Routing User Guide-DRAFT

**VistA Imaging
V. 3.0, Patch 18
April 2006**

VistA Imaging Software Design & Development
Veterans Health Administration
Department of Veterans Affairs

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Patch 18
April 2006

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Contents

Introduction

This manual explains how to configure and use the routing capability of the VistA DICOM Gateway. This manual also explains how to use the on-demand routing capability of the VistARad diagnostic workstation software.

This manual is intended for:

- Staff at VA Medical Centers who are responsible for setting up and maintaining Routing Gateways.

- Clinical staff who need to use VistARad for on-demand routing.

For technical staff, this manual assumes familiarity with the VistA system, MUMPS, and Windows networking. For clinical staff, this manual assumes familiarity with the Windows environment and the VistARad diagnostic workstation software.

Terms of Use

In compliance with FDA and VA policies, authorization to use the software described in this document is contingent on the execution of a Site Agreement between the VistA Imaging HSD&D group and the site where this software is installed.

Once a routing system is enabled at a site, an updated Site Agreement must be filed before significantly altering the configuration of a routing system.

In addition to any restrictions noted in the Site Agreement, the following restrictions apply:

⚠️ Caution: Federal law restricts this device to use by or on the order of either a licensed practitioner or persons lawfully engaged in the manufacture or distribution of the product.

⚠️ No modifications may be made to this software without the express written consent of the VistA Imaging National Project Manager.

⚠️ The Food and Drug Administration classifies this software as a medical device. Modifications to the computer where this software is installed, such as the installation of unapproved hardware or software, will adulterate the medical device. The use of an adulterated medical device violates US Federal Law (21CFR820).

⚠️ US Federal regulations and VA internal policy prohibit unencrypted transmission of patient information outside the VA's intranet.

About this Manual

Using this Manual

This document contains material of interest to different types of users.

User	Please read…
All users	The Routing Overview and the Glossary. The Index can also be used to find information about specific topics in this document.
Clinical users	The Using VistARad in a Routing System chapter.
Users responsible for DICOM Gateway operation and maintenance	The Using the Routing Gateway chapter. You may also find useful information in the Troubleshooting Routing and Defining Routing Rules chapters.
Users responsible for installing or configuring a routing system	The Defining Routing Rules and Configuring Routing chapters. Installation worksheets are available in Appendix A.

Conventions

This manual uses the following conventions:

- Examples are shown in `Courier`.

- Useful or supplementary information is indicated by a ➲ icon

- VA File Manager file names are shown in SMALL CAPS. The first time a FileMan file is referenced in a topic, the file number is indicated in parentheses.

- Menu options, buttons and other controls found in a graphical user interface are indicated by title case. Menu sequences are indicated by vertical bars (|).

- Cross-references are underlined. If this document is being used online, cross-references are shown in blue and are active links.

- Sidebars shown in margins indicate new or revised content.

Acknowledgements

This document is based on the "Autorouting Tutorial" authored by Ed de Moel.

Special thanks to Brian Belleau, Craig W. Hunter, Cheryl Marland, Arnold Pfenninger, and Hedy Towan, who provided valuable background information and feedback for initial drafts of this document.

Revision Table

Date	Rev.	Notes
25 Jun 2002	.9	Draft. Based on 23 Sep 1999 "Autorouting Tutorial." Updated for Patch 9, test 2 distribution.
20 Mar 2003	1.0	Final version for p9 release. A. McFarren, E. deMoel
22 Sep 2003	1.1	Minor p22 updates in VistARad chapter. Added info about routing rules and priority that was not included in original rev. Minor clarifications and corrections throughout. A. McFarren, J. Christensen.
30 Jul 2005	1.2	Updates for patches 11 and 51. Change bars in margins indicate updated content. A. McFarren, E. deMoel
03 Apr 2006	1.3	Updates minor updates for patch 18. Change bars in margins indicate updated content. A. McFarren, J. Christensen

Related Documents

The following documents contain additional information about routing:

- Patch Descriptions for patches 9, 11, and 51.
- Routing Guidance Document

The following documents contain additional information about components in the routing system:

- DICOM Gateway User Guide
- DICOM Gateway Installation Guide
- VistARad User Guide

The following documents contain information about the VistA Imaging system in general:

- VistA Imaging System Installation Guide
- VistA Imaging System Technical Manual
- VistA Imaging System Planning Document & Approved Equipment List

Copies of these documents are available at http://vaww.va.gov.imaging.

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Routing Overview

This chapter explains how routing functions within the VistA Imaging system. It covers the following topics:

Routing Explained

In VistA Imaging, *routing* is the combination of methods and software used to identify and transmit exams produced at one site to a storage location at another site.

Routing takes two forms: autorouting, and on-demand routing.

- In *autorouting*, automatically selected images are transmitted to one or more destinations. Images are selected based on a predefined set of routing rules. Autorouting functions are managed using the Routing Gateway.

- In *on-demand routing*, manually selected exams are transmitted to one or more destinations. Exams are selected using the VistARad diagnostic workstation and are transmitted by the Routing Gateway.

Destinations of routed images fall into two broad groups. *Imaging destinations* are defined to support remote reading using a VistARad workstation. Images sent to these destinations are in VistA Imaging's internal file format. *DICOM destinations* are defined to support transmission of DICOM images to a Storage SCP (Service Class Provider), such as a film printer or an external PACS.

A properly implemented routing system can streamline a site's imaging workflow. Scenarios where routing can be used include:

- Workload sharing between institutions or service providers
- Rapid access of exams at remote clinics or other facilities
- Remote specialist interpretation or consultation
- Off-hours, holiday, or emergency services
- Off-site contract radiology services for primary interpretation

What is a Routing Gateway?

A Routing Gateway locates routable images, determines where the images are to be routed to, and sends copies of those images to other locations. Routing is a function of the DICOM Gateway software. When properly configured, any DICOM Gateway can function as a Routing Gateway.

Typically, a Routing Gateway runs on a dedicated computer. At sites where only a small volume of images are produced, a Routing Gateway can coexist on the same computer as an Image Gateway or a Text Gateway.

Routing Prerequisites

For a site to be authorized to use a routing system:

- An executed Site Agreement must be filed with the VistA Imaging HSD&D group.

  Note: An updated site agreement must be filed if the routing system is altered (for example: if site information changes, if a new destination is added, or if routing volume increases by 50% or more).

- A contingency plan must be implemented at all sites in the routing system and filed with the VistA Imaging HSD&D group. The contingency plan must contain procedures to be followed should the routing system be unavailable.

General hardware and operational requirements for routing are summarized below. For detailed information, contact your VistA Imaging Implementation Manager.

Infrastructure Requirements

Routing relies on the following infrastructure:

- If remote interpretation is being performed, one or more VistARad diagnostic workstations for the display of routed exams.

- An operational VistA Hospital Information System, an operational Image Gateway, and an operational Routing Gateway, configured as described in this document.

- An operational Local Area Network (LAN).

- An operational Wide Area Network (WAN) with sufficient bandwidth to manage the anticipated volume of routed exams.

- Windows-based servers to provide exam storage at each routing destination, configured as described in this document.

Operational Requirements

The medical and IT management at a site implementing the routing system will need to develop policies establishing:

- Locations to which the exams may and may not be routed
- Reporting / transcription requirements for routed exams
- Bandwidth utilization guidelines and priorities
- Storage of routed exams at receiving sites
- Management of patient confidentiality and privacy issues related to routed exams
- Methods for addressing performance issues and/or misuse of the routing system

How Autorouting Works

The following figure illustrates the transfer of automatically routed images to a VistARad workstation for remote reading. The processes outlined in this figure are explained in more detail below. (Apart from the destination, the same processes are used when autorouting images to a DICOM Storage SCP).
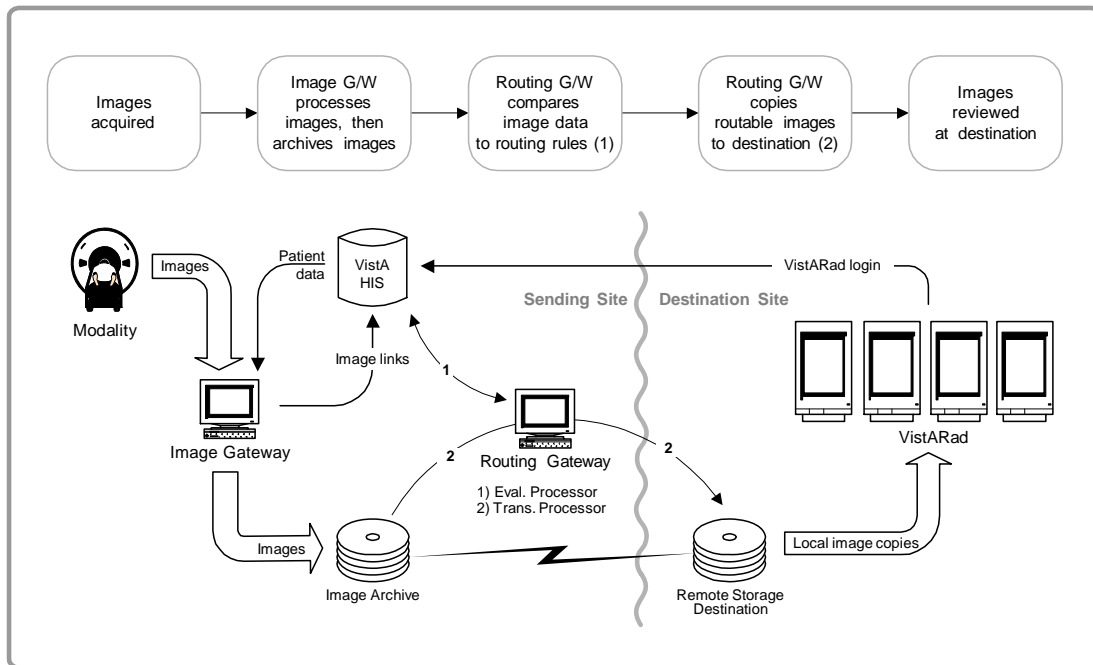
Identifying Images to be Autorouted

Autorouting begins with an Image Gateway. As it is processing newly acquired images, a properly configured Image Gateway will add routing-specific entries to the rule evaluation queue.[1] This queue is continually checked by the evaluation processor (which resides on the VistA Host and is started from the Routing Gateway).

➲ If the Image Gateway is not configured to add entries to the rule evaluation queue, the images being processed by the gateway cannot be autorouted. For more information, see page .

Each image referenced in the rule evaluation queue is checked against a set of site-specific routing rules. If the rules indicate that the image should be routed, the evaluation processor creates an entry in the transmission queue.[2] Entries in the rule evaluation queue are deleted after they are checked.

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[1] The rule evaluation queue is a subset of the IMAGE BACKGROUND QUEUE file (#2006.03).
[2] The transmission queue is stored in the SEND QUEUE file (#2006.035).

Autorouting Images from Prior Exams

Autorouting offers the option to include images from prior exams. When this option is used in a routing rule, the Routing software will use the VistARad prefetch logic defined at acquisition site to create a list of prior exams. Images from the prior exams will be routed using same priority as the newly acquired image and, when appropriate, will be purged based on the same retention period as the newly acquired image. For more details about autorouting priors, see page 22.

Sending Images to Destinations

The transmission of routed images is based on entries in the transmission queue. Each entry in the transmission queue identifies the image to be routed and the destination of the image.

The transmission queue is continually checked by the Routing Gateway transmission processor. For each entry in the queue, the transmission processor locates the image, and identifies the destination.

For Imaging destinations, the transmission processor is responsible for copying the image to the destination. For DICOM destinations, the transmission processor passes the image and destination information to the 'Transmit DICOM Images to a DICOM SCP' function of the DICOM Gateway, and waits for the function to report the status of the transfer back to the routing software.

After the image is copied, the appropriate entry in the transmission queue is updated with the status of the image transfer. Transmission queue entries are retained for tracking and troubleshooting purposes. Entries can be deleted as described on page 57.

Remote Reading with VistARad

A properly-configured VistARad workstation can be used to display and interpret exams routed from another site. Radiologists performing remote reading can use VistARad to log into the site that sent the routed exams, and then use the contents of the RC (Remote Cache) exam list column to determine which exams have been routed to them. For additional information about working with routed exams, refer to page 59.

Exporting DICOM Images

In general terms, any DICOM Storage SCP (Service Class Provider) can serve as a DICOM destination. Apart from transmission logs, images routed to a DICOM destination are not tracked by the Imaging system. Retention, management, and deletion of routed images is the responsibility of the destination.

Deletion of Routed Images

For Imaging destinations, the amount of time routed images are retained is based on the value of the RETENTION PERIOD field in the NETWORK LOCATION File (#2005.2). When connecting to a destination for the first time on a given day, the transmission processor

determines if images at the destination are older than the number of days specified in RETENTION PERIOD. Images older than the specified number of days[1] are deleted from the destination's storage location.

For DICOM destinations, routed images are retained until they are deleted locally. The routing software will not delete images sent to DICOM destinations.

➲ Routed images are copies. The original image files are retained at the site where they were acquired.

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[1] The age of a routed image is based on the transmission queue entry for that image, not on the date of the image file itself. Changes made to the date of the image file (such as those made by some anti-virus packages) will not affect when the image is deleted.

How On-Demand Routing Works

On-demand routing uses the same infrastructure as autorouting. However, in on-demand routing, exams to be routed are manually selected by a VistARad user, rather than being identified automatically by a Routing Gateway. With the proper security keys, on-demand routing is available to any VistARad user in the routing system.

The following figure illustrates the transfer of images between a local and remote VistARad workstation using on-demand routing.[1] On-demand routing can also be used to transfer images to a DICOM destination such as a film printer or an external PACS.
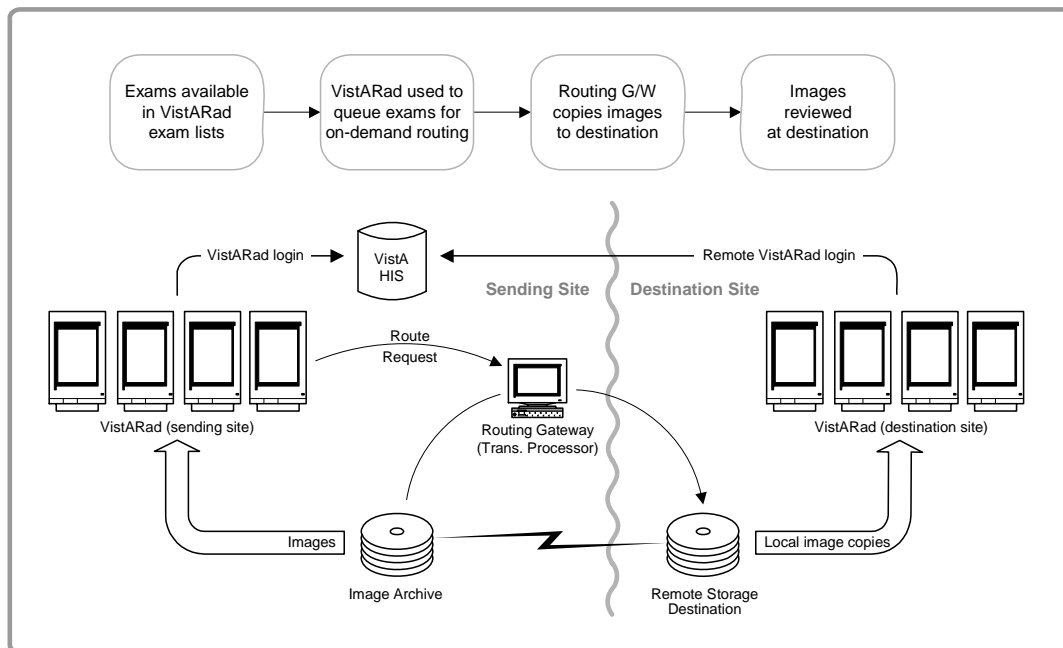
Selecting Images for On-Demand Routing

VistARad's Route Request dialog is used to select the exams to be routed on-demand and to indicate where exams are to be sent. When a user accepts the settings in the Route Request dialog, the exams are checked by VistARad to see if they can be routed (images present, available in short-term storage, etc.). Then entries for each image in the selected exams are added to the transmission queue.

