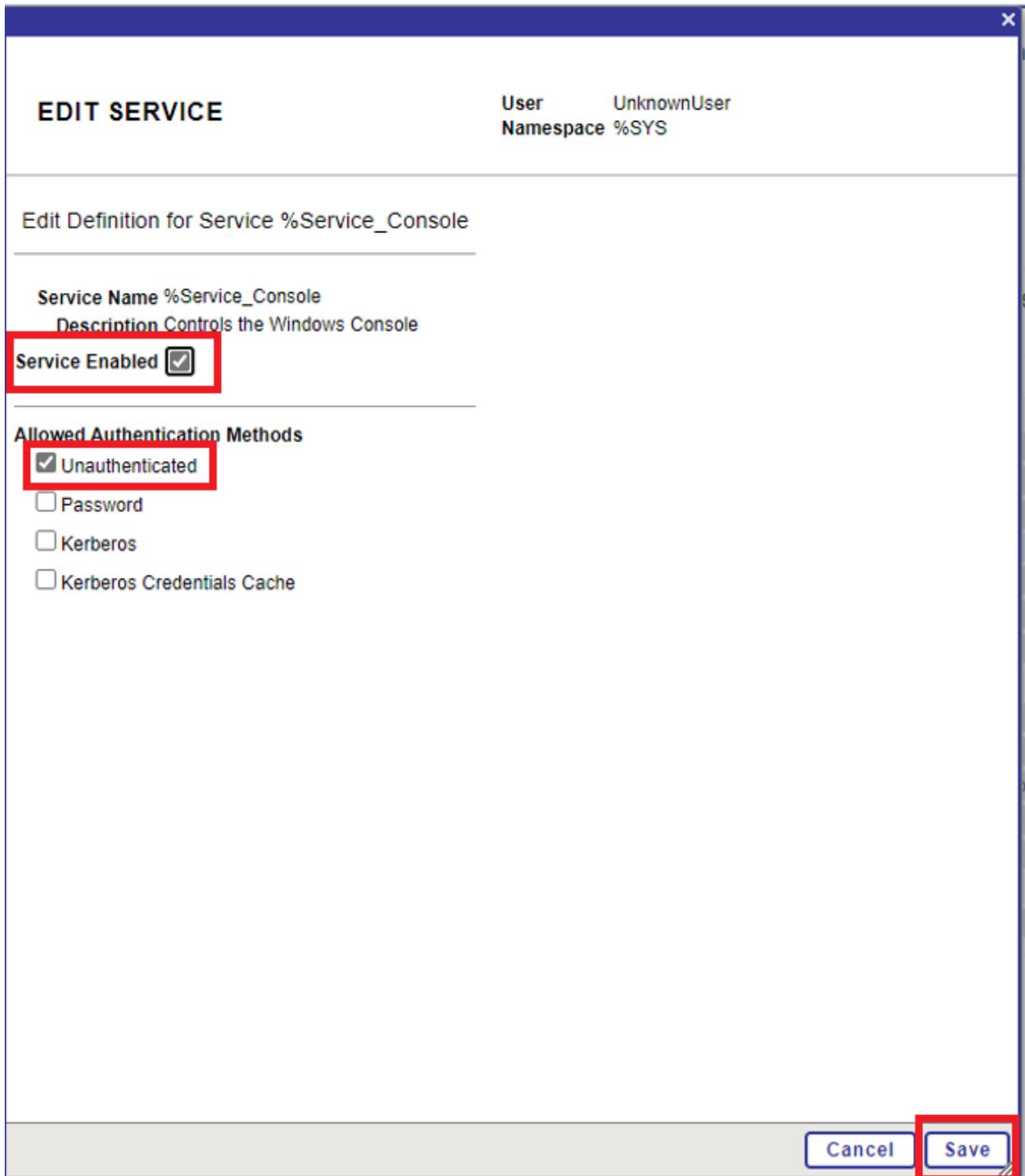
4. Click Save.

4.1.4.2 CSP Applications

1. From the Management Portal home page, select **System Administration**, then select **Security**, then select **Applications**, then select **Web Applications.**
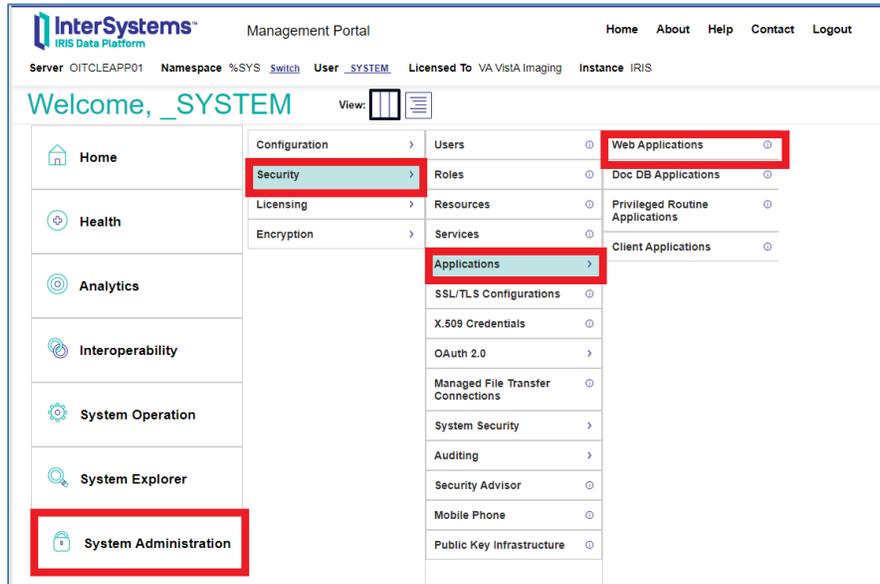
2. Select /csp/sys/exp. The Edit Web Applications /csp/sys/exp page is displayed.
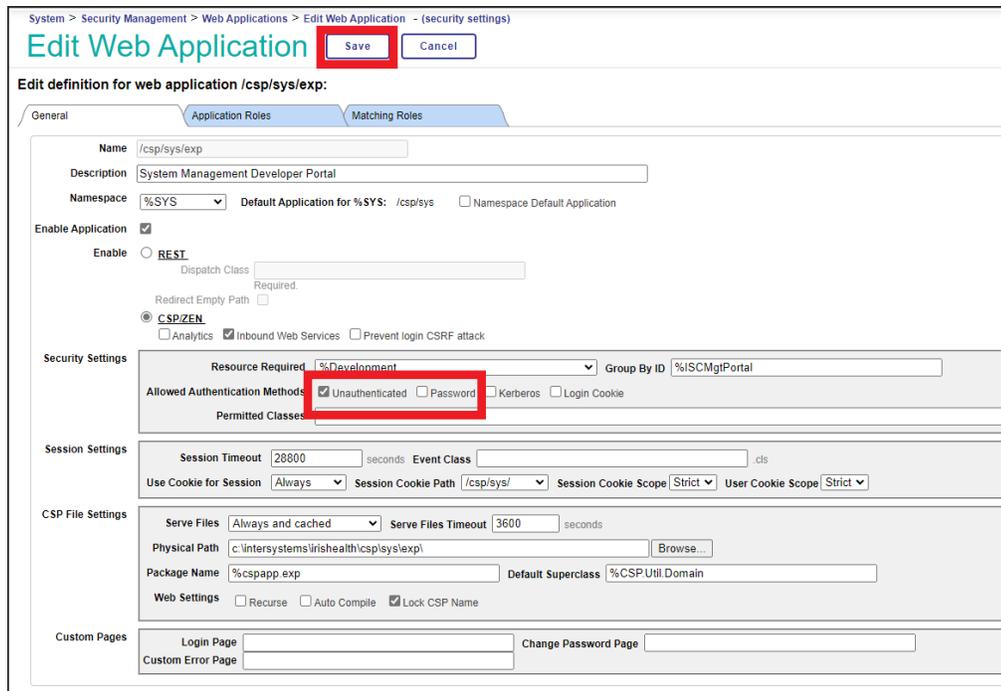
3. Check the Unauthenticated box and then uncheck the Password box. Click **Save.**
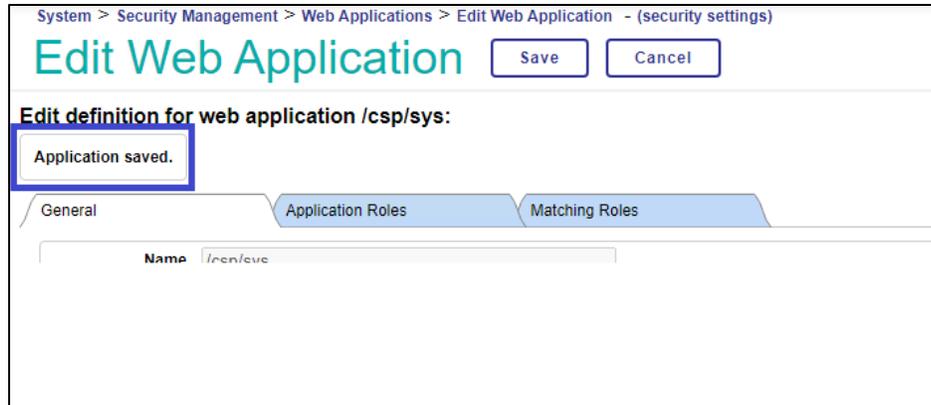
4. When the changes to the application have been saved, the message "Application saved" will be displayed. Click on the Web Applications breadcrumb trail to return to the list of Web Applications. Repeat steps 1 through 3 for the following Web Applications:
   - /csp/sys/mgr
   - /csp/sys/op
   - /csp/sys/sec

5. When finished, the Web Applications table should look like the figure below.

4.1.5   Turning off Journaling

Setting the DICOM database item, Global Journal State, option to "No" corrects the excessive disk space usage and an added benefit is that the image processing speed increased significantly. If sites are experiencing this problem, it is recommended that they turn the journaling off.

1. Click on **System Administration**, then click on **Configuration**, then click on **System Configuration,** then click on **Local Databases.**
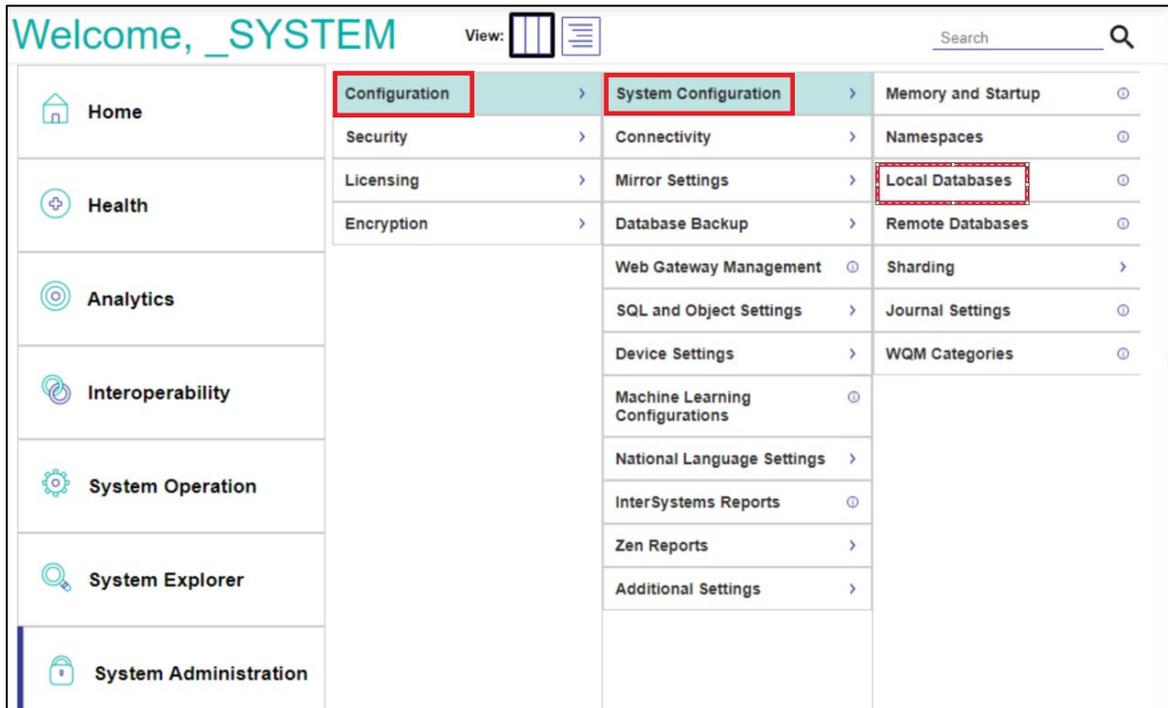
2. The Local Databases screen appears:

3. Click on DICOM to display the Database Properties screen:

4. Uncheck the 'Global Journal State' checkbox and then click the 'Save' button and close Management Portal.

4.2 Verifying Full Control of the Image_In Folder

After installing the Legacy DICOM Gateway, verify that the System Domain Admin Service Account (**IA account**) has full control of the C:\DICOM\Image_In folder.

1. In Explorer, right click the c:\DICOM\Image_In and select Properties.
2. Select the Security tab. The following Image_In Properties screen is displayed
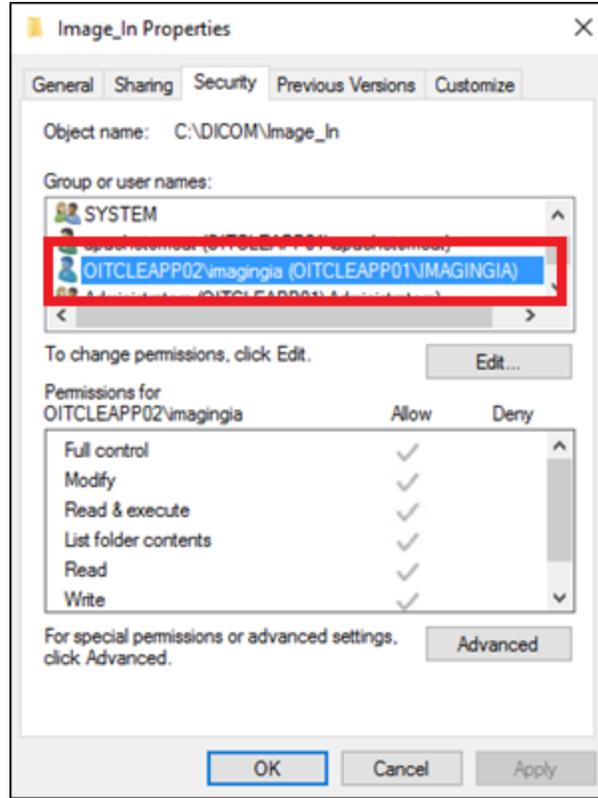
4.3 Remove Authenticated Users from httpd.exe

Authenticated Users must be removed from the httpd.exe file once Iris is installed to avoid creating a security violation:

1. Navigate to the C:\InterSystems\IRISHealth\httpd\bin folder in Windows Explorer.
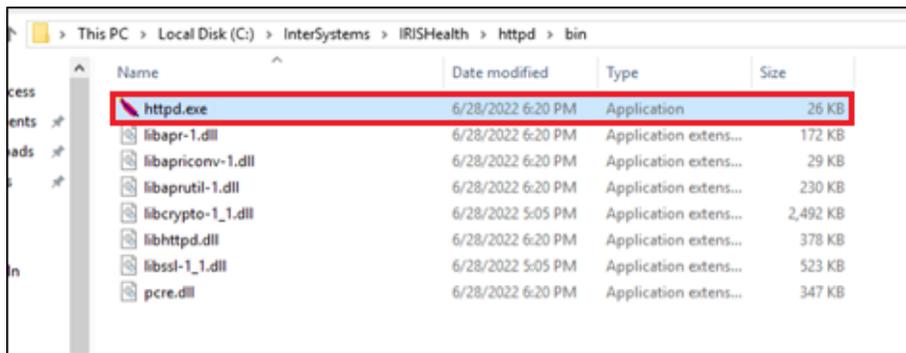
2. Right-click on HTTPD.EXE and then click on Properties to display the Properties screen.
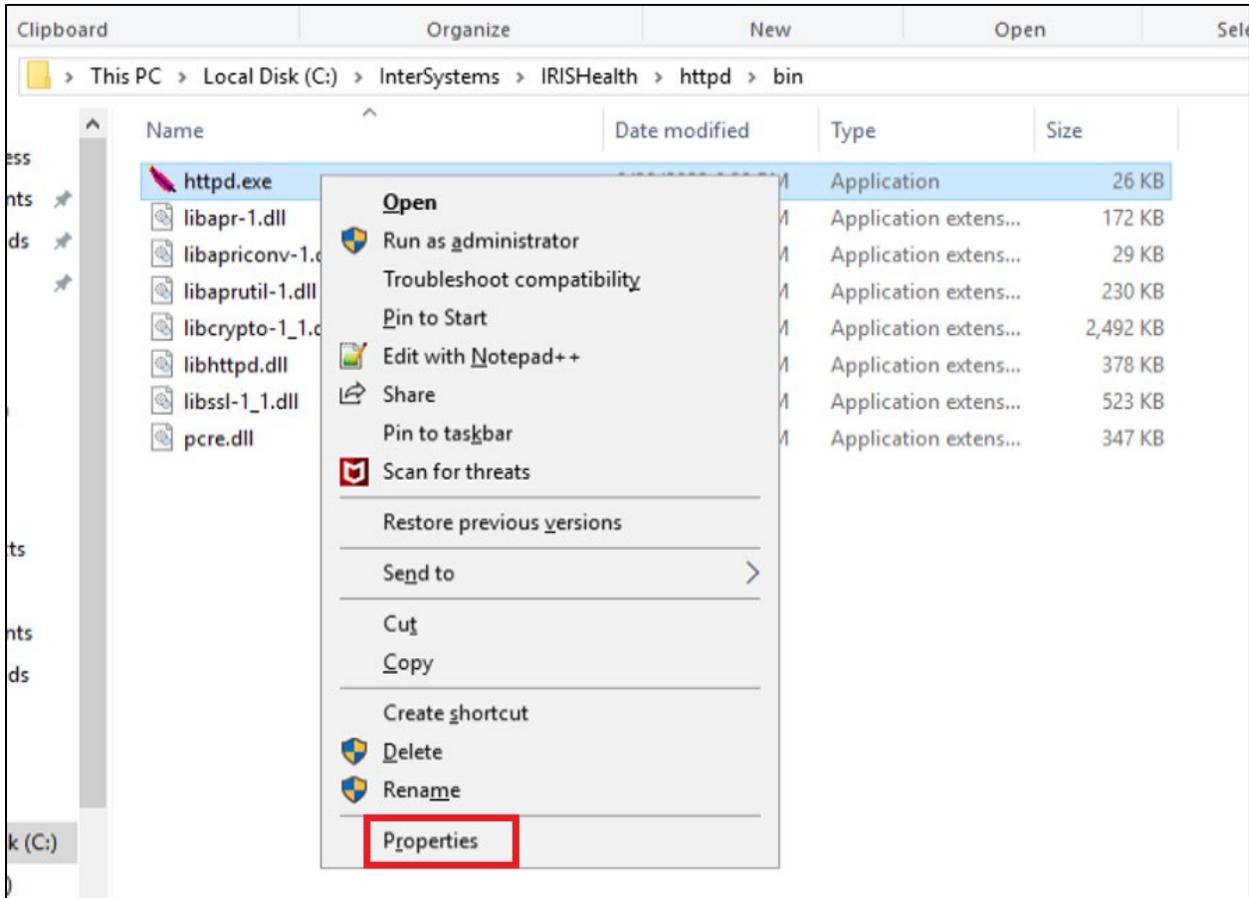
3. Click on the Security tab and then click on the Advanced button to display the Advanced Security Settings window.
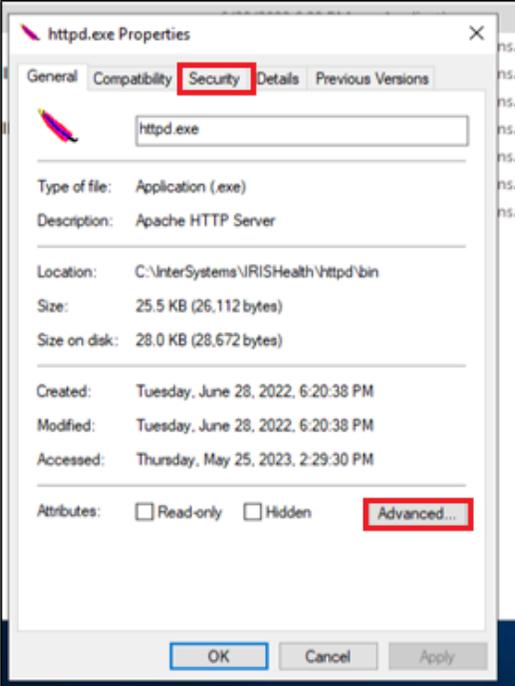
4. Select Authenticated Users.
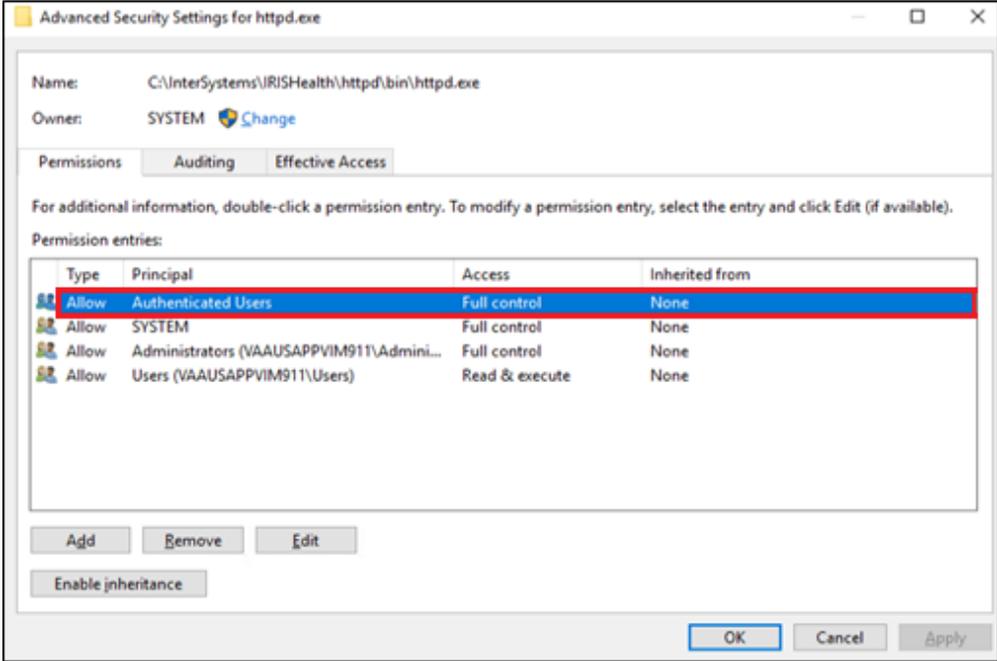
5. Click on the Remove button to delete the Authenticated Users.
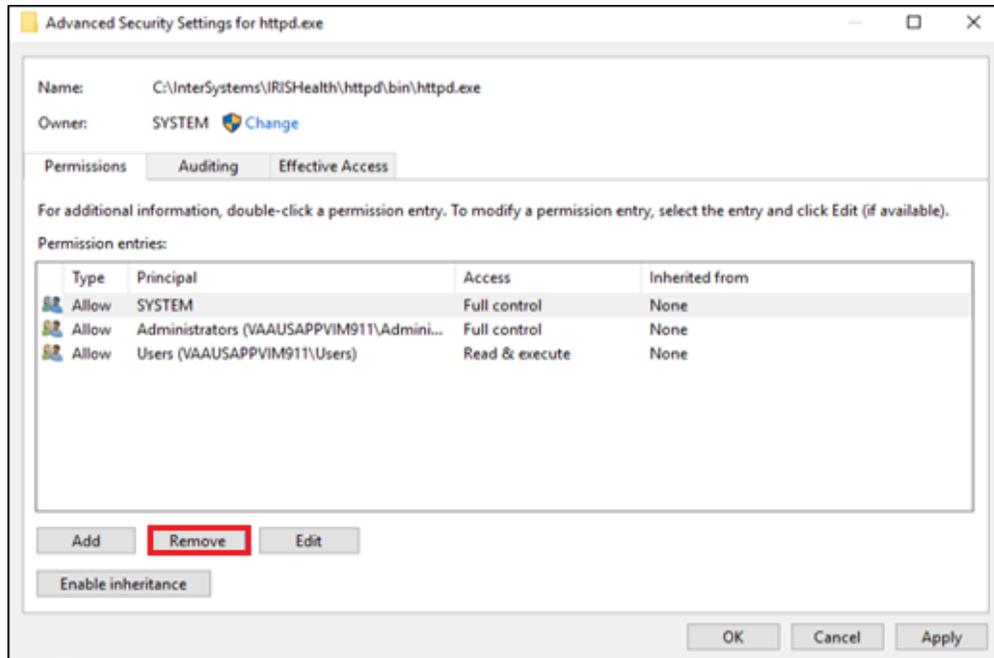
6. Click on the OK button to close the window and finalize the process.
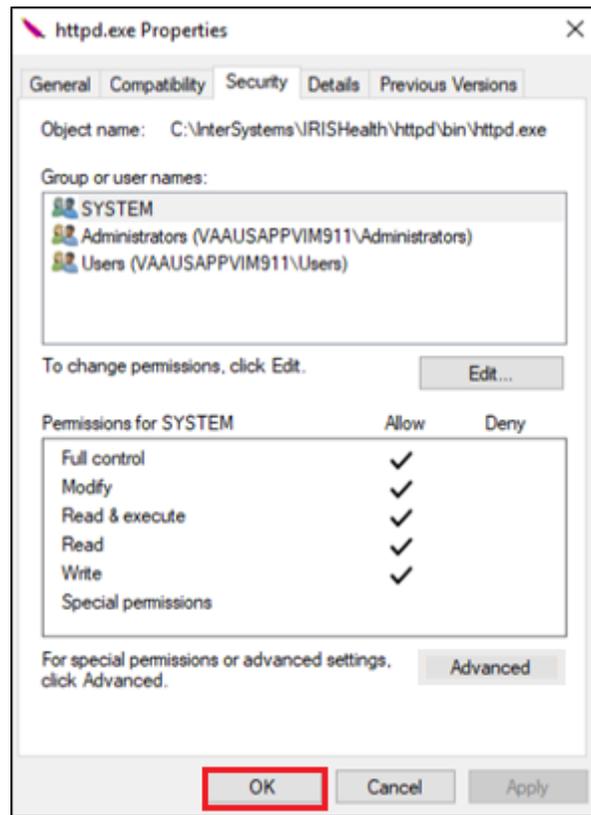
5. Starting and configuring the Legacy DICOM Gateway

To start configuring the DICOM Gateway

1. Double Click on the short_cut 'Initial Startup.bat' on Windows desktop press return for Y

2. Enter your VistA Full Qualified Domain Name (FQDN) or IP address, and the port # for M-M broker listener. (Only required 1st time LDGW configuration)

3. Enter your LDGW VistA account Access/Verify code to login.

5.1   Configure the DICOM Gateway and Load the DICOM Dictionaries

The following subsections describe the process of completely configuring a VistA Imaging DICOM Gateway, including loading all the dictionaries.

Note: Individual portions of the VistA Imaging DICOM Gateway can be selectively updated as well. This operation is described in the *VistA Imaging DICOM Gateway User Manual*.

1. To configure the DICOM Gateway select menu option **4-2-2**:

   4 System Maintenance
   → **2** Gateway Configuration and DICOM Master Files
   → **2** Update Gateway Configuration Parameters

5.1.1   Name of System

The system title is a short character string that appears on the top of the main DICOM application menu. Examples:

```
            "Washington DICOM Image Server System #3"
                 "New Orleans DICOM Text Gateway"


   Please enter the system title: IMAGUSER's Gateway <Enter>
```

5.1.2   Location of DICOM Gateway

The configuration program will query the VistA system in order to obtain a list of the locations that are operational for the site. When a DICOM Gateway is part of a site that has only one location, the software will merely display the name of that location, and not ask the end-user for any input, e.g.:

```
   This computer is currently located at SALT LAKE CITY (660)
```

Otherwise, the end-user will be asked to identify the name of the location for which the DICOM Gateway in question will be operating.