Once an exam has been added to the transmission queue, on-demand routing functions in the same way as autorouting.

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[1] This figure illustrates on-demand routing being initiated from the site with a local Routing Gateway. On-demand routing can also be initiated from a destination site, as long as the destination site is logged into the location (division) where the exams to be routed were acquired.

How Routing Priority Works

The following factors are used to determine the priority of a routed exam:

- Assigned priority
- Clinical urgency (autorouting only)
- Time in transmission queue

Priority and Autorouting

For automatically routed exams, the routing software uses the priority assigned in a routing rule and the clinical urgency of the exam to calculate a numeric value. Images with the highest priority value are transmitted first.

Factor	Values	Notes
Assigned priority	Low: +250 Medium: +500 High: +750	Priority is set in routing rules as described on page 9. If not explicitly set, a default value of Medium is used.
Clinical urgency	Routine: +0 Urgent: +10 STAT: +20	Values are based on the clinical urgency defined for the exam in the VistA system.

Priority and On-demand Routing

When an exam is routed on-demand, VistARad's Route Request dialog can be used to assign a priority of Low, Medium or High. (The clinical urgency of the exam is not used). The Route Request dialog is described on page 61.

If a user selects an exam to be routed on-demand that is already in the transmission queue, the higher priority of the two instances will be used.

Other Priority Factors

If two or more entries in the transmission queue have the same priority value, entries are processed on a First In, First Out (FIFO) basis.

Because the transmission processor works on an image-by-image basis, it is possible for the images in a lower-priority exam to be interrupted 'mid-stream' by the images in a higher-priority exam. If this happens, transmission of all lower priority images will resume after transmission of all higher-priority images is complete.

Defining Routing Rules

This chapter explains how to define the rules used for autorouting. This chapter covers the following topics:

- Routing Rules Explained
- Rule Destinations
- Rule Conditions
- Routing Rule Priority
- Routing Rule Tips

➲ Routing rules can be defined before the configuration of the routing system is complete, but cannot be tested until the setup of the routing system is finished.

Routing Rules Explained

The Routing Gateway uses routing rules to determine which images are to be automatically routed and where the images are to be sent. Routing rules need to be established as a part of configuring the routing software, and will need to be adjusted if there is a change of staff availability or workflow.

The definition of routing rules involves:

1 Determining the needs of the staff at the sending and receiving sites.

2 Determining what resources will be used at the receiving site.

3 Translating the resulting information into a rule that can be executed by the routing software.

➲ A rules definition worksheet is located in Appendix A.

How Routing Rules Work

Routing rules are defined in a text file and are implemented when the text file is imported into a local table on the Routing Gateway.

A basic routing rule looks like:

```
send("destination")
   when [condition A
         condition B...]
```

Each routing rule must contain at least one destination and one condition. When the conditions in a rule are met, the image is sent to the specified destination.

- The destination specified in a rule must match an entry in either the NETWORK LOCATION File (#2005.2) or the DICOM TRANSMIT DESTINATION File (#2006.587). Routing rule destinations are described in detail on page 12.

- A condition is a comparison between a general image property and the specific value associated with a particular image. Conditions are described in detail on page 14.

Sample Routing Rules

The following pages contain examples of routing rules as they would be entered into the `Route.dic` file. For more information about the `Route.dic` file, see page 44.

A Simple Routing Rule

A common routing scenario is the transmission of images from a particular modality for remote interpretation.

Send CR images to Kansas City

```
send("KANSASCITY")
   when MODALITY = "CR"
```

Rules using Multiple Conditions

If a rule contains more than one condition, all of the conditions must be met for an image to be routed.

Send CR images produced in Wichita to Kansas City

```
send("KANSASCITY")
   when MODALITY = "CR"
        SOURCE   = "WICHITA"
```

Tip: When defining multiple conditions for a rule, list the most restrictive condition first. Listing the most restrictive condition first will minimize the amount of time needed by the routing software to process the rule.

Rules using Wildcards

Wildcards can be used when you want a condition to be valid for more than one value. In the example below, all images, regardless of modality, will be routed.

Send all images to Kansas City

```
send("KANSASCITY")
    when MODALITY="*"
```

Wildcards are described in detail on page 20.

Rules using the "does not match" Operator

A condition can use different types of operators. The previous examples used "=" as an operator, indicating that the specified image property must match a particular value for a condition to be met.

The following example uses "!=" as an operator, indicating the image property in question can be any value *except* the listed value.

Send non-CR images to Kansas City

```
send("KANSASCITY")
    when MODALITY != "CR"
```

Operators are described in detail on page 20.

Rules using Date/Time Conditions

A rule using date/time conditions can be used to route images based on date, time of day, or "type" of day (such as weekday, holiday, and so on).

A rule to send all CR images to a destination on certain days would look like:

Send CR images to Kansas City on Mon/Wed/Fri

```
send("KANSASCITY")
    when MODALITY="CR"
         NOW={MON 00:01AM to 11:59PM;
              WED 00:01AM to 11:59PM;
              FRI 00:01AM to 11:59PM}
```

The NOW condition is described, along with other date/time conditions, on page 21.

Rule Destinations

The first parameter in a routing rule contains either the `send` command or the `balance` command, and contains one or more destination names.

The `send` and `balance` commands are described in detail below. Destination names are described on pages and .

The SEND Command

Typically, the `send` command is used to specify a single destination, as in the example below:

```
send("KANSASCITY")
   when MODALITY="CR"
        NOW={MON 00:01AM to 11:59PM;
             WED 00:01AM to 11:59PM;
             FRI 00:01AM to 11:59PM}
```

To send similar exams to multiple destinations, multiple rules would be used, as shown below:

```
send("KANSASCITY")
   when MODALITY="CR"

send("BACKUP")
   when MODALITY="CR"
```

The BALANCE Command

Use the `balance` command when you want to divide a pool of exams between multiple destinations. When using the `balance` command, you must specify what percentage of exams should be sent to each destination.

In the sample rule below, 25% of the exams are sent to KANSASCITY, and 35% of the exams are sent to KANSASCITY2. The remaining exams are not routed at all (as indicated by the `<local>=40%` portion of the command).

```
balance("KANSASCITY"=25%,"KANSASCITY2"=35%,<local>=40%)
   when MODALITY="CR"
```

 The total value of the percentages specified in the command must equal 100%.

How Load Balancing Works

When a rule incorporates the `balance` command, the routing software uses two things to determine which destination receives a given exam: the percentages specified in the rule and internal counters set by the routing software.

When a rule including a `balance` command is first applied, the routing software begins distributing exams the same way a deck of cards is dealt: the first destination receives one exam, the second destination receives the next exam, and so on. Exams are evenly distributed until the destination with the lowest value specified in the `balance` command has received its allotted percentage of exams. Then that destination is skipped until the counter resets. Since load balancing is based on percentages, the counter is reset each time 100 exams have been sent.

For example, if a rule specifies…

```
balance("DEST1"=10%,"DEST2"=40%,"DEST3"=50%)
    when MODALITY="CR"
```

- The first 30 CR exams will be distributed evenly, with each destination receiving 10 exams. Once `DEST1` has received 10% of the exams, the routing software will skip `DEST1` until the counter resets.

- The next 60 CR exams are split evenly between `DEST2` and `DEST3`. After this point, `DEST2` and `DEST3` each have a total of 40 exams. `DEST2` now has its allotment of 40 exams, and will be skipped until the counter resets.

- The remaining 10 CR exams are sent to `DEST3`, giving that destination a total of 50 exams.

- Once 100 CR exams have been sent, the routing software resets its counters to zero, and starts distributing exams to all three destinations again.

Note that a destination receiving a comparatively smaller percentage of exams will become idle more often than destinations that receive a greater percentage of exams.

Resetting the Load Balancing Counter

When routing rules are imported, the counters used for load balancing are all reset to zero. You can take advantage of this trait if you need to fine-tune or troubleshoot situations where load balancing is used. Note that it is not necessary to change routing rules to achieve this; you only need to re-import them.

Rule Conditions

In routing rules, a condition is a comparison between a particular property of an image and a user-supplied value. The results of the comparison determine if the rule will be applied to an image or not.

A routing rule can contain multiple conditions. A single `when` statement precedes all conditions in a rule.

```
send("KANSASCITY")
   when MODALITY = "CR"
        SOURCE   = "WICHITA"
```

The parts of a condition are:

```
property operator value
```

A property is one of the known attributes of an image. Properties that can be used in a condition are listed the following section.

An operator is a code for a type of comparison. Operators are described on page 20.

A value is a text or date string supplied by the user. A value specifies what is being tested in the condition. Values are described on page 21.

Properties

The properties listed in this section can be used in routing rule conditions.

➲ Property names are not case-sensitive. However, properties are typically rendered in uppercase.

Frequently Used Properties

MODALITY

Abbreviation for the type of modality. Possible values are listed below. Retired values are indicated by (ret.).

AS:	Angioscopy	MA:	Magnetic Resonance Angiography
AU:	Audio	MG:	Mammography
BI:	Biomagnetic Imaging	MR:	Magnetic Resonance
CD:	Color Flow Doppler	MS:	Magnetic Resonance Spectroscopy
CF:	Cinefluorography	NM:	Nuclear Medicine
CP:	Colposcopy	OP:	Ophthalmic Photography
CR:	Computed Radiography	OT:	Other
CS:	Cystoscopy	PR:	Presentation State
CT:	Computed Tomography	PT:	Positron Emission Tomography (PET)

(continued)

`DD`: Duplex Doppler	`PX`: Panoramic X-Ray
`DF`: Digital Fluoroscopy (ret)	`RF`: Radio Fluoroscopy
`DG`: Diaphanography	`RG`: Radiographic Imaging (conventional)
`DM`: Digital Microscopy	`RTDOSE`: Radiotherapy Dose
`DS`: Digital Subtraction Angiography (ret)	`RTIMAXGE`: Radiotherapy Image
`DX`: Digital Radiography	`RTPLAN`: Radiotherapy Plan
`EC`: Echocardiography	`RTRECORD`: RT Treatment Record
`ECG`: Electrocardiography	`RTSTRUCT`: Radiotherapy Structure Set
`EPS`: Cardiac Electrophysiology	`SM`: Slide Microscopy
`ES`: Endoscopy	`SMR`: Stereometric Relationship
`FA`: Fluorescein Angiography	`SR`: SR Document
`FS`: Fundoscopy	`ST`: Single-Photon Emission Computed
`GM`: General Microscopy	Tomography (SPECT)
`HC`: Hard Copy	`TG`: Thermography
`HD`: Hemodynamic Waveform	`US`: Ultrasound
`IO`: Intra-oral Radiography	`VF`: Videofluorography
`IVUS`: Intravascular Ultrasound	`VL`: Visible Light (VA extension)
`LP`: Laparoscopy	`XA`: X-Ray Angiography
`LS`: Laser Surface Scan	`XC`: External-camera Photography

`NOW`

Date and time that the rule is being processed. For more information, see page .

`SOURCE`

Name of the site that originally acquired the image. The value for this field is determined as follows:

If the ACQUISITION SITE field (#2005, .05) has a non-empty value, the value of this field is used, otherwise;

If the end-user credentials have a non-empty value for the current division (i.e. the location code for the DICOM Gateway from which the evaluation processor was started), the number of this division will be used, otherwise;

As a last resort, the KERNEL SITE PARAMETER field for the number of the institution will be used.

Other Properties

ABSTRACT_REF
   The network storage location of the image abstract.

ACQUISITION_DEVICE
   The name of the device that generated the image as defined in the ACQUISITION
   DEVICE File (#2006.04).

BIG_JUKEBOX_PATH
   Full file path on jukebox for .BIG images. This field indicates whether this file is
   located on the jukebox.

BIG_MAGNETIC_PATH
   Full file path for .BIG images. This field indicates on which magnetic server this file
   resides.

CLASS
   The class of the image, as stored in the CLASS INDEX field (#2005, 41). Typical values
   are CLIN, ADMIN, CLIN/ADMIN, and ADMIN/CLIN.

CLINIC
   If an image is associated with a patient encounter (visit), the value of this parameter is
   the name of the clinic where the appointment occurred.

DESCRIPTIVE_CATEGORY
   This is mainly for Document Imaging; it further describes the type of document
   image.

EXAM_TIME
   The date/time of the procedure or the examination. For more information, see page .

   EXAM_TIME can be used to compare the exam date/time of the "image at hand" to the
   provided value.

   EXAM_TIME_FIRST can be used to compare the exam date/time of the earliest (oldest)
   image in the exam to the provided value.

   EXAM_TIME_LAST can be used to compare the exam date/time of the latest (newest)
   image in the exam to the provided value.

EXPORT_REQUEST_STATUS
   The value of this field, if defined, indicates if MailMan will send or has sent the image
   to another site. Possible values are:

```
1 = EXPORT REQUESTED
0 = EXPORTED
```

FILE_REF

> The unique image filename of the image, as stored on the magnetic server (and/or jukebox).

IMAGE_SAVED

> The date and time the image was captured (as opposed to the date and time of the procedure or exam). For more information, see page 21.

> IMAGE_SAVED can be used to compare the save date/time of the "image at hand" to the provided value.

> IMAGE_SAVED_FIRST can be used to compare the save date/time of the earliest (oldest) image in the exam to the provided value.

> IMAGE_SAVED_LAST can be used to compare the save date/time of the latest (newest) image in the exam to the provided value.

IQ

> A flag that indicates whether or not an image has questionable integrity, as specified in the IQ field (#2005, 13). This field is either empty or equal to YES. Note that images with questionable integrity will be transmitted, but may not be displayed by the software on the receiving system. (On VistARad workstations, a warning is displayed if a user opens an image with questionable integrity, and only a user with the proper security key can actually display the image.)