5.1.3   DICOM Data Directories

The DICOM data directories are located on the local system and are used to hold both the DICOM text and image files. C:\DICOM is typically the DICOM data directory. However, you may select another device letter (C:-Z:).

```
      Please enter the device letter for
      the DICOM text directory: c:// <Type Response> <Enter>

      Please enter the device letter for
      the DICOM image directories: c:// <Type Response> <Enter>
```

5.1.4   Percentage of Free Disk Space

The software will cease storing image files when the amount of free disk space drops below a certain threshold. The usual value for this threshold is **15%**.

```
      Please enter the percentage of free disk space
      required to allow storage of image files: 15%// <Type Response> <Enter>
```

5.1.5 DICOM Dictionary Directory

The DICOM dictionary directory is usually on a shared network system and is used to hold DICOM master files. F:\DICOM is typically the DICOM dictionary directory. You may select any other device letter or Fully Qualified Domain Name (FDQN) with shared network drive (i.e.: \\VHAxxxclu10a...\GW_dic_files), however.

```
        Enter the device letter for
        the DICOM dictionary directory: c:// <Type Response> <Enter>
```

5.1.6 Communication Channels

Communication channels are used to broadcast VistA event data. A separate channel is needed for each different destination. For instance, event data may be sent to both a commercial PACS and to one or more Modality Worklist service class providers (for example a Mitra Broker or a DeJarnette MediShare). Each destination must have its own event channel *n* and a dedicated c:\dicom\data*n* subdirectory. This is not used much anymore as the Mitra boxes have been phased out.
The number of communication channels must be between 1 and 9.

```
        Please enter the number of communication channels 2// <Type Response> <Enter>
```

5.1.7 DICOM Image Gateway

If this system is to be configured as a VistA DICOM Image Gateway, the answer to this question must be **Yes**. If this system is to be configured otherwise, answer **No**.

Note: A VistA DICOM Gateway may be configured as a Text Gateway, an Image Gateway, a Routing Processor, or any combination thereof.

```
        Will this system be a DICOM Image Gateway?  No// <Type Response> <Enter>
```

5.1.8 DICOM Text Gateway

If this system is to be configured as a VistA DICOM Text Gateway, to support the Modality Worklist and/or send event messages to a commercial **P**icture **A**rchiving and **C**ommunication **S**ystem (PACS), the answer to this question must be **Yes**. If this system is to be configured otherwise, answer **No**.

Note: A VistA DICOM Gateway may be configured as a Text Gateway, an Image Gateway, a Routing Processor, or any combination thereof.

```
        Will this system be a DICOM Text Gateway?  YES// <Type Response> <Enter>
```

5.1.9 DICOM Routing Processor

If this DICOM Gateway is to be configured as a VistA DICOM Routing Processor, the answer to this question must be **Yes**. If this system is to be configured otherwise, answer **No**.

Note: A VistA DICOM Gateway may be configured as a Text Gateway, an Image Gateway, a Routing Processor, or any combination thereof.

```
Will this system be a DICOM Routing Processor?  YES// <Type Response>
<Enter>
```

5.1.10   Auto-Routing Active

If one of the DICOM Gateways at this site is being used as a Routing Processor, the answer to this question must be **Yes**. If no automated routing is to occur at this site, the answer to this question must be **No**.

```
Will this computer be part of a system where 'autorouting' is active?
NO// <Type Response> <Enter>
```

Note: When the answer to this question is set to **Yes**, queue-entries will be created for automated routing. If no Routing Processor is active at the site, these queue entries will accumulate and never be processed or purged.

For detailed information about setting up a DICOM Gateway to perform automated routing, see the *VistA Imaging DICOM Routing Setup and User Guide*.

5.1.11   Radiology

If this DICOM Gateway is to be configured as a computer that processes Radiology exams, the answer to this question must be **Yes**. If this system is to be configured otherwise, answer **No**.

```
Will this Text Gateway be used for Radiology? YES// <Type Response>
<Enter>
```

Note: A VistA DICOM Gateway may be configured as one that processes Radiology exams, one that handles Consults, or one that supports both.

5.1.12   Consults and Anatomic Pathology

If this DICOM Gateway is to be configured as a computer that processes Consults and Anatomic Pathology, the answer to this question must be **Yes**. If this system is to be configured otherwise, answer **No**.

```
Will this Text Gateway be used for Consults and Anatomic Pathology? YES//
<Type Response> <Enter>
```

Note: A VistA DICOM Gateway may be configured as one that processes Radiology exams, one that handles Consults, or one that supports both.

5.1.13   Send Text to commercial PACS

If this VistA DICOM Text Gateway is to be configured to send messages to either a commercial PACS or a Modality Worklist provider (for example, a Mitra Broker or a DeJarnette MediShare), the following question should be answered with **Yes**. Otherwise, answer **No**.

```
Send text to a commercial PACS, Mitra Broker, et cetera? n// <Type
Response> <Enter>
```

5.1.14   Receive EXAM COMPLETE Message from commercial PACS

The EXAM COMPLETE message is sent by some commercial PACS to signal that all the images for a study have been acquired and are ready to be sent to VistA. The EXAM COMPLETE message then serves as a trigger for VistA to pull the images from the commercial PACS. Other commercial PACS do not use the EXAM COMPLETE message, but autoroute their images to VistA.

If a commercial PACS is going to transmit EXAM COMPLETE messages to VistA that indicate all the images in a study are ready to be sent, answer **Yes** to this question. Otherwise, answer "**No**."

```
Is a PACS going to send Exam Complete messages to VistA?  NO// <Type
Response> <Enter>
```

5.1.15   Kind of PACS

If the previous question is answered with "**Yes**," an additional question will be asked:

```
Select the kind of commercial PACS at this site
------------------------------------------------
    1 - GE Medical Systems PACS with Mitra PACS Broker
    2 - GE Medical Systems PACS with ACR-NEMA Text Gateway
    3 - eMed Technology Corporation PACS
    4 - Other commercial PACS

What kind of a PACS? <Type Response> <Enter>
```

This question will only be asked on a system that is slated to either be sending text messages to a PACS, or to be receiving Exam Complete messages from a PACS. Enter the sequence number for the kind of PACS that is present at the site.

5.1.16   C-Move destination

This question will only be asked on a system that is slated to be receiving Exam Complete messages from a PACS.

- Some PACSs find the VistA system using its Application Entity Title, so that they can move images from PACS to VistA.
- An AE-title can have up to 16 characters.
- While the DICOM standard allows spaces in AE-titles, these names are often also used as "hostnames" in TCP/IP addresses. Hence, it is strongly recommended to refrain from using names with spaces in them.

```
Enter the PACS-to-VistA C-Move destination AE Title: VISTA_STORAGE// <Type
Response> <Enter>
```

5.1.17   Modality Worklist Provider

If this Text Gateway is to be configured to provide the "Modality Worklist" capability, answer **Yes** to this question. Otherwise, answer **No**.

```
    Will this system be a Modality Worklist Provider?  y// <Enter> yes
```

5.1.18   Send CPT Modifiers

Modifier codes are included when CPT codes are transmitted. These modifier codes` may be sent to PACSs and modalities via DICOM as a two-character suffix to a procedure code (*nnnn-xx*). The usual configuration is to include the modifier suffix.

If the modifier suffices are to be included in messages, answer **Yes** to this question. If these suffixes are to be omitted, answer **No**.

If the site is going to use VistARad, enter **Yes**. If it is going to use a commercial PACS, check with the vendor to see if it can support CPT-Modifiers.

```
    Send CPT Modifiers? Yes // <Type Response> <Enter>
```

5.1.19   Dashes in SSN sent to PACS

This question will be asked only on a system that is slated to send text messages to a PACS.

The DICOM Text Gateway can be configured to include or not include dashes in Social Security Numbers sent to a PACS. If the PACS can handle dashes in Social Security Numbers, enter **Yes**. If it cannot handle them, enter **No**.

```
Include DASHES in Social Security Numbers sent to PACS? YES// <Type Response>
<Enter>
```

Note: Dashes can also be suppressed in Modality Worklist. See Section <u>B.4.6 WORKLIST.DIC</u>.

5.1.20   TCP/IP Address for VistA

In order to connect to the VistA system using the MUMPS-to-MUMPS Kernel Broker, the DICOM Gateway must know the TCP/IP address of the VistA system. Enter the site-specific address.

```
    Enter the network address for the main VistA HIS:
    ecp.<VistaSiteName>.med.va.gov// <Type Response> <Enter>
```

The address may be entered as the numeric address (in those cases that the connection must be with a specific processor) or to the "human-readable" name that is set up in the domain name server(DNS).

Note: The TCP/IP Address was entered when initially starting the LDGW and should not need to be updated again.

5.1.21   TCP/IP Port for MUMPS-to-MUMPS Broker

To connect to the VistA system using the MUMPS-to-MUMPS Kernel Broker, the DICOM Gateway must know the TCP/IP port number on which the Broker is listening on the VistA system. Enter the site-specific port-number.

```
Enter the network port number for the main VistA HIS: 148##// <Type
Response> <Enter>
```

Note: The TCP/IP Port was entered when initially starting the LDGW and should not need to be updated again.

5.1.22   Mail Group

When significant operational issues arise, the DICOM Gateway will send e-mail messages to a site-specific mail-group. Enter the e-mail address for the site-specific mail-group.

Note 1: A DICOM Gateway sends e-mail using the standard SMTP protocol, ***not*** through MailMan. If a mail-group within MailMan needs to receive these e-mail messages, the name of this mail-group cannot include any space characters.

Note 2: A site may or may not decide to include addresses in this mail-group that cause a pager/cell phone to be activated.

```
Send emergency e-mail notices to: DICOM@site// <Type Response> <Enter>
```

5.1.23   Display Patient Name

A DICOM Image Gateway presents an activity log while it is processing images. This activity log includes information that contains patient identifiers. When this display is visible from a public area, it is necessary to suppress the privacy-sensitive details.

When these details are to be suppressed (i.e., displayed as a series of asterisks), the answer to this question must be **No**. If these details are allowed to be visible, the answer to this question can be **Yes**.

```
Display Patient Name/ID in Image Processing? NO// <Type Response> <Enter>
```

5.1.24   Access Code for Background Tasks

When an external entity sends a Modality Worklist request to a DICOM Gateway, the DICOM Gateway is usually able to respond to the request using information that is stored on the Gateway itself. In some cases, the DICOM Gateway will need to query the VistA system for details to report back to the requester. When the DICOM Gateway makes such a request to the VistA system, it will use the access code that is specified as the answer to this question.

Note: The response to this question is treated as a password; i.e., it is not displayed on the monitor of the end-user. Also, you will be prompted to enter access code again for verification.

```
Access Code for Background Tasks // <Type Response> <Enter>
```

5.1.25 Verify Code for Background Tasks

When an external entity sends a Modality Worklist request to a DICOM Gateway, the DICOM Gateway is usually able to respond to the request using information that is stored on the Gateway itself. In some cases, the DICOM Gateway will need to query the VistA system for details to report back to the requester. When the DICOM Gateway makes such a request to the VistA system, it will use the verify code that is specified as the answer to this question.

Note: The response to this question is treated as a password (i.e., it is not displayed on the monitor of the end-user). Also, you will be prompted to enter verify code again for verification.

```
Verify Code for Background Tasks // <Type Response> <Enter>
```

5.1.26 Modality Worklist Port Numbers

Normally, modality worklist requests are processed through TCP/IP port number 60010. Some sites have equipment that uses a different port number, and which cannot be configured to use any other port number. In order to support such equipment, it is possible to define additional port numbers for modality worklist processors.

```
Currently, there is a Modality WorkList processor for
the following port:
        60010

Change? [A/D/N] N// ? <Enter>
Enter one of the following:
  No                 if no (additional) change is to be made
  Add <number>       to add a listener for a port
  Delete <number>    to remove a listener for a port
Note that valid port numbers are integers between 1 and 65535.
Note that the listener for port 60010 may not be removed.

Currently, there is a Modality WorkList processor for
the following port:
        60010

Change? [A/D/N] N// a 104 <Enter>

Currently, there are Modality WorkList processors for
the following ports:
        104
        60010

Change? [A/D/N] N// d 104 <Enter>

Currently, there is a Modality WorkList processor for
the following port:
        60010

Change? [A/D/N] N//
```

5.1.27   E-Mail Post Office

The Department of Veterans Affairs has three virus-checking post offices set up for nationwide e-mail. The post office that should be selected for this setting should be the one to which the site has the best network-connection. There are six possible responses for this question:

> **0: the local VistA system at R03CLEAPP10.r03.med.va.gov**
> **1: smtp.va.gov - this is the default post office for the VA**
> **2: smtpre.ihs.gov - this is the default for the Indian Health Service**
> **3: forum.va.gov - this is the VA Forum post office**

(or enter the TCP/IP address of the system to be used).
```
Which post office will this computer use? smtp.va.gov// <Type Response>
<Enter>
```

Note: VA policy on the usage of e-mail post offices has changed several times while this documentation was being prepared. At the time this documentation is being written, the only value that is allowed to be entered for this parameter is "**smtp.va.gov**".

Consult with your ISO for the VA's current policy on this issue.

5.1.28   E-Mail Post Office Port Number

Define the port number for the E-Mail Post Office when prompted:

```
Which port number will this computer use for e-mail? 25// <Type
Response> <Enter>
```

Email is transmitted using SMTP protocol. Normally, this protocol uses port number 25. In some cases, a different port number may have been set up at the site.
Note: The port number should be between 1 and 65,535:
        1 <= port number <= 65,535.
For more information about E-Mail Post Office, see the section 5.1.27 .

5.1.29   Specifying the Agency

If you are setting up a new DICOM Gateway, when you run option **4-2-2**, you are prompted to specify whether the DICOM Gateway is installed at a Department of Veterans Affairs (VA) site or an Indian Health Services (IHS) site.

```
Is this gateway installed in VA (V)or IHS (I)? V// <Type Response>
<Enter>
```

If you get this prompt, do one of the following:
- For VA sites, press Enter to accept the default, V.
- For IHS sites, type I and press Enter.

5.1.30   DICOM Message Logs

Define the number of DICOM Message logs you want to retain when prompted:

```
How many DICOM Message Logs do you want to keep? 20// <Type Response>
<Enter>
```

5.1.31   Image with Long Values

Define if Imaging Processing should reject DICOM objects that have excessively long data
elements. Enter "Yes" to reject DICOM objects and "No" to accept.

```
Should Image Processing reject objects with excessively long values?
NO// <Type Response> <Enter>
```

5.2   Loading the DICOM Dictionaries

The DICOM Dictionaries are constructed by populating a number of FileMan globals with data
from the master files. Appendix B contains a detailed description of each master file. The format
and contents of the resulting subtrees in global variable ^MAGDICOM(2006.5xx) are described
in the (online) FileMan Data Dictionaries.

Sites should make changes to the master files only for the site-specific DICOM Dictionaries. The
information in the global variable themselves should not be manually modified, as it will be
overwritten the next time the master file is loaded.

In order to start loading the dictionaries, select menu option **4-2-9**:

> **4** System Maintenance
> → **2** Gateway Configuration and DICOM Master Files
> → → **9** Reinitialize All the DICOM Master Files

```
Ready to build all of the DICOM Master Files?  y//  <Enter> yes
```

Note: If the DICOM dictionaries are stored in a network path, that will be shown:
*server**share**DICOM**Dict*\DICOMDICNAME.*DIC*

> Example:
>   From: f:\DICOM\Dict\ELEMENT.DIC
>   To   : \\server\share\DICOM\Dict\ELEMENT.DIC

5.2.1   DICOM Data Element Dictionary

During this step, the contents of the file **ELEMENT.DIC** are loaded into global variable
^MAGDICOM(2006.51,…).

The contents of the master file **ELEMENT.DIC** may not be modified by the site.

```
Building the DICOM Element Dictionary -- ^MAGDICOM(2006.51)
Ready to read dictionary file "f:\DICOM\Dict\ELEMENT.DIC"?  y// y <Enter>
```

5.2.2   DICOM Message Template Dictionary

During this step, the contents of the file **TEMPLATE.DIC** are loaded into global variable **^MAGDICOM(2006.52,…)**.

The contents of the master file **TEMPLATE.DIC** may not be modified by the site.

```
Building the DICOM Message Template Dictionary -- ^MAGDICOM(2006.52)

Ready to read dictionary file "f:\DICOM\Dict\TEMPLATE.DIC"?  y// <Enter> yes

*** PASS 1 STARTED ***
*** PASS 2 STARTED ***
- DONE -
```

5.2.3   DICOM Unique Identifier Dictionary

During this step, the contents of the file **UID.DIC** are into global variable **^MAGDICOM(2006.53,…)**.

The contents of the master file **UID.DIC** may not be modified by the site.

```
Building the DICOM UID Dictionary -- ^MAGDICOM(2006.53)
Ready to read dictionary file "f:\DICOM\Dict\UID.DIC"?  y// y <Enter>
```

5.2.4   Extended SOP Negotiation Table

During this step, the Extended SOP (Service Object Pair) Negotiation Table is loaded into global variable **^MAGDICOM(2006.531,…)**.

```
Updating the extended SOP negotiation table... done!
```

5.2.5   DICOM PDU Types

During this step, the PDU (Protocol Data Unit) table is loaded into global variable **^MAGDICOM(2006.54,…)**.

```
Updating the PDU TYPE table... done!
```

5.2.6   DICOM HL7 Segment and Field Dictionary

During this step, the contents of the file **HL7.DIC** are loaded into global variable **^MAGDICOM(2006.57,…)**.

The site may not modify the contents of the master file **HL7.DIC**.

```
Building the DICOM HL7 dictionary in ^MAGDICOM(2006.57)
Ready to read dictionary file "f:\DICOM\Dict\HL7.DIC"?  y// y <Enter>
```

```
done!
```

5.2.7   Instruments

During this step, the contents of the file **INSTRUMENT.DIC** are loaded into global variable **^MAGDICOM(2006.581,…)**.

The contents of the master file **INSTRUMENT.DIC** must be customized for the site.

```
Building the Instrument Dictionary -- ^MAGDICOM(2006.581)
Ready to read dictionary file "f:\DICOM\Dict\INSTRUMENT.DIC"?  y// y <Enter>
```

5.2.8   Modalities

During this step, the contents of the file **MODALITY.DIC** are loaded into global variable **^MAGDICOM(2006.582,…)**.

The contents of the master file **MODALITY.DIC** must be customized for the site.

```
Building the Modality Type Dictionary -- ^MAGDICOM(2006.582)
Ready to read dictionary file "f:\DICOM\Dict\MODALITY.DIC"?  y// y <Enter>
```

5.2.9   CT Conversion History

During this step, the contents of the file **CT_PARAM.DIC** are loaded into global variable **^MAGDICOM(2006.5821,…)**.

The contents of the master file **CT_PARAM.DIC** may not be customized for the site.

```
Building the CT Conversion History Dictionary -- ^MAGDICOM(2006.5821)
Ready to read dictionary file "f:\DICOM\Dict\CT_PARAM.DIC"?  y// y <Enter>
```

5.2.10   Modality Worklist

During this step, the contents of the file **WORKLIST.DIC** are loaded into global variable **^MAGDICOM(2006.583,…)**.

The contents of the master file **WORKLIST.DIC** must be customized for the site.

```
Building the Modality Worklist Dictionary -- ^MAGDICOM(2006.583)
Ready to read dictionary file "f:\DICOM\Dict\WORKLIST.DIC"?  y// y <Enter>
```

5.2.11   Port Numbers for Text Gateway sending messages to PACS

During this step, the contents of the file **PORTLIST.DIC** are loaded into global variable **^MAGDICOM(2006.584,…)**.

The contents of the master file **PORTLIST.DIC**, if used, must be customized for your site.

```
Building the TCP/IP Provider Port Dictionary -- ^MAGDICOM(2006.584)
Ready to read dictionary file "f:\DICOM\Dict\PORTLIST.DIC"?  y// y <Enter>
```

5.2.12   User Application Parameters

During this step, the contents of the file **SCU_LIST.DIC** are loaded into global variable **^MAGDICOM(2006.585,…)**.

The contents of the master file **SCU_LIST.DIC** must be customized for the site.

```
Building the User Application Dictionary -- ^MAGDICOM(2006.585)
Ready to read dictionary file "f:\DICOM\Dict\SCU_LIST.DIC"?  y// y <Enter>
```

5.2.13   Provider Application Dictionary

During this step, the contents of the file **SCP_LIST.DIC** are loaded into global variable **^MAGDICOM(2006.586,…)**.

The contents of the master file **SCP_LIST.DIC** may not be modified by the site.

```
Building the Provider Application Dictionary -- ^MAGDICOM(2006.586)
Ready to read dictionary file "f:\DICOM\Dict\SCP_LIST.DIC"?  y// y <Enter>
```

5.2.14   Application Entity Title Dictionary

During this step, the contents of the file AE_TITLE.DIC are loaded into global variable ^MAGDICOM(2006.588,…).
The contents of the master file AE_TITLE.DIC may be customized for the site.

```
Building the Application Entity Title Dictionary -- ^MAGDICOM(2006.588)
Ready to read dictionary file "f:\DICOM\DICT\AE_TITLE.dic"?  y// yes <Enter>
```

5.2.15   Data Transfer

The master file named **DATAMISC.DIC** references several other dictionary files that contain lists of additional data elements to be displayed on a diagnostic workstation. These "data transfer" dictionaries are loaded during this step.

```
Ready to read dictionary file "f:\DICOM\DICT\DATAMISC.DIC"?  y//
```

5.2.16   Terminal Title

The master file named TERMINAL_TITLE.DIC is loaded (see Appendix A).

```
Ready to read dictionary file "f:\DICOM\DICT\TERMINAL_TITLE.dic"?  y// yes <Enter>

-- DICOM Master File Build completed successfully –
```

5.3 Verify the DICOM Gateway Installation

1. On the DICOM Gateway, run option **4-1-4** to verify the patch version.

   4 - System Maintenance
   → **1** - System Operation
   →→ **4** - Display the Version of the Software

2. On the DICOM Gateway, run option **4-2-1** to verify the LDGW configuration.

   4 - System Maintenance
   → **2** - Gateway Configuration and DICOM Master Files
   →→ **1** - Display Gateway Configuration Parameters

3. Run option **4-2-11** to confirm the Access and Verify codes.

   4 – System Maintenance
   → **2** – Gateway Configuration and Master Files
   →→ **11** – Validate Access/Verify Codes for Modality Worklist
4. Run option **4-2-12** to take DICOM Gateway parameters and store them on VistA**.**

   4 System Maintenance
   → **2** Gateway Configuration and Master Files
   → → **12** Display Versions and/or Time Stamps of Components

5.4 Logging into the DICOM Gateway

With patch MAG*3.0*319 new Auto-Login/Start up of LDGW Terminal Sessions, the various
DICOM Gateway programs that are part of the VistA Imaging DICOM Gateway, e.g.: 1-1,2-3,2-
8-2…etc., can be started from one **short_cut** on Windows desktop:

Double click the shortcut icon "DICOM Gateway Startup" on the desktop (or
C:\Users\Public\Desktop), then click/select on the most left window with the title "1-1 Start

Processing Text…" from the listing group on Windows task bar to login with the LDGW VistA access/verify code.
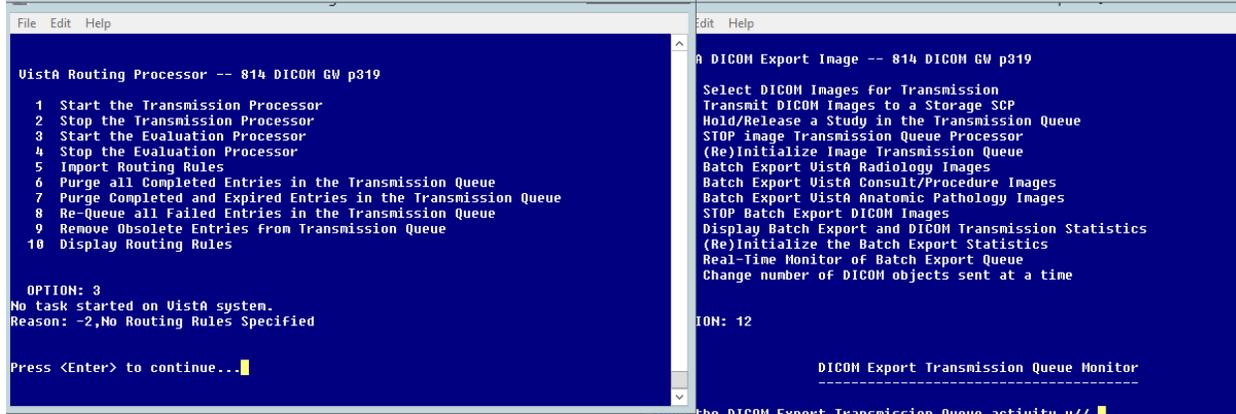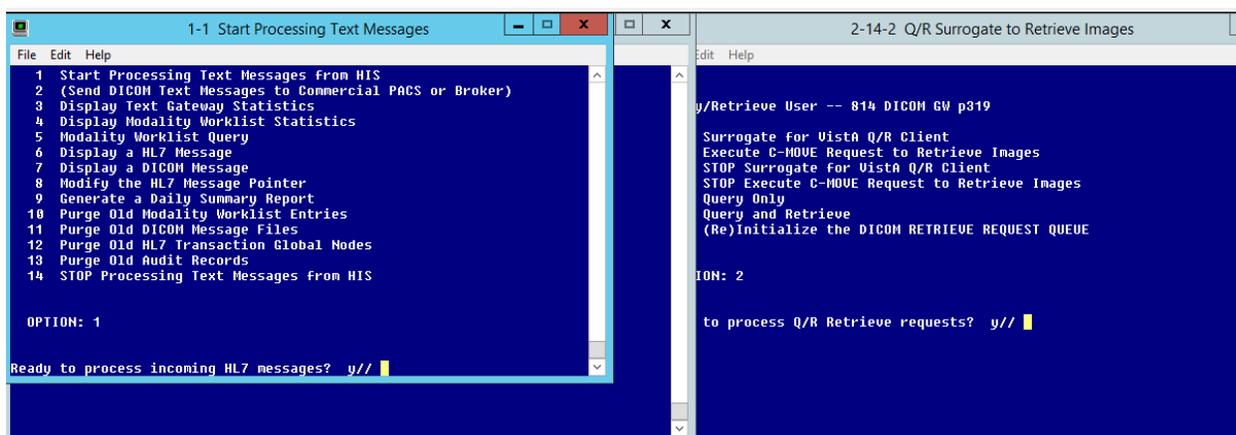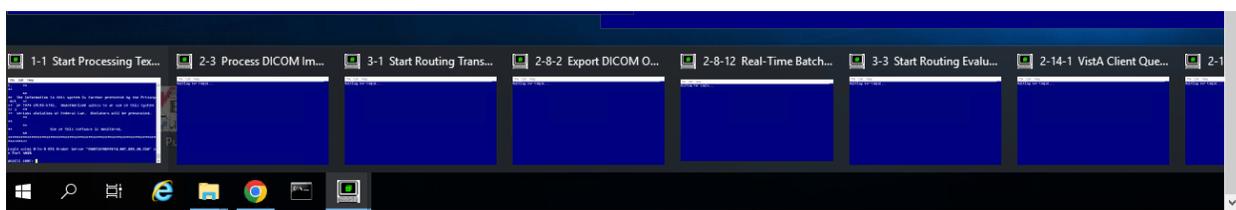
The default "DICOM Gateway Startup" opens all windows. You can specify for each gateway the terminal windows that open. You must modify the DICOM Gateway Startup.bat. See Appendix A.

5.5   Recommended Icons – DGW Terminal sessions

The installation process creates a shortcut icon of 9 IRIS terminal sessions for the benefit of the end-user. A typical site will use only a subset of these 9. It is recommended that a site customize the windows that are described below. Usage of the various session will depend on the tasks that are run from the system. The table below shows which gateway tasks relate to which type of gateway. See Appendix A.

5.6 Gateway Tasks Related to Gateway Types

Menu Option	Text G/W	Image G/W	Routing G/W	Study Tracker G/W
1-1|Start Processing Text Messages	X			
1-4|Display Modality Worklist Statistics	X			
2-3|Process DICOM Images		X		
2-5|Display Real-Time Storage Server Statistics		X		
2-8-2|Export DICOM Objects			X	
2-8-12|Real-Time Batch Export Queue Monitor			X	
2-14-1|VistA Client Query/Retrieve Surrogate				X
2-14-2|Q/R Surrogate to Retrieve Images				X
3-1|Start Routing Transmission Processor			X	
3-3|Start Routing Evaluation Processor			X	

Appendix A Creating Automatic Startup of IRIS Terminal Sessions

The default **IRIS** installation will be enable the **Automatic Startup of IRIS Terminal Session** w/ one login (access/verify code)

A.1   Introduction

When the DICOM Gateways were first released (1996), Telnet terminal sessions were used with Micronetics Standard MUMPS. The use of Telnet terminal sessions was continued with the InterSystems Caché implementations. Telnet was a non-secure protocol, however.
Five years ago, when MAG*3.0*166 was released and SSH was installed on the Cache DICOM Gateways to replace Telnet, Micro Focus Reflection Workspace was added to provide a secure connection. Reflection server and client was installed on the DICOM Gateways. Reflection clients were used to access Reflection servers on the same DICOM Gateway. It was soon realized that Reflection provided no value to the DICOM Gateway because Caché and IRIS Terminal communicated directly with the MUMPS servers on the local DICOM Gateway bypassing Telnet. With the upgrade to IRIS, we will discontinue the use of Reflection and SSH and instead use IRIS Terminal with an automatic start up process. (The Telnet service will continue to be disabled.)

The automatic startup procedure for IRIS Terminal sessions has the following capabilities:
- Display name of the application in the Title Bar of the IRIS Terminal window
- Automatically navigate the menu tree and start the appropriate application
- Require a single login for all of IRIS Terminal windows started in a batch
- Position the IRIS Terminal window on the screen
- Adjust the size of the IRIS Terminal window (rows and columns)

A.2   Customize DICOM Gateway Startup.bat

Edit the DICOM Gateway Startup.bat Shortcut on the desktop by right clicking the shortcut and selecting Edit.

The DICOM Gateway Startup.bat can be modified to specify which windows automatically display, the position of each window on the screen and size of the window. These are controlled by the Call LDGW_Startup lines in the file. To remove a window comment it out with "rem" in the front. Lines can also be added to start additional windows.

Example

```
rem  LDGD_StartUp       Option    X-Pos     Y-Pos    Rows    Columns
call LDGW_StartUp       1-1       0         0        20      70
rem call LDGW_StartUp   2-3       625       0
rem call LDGW_StartUp   3-1       1250      0
call LDGW_StartUp       2-8-2     0         400
call LDGW_StartUp       2-8-12    625       400      25      90
call LDGW_StartUp       3-3       1250      400
call LDGW_StartUp       2-14-1    0         800
call LDGW_StartUp       2-14-2    625       800
call LDGW_StartUp       -         1250      800
```

The current window options that can be included in the DICOM Gateway Startup.bat are listed below. A window can be added more than once.

>   1-1|Start Processing Text Messages
>   1-4|Display Modality Worklist Statistics
>   2-3|Process DICOM Images
>   2-5|Display Real-Time Storage Server Statistics
>   2-8-2|Export DICOM Objects
>   2-8-12|Real-Time Batch Export Queue Monitor
>   2-14-1|VistA Client Query/Retrieve Surrogate
>   2-14-2|Q/R Surrogate to Retrieve Images
>   3-1|Start Routing Transmission Processor
>   3-3|Start Routing Evaluation Processor
>   4-1-3|Issue a DICOM Echo Request
>   -|VistA DICOM Gateway Menu

The screens shot below shows how the menu trees in all nine windows were automatically navigated to the appropriate application. Login was required for just the first most upper left (reduced 20x70 size) window and then propagated to the other eight windows
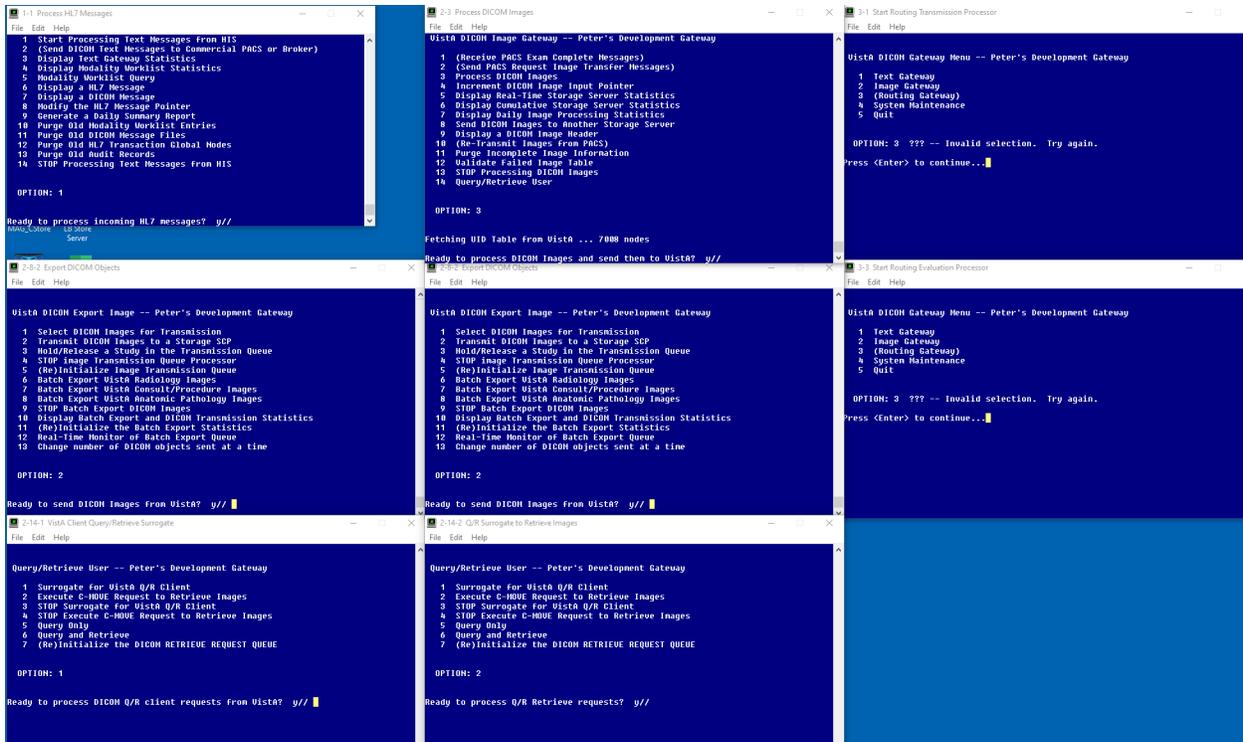
A.3   TERMINAL_TITLE.DIC

The new TERMINAL_TITLE.DIC contains the list of windows that are available to be customized in DICOM Gateway Startup.bat. This information can be modified to allow additional windows to be available.

The format of each entry is {option number string} | {option title}

- {option number string} are the are the option's menu numbers separated by dashes
- {option title} is displayed in the Title Bar of the DICOM Gateway terminal window

If an entry does not exist for an option, the default InterSystems title will be used.

```
1-1|START PROCESSING TEXT MESSAGES
1-4|DISPLAY MODALITY WORKLIST STATISTICS
2-3|PROCESS DICOM IMAGES
2-5|DISPLAY REAL-TIME STORAGE SERVER STATISTICS
2-8-2|EXPORT DICOM OBJECTS
2-8-12|REAL-TIME BATCH EXPORT QUEUE MONITOR
2-14-1|VISTA CLIENT QUERY/RETRIEVE SURROGATE
2-14-2|Q/R SURROGATE TO RETRIEVE IMAGES
3-1|START ROUTING TRANSMISSION PROCESSOR
3-3|START ROUTING EVALUATION PROCESSOR
-|VISTA DICOM GATEWAY MENU
```

A.4   Update TERMINAL_TITLE.DIC Menu

If the TERMINAL_TITLE.DIC is modified the menu option 4-2-13 Update TERMINAL_TITLE.DIC needs to be run.

Answer Yes to the "Ready to read dictionary file" question.

```
Gateway Configuration and DICOM Master Files -- DICOM APPVIM843

   1   Display Gateway Configuration Parameters
   2   Update Gateway Configuration Parameters
   3   Update AE_TITLE.DIC
   4   Update INSTRUMENT.DIC
   5   Update MODALITY.DIC
   6   Update PORTLIST.DIC
   7   Update SCU_LIST.DIC
   8   Update WORKLIST.DIC
   9   Reinitialize All the DICOM Master Files
  10   Create Shortcuts for Instruments
  11   Validate Access/Verify Codes for Background Task Usage
  12   Display Versions and/or Time Stamps of Components
  13   Update TERMINAL_TITLE.DIC


  OPTION:   13



Tue 13:55 Import Master File with "Terminal Title" definitions.
Tue 13:55 from file "C:\DICOM\DICT\TERMINAL_TITLE.dic".
Ready to read dictionary file "C:\DICOM\DICT\TERMINAL_TITLE.dic"?  y//
```

The TERMINAL_TITLE.DIC will then be updated

```
Tue 13:56 Comment: << {option number string} are the are the option's menu numbe
rs separated by dashes>>
Tue 13:56 Comment: << {option title} is displayed in the Title Bar of the DICOM
Gateway terminal window>>
Tue 13:56 Comment: <<>>
Tue 13:56 Comment: << if an entry does not exist for an option, the default Inte
rSystems title will be used.>>
Tue 13:56 Comment: <<>>
Tue 13:56 Comment: << TERMINAL_TITLE.DIC is used to build the files in the c:\DI
COM\DICT\LGDW_StartUP folder.>>
Tue 13:56 Comment: <<>>
Tue 13:56 1-1|Start Processing Text Messages
Tue 13:56 1-4|Display Modality Worklist Statistics
Tue 13:56 2-3|Process DICOM Images
Tue 13:56 2-5|Display Real-Time Storage Server Statistics
Tue 13:56 2-8-2|Export DICOM Objects
Tue 13:56 2-8-12|Real-Time Batch Export Queue Monitor
Tue 13:56 2-14-1|VistA Client Query/Retrieve Surrogate
Tue 13:56 2-14-2|Q/R Surrogate to Retrieve Images
Tue 13:56 3-1|Start Routing Transmission Processor
Tue 13:56 3-3|Start Routing Evaluation Processor
Tue 13:56 -|VistA DICOM Gateway Menu

Press <Enter> to continue...
```

Appendix B Master Files

B.1   Overview

The VistA Imaging DICOM Gateway uses a number of tables to drive certain parameterized procedures within the VistA Imaging DICOM Gateway software. These tables are populated from the data in a set of ASCII text files. In the context of the VistA Imaging DICOM Gateway, these text files are called "master files."

Common usage within the Department of Veterans Affairs is to use the term "file" for a subtree of a global variable in MUMPS. The master files that are described in this chapter, however, are files in the more traditional sense: entities that live in directories within an operating system. To minimize confusion about the meaning of the term "file," this chapter will reserve the term "file" for entities outside of MUMPS, and the term "table" for databases within a MUMPS environment.

B.2   Master Files

The VistA Imaging DICOM Gateway uses a number of FileMan tables to drive the VistA Imaging DICOM Gateway software. These FileMan tables are populated from ASCII text data stored in master files located in a directory named **F:\DICOM\Dict**, (in this document, the drive-letter **F:** is used; see sections 3.3 and 3.4). The actual name for this directory is stored by the VistA Imaging DICOM Gateway software as data in **^MAGDICOM(2006.563,1,"DICT PATH")**.

B.2.1   Master File Menu Options

The menu of the VistA Imaging DICOM Gateway has number of options that each import one, some or all of the master files. These menu options are:

4 System Maintenance
→ **2** Gateway Configuration and DICOM Master Files
→ → **1** Display Gateway Configuration Parameters
→ → **2** Update Gateway Configuration
→ → **3** Update AETITLE.DIC
→ → **4** Update INSTRUMENT.DIC
→ → **5** Update MODALITY.DIC
→ → **6** Update PORTLIST.DIC
→ → **7** Update SCU_LIST.DIC
→ → **8** Update WORKLIST.DIC
→ → **9** Reinitialize All the DICOM Master Files
→ → **10** Create Shortcuts for Instruments
→ → **11** Validate Access/Verify Codes for Modality Worklist
→ → **12** Display Versions and/or Time Stamps of Components
→→ **13** Update TERMINAL_TITLE.DIC

There are two groups of master files: static ones that are the same for all sites, and site-configurable ones that must be edited at each site.

B.2.2   General Formatting Issues

- In all master files, lines that start with a pound sign ("#") are comment lines.
- Text lines that do not start with a number sign contain dictionary data.
- While updating master files, blank lines and comment lines will be ignored.

Note: The final line in any master file must be followed by an "end-of-line" control sequence (carriage return and line feed). If the final "end-of-line" control sequence is missing, the line will be invisible to the software that updates the master files. To prevent this problem, all distributed versions of the master files end with the following comment line:

```
# End of File<CR><LF>
```

B.3   Static Master Files

This section describes the format and contents of the static master files, which are part of the release distribution of the VistA Imaging.

Static master files in this category contain data that is the same for all sites. These files may not be modified by the sites (reference VA directive and FDA warning).

The following files are included in the release:

File Name	FileMan Table	MUMPS Routine	Comment
CT_PARAM.DIC	2006.5821	^MAGDMFB7	Contains list of image processing rules for historical CT images.
DATAGECT.DIC	2006.511 sub 2006.5112	^MAGDIR4	Contains list of data-items to be shown on diagnostic workstation displays.
DATA_CR.DIC	2006.511 sub 2006.5112	^MAGDIR4	Contains list of data-items to be shown on diagnostic workstation displays.
DATAMISC.DIC	2006.511 sub 2006.5112	^MAGDIR4	Contains list of data-items to be shown on diagnostic workstation displays.
DATA_MRI.DIC	2006.511 sub 2006.5112	^MAGDIR4	Contains list of data-items to be shown on diagnostic workstation displays.
ELEMENT.DIC	2006.51	^MAGDMFB2	Contains DICOM Standard data elements.
HL7.DIC	2006.57	^MAGDMFB7	Contains list of HL7 message templates.
SCP_LIST.DIC	2006.586	^MAGDMFB9	Contains lists of parameters for Provider Applications
TEMPLATE.DIC	2006.52	^MAGDMFB3 ^MAGDMFB4	Contains templates for DICOM messages.
UID.DIC	2006.53	^MAGDMFB5	Contains list of unique DICOM identifiers.

B.3.1 ELEMENT.DIC

The file **ELEMENT.DIC** contains the DICOM data dictionary. As part of the installation process, this file is read by routine ^**MAGDMB2** and is used to construct the FileMan table **DICOM Data Element Dictionary** (File 2006.51, stored in ^**MAGDICOM(2006.51,…)**).

In a DICOM data stream, every data element is identified by a four-byte binary "tag" consisting of a two-byte group field and a two-byte element field. The tag value is usually represented by two groups of four hexadecimal digits, separated by a comma (group, element, e.g., 0010,21B0 for Additional Patient History). Odd-numbered groups denote private elements and are accompanied by an explicit owner identification code.

The file **ELEMENT.DIC** contains three kinds of records:

The first is the "group" record, which for odd-numbered groups defines the owner identification code for private elements. Following the group record are one or more "element" records that define each element and its set of attributes. Some of the element records are followed by optional "value" records, which define the legal set of enumerated values or defined terms for the element.

The values of an element are "enumerated values" when the value of that element may be one of an explicitly specified set of standard values, which shall not be extended by implementers.

The values of an element are "defined terms" when the value of that element may be one of an explicitly specified set of standard values, which may be extended by implementers.

The formats for the different record types are as follows:

- Group Record: <group> | <group owner> | <group title>

- Element Record: <tag> | <element name> | <value representation> | <multiplicity> | <value flag> | <retired flag>

- Value Record: <tag> | <permitted value>

The different fields are defined below:

<group>   The group identifier, expressed in four hexadecimal digits.

<group owner>   Blank for groups that are defined in the DICOM standard, and otherwise contains the name of or a mnemonic for the owner of the group.

<group title>   A name for the group for documentation purposes.

<tag>   Identifies the group and element(s), the value may contain hexadecimal digits and several wildcard characters.

<element name>   The name of the element (case-sensitive).

<value   The 2-letter data type mnemonic.
representation>

<multiplicity>   Identifies the (maximum) number of values that may be passed at a
                          time.

<retired flag>   An identifier that denotes that the element is no longer current.

<permitted value>   The enumerated value or defined term, along with its meaning.

Example:

```
0010||Patient Information
0010,0000|Group Length|UL|1||
0010,0010|Patient's Name|PN|1||
0010,0020|Patient ID|LO|1||
0010,0021|Issuer of Patient ID|LO|1||
0010,0030|Patient's Birth Date|DA|1||
0010,0032|Patient's Birth Time|TM|1||
0010,0040|Patient's Sex|CS|1|E|
0010,0040|M=male
0010,0040|F=female
0010,0040|O=other
0039|VA DHCP|Admission, Discharge, and Transfer Information Shadow
0039,0000|Group Length|UL|1||
0039,0010:1:00FF|Owner of Group|LO|1||
0039,xx10|Current Patient Location Sequence|SQ|1||
0039,xx20|Patient's Institutional Residence Sequence|SQ|1||
```

When a <tag> contains an "xx," this means that it is a private element, and the same definition applies to all tags that have any hexadecimal digit in the position of that "xx."

When a tag contains a value of the format <start>:<step>:<end>, this means that the same definition applies to all values covered by that range definition.

The information in ELEMENT.DIC is extracted directly from the DICOM standard (element definitions are specified in **Part 6: Data Dictionary (PS 3.6)**; lists of permitted values are specified in **Part 3: Information Object Definitions (PS 3.3)**). The full DICOM standard can be found at https://www.dicomstandard.org/

The data from this file is stored in MUMPS in the following structure:

```
^MAGDICOM(2006.51,d0,0) = group , element [ , owner ] ^ name ^ VR ^ mult ^ flag
^MAGDICOM(2006.51,d0,1,d1,0) = value ^ meaning
^MAGDICOM(2006.51,"B", group element [owner], d0) = ""
^MAGDICOM(2006.51,d0,1,"B",value,d1) = ""
```

B.3.2   HL7.DIC

The file **HL7.DIC** contains the definitions of the recognized HL7 messages. As part of the installation process, this file is read by routine ^**MAGDMB7** and is used to construct the FileMan table **DICOM HL7 SEGMENT** (File 2006.57, stored in **^MAGDICOM(HL7,…)**).

The routine **^MAGDHRP** uses the values in this table to produce a formatted HL7 message listing. Each record consists of two pieces. The first piece is either the HL7 segment identifier (if it is alphanumeric), or it contains the HL7 segment field number (if it is numeric). The second piece is text that defines either the name of the segment or the name of the field.

Example of an HL7 segment with its fields:

```
PID|Patient Identification Segment
1|Set ID - Patient ID
2|Patient ID (External ID)
3|Patient ID (Internal ID)
4|Alternate Patient ID
5|Patient Name
6|Mother's Maiden Name
7|Date of Birth
8|Sex
9|Patient Alias
10|Race
11|Patient Address
12|Country Code
13|Phone Number - Home
14|Phone Number - Business
15|Language - Patient
16|Marital Status
17|Religion
18|Patient Account Number
19|SSN Number - Patient
20|Driver's Lic Num - Patient
21|Mother's Identifier
22|Ethnic Group
```
The data from this file is stored in MUMPS in the following structure:

```
^MAGDICOM("HL7",d0,0) = segment ^ name of segment
^MAGDICOM("HL7",d0,1,d1,0) = name of element
^MAGDICOM("HL7","B",segment,d0) = ""
```

B.3.3   CT_PARAM.DIC

The file **CT_PARAM.DIC** contains the definitions of historical CT parameters used by VA sites that are supported by the VistA Imaging DICOM Gateway. The primary purpose of this file is for CT images processed before installation of Imaging Patch 30. (In images processed after the installation of Patch 30, image processing rules are saved into the image's .txt file, and the CT_PARAM.DIC file is not used.)

There is one type of record in **CT_PARAM.DIC**.

- Application Record: <Site Code> | <Manufacturer>|<Model>|<Latest Date Saved>|<Image Processing Rules>

The different fields in this record are defined below:

<Site Code>	Also known as the Institution Code.
<Manufacturer>	The manufacturer of the equipment producing the images; element (0008,0070).
<Model>	The manufacturer's model name for the equipment; element (0008,1090).
<Latest Date Saved>	The last date this specific image processing rule was set or changed in MODALITY.DIC.
<Image Processing Rules>	Control the conversion of the image from DICOM to Targa file format.

Example of entries in CT_PARAM.DIC:

```
442|TOSHIBA|AQUILION|9-Jun-2006|b12 a2048 f0 c4095
442|TOSHIBA|ASTEION|25-Feb-2005|b12
442|PHILIPS|BRILLIANCE16|14-Jul-2006|
442|GE MEDICAL SYSTEMS|HISPEED|4-May-2004|b12 a1000 f0 c4095
442|GE MEDICAL SYSTEMS|HISPEED CT/I|9-Jun-2006|b12 f0
442|GE MEDICAL SYSTEMS|LIGHTSPEED16|9-Jun-2006|b12 f0 c4095
442|PHILIPS|MX8000|9-Jun-2006|b12
442|PHILIPS|MX8000 IDT 16|9-Jun-2006|b12 f0 c4095
442|PICKER INTERNATIONAL, INC.|PQ5000|9-Jun-2006|b12 a1000 f0 c4095
```

B.3.4   SCP_LIST.DIC

The file **SCP_LIST.DIC** contains the definitions of the applications that are supported by the VistA Imaging DICOM Gateway operating in the role of a **S**ervice **C**lass **P**rovider (SCP). As part of the installation process, this file is read by routine ^**MAGDMB9** and is used to construct the FileMan table **Provider Application List** (File 2006.586, stored in **^MAGDICOM(2006.586,…)**).

There are three kinds of records in the file **SCP_LIST.DIC**. The first is the "application" record, which identifies the name of the VistA service class provider. Following the application record are one or more "service" records defining the services that may be utilized. Following a "service" record, there is at least one "transfer syntax" record, defining how information may be exchanged.

- Application Record: <called AE title> | <application name>

- Service Record: | <SOP Class>

- Transfer Syntax | | <syntax>
Record:

The different fields are defined below:

<called AE title>	The title of the called VistA provider (SCP) application entity.
<application name>	The name that VistA uses to refer to the DICOM application.
<SOP Class>	The name of the DICOM service object pair (SOP).
<syntax>	is the name of a supported transfer syntax

Example of entries in SCP_LIST.DIC:

```
    # VistA Service Class Providers
    # <VistA Application Entity Title> | <application name>
    # | <supported SOP class>
    #
    VISTA_WORKLIST|VistA Modality Worklist
    |Verification SOP Class
    ||Implicit VR Little Endian
    |Modality Worklist Information Model – FIND
    ||Implicit VR Little Endian
    #
    VISTA_STORAGE|VistA Storage
    |Verification SOP Class
    ||Explicit VR Little Endian
    ||Implicit VR Little Endian
    |Computed Radiography Image Storage
    ||Explicit VR Little Endian
    ||Implicit VR Little Endian
    |CT Image Storage
    ||Explicit VR Little Endian
    ||Implicit VR Little Endian
    |Ultrasound Multi-frame Image Storage (retired)
    ||Explicit VR Little Endian
    ||Implicit VR Little Endian
```

The data from this file is stored in MUMPS in the following structure:

```
^MAGDICOM(2006.586,d0,0) = AE Title ^ Application name
^MAGDICOM(2006.586,d0,1,d1,0) = SOP Class UID ^ SOP Class Name
^MAGDICOM(2006.586,d0,1,d1,1,d2,0)
                            = Transfer Syntax UID ^ Transfer Syntax Name
^MAGDICOM(2006.586,"B",AE Title,d0) = ""
^MAGDICOM(2006.586,d0,1,"B",SOP Class UID,d1) = ""
^MAGDICOM(2006.586,d0,1,d1,1,"B",Transfer Syntax UID,d2) = ""
```

B.3.5   TEMPLATE.DIC

The file **TEMPLATE.DIC** contains model definitions of the messages that are supported by the VistA Imaging DICOM Gateway. As part of the installation process, this file is read by routines **^MAGDMB3** and **^MAGDMFB4** and is used to construct the file **F:\DICOM\ Dict\Template.TMP** and the FileMan table **DICOM Message Template Dictionary** (File 2006.52, stored in **^MAGDICOM(2006.52,…)**).

DICOM data elements are the attributes of the Service Classes and the Information Object Definitions. The service classes and information object definitions are joined together to form the Service-Object Pair (SOP) classes. The SOP classes are the high-level communications message protocol units of DICOM.

The file **TEMPLATE.DIC** defines the way that the DICOM data elements are combined to make up the SOP Classes. The file **TEMPLATE.DIC** contains attributes of the service classes,

the information object definition modules, and the SOP classes. Because the same set of attributes is often repeated in several different SOP classes, the gateway master file update software uses a macro facility so that the attributes can be defined once and used multiple times. The file **TEMPLATE.DIC** is expanded by the macro facility (routine **^MAGDMFM4**) to create the file **Template.TMP**, which contains the model of each DICOM message. The routine **^MAGDMFB3** routine invokes **^MAGDMFM4** to expand the macros, and then reads the resulting file **F:\DICOM\ Dict\Template.TMP** to populate the FileMan table in global variable ^MAGDICOM(2006.52).

The format for the macro definitions is as follows:

```
{$define <name of macro>}
     <body of macro>
{$end <name of macro>}
```

The macro facility performs simple text replacement. When a macro is invoked, the invocation is replaced by the macro text. The format for a macro invocation is {<name of macro>}. The macro invocation is replaced with <body of macro> in the expanded text. Macros may be nested.

The <body of macro> (i.e., the macro text) consists of a sequence of DICOM Element Records and (optional) Macro Invocation Records. The formats for these two types of records are as follows:

- Element Record: <element name> | <tag> | <group owner> | <SCP/SCU Type> |<default value>

- Macro Invocation: {<name of macro>}

The different fields are defined below:

<element name>   The case-sensitive name of the element.

<tag>   The group and element numbers, in (gggg,eeee) hexadecimal format.

<group owner>   The name/mnemonic for the owner of the group.

<SCP/SCU Type>   The SCP and SCU DICOM Type (1, 1C, 2, 3, etc.).

<default value>   The default value of the element in the message.

Example of a macro definition:

```
{$define N-EVENT-REPORT-RQ}
Affected SOP Class UID|(0000,0002)||1/1|
Command Field|(0000,0100)||1/1|0100H
```

```
Message ID|(0000,0110)||1/1|
Priority|(0000,0700)||1/1|
Data Set Type|(0000,0800)||1/1|0003H
Affected SOP Instance UID|(0000,1000)||1/1|
Event Type ID|(0000,1002)||1/1|
{$end N-EVENT-REPORT-RQ}
```

Macros are used for building model message templates.

A message template consists of four different types of records. The "template" record identifies the beginning of the message template. The "SOP" record defines the SOP class for the template. The "element" and "macro invocation" records define the element attributes of the template. The different fields for the "template" and "sop" records are defined below:

- Template Record: $TEMPLATE | <message name> | <DIMSE> | <typename> | <typeid>

- SOP Record: $SOP | <SOP class name>

- Element Record: <element name> | <tag> | <group owner> | <SCP/SCU Type> | <default value>

- Macro Invocation: {<name of macro>}

The different fields for the "template" and "sop" records are defined below:

<message name>	The name of the template.
<DIMSE>	The DICOM Message Service Element.
<typename>	The DICOM Event Type Name.
<typeid>	The DICOM Event Type Id.
<SOP class name>	The case-sensitive name of the SOP class defined in the UID.DIC file.

Note: Refer to the **DICOM standard, Part 4 Service Class Specifications (PS 3.4)** for the definition of the DICOM terms.

Example of a template definition:

```
$TEMPLATE|PATIENT DEMOGRAPHIC CHANGE|N-EVENT-REPORT|Patient Updated|3|
$SOP|VA Detached Patient Management SOP Class
{N-EVENT-REPORT-RQ}
Instance Creation Date|(0008,0012)||-/2|
Instance Creation Time|(0008,0013)||-/2|
Instance Creator UID|(0008,0014)||-/2|
{Patient Data}
```

```
     {Message Handle}
```

The element information in the file **TEMPLATE.DIC** is extracted directly from the DICOM standard, **Part 6: Data Dictionary (PS 3.6)** and **Part 7:Message Exchange (PS 3.7).** The list of attributes comes from **Part 3: Information Object Definitions (PS 3.3)** and **Part 7:Message Exchange (PS 3.7).**

See https://www.dicomstandard.org/ for more information about the DICOM standard.

The data from this file is stored in MUMPS in the following structure:

```
^MAGDICOM(2006.52,d0,0) = Title ^ DIMSE ^ SOP Class ^ Type Name ^ Type ID
^MAGDICOM(2006.52,d0,1,d2,0) = tag ^ name ^ SCP type / SCU type ^ Value ^ Pointer
^MAGDICOM(2006.52,"B",Title,d0) = ""
```

B.3.6   UID.DIC

The file **UID.DIC** contains the definitions of the unique identifiers for SOP classes, transfer syntax's and class instances for the DICOM standard. As part of the installation process, this file is read by routine **^MAGDMB5** and is used to construct the FileMan table **DICOM UID Dictionary** (File 2006.53, stored in **^MAGDICOM(2006.53,…)**).

DICOM uses a unique object identification scheme based upon ISO-9834-3. This standard uses numeric fields separated by periods that are assigned in a left-to-right hierarchical fashion in order to allow uniqueness. All DICOM standard UIDs have the root **1.2.840.10008**, and UIDs generated by the VA have the root **1.2.840.113754**.

The file **UID.DIC** contains all the pre-defined UID values that are used by the VistA DICOM applications.

The file UID.DIC contains two types of records:

- UID Record: <UID Value> | <UID Name> | <UID Type> | <Reference> | <Function>

- Meta Record | <UID Value> | <UID Name>

When a UID identifies a Meta SOP Class, the record for the Meta SOP Class will be followed by one or more Meta records. In such a case, each Meta record defines one UID that identifies a SOP class that is a member of the Meta SOP class.