LAST_ACCESS

> The date and time the image was last viewed or accessed. For more information, see page 21.

> LAST_ACCESS can be used to compare the last access date of the "image at hand" to the provided value.

> LAST_ACCESS_FIRST can be used to compare the last access date of the earliest (oldest) image in the exam to the provided value.

> LAST_ACCESS_LAST can be used to compare the last access date of the latest (newest) image in the exam to the provided value.

MAGNETIC_REF

> The path for the network location of the stored image.

MICROSCOPIC_OBJECTIVE

> Free text description of the Microscopic Objective selected by the pathologist. It identifies the power of the microscope objective used when capturing an image of a slide.

OBJECT_NAME

> The natural language name for the image, usually consisting of the patient name, social security number, and image description.

OBJECT_TYPE
   The object type (such as still image, black & white image, x-ray) as described in the
   OBJECT TYPE File (#2005.02).

PACKAGE
   An abbreviation for the name of the package that the image is attached to, as defined
   in the PACKAGE INDEX field (#2005, 40). Possible values are: RAD, LAB, MED,
   NOTE, CP, SUR, PHOTOID, NONE, or CONS.

PACS_PROCEDURE
   The name in the radiology reports file that identifies the procedure.

PACS_UID
   The unique 26-character image identifier of the PACS image.

PARENT_DATA
   The name of the file that contains the "Parent Data." See also
   PARENT_DATA_FILE_IMAGE_POINTER, PARENT_GLOBAL_ROOT_D0 and
   PARENT_GLOBAL_ROOT_D1.

PARENT_DATA_FILE_IMAGE_POINTER
   In the file identified by "Parent Data," a multiple valued field may exist that identifies
   groups of images. When there is such a "multiple," the value of this parameter is the
   entry number in this multiple that points back to the parent image of the current
   image.

PARENT_GLOBAL_ROOT_D0
   The internal entry number in the file identified by PARENT_DATA.

PARENT_GLOBAL_ROOT_D1
   The value of this parameter is defined only for laboratory images to record the third
   subscript of ^LR(D0,"SP",D1) as a backward pointer for use in report display and
   image deletion.

PATH_ACCESSION_NUMBER
   The Anatomic Pathology accession number - the identifying number for the slide.

PATIENT
   The name of the patient.

PROCEDURE
   An abbreviation for the procedure as stored in the PROCEDURE field (#2005, 6).
   This field is set automatically by Imaging. Typical values are COL for colonoscopy,
   SUR for surgery, SP for surgical pathology, or XRAY for radiology.

PROCEDURE_OR_EVENT
   The name of the procedure or event for which the image was created, as stored in the
   PROC/EVENT INDEX field (#2005, 43).

PROCEDURE_TIME

The date/time of the procedure or the examination. For more information, see page .

PROCEDURE_TIME can be used to compare the procedure date/time of the "image at hand" to the provided value.

PROCEDURE_TIME_FIRST can be used to compare the procedure date/time of the earliest (oldest) image in the exam to the provided value.

PROCEDURE_TIME_LAST can be used to compare the procedure date/time of the latest (newest) image in the exam to the provided value.

RADIOLOGY_REPORT

The name of the Radiology Report associated with the image.

SAVED_BY

The name of the person who logged in to capture the image.

SHORT_DESCRIPTION

A one-line description of the image or object record.

SPECIALTY

The specialty (or sub-specialty) for which the image was acquired, as stored in the SPEC/SUBSPEC INDEX field (#2005, 44).

SPECIMEN

The specimen number of the slide given in the LAB DATA File (#63).

SPECIMEN_DESCRIPTION

The description given to the specimen in the LAB DATA File (#63).

STAIN

Free text description of the Histological Stain.

SUMMARY

A flag that indicates whether or not the image functions as a summary for a group. The value of this property is either empty, or equal to 0 (NO) or 1 (YES).

TRACKING_ID

An identifier for the package that performed the Import (value looks like package name, semi-colon, ID-code).

TYPE

The type of image, as stored in the TYPE INDEX field (#2005, 42). Typical types are IMAGE, DIAGRAM, CONSENT, etc...

URGENCY

A code that indicates the clinical urgency of the exam for which the image was produced. Possible values are: ROUTINE, URGENT and STAT. The value for this field is determined by the Radiology Package.

WORM_REF
> The network location of the jukebox platter where the image is stored (provided there is a jukebox in the Imaging system).

Operators

The following operators can be used in routing rule conditions:

Operator	Image property must…
=	Match value in rule.
!=	Not match value in rule.
<	Be less than a numeric value in rule. For date/time values, this operator can be used for "earlier than."
>	Be greater than a numeric value in rule. For date/time values, this operator can be used for "later than."
<=	Be less than or equal to a numeric or date/time value in rule.
>=	Be greater than or equal to a numeric or date/time value in rule.

Values

Values are the user-supplied part of a routing rule condition. Most values are text strings.

Values are typically enclosed in quotation marks ("). If a value contains both upper and lowercase characters, or if it contains punctuation marks or spaces, quotation marks are required.

Two types of wildcard characters can be used in routing rules: the asterisk (*) and the question mark (?). The question mark allows one single character in a value to be "any character." The asterisk allows one or more characters to be "any character."

The following examples demonstrate how wildcards can be used in text-based values:

PATIENT="*CRAY*"
> To meet this condition, the patient name for an image must contain the characters CRAY. Any characters may precede or trail these characters. Names like CRAY, MCCRAY, and CRAYNE will meet this condition, but CREY will not.

PATIENT="SMIT?"
> To meet this condition, the patient name for an image must start with the characters SMIT, after which exactly one character may follow. Names like SMITH and SMITT will meet this condition, but SMITHSON will not.

PATIENT="PETERS?N"
> To meet this condition, the patient name for an image must start with the characters PETERS, then contain one arbitrary character, then end with N. Names like PETERSON and PETERSEN will match this comparison, but PETERSSEN will not.

Values for Date/Time Properties

When condition based on date and time is used, the supplied value must adhere to VA-FileMan conventions. Values for date/time conditions are presented as a range enclosed in braces { }.

The most frequently used date/time property is NOW. NOW can be used to select the times that a staff member will be present by specifying certain workdays and times of day.[1]

Send CR images to Kansas on Mon/Wed/Fri

```
send("KANSAS")
   when MODALITY="CR"
        NOW={MON 08:00AM to 17:00PM;
             WED 08:00AM to 15:30PM;
             FRI 08:00AM to 17:00PM}
```

Date/time properties can also be used to specify holidays. In this context, holidays are those days that are marked as such in the sending site's HOLIDAY File (#40.5). A rule to send images on holidays only could be specified as:

Send CR images to Kansas on Holidays

```
send("KANSAS")
   when MODALITY="CR"
        NOW={HOL 00:01AM to 23:59PM}
```

Date/time ranges use a 24-hour clock. While the use of AM or PM indicators is not required they can be useful when the hours specified are 0:00 AM (midnight) and 12:00 PM (noon). Date/time ranges can be used to express date values from any century as well as time values for any second in the day.

When the routing software compares a date/time property in an image entry to a specified value, the date/time value is broken into components:

Day of week	Hour
Day of month	Minute
Month	Second
Year	

Which of these components will be used in the actual comparison will depend on the specified value.

---

[1] The actual value of NOW is the moment when the rule is evaluated.

Routing Rule Priority

Automatically routed exams are assigned a default priority of 'Medium.' This priority can be changed by adding a `priority` statement after the conditions for the rule.

Prioritize images based on destination

```
send("KANSAS")
    when MODALITY="CT"
    priority HIGH

send("BACKUP")
    when MODALITY="CT"
    priority LOW
```

In addition to the priority that is derived from routing rules, the routing software takes the clinical urgency of an exam into account. For more information, see page .

Routing Images from Prior Exams

Images from prior exams can be automatically routed by adding a `priorstudy` statement after the conditions for the rule.

Do or Do Not include Prior Studies

```
send("KANSAS")
    when MODALITY="CT"
    priorstudy YES

send("BACKUP")
    when MODALITY="CT"
    priorstudy NO
```

When `priorstudy` is set to YES, images from prior exams will be included based on routing-specific settings in the MAG RAD PRIOR EXAMS LOGIC File (#2006.65). (Settings in this file are described in detail on page).

When `priorstudy` is set to NO, or if the `priorstudy` statement is absent, images from prior exams will not be included.

⚠️ Using `priorstudy` in a routing rule can significantly increase network traffic. If a rule of this sort is implemented, be sure to monitor the network to ensure no problems arise.

Routing Rule Tips

The following tips may be useful while creating or editing routing rules:

- When defining multiple conditions for a rule, list the most restrictive condition first. This will reduce the amount of time needed to process the rule.

- The number symbol # can be used for comments, or to disable a rule. When disabling a rule, precede each line in the rule with #.

- Spaces and line breaks can be used as needed for legibility.

- `Route.dic` must end with a line-feed. To ensure proper termination of the last meaningful line, add a comment-line after the last routing rule, such as:

```
# last update on 1 April 2003
# end of file
```

When rules are imported as described on page , the routing software will check the syntax used and will report on any problems detected.

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Configuring Routing

This chapter assumes that routing software has been installed, and that an initial set of routing rules have been defined.

This chapter explains how to configure a routing system. The following table lists the configuration tasks described in this chapter.

Configuration Task	Performed By	See Page…
Set up Imaging destinations	All sites involved	26
Set up DICOM destinations	All sites involved	37
Review/edit route priors logic	Sending site	40
Image Gateway configuration	Sending site	42
Routing Gateway configuration	Sending site	43
Import routing rules	Sending site	44
VistARad site parameter setup	Sending site	47
VistARad workstation setup	Receiving site	48
Alter configuration in response to changes in routing system	All sites involved	50

A configuration checklist is also available in Appendix A.

Defining Imaging Destinations

The following sections explain how to define an Imaging (non-DICOM) destination for routing. In general terms, defining an Imaging destination breaks down into the following steps:

1 Establish naming conventions that are agreed on by the sending and receiving sites.

2 Define storage folders for routed images at the receiving site and verify that the sending site can access those folders.

3 Create routing-specific entries in the NETWORK LOCATION File (#2005.2) at the sending site.

A destination definition worksheet is located on page 71.

Note: Imaging destinations are defined to support remote reading using VistARad. For information about defining a DICOM destination, see page 37.

## Naming Conventions for Imaging Destinations

Before an Imaging destination is established, the sending and receiving sites should decide how to identify themselves to routing users.

The values that identify an Imaging destination are stored in the NETWORK LOCATION File (#2005.2) at the site where the Routing Gateway is installed. The values defined for the following should be related in some way.

Field	Description	Notes
Network Location (.01)	The "official" destination name.	Used by routing rules and the Routing Gateway at the sending site. Referenced in VistARad CacheLocationID at appropriate receiving site.
		Cannot match any other name in the NETWORK LOCATION File or in the DICOM TRANSMIT DESTINATION File (#2006.587).
		30 max, no spaces or punctuation.
		The value used should contain the nationally assigned 3-character site code and should indicate that the entry in question is used for routing.
Physical Reference (1)	The computer and share name at the receiving site.	The name used should be meaningful to both the sending and receiving sites. Cannot exceed 63 characters in length
Site (25)	Destination as reported to VistARad users.	Used in the RC column of VistARad's exam lists.
		The value used should contain the nationally assigned 3-character site code.

When an Imaging destination is established, all the above values should be related in some way. The following example illustrates destination names for a fictional routing system.

In this system, the sending site uses autorouting to meet two sets of needs. MRI images are routed to an off-site specialist for interpretation. Urgent exams acquired in the evening are routed to an affiliated hospital for after-hours interpretation.
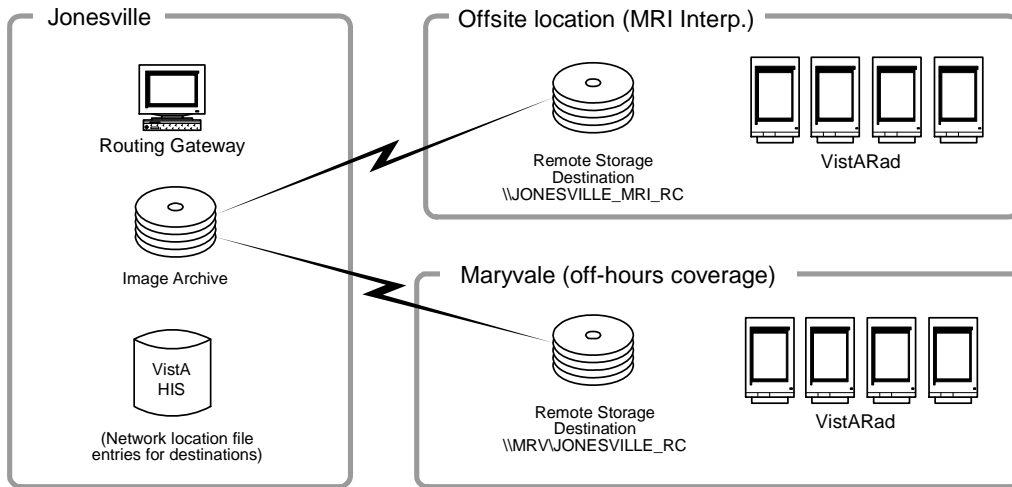
NETWORK LOCATION File Entries at "Jonesville"

Name field for Destination 1:	OFFSITE_MRI_READ
Phys. Ref. field for Destination 1:	\\JONESVILLE_MRI_RC
Site field for Destination 1:	JVL_MRI
Name field for Destination 2:	MARYVALE_RC
Phys. Ref. field for Destination 1:	\\MRV_RC1\JONESVILLE_RC
Site field for Destination 2:	MRV

Storage Location Names for offsite MRI specialist

Folder name:	Exams_from_Jonesville
Computer and share name:	\\JONESVILLE__MRI_RC
VistARad CacheLocationID:	JVL_MRI_RC

Storage Location Names at for after-hours coverage at Maryvale

Folder name:	Exams_from_Jonesville
Computer and share name:	\\MRV_RC1\JONESVILLE_RC
VistARad CacheLocationID:	MARYVALE_RC

Storage Folders for Imaging Destinations

This section explains how to create and verify a folder for an Imaging destination on a Windows-based server. The folder will be used as the storage location for routed images at a receiving site.

The resulting folder will be referenced in the NETWORK LOCATION File (#2005.2).

Folder Prerequisites

Before creating the folder:

- A username and password, to be used by the routing software to copy images to the folder, will need to be established by the receiving site. The username/password must be provided to the sending site.

  Note: Unannounced password changes are a major cause of routing problems. To avoid future problems, the sending and receiving sites need to establish a procedure by which username/password changes can be implemented without adversely affecting routing.

- The sending site and the receiving site must establish naming conventions to use for the various elements that describe an Imaging destination. For more information, refer to the previous section.

- The sending site should work with the receiving site to estimate the amount of storage space needed based on the anticipated volume of transmitted images and the planned retention period.