The different fields are defined below:

<UID Value>   The unique period delimited numeric string that represents the value of the UID

<UID Name>   The text name for the UID; 1:1 mapping between <UID Value> and <UID NAME>.

<UID Type>   Indicates the usage for the UID.

<Reference>   Documents where the UID is officially defined.

<Function>   Identifies which UIDs are supported by VistA Storage (for example, S for Storage).

Example of some UID definitions:

```
1.2.840.10008.1.1|Verification SOP Class|SOP Class|Part 4|*
1.2.840.10008.3.1.2.1.4|Detached Patient Management Meta SOP Class
                                            |Meta SOP Class|Part 4|
|1.2.840.10008.3.1.2.1.1|Detached Patient Management SOP Class
|1.2.840.10008.3.1.2.2.1|Detached Visit Management SOP Class
1.2.840.113754.3.1.2.1.4|VA Detached Patient Management Meta SOP Class
                                            |Meta SOP Class|Part 4|S
|1.2.840.113754.3.1.2.1.1|VA Detached Patient Management SOP Class
|1.2.840.113754.3.1.2.2.1|VA Detached Visit Management SOP Class
```

The UID information in the file **UID.DIC** is extracted directly from the [DICOM Standard, **Part 6: Data Dictionary (PS 3.6)**](#) and material supplied by the Imaging Project.

The data from this file is stored in MUMPS in the following structure:

```
^MAGDICOM(2006.53,d0,0) = Name ^ UID Code ^ Type ^ Reference
^MAGDICOM(2006.53,d0,1,d1,0) = Name ^ UID Code
^MAGDICOM(2006.53,"B",Name,d0)= ""
^MAGDICOM(2006.53,"C",UID Code,d0) = ""
^MAGDICOM(2006.53,d0,1,"B",Name,d1) = ""
^MAGDICOM(2006.53,d0,1,"C",UID Code,d1) = ""
```

B.3.7   Additional Data

Certain DICOM elements are extracted from the DICOM image header and copied into the "about image" text file when an image is processed. These data items are then displayed on the diagnostic workstation with the image.

Different items may be selected and displayed for different modalities. Currently, the following files with lists of additional data-items are available:

- DATAGECT.DIC (specific for CT equipment from General Electric and others)

- DATA_CR.DIC (specific for CR equipment)
- DATAMISC.DIC (general for any other equipment)
- DATA_MRI.DIC (specific for MRI equipment)

In these files, each line that defines a data-item consists of two parts: the first part identifies an attribute tag, and the second part specifies an attribute name, e.g.:

```
0008,0070|Manufacturer
```

The data from these files is stored in MUMPS in the following structure:

```
^MAGDICOM(2006.511,d0,0) = filename
^MAGDICOM(2006.511,d0,1,d1,0)=tag ^ name
^MAGDICOM(2006.511,"B",filename,d0) = ""
```

B.3.7.1   DATAMISC.DIC

The file DATAMISC.DIC contains a list of general-purpose elements to be displayed. These data-items are:

```
0008,0008|Image Type
0008,0023|Image Date
0008,0033|Image Time
0008,0060|Modality
0008,0070|Manufacturer
0008,0080|Institution Name
0008,1010|Station Name
0008,1090|Manufacturer's Model Name
0018,0010|Contrast/Bolus Agent
0018,0015|Body Part Examined
0018,5100|Patient Position
0020,0010|Study ID
0020,0011|Series Number
0020,0012|Acquisition Number
0020,0013|Image Number
0020,0032|Image Position (Patient)
0028,0004|Photometric Interpretation
0028,0010|Rows
0028,0011|Columns
0028,0030|Pixel Spacing
0028,0101|Bits Stored
0028,0102|High Bit
0028,0103|Pixel Representation
0028,1052|Rescale Intercept
0028,1053|Rescale Slope
```

Note: In the following lists, the highlighted lines are additional fields.

B.3.7.2   DATAGECT.DIC

The data-items for CTs from General Electric (and other manufacturers) are:

```
0008,0008|Image Type
0008,0023|Image Date
0008,0033|Image Time
0008,0060|Modality
0008,0070|Manufacturer
0008,0080|Institution Name
0008,1010|Station Name
0008,1090|Manufacturer's Model Name
0018,0010|Contrast/Bolus Agent
0018,0015|Body Part Examined
0018,0050|Slice Thickness
0018,0060|KVP
0018,1100|Reconstruction Diameter
0018,1120|Gantry/Detector Tilt
0018,1150|Exposure Time
0018,1151|X-ray Tube Current
0018,1190|Focal Spot(s)
0018,1210|Convolution Kernel
0018,5100|Patient Position
0020,0010|Study ID
0020,0011|Series Number
0020,0012|Acquisition Number
0020,0013|Image Number
0020,0032|Image Position (Patient)
0020,0060|Laterality
0020,1040|Position Reference Indicator
0020,1041|Slice Location
0028,0004|Photometric Interpretation
0028,0010|Rows
0028,0011|Columns
0028,0030|Pixel Spacing
0028,0101|Bits Stored
0028,0102|High Bit
0028,0103|Pixel Representation
0028,1052|Rescale Intercept
0028,1053|Rescale Slope
```

B.3.7.3   DATA_CR.DIC

The data-items for CRs are:

```
0008,0008|Image Type
0008,0023|Image Date
0008,0033|Image Time
0008,0060|Modality
0008,0070|Manufacturer
0008,0080|Institution Name
0008,1010|Station Name
0008,1090|Manufacturer's Model Name
```

```
0018,0010|Contrast/Bolus Agent
0018,0015|Body Part Examined
0018,1004|Plate ID
0018,1400|Acquisition Device Processing Description
0018,1405|Relative X-ray Exposure
0018,5100|Patient Position
0018,6000|Sensitivity
0020,0010|Study ID
0020,0011|Series Number
0020,0012|Acquisition Number
0020,0013|Image Number
0020,0032|Image Position (Patient)
0028,0004|Photometric Interpretation
0028,0010|Rows
0028,0011|Columns
0028,0030|Pixel Spacing
0028,0101|Bits Stored
0028,0102|High Bit
0028,0103|Pixel Representation
0028,1052|Rescale Intercept
0028,1053|Rescale Slope
```

B.3.7.4   DATA_MRI.DIC

The data items for MRIs are:

```
0008,0008|Image Type
0008,0023|Image Date
0008,0033|Image Time
0008,0060|Modality
0008,0070|Manufacturer
0008,0080|Institution Name
0008,1010|Station Name
0008,1090|Manufacturer's Model Name
0018,0010|Contrast/Bolus Agent
0018,0015|Body Part Examined
0018,0020|Scanning Sequence
0018,0080|Repetition Time
0018,0081|Echo Time
0018,0083|Number of Averages
0018,0091|Echo Train Length
0018,1310|Acquisition Matrix
0018,5100|Patient Position
0020,0010|Study ID
0020,0011|Series Number
0020,0012|Acquisition Number
0020,0013|Image Number
0020,0032|Image Position (Patient)
0028,0004|Photometric Interpretation
0028,0010|Rows
0028,0011|Columns
0028,0030|Pixel Spacing
0028,0101|Bits Stored
```

```
0028,0102|High Bit
0028,0103|Pixel Representation
0028,1052|Rescale Intercept
0028,1053|Rescale Slope
```

B.4 Site-Specific Master Files

This section describes the format and contents of the site-specific master files.

Currently, the following files exist:

File Name	FileMan Table	Comment
AETITLE.DIC	2006.588	Contains list of aliases' that point to entries in the SCP_LIST.DIC
INSTRUMENT.DIC	2006.581	Contains list of operational instruments and their associated listening ports.
MODALITY.DIC	2006.582	Contains list of parameters for handling modalities.
PORTLIST.DIC	2006.584	Contains list of port numbers for handling instruments. Contains the port numbers of commercial PACS (typically Mitra Brokers) that receive messages from the DICOM Text Gateway.
SCU_List.DIC	2006.585	Contains lists of parameters for User Applications.
WORKLIST.DIC	2006.583	Contains list of parameters for Modality Worklist handling.
Clinical Specialty DICOM & HL7	2006.5831	Contains mapping of Request Services (^GMR(123.5)) to Image Index for Specialty/Subspecialty (^MAG(2005.84))
TERMINAL_TITLE.DIC	N/A	See Appendix A, Section A.3

The contents of the files in this section need to be customized to reflect the actual attributes used at the site.

Note: These changes should be made to the text file dictionaries in **DICOM\Dict** only. The software will load this information from these dictionary files into the global variables, overwriting any previously saved information.

Note: in the .dic files, leading and trailing spaces are ignored when the data is imported into the database. This makes it possible to align information for easier reading:

```
#
RADIOLOGY      ||RAD| RAD    |LONG|Local Vista Modality Worklist provider
DENTAL         ||CON| DENT   |LONG|Local dental worklist provider
OPHTHALMOLOGY  ||CON| OPHTH  |LONG|Local eye care worklist provider
OPTOMETRY      ||CON| OPTOM  |LONG|Local optometry worklist provider
CARDIOLOGY     ||CON| CARDIO |LONG|Local cardiology worklist provider
PATH           ||LAB| CY,SP  |LONG|Local cardiology worklist provider
#
```

B.4.1   AETITLE.DIC

The file APPLICATION ENTITY TITLE (#2006.588) on the DICOM Gateway provides aliases for APPLICATION ENTITY TITLES stored in the global ^MAGDICOM (2006.588) and AE_TITLE.DIC file.

DICOM negotiation requests now require <u>known</u> Called Application Entity Titles so that acceptable presentation contexts in SCP_LIST.DIC can be properly identified.

AE_TITLE.DIC is an Application Entity Title dictionary. The AE_TITLE.DIC is used to map the Called Application Entity Title of a DICOM negotiation request to the alias that identifies the VistA Application Entity Title name for the SCP. This is used for looking up acceptable presentation contexts in SCP_LIST.DIC. The Called Application Entity Title for a DICOM request must either be the VistA Application Entity Title name for the SCP defined in SCP_LIST.DIC (for example, "VISTA_STORAGE") or else one defined in AE_TITLE.DIC as an alias for the VistA one. Otherwise, the DICOM negotiation request will be rejected.

The default Mallinckrodt SEND_IMAGE.EXE Called Application Entity Title "DICOM_STORAGE" is mapped to "VISTA_STORAGE" in the distributed version of AE_TILE.DIC as shown below. (The mapping is not case-sensitive.)

The AE_TITLE.DIC is also used to record names associated with Application Entity Titles. (For example, "Walter Reed AMC" is the site name for the Application Entity Title "OS1WRAMC".)

Add any entries to AE_TITLE.DIC (none may be needed) and run Menu Option 4-2-3.

```
# Last edited 30 July 2008, 11:43 am
#
# Application Entity Title
# <Application Entity Title> | <VistA Application Title Alias> | <Site Name>
#
# This entry is for Mallinckrodt Send_Image
DICOM_STORAGE|VistA_Storage|VistA Imaging Testing
```

```
#
# Put your entries here
#
#
# end of file
```

B.4.2   INSTRUMENT.DIC

The file **INSTRUMENT.DIC** contains the definitions of the various image acquisition devices that the site uses. Menu Option 4.2.4, Update INSTRUMENT.DIC, reads this file to populate the Instrument Dictionary file (#2006.581). This is done as part of the installation process, and whenever operational information has changed at the site.

Use the VistA Imaging DICOM Gateway menu to update this master file as follows:

4. System Maintenance
→ 2. Gateway Configuration and DICOM Master Files
→ → 4. Update INSTRUMENT.DIC

Each image producing instrument must send its images to a VistA storage provider. In the VistA DICOM Image Gateway, there is a separate storage provider process running on a dedicated network port for each instrument that produces images. The file **INSTRUMENT.DIC** lists each image producing instrument and its dedicated communications port, along with its corresponding imaging service.

An entry in the file **INSTRUMENT.DIC** is formatted as follows:

<mnemonic> | <description> | <institution name> | <imaging service> | <port> [| <machine]

The different fields are defined below:

<mnemonic>	A short code for the instrument created by the site (it must be unique). Typically, abbreviations like **CR1**, **CT2**, **NM, GI-FLUORO**, and so forth.
<description>	Free text describing the instrument and its location.
<institution name>	The name of the institution (as defined in `Piece(^DIC(4,ien,0),"^",1)`). It also may be the site ID or may be left null (default is the site of the DICOM Gateway).
<imaging service>	Indicates where the orders and reports are placed on the hospital information system ("**RAD**", "**CON**", or "**LAB**" – see below)
<port>	The network communications port number (this must be unique, see Appendix E)
<machine>	Identifies the Image Gateway computer that will receive image files from this instrument (optional parameter, free text)

Example of a portion of the INSTRUMENT.DIC file:

```
# Computed Radiography
CR1|Fuji AC3 CR, Room 2156|Wilmington, DE|RAD|60050|ISWIMGDIG1
CR2|Fuji AC3 CR, Room 2160 (Chest)|Wilmington, DE|RAD|60051|ISWIMGDIG3
CR3|Fuji AC3 CR, Cubby, 2145 Hallway|Wilmington, DE|RAD|60052|ISWIMDIG2
#
# Computed Tomography
CT1|GE High Speed Advantage, Room 2142|Wilmington, DE|RAD|60060|ISWIMGDIG1
#
# Clinical Specialties
# EYE-2|Eye Examination Station||CON|60302|ISWIMGDIG1
```

In the previous example, please observe that there are **five** different instruments and **three** different modalities.

The site must create an entry in the file **INSTRUMENT.DIC** for each piece of equipment that is going to produce images and send them to VistA. Otherwise, the DICOM Gateway cannot acquire the images from the equipment.

Please note that the port numbers must be unique for every instrument. Use a unique port even where several different VistA DICOM Image Gateways are used. Making the port numbers unique, makes it possible to redirect the output of any image producing instrument to a different VistA DICOM Image Gateway by adding a second IP address to the gateway. The recommended port number scheme is included in Appendix E.

Names of institutions must be spelled exactly, as in the Institution File (File number 4, stored in ^DIC(4,...)) or use the IEN from the Institution File. These names are processed in a case-insensitive fashion. Only the part of the name before the first comma needs to match the value in the institution file. Any other punctuation characters that occur in that part of the official name must appear in the value that is entered here.

If no name is specified for the name of an institution, the default value from the gateway site will be used.

Names of imaging services must be either "**RAD**," for Radiology, or "**CON**," for consults and procedures, or "**LAB**" for Anatomic Pathology.

Note: The names must be spelled in all upper-case characters.

The sixth parameter identifies the Image Gateway to which the instrument will transmit its image files. DICOM Gateways are identified by the host-name of their computer. Host-names are typically assigned by OIT and site management, and usually follow VA-wide naming conventions.

A sample file **INSTRUMENT.SAMPLE** is supplied with the VistA Imaging DICOM Gateway distribution and may be edited by adding and/or deleting the pound sign ("#"). During an initial installation, this sample file is renamed to **INSTRUMENT.DIC**. When performing an upgrade, the existing copy of this file will remain unaffected. Information from the sample file may be manually transferred to the operational master file at the discretion of the site.

B.4.2.1   Legacy Icons for Instruments

The generation of icons is now a manual procedure for all instruments when the program `^MAGDMFIC` is run. The Site Manager can then adjust the icons in the window to show only those storage providers that are actually being used on the current Server.

When set-up parameters need to be modified for one of these icons, it is important to know the values that should be entered. The typical values for each of these icons are shown below.
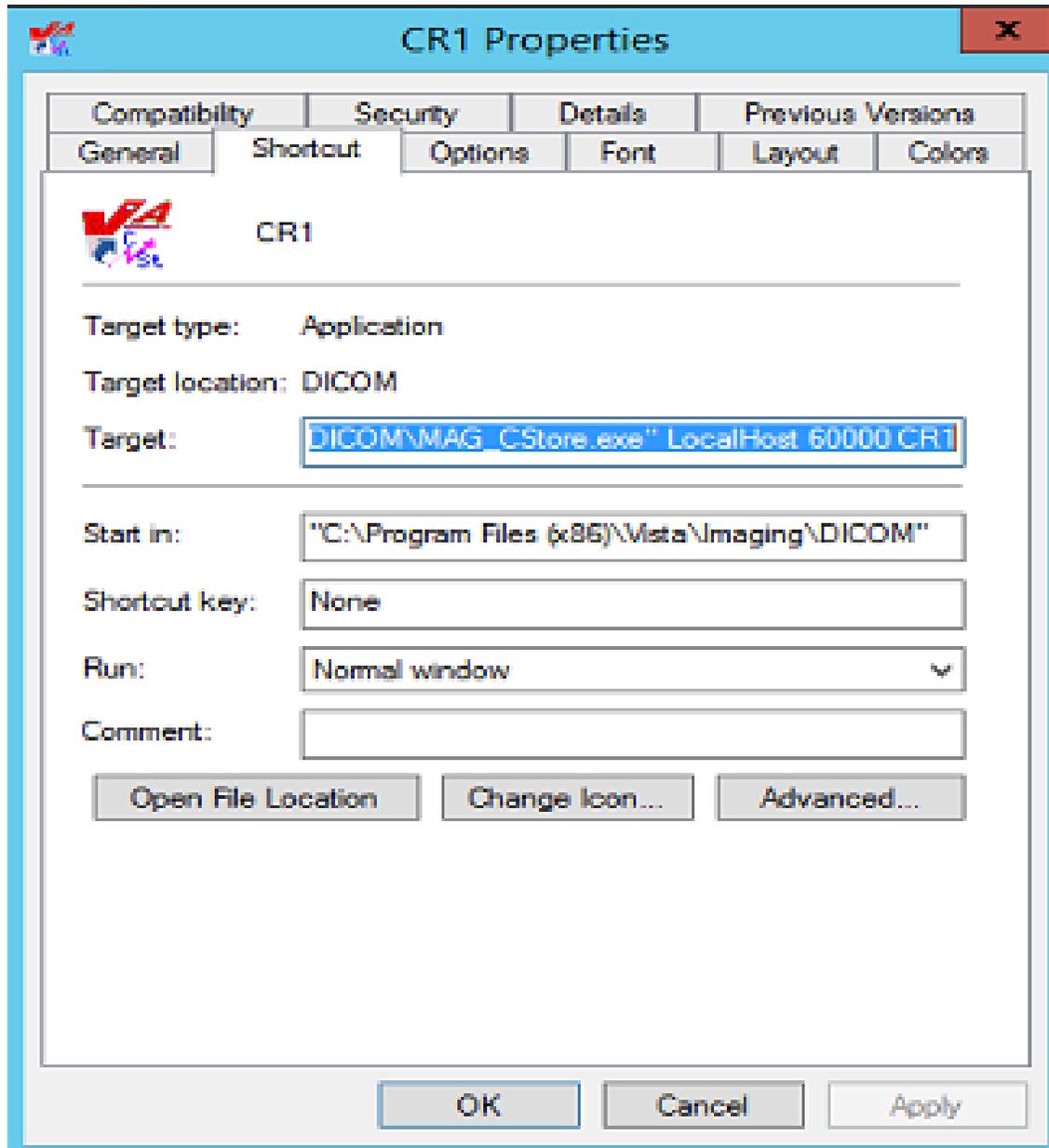
In the example above, the complete value for "target" would be:

 "C:\Program Files(x86)**\VistA\Imaging\DICOM\MAG_CSTORE.exe" localhost 60000 CR1**

Note: The quotes around the path-name for the C-Store program are required.

The entry for "Target" should link the icon to the "C-Store" program, and specify the parameters:

- IP-address is always "**localhost**" (never modify this value).

- Port number is always **60000** (never modify this value).
- Instrument name is the abbreviation for the instrument, e.g., "**CR1**" (only modify this value to reflect changes made in the master file **INSTRUMENT.DIC**).

The icon can be changed to be more descriptive for the type of instrument. For CRs, the distributed system provides two sample icons:

The end-user may select any other icon that would be more descriptive of the instrument.

B.4.4.2 Invoking MAG_CSTORE.EXE without an INSTRUMENT.DIC entry

For modality testing, MAG_CSTORE.EXE may be invoked using a port number instead of the instrument name. The port number must not be one that is already used in INSTRUMENT.DIC or used for anything else. This bypasses the HDIG and is useful for acquiring DICOM objects in the traditional manner and storing them in the C:\DICOM\IMAGE_IN folder.

The complete format of the command is shown below.

B.4.4.2.1 Traditional way using an instrument mnemonic defined in INSTRUMENT.DIC

MAG_CSTORE localhost 60000 <instrument mnemonic>

>   Example: `MAG_CSTORE.exe" localhost 60000 CR1`

B.4.4.2.2 Specifying a port number (one not used in INSTRUMENT.DIC)

MAG_CSTORE localhost 60000 <port number>

>   Example: `MAG_CSTORE.exe" localhost 60000 50100`

B.4.4.2.3 Specifying a port number and designating an Imaging Service

MAG_CSTORE localhost 60000 "<port number> <imaging service>"

>   Example: `MAG_CSTORE.exe" localhost 60000 "50100 RAD"`

B.4.4.2.4 Specifying a port number and designating an Imaging Service and Location

MAG_CSTORE localhost 60000 "<port number> <imaging service> <location>"

Example: **MAG_CSTORE.exe" localhost 60000 "50100 RAD BOSTON, MA"**

MAG_CSTORE.EXE may be invoked either from the CMD shell or via a shortcut. The following two figures illustrate this.
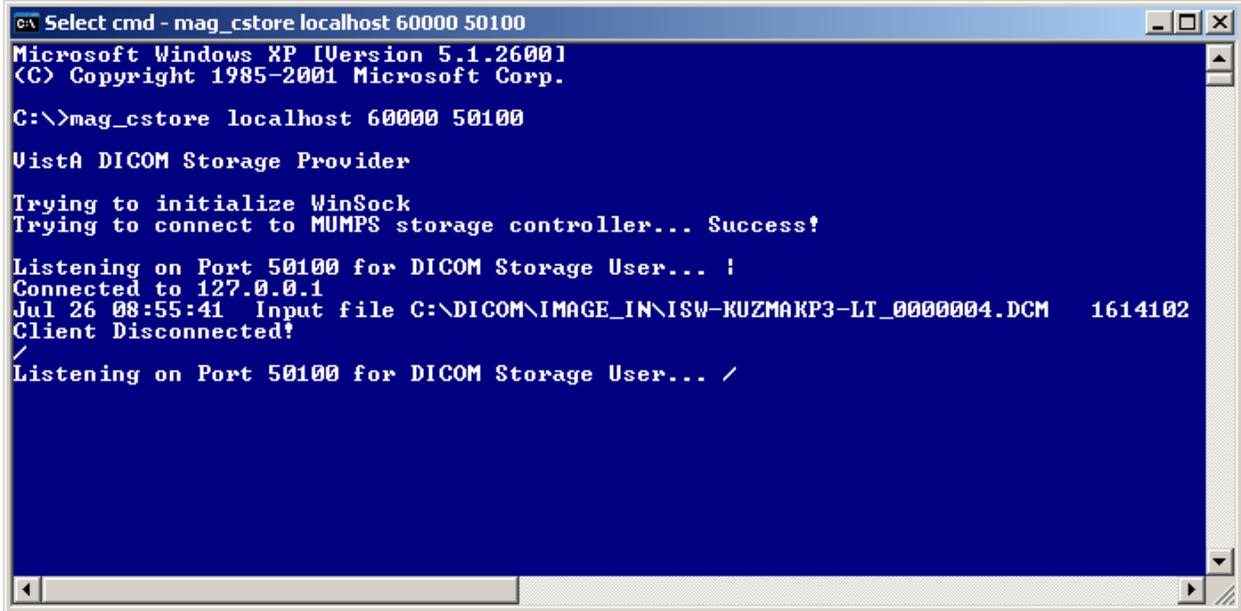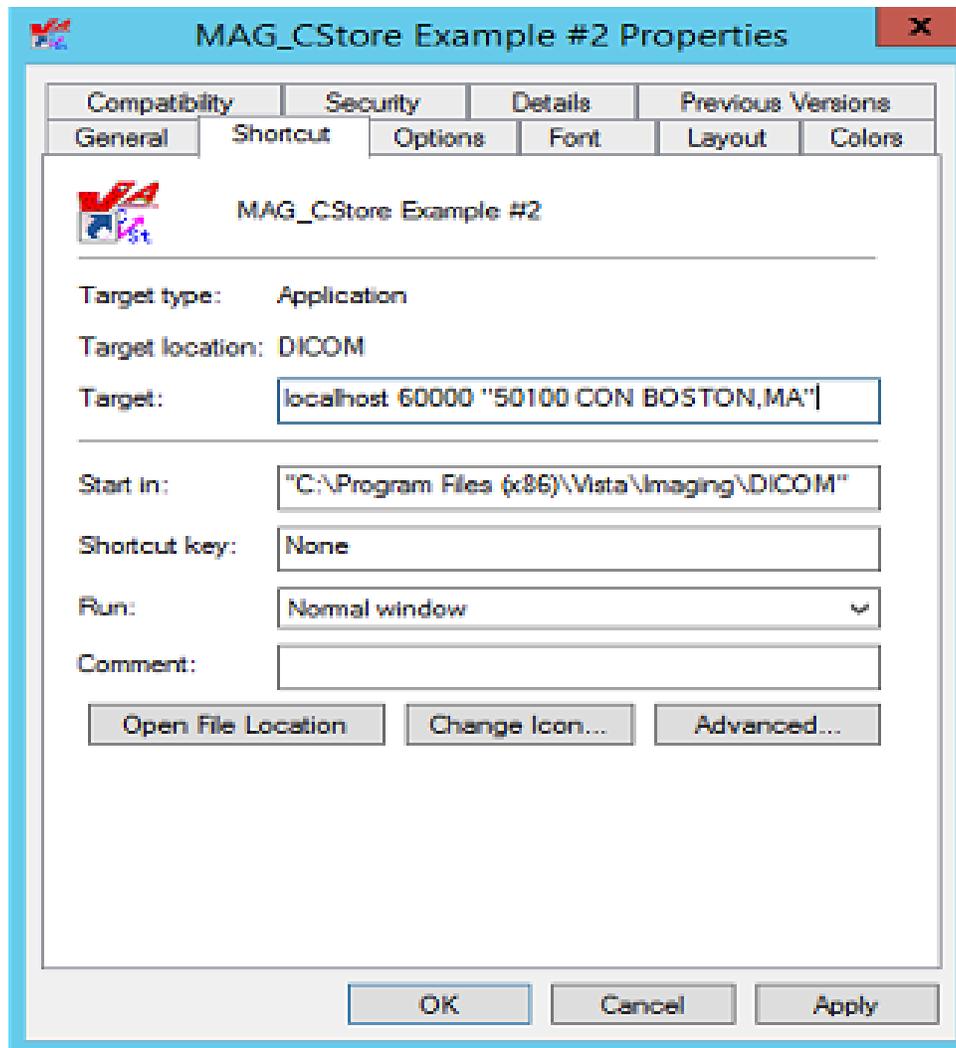
B.4.3 MODALITY.DIC

The file **MODALITY.DIC** contains the definitions of the parameters that the DICOM Gateway needs to process image files, store them on the file server, and associate them with the patient record. Menu Option 4.2.5, Update MODALITY.DIC, reads this file to populate the Modality Type Dictionary File (#2006.582). This is done as part of the installation process and whenever operational information has changed at the site.

Use the VistA Imaging DICOM Gateway menu to update this master file as follows:

4. System Maintenance
→ 2. Gateway Configuration and DICOM Master Files
→ → 5. Update MODALITY.DIC

B.4.3.1   Image Processing Overview

After the gateway acquires images, it has to process them and incorporate them into the patient medical record. The rules for processing the images produced by each different kind of modality are stored in the file **MODALITY.DIC**.

NOTE: The information in the following sections is for reference purposes only. All images can come in through one default entry using the <DICOM> rule as shown below.

DEFAULT|DEFAULT|DEFAULT|<DICOM>|CORRECT^MAGDIR3||DATAMISC.DIC

Each time the gateway processes an image, it does the following:

1. Extracts the patient and study information from the image header.

2. Looks up the study on VistA using the patient and study information from the image header.

3. Creates the image abstract (also known as thumbnail or icon).

4. *Processes the image according to the image format and parameters specified in the field <image processing rules> in the file **MODALITY.DIC**. Images can be stored in their original DICOM format or converted in TARGA (*.TGA) format. DICOM format is the preferred. Only in rare instances for VistARad sites and specific modalities that are having display issues, should Targa be used. For more information, see section*

5. *B.4.3.2.1   Image Processing* **Rules**.

6. Saves image attributes from the header in a text (*.TXT) file.

B.4.3.2   Assigning Field Values for the Modality Dictionary

The file **MODALITY.DIC** determines how the DICOM Gateway stores images. The structure of each record is:

Modality Record: <mfgr> | <model> | <modality> | <image processing   rules> |
                          <accession number code> | <text data code>| <text data file> |
                          <imaging service>

The different fields are:

<mfgr>   The manufacturer of the equipment producing the images;
                                    element (0008,0070).

<model>   The manufacturer's model name for the equipment; element
                                    (0008,1090).

<modality>   The official DICOM defined term for the modality; element
                         (0008,0060).

The rules that control the format in which the image is stored. For
more information about the syntax of the image processing rules, see section B.4.3.2.1   Image
Processing Rules
Please use <DICOM>.

<accession number code>   The name of the M routine used to extract the accession number
                         from image header. The typical value is
                         CORRECT^MAGDIR3.

<text data code>   The M routine for outputting text data (*.TXT) for diagnostic
                         workstation. This is how Hounsfield units are calculated for CT
                         images when converting to DICOM.

<text data file>   A text file that lists DICOM attributes to output as text (*.TXT)
                         for diagnostic workstation (see *B.3.7 Additional Data* for a
                         description of the format of a text data file).

<imaging service>   A parameter that indicates where the orders and reports are placed
                         on the hospital information system. The value is either "**RAD**"
                         for Radiology, "**CON**" for CPRS consults and procedures, or
                         "**LAB**" for Anatomic Pathology. It is used to select imaging
                         service-specific processing.

The file **MODALITY.DIC** includes defaults as well as entries for different modalities. If there is
no definition for the specific device, the DICOM Gateway uses the default definitions.

Note: There can be multiple entries for an instrument, if the instrument produces more than one
type of image.

There are several types of default definitions:

- The general default modality definition must always be present in the file
  MODALITY.DIC and should never be modified.

```
DEFAULT|  DEFAULT|DEFAULT|<DICOM>|CORRECT^MAGDIR3||DATAMISC.DIC|RAD
```

- You can also set up modality-specific defaults for each modality type, as noted below and
  illustrated in the example. Including these definitions, while optional, is strongly
  recommended so that individual modalities can be converted to DICOM storage one at a
  time. Additional examples can be found in the **MODALITY.SAMPLE** file provided
  during installation.

```
DEFAULT|  DEFAULT|CR|R8/<DICOM>|CORRECT^MAGDIR3||DATAMISC.DIC|RAD
```

- In addition to the default definitions, you can set up or continue using modality-specific definitions by manufacturer, model, and modality as illustrated in the following example.

```
ACME, Inc.|Coyotes Rule|CT|<DICOM>|CORRECT^MAGDIR3||DATAGECT.DIC|RAD
```

The DICOM Gateway applies the modality definitions in the following order of specificity:

1. Manufacturer, model, and modality
2. General by modality type
3. General

If there is a specific modality definition for a modality, manufacturer, and model, these settings will apply to that modality. If such a definition is missing, the default setting for the modality type for the modality will apply. If this setting is also missing, the general default definition will apply.

We recommend using the defaults for all modalities. Use device-specific definitions only for devices if the images from these devices do not display properly when stored in DICOM format. For more information, see B.4.3.2.1   Image Processing Rules

The MODALITY.DIC entry for the image acquisition device should specify "**<DICOM>**" in the <image processing rules> field when the image should be stored in DICOM format. Typically, the entry should specify "**CORRECT^MAGDIR3**" in the <accession number code> field. The "RoadRunner" example illustrates this:

```
# Examples:
#
# ACME CT Company|BETA|CT|b12 f0|GECT^MAGDIR3|GECTHISA^MAGDIR4A|DATAGECT.DIC|RAD
#
# RoadRunner, INC|Beep-Beep|OT|<DICOM>|CORRECT^MAGDIR3||DATAMISC.DIC|CON
#
# end of file
```

The next example shows a configuration to handle a CT study containing both standard and Secondary Capture images. The normal CT SOP Class-based images will process into a Targa images. The accompanying Secondary Capture SOP Class-based image will process but stay as a DICOM image. The trigger to accomplish this is the <SC> pseudo modality type.

```
# Examples:
#
Roadrunner, Inc.|Beep-Beep|CT|b12 a1000 f0 c4095|LONGCASE^MAGDIR3||DATAGECT.DIC|RAD
Roadrunner, Inc.|Beep-Beep|<SC>|<DICOM>|CORRECT^MAGDIR3||DATAMISC.DIC|RAD
#
# end of file
```

The <SC> pseudo-modality code can only be used for scanners that support the SOP classes listed below. (Note: These objects can only be saved as DICOM, not as TGA.):

- 1.2.840.10008.5.1.4.1.1.7 (Secondary Capture Image Storage)

- 1.2.840.10008.5.1.4.1.1.7.2 (Multi-frame Grayscale Byte Secondary Capture Image Storage)

- 1.2.840.10008.5.1.4.1.1.7.3 (Multi-frame Grayscale Word Secondary Capture Image Storage)

- 1.2.840.10008.5.1.4.1.1.7.4 (Multi-frame True Color Secondary Capture Image Storage

B.4.3.2.1   Image Processing Rules

Images are converted from the DICOM format to the Targa format by the program `MAG_DCMTOTGA.EXE`. The image processing rules are parameters of `MAG_DCMTOTGA.EXE` and control the conversion process. The rules are specified in the master file **MODALITY.DIC**. They are not case-sensitive.

Two sets of rules, separated by a slash (/), can be placed in the <image processing rules> field of the modality record. When two sets of rules are present in the same record, the first set of rules defines the reduced size image. The second set defines the full-size image that the diagnostic workstation uses.

The value **<DICOM>** in a rule indicates that the DICOM Gateway should store the full-size images in DICOM format (with a .DCM extension). When the value **<DICOM>** is not present in the rule, the DICOM Gateway stores the full-size image with a .BIG extension.

In addition to the full-size image, the DICOM Gateway can produce a reduced Targa image (with a .TGA extension). The framing and reduction factors in the modality record define the Targa image.

The following table explains the framing and reduction parameters and their values:

A*nnn*   Add *nnn* to each pixel (before the minimum/maximum check is performed).

B*nnn**   Specifies the number of bits in the original pixel.

C*nnn*   Ceiling (maximum) pixel value; any value > *nnn* is replaced by *nnn.*

F*nnn*   Floor (minimum) pixel value; any value < *nnn* is replaced by *nnn.*

I   Invert each pixel.

O*nnn**   Byte offset in the DICOM file to the image.

R1   Reduce the size of the image file by outputting the low-order byte of a two-byte pixel.

R2 Reduce the size of the image file by two by shifting two-byte pixels into one-byte pixels.

R4 Reduce the size of the image by four by combining four pixels into one two-byte pixel.

R8 Reduce the size of the image by eight by combining four pixels into one one-byte pixel.

R16 Reduce the size of the image by sixteen by combining sixteen pixels into one two-byte pixel.

R32 Reduce the size of the image by thirty-two by combining sixteen pixels into one one-byte pixel.

S*nnn* Subtract *nnn* from each pixel (unsigned arithmetic, executed before add is performed).

X*nnn** X-dimension of the image (horizontal width or the number of columns).

Y*nnn** Y-dimension of the image (vertical height or the number of rows).

When it processes an image, the DICOM Gateway validates the image processing rules. This is necessary to ensure that the original copy of the image is not altered during storage and is essential for compliance with DICOM Level 2 archive standards. Images, like CR and DX, can only have `<DICOM>` or no parameter in **MODALITY.DIC** for the full-size image. The image processing rules for such images cannot have reduction and framing parameters. In addition to this, the reduced image associated with these types of images, must have a valid reduction factor (**Rnn**), where **nn** represents a reduction value with one to two digits. The reduced image may also have framing parameters defined.

The following examples are valid and will be accepted.
(Please note that these are partial entries shortened for simplicity.)

```
ACME, Inc.|Coyotes Rule|CR|
ACME, Inc.|Coyotes Rule|CR|<DICOM>
ACME, Inc.|Coyotes Rule|CR| R8/
ACME, Inc.|Coyotes Rule|CR| R8/<DICOM>
ACME, Inc.|Coyotes Rule|CR|b10 f0 c1023 R8/
ACME, Inc.|Coyotes Rule|CR|b10 f0 c1023 R8/<DICOM>
```

The following rules define syntax of in the **MODALITY.DIC** file:

- The slash can be followed *only by* `<DICOM>`. That is, the backslash cannot be followed by a reduction factor, a framing factor, or a space.

  - When the backslash is followed by `<DICOM>`, the image will be processed in DICOM format. Its full-size image will be stored with a .DCM extension and its reduced size image will have a TGA extension.

  - When the slash is *not* followed by `<DICOM>`, the image will be processed in Targa format. Its full-size image will be stored with a .BIG extension and its reduced size image, if defined, will have a TGA extension.

- The framing and reduction parameters should *precede* the backslash.

- When there is a slash, the reduction factor should be specified. That is, a slash should *always* be preceded by a reduction factor. The slash should not be used when a reduction factor is not specified.

  The following examples are *not* valid and will be rejected.

  ```
  ACME, Inc.|Coyotes Rule|CR|  /<DICOM>
  ACME, Inc.|Coyotes Rule|CR| R8/R8
  ACME, Inc.|Coyotes Rule|CR| R8/R8<DICOM>
  ACME, Inc.|Coyotes Rule|CR|b10 f0 c1023 R8/|b10 f0
  ACME, Inc.|Coyotes Rule|CR|b10 f0 c1023 R8/ b10 f0 <DICOM>
  ACME, Inc.|Coyotes Rule|CR| R8/<DICOM><DICOM>
  ```

B.4.3.2.2.1   Typical Values for Image Conversion Parameters, for reference only

Parameter Value	Equipment
<DICOM>	Images stored in VistA in DICOM format, exactly as they were received from the instrument.
b8	Acuson, Sequoia, US
b12 f0 c4095	ADAC, *, NM
b12 f0 c4095	ADAC, Solus, NM
b12 f0 c4095	ADAC, Vertex, NM
b12 f0 c4095 R8/ or b12 f0 c4095 R8/<DICOM>	AGFA, ADC 5145, CR

Parameter Value	Equipment
b8	Aspect Electronics, Inc., Access Acquisition Module, US and OT
b8 f0	ATL, 8500-0030-01 (HDI 3000, Pegasus Level 8), US
b10 f0 c1023 R8/ or b10 f0 c1023 R8/<DICOM>	DeJarnette Research Systems, ImageShare CR, CR
b10 f0 c1023 R8/ or b10 f0 c1023 R8/<DICOM>	DeJarnette Research Systems, Imageshare Fuji CR Acquisition Station, CR
b8	Diasonics, *, US
b10	GE Medical Systems, DLX, XA
b8	GE Medical Systems, DRS, RF
b12 f0	GE Medical Systems, Genesis CT9800 QHL, CT
b12 f0	GE Medical Systems, Genesis HiSpeed RP, CT
b12 f0	GE Medical Systems, Genesis Jupiter, CT
b12 f0	GE Medical Systems, Genesis Signa, MR
b12 f0	GE Medical Systems, HiSpeed CT/i, CT
b12 f0	GE Medical Systems, HiSpeed RP, CT
a1000 b12 f0 c4095	GE Medical Systems, ProSpeed, CT
b12 f0	GE Medical Systems, Rhapsode, CT
b12 f0 c4095 R8	Lumisys, *, CR, CT, NM, OT, RAD, SC and US
b12 f0 c4095 R8	Lumisys, LS75, CR, CT, MR, MRI, NM, OT, RAD, SC and US
b12 f0 c4095	Picker International, Inc., AX000, MR
b12 f0 c4095	Picker International, Inc., Edge 1.5T, MR
b16 a1000 f0 c4095	Picker International, Inc., Polaris, CT

Parameter Value	Equipment
b12 a1000 f0 c4095	Picker International, Inc., PQ2000, CT
b12 a1000 f0 c4095	Picker International, Inc., PQ2000, SC
b12 a1000 f0 c4095	Picker International, Inc., PQ5000, CT
b12 a1000 f0 c4095	Picker International, Inc., PQ5000, SC
b12 a1000 f0 c4095	Picker International, Inc., PQ6000, CT
b12 a1000 f0 c4095	Picker International, Inc., PQS, CT
b12 a1000 f0 c4095	Picker International, Inc., PQS, SC
b12 a1000 f0 c4095	Picker International, Inc., VOXEL, CT
b12 a1000 f0 c4095	Picker International, Inc., VOXELQ, CT
b8	VAMC Image Acquisition Corporation, VA Image Camera, OT

The parameter value for the AGFA CR and the Fuji CR (labeled above as "DeJarnette Research Systems Imageshare") consists of two parts. The first part is used to create the clinician's down-sampled image file and the second is used to create the full diagnostic resolution image file, which could either be a file in DICOM format or a file with a .BIG extension.

B.4.3.2.2   Accession Number Extraction Subroutines

The names of the MUMPS routines for extracting the accession number from the image header, and for outputting formatted text for display on the diagnostic workstation, are defined by the VistA Imaging Project.

Possible names of subroutines that extract Accession Numbers are:

Line Tag^Routine	Description
CORRECT^MAGDIR3	DICOM for Consults and Procedures (native DICOM format)
IGNORE^MAGDIR3	Ignore Image
STUDYUID^MAGDIR3	Get from a VistA-generated Study Instance UID

Line Tag^Routine	Description
GEMSPACS^MAGDIR3	GE Medical Systems PACS
PQ2000^MAGDIR3	Picker PQ 2000 CT
GECTHISA^MAGDIR3	GE High Speed Advantage CT
GEDRS^MAGDIR3	GE Digital Radiography System
LONGCASE^MAGDIR3	Long Case Number
PIDCASE^MAGDIR3	PID after SSN
PIDCASE2^MAGDIR3	PID after //
STUDYID^MAGDIR3	Study ID with Long Case Number
ADACNM^MAGDIR3	ADAC Nuclear Medicine
SERDESC^MAGDIR3	ADAC Nuclear Medicine, Solus
PNAME^MAGDIR3	After Patient Name
MEDCASE^MAGDIR3	Medicine Capture

B.4.3.2.2.1 Typical Values for Accession Number Subroutine

Parameter Value	Equipment
PNAME^MAGDIR3	Acuson, Sequoia, US
LONGCASE^MAGDIR3	ADAC, *, NM
LONGCASE^MAGDIR3	ADAC, Solus, NM
LONGCASE^MAGDIR3	ADAC, Vertex, NM
LONGCASE^MAGDIR3	AGFA, ADC 5145, CR
PIDCASE^MAGDIR3	Aspect Electronics, Inc., Access Acquisition Module, US and OT
LONGCASE^MAGDIR3	ATL, 8500-0030-01 (HDI 3000, Pegasus Level 8), US

Parameter Value	Equipment
LONGCASE^MAGDIR3	DeJarnette Research Systems, ImageShare CR, CR
LONGCASE^MAGDIR3	DeJarnette Research Systems, Imageshare Fuji CR Acquisition Station, CR
PNAME^MAGDIR3	Diasonics, *, US
STUDYID^MAGDIR3	GE Medical Systems, DLX, XA
GEDRS^MAGDIR3	GE Medical Systems, DRS, RF
LONGCASE^MAGDIR3	GE Medical Systems, Genesis CT9800 QHL, CT
GECTHISA^MAGDIR3	GE Medical Systems, Genesis HiSpeed RP, CT
GECT^MAGDIR3	GE Medical Systems, Genesis Jupiter, CT
LONGCASE^MAGDIR3	GE Medical Systems, Genesis Signa, MR
LONGCASE^MAGDIR3	GE Medical Systems, HiSpeed CT/i, CT
GECTHISA^MAGDIR3	GE Medical Systems, HiSpeed RP, CT
LONGCASE^MAGDIR3	GE Medical Systems, ProSpeed, CT
LONGCASE^MAGDIR3	GE Medical Systems, Rhapsode, CT
LONGCASE^MAGDIR3	Lumisys, *, CR, CT, NM, OT, RAD, SC and US
LONGCASE^MAGDIR3	Lumisys, LS75, CR, CT, MR, MRI, NM, OT, RAD, SC and US
PQ2000^MAGDIR3	Picker International, Inc., AX000, MR
PQ2000^MAGDIR3	Picker International, Inc., Edge 1.5T, MR
PQ2000^MAGDIR3	Picker International, Inc., Polaris, CT
PQ2000^MAGDIR3	Picker International, Inc., PQ2000, CT
PQ2000^MAGDIR3	Picker International, Inc., PQ2000, SC
LONGCASE^MAGDIR3	Picker International, Inc., PQ5000, CT

Parameter Value	Equipment
PQ2000^MAGDIR3	Picker International, Inc., PQ5000, CT
LONGCASE^MAGDIR3	Picker International, Inc., PQ5000, SC
PQ2000^MAGDIR3	Picker International, Inc., PQ5000, SC
PQ2000^MAGDIR3	Picker International, Inc., PQ6000, CT
PQ2000^MAGDIR3	Picker International, Inc., PQS, CT
PQ2000^MAGDIR3	Picker International, Inc., PQS, SC
PQ2000^MAGDIR3	Picker International, Inc., VOXEL, CT
PQ2000^MAGDIR3	Picker International, Inc., VOXELQ, CT
IGNORE^MADGIR3	(skip this image)

Note: There are multiple possibilities for the same modality, depending on whether the image was sent directly or via a commercial PACS.

B.4.3.2.3   Text Data Subroutines - Setup

Possible names of subroutines that generate extra text data are:

Line Tag^Name	Description
GECT^MAGDIR4A	General Electric CTs
PICKERCT^MAGDIR4A	Picker CTs
PHILIPCT^MAGDIR4A	Philips CTs
GELCA^MAGDIR4A	General Electric LCA DLX

B.4.3.2.3.1   Typical Values for Data Extraction Subroutine

Parameter Value	Equipment
(none)	Accuson, Sequoia, US

Parameter Value	Equipment
(none)	ADAC, *, NM
(none)	ADAC, Solus, NM
(none)	ADAC, Vertex, NM
(none)	AGFA, ADC 5145, CR
(none)	Aspect Electronics, Inc., Access Acquisition Module, US and OT
(none)	ATL, 8500-0030-01 (HDI 3000, Pegasus Level 8), US
(none)	DeJarnette Research Systems, ImageShare CR, CR
(none)	DeJarnette Research Systems, Imageshare Fuji CR Acquisition Station, CR
(none)	Diasonics, *, US
GELCA^MAGDIR4A	GE Medical Systems, DLX, XA and RF
GECT^MAGDIR4A	GE Medical Systems, Genesis CT9800 QHL, CT
GECT^MAGDIR4A	GE Medical Systems, Genesis HiSpeed RP, CT
GECT^MAGDIR4A	GE Medical Systems, Genesis Jupiter, CT
GECT^MAGDIR4A	GE Medical Systems, Genesis Signa, MR
GECT^MAGDIR4A	GE Medical Systems, HiSpeed CT/i, CT
GECT^MAGDIR4A	GE Medical Systems, HiSpeed RP, CT
GECT1000^MAGDIR4A	GE Medical Systems, ProSpeed, CT
GECT^MAGDIR4A	GE Medical Systems, Rhapsode, CT
(none)	Lumisys, *, CR, CT, NM, OT, RAD, SC and US
(none)	Lumisys, LS75, CR, CT, MR, MRI, NM, OT, RAD, SC and US
(none)	Picker International, Inc., AX000, MR

Parameter Value	Equipment
(none)	Picker International, Inc., Edge 1.5T, MR
PickerCT^MAGDIR4A	Picker International, Inc., Polaris, CT
PickerCT^MAGDIR4A	Picker International, Inc., PQ2000, CT
PickerCT^MAGDIR4A	Picker International, Inc., PQ2000, SC
PickerCT^MAGDIR4A	Picker International, Inc., PQ5000, CT
PickerCT^MAGDIR4A	Picker International, Inc., PQ5000, SC
PickerCT^MAGDIR4A	Picker International, Inc., PQ6000, CT
PickerCT^MAGDIR4A	Picker International, Inc., PQS, CT
PickerCT^MAGDIR4A	Picker International, Inc., PQS, SC
PickerCT^MAGDIR4A	Picker International, Inc., VOXEL, CT
PickerCT^MAGDIR4A	Picker International, Inc., VOXELQ, CT

B.4.3.2.4   Text Data File – Setup

Possible names of files with DICOM elements to be output as text data are:

Name	Description
DATAGECT.DIC	General Electric CTs
DATA_CR.DIC	CR Units
DATAMISC.DIC	Miscellaneous
DATA_MRI.DIC	MRI Units

B.4.3.2.4.1   Typical Values for Text Data Extraction Element List

Parameter Value	Equipment
DATAMISC.DIC	Accuson, Sequoia, US

Parameter Value	Equipment
DATAMISC.DIC	ADAC, *, NM
DATAMISC.DIC	ADAC, Solus, NM
DATAMISC.DIC	ADAC, Vertex, NM
DATAMISC.DIC	AGFA, ADC 5145, CR
DATAMISC.DIC	Aspect Electronics, Inc., Access Acquisition Module, US and OT
DATAMISC.DIC	ATL, 8500-0030-01 (HDI 3000, Pegasus Level 8), US
DATAMISC.DIC	DeJarnette Research Systems, ImageShare CR, CR
DATAMISC.DIC	DeJarnette Research Systems, Imageshare Fuji CR Acquisition Station, CR
DATAMISC.DIC	Diasonics, *, US
DATAMISC.DIC	GE Medical Systems, DLX, XA and RF
DATAGECT.DIC	GE Medical Systems, Genesis CT9800 QHL, CT
DATAGECT.DIC	GE Medical Systems, Genesis HiSpeed RP, CT
DATAGECT.DIC	GE Medical Systems, Genesis Jupiter, CT
DATAGECT.DIC	GE Medical Systems, Genesis Signa, MR
DATAGECT.DIC	GE Medical Systems, HiSpeed CT/i, CT
DATAGECT.DIC	GE Medical Systems, HiSpeed RP, CT
DATAGECT.DIC	GE Medical Systems, ProSpeed, CT
DATAGECT.DIC	GE Medical Systems, Rhapsode, CT
DATAMISC.DIC	Lumisys, *, CR, CT, NM, OT, RAD, SC and US
DATAMISC.DIC	Lumisys, LS75, CR, CT, MR, MRI. NM, OT, RAD, SC and US
DATAMISC.DIC	Picker International, Inc., AX000, MR

Parameter Value	Equipment
DATAMISC.DIC	Picker International, Inc., Edge 1.5T, MR
DATAGECT.DIC	Picker International, Inc., Polaris, CT
DATAGECT.DIC	Picker International, Inc., PQ2000, CT
DATAGECT.DIC	Picker International, Inc., PQ2000, SC
DATAGECT.DIC	Picker International, Inc., PQ5000, CT
DATAGECT.DIC	Picker International, Inc., PQ5000, SC
DATAGECT.DIC	Picker International, Inc., PQ6000, CT
DATAGECT.DIC	Picker International, Inc., PQS, CT
DATAGECT.DIC	Picker International, Inc., PQS, SC
DATAGECT.DIC	Picker International, Inc., VOXEL, CT
DATAGECT.DIC	Picker International, Inc., VOXELQ, CT

B.4.3.4 Setting Up the MODALITY.DIC File

The defaults in the modality master file, **MODALITY.DIC,** are set so the DICOM Gateway will store images in DICOM format. We recommend using defaults for all modalities and devices except when the images do not display correctly. In such cases, you should add an entry for the specific device to store the images in Targa format.

The file **MODALITY.SAMPLE**, which is included with the DICOM Gateway, contains the general default definition and default definitions for some modalities. The sample file can be edited by adding or deleting the pound sign ("#"), which indicates comments. When the DICOM Gateway is first installed, the sample file is renamed to **MODALITY.DIC**. When performing an upgrade, the existing copy of **MODALITY.DIC** remains unaffected.

You should then set up defaults for all modalities to store images in DICOM. You can use the default modality definitions in the sample file to guide you. The following are examples of default definitions.

```
DEFAULT|  DEFAULT |CT|<DICOM>|CORRECT^MAGDIR3||DATAMISC.DIC|RAD
DEFAULT|  DEFAULT |CR|R8/<DICOM>|CORRECT^MAGDIR3||DATAMISC.DIC|RAD
DEFAULT|  DEFAULT |DX|R16/<DICOM>|CORRECT^MAGDIR3||DATAMISC.DIC|RAD
DEFAULT|  DEFAULT |OT|<DICOM>|CORRECT^MAGDIR3||DATAMISC.DIC|RAD
```

```
DEFAULT| DEFAULT |US|<DICOM>|CORRECT^MAGDIR3||DATAMISC.DIC|RAD
```

The defaults in **MODALITY.SAMPLE** are set to store images in their original DICOM format. Some image viewers may have trouble displaying images in DICOM format from certain devices. Such devices should be configured to store images in Targa format.. When the modality master file contains a device-specific definition, the device-specific definition overrides the defaults. You must comment out the device-specific definition for the defaults to be used.

To comment out a definition add the pound sign "#" before the record.

```
#ACME, Inc.|Coyotes Rule|CT|<DICOM>|CORRECT^MAGDIR3||DATAGECT.DIC|RAD
```

To activate a definition, remove the pound sign.

```
ACME, Inc.|Coyotes Rule|CT|<DICOM>|CORRECT^MAGDIR3||DATAGECT.DIC|RAD
```

B.4.4   PORTLIST.DIC

The Portlist.dic dictionary is not used anymore. This section is retained for historical reference.

The file **PORTLIST.DIC** contains the port numbers of commercial PACS (typically Mitra Brokers) that receive messages from the DICOM Text Gateway. This file is read by routine **^MAGDMB8** to (re)construct the FileMan table **Radiology TCP/IP Provider Port** (File 2006.584, stored in **^MAGDICOM(2006.584,…)**). This should be done manually as part of the installation process, and whenever operational information has changed at the site.

Use the VistA Imaging DICOM Gateway menu to update this master file as follows:

4. System Maintenance
→ 2. Gateway Configuration and DICOM Master Files
→ → 6. Update PORTLIST.DIC

The VistA DICOM Text Gateway has the ability to send (push) data to multiple destinations. These destinations may be commercial PACSs or commercial providers of the DICOM Modality Worklist service. The file **PORTLIST.DIC** is used to specify the communication ports for each of the different applications receiving VistA text transactions.

Portlist Record: <menu option> | <AE title> | <port number> | <file mode> | <channel>

The various fields are defined below:

<menu option> The text for the communications menu of the VistA DICOM Text Gateway.

<AE title>   The application entity title of the service.

<port number>	The network communications port number.
<file mode>	Specifies that the service will use fifo queue file buffering.
<channel>	Is 1:n, for the DICOM\DATA1 to DICOM\DATAn directory.

An example of the file **PORTLIST.DIC** is shown below:

```
#Menu-option|AE Title|Port|File Mode (FIFO QUEUE or DIRECT)|CHANNEL
PACS Interface|VistA PACS I/F|60041|FIFO QUEUE|1
#MITRA Broker Interface|VistA PACS I/F|60042|FIFO QUEUE|2
#DeJarnette Medishare Interface|VistA PACS I/F|60043|FIFO QUEUE|2
```

A sample file **PORTLIST.SAMPLE** is supplied with the VistA Imaging DICOM Gateway distribution and may be edited by adding and/or deleting the pound sign ("#"). During an initial installation, this sample file is renamed to **PORTLIST.DIC**. When performing an upgrade, the existing copy of this file will remain unaffected. Information from the sample file may be transferred to the operational master file at the discretion of the site.

The port number for this dictionary should be on the range 60040:60049 – see Appendix E.

The data from this file is stored in MUMPS in the following structure:

```
^MAGDICOM(2006.584,d0,0) = Destination ^ Name ^ Port ^ Mode ^ Channel
^MAGDICOM(2006.584,"B",Destination,d0) = ""
```

B.4.5   SCU_LIST.DIC

SCU_LIST.DIC contains entries for various types of non-VistA DICOM applications and is stored in the **f:\DICOM\Dict** folder on the drive specified for storing master files. Initially developed to send images to Print SCPs (Service Class Providers), the use of this file has been expanded.

- One of the purposes of including entries in this file is so that images can be transmitted to DICOM Storage destinations. For the details of using entries as Routing Destinations, see the VistA Imaging DICOM Gateway Routing Setup and User Guide.

- This file also contains entries for the VistA Query/Retrieve application and the devices that use this application to retrieve studies from VistA. For details, see *Section 4.5.18* in the *VistA Imaging* DICOM User Manual .

Despite its name, **SCU_LIST.DIC** contains entries for SCPs as well as SCUs. All information needed to initiate an association is stored in this file. This file is read by routine **^MAGDMB9** to (re)construct the FileMan table **User Application** (File 2006.585, stored in **^MAGDICOM (2006.585,…)**). This should be done as part of the installation process, and whenever operational information has changed at the site.

Use the VistA Imaging DICOM Gateway menu to update this master file as follows:

4. System Maintenance
→ 2. Gateway Configuration and DICOM Master Files
→ → 7. Update SCU_LIST.DIC

There are four kinds of records in **SCU_LIST.DIC**. The first is the "provider" record, which identifies a DICOM application. Following the provider record are one or more "service" records defining the services to be utilized. "Service" records may be followed by optional "transfer syntax" records. The last record is a "Role" record used only for query/retrieve. The Role record, unlike the other records, must be preceded by a tilde (~), if it is present, and will have one line for each role supported by the query/retrieve device.