Folder Creation

When the folder to be used as an Imaging destination is established by the receiving site, the receiving site will need to choose a logical folder name and share name. The share name will ultimately be referenced in the *sending* site's NETWORK LOCATION File.

Creating & sharing a folder to be used in an Imaging destination

1 Log in as an Administrator to the computer where you will be creating the folder, and start Windows Explorer (choose Start | Run, then type Explorer).

2 Select the drive (or folder) that you want to create the new folder in.

3 Click File | New | Folder. After the new folder appears in the right side of the Explorer window, type the name of the new folder and press Enter.

4 Right click the new folder, then click Sharing.

5 In the Sharing tab, click the option that allows for sharing the folder, then enter the share name you want used for the folder.[1]

➲ The share name cannot contain punctuation marks or spaces, and the combined string identifying the computer and the shared folder cannot be more than 63 characters long.

➲ The share name you enter must match the PHYSICAL REFERENCE field value (#2005.2,1) defined at the site that will be sending images to this folder.

➲ It is recommended that you make the folder a hidden share by adding a dollar sign ($) to the end of the share name. A hidden share will be accessible by the routing software, but will not be visible to users browsing your network.

6 After typing the share name, click Permissions.

7 In the Permissions dialog, click Add, then select the user group / user name that the routing software will use to access this folder.

➲ The username and password for the user you choose will need to be included in the NETWORK LOCATION File entry that references this folder.

➲ Use the domain name as well as the username. Example: VHAIS\VHAKANIU (note the absence of leading backslashes).

8 After adding the "routing user," set the access type for the routing user to Full.

9 In the list of users allowed to access the folder, click the "Everyone" user group, then click Remove.

10 When you are finished, click OK to apply your changes and to close the Properties dialog.

Folder Verification

After the receiving site has created the folder, the sending site will need to verify that the folder can be remotely accessed and that files can be copied to and deleted from the folder.

➲ To complete the following steps, you will need the username and password that the routing software will use to access the folder.

Testing folders from the sending site (Explorer)

1 On the computer you will be using to test the folder, log in as an Administrator.

---

[1] Under Windows NT, the option name is 'Share As'. Under Windows 2000, it is 'Sharing'. Under Windows XP and 2003, it is 'Sharing and Security'.

2   Start Windows Explorer (choose Start | Run, then type Explorer), then click Tools |
       Map Network drive.

3   In the Map Network Drive dialog, enter the drive letter, path, and username (including
       domain name) that the routing software will be using. Then click OK.

   ➲   If desired, you can map a drive to the folder to make troubleshooting easier.
       However, be aware that the transmission processor will map certain drives as it
       sends exams to Imaging destinations. For more information, see page 66.

4   When prompted, enter the password that will be used by the routing software, then
       click OK.

   ➲   If you cannot map the folder, use the next set of steps below (Testing folders from
       the sending site (Command Line)) to provide more detailed information about the
       problem you are encountering.

5   Select the folder you just mapped to, copy a test file into the folder, and then delete
       the file. If the file is successfully copied and deleted, the routing software should be
       able to use the folder.

6   Disconnect the mapped drive.

Testing folders from the sending site (Command Line)

1   Log in as an Administrator to the computer you will be using to test the folder on.

2   Open a command prompt window (choose Start | Run, then enter CMD).

3   Enter the following command to map the folder to a local drive. Parameters shown in
       bold will need to be replaced with valid values established by the receiving site

```
> net use x: \\VHAxxxxxx\sharename\ password /u:username
```

4   After mapping the drive, copy a test file to the folder, and then delete the file. If the
       file is successfully copied and deleted, the routing software should be able to use the
       folder.

```
> copy any.file x:\<path>
> delete x:\<path>\any.file
```

5   When you are satisfied that the above parameters can be used to successfully access
       the folder, delete the test file, then terminate the test connection.

```
> net use x: /delete
```

   ➲ Be sure to terminate the test connection. Letting a connection linger may prevent
       the routing software from establishing its own connection to the folder.

Imaging Destination Definition

Imaging Destination Definition using FileMan

The following steps explain how to create an Imaging destination using FileMan. For information about values for specific fields, refer to page 32. A destination definition worksheet is also located on page 71.

Editing the Network Location File at the sending site

1 Log into the VistA Hospital Information System.

2 Use FileMan to select the NETWORK LOCATION File (#2005.2) for editing.

```
Select OPTION: E ENTER OR EDIT FILE ENTRIES

INPUT TO WHAT FILE: 2005.2 NETWORK LOCATION (7 entries)
EDIT WHICH FIELD: ALL// <Enter>
```

3 When you are prompted to select a network location, enter the name that you want used for the destination.

```
Select NETWORK LOCATION: TESTDEST
  Are you adding 'TESTDEST' as a new NETWORK LOCATION (the 11TH)? No// YES
```

➲ The name must be entered in upper case, cannot contain punctuation or spaces, and cannot match the name of a DICOM destination.

4 At the next prompt, enter the computer name and share name of the storage location you want used for this destination. This name references a folder defined as described on page 28.

```
PHYSICAL REFERENCE: \\VHAxxxxxx\images$\
```

5 At each new prompt, enter the desired values for each field. Be sure to enter Y at the ROUTER prompt.

➲ Typical values for a routing destination are shown below. For more detailed information about a particular field, enter "?" at the prompt, or refer to the next section.

```
…
STORAGE TYPE: MAG   MAGNETIC
TOTAL SPACE: <blank>
SPACE USED: <blank>
FREE SPACE: <blank>
```

```
OPERATIONAL STATUS: 1  On-Line
HASH SUBDIRECTORY: <set as appropriate for your site>
ABSTRACT: N   No
FULL: Y   Yes
BIG: Y   Yes
TEXT: Y   Yes
DICOM: N   No
COMPRESSION: <blank or J2K>
USER NAME: <Use the "routing username" here>
PASSWORD: <Use the "routing password" here>
MAINTAINCONNECTION: <blank>
MAX # RETRY ON CONNECT: 3
MAX # RETRY ON TRANSMIT: 5
SYNTAX: U UNC
SUBDIRECTORY: <blank>
Select USER    <blank>
RETENTION PERIOD: 5
LAST PURGE DATE: <set by routing software>
SITE: <set as appropriate for your site>
ROUTER: Y   YES
TIME OFFLINE: <blank>
MUSE SITE #:  <blank>
MUSE VERSION #: <blank>
```

Imaging Destination Definition using the Background Processor

The Background Processor software can also be used to define an Imaging destination in the NETWORK LOCATION File (#2005.2). (In the Background Processor, choose Edit | Network Location Manager). A destination definition worksheet is also located on page 71.

Imaging Destination Values

Fields used in the NETWORK LOCATION File are described below. These fields are listed in the order that they are defined in the file, and their descriptions assume that a routing destination is being defined.

NETWORK LOCATION
   The value of this field will serve as the destination name for the location where image files will be sent. The routing software will accept uppercase alphanumeric characters and dashes (–), but will not accept values that use lowercase characters or other punctuation marks.

▪ The value for this field is used in the routing rules file (described on page 44).

▪ The value for this field can be different from the actual directory name or "share" name used for physical network location being referenced.

PHYSICAL REFERENCE
   The value of this field identifies the physical network location where routed images will be stored. This value must contain the computer name and the share name of the directory where routed images will be stored.

```
\\ISWIMG01\IMAGE1$\
\\TeleRad\Wichita$\
```

   This value must be entered using UNC (Universal Naming Convention) standards. This field is limited to 63 characters in length, must end in a backslash (\ ), and the part of the name that identifies the computer cannot contain punctuation.

TOTAL SPACE
SPACE USED
FREE SPACE
   These fields are not used for routing. The Background Processor uses these fields and will set values as needed.

OPERATIONAL STATUS
   The value for this field can be 0 (off-line) or 1 (on-line). The routing software will set this value appropriately as it is operating. When no connection can be established, the routing software will set this field to 0 (off-line). Once this field is set to 0, the routing software will not attempt to reach the storage location referenced in this entry for 15 minutes. After 15 minutes have passed, the routing software will reset this field to 1 and then try to connect again.

STORAGE TYPE
   The value of this field describes the media type for the storage location identified above. For routing destinations, the value will be MAGNETIC.

HASH SUBDIRECTORY
   The value of this field determines if routed image files are stored in one single directory (value is No or empty), or in a hierarchy of directories (value is Yes). This value should be set based on the needs of your site.

ABSTRACT
   The value of this field indicates whether or not "abstract" files should be transmitted to this destination. Abstract files (also known as thumbnail or icon files) are used by Clinical Display workstations.

FULL
   The value of this field indicates whether or not "full" files should be transmitted to this destination. Full files contain the complete image, potentially at a reduced resolution. For routing, this field should be set to Yes.

BIG

The value of this field indicates whether or not "big" files should be transmitted to this destination. Big files contain the complete image, always at the original resolution. For routing, this field should be set to `Yes`.

TEXT

The value of this field indicates whether or not text files should be transmitted to this destination. Text files contain the header information from the original DICOM file. For routing, this field should be set to `Yes`.

DICOM

Do not use.

COMPRESSION

The value of this field is a code that indicates which type of compression will be used for routed images. When the value of this field is equal to "J2K", JPEG 2000 compression will be applied before the file is transmitted. When the value of this field is empty or equal to "None", no compression will take place. All images that are sent to the destination will be treated in the same fashion, that is: either compressed or uncompressed.

Note: If compressed images are to be sent to a VistARad workstation, the MAG_Decompressor software will need to be installed on the workstation. See Appendix B for more information.

Note: A toolkit license is needed for each system that is sending or receiving compressed images. For more information, contact VistA Imaging Customer Support.

If some images need to be sent compressed and some not compressed, set up two destinations that are almost the same, one with a name like "WhereEver", with this field set to <blank>, and one with a name like "WhereEver_Compressed", with this field set to the appropriate type of compression.

All other fields in the two records could have the same value, most specifically the field named "Physical Location".

Then, the following routing rules could be set up:

```
Send("WhereEver")
        when MODALITY="MR"
```
and
```
Send("WhereEver_Compressed")
        when MODALITY="MR"
```

This will allow both compressed and uncompressed images to be sent to the same destination.

USER NAME
    The value of this field is the username that the routing software will use to log into the shared folder defined in the PHYSICAL REFERENCE field. This username must include permission to read, write, and delete on the physical storage space for this destination.

PASSWORD
    The value of this field is the password that is used with the username above to log into the destination. The password is case-sensitive and is stored in an encrypted format.

MAINTAINCONNECTION
    This field is not used for routing, and should be left blank.

MAX # RETRY ON CONNECT
    Indicates the maximum number of successive attempts that will be made by the routing software to connect to this destination. A typical value is three attempts.

    If a successful connection cannot be made, the destination will be marked "off-line." After 15 minutes, the destination will be marked "on-line," and the routing software will begin trying to connect to this destination again.

MAX # RETRY ON TRANSMIT
    Indicates the maximum number of successive attempts the routing software will make to transmit a file to this destination. A typical value is five attempts.

    When it is not possible to make a successful copy of an image within the number of attempts, the entry for the image in the transmission queue will be marked as failed (There is a Routing Gateway menu option to re-transmit failed queue entries.)

SYNTAX
    The value of this field is a code that indicates the format for the name of the physical location. Currently, only UNC (Universal Naming Convention) is accepted.

SUBDIRECTORY
    Typically, this field is left blank. The value of this field determines if a subdirectory (under the directory specified in PHYSICAL REFERENCE) should be used to store files for this destination. If hashing is turned off, all transmitted files will be stored in the subdirectory specified in this field; if hashing is turned on, all transmitted files will be stored in subdirectories of this subdirectory.

Select USER
    <Future use> The values that may be entered for this (multiple-valued) field are e-mail addresses that will be used by a future version of the routing software to notify people about significant events related to routing activities.

RETENTION PERIOD

The value of this field determines the number of days routed image files are stored at this destination. A typical value is five days.

Whenever a transmission processor connects to a destination, it checks whether or not it has executed a purge for that destination on that day. If the connection in question is the first of the day and no purge has been executed yet, a purge will be initiated. During a purge, any image files older than the number of days specified by RETENTION PERIOD are deleted (note that files are always retained at the sending site).

LAST PURGE DATE

The value of this field is set by the transmission processor when it executes a purge.

SITE

The value of this field is a code used by VistARad to identify the source of routed exams. The value of this field can be any text string. In the VistARad software, the value for this field will be shown in the RC (Remote Cache) exam list column.

ROUTER

The value of this field indicates whether or not the shared folder defined in the PHYSICAL REFERENCE field is being used as a routing destination. For routing, the value of this field must be Yes.

TIME OFFLINE

The value of this field will be filled in by the transmission processor if it marks a destination as off-line. For more information, see MAX # RETRY ON CONNECT.

MUSE SITE #

This field is not used for routing. For MUSE EKG network locations, this field contains the MUSE site number assigned by a GE Marquette field engineer during MUSE server installation.

MUSE VERSION #

This field is not used for routing. For MUSE EKG network locations, this field contains the MUSE software version number.

Defining DICOM Destinations

In general terms, defining a DICOM destination breaks down into the following steps:

1 Determine the names that will be used to identify the destination and gather information about the receiving application.

2 Edit the SCU_List.dic file, a dictionary file used by the DICOM Gateway(s).

3 Use the DICOM Gateway to load the contents of SCU_List.dic into the MUMPS databases on the DICOM Gateway and on the VistA Host.

The three following sections explain in detail how each general step is performed. A destination definition worksheet is located on page .

Note: A DICOM destination must be a DICOM Storage SCP (Service Class Provider). For information about defining Imaging (VistARad) destinations, see page .

Naming Conventions for DICOM Destinations

The first step in defining a DICOM destination is determining what to name the destination and how to identify the sender of DICOM images.

- When selecting a destination name (entered as the Application in SCU_List.dic), be sure that the name is 31 characters or less in length (case insensitive, punctuation is allowed), and that the name does not match any name defined for an Imaging destination.

- The sender of DICOM images (Calling AE in SCU_List.dic) is the 'Transmit DICOM Images to a DICOM SCP' function of the DICOM Gateway. The name used to identify this function needs to be agreed on by the sender and receiver of the DICOM transmission.

The remaining information needed to define a DICOM destination is determined by the system that will be receiving the routed images. This information is described in detail on page .

DICOM Destination Definitions in SCU_List.dic

This section explains how to update SCU_List.dic specifically for the purposes of routing, and how to load the contents of SCU_List.dic into the DICOM and VistA system databases. The steps below assume that a single instance of SCU_List.dic is used by all DICOM Gateways at a site.

Adding DICOM Destinations to SCU_List.dic

1 Stop all active DICOM processes by waiting until they reach an idle state, and then terminating them.

2 On the DICOM Gateway, use a text editor to open
   `x:\DICOM\Dict\SCU_List.dic`, where `x` is the name of the drive used by the
   DICOM Gateway to store dictionary files.