· Provider Record: \<application name\> | \<called AE title\> | \<calling AE title\> | \<destination IP address\> | \<destination port number\> [| \<PACS-type\>][| \<priority\> |] \<store\>

• Service Record: \<presentation context name\> | \<transfer syntax name\>

• Transfer Syntax Record: | | \<transfer syntax name\>

• Role Record: ~\<service type\>|\<user Y/N \>|\<provider Y/N\>

The different fields are defined below:

\<application name\>	The name that VistA uses to refer to the DICOM application.
\<called AE title\>	The title of the called provider (SCP) application entity.
\<calling AE title\>	The name of the VistA user (SCU) application entity.
\<destination IP address\>	The network IP address of the provider (SCP) application entity.
\<destination port number\>	The network port number for the provider (SCP application entity.
\<PACS-type\>	Optional field that indicates the type of PACS system. Valid values are Null, "GE" or "KODAK"
\<priority\>	Optional field that sets the priority. Any integer is valid. Defaults to 500 if no value is provided.
\<store\>	Indicates if the device is a storage device. Valid values are "STORE" or Null.\<presentation context name\> The name of the DICOM service object pair (SOP).
\<transfer syntax name\>	The name of the DICOM transfer syntax
~\<service type\>	Query/retrieve only. The services supported by the query/retrieve device. Valid values are "C-Find", "C-Move", or "S-Store"

<user Yes/No>   Query/retrieve only. Indicates if the device is a user of the
                                       named <service type>.

<provider Yes/No>   Query/retrieve only. Indicates if the device is a provider of the
                                       named <service type>.

The following is an example of entries in **SCU_LIST.DIC**:

```
# User Application List
# Format:
# line 1:App Name|Called AE|Calling AE|Destination IP
Address|Socket|Type|priority|store
# line 2:|Presentation Context Name|Transfer Syntax Name
# line 3:||Transfer Syntax Name (if there are more than one)
#
Local Modality Worklist|VistA_Worklist|VistA
Testing|LOCALHOST|60010|||WORKLIST
|Verification SOP Class|Implicit VR Little Endian
|Study Root Query/Retrieve Information Model - MOVE|Implicit VR Little
Endian
#
```

A sample version of this file, named **SCU_LIST.SAMPLE,** is supplied with the VistA Imaging
DICOM Gateway distribution, and may be edited by adding and/or deleting the pound sign ("#").
During an initial installation, this sample file is renamed to **SCU_LIST.DIC**.

When performing an update, the existing copy of this file will remain unaffected. Information
from the sample file may be transferred to the operational master file at the discretion of the site.

The data from this file is stored in MUMPS in the following structure:

```
^MAG(2006.587,D0,0)= SERVICE NAME
^MAG(2006.587,D0,1,0)=SERVICE TYPE
^MAG(2006.587,D0,1,D1,0)= ""
```

After editing the contents of this file, it must be loaded onto the DICOM Gateway and into the
VistA database using the VistA Imaging DICOM Gateway menu Update SCU_LIST.DIC as
described earlier in this section.

Note: In the *.DIC files, leading and trailing spaces are ignored when the data is imported into
the database. This makes it possible to align information for easier reading.

B.4.6   WORKLIST.DIC

The file **WORKLIST.DIC** contains the definitions of the various parameters that are needed for
Modality Worklist processing by the instruments that are being used at the site. Menu Option
4.2.8, Update WORKLIST.DIC, reads this file to populate the Modality Worklist Dictionary file

(#2006.583). This is done manually as part of the installation process, and whenever operational information has changed at the site.

After editing, use the VistA Imaging DICOM Gateway menu option to update this master file as follows:

4. System Maintenance
→ 2. Gateway Configuration and DICOM Master Files
→ → 8. Update WORKLIST.DIC

The file **WORKLIST.DIC** is used in conjunction with the VistA Modality Worklist Service Class Provider. It maps the modality issuing the request to the corresponding site of image acquisition, image service, and image type. The record defining the modality is defined below:

```
<calling AE Title> | <institution name> | <imaging service> | <imaging
type> | <format options> | <description>
```

The different fields are defined below:

<calling AE Title>	The AE title of the modality; different units should use different AE titles.
<institution name>	The name of the institution (as defined in 0.1 field of the INSTITUTION (#4) file. These names are processed in a case-insensitive fashion. Only the part of the name before the first comma needs to match the value in the institution file. Any other punctuation characters that occur in that part of the official name must appear in the value that is entered here. It also may be the site id or left null (the default is the site of the gateway).
<imaging service>	The name of the imaging service: "**RAD**" for Radiology "**CON**" for CPRS Consult/Procedure Request Tracking "**LAB**" for Anatomic Pathology

\<imaging type\>	The imaging type may have any of the following six formats: 1) For radiology, the abbreviation of the imaging type of the procedure, from the IMAGING TYPE file (#79.2) (that is, RAD, NM, US, MRI, CT, ANI, CARD, VAS, or MAM) 2) For consults or procedures, the abbreviation from IMAGE INDEX FOR SPECIALTY/SUBSPECIALTY file (#2005.84) 3) For consults or procedures, the abbreviation from IMAGE INDEX FOR SPECIALTY/SUBSPECIALTY file (#2005.84) followed by "/" and the abbreviation from IMAGE INDEX FOR PROCEDURE/EVENT file (#2005.85) 4) For consults or procedures, the abbreviation from IMAGE INDEX FOR SPECIALTY/SUBSPECIALTY file (#2005.84) followed by "/*" – this includes all of the worklists for the specialty 5) Anatomic pathology utilizes the abbreviation to get the internal ID, and then the subscript value. from the ACCESSION file (#68). 6) A comma delimited list of any of the above – this allows a modality to be used by differ services (for example an angiography suite that is shared between radiology and cardiology) Note: a prefix of "RAD:", "CON:", or "LAB:" can be used to specify an imaging type for a different imaging service.
\<format options\>	Format Options: Accession Number / SSN / Weight / Allergies / Reason • Accession Number: Long or Short (case number) - Default = LONG • SSN: Dash or NoDash - Default DASH • Weight: Weight or NoWeight - Default WEIGHT • Allergies: Output in Allergies (0010,2110) or Medical Alerts (0010,2000) - default both • Reason: Output reason for request in Requested Procedure Comments (0040,1400) or Additional Patient History (0010,21B0) (send both is the default)

<description>	A description that describes the equipment, and typically, also its location.

Examples of the WORKLIST.DIC file are shown below:

```
# Examples:
#
# Radiology
#PCU_QWL_SCU|<Your Institution goes here>|RAD|RAD|LONG|Building E, Rm 225
CT_SCAN_1|688|RAD|CT|LONG|Philips CT, Radiology East, Rm B-129
#
# Consults
IRIS-1||CON|OPHTH|LONG|Canon Retinal Camera, Eye Clinic, Rm, E-170
DENIX-2||CON|DENTAL|LONG|Intra-Oral Xray Unit, Rm, D-153
GI_LAB_SCU|<Your Institution goes here>|CON|GI|LONG|North Clinic
#
# Anatomic Pathology
PATH||LAB|SP,CY|L|AP Surgical Path and Cytopath, but not Electron Microscopy
#
# Different Image Types
C1||CON|CARDIO|L|CARDIO alone
C2||CON|CARDIO/ECHO|L|CARDIO ECHO alone
C3||CON|CARDIO/CATH|L|CARDIO CATH alone
C4||CON|CARDIO/EKG|L|CARDIO EKG alone
C5||CON|CARDIO,CARDIO/CATH,CARDIO/ECHO|L|all CARDIO, but not EKG
C6||CON|CARDIO/*|L|all CARDIO together including EKG
RC||RAD|RAD,CON:CARDIO,CON:OPHTH|L|RAD, CARDIO, and OPHTH
CR||CON|RAD:RAD,CARDIO/*,OPHTH|L|RAD, CARDIO/*, and OPHTH
#
# Allergy and Weight preferences
A1||RAD|RAD|L////|RAD with defaults for allergies, reason, and weight
A2||RAD|RAD|L///a/|RAD with allergies returned in Allergies (0010,2110)
A3||RAD|RAD|L///M/|RAD with allergies returned in Medical Alerts (0010,2000)
R1||RAD|RAD|L////c|RAD with reason in Requested Procedure Comment (0040,1400)
R2||RAD|RAD|L////h|RAD with reason in Additional Patient History (0010,21B0)
W1||RAD|RAD|L//W//|RAD with weight returned
W2||RAD|RAD|L//N//|RAD with weight set to null (NoWeight)
```

The file WORKLIST.DIC has to be edited for every new instrument using the VistA modality worklist service.

B.4.7   Editing the Clinical Specialty DICOM & HL7 file

The CLINICAL SPECIALTY DICOM & HL7 file is used for mapping CPRS Consult Request Tracking Consults and Procedures to DICOM Modality Worklist and to HL7 that is sent to clinical specialty PACS.

B.4.7.1 Displaying the CLINICAL SPECIALTY DICOM & HL7 file

The following example shows how to display the entries in the file. (The file used in these examples contains fictional data.)

```
Select OPTION NAME: MAGD DICOM MENU        DICOM Menu Options


   ECTP   Edit CT PARAMETER File
   ICTP   Display MAGD CT PARAMETER entries
   ECRP   Edit CR PARAMETER File
   ICRP   Display MAGD CR PARAMETER entries
   ECS    Edit CLINICAL SPECIALTY DICOM & HL7 file
   EXP    Display DICOM OBJECT EXPORT file entries
   CLN    Correct Clinical Specialties DICOM File Entries
   RAD    Correct RAD-DICOM File Entries
          Clean Up DICOM Gateway (Failed Images)
          Clean Up Gateway (DICOM Destinations)
          List Unread Studies
          Print DICOM Failed Image File Entries
          Rename DICOM Gateway (DICOM Destinations)
          Rename DICOM Gateway (Failed Images)
          Validate DICOM Correct Information


You have PENDING ALERTS
        Enter  "VA to jump to VIEW ALERTS option


You've got PRIORITY mail!


Select DICOM Menu Options <TEST ACCOUNT> Option: ecs  Edit CLINICAL SPECIALTY DI
COM & HL7 file


********************************************************************************
***                                                                          ***
***         CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor           ***
***                                                                          ***
********************************************************************************


Add/Edit a Consult or a Procedure?

     Select one of the following:

          1          Consult
          2          Procedure
          3          Display the existing dictionary
          4          Quit

Enter an option: 3  Display the existing dictionary
DEVICE: HOME//   HERE



********************************************************************************
***                                                                          ***
*** CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) -- 7/19/13@12:07          ***
```

```
***                                                                    ***
**************************************************************************

            -- Consult --
     Request Service: CARDIOLOGY
           Worklist: CARDIO (CARDIOLOGY)
        Acquired at: 660 -- SALT LAKE CITY
          Clinic(s): CARDIOLOGY
Warning: No Associated Stop Codes are defined for this Request Service.
        Use CONSULT ASSOCIATED STOP CODE menu option to define them.

            -- Consult --
     Request Service: GASTROENTEROLOGY
           Worklist: GI (GASTROENTEROLOGY)
        Acquired at: 660 -- SALT LAKE CITY
          Clinic(s): GI CLINIC
Warning: No Associated Stop Codes are defined for this Request Service.
        Use CONSULT ASSOCIATED STOP CODE menu option to define them.

            -- Consult --
     Request Service: OPHTHALMOLOGY
           Worklist: OPHTH (OPHTHALMOLOGY)
        Acquired at: 660 -- SALT LAKE CITY
          Clinic(s): OPHTHALMOLOGY    OPHTHALMOLOGY-EYEPHOTOGRAPHY
Warning: No Associated Stop Codes are defined for this Request Service.
        Use CONSULT ASSOCIATED STOP CODE menu option to define them.

            -- Consult --
     Request Service: DENTAL-OPT
           Worklist: DENT (DENTISTRY)
        Acquired at: 660 -- SALT LAKE CITY
          Clinic(s): DENTAL CLINIC
Warning: No Associated Stop Codes are defined for this Request Service.
        Use CONSULT ASSOCIATED STOP CODE menu option to define them.

            -- Consult --
     Request Service: DENTAL-INPT
           Worklist: DENT (DENTISTRY)
        Acquired at: 660 -- SALT LAKE CITY
          Clinic(s): DENTAL CLINIC
Warning: No Associated Stop Codes are defined for this Request Service.
        Use CONSULT ASSOCIATED STOP CODE menu option to define them.
-- End of File --


**************************************************************************
***                                                                    ***
***        CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor      ***
***                                                                    ***
**************************************************************************


Add/Edit a Consult or a Procedure?

     Select one of the following:

          1          Consult
          2          Procedure
          3          Display the existing dictionary
          4          Quit

Enter an option:
```

B.4.7.2 Adding a Consult to the CLINICAL SPECIALTY DICOM & HL7 file

In the following example, a general Pulmonary Consult is added to the file. This is a two-step process. First, the entry is added to this file. Second, the Stop Code is added using the ***CONSULT ASSOCIATED STOP CODE*** menu option. This associates the consult request with the clinic(s) where the patient is seen. This information is used when the appointment is made to provide DICOM Modality Worklist with scheduling information for the consult request.

B.4.7.2.1 Adding the Consult to the file

```
*****************************************************************************
***                                                                       ***
***          CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor       ***
***                                                                       ***
*****************************************************************************


Add/Edit a Consult or a Procedure?

     Select one of the following:


          1          Consult
          2          Procedure
          3          Display the existing dictionary
          4          Quit

Enter an option: 1  Consult
Enter the Request Service: PULMONARY

Enter the Imaging Specialty Index: PULMONARY
Enter the Imaging Procedure Index:
Enter the Acquisition Institution: 660
     1   660   SALT LAKE CITY    UT            660
     2   660AA  SALT LAKE DOM   UT  VAMC       660AA
CHOOSE 1-2: 1   SALT LAKE CITY   UT              660
Enter the CPT Code:
Enter the HL7 (Optimized) Subscription List: MAG
     1   MAGD ADT
     2   MAGD DEFAULT
CHOOSE 1-2: 2   MAGD DEFAULT


Enter the Clinic #1: PU
     1    PULMONARY
     2    PULMONARY CLINIC
CHOOSE 1-2: 2   PULMONARY CLINIC
Enter the Clinic #2:

     Request Service = PULMONARY
           Procedure =
     Specialty Index = PULMONARY -- PULM
     Procedure Index =
            Worklist = PULM (PULMONARY)
         Acquired at = 660 -- SALT LAKE CITY
            CPT Code =
```

```
  HL7 Subscriber List = MAGD DEFAULT
             Clinic = PULMONARY CLINIC


Warning: No Associated Stop Codes are defined for this Request Service.
        Use CONSULT ASSOCIATED STOP CODE menu option to define them.



Create this entry? n// YES -- entry created


********************************************************************************
***                                                                          ***
***          CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor         ***
***                                                                          ***
********************************************************************************


Add/Edit a Consult or a Procedure?

     Select one of the following:


          1          Consult
          2          Procedure
          3          Display the existing dictionary
          4          Quit

Enter an option: 4 Quit
```

Note that the Pulmonary Consult will appear on the Modality Worklist with the name **PULM**.

B.4.7.2.2   Add the Stop Codes(s)

Now use the ***CONSULT ASSOCIATED STOP CODE*** menu option to define a Stop Code(s)
associated with the consult request.

```
Select OPTION NAME: CONSULT ASSOCIATED STOP CODE  SD ASSOCIATED STOP CODE
CONSULT ASSOCIATED STOP CODE
CONSULT ASSOCIATED STOP CODE

Select REQUEST SERVICES SERVICE NAME: PULMONARY

Select ASSOCIATED STOP CODE: PU
    1    PUBLIC HEALTH NURSING         122     10-01-2007
    2    PULMONARY FUNCTION         104
    3    PULMONARY/CHEST        312
CHOOSE 1-3: 2   PULMONARY FUNCTION      104
  Are you adding 'PULMONARY FUNCTION' as
    a new ASSOCIATED STOP CODE (the 1ST for this REQUEST SERVICES)? No// Y  (Yes)
Select ASSOCIATED STOP CODE: PULMONARY FUNCTION        104
        ...OK? Yes// N   (No)
    PU
    1    PUBLIC HEALTH NURSING         122     10-01-2007
    2    PULMONARY/CHEST        312
CHOOSE 1-2: 2   PULMONARY/CHEST      312
  Are you adding 'PULMONARY/CHEST' as
    a new ASSOCIATED STOP CODE (the 2ND for this REQUEST SERVICES)? No// Y  (Yes)
```

```
Select ASSOCIATED STOP CODE:

Select REQUEST SERVICES
```

B.4.7.2.3   Display the Consult with the Stop Code(s)

Now when the CLINICAL SPECIALTY DICOM & HL7 file is display, the Stop codes are shown.

```
*******************************************************************************
***                                                                         ***
***           CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor        ***
***                                                                         ***
*******************************************************************************


Add/Edit a Consult or a Procedure?

     Select one of the following:

          1          Consult
          2          Procedure
          3          Display the existing dictionary
          4          Quit

Enter an option: 3  Display the existing dictionary
DEVICE: HOME//   HERE



*******************************************************************************
***                                                                         ***
*** CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) -- 7/19/13@12:44        ***
***                                                                         ***
*******************************************************************************


               -- Consult --
     Request Service: CARDIOLOGY
           Worklist: CARDIO (CARDIOLOGY)
         Acquired at: 660 -- SALT LAKE CITY
          Clinic(s): CARDIOLOGY
Warning: No Associated Stop Codes are defined for this Request Service.
         Use CONSULT ASSOCIATED STOP CODE menu option to define them.

               -- Consult --
     Request Service: GASTROENTEROLOGY
           Worklist: GI (GASTROENTEROLOGY)
         Acquired at: 660 -- SALT LAKE CITY
          Clinic(s): GI CLINIC
Warning: No Associated Stop Codes are defined for this Request Service.
         Use CONSULT ASSOCIATED STOP CODE menu option to define them.

               -- Consult --
     Request Service: OPHTHALMOLOGY
           Worklist: OPHTH (OPHTHALMOLOGY)
         Acquired at: 660 -- SALT LAKE CITY
          Clinic(s): OPHTHALMOLOGY    OPHTHALMOLOGY-EYEPHOTOGRAPHY
Warning: No Associated Stop Codes are defined for this Request Service.
         Use CONSULT ASSOCIATED STOP CODE menu option to define them.
```

```
                   -- Consult --
      Request Service: DENTAL-OPT
             Worklist: DENT (DENTISTRY)
          Acquired at: 660 -- SALT LAKE CITY
           Clinic(s): DENTAL CLINIC
Warning: No Associated Stop Codes are defined for this Request Service.
          Use CONSULT ASSOCIATED STOP CODE menu option to define them.

                   -- Consult --
      Request Service: DENTAL-INPT
             Worklist: DENT (DENTISTRY)
          Acquired at: 660 -- SALT LAKE CITY
           Clinic(s): DENTAL CLINIC
Warning: No Associated Stop Codes are defined for this Request Service.
          Use CONSULT ASSOCIATED STOP CODE menu option to define them.

                   -- Consult --
      Request Service: PULMONARY
             Worklist: PULM (PULMONARY)
          Acquired at: 660 -- SALT LAKE CITY
 HL7 Subscriber List: MAGD DEFAULT
           Clinic(s): PULMONARY CLINIC
Associated Stop Code: PULMONARY FUNCTION
Associated Stop Code: PULMONARY/CHEST
-- End of File --

********************************************************************************
***                                                                          ***
***         CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor          ***
***                                                                          ***
********************************************************************************


Add/Edit a Consult or a Procedure?

     Select one of the following:

          1          Consult
          2          Procedure
          3          Display the existing dictionary
          4          Quit

Enter an option: 4 Quit
```

B.4.7.3 Adding a Procedure to the CLINICAL SPECIALTY DICOM & HL7 file

In the following example, a Cardiology Electrocardiogram is added to the file. This is the same two-step process as adding a consult. First, the entry is added to this file. Second, the Stop Code is added using the *CONSULT ASSOCIATED STOP CODE* menu option.

B.4.7.3.1 Adding the Procedure to the file

```
********************************************************************************
***                                                                          ***
***         CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor          ***
***                                                                          ***
********************************************************************************
```

```
Add/Edit a Consult or a Procedure?

     Select one of the following:

          1          Consult
          2          Procedure
          3          Display the existing dictionary
          4          Quit

Enter an option: 2  Procedure
Enter the Procedure: ELECTRO
     1   ELECTROCARDIOGRAM
     2   ELECTROPHYSIOLOGY
CHOOSE 1-2: 1  ELECTROCARDIOGRAM
Request Service: CARDIOLOGY

Enter the Imaging Specialty Index: CARD
     1   CARDIAC SURGERY
     2   CARDIOLOGY
CHOOSE 1-2: 2  CARDIOLOGY

Enter the Imaging Procedure Index: EKG
Enter the Acquisition Institution: 660
     1   660   SALT LAKE CITY   UT              660
     2   660AA   SALT LAKE DOM   UT  VAMC        660AA
CHOOSE 1-2: 1  SALT LAKE CITY  UT               660


CPT Code: 93005 -- ELECTROCARDIOGRAM TRACING
Change this value? n//   NO
Enter the HL7 (Optimized) Subscription List: MAG
     1   MAGD ADT
     2   MAGD DEFAULT
CHOOSE 1-2: 2  MAGD DEFAULT

Enter the Clinic #1: CARDIOLOGY        IMAGPROVIDERFIVEEIGHT,FIVEEIGHT
Enter the Clinic #2:

     Request Service = CARDIOLOGY
           Procedure = ELECTROCARDIOGRAM
     Specialty Index = CARDIOLOGY -- CARDIO
     Procedure Index = EKG -- EKG
            Worklist = CARDIO/EKG (CARDIOLOGY/EKG)
         Acquired at = 660 -- SALT LAKE CITY
            CPT Code = 93005 -- ELECTROCARDIOGRAM TRACING
 HL7 Subscriber List = MAGD DEFAULT
              Clinic = CARDIOLOGY

Warning: No Associated Stop Codes are defined for this Request Service.
        Use CONSULT ASSOCIATED STOP CODE menu option to define them.



Create this entry? n// YES -- entry created


*******************************************************************************
***                                                                         ***
***        CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor          ***
***                                                                         ***
*******************************************************************************
```

```
Add/Edit a Consult or a Procedure?

     Select one of the following:

          1          Consult
          2          Procedure
          3          Display the existing dictionary
          4          Quit

Enter an option: 4 Quit
```

Note that the Electrocardiogram procedure will appear on the Modality Worklist with the name **CARD/EKG**.

B.4.7.3.2   Add the Stop Codes(s)

Now use the ***CONSULT ASSOCIATED STOP CODE*** menu option to define a Stop Code(s) associated with the procedure request.

```
Select OPTION NAME: CONSULT ASSOCIATED STOP CODE  SD ASSOCIATED STOP CODE     CO
NSULT ASSOCIATED STOP CODE
CONSULT ASSOCIATED STOP CODE

Select REQUEST SERVICES SERVICE NAME: CARD
     1   CARDIOLOGY
     2   CARDIOLOGY CLINIC
CHOOSE 1-2: 1  CARDIOLOGY
Select ASSOCIATED STOP CODE: EKG         107
  Are you adding 'EKG' as a new ASSOCIATED STOP CODE (the 1ST for this REQUEST S
ERVICES)? No// Y  (Yes)
Select ASSOCIATED STOP CODE:

Select REQUEST SERVICES SERVICE NAME:
```

B.4.7.3.3   Display the Consult with the Stop Code(s)

Now when the CLINICAL SPECIALTY DICOM & HL7 file is display, the Stop codes are shown.
```
*******************************************************************************
***                                                                         ***
***         CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor          ***
***                                                                         ***
*******************************************************************************

Add/Edit a Consult or a Procedure?

     Select one of the following:

          1          Consult
          2          Procedure
          3          Display the existing dictionary
          4          Quit

Enter an option: 3  Display the existing dictionary
```

```
DEVICE: HOME//   HERE




*******************************************************************************
***                                                                         ***
*** CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) -- 7/19/13@13:09    ***
***                                                                         ***
*******************************************************************************

               -- Consult --
     Request Service: CARDIOLOGY
            Worklist: CARDIO (CARDIOLOGY)
         Acquired at: 660 -- SALT LAKE CITY
           Clinic(s): CARDIOLOGY
Associated Stop Code: EKG

               -- Consult --
     Request Service: GASTROENTEROLOGY
            Worklist: GI (GASTROENTEROLOGY)
         Acquired at: 660 -- SALT LAKE CITY
           Clinic(s): GI CLINIC
Warning: No Associated Stop Codes are defined for this Request Service.
         Use CONSULT ASSOCIATED STOP CODE menu option to define them.

               -- Consult --
     Request Service: OPHTHALMOLOGY
            Worklist: OPHTH (OPHTHALMOLOGY)
         Acquired at: 660 -- SALT LAKE CITY
           Clinic(s): OPHTHALMOLOGY    OPHTHALMOLOGY-EYEPHOTOGRAPHY
Warning: No Associated Stop Codes are defined for this Request Service.
         Use CONSULT ASSOCIATED STOP CODE menu option to define them.

               -- Consult --
     Request Service: DENTAL-OPT
            Worklist: DENT (DENTISTRY)
         Acquired at: 660 -- SALT LAKE CITY
           Clinic(s): DENTAL CLINIC
Warning: No Associated Stop Codes are defined for this Request Service.
         Use CONSULT ASSOCIATED STOP CODE menu option to define them.

               -- Consult --
     Request Service: DENTAL-INPT
            Worklist: DENT (DENTISTRY)
         Acquired at: 660 -- SALT LAKE CITY
           Clinic(s): DENTAL CLINIC
Warning: No Associated Stop Codes are defined for this Request Service.
         Use CONSULT ASSOCIATED STOP CODE menu option to define them.

               -- Consult --
     Request Service: PULMONARY
            Worklist: PULM (PULMONARY)
         Acquired at: 660 -- SALT LAKE CITY
 HL7 Subscriber List: MAGD DEFAULT
           Clinic(s): PULMONARY CLINIC
Associated Stop Code: PULMONARY FUNCTION
Associated Stop Code: PULMONARY/CHEST

               -- Procedure --
     Request Service: CARDIOLOGY
```

```
        Procedure: ELECTROCARDIOGRAM
          Worklist: CARDIO/EKG (CARDIOLOGY/EKG)
      Acquired at: 660 -- SALT LAKE CITY
          CPT Code: 93005 -- ELECTROCARDIOGRAM TRACING
 HL7 Subscriber List: MAGD DEFAULT
          Clinic(s): CARDIOLOGY
Associated Stop Code: EKG
-- End of File --


*******************************************************************************
***                                                                         ***
***        CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor          ***
***                                                                         ***
*******************************************************************************


Add/Edit a Consult or a Procedure?

    Select one of the following:

        1          Consult
        2          Procedure
        3          Display the existing dictionary
        4          Quit

Enter an option: 4 Quit
```

B.4.7.4   Changing an entry in the CLINICAL SPECIALTY DICOM & HL7 file

In the following example, a procedure index (SCREENING AND SURVEILLANCE) is added
to the Pulmonary Consult. This will change the name of the consult on the Modality Worklist
from PULM to PULM/SCRNSURV.

```
*******************************************************************************
***                                                                         ***
***        CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor          ***
***                                                                         ***
*******************************************************************************


Add/Edit a Consult or a Procedure?


    Select one of the following:

        1          Consult
        2          Procedure
        3          Display the existing dictionary
        4          Quit


Enter an option: 1   Consult
Enter the Request Service: PULMONARY

An entry for the PULMONARY consult
is already on file.

    Request Service = PULMONARY
          Procedure =
    Specialty Index = PULMONARY -- PULM
```

```
     Procedure Index =
           Worklist = PULM (PULMONARY)
        Acquired at = SALT LAKE CITY -- 660
           CPT Code =
 HL7 Subscriber List = MAGD DEFAULT
             Clinic = PULMONARY CLINIC


Associated Stop Code = PULMONARY FUNCTION
Associated Stop Code = PULMONARY/CHEST


Change this entry? n// y  YES


Delete the entire entry? n//   NO -- entry not deleted

Imaging Specialty Index: PULMONARY -- PULM
Change this value? n//   NO


Imaging Procedure Index:
Change this value? n// y  YES

Enter the Imaging Procedure Index: scr
     1   SCREENING
     2   SCREENING (ACTIVE)
     3   SCREENING AND SURVEILLANCE
CHOOSE 1-3: 3  SCREENING AND SURVEILLANCE


Acquisition Institution: SALT LAKE CITY -- 660
Change this value? n//   NO


CPT Code:
Change this value? n//   NO


HL7 (Optimized) Subscription List: MAGD DEFAULT
Change this value? n//   NO


Clinic: PULMONARY CLINIC -------------- Remove this clinic? n// NO


Enter the Clinic #2:


     Request Service = PULMONARY
           Procedure =
     Specialty Index = PULMONARY -- PULM
     Procedure Index = SCREENING AND SURVEILLANCE -- SCRNSURV
            Worklist = PULM/SCRNSURV (PULMONARY/SCREENING AND SURVEILLANCE)
         Acquired at = SALT LAKE CITY -- 660
            CPT Code =
 HL7 Subscriber List = MAGD DEFAULT
             Clinic = PULMONARY CLINIC


Associated Stop Code = PULMONARY FUNCTION
Associated Stop Code = PULMONARY/CHEST



Update this entry? n// y  YES


Entry Updated



*******************************************************************************
***                                                                         ***
***        CLINICAL SPECIALTY DICOM & HL7 file (#2006.5831) Editor       ***
```

```
***                                                               ***
*******************************************************************************

Add/Edit a Consult or a Procedure?

     Select one of the following:

          1          Consult
          2          Procedure
          3          Display the existing dictionary
          4          Quit

Enter an option: 4 Quit
```

Now the Pulmonary Consult will appear on the Modality Worklist with the name
PULM/SCRNSURV.

Note: If this change were to be made on a live system, those modalities that were previously
mapped to PULM would need to be re-mapped to PULM/SCRNSURV. It might be necessary to
map them to both PULM and PULM/SCRNSURV to be backward compatible with existing
studies in the worklist and forward compatible with the new studies.

This is easily done by including both in the WORKLIST.DIC file as shown below:

<AE Title> ||PULM,PULM/SCRNSURV|L|mapped to both PULM and PULM/SCRNSURV

Appendix C Networking Fundamentals

C.1   Overview

TCP/IP inter-process (i.e., computer-to-computer) communications are performed between operating system endpoints called sockets. A socket is assigned a unique numeric port value (1-65535) when it is placed into use. Server applications allocate sockets and assign well-known port numbers when they start up. Client applications allocate sockets and access the server applications via the well-known port numbers.

Internet convention reserves port numbers 1-1023 for the system. The Secure Shell server application, for example, uses port number 22. Port numbers 1024-5000 are automatically assigned by the system, as needed, for things like handling client sessions. Port numbers above 5000 are available for user-developed services[2] (e.g., VA Kernel Broker uses 9200).

DICOM applications require well-known port numbers. The port numbers for the VistA Imaging DICOM Gateway are assigned in a consistent dedicated fashion so that each application always uses the same port number, and different applications are always assigned different port numbers.

This allows applications to be moved between machines for redundancy and load balancing, without requiring the port numbers to be reconfigured. The VistA Imaging DICOM Gateway applications use port numbers in the range of 60000-61000 (see Appendix E).

C.2   IP Addresses and Subnet Masks

Internet Protocol (IP) addresses are defined for network interfaces. More than one address may be defined for an individual network interface, and a machine may have more than one network interface. If a machine has more than one network interface, the IP address for each of the interfaces must be assigned in different subnets.

IP addresses are 32 bits long and are represented in the format *aaa.bbb.ccc.ddd*, where *aaa*, *bbb*, *ccc*, and *ddd* are the first, second, third, and fourth octets (bytes) respectively.

Large organizations sub-divide their network namespace into logically independent *subnets*. With the TCP/IP protocol suite, two machines can directly communicate with one another *only if they have IP addresses that are in the same subnet*. Otherwise, routers must be used to provide inter-subnet store and forward communications.

The *subnet mask* is used to partition the network namespace IP addresses into the different subnets. The subnet mask is also 32 bits long and has the same *aaa.bbb.ccc.ddd* format as the IP address. By definition, the subnet mask consists of a string of high-order ONE bits followed by a string of low-order ZERO bits. The bits in the *aaa* octet of the subnet mask are usually set to ONE. The *bbb, ccc,* and *ddd* octets have a specific number of high-order ONE bits and low-order ZERO bits. The

---

[2] UNIX® Network Programming, W. Richard Stephens, Prentice Hall, 1990, page 304.

sequence of the ONE bits in the subnet mask define the subnet of the IP address. In a very frequently used combination in the VA, the *ccc* and *ddd* octets may have a string of nine high-order ONE bits followed by seven low-order ZERO bits. The resulting decimal sequence 255.255.255.128 (i.e., 11111111.11111111.11111111.10000000 in binary) is commonly referred to as a seven-bit subnet mask.

The selection of the subnet mask is a crucial configuration factor governing performance in the imaging network.

Two IP addresses are in the same subnet if two conditions are met:
- They have the same subnet mask.
- The logical AND of the subnet mask and each IP address are the same.

Routing imposes a network bottleneck for high-volume LAN applications like imaging. It is highly desirable, for performance reasons, to avoid routing imaging traffic, whenever possible. One way to accomplish this is to use a switched network topology and place all of the components (workstations, servers, etc.) in the same subnet. Another way is to have separate subnets, but to assign multiple IP addresses to the servers, one for each subnet.

C.2.1 Example 1 – Original Configuration – Seven-bit Subnet Mask

Assume that machines A, B, C, and D are all on the same switched network. Machines A and B are file servers containing images, and machines C and D are imaging workstations.

Subnet Mask	255.255.255.128	(seven-bit subnet mask)
IP Address A	111.222.34.30	
IP Address B	111.222.34.31	
IP Address C	111.222.34.130	
IP Address D	111.222.34.131	

Note: In all the examples in this document, dummy IP addresses starting with 111.222 are used (Please ignore the fact that 111.xxx.yyy.zzz is a Class A network address, while 152.xxx.yyy.zzz is a Class B one).

The subnet mask specifies that the upper three octets and the high order bit of the low order octet must be the same. The seven low order bits may be different.

There are 128 (2^7) different IP address combinations in this subnet, of which 126 may be used (The lowest and highest addresses in the range are reserved).

In Example 1, there are two different subnets: 111.222.34.0 to 111.222.34.127 and 111.222.34.128 to 111.222.34.255. IP Addresses A and B are in one subnet (see Table C.1), while IP addresses C and D are in another subnet (see Table C.2).

IP Address "A" Logically ANDed with Subnet Mask

	Decimal Notation	**Binary Notation**
IP Address "A"	111.222.34.30	01101111.11011110.00100010.00011110
Subnet Mask	255.255.255.128	11111111.11111111.11111111.10000000
Logical AND	111.222.34.0	01101111.11011110.00100010.00000000

Table C.1

IP Address "C" Logically ANDed with Subnet Mask

	Decimal Notation	**Binary Notation**
IP Address "C"	111.222.34.130	01101111.11011110.00100010.10000010
Subnet Mask	255.255.255.128	11111111.11111111.11111111.10000000
Logical AND	111.222.34.128	01101111.11011110.00100010.10000000

Table C.2

Machines A and B can communicate directly with each other, as can machines C and D, but machines A and B cannot directly communicate with machines C and D. A router is required in order for machines A & B to communicate with machines C & D.

Rather poor image retrieval performance is obtained in the Example 1 configuration because every byte of data transferred from the file servers (A & B) to the workstations (C & D) must pass through the router. As Example 2 will show, merely by changing the subnet mask by one bit can dramatically improve image transfer times.

C.2.2   Example 2 – Change to Eight-bit Subnet Mask

Assume that machines A, B, C, and D are all on the same switched network. Machines A and B are file servers containing images, and machines C and D are imaging workstations.

```
Subnet Mask      255.255.255.0        (eight-bit subnet mask)
IP Address A     111.222.34.30
IP Address B     111.222.34.31
```

IP Address C	111.222.34.130
IP Address D	111.222.34.131

In Example 2, there is only one subnet: 111.222.34.0 to 111.222.34.255 with 254 usable IP addresses. Machines A, B, C, and D can directly communicate with each other without requiring a router.

There is a significant gain in performance for the imaging application between the first and the second configuration. The second configuration is much faster than the first because the images can be retrieved from the file servers directly, without having to be passed through a router.

C.2.3   Example 3 – Keep Seven-Bit Subnet Mask and Add Secondary IP Address to Servers

Another option is to keep the original nine-bit subnet masks and add secondary IP addresses to the servers.

Assume that machines A, B, C, and D are all on the same switched network. Machines A and B are file servers containing images, and machines C and D are imaging workstations.

Subnet Mask	255.255.255.128 (seven-bit subnet mask)
IP Address A	111.222.34.30, 111.222.34.250
IP Address B	111.222.34.31, 111.222.34.251
IP Address C	111.222.34.130
IP Address D	111.222.34.131

In Example 3, there are the two original subnets: 111.222.34.0 to 111.222.34.127 and 111.222.34.128 to 111.222.34.255. IP Addresses C and D are in one subnet, but IP addresses A and B are in both subnets. Machines A, B, C, and D can directly communicate with each other without requiring a router. Like Example 2, there is a similar significant gain in performance for the imaging application with this configuration.

For several years, the seven-bit subnet mask 255.255.255.128 was the recommended for the VA when the network topology consisted of several subnets connected by routers. With the new switched network topology consisting (ideally) of a single subnet containing several segments connected together by switches, other subnet mask values will be used.

The Telecommunications Support Office recommends using Variable Length Subnet Masks with a switched network topology in order to minimize the router load and maximize throughput. This means using different-sized subnet masks for different parts of the network IP address space.

To achieve optimal performance in a switched network topology, partition the IP address space and assign subnet masks to provide the largest possible subnets and minimize routing.

C.2.4   Example 4 – Use Multiple Subnets

A VAMC has been assigned the 111.222.29.1 to 111.222.32.126 range of IP addresses. All addresses outside this range are assigned to other facilities. The entire VAMC is wired with a 100 Base TX switched network infrastructure. What subnet masks should be used to provide the largest possible subnets?

The best solution is to use three subnets as follows:

Name	IP Address Range	Subnet Mask	Number of Addresses
Subnet A	111.222.29.1 - 111.222.29.254	255.255.255.0 eight-bit subnet mask	254
Subnet B	111.222.30.1 - 111.222.31.254	255.255.254.0 nine-bit subnet mask	510
Subnet C	111.222.32.1 - 111.222.32.126	255.255.255.128 seven-bit subnet mask	126

Note how the values of the IP addresses affect the way that the subnets can be constructed. The high-order bits of the IP address ANDed with the subnet mask must be the same for the entire subnet. IP addresses 111.222.30.* and 111.222.31.* can be placed into the same subnet using the nine-bit mask because the value of the ANDs are both 111.222.30.0. Note, however, that IP addresses 111.222.29.* and 111.222.30.* cannot be placed into the same subnet using the nine-bit mask, because the value for the ANDs are different, 111.222.28.0 and 111.222.30.0 respectively.

Subnet A can accommodate the imaging application with up to 250 workstations with no need for routing. An application with more workstations (like office automation) might be placed in Subnet B. Miscellaneous applications can be placed in Subnet C.

If the seven-bit subnet mask were used instead of the variable length subnet mask scheme, there would be seven subnets with 126 addresses in each. The image file servers could then have multiple IP addresses, one in each subnet to avoid much of the routing. Otherwise, considerably more routing would be required.

Another site has used subnet mask 255.255.128.0 (allowing 32,766 addresses) so that all the devices in the facility are on the same subnet. It is also possible to use a VISN-wide Class A private network address scheme with a subnet mask 255.0.0.0 and IP addresses like 10.130.xxx.yyy.

Note: The site then may need to provide an IP address conversion capability so that ~~Silver Spring can access~~ the gateway can be accessed remotely.

Warning: **Changes to the subnets need to be reflected in the routers and the other systems on the network.**

For further information, contact your CIO Network Group and the network vendor specialists.

C.3 Default Gateways

A Default Gateway is typically a port on a router that is used to transfer traffic between subnets. The default gateway port IP address must be in the same subnet as the IP address of the network interface. Typically, the bottom or top address in a subnet is used as the IP address for the default gateway. In this example, the default gateway IP address might be 111.222.34.1 or 111.222.34.126 for IP addresses A and B, and 111.222.34.129 or 111.222.34.254 for IP addresses C and D.

It is possible to set the default gateway IP address incorrectly and still get routing to occur. Some routers have an automatic address resolution option, which, if enabled, will automatically resolve IP addresses and perform routing, in spite of the possibility that the default gateway IP address is incorrect. This feature may tend to hide IP address problems and may promote bad networking practices.

The IP addresses on a Windows workstation are set by mouse clicking on Start, picking Settings, and selecting Control Panel. Clicking on the Network icon on the Control Panel window brings up the Network window. Selecting the Protocols tab brings up a list of the installed network protocols. Selecting the TCP/IP Protocol and the Properties button brings up the Microsoft TCP/IP Properties window. Select the adapter and enter the IP address, subnet mask, and default gateway. The system may have to be rebooted afterwards.

The Advanced button brings up the Advanced IP Addressing window that allows the entry of the additional IP addresses. The IP addresses can be in either the same subnet or in different subnets. This is very useful for connecting servers to multiple subnets. It is also useful in the event of a system failure for redirecting communications to an operational VistA DICOM machine.

For imaging workstations, the IP address, subnet mask, default gateway, and other parameters, such as DNS addresses, can be left blank and be assigned at run time using the Dynamic Host Configuration Protocol (DHCP). This should not be used for VistA Imaging DICOM Gateways, however, as permanent (i.e., hard-coded) IP addresses are usually required for communications by the commercial DICOM equipment.

C.4 HOSTS File

The HOSTS file maps IP addresses to aliases. Aliases are mnemonics, memory aids that can serve multiple purposes. It is very useful to place entries for all the commercial DICOM equipment into the HOSTS file of the VistA Imaging DICOM Gateway.

Using aliases makes it much easier to access the other systems. The aliases can be used in commands in place of the numeric IP addresses. If it is necessary to change the IP address of the commercial DICOM equipment, it can be changed in the HOSTS file while keeping the same familiar alias.

Service providers can use the information in the HOSTS file in a reverse fashion, to lookup incoming client IP addresses and display the corresponding alias.

Example of HOSTS file:

```
# VAMC DICOM Image Producing Modalities
111.222.35.30 CT1               # Picker CT PQ-2000 #1
111.222.35.31 CT2               # Picker CT PQ-2000 #2
111.222.35.32 CT3               # GEMS High Speed Advantax CT
```

The HOSTS file is not limited to IP addresses of other systems, however. Aliases can also point to the current system (using the IP address 127.0.0.1) and form a local loopback.

A new IRIS TERMINAL session needs to be created for each alias in order for it to be displayed in the title bar while it is running.

Note: The alias can also contain the menu prompt numbers, making it easier to start the process).

Example of HOSTS file:

```
# local host telnet connections for the VistA DICOM PACS Interface
# VistA DICOM Text Gateway
127.0.0.1   TEXT_INTERFACE_1_1      # HIS to DICOM Test Interface
127.0.0.1   EMED_PACS_1_2_1         # EMED PACS Communications
127.0.0.1   MITRA_BROKER_1_2_2      # MITRA / FUJI Communications
```

Appendix D Diagnostic Networking Tools

D.1   HOSTDIR.BAT

The full path to the HOSTS file is several directories deep and is system dependent (e.g.,
`c:\Windows\system32\drivers\etc\hosts`). Rather than trying to remember which
path to use for which system and typing in the whole thing every time, use the following script:

```
cd %SystemRoot%\system32\drivers\etc
```

This takes you to the directory containing the HOSTS file. The script is stored in the file c:\Program
Files(x86)\VistA\Imaging\DICOM\hostdir.bat. The installation procedure ensures that this directory
will be included in the path, so that this command file can be started by simply typing "`hostdir`".

D.2   IPCONFIG

The current system's IP address, subnet masks, and default gateways can be conveniently displayed
with the IPCONFIG command, as shown below:

```
c:\>ipconfig

Windows IP Configuration

Ethernet adapter DC21X42:

    IP Address. . . . . . . . . : 222.111.36.162
    Subnet Mask . . . . . . . . : 255.255.255.192
    Default Gateway . . . . . . : 222.111.36.190

Ethernet adapter DC21X41:

    IP Address. . . . . . . . . : 111.222.36.39
    Subnet Mask . . . . . . . . : 255.255.255.128
    IP Address. . . . . . . . . : 111.222.36.40
    Subnet Mask . . . . . . . . : 255.255.255.128
    Default Gateway . . . . . . : 111.222.36.122
```

Note that the second network interface has two different IP addresses assigned to it. This illustrates
how one VistA Imaging DICOM Gateway can be configured to subsume the tasks of another, in
the event of a system failure. In this example, the system with IP address 111.222.36.40 was taken
out of service and all of its tasks were given to the system with IP address 111.222.36.39. The
DICOM applications that had run on the old system now run on the new system without any
changes to the commercial DICOM system's configuration files.

Multiple IP addresses can also be used in a switched network to span multiple subnets. These
additional IP address can be defined by selecting the Advanced button of the Microsoft TCP/IP
Properties window (see Section C.2.3 above).

D.3   PING

Probably the most useful command for network troubleshooting is PING which, like the navy destroyers of old, listens for an echo response from its target destination. The pinging of FORUM, the VA email system, is shown below:

```
c:\>ping forum

Pinging FORUM [nnn.nnn.nn.nn] with 32 bytes of data:

Reply from nnn.nnn.nn.nn: bytes=32 time<10ms TTL=254
Reply from nnn.nnn.nn.nn: bytes=32 time<10ms TTL=254
Reply from nnn.nnn.nn.nn: bytes=32 time<10ms TTL=254
Reply from nnn.nnn.nn.nn: bytes=32 time<10ms TTL=254
```

or

```
Request timed out.
Request timed out.
Request timed out.
Request timed out.
```

The above example shows the results of one successful and one unsuccessful PING. The PING protocol uses "impc" request and response packets. Four "impc requests" were issued by PING and four (or zero) "impc responses" were received.

A system should <u>always</u> be able to ping its default gateway. A good initial test for physical network integrity is to try to ping the system's default gateway.

Note: While most DICOM devices support PING in both directions, at least one commercial DICOM image acquisition device (the GE Digital Radiofluoro DRS 3.1) simulates a phony PING function by attempting to establish an FTP session with the destination system. This does not work with the VistA DICOM system, since Windows Professional workstation does not normally provide an FTP server.

D.4   TRACERT

In addition to PING, Windows Professional supports TRACERT (trace route) to explicitly display the full route that is used to communicate with the target system. This tool presents many more diagnostic details. The route to Forum is shown below:

```
c:\>tracert forum

Tracing route to FORUM [nnn.nnn.nn.nn]
over a maximum of 30 hops:

  1   <10 ms   <10 ms   <10 ms   111.222.38.122
  2   <10 ms   <10 ms   <10 ms   FORUM [nnn.nnn.nn.nn]
```

```
Trace complete.
```

In the above example, the host system nnn.nnn.nn.nn used its default gateway nnn.nnn.nn.nn to hop first to the gateway nnn.nnn.nn.nn and then to FORUM nnn.nnn.nn.nn.

D.5   NETSTAT

NETSTAT displays protocol statistics and current TCP/IP network connections. The telnet, NetBIOS, and DICOM sessions are displayed by NETSTAT, as shown in the following example:

```
C:\>netstat

Active Connections

  Proto  Local Address        Foreign Address       State
  TCP    isw-xxx:60000        localhost:1091        ESTABLISHED
  TCP    isw-xxx:60120        localhost:1096        ESTABLISHED
  TCP    isw-xxx:1091         localhost:60000       ESTABLISHED
  TCP    isw-xxx:1096         localhost:60120       ESTABLISHED
  TCP    isw-xxx:1070         VHAISWXX2:nbsession   ESTABLISHED
  TCP    isw-xxx:1073         VHAISWXX1:nbsession   ESTABLISHED
  TCP    isw-xxx:22           localhost:60743       ESTABLISHED
```

In this example, ports 1070 and 1073 are used for NetBIOS sessions, and the other ports were used for DICOM. Port 60000 and 60120 were used for the VistA DICOM application, while ports 1091 and 1096 were assigned by the system for DICOM clients.

D.6   DICOM_Echo

Note: The DICOM_Echo utility is part of our normal distribution and is located in the **c:\Program Files(x86)\VistA\Imaging\DICOM** directory.

C-ECHO is a DICOM service that is used to verify communications to a remote DICOM application entity (AE). A Verification SOP Class user can send a C-ECHO request to another DICOM AE. If the remote AE is a Verification SOP Class provider, it will return a C-ECHO response back to the original requesting AE. This function is analogous to a DICOM application-level PING.

DICOM_Echo is a public domain utility written by the Mallinckrodt Institute of Radiology that sends a C-ECHO request to a remote DICOM AE, and then waits for a response.

To View HELP:

```
C:\User>dicom_echo
```

```
dicom_echo [-a title] [-d] [-c title] [-m mode] [-n num] [-p] [-r repeat] [-s
sleeptime] [-v] [-x] node port

    a       Application title of this application
    c       Called AP title to use during Association setup
    d       Drop Association after echo requests
    m       Mode for SCU/SCP negotiation (SCU, SCP, SCUSCP)
    n       Number of network connections
    p       Dump service parameters after Association Request
    r       Number of times to repeat echo request
    s       Time to sleep after each echo request
    v       Verbose mode for DUL/SRV facilities
    x       Do not release Associations when finished with echo


    node  Node name of server
    port  Port number of server
```

Actual Usage:

```
C:\User>dicom_echo 111.222.36.38 60120
Echo context: Context
Verification Response
  Message ID Responded to:    1
  Verification Status:     0000
Echo Response
Message ID Responded To: 1
Data Set Type:          0101
Status:                 0000  Status Information:-
      Successful operation
Class UID:              1.2.840.10008.1.1
```

D.7   Send_Image

Note: The Send_Image utility is part of our normal distribution and is located in the **c:\Program Files\VistA\Imaging\DICOM** directory.

C-STORE is the DICOM service that is used to transfer an image (i.e., a composite object) to a remote DICOM application entity. A Storage SOP Class user can send a C-STORE request to another DICOM destination. If the remote DICOM destination is a corresponding Storage SOP Class provider, it will accept the association and await image transfer. The Storage SOP Class user can then transfer one or more images to the Storage SOP Class provider. After the images are sent, it closes the association.

Send_Image is a public domain utility written by the Mallinckrodt Institute of Radiology to issue a C-STORE request and send one or more images to a remote DICOM Storage SOP Class provider.

To View HELP:

```
C:\User>send_image
send_image [-a application] [-c called] [-m maxPDU] [-p] [-q] [-r]
[-s SOPName][-t] [-x FAC] [-X xfer] [-v] [-w flag] [-Z] node port image
[image...]

    -a    Set application title of this (calling) application
    -c    Set called AE title to title in Association RQ
    -m    Set maximum PDU in Association RQ to maxPDU
    -p    Alter image by sending minimal pixel data
    -q    Quiet mode.  Suppresses some messages to stdout
    -r    Make program sensitive to response status.  If not success, stop
    -s    Force an initial Association using one SOP Class based on SOPName
          (CR, CT, MR, NM, SC, US)
    -t    Time the image transfer.  Print elapsed time and transfer rate.
    -v    Place DUL and SRV facilities in verbose mode
    -x    Place one facility(DCM, DUL, SRV) in verbose mode
    -X    Specify a transfer syntax to be proposed; may repeat this switch
    -w    Set open options; flag can be REPEAT
    -Z    Allow VR mismatch in input files

    node  Node name for network connection
    port  TCP / IP port number of server application
    image A list of one or more images to send
```

Actual Usage:

```
C:\User>send_image -q cemax30 104 a0000001.dcm a0000002.dcm a0000003.dcm
Store Response
Message ID Resp:1
Data Set Type:  0101
Status:        0000  Status Information:-
      Successful operation
Class UID:      1.2.840.10008.5.1.4.1.1.2
Instance UID:   1.2.840.113619.2.1.11101.786458237.2.11.858271581
Store Response
Message ID Resp:2
Data Set Type:  0101
Status:        0000  Status Information:-
      Successful operation
Class UID:      1.2.840.10008.5.1.4.1.1.2
Instance UID:   1.2.840.113619.2.1.11101.786458237.2.11.858271582
Store Response
Message ID Resp:3
Data Set Type:  0101
Status:        0000  Status Information:-
      Successful operation
Class UID:      1.2.840.10008.5.1.4.1.1.2
```

Appendix E Port Numbers for VistA Imaging DICOM Gateway Applications

Attention: For inter-process communications, DICOM applications require well-known port numbers[3].

The VistA Imaging DICOM Gateway uses port numbers in the 60000-61000 range, in order to avoid conflicting with those used by other applications.

Note: 104 is commonly used as the default port number for DICOM.

The following table contains suggested port numbers for the VistA DICOM Applications.

VistA Imaging DICOM Gateway Application	Port Number
Commercial Modality Worklist SCP #1	60041
Commercial Modality Worklist SCP #2	60042
Commercial PACS Text Interface	60040
CR Modality – Image Storage	60100 – 60109
CT Modality – Image Storage	60120 – 60129
Default – Image Storage	104
Dental – Image Storage	60200 – 60299
Digital Angiography – Image Storage	60150 – 60159
Digital Radio Fluoro – Image Storage	60140 – 60149
Digital Radiography – Image Storage	60110 – 60119
Film Digitizer – Image Storage	60190 – 60199
Image acquisition MUMPS storage controller	60000
Modality Worklist SCP	60010

---

[3] DICOM applications require "hard coded" IP addresses and cannot use those assigned by the Dynamic Host Configuration Protocol (DHCP).

VistA Imaging DICOM Gateway Application	Port Number
MR Modality – Image Storage	60130 – 60139
Nuclear Medicine – Image Storage	60170 – 60179
Ophthalmology – Image Storage	60300 – 60399
Performed Procedure Step SCP	60020
Query/Retrieve SCP	60090
Storage Commitment SCP	60030
Ultrasound – Image Storage	60160 – 60169
Visible Light – Image Storage	60180 – 60189

Appendix F VistA Imaging DICOM Gateway Application Entity (AE) Titles

DICOM requires the calling application entity to supply both its AE title and the called AE title when the association request is made. The AE titles for the VistA Gateway processes are listed in the following table (These values are defined in the master file named SCP_LIST.DIC).

VistA Imaging DICOM Gateway Process	Application Entity Title
PACS Text Interface	VISTA_PACS_IF
Query/Retrieve Provider	VISTA_QR_SCP
Query/Retrieve User	VISTA_QR_SCU
Modality Worklist	VISTA_WORKLIST
Image Storage	VISTA_STORAGE
Image Import	VISTA_SEND_IMAGE

Appendix G Setting Up the MUMPS-to-MUMPS Broker

Please refer to the [M-to-M Broker Kernel Documentation](#).

Appendix H Change IRIS Password

When the password for the IA account is changed, the details that are saved also needs to be updated on IRIS service.

1. Open the 'InterSystems IRIS Controller for IRIS' from Windows - Services
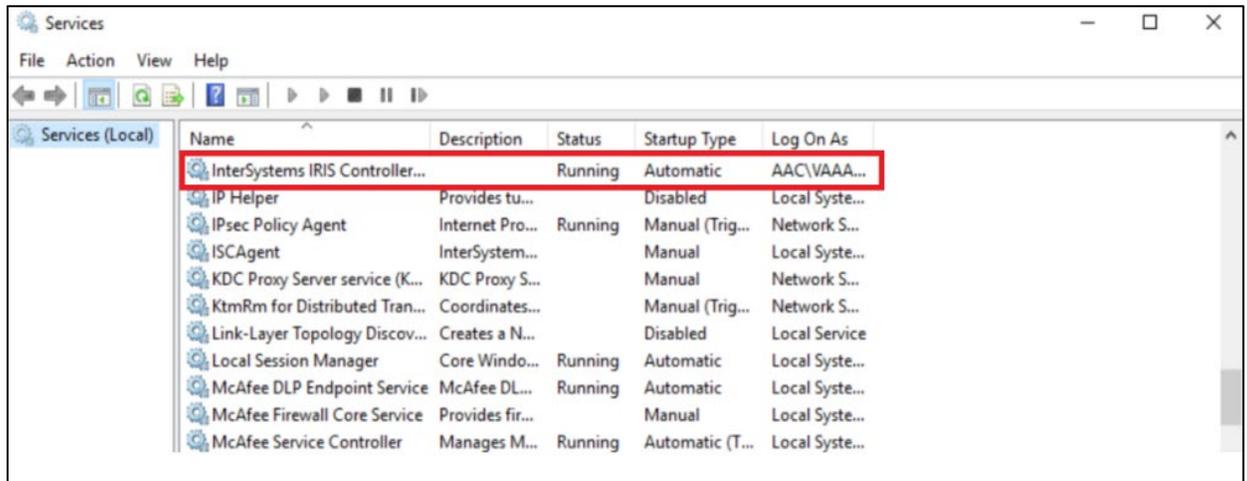
2. Right click – Properties, select the 'Log On' tab. The update the password and Apply/OK.
   Make sure to Stop and restart the IRIS service to ensure the new password is valid.
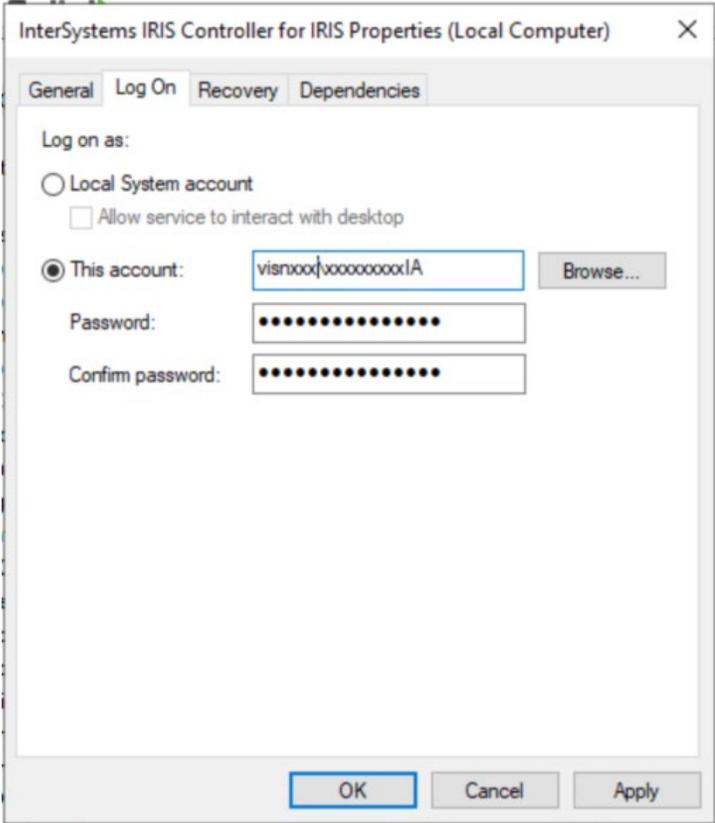
Appendix I KIDS Package to Install in the VistA System

This chapter describes the installation of the "KIDS" package that is to be installed into a VistA system to support the VistA Imaging DICOM Gateway that will be running on satellite SERVERs. The complete KIDS installation is detailed in the VistA Imaging Installation Guide or Patch Description. Specific details pertinent to the DICOM Gateway are covered here.