3 Add the information for each DICOM destination as shown below (comment lines are
   preceded by #). Specific fields are defined in the next section.

```
# User Application List
# Format:
# line 1:App Name|Called AE|Calling AE|Destination IP Address|Socket
# line 2:|Presentation Context Name|Transfer Syntax Name
# line 3:||Transfer Syntax Name (if there are more than one)
#
MERGE EFILM|VistA_Storage|VistA_Send_Image|111.222.33.44|4006
|Modality Worklist Information Model - FIND|Implicit VR Little Endian
|Verification SOP Class|Implicit VR Little Endian
```

4 Save the file into the directory noted in Step 1.

   ➲ When using programs such as Microsoft Word, make sure that the file is saved in
      "text only" mode.

   ➲ Confirm that the file extension is not changed by the text editor. The file will only
      be imported if it is named `SCU_List.dic` and if it is stored in the proper
      directory.

5 Open a terminal window and log into the DICOM Gateway software.

6 Enter 4 to select "System Maintenance" from the DICOM Gateway Menu
   [MAGDMENU].

7 Enter 2 to select "Gateway Configuration and DICOM Master Files".

8 Enter 5 to select "Update SCU_List.dic"

9 When you are prompted to update the file, enter Y.

```
 Ready to read dictionary file "<x>:\DICOM\Dict\SCU_List.dic"?  y// y
<Enter>
```

10 The file will be updated. If the operation is successful, you will be prompted to return
   to the menu.

   ➲ If you encounter any errors, record the information and then press Enter. You will
      need to correct the offending information and repeat the ten steps above.

Field Definitions

Fields defined in SCU_List.dic and used in the DICOM TRANSMIT DESTINATION File (#2006.587) are described below. These fields are listed in the order that they are defined in SCU_List.dic.

Application

    The name that will be used to identify the receiving application and to identify the destination in a routing rule. The value for this field may be up to 31 characters in length, is case-insensitive, and punctuation can be used.

Called AE

    The Application Entity Title of the application that is being called. The value of this field is dictated by the system that will be receiving the DICOM transmission.

Calling AE

    The Application Entity Title of the application that initiates the call (i.e., the Transmit DICOM Images to a DICOM SCP function of the DICOM Gateway). The value for this field may be up to 16 characters in length, is case-insensitive, and punctuation can be used.

Destination IP

    The TCP/IP address of the machine that will be receiving the DICOM transmission. The IP address can be numeric (123.46.57.89), symbolic (xxx.yyy.med.va.gov), or a name stored in the local "hosts" file.

Socket

    The TCP/IP port number on which the system that will be receiving the DICOM transmission expects to be called.

Presentation Context

    The name of a presentation context expected by the system that will be receiving the DICOM transmission. Refer to the current DICOM standard for a complete list of possible values.

Transfer Syntax

    The name of a transfer syntax expected by the system that will be receiving the DICOM transmission. There are four possible transfer syntaxes

        Implicit VR Little Endian
        Implicit VR Big Endian
        Explicit VR Little Endian
        Explicit VR Big Endian

Defining "Route Priors" Logic

Verifying that Prefetch is Enabled

The capability to route priors assumes that 'prefetch' is enabled. Prefetch is generally enabled at sites using VistARad.

You can verify that prefetch is enabled by checking the following settings.

- In the Protocol File (#101), use FileMan to verify that MAGJ PREFETCH/SEND ORM is defined as a Subscriber to the RA REG protocol.

- In the APPLICATION PARAMETER File (#771), verify that MAGJ CLIENT is set to "Active."

Note: The PREFETCH ACTIVE? setting in the VistARad Site Parameters File (#2006.69) does not affect the automatic routing of priors.

For more information, refer to chapter 3 in the Imaging System Installation Guide.

How Prior Exam Routing Works

The logic for automatically routing prior exams is triggered when a `prior study` statement is used in a routing rule. The baseline logic for routing priors is:

> For each exam being automatically routed, also route up to one matching prior exam up to 1800 days (about five years) old.

This logic is stored in the MAG RAD PRIOR EXAMS LOGIC File (#2006.65). In a nutshell, this file is used for three things:

1 It is used to identify, based on procedure name/CPT code, what qualifies as a 'prior exam'.

2 It is used to determine the maximum number and age of exams to automatically route as priors.

3 It is used to determine the maximum number and age of exams to retrieve from the jukebox for VistARad prefetch.

Note: Numbers 1 and 3 above are pre-existing functions. Number 2 is a new function introduced in Patch 51.

Altering "Route Priors" Logic

To alter the logic used for automatic routing of prior exams, you will first need to identify the procedure name/CPT code of the current exams in question. Then you will need to edit the MAG RAD PRIOR EXAMS LOGIC File (#2006.65) as described below.

Note: Altering the settings used to *identify* a prior will affect both VistARad's prefetch function as well as the auto-route priors capability. However, the settings that determine the number and age of priors to be auto-routed can be set independently from the similar settings used for prefetch.

To change "route priors" logic

1 Log into the VistA Hospital Information System.

2 Use FileMan to select the MAG RAD PRIOR EXAMS LOGIC File (#2006.65) for editing.

```
Select OPTION: E ENTER OR EDIT FILE ENTRIES

INPUT TO WHAT FILE: 2006.65 MAG RAD PRIOR EXAMS LOGIC (288 entries)
```

3 Select the following fields for editing.

```
EDIT WHICH FIELD: ALL// .01 <Enter>  CURRENT CASE CPT GROUP
THEN EDIT FIELD: 1 <Enter>  PRIOR CASE MATCHING CPT GROUP  (multiple)
   EDIT WHICH PRIOR CASE MATCHING CPT GROUP SUB-FIELD: ALL// .01 <Enter>
MATCHING CPT GROUP
   THEN EDIT PRIOR CASE MATCHING CPT GROUP SUB-FIELD: 1 <Enter>  AUTO-DISPLAY?
   THEN EDIT PRIOR CASE MATCHING CPT GROUP SUB-FIELD: 2 <Enter>  DAYS
LIMIT/AUTO-DISPLAY
   THEN EDIT PRIOR CASE MATCHING CPT GROUP SUB-FIELD: 3 <Enter>  VERSION
LIMIT/AUTO-DISPLAY
   THEN EDIT PRIOR CASE MATCHING CPT GROUP SUB-FIELD: <Enter>
THEN EDIT FIELD: <Enter>
STORE THESE FIELDS IN TEMPLATE: <Enter>
```

4 At the following prompt, enter the CPT code or description for the types current exams you want to alter the route priors logic for. (Enter ? to see a list of CPT codes and descriptions).

```
Select MAG RAD PRIOR EXAMS LOGIC CURRENT CASE CPT GROUP:
```

5 At the 'Select MATCHING CPT GROUP' prompt, enter a CPT code that has been previously entered as being a match for the current exam, or enter a new CPT code to match to the current exam.

> **Note:** Altering the settings for this prompt will affect both VistARad's prefetch function as well as the auto-route priors capability.

6 Set the following three prompts as desired for autorouting priors. Details follow.

```
AUTO-DISPLAY: YES//
VERSION LIMIT/AUTO-DISPLAY: 1//
DAYS LIMIT/AUTO-DISPLAY: 1800//
```

AUTO-DISPLAY?
The value of this field should be set to "YES" for entries that should cause autorouting of prior studies

DAYS LIMIT/AUTO-DISPLAY
The value of this field should be set to an integer number. Studies that precede the current image by more than this number of days will not be candidates for autorouted transmission. Only studies that are less than the number of specified days will be included.

VERSION LIMIT/AUTO-DISPLAY
The value of this field should be set to an integer number. This number indicates the maximum number of prior studies that will be auto-routed for the current image.

Note: The names of fields will be changed in a future patch.

7 Select additional fields to edit, or exit FileMan.

DICOM Gateway Configuration
A site that is the source of auto-routed images will need to set the configuration file for **all** Image and Routing Gateways as described in the following sections.

➲ No configuration changes are needed for Text Gateways in a routing system.

Image Gateway Configuration
Image Gateways at a site using autorouting will need to have their configuration file set as described below.

➲ The following steps cover only routing-related configuration parameters. For information about other configuration parameters, refer to the DICOM Gateway Installation Guide.

To configure Image Gateways
1 Open a terminal window and log into the DICOM Gateway software.

2 Enter 4 to select "System Maintenance" from the DICOM Gateway Menu [MAGDMENU].

3   Enter 2 to select "Gateway Configuration and DICOM Master Files."

4   Enter 1 to select "Update Gateway Configuration files."

5   Set the prompts indicated in bold below to Yes.

```
…
Will this computer be a DICOM Image Gateway? YES// YES

Will this computer be a DICOM Text Gateway? NO// NO

Will this computer be a Routing Gateway? NO// NO

Will this computer be part of a system where autorouting is active? NO// Yes

Send text to a commercial PACS, Mitra Broker, et cetera? NO// NO
…
```

6   Press <Enter> to cycle though the rest of the prompts and to exit the program.

Routing Gateway Configuration

The workstation serving as a Routing Gateway will need to have its configuration file set as described below. Completing these steps will make the Routing Gateway menu option and its submenus available in the main DICOM Gateway Menu [MAGDMENU].

➲   The following steps cover only routing-related configuration parameters. For information about other configuration parameters, refer to the DICOM Gateway Installation Guide.

To configure the Routing Gateway

1   Open a terminal window and log into the DICOM Gateway software.

2   Enter 4 to select "System Maintenance" from the DICOM Gateway Menu.

3   Enter 2 to select "Gateway Configuration and DICOM Master Files."

4   Enter 1 to select "Update Gateway Configuration files."

5   Set the prompts indicated in bold below to Yes.

```
…
Will this computer be a DICOM Image Gateway? YES// NO

Will this computer be a DICOM Text Gateway? NO// NO

Will this computer be a Routing Gateway? NO// Yes

Will this computer be part of a system where autorouting is active? NO// Yes

Send text to a commercial PACS, Mitra Broker, et cetera? NO// NO
…
```

6 Press `<Enter>` to cycle though the rest of the prompts and to exit the program.

Importing Routing Rules (Route.dic)

This section covers the following topics:

- Creating and Importing a Routing Rules File
- Verifying Imported Rules
- Re-Importing Routing Rules
- Routing Rules & Multiple Routing Gateways

This section assumes that you have prepared your routing rules as described in the previous chapter.

Creating and Importing a Routing Rules File

Routing rules are initially defined in the `\DICOM\Dict\Route.dic` file, which is stored on the Routing Gateway. This file can be created and modified using any text editing program.

Routing rules take effect after `Route.dic` has been imported into a local MUMPS table used by the Routing Gateway.

To create and import routing rules

1 On the Routing Gateway, use a text editor to open `x:\DICOM\Dict\Route.dic`, where `x` is the name of the drive used by the Routing Gateway to store dictionary files.

➲ The first time routing rules are defined; this file will need to be created. If you are modifying an existing file, it is recommended that you create a backup copy of the file.

2 Enter your rules.

➲ `Route.dic` must end with a line-feed. To ensure proper termination of the last meaningful line, add a comment-line after the last routing rule, such as:

```
# last update on 1 April 2003
# end of file
```

3 Save the file into the directory noted in Step 1.

➲ When using programs such as Microsoft Word, make sure that the file is saved in "text only" mode.

➲ Confirm that the file extension is not changed by the text editor. The file will only be imported if it is named `Route.dic` and if it is stored in the proper directory.

4 Open a terminal window and log into the Routing Gateway software.

5 Enter 3 to select "Routing Gateway" from the DICOM Gateway Menu [MAGDMENU].

6 Enter 5 to select "Import Routing Rules."

7 When you are prompted to build the Routing Table, enter Y.

```
Ready to build the Routing Table?  y// y <Enter>
```

8 The file will be imported. If the import is successful, the following will be displayed. You will be prompted to return to the menu.

```
nnn rules stored in the database

Press <Enter> to continue:
```

➲ If you encounter any errors, record the information and then press Enter. You will need to correct the offending rules and repeat these steps.

Verifying Imported Rules

When new routing rules are imported it is important to double-check that the new set of rules corresponds to the intent of the end-user.

To verify imported rules

Open a terminal window and log into the Routing Gateway software.

1 Enter 3 to select "Routing Gateway" from the DICOM Gateway Menu [MAGDMENU].

2 Enter 10 to select "Display Routing Rules".

3 The current set of Routing Rules will be displayed:

```
Routing rules:

SEND(IMAGPROVIDER1)
     If: MODALITY=CT

SEND(IMAGPROVIDER2)
     If: MODALITY=CR

SEND(BAL2)
     If: MODALITY=XA
     Priority: HIGH

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

4   After the rules are displayed and double-checked, press Enter to return to the menu.

Re-Importing Routing Rules

To be change routing rules, `Route.dic` will need to be modified, and then re-imported. When routing rules are re-imported:

- The existing routing table will be replaced. Retaining the original set of rules in a backup file allows you to restore the routing table, if necessary.

- If you are using load balancing, importing routing rules will cause internal counters that control load balancing to be reset. For more information, see page 13.

- If multiple Routing Gateways are present, the steps for importing the modified rules file must be performed for **all** Routing Gateways, so that Gateways will all use the same set of rules.

Routing Rules & Multiple Routing Gateways

If multiple evaluation processors need to be active (as could be the case at a consolidated site) each Routing Gateway can use its own local set of rules.

However, it is usually better for all Routing Gateways to use a single set of rules stored in a shared directory. Using the same set of rules will make maintenance easier (changes to rules need to be made in only one `Route.dic` file, rather than several), and allows each gateway in the pool to function as a backup for any other gateway.

VistARad Configuration—Sending Sites

For sites that will be *sending* autorouted images:

- The MAG VISTARAD SITE PARAMETERS File (#2006.69) needs to be edited.

- A site's SITE CODE (IMAGING SITE PARAMETERS File (#2006.1)) must be set to a non-null value that will identify the sending site.

To set routing-related VistARad site parameters

1   Open a terminal window and log into the VistA Hospital Information System.

2   Access the VistARad System Options menu [MAGJ MAIN] and run the "E/E VistARad Site Parameters" option [MAGJ VISTARAD SITE PARAMETERS].

3   Set the routing-related fields (shown in bold below) to YES.

```
Select MAG VISTARAD SITE PARAMETERS VISTARAD SITE NAME: DEMO
VISTARAD SITE NAME: DEMO//
ENABLE STATUS UPDATE?: YES//
RECENT EXAMS DAYS LIMIT: 9999//
UNREAD EXAMS DAYS LIMIT: 9999//
PREFETCH ACTIVE?: YES//
LIST ONLY EXAMS HAVING IMAGES?: NO//
ENABLE SERIES DISPLAY?: YES//
BACKGROUND COMPILE EXAM LISTS?: NO//
UNREAD BKGND COMPILE INTERVAL: 2//
RECENT BKGND COMPILE INTERVAL: 30//
REMOTE LIST ONLY REMOTE CACHE?: NO// YES   <obsolete>¹
SITE SENDS TO REMOTE CACHE:  NO// YES     <required>²
PATIENT LIST LIMIT # YEARS: 10//
PATIENT LIST LIMIT # EXAMS: 15//
UNREAD LIST PRIORITY SEQ: S,U,P,R//
```

> ➲ These steps assume that other fields in MAG VISTARAD SITE PARAMETERS are already set as desired. For information about other site parameters, refer to chapter 3 in the VistA Imaging Installation Guide.

4   Use FileMan to check the value of your site's SITE CODE field (#2006.1,.09). The value entered must not match any of the CacheLocationID values defined at

---

[1]   REMOTE LIST ONLY REMOTE CACHE? This field is retained for backward compatibility. For sites using the patch 32 VistARad client, this field, when set to YES, will show only the exams that have been routed to their site. For sites using the patch 18 client, this setting is a filter that can be set as desired by each user. For more information, refer to the *VistARad Quick Start Guide*.

[2]   SITE SENDS TO REMOTE CACHE? Setting this field to YES turns on extra processing that is needed to manage routed exams properly. One of the results of setting this field to YES is the addition of the RC column to VistARad's exam lists. The RC column is described on page 59.

receiving sites (see the next section for details). It is recommended that the SITE CODE be set to your standard 3-digit site code.

```
Select OPTION: E ENTER OR EDIT FILE ENTRIES

INPUT TO WHAT FILE: 2006.1 IMAGING SITE PARAMETERS (1 entry)
EDIT WHICH FIELD: ALL// .09 SITE CODE
THEN EDIT FIELD: <enter>

Select IMAGING SITE PARAMETERS NAME: `1 TEST SITE
SITE CODE: TST
```

VistARad Configuration—Receiving Sites

VistARad workstations at receiving sites will need to be configured to check the appropriate local storage location for the presence of routed exams. This is done by setting the CacheLocationID in the MAGJ.INI file for each VistARad workstation.

Setting the CacheLocationID affects VistARad in the following ways:

▪ When a user logs into VistARad, the locally-defined CacheLocationID is compared to the SITE CODE (IMAGING SITE PARAMETERS File (#2006.1)) of the site being logged into. If the two values are different, the VistARad software assumes that it will be used to display routed images.

▪ When a routed exam is selected for display, VistARad will check the local storage location for routed images. The storage location checked is specified in the applicable NETWORK LOCATION File (#2005.2) entry at the sending site.

The following steps must be performed for each VistARad workstation that will be used to display routed images.

To set the CacheLocationID in MAGJ.INI

1 Log into the VistARad workstation as an administrator.

2 Use Explorer or the Start | Run menu option to open C:\Programs\Vista\Imaging|MAG_VistaRad\MAGJ.INI.

3 Locate the CacheLocationID line under [Workstation Settings], near the beginning of the file.

4 For CacheLocationID, enter the destination name that contains local copies of routed images.

   ➲ The value you enter must match a routing destination name as defined in the sending site's NETWORK LOCATION File.

⮞ Partial matching can be used to allow VistARad to access images from multiple destinations. For more information, see the next section.

```
…
[Workstation Settings]
WorkStation TimeOut minutes=0
ID=UNKnown
Location=UNKnown
VistaRad test mode=FALSE
CacheLocationID=DEMO
…
```

5 Save and close the file.

Making Multiple Destinations Accessible to VistARad

A VistARad workstation can be used to display images from multiple (local) destinations. This is possible because partial matching is used when the CacheLocationID is compared to the names of routing destinations defined in the NETWORK LOCATION File (#2005.2).

For example, if a site is sending images to the destinations shown below, a VistARad workstation with its CacheLocationID set to Telerad would be able to access both destinations.

        TeleradMain
        TeleradBackup

Note that the partial matching used is based on leading characters. Continuing the above example, a destination named NewTelerad would not be treated as a match for workstations using Telerad as their CacheLocationID.

Changes Affecting Routing System Configuration

The following table lists situations that will require a change in routing configuration, and outlines the changes that will need to be made.

Routing System Change	Related Configuration Change
Alteration of location, permissions, etc., of a Imaging destination folder	Update NETWORK LOCATION File (#2005.2) entry for the applicable destination
New destination, or name change of existing destination	- Update NETWORK LOCATION File entry for the applicable destination - Update routing rules - Stop and restart transmission processor (if one processor serves all destinations), or start a new instance of the transmission processor for the new destination - Update VistARad workstation MAGJ.INI at receiving site
New Image Gateway / imaging modality	- Configure Image Gateway - Review and update routing rules if needed
Change of radiology staff at sending or receiving site	- Review and update routing rules if needed - Review NETWORK LOCATION File entry for destination and adjust if needed. - Determine if new staff members need on-demand routing privileges
Addition of new VistARad workstation	Update VistARad workstation MAGJ.INI

Using the Routing Gateway

This chapter explains how to use the Routing Gateway. This chapter covers the following topics:

- Activating Routing
- Maintaining Routing
- Disabling Routing
- Routing Gateway Menu Options

This chapter assumes that the Routing Gateway has been properly installed and configured.

⚠ US Federal regulations and VA internal policy prohibit unencrypted transmission of patient information outside the VA's intranet.

⚠ Routing can have a significant impact on network traffic. It is the responsibility of sites using routing to properly manage network demands related to routing. Before activating the routing software, notify your network administrator that there will be an increase (often a significant one) in network traffic to routing destinations.

Activating Routing

The steps below explain how to start the Routing Gateway's evaluation processor and transmission processor.

➲ Before performing the following steps, verify that Image Gateways in the routing system are processing images. If images are not being processed, no new entries will be added to the rule evaluation queue.

Starting the Evaluation Processor

1   Verify that the MSM server is running on the Routing Gateway. If it is not, double-click the MSM Console icon to start the MSM server.

MSM Console

2   Open a terminal window and log into the DICOM Gateway software.

3   Enter 3 to select "Routing Gateway" from the DICOM Gateway Menu [MAGDMENU].

4   Enter 3 to select "Start Evaluation Processor" from the Routing Gateway Menu.

5   Position and size the terminal window for subsequent monitoring. (Note that no new information will be shown in the terminal window until the evaluation processor encounters entries in the rule evaluation queue.)

Starting the Transmission Processor

1   Open a new terminal window and log into the DICOM Gateway software.

2   Enter 3 to select "Routing Gateway" from the DICOM Gateway Menu [MAGDMENU].

3   Enter 1 to select "Start the Transmission Processor."

4   A list of destinations will be displayed. To select all possible destinations, enter an asterisk (*). To enter a partial list, follow the instructions at the prompt.

```
Possible destinations are:
    125: KANSAS at \\TELERAD3\wichita
    152: ST LOUIS CR at \\vhastlvistarad
    164: IMAGPROVIDER1 at C:\REMOTE\IMAG1\
    166: LEAVENWORTH, KS at C:\REMOTE\LVW\
    167: IMAGPROVIDER2 HOME at C:\REMOTE\IMAG2\
    168: ST. LOUIS, MO at C:\REMOTE\STL\

Select destinations by:
 ==> Enter their number(s), separated by commas
 ==> Enter an asterisk (*) to select all possible destinations
Prefixing an entry with a dash deselects the listed
destinations

Enter a period when the selection is complete.
---> *
```

5   The destinations you selected will be displayed. Enter a period when you are finished.

6   Position and size the terminal window for subsequent monitoring.

➲ As the transmission processor sends exams to Imaging destinations, it will map and un-map certain drives. For more information, see page 66.

7   To start additional transmission processors, repeat steps 1 – 6 in a new terminal window.

Maintaining Routing

This section provides a summary of maintenance tasks for a routing system and explains how to access Routing Gateway log files.

Periodic Maintenance

The following tasks should be performed periodically to control the size of the transmission queue and to detect potential routing problems.

Task	Interval	Menu Seq.
Check terminal windows for evaluation and transmission processors	2-3 times daily	N/A
Review log files for error messages	Daily	4, 1, 2
Re-queue all failed entries in the transmission queue	As needed based on routing volume	3, 8
Purge completed and expired entries in the transmission queue	Monthly	3, 7
Remove obsolete entries from transmission queue	Monthly	3, 9
Monitor available free space in Imaging destinations (this can be done using the Background Processor's Network Location Manager)	As Needed	N/A
Confirm access to routing destinations	As Needed	N/A

Using Routing Log Files

A log file is created for each evaluation and transmission processor session. These log files can be used to review routing processes and to ensure that no errors have occurred.

➲ A DICOM Gateway retains the 20 most recently generated log files. Additional files will be retained if they are still open. Older log files are deleted.

Displaying log files

1 Open a terminal window and log into the Routing Gateway.

2 Enter 4 at the prompt to select "System Maintenance" from the DICOM Gateway Menu [MAGDMENU].

3 Enter 1 to select "System Operation."

4 Enter 2 to select "Display DICOM Message Log." The most recent log files will be displayed.

5 Enter the number of the log file you wish to display.

Disabling Routing

Short-Term Routing Shutdown

If routing needs to be disabled for a short period of time, the easiest thing to do is to stop the transmission processor(s). When this is done, images will still be evaluated and queued, but they will not be transmitted until the transmission processor is restarted.

Before restarting the transmission processor, use option 9: Remove Obsolete Entries from Transmission Queue to remove any entries that may have been created while the routing system was disabled. For more information, see page <u>57</u>.

Long-Term Routing Shutdown

If routing needs to be disabled for an extended period of time, perform the following:

- Stop the evaluation processor
- Stop all transmission processors
- Alter the configuration files for all Image Gateways to indicate that they are NOT part of a routing system (see page <u>37</u> for more information).

All images processed when routing is disabled as described above cannot be autorouted, even after routing has been restarted. Such images will need to be routed on-demand using VistARad.

Routing Gateway Menu Options

This section describes the menu options associated with the Routing Gateway. Routing Gateway menu options are accessed by entering 3: Routing Gateway from the DICOM Gateway main menu.