The name of the KIDS package will be in the VistA Imaging namespace ("MAG"). Review the [VistA Imaging Installation Guide](#) or an example of the KIDS installation.

Installation of the KIDS package "VistA Imaging" is required to establish the files needed for DICOM image acquisition and for DICOM Text Gateway. It establishes the global variable (^MAGDHL7) used for providing information to an outside PACS vendor and for providing a modality worklist to a radiology instrument. Data dictionaries and menu options are also created to assist in manual correction of images that failed to be processed during the initial image download for the Radiology and Consult modalities.

The following sections describe those parts of the KIDS installation on the VistA system that pertain to the operation of the DICOM Gateway.

I.1 VistA -PACS Radiology Interface Setup Instructions

The following steps are required to establish the global variable (^MAGDHL7) used for providing radiology order information to an outside PACS vendor and for providing a modality worklist to radiology devices. These steps are performed on the VistA system using FileMan utility. Apply one-step at a time to allow testing changes and tracking errors before applying all changes. It is imperative that you follow the instructions precisely -- especially if you are not installing in a test account.

1. Use FileMan Enter/Edit to edit file 771 (HL7 APPLICATION PARAMETER) and update the FACILITY NAME field for the following entries RA-CLIENT-IMG, RA-SERVER-IMG and MAGD-CLIENT. Also, ensure that the ACTIVE\INACTIVE field is set to active for entries RA-SERVER-IMG, MAGD-CLIENT, MAG COMRCL PACS and MAG VISTA IMGNG.

2. Follow the instructions in sections Change Subscribers and Entering Facility Names for Sending/Receiving Applications for PACS Messaging to subscribe to the appropriate HL7 Radiology event drivers (either V2.1 or V2.4) and associate the appropriate facility name with Imaging's PACS protocols.

3. Activate the triggering of HL7 messages during Radiology exam registration by entering RA-SERVER-IMG into the SENDING APPLICATION field of the RA REG 2.4 protocol entry.

```
Select OPTION: EN <Enter>TER OR EDIT FILE ENTRIES
INPUT TO WHAT FILE: ACCESSION// 101 <Enter>  PROTOCOL     (1710 entries)
EDIT WHICH FIELD: ALL// SENDING APPLICATION <Enter>
THEN EDIT FIELD:

Select PROTOCOL NAME: RA REG 2.4 <Enter>        Rad/Nuc Med exam registered
SENDING APPLICATION: RA-SERVER-IMG <Enter>
```

Once this step is complete, entries should start populating file 772 and file 2006.5 (global variable ^MAGDHL7). You can test by using the Radiology options to register an exam. For each exam case registered, an entry will be set in file 2006.5.

4. Select the EXAMINATION STATUS for each Imaging type that should trigger the "examined" HL7 message. The HL7 will only be triggered once for an exam – when the exam has been upgraded to the status with the GENERATE EXAMINED HL7 MESSAGE field set to Yes. (Examination Status file #72).

Example:

```
>D P^DII <Enter>

VA FileMan 22.0

Select OPTION: ENT <Enter>ER OR EDIT FILE ENTRIES

INPUT TO WHAT FILE: PROTOCOL// 72 <Enter>  EXAMINATION STATUS
                                     (55 entries)
EDIT WHICH FIELD: ALL// 8 <Enter>  GENERATE EXAMINED HL7 MESSAGE
THEN EDIT FIELD: <Enter>

Select EXAMINATION STATUS: EXAMINED <Enter>
    1    EXAMINED          GENERAL RADIOLOGY
    2    EXAMINED          ULTRASOUND
    3    EXAMINED          MAGNETIC RESONANCE IMAGING
    4    EXAMINED          NUCLEAR MEDICINE
    5    EXAMINED          CARDIOLOGY STUDIES (NUC MED)
Press <RETURN> to see more, '^' to exit this list, OR
CHOOSE 1-5: 1 <Enter>  EXAMINED         GENERAL RADIOLOGY
GENERATE EXAMINED HL7 MESSAGE: YES// <Enter>
```

5. Follow step 3 and apply to protocol RA EXAMINED 2.4 instead of RA REG 2.4.

```
Select OPTION: EN <Enter>TER OR EDIT FILE ENTRIES
INPUT TO WHAT FILE: 101 <Enter>  PROTOCOL
EDIT WHICH FIELD: SENDING APPLICATION <Enter>

Select PROTOCOL NAME:  RA EXAMINED 2.4 <Enter>
SENDING APPLICATION:  RA-SERVER-IMG <Enter>
```

Once this step is complete, entries should start populating file 772 and file 2006.5 (^MAGDHL7 global). You can test by using the Radiology options to edit an exam. For each exam case edited that is upgraded to the status with the GENERATE EXAMINED HL7 MESSAGE field set to yes, an entry will be set in file 2006.5 (Usually this is done for all cases that have been upgraded to examined).

6. Apply the step outlined for steps3 for the RA CANCEL 2.4 protocol.

```
INPUT TO WHAT FILE:  101 <Enter>  PROTOCOL
EDIT WHICH FIELD: SENDING APPLICATION <Enter>

Select PROTOCOL NAME:  RA CANCEL 2.4 <Enter>
SENDING APPLICATION:  RA-SERVER-IMG <Enter>
```

Use the Radiology option to cancel a radiology case. An entry for each canceled case should be entered into files 772 & 2006.5.

7. Apply step 3 for the RA RPT 2.4 protocol.

```
INPUT TO WHAT FILE:  101 <Enter>  PROTOCOL
EDIT WHICH FIELD: SENDING APPLICATION <Enter>

Select PROTOCOL NAME:  RA RPT 2.4 <Enter>
SENDING APPLICATION:  RA-SERVER-IMG <Enter>
```

Use the Radiology option to produce a verified report. Only verified reports will create entries in files 772 and 2006.5.

Reminder: If any errors occur, the DHCP-PACS Radiology interface can be stopped by taking the following steps:

- Removing the SENDING APPLICATION and SUBSCRIBERS entries from the protocol causing the error.

- Log a support ticket or contact the VA support group. Include a copy of the error trap with the ticket.

I.2   VistA -PACS ADT Interface Setup Instructions

Note: This section is relevant for sites interfacing to a Commercial PACS system.

The following are the instructions for establishing the interface to provide a mechanism for notifying the PACS system regarding changes in ADT events.

1. Use FileMan to set the field PACS INTERFACE SWITCH to ON in the IMAGING SITE PARAMETERS file (#2006.1).

```
> Do P^DII <Enter>
```

```
VA FileMan 22.0

Select OPTION: EN <Enter> TER OR EDIT FILE ENTRIES

INPUT TO WHAT FILE: IMAGING SITE PARAMETERS// 2006.1 <Enter>

IMAGING SITE PARAMETER   (1 entry)
EDIT WHICH FIELD: ALL// PACS INTERFACE SWITCH <Enter>
THEN EDIT FIELD: <Enter>

Select IMAGING SITE PARAMETERS NAME: your site name <Enter>
PACS INTERFACE SWITCH: 1 <Enter>        ON PACS INTERFACE

Select IMAGING SITE PARAMETERS NAME: <Enter>

Select OPTION: <Enter>
>
```

2. Routine ^MAGDHLE invokes INIT^HLTRANS which checks for the existence of "PACS GATEWAY" entry in the NON-DHCP APPLICATION PARAMETER file (#770).

First, the following entry needs to be established in the HL7 APPLICATION PARAMETER file (#771):

> NAME**: PAC GATEWAY**
> ACTIVE/INACTIVE: **ACTIVE**

Then the following entry must be created in the NON-DHCP APPLICATION PARAMETER file (#770):

> NAME**: PACS GATEWAY**
> NON-DHCP FACILITY NAME: *your facility name*
> DHCP STATION NUMBER: *your facility number*
> DHCP APPLICATION: **PAC GATEWAY**   <<Pointer to file 771.

Then the entry for PAC GATEWAY entry in file 771 can be renamed to PACS GATEWAY.

Use FileMan to perform this set-up:

```
> Do P^DII <Enter>

VA FileMan 22.0

Select OPTION: en <Enter> TER OR EDIT FILE ENTRIES

INPUT TO WHAT FILE: 771 <Enter>  HL7 APPLICATION PARAMETER (139 entries)
EDIT WHICH FIELD: ALL//  <Enter>

Select HL7 APPLICATION PARAMETER NAME: PAC GATEWAY <Enter>
  Are you adding 'PAC GATEWAY' as
    a new HL7 APPLICATION PARAMETER (the 140TH)? No// Y <Enter>   (Yes)
ACTIVE/INACTIVE: AC <Enter>   ACTIVE
```

```
FACILITY NAME: ^ <Enter>

Select HL7 APPLICATION PARAMETER NAME:  <Enter>

Select OPTION: en <Enter> TER OR EDIT FILE ENTRIES

INPUT TO WHAT FILE: HL7 APPLICATION PARAMETER// 770 <Enter>
                               HL7 NON-DHCP APPLICATION PARAMETER (2 entries)
EDIT WHICH FIELD: ALL//  <Enter>

Select HL7 NON-DHCP APPLICATION PARAMETER NAME: PACS GATEWAY <Enter>
  Are you adding 'PACS GATEWAY' as
    a new HL7 NON-DHCP APPLICATION PARAMETER (the 3RD)? No// Y <Enter>   (Yes)
   HL7 NON-DHCP APPLICATION PARAMETER DHCP STATION NUMBER: <your station number> <Enter>
   HL7 NON-DHCP APPLICATION PARAMETER NON-DHCP FACILITY NAME: <your facility name> <Enter>
   HL7 NON-DHCP APPLICATION PARAMETER DHCP APPLICATION: PAC GATEWAY <Enter>   ACTIVE
DHCP STATION NUMBER: <your facility number> //  <Enter>
NON-DHCP FACILITY NAME: <your facility name> //   <Enter>
MAXIMUM BLOCK SIZE: ^ <Enter>

Select HL7 NON-DHCP APPLICATION PARAMETER NAME:  <Enter>

Select OPTION: en <Enter> TER OR EDIT FILE ENTRIES

INPUT TO WHAT FILE: HL7 NON-DHCP APPLICATION PARAMETER// 771 <Enter>
                                  HL7 APPLICATION PARAMETER (140 entries)
EDIT WHICH FIELD: ALL// .01 <Enter>   NAME
THEN EDIT FIELD:  <Enter>

Select HL7 APPLICATION PARAMETER NAME: PAC GATEWAY <Enter>       ACTIVE
NAME: PAC GATEWAY// PACS GATEWAY <Enter>

Select HL7 APPLICATION PARAMETER NAME:  <Enter>

Select OPTION:  <Enter>
```

3.   The ADT changes are trigged by a protocol running off the MAS Event driver. You must add the MAGD DHCP-PACS ADT EVENTS protocol to the DGPM Movements Events protocol.

```
> Do P^DII <Enter>

VA Fileman 22.0

Select OPTION: en <Enter> TER OR EDIT FILE ENTRIES

INPUT TO WHAT FILE: IMAGING WORKSTATIONS//  101 <Enter>     PROTOCOL
EDIT WHICH FIELD: ALL// ITEM <Enter>
     1   ITEM      (multiple)
     2   ITEM TEXT
CHOOSE 1-2: 1 <Enter>
   EDIT WHICH ITEM SUB-FIELD: ALL// <Enter>
THEN EDIT FIELD: <Enter>

Select PROTOCOL NAME: DGPM MOVEMENT EVENTS <Enter>

Select ITEM: IB CATEGORY C BILLING// MAGD DHCP-PACS ADT EVENTS <Enter>
     NOTIFICATION DHCP-PACS ADT EVENT
  MNEMONIC: ^ <Enter>
```

Select PROTOCOL NAME: **<Enter>**

Select OPTION: **<Enter>**

This completes the creation of the items necessary for the PACS ADT interface. Use the PIMMS option to Admit, Transfer and Discharge a patient to test the cross-reference setting. During the update processing, on any of these three transactions, the system will spawn off a background task that will execute the cross-reference routine and display the following on the screen:

<div align="center">*** HL7 TASK FOR PACS ***</div>

If successful, the HL7 messages for the events will be recorded in the PACS MESSAGES file (#2006.5).

I.3 Change Subscribers

As referenced from Section 5.1, use the instructions in this section to update subscribe the HL7 Radiology Imaging Subscriber Protocols to the Radiology version 2.4 event driver protocols. (As explained in the NOTE in the screen dialog box, these instructions could also be used to subscribe to the Radiology version 2.1 event driver protocols if for some reason it were deemed necessary not to use HL7 2.4.)

1. Use the Imaging System Manager (MAG SYS MENU) setup options. Type the bolded responses.

```
DVA>D ^XUP

Setting up programmer environment
This is a TEST account.

Terminal Type set to: C-VT320 48 LINE

Select OPTION NAME: MAG SYS MENU        Imaging System Manager Menu


   HL7     Imaging HL7 Messaging Maintenance ...
   IX      Image Index Conversion Menu ...
   LS      Edit Network Location STATUS
   TR      Telereader Menu ...
           Ad hoc Enterprise Site Report
           Delete Image Group
           Enter/edit Reason
           Imaging Database Integrity Checker Menu ...
           Imaging Site Reports ...

Select Imaging System Manager Menu Option: HL7  Imaging HL7 Messaging
Maintenance


   RHL7   Maintain Subscriptions to Radiology HL7 Drivers
   IHE    Configure IHE-Based HL7 Interface to PACS

Select Imaging HL7 Messaging Maintenance Option: RHL7  Maintain Subscriptions
to
 Radiology HL7 Drivers

MAGD SEND ORM protocol found...
```

```
MAGD SEND ORU protocol found...

RA CANCEL protocol found...
RA EXAMINED protocol found...
RA REG protocol found...
RA RPT protocol found...
RA CANCEL 2.4 protocol found...
RA EXAMINED 2.4 protocol found...
RA REG 2.4 protocol found...
RA RPT 2.4 protocol found...

Enter the desired version of HL7: 2.4  HL7 Version 2.4

[NOTE:  Enter 2.1 instead of 2.4 above if you wish to subscribe to the Version 2.1
protocols.]

Subscribing to HL7 version 2.4 protocols...
   Protocol RA CANCEL has been unsubscribed from...
   Protocol RA EXAMINED has been unsubscribed from...
   Protocol RA REG has been unsubscribed from...
   Protocol RA RPT has been unsubscribed from...
   Protocol RA CANCEL 2.4 has been subscribed to...
   Protocol RA EXAMINED 2.4 has been subscribed to...
   Protocol RA REG 2.4 has been subscribed to...
   Protocol RA RPT 2.4 has been subscribed to...
```

2. Select option IHE to enter name and address information for the HL7 PACS interface (if you are using a commercial PACS), and to turn on HL7 version 2.4 messaging to the VistA DICOM Gateway.

a You are presented with the sending application name and receiving application name. These are the names that will be sent in the MSH Segment of the HL7 messages that are transmitted to PACS (if used) and to the VistA DICOM Gateway. (See also the PACs Configuration Notes on the following pages.)

- Ordinarily, you will not wish to change either of these names and will enter NO when prompted to change them.

- If you wish to change either of these names, enter **YES** when prompted.

b You are then asked to enter the TCP/IP address and port number for the logical link. This information defines where VistA HL7 will send the ADT messages. If you are not using a commercial PACS, leave the TCP/IP address and port number blank. If you need help finding the correct values to enter at these prompts, please consult your site's PACS Administrator or HL7 Specialist.

c Finally, you will be asked whether you want to turn on the IHE-based interface. You must answer **YES** if you wish HL7 version 2.4 messages to be sent from VistA to PACS (if used) and to the DICOM Gateway. If you do not wish HL7 version 2.4 messages to be sent from VistA to PACS (if used) and to the DICOM Gateway, enter **NO**.

The following is a sample of the prompts you will see when you select option **IHE**. The bolded text is what you need to type. Note that the IP address and port number are examples

and you should enter the ones that apply to your PACS. If you are not using a commercial PACS, leave the IP address and port number blank.

```
  RHL7   Maintain Subscriptions to Radiology HL7 Drivers
   IHE    Configure IHE-Based HL7 Interface to PACS

Select Imaging HL7 Messaging Maintenance Option: IHE  Configure IHE-Based HL7
Interface to PACS

HL7 PACS Interface Configuration


Sending application name:   MAG VISTA IMGNG
Receiving application name: MAG COMRCL PACS

Do you wish to change either of these names? NO

Please enter the TCP/IP address and port number for the logical link.
TCP/IP ADDRESS: www.xxx.yyy.zzz  <enter the address that applies to your PACS>
TCP/IP PORT: nnnnn           <enter the port number that applies to your PACS>

Enter Y or YES below to turn the IHE-based HL7 PACS interface ON;
enter N or NO to turn the interface OFF.

IHE PACS HL7 INTERFACE ACTIVE: Y  YES
```

PACS CONFIGURATION NOTES	PACS must be configured to accept in field *MSH-3-Sending Application* the value of "Sending application name:" shown in the preceding sample, and to return this value in field *MSH-5-Receiving Application* when sending replies.
	PACS must be configured to accept in field *MSH-5-Receiving Application* the value of "Receiving application name:" shown in the preceding sample, and to return this value in field *MSH-3-Sending Application* when sending replies.
	For both these values, follow your PACS manufacturer's configuration instructions.

I.4   Radiology HL7 Protocols and Imaging Subscribers

If HL7 Version 2.4 is in use, Imaging subscribers will be attached to Radiology event drivers for HL7 V2.4 messaging as shown below.

```
NAME: RA REG 2.4
  ITEM TEXT: Rad/Nuc Med exam registered (v2.4 HL7)
  TYPE: event driver                  CREATOR: HENDERSON,MIKE
  PACKAGE: RADIOLOGY/NUCLEAR MEDICINE
 DESCRIPTION:   This protocol is triggered whenever a Radiology/Nuclear
 Medicine exam is registered.  It executes code that creates an HL7 ORM
message
 consisting of PID, PV1, ORC, OBR, OBX and ZDS segments. The message contains
 all relevant information about the exam, including procedure, time of
 registration, procedure modifiers, CPT modifiers, patient allergies, and
 clinical history.

 This protocol is used to trigger v2.4 compliant HL7 messages.
  TIMESTAMP: 61846,30525                  SENDING APPLICATION: RA-SERVER-IMG
  TRANSACTION MESSAGE TYPE: ORM           EVENT TYPE: O01
  VERSION ID: 2.4
  RESPONSE PROCESSING ROUTINE: D MAIN^RAHLACK
SUBSCRIBERS: MAGJ PREFETCH/SEND ORM
SUBSCRIBERS: MAGD SEND ORM


NAME: RA EXAMINED 2.4
  ITEM TEXT: Rad/Nuc Med examined case (v2.4 HL7)
  TYPE: event driver                  CREATOR: HENDERSON,MIKE
  PACKAGE: RADIOLOGY/NUCLEAR MEDICINE
 DESCRIPTION:   This protocol is triggered whenever a Radiology/Nuclear
 Medicine exam has been edited by the user. It executes code that creates an
 HL7 ORM message consisting of PID, PV1, ORC, OBR, OBX and ZDS segments. This
 message contains all relevant information about the exam, including
procedure,
 time of registration, procedure modifiers, CPT modifiers, patient allergies,
 and clinical history.

 This protocol is used to trigger v2.4 compliant HL7 messages.
  TIMESTAMP: 61846,30525                  SENDING APPLICATION: RA-SERVER-IMG
  TRANSACTION MESSAGE TYPE: ORM           EVENT TYPE: O01
  VERSION ID: 2.4
  RESPONSE PROCESSING ROUTINE: D MAIN^RAHLACK
SUBSCRIBERS: MAGD SEND ORM


NAME: RA CANCEL 2.4
  ITEM TEXT: Rad/Nuc Med exam cancellation (v2.4 HL7)
  TYPE: event driver                  CREATOR: HENDERSON,MIKE
  PACKAGE: RADIOLOGY/NUCLEAR MEDICINE
 DESCRIPTION:   This protocol is triggered whenever a Radiology/Nuclear
 Medicine exam is cancelled.  It executes code that creates an HL7 ORM message
 consisting of PID, PV1, ORC, OBR, OBX and ZDS segments. The message contains
all relevant information about the exam, including procedure, time of
 cancellation, procedure modifiers, CPT modifiers, patient allergies and
 clinical history.

 This protocol is used to trigger v2.4 compliant HL7 messages.
  TIMESTAMP: 61846,30525                  SENDING APPLICATION: RA-SERVER-IMG
  TRANSACTION MESSAGE TYPE: ORM           EVENT TYPE: O01
  VERSION ID: 2.4
  RESPONSE PROCESSING ROUTINE: D MAIN^RAHLACK
SUBSCRIBERS: MAGD SEND ORM


NAME: RA RPT 2.4
  ITEM TEXT: Rad/Nuc Med report released/verified (v2.4 HL7)
```

```
  TYPE: event driver                     CREATOR: HENDERSON,MIKE
  PACKAGE: RADIOLOGY/NUCLEAR MEDICINE
 DESCRIPTION:   This protocol is triggered whenever a Radiology/Nuclear
 Medicine report enters into a status of Verified or Released/Not Verified.
It
 executes code that creates an HL7 ORU message consisting of PID, OBR and OBX
 segments.  The message contains relevant information about the report,
 including procedure, procedure modifiers, diagnostic code, interpreting
 physician, impression text and report text.

 This protocol is used to trigger v2.4 compliant HL7 messages.
  TIMESTAMP: 61846,30525                 SENDING APPLICATION: RA-SERVER-IMG
  TRANSACTION MESSAGE TYPE: ORU          EVENT TYPE: R01
  VERSION ID: 2.4
  RESPONSE PROCESSING ROUTINE: D MAIN^RAHLACK
SUBSCRIBERS: MAGD SEND ORU
```

I.5 Entering Facility Names for Sending/Receiving Applications for PACS Messaging

Within the VistA HL7 package, the correct facility names need to be associated with the MAG VISTA IMGNG sending application and with the MAG COMRCL PACS receiving application. This section provides instructions on how to do this.

You associate the facility names with the sending and receiving applications using the HL7 menu system. You must have access to the HL7 menus to set the facility names for the sending and receiving applications.

1. Assign the correct facility name to the MAG VISTA IMGNG sending application as follows:

a From the main menu, select option **HL7 MAIN MENU** and enter the underlined values illustrated in the following sample.

```
         Event monitoring menu ...
            Systems Link Monitor
            Filer and Link Management Options ...
            Message Management Options ...
            Interface Developer Options ...
            Site Parameter Edit
   HLO    HL7 (Optimized) MAIN MENU ...

Select HL7 Main Menu Option: INterface Developer Options


   EA     Application Edit
   EP     Protocol Edit
   EL     Link Edit
   VI     Validate Interfaces
          Reports ...

Select Interface Developer Options Option: EA  Application Edit


Select HL7 APPLICATION PARAMETER NAME: MAG VISTA IMGNG      ACTIVE
```

An entry screen like this one will appear:

```
                    HL7 APPLICATION EDIT
-------------------------------------------------------------------

              NAME: MAG VISTA IMGNG          ACTIVE/INACTIVE: ACTIVE


      FACILITY NAME: VA-WOIFO                    COUNTRY CODE: USA


HL7 FIELD SEPARATOR:              HL7 ENCODING CHARACTERS:


      MAIL GROUP:
```

b Change the value of the **FACILITY NAME** field to indicate the facility in which VistA is installed. The value you specify will be transmitted to PACS in the field *MSH-4-Sending Facility*.

PACS CONFIGURATION NOTES	PACS must be configured to accept the value specified for the FACILITY NAME field in field *MSH-4-Sending Facility* when receiving messages, and to return this value in field *MSH-6-Receiving Facility* when sending replies.
	Follow your PACS manufacturer's configuration instructions to configure your PACS in this manner.

c After changing the **FACILITY NAME** field, save your changes and exit the form.

2. Assign the correct facility name to the MAG COMRCL PACS receiving application as follows:

a From the HL7 APPLICATION PARAMETER NAME menu option, select **MAG COMRCL PACS**.

```
Select HL7 APPLICATION PARAMETER NAME: MAG COMRCL PACS       ACTIVE
```

An entry screen like this one will appear.

```
                    HL7 APPLICATION EDIT
-------------------------------------------------------------------

              NAME: MAG COMRCL PACS          ACTIVE/INACTIVE: ACTIVE


      FACILITY NAME: CPACS FACILITY              COUNTRY CODE: USA


HL7 FIELD SEPARATOR:              HL7 ENCODING CHARACTERS:


      MAIL GROUP:
```

b Change the value of the **FACILITY NAME** field to indicate the facility in which PACS is installed. This value will be transmitted to PACS in field *MSH-6-Receiving Facility*.

PACS CONFIGURATION NOTES	PACS will need to be configured to accept this value in field *MSH-6-Receiving Facility* when receiving messages, and to return this value in field *MSH-4-Sending Facility* when sending replies.
	Follow your PACS manufacturer's configuration instructions to configure your PACS in this manner.

c After changing the **FACILITY NAME** field, save your changes and exit the form.

I.6 Service Account

Some processes on a DICOM Gateway are executed in typical "user oriented" sessions: the user logs in, performs a task, and logs out. However, the tasks that embody the main purpose of the DICOM Gateway run for a long time, typically weeks or months on end, and are intended to keep functioning without any human interaction.

Since these tasks need to be started at some point in time, a (fully privileged) user will log in, and request the menu option that starts the long-running task. From that point on, the task will run and will continue to run until stopped by a system manager.

When the network connection between the DICOM Gateway and the VistA Hospital Information System is interrupted, the DICOM Gateway will recover from this situation, and will periodically attempt to reconnect (at 5-minute intervals). Once the connection is re-established, the DICOM Gateway will continue processing where it left off when the connection was interrupted.

To establish a service account, use the Kernel Tools to establish the account, then conduct a dialog like the following:

```
VISTA>d P^DII <Enter>

VA FileMan 22.0

Select OPTION: en <Enter> TER OR EDIT FILE ENTRIES

INPUT TO WHAT FILE: // 2006.1 <Enter>   IMAGING SITE PARAMETERS
                                     (2 entries)
EDIT WHICH FIELD: ALL// DICO <Enter>
    1   DICOM GATEWAY ACCESS CODE
    2   DICOM GATEWAY VERIFY CODE
CHOOSE 1-2: 1 <Enter>  DICOM GATEWAY ACCESS CODE
THEN EDIT FIELD: DICO <Enter>
    1   DICOM GATEWAY ACCESS CODE
    2   DICOM GATEWAY VERIFY CODE
CHOOSE 1-2: 2 <Enter>  DICOM GATEWAY VERIFY CODE
THEN EDIT FIELD: <Enter>
```

```
Select IMAGING SITE PARAMETERS INSTITUTION NAME: `1 <Enter>  <your site name>
DICOM GATEWAY ACCESS CODE: <hidden>// xxaccxx_123 <Enter>
DICOM GATEWAY VERIFY CODE: <hidden>// xxverxx_456 <Enter>

Select IMAGING SITE PARAMETERS INSTITUTION NAME: <Enter>

Select OPTION: <Enter>
VISTA>
```