```
 1  Start the Transmission Processor
 2  Stop the Transmission Processor
 3  Start the Evaluation Processor
 4  Stop the Evaluation Processor
 5  Import Routing Rules
 6  Purge all completed entries in the Transmission Queue
 7  Purge completed and expired entries in Transmission Queue
 8  Re-Queue all Failed Entries in the Transmission Queue
 9  Remove Obsolete Entries from Transmission Queue
10  Display Routing Rules
```

1 Start the Transmission Processor

Use this option to start the transmission processor. Once started, the transmission processor will begin processing entries in the transmission queue.

➲ As the transmission processor sends exams to Imaging destinations, it will map and un-map certain drives. For more information, see page 66.

If a single transmission processor cannot manage a site's routing workload, additional transmission processors, each sending images to a subset of destinations, can be started using this option. For detailed steps, see page 51.

2 Stop the Transmission Processor

Use this option to stop all running instances of the transmission processor. When this option is executed, a flag is set that the transmission processor will recognize as "stop processing." The transmission processor checks this flag after transmitting each image file.

➲ Stopping the transmission processor can result in an incomplete exam being sent to a destination. If this occurs, the remainder of the exam will be transmitted when the transmission processor is re-started, provided that the applicable entries in the transmission queue are still present.

3 Start the Evaluation Processor

When this option is executed, the evaluation processor will begin examining routing-specific entries in the rule evaluation queue. This file is populated by Image Gateways (provided that Image Gateways are configured as part of a routing system).

The evaluation processor uses the rule evaluation queue and site-specific routing rules to determine which images are to be routed and where they are to be routed. Entries for images to be autorouted are added to the transmission queue.

Typically, a single instance of the evaluation processor can manage all images produced at the sending site. For consolidated sites, an instance of the evaluation processor should be started for each location. (In this situation, a "location" equates to an entry in the IMAGING SITE PARAMETERS File (#2006.1).)

4 Stop the Evaluation Processor

Use this option to stop the evaluation processor. When this option is executed, a flag is set that the evaluation processor will recognize as "stop evaluating." The evaluation processor checks this flag after analyzing each image file against the routing rules.

5 Import Routing Rules

When this option is executed, the rules in `\DICOM\Dict\Route.dic` will be loaded into the Routing Gateway's local MUMPS environment. For detailed steps about importing routing rules, see page .

6 Purge all completed entries in the Transmission Queue

Use this option to reduce the size of the transmission queue in test installations. Executing this option will remove entries for files that have been transmitted successfully.

Ã This option is intended for use at test sites. If this option is used, routed images will be "orphaned" at a destination—rather than being deleted automatically (after the defined retention period); the images will remain until deleted manually.

To purge completed entries without orphaning routed images, use the option described in the next section.

7 Purge completed and expired entries in the Transmission Queue

Use this option to control the size of the transmission queue. Executing this option will remove entries if both of the following conditions are met:

- The status of the entry indicates that an image file has been transmitted successfully.

- The entry is older than the RETENTION PERIOD (number of days) for the applicable destination.

This option should be run once a month as part of a Routing Gateway's periodic maintenance cycle.

8 Re-Queue all failed entries in the Transmission Queue

Use this option to try to re-send routed images that could not be sent within the number of attempts specified for that destination.

This option should be run periodically as part of a Routing Gateway's maintenance cycle. Sites that route a large number of exams, or that route high priority exams, should run this option daily. Sites that route a lower volume of exams may only need to run this option once a week.

9 Remove obsolete entries from Transmission Queue

Use this option when there is a large backlog of outdated entries in the transmission queue. When this option is executed, you will be prompted to enter a cutoff date (the date can be entered using FileMan conventions). After the date is entered, all unprocessed queue entries older than the specified date will be removed.

This option should be run once a month as part of a Routing Gateway's periodic maintenance cycle.

10 Display Current Set of Routing Rules

Use this option to display the current set of routing rules. This option is especially useful immediately after using option 5 to import a new set of rules.

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Using VistARad in a Routing System

This chapter explains how to use the VistARad diagnostic workstation software at sites that are part of a routing system. This chapter covers the following topics:

- Displaying Routed Exams
- VistARad & On-Demand Routing

Displaying Routed Exams

In VistA Imaging, the VistARad diagnostic workstation is used to display routed exams. A routed exam is available for display when the RC (Remote Cache) column in a VistARad exam list contains the destination name established for your site.

Remote Cache
Indicator

Values in the RC column are based on the SITE field in the sending site's NETWORK LOCATION File (#2005.2).

- When VistARad is used at a site that is the *source* of routed exams, the RC column can be used to determine which exams have been routed, and where they have been routed to.

- When VistARad is used at a site that is the *destination* of routed exams, users will need to log into the sending site's VistA system. After logging in, VistARad will automatically filter exam lists to include only routed exams (this filter can be removed if desired; see the next page for details).

Detailed steps for displaying routed exams are on the next page.

To display a routed exam

1 Log into the site or division that the routed exam was sent from.

2 Use an exam list to locate the routed exam you want to open. By default, exam lists are filtered to show only exams that have been routed from the site or division you are performing remote reading for.

Remote Cache
Indicator

Manager - In Use by IMAGPROVIDER8,8 on vhaiswimgs1										

File   View   Help

Exam List		Refresh Exams	Patient Lookup		☑ Remote Read Filter	Route Exams	

| Patient Exams | Unread Exams | Custom | Exam History | All Active Exams | |

40 UNREAD EXAMS: All Examined by Priority, Date/Time

Case #	Lock	Patient Name	ID #	Priority	Procedure	Image Date/Time	Status	# Img	Onl	RC	Mod
040600-28		IMAGPATIENT1011,...	I1011	4-Rout	CHEST SINGLE VIEW	08/01/2000@10:58	EXAMIN	1	Y		CR
092602-123		IMAGPATIENT1011,...	I1011	4-Rout	CT ABDOMEN W/CONT	09/26/2002@18:03	EXAMIN	112	Y		CT
112403-176		IMAGPATIENT1201,...	I1201	4-Rout	CHEST 2 VIEWS PA&LAT	11/24/2003@17:07	EXAMIN	2	Y	Route1	CR
112403-175		IMAGPATIENT1201,...	I1201	4-Rout	CT THORAX W/CONT	11/25/2003@09:43	EXAMIN	66	Y	Route1	CT
112403-179		IMAGPATIENT1202,...	I1202	4-Rout	CHEST 2 VIEWS PA&LAT	11/25/2003@10:30	EXAMIN	2	Y		CR
112403-180		IMAGPATIENT1203,...	I1203	4-Rout	SHOULDER 2 OR MORE ...	11/25/2003@10:40	EXAMIN	6	Y		CR
112403-181		IMAGPATIENT1203,...	I1203	4-Rout	MAGNETIC IMAGE,UPPE...	11/25/2003@10:53	EXAMIN	93	Y		MR
112403-183		IMAGPATIENT1204,...	I1204	4-Rout	ABDOMEN 3 OR MORE ...	11/25/2003@11:08	EXAMIN	4	Y		CR
112403-182		IMAGPATIENT1204,...	I1204	4-Rout	CHEST 2 VIEWS PA&LAT	11/25/2003@11:19	EXAMIN	2	Y		CR
112403-184		IMAGPATIENT1204,...	I1204	4-Rout	CT ABDOMEN W/CONT	11/25/2003@11:27	EXAMIN	113	Y		CT

➲ You can view all exams (routed and non-routed) by clearing the checkbox in the Remote Read Filter area near the top of the Manager window.

3 Double-click the exam, or select the exam and click Open.

➲ If a non-routed exam (an exam without a value in the RC column) is selected for display, there will be a delay while the images are retrieved.

➲ A routed exam can be locked and marked as interpreted in the same manner as any other exam. For more information, refer to VistARad User Guide.

➲ You can use ReadList to successively display all routed exams in an exam list. For more information, refer to VistARad User Guide.

➲ Local copies of routed exams are stored for a certain period of time (typically several days) and then deleted automatically by a process initiated from the sending site. The "original" exam remains available at the sending site after routed copies are deleted.

VistARad & On-Demand Routing

This section describes on-demand routing prerequisites and explains how to use VistARad's on-demand routing capability.

⚠ US Federal regulations and VA internal policy prohibit unencrypted transmission of patient information outside the VA's intranet.

⚠ Like autorouting, on-demand routing can have a significant impact on network traffic. It is the responsibility of sites using routing to properly manage network demands related to routing.

On-Demand Routing Requirements

For on-demand routing to function:

- A VistARad user must be logged into an Imaging system that includes a Routing Gateway.

- At the site being logged into, the VistA Imaging host, the Routing Gateway, and storage folders must be set up as described in this manual. The Routing Gateway's transmission processor must be running.

- To route images to other non-DICOM destinations within the VistA system (such as VistARad at a remote site) a VistARad user must have the MAGJ DEMAND ROUTE security key assigned to their account. To route images to a DICOM Storage SCP destination, the MAGJ DEMAND ROUTE DICOM key must be assigned to their account.

Using On-Demand Routing

On-demand routing lets you use VistARad to manually select exams and transmit them to existing routing destinations. On-demand routing is intended for situations where you need to route exams that do not satisfy existing routing rules, or where autorouting is not used.

➲ If you are frequently using on-demand routing for the same sorts of exams, contact your Imaging Coordinator and request that a change or addition be made to the rules used for autorouting.

Any exam that appears in a VistARad exam list can be routed on-demand. Newly acquired exams should not be routed until they have been case edited by a technologist using the Radiology package. Such exams have a status of "examined" in VistARad's exam lists.

To use on-demand routing

1   Log into VistARad. The VistARad workstation used for on-demand routing must be
       logged into a VistA system that includes a Routing Gateway.

  ➲ If you have access to more than one division, log into the division where the exams
     to be routed originate from.

2   Use the exam lists in the VistARad Manager to select the exams you want to send.

3   Click the Route Exams button, located in the upper right corner of the exam list.

  ➲ If the Route Exams button is not present, your user account does not have any of
     the security keys for on-demand routing assigned.

4   When the Route Request dialog opens, make sure all the exams you selected are
       shown.

  ➲ If a selected exam is not "online" (not available in short-term storage), a message
     will appear at the bottom of the Route Request window indicating that exam has
     been requested from the jukebox (long-term storage). Once the exam is available
     in short-term storage, you can select it for on-demand routing.

Case #	Patient	Procedure	Image Date/Time	Status	Route To	Priority
080504-255	IMAGPATIENT1011,...	TIBIA & FIBULA 2 VIEWS	AUG 5,2004@13:51	EXAMINED	ROUTESITE1	Medium
080504-256	IMAGPATIENT1011,...	KNEE 2 VIEWS	AUG 5,2004@13:51	EXAMINED	[Do Not Route]	Medium

Default Route To: [Do Not Route] ▼   Default Priority: Medium ▼

OK   Cancel
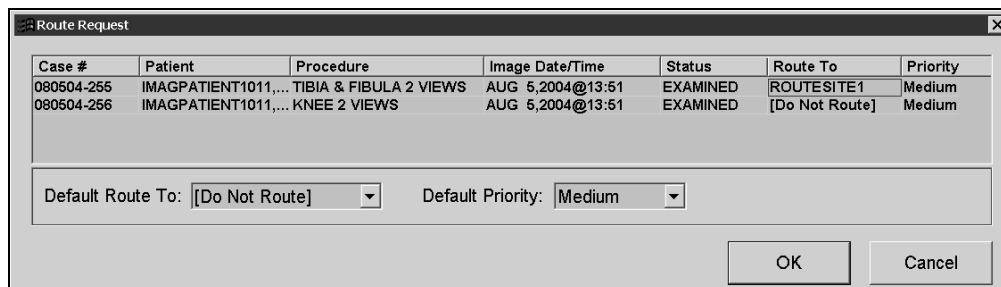
5   For each exam, click the 'Route To' field to select where you want to send the exam.

  ➲ In the 'Route To' field, the first destinations listed are Imaging destinations, such
     as remote VistARad workstations. If there are any DICOM destinations (such as
     film printers) defined, they will appear at the bottom of the 'Route To' field and
     will be preceded by "**dcm**".

  ➲ Use the Default Route To box near the bottom of the Route Request window to
     choose a single destination for all listed exams.

6   For each exam, use the Priority field to select the priority used to send the exam.

  ➲ Use the Default Priority box near the bottom of the dialog to choose a single
     priority for all listed exams.

• The priority assigned to exams for on-demand routing is not related to the exam priority indicated in VistARad's exam lists.

7 Confirm that the settings in the Route Request dialog are correct.

• You can choose not to route a listed exam by selecting the Route To box for that exam and choosing the [Do Not Route] option.

• You can click Cancel to close the Route Request dialog without routing any exams.

8 Click OK to route the exams. When the exam is received by the receiving site, the RC column entry for that exam will show the name of the receiving site.

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Troubleshooting Routing

This chapter covers the following topics:

- Basic Troubleshooting
- Getting Help
- Additional Routing Considerations

Basic Troubleshooting

If images are not arriving as expected at a routing destination, perform the following steps:

If…	Then…
This is the first time that routing software is being used	Verify that all configuration steps described in this document have been completed. Configuration checklists are available in Appendix A.
Exams are not being routed or are being routed incorrectly	1 Check the Image Gateways and verify that they are processing images. 2 Attempt to re-send images by running the "Re-Queue all failed entries in the Transmission Queue" option (Routing Gateway menu shortcut: 3, 8). 3 Review the routing log files to determine if the images were transmitted successfully (if you have just used the re-queue failed entries option, wait 15-20 minutes before opening the log files). 4 Review the contents of the routing rules file (Route.dic).
The routing software cannot connect to the destination	Verify that the network connection being used is available and set up properly. If the destination is an Imaging destination, refer to the steps for testing folders on page 29.
The log files indicate an invalid username or password.	Contact the receiving site and verify that the correct user name and password is being used by the routing software.

Getting Help

If additional assistance is needed, contact your Imaging Coordinator or local support staff.

If the problem cannot be resolved locally, open a help desk ticket, or contact the National Help Desk between 8:00AM and 6:00PM Eastern time, Monday through Friday, at 1-888-596-4357.

Urgent after-hours service requests can be directed to the Expertise Center at 1-800-299-7282.

Additional Routing Considerations

Transmission Processors and Drive Mapping

For each Imaging destination that it sends exams to, the transmission processor will map a drive using the following progression of drive letters: Q – Z, then G – P. If a drive letter (Q, for example) is not available, it will move to the next letter (R, for example) and so on. When all entries for a particular destination have been processed, the applicable drive is unmapped. This logic is not used for DICOM destinations.

Factors Affecting Routing Speed

Given a T1 connection and a light to moderate amount of network traffic, the first images in a routed exam will typically begin arriving at a destination within minutes. However, any of the following can impact the delivery of routed exams:

- A backlog of images at the Image Gateway, which is responsible for adding entries to the rule evaluation queue.

- A backlog of entries in the transmission queue. If numerous large exams are flagged for routing in a brief period of time, there will be a delay while all the images in the exam are transmitted. In situations where multiple destinations are being used, additional transmission processors may be used to alleviate delays. For more information, see page 51.

- Problems connecting to destinations. For Imaging destinations, the routing software will attempt to re-connect or retransmit the number of times specified for each destination in the NETWORK LOCATION File (#2005.2). For DICOM destinations, retry attempts are part of the DICOM transmission protocol. Failed connection or transmission attempts are logged by the Routing Gateway.

- The routing priority of a particular exam. For more information, see page 67.

Routed Images vs. Routed Exams

The Routing Gateway evaluates and transmits data on an image-by-image basis. If the transmission processor is disabled when an exam is partially transmitted, the exam is usually treated as "unrouted" until the transmission processor is re-started, and the transmission of the exam is completed.

In some situations, such as the presence of multiple Image Gateways or the use of on-demand routing, images from one exam will "interrupt" the transmission of images of an exam that is partially routed. This can occur because entries are added to the rule evaluation and transmission queues for each image, rather than for each exam. Usually, this behavior is invisible to the end user.

If a partially routed exam is opened from VistARad, the VistARad software will first attempt to retrieve images from the local storage location identified in the MAGJ.INI file

for that workstation. Images not found in local storage will be retrieved from their originating site.

How the RC Column is Populated

The RC (Remote Cache) column in VistARad's exam lists is populated with a destination-specific indicator when a routed exam is received by a destination. The same indicator is removed from the RC column when the routing software deletes the local copy of the exam.

The addition or removal of the indicator is dependent on a specific "representative image" in the routed exam. A "representative image" is the last image processed by an Image Gateway for a given exam. Typically, the representative image is also the last image in an exam's clinical sequence.

Image Gateways process images in the order that they are received from a modality. Some modalities may send images to Image Gateways in an order other than the expected clinical sequence. If this occurs, and if such an exam is routed, the RC column may be populated before transmission of all the exam's images has completed. A user opening such an exam may experience a delay while part of the exam is retrieved from the sending site.

Preventing Transmission of Duplicate Exams

For Imaging destinations, the transmission processor will check the destination to see if the image to be routed is already present. If a duplicate of the image is found, the transmission processor removes the redundant entry from the transmission queue, and moves on to the next entry in the queue.

For DICOM destinations, image management and duplicate checking is the responsibility of the destination system.

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Appendix A

This appendix contains worksheets that can be used while setting up a routing system. They can also be used for record-keeping purposes. The following worksheets are provided:

- Imaging Destination Worksheet
- DICOM Destination Worksheet
- Routing Rule Definition Worksheet
- Routing Setup Checklist

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Imaging Destination Worksheet

Use this worksheet to record information about a specific Imaging destination. A sample Network Location File definition is provided on the next page.

Destination name[1] _____

Site served by destination _____

General purpose of this destination _____

Alternate/backup destination _____

Storage folder name _____

Destination computer/share name[2] _____

Username/password for destination _____

Associated user group (if any)[2] _____

File types transmitted to destination (circle those that apply)[3]   Abstract / Full / Text / Big

Retention period? (in days)[3] _____

_____

[1] Specified in the .01 field in the NETWORK LOCATION file. Referenced in routing rules (Route.dic), and in the CacheLocationID parameter for VistARad workstations at receiving sites.

[2] Specified by receiving sites when creating a storage folder. Referenced sending site's NETWORK LOCATION file.

[3] Specified in sending site's NETWORK LOCATION file.

NETWORK LOCATION **File Sample**

For detailed information about specific fields, see page 32.

```
 Select NETWORK LOCATION: TESTDEST
   Are you adding 'TESTDEST' as a new NETWORK LOCATION (the 11TH)?
No// Y

 PHYSICAL REFERENCE: \\VHAxxxxxx\images$\
 STORAGE TYPE: MAG   MAGNETIC
 TOTAL SPACE: <blank>
 SPACE USED: <blank>
 FREE SPACE: <blank>
 OPERATIONAL STATUS: 1  On-Line
 HASH SUBDIRECTORY: <set as appropriate for your site>
 ABSTRACT: N   No
 FULL: Y   Yes
 BIG: Y   Yes
 TEXT: Y   Yes
 DICOM: N   No
 COMPRESSION: <blank or J2K >
 USER NAME: <Use the "routing username" here>
 PASSWORD: <Use the "routing password" here>
 MAINTAINCONNECTION: <blank>
 MAX # RETRY ON CONNECT: 3
 MAX # RETRY ON TRANSMIT: 5
 SYNTAX: U UNC
 SUBDIRECTORY: <blank>
 Select USER    <blank>
 RETENTION PERIOD: 5
 LAST PURGE DATE:
 SITE: <set as appropriate for your site>
 ROUTER: Y  YES
 TIME OFFLINE: <blank>
 MUSE SITE #:  <blank>
 MUSE VERSION #: <blank>
```

DICOM Destination Worksheet

Use this worksheet to record information about a specific DICOM destination.

Destination name[1] _____

Site served by destination _____

General purpose of this destination _____

Alternate/backup destination _____

Calling AE Title _____

Called AE Title _____

IP address/hostname _____

Socket/port _____

Presentation Context / Transfer Syntax (list all used)

_____

_____

_____

_____

DICOM Destination Sample

For detailed information about specific fields, see page .

```
# User Application List
# Format:
# line 1:App Name|Called AE|Calling AE|Destination IP Address|Socket
# line 2:|Presentation Context Name|Transfer Syntax Name
# line 3:||Transfer Syntax Name (if there are more than one)
#
MERGE EFILM|VistA_Storage|VistA_Send_Image|111.222.33.44|4006
|Modality Worklist Information Model – FIND|Implicit VR Little Endian
|Verification SOP Class|Implicit VR Little Endian
```

---

[1] Specified as the Application in the SCU_List.dic file, and referenced in routing rules
   (Route.dic).

Routing Rule Definition Worksheet

Rule Request *(to be completed by Radiology staff or supervisor)*

Identify the purpose of the rule (circle one):

    a Routine workload sharing

    b Rapid access for clinic / facility

    c After-hours or holiday coverage

    d Second opinions / consults

    e Transfer of images to a non-local specialist / support for a new modality or imaging type

    f Other _____

List each destination that this rule will serve:

    a _____   **d** _____

    b _____   **e** _____

    c _____

Will prior exams be included with this rule? (circle one):   Yes   No

Will prior exams be included with this rule? (circle one):   Yes   No

Will all exams for this rule be sent to all listed destinations (circle one):   Yes   No

If the answer to the above is **NO**, specify the % of exams each destination should receive (total must = 100%):

    a _____ ____ %   **d** _____ ____ %

    b _____ ____ %   **e** _____ ____ %

    c _____ ____ %   <u>local (not routed)</u> ____ %

List conditions that will trigger the execution of the rule (fill any all that apply):

a   Exam modality of: _____

b   Off hours/holiday coverage (specify hours/days)

_____

_____

_____

c   Other _____

_____

Rule Impact/Review *(to be completed by Imaging Coordinator)*

Estimated amount of storage needed at each destination for this rule: _____

Bandwidth available between sending and receiving sites: _____

Total number of exams expected to be transmitted per month: _____

Rule adheres to routing policies established by sending site (circle one):   Yes   No

Rule adheres to routing policies established by receiving site (circle one):   Yes   No

Rule Implementation *(to be completed by staff responsible for Routing G/W)*

Rule as entered into the Route.dic file: (sample rules listed below)

_____

_____

_____

_____

_____

_____

_____

Route.dic imported to Routing Gateway (circle one):   Yes   No

Rule tested and found to be functional (circle one):   Yes   No

Date _____

Sample Rules

The following sample rules use the fictional destinations listed below:

Imaging destinations (entered in the Network Location File (#2005.2))

```
        Archive
        Contractor1
        Contractor2
        Contractor3
        ContractingReader
        LocalJukeBox
        LogBook
```

DICOM destinations (entered in the DICOM Transmit Destination File (#2005.587) via SCU_List.dic):

```
        E-FilmApplication
        LaserShare
```

Example #1:
```
# auto-route all images from a specific modality to a
# contractor who reads this type of images, using standard
# copy for transmission

Send("ContractingReader")
     When MODALITY="CT"
```

Example #2:
```
# auto-route all images to an archive, using standard copy
# for transmission

Send("Archive")
     When MODALITY="*"
```

Example #3:
```
# auto-route all images from a remote site back to local
# storage at that site, using standard copy for
# transmission

Send("LocalJukeBox")
     When MODALITY="*"
          SOURCE="StElseWhere"
```

Example #4:
```
# auto-route all important studies to an internal
#  workstation, using standard copy for transmission

Send("LogBook")
     When MODALITY="*"
          URGENCY="STAT"
```

Example #5:
```
# auto-route all images from a specific modality to three
# contractors, balancing the load, so that each contract
# receives a pre-determined fraction of the studies and
# leaving a pre-determined fraction for interpretation by
# local staff, using standard copy for transmission

Balance("Contractor1"=20%, "Contractor2"=40%,
"Contractor3"=20%, <LOCAL>=20%)
     When MODALITY="XA"
```

Example #6:
```
# auto-route all images from a specific modality to a
# contractor who reads this type of images, using standard
# copy for transmission and giving these transmissions a
# high priority

Send("ContractingReader")
     When MODALITY="XA"
     Priority High
```

Example #7:
```
# auto-route all images from a specific modality to a
# printer, using the DICOM protocol for transmission and
# giving these transmissions a low priority

Send("LaserShare")
     When MODALITY="CT"
     Priority Low
```

Example #8:
```
# auto-route all images from a specific modality to a DICOM
# repository, using the DICOM protocol for transmission and
# including images from prior studies

Send("E-FilmApplication")
     When MODALITY="CT"
     PriorStudy Yes
```

Routing Setup Checklist

Imaging Destination Setup

a Username and password available for each destination? _____

b Folders created and shared for each destination? _____

c Ability to access and write to each storage folder verified? _____

d Network location entry defined for each destination? _____

e VistARad site parameters set up at sending site? _____

f CacheLocationID set on workstations at receiving sites? _____

DICOM Destination Setup

a Destination information added to SCU_List.dic? _____

b SCU_List.dic updated on DICOM Gateway? _____

Destination application accessible? _____

DICOM Gateway Setup

a Image Gateways configured properly? _____

b Routing Gateway configured properly? _____

Routing Rule Setup

a Rules defined in Route.dic? _____

b Route.dic imported successfully? _____

Routing Activation

a Image Gateways processing images? _____

b Routing Gateway evaluation processor activated? _____

c Routing Gateway transmission processor(s) activated? _____

d Images routed successfully? _____

e Images at receiving site purged at end of retention period (Imaging dest. only) _____

Appendix B: Using MAG_Decompressor

This section explains how to install and configure the Automatic Decompression Service (MAG_Decompressor).

MAG_Decompressor can be installed on a VistARad workstation or on any other system that is receiving compressed images via automatic or on-demand routing. Note that MAG_Decompressor should *NOT* be installed on a DICOM Gateway.

Once it is configured, MAG_Decompressor runs in the background and will de-compress routed images as they are received by the destination system.

This service does not need to be installed on systems that only receive uncompressed routed images.

Licensing

A toolkit license is needed for each system that is sending or receiving compressed images. For more information, contact VistA Imaging Customer Support.

MAG_Decompressor Setup

Distribution

The decompression software is distributed as a part of Patch 51. The installation file, MAG_Decompressor_Setup.exe, is available on the Imaging FTP site under Software\Released Software\ Mag3_0p51\MAG_Decompressor.

Installation

1 Log in as an administrator on to the system that will be receiving compressed images via automatic or on-demand routing.

2 Install the MAG_Decompressor_Setup.exe file as follows:

   a Locate the distribution directory for MAG_Decompressor_Setup.exe and double-click the file.

   b As the InstallShield script is executed, click on **Next**, **OK** and **Finish** as appropriate. The software will be installed into its own folder under C:\Program Files\VistA Imaging.

3 Set up system variables for the decompression service as follows:

   a Open the Windows Control Panel (click Start | Settings), then double-click on System.

b In the System Properties dialog, click the Advanced tab, then click Environment Variables.

c In the System Variables list at the bottom of the dialog, locate the following variables and adjust the values if needed.

DECOMP_LOG_FSPEC: the path and file name of the decompression service log file. The administrative user must have write-permission for this file. The format of this name must follow the usual pattern: <drive:>\<path>\<filename>.<ext> (neither <filename> nor <ext> may contain a period).

DECOMP_LOG_FILE_MBYTES: the maximum size permitted for the decompression service log-file (default is **1MB**); when this limit is reached, the old log-file is renamed and a new one is created. The last 10 files are retained.

DECOMP_WATCH_DIR: the root-directory of the directory tree that will be monitored by the decompression service (default is **c:**). This value should be changed to reflect the folder that is receiving compressed images.
The format of this name must follow the usual pattern: <drive:>\<path>[\]

DECOMP_DELAY_MS: the number of milliseconds that the service will wait after detecting a compressed file before beginning the decompression process (default is **50ms**).

d Click OK on the various dialogs until all dialog windows for setting up System parameters are closed. (Keep the Control Panel open; it will be needed for a later step).

4 Activate the MAG_Decompressor program as follows:

a Open a command line window (click Start | Run, then enter 'cmd').

b Enter the following command to switch to the MAG_Decompressor installation folder:

```
cd \Program Files\VistA\Imaging\MAG_Decompressor <Enter>
```

c Enter **dir** at the prompt and verify that the files shown below are present.

```
Directory of C:\Program Files\Vista\Imaging\MAG_Decompressor

05/02/2005  09:37a       <DIR>          .
05/02/2005  09:37a       <DIR>          ..
04/13/2005  07:16a              856,064 awj2k.dll
05/02/2005  08:39a               53,248 MAG_Decompressor.exe
               2 File(s)        909,312 bytes
               2 Dir(s)  58,401,358,848 bytes free
C:\ . . .>
```

> **Note:** If the DLL file is not present, contact the Imaging Group for information about acquiring a toolkit license. The decompression software will not work without the DLL file.

d Enter the following command to activate the program (The command will complete without any warning or error messages).

```
Mag_Decompressor –install <Enter>
```

e Close the command window.

5 Activate the decompression service as follows:

a In the Control Panel, double-click Administrative Tools.

b Double-click Services. (On some versions of the Windows operating system, this icon is labeled Component Services.)

c In the window that opens, locate the entry for the "MAG J2K Decompressor Service".

d Right-click on the entry and select Start. Wait until the status display shows that the service is started.

e Right-click again on the entry and select Properties.

f In the Properties window, select Automatic as the startup type, then click OK.

g Verify that the status display shows that the service is "Automatic".

h Close all remaining Control Panel windows.

Your system is now ready to start decompressing files that were routed in compressed form.

Note: when parameters need to be modified, the steps listed above can be used to establish new values for the parameters. However, it will be necessary to reboot the computer before the new values of the parameters will become effective.

MAG_Decompressor Logging

The decompression software will run automatically when needed. If problems are encountered review, the log files generated by the MAG_Decompressor software.

Log files are stored in the location specified in the **DECOMP_LOG_FSPEC** system variable. The ten most recently generated log files are retained.

Sample log entry:

2005-04-19 16:59:01 --

2005-04-19 16:59:01 S T A R T E D Directory-Watch/Decompression Service over
C:\test_img_cache\
2005-04-19 17:01:10 C:\test_img_cache\MAG_EyeClot.J2K Status -> SUCCESS (0)
2005-04-19 17:01:11 C:\test_img_cache\MAG_Skull.J2K Status -> SUCCESS (0)
2005-04-19 17:01:19 C:\test_img_cache\MAG_Spine.J2K Status -> SUCCESS (0)
2005-04-20 13:32:59 C:\test_img_cache\MAG_Spine.J2K Status -> OutFile Already Exists, InFile
Removed
…..
…..
2005-04-21 13:34:32 S T O P P E D Directory-Watch/Decompression Service over
C:\test_img_cache\ (status=ok)

Selected log file error codes:

1..999   Aware JPEG2000 library errors

1000... Application errors:

   2006: EIFILEREMOVE-- input file remove error (access violation)
   3000: EOFILEEXISTS-- output file already exists
   3001: EOFILEOPEN-- error while opening the output file
   3003: EOFILEWRITE-- problem attempting to write the data to the output file
   3004: EOFILERENAME-- error while renaming output file from .tmp to .<ext>

Glossary

This manual uses the following terms:

autorouting   The automatic transmission of selected images to one or more destinations. Autorouting functions are managed using the Routing Gateway.

destination   An intended recipient of routed images. Destinations can be Imaging destinations, such as VistARad workstations, or DICOM destinations, such as a film printer or external PACS (or any other DICOM Storage Service Class Provider).

DICOM TRANSMIT DESTINATION File (#2006.587)   The FileMan file where information about DICOM destinations is stored. This file should not be edited directly; to update the contents of this file, use the DICOM Gateway to update the SCU_List.dic file.

evaluation processor   The process responsible for handling entries in the rule evaluation queue. This process is started or stopped from the Routing Gateway, and executes from the VistA Host.

IMAGE BACKGROUND QUEUE File (#2006.03)   The FileMan file where rule evaluation queue entries are stored. The IMAGE BACKGROUND QUEUE File contains entries used by various processes to move, copy, or delete images. The IMAGE BACKGROUND QUEUE File is populated by Image Gateways, and is used by both the Background Processor and the evaluation processor.

locks   Used on a VistARad workstation prevent more than one radiologist from interpreting the same exam. If a radiologist opens a locked exam, they will be notified that the exam is locked, and while they can display the exam, they will be unable to update its status.

NETWORK LOCATION File (#2005.2)   The FileMan file where routing destinations are defined. The NETWORK LOCATION File contains entries for all physical storage devices in the Imaging system.

on-demand routing   The transmission of manually selected exams to one or more destinations. Images are selected using the VistARad diagnostic workstation and are transmitted by the Routing Gateway.

receiving site   The recipient of routed images. The receiving site provides either a storage folder (for Imaging destinations) or a DICOM Storage SCP (for DICOM destinations) for images to be routed to.

Route.dic   The DICOM Gateway dictionary file used to store routing rules.

routing   In the VistA system, the process responsible for sending images across a WAN to one or more remote locations. Routing can be performed automatically (autorouting), or on-demand.

Routing Gateway   A computer running the DICOM Gateway software that is configured to manage the routing of images in the VistA system. A Routing Gateway is typically run on a dedicated computer. Also, the set of menu options in the DICOM Gateway software specific to routing.

routing rules   The information used by the Routing Gateway to select images for autorouting. Routing rules are defined in a text file and are imported into a MUMPS table used by the Routing Gateway.

routing system   All of the software and hardware components related (but not necessarily limited to) routing. Parts of the routing system include the Routing Gateway, Image Gateways, and VistARad workstations.

rule evaluation queue   The queue used to determine if newly acquired images will be autorouted or not. This queue is populated by Image Gateways. Entries in this queue are compared to routing rules by the evaluation processor. Entries that meet the criteria in routing rules are added to the transmission queue.

SCU_List.dic A dictionary file used by the DICOM Gateway that contains information about each DICOM Storage SCP that can receive DICOM images from VistA Imaging. DICOM Storage SCPs in this file can receive DICOM images sent automatically as a function of routing, or sent manually using a menu option on the DICOM Gateway.

SEND QUEUE (#2006.035) The FileMan file where transmission queue entries are stored.

sending site The site where routed images are produced. The Routing Gateway resides at and is maintained by the sending site.

storage folder   The physical storage location provided by an Imaging destination. A storage folder must be referenced in a destination entry in the NETWORK LOCATION File.

transmission background processor   The original name of the transmission processor in test versions of the routing software. There is no relationship between the transmission background processor and the Background Processor.

transmission processor   The Routing Gateway process responsible for processing entries in the transmission queue, and for purging obsolete routed image files from routing destinations.

transmission queue   The queue used by the transmission processor to send routable images to their destinations. Each entry in this queue represents a single image file. Entries are added to this queue by the evaluation processor (for autorouting) or by VistARad (for on-demand routing). Processed entries can be purged from this queue using a Routing Gateway menu option.

VistARad   In VistA Imaging, the software used to display diagnostic-quality radiologic exams. VistARad is the primary tool used to display routed exams and to route exams on-demand.

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