Installation and Configuration Guide

Version 6.0.0

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I. Overview

A. SUMMARY

RIdistribute has been designed and implemented to reduce the manual image distribution tasks in a complex imaging network. It provides basic functionality for disk balancing between workstations, scheduled image distribution to other workstations or facilities based on user-defined criteria, remote distribution to other databases or DICOM storage class providers, and threshold based archiving to accommodate hierarchical storage technology.

It has been designed to operate on each workstation to optimize network efficiency and minimize communications costs. However it does rely on the central image manager (database) to coordinate its image distribution tasks so that multiple processes can accurately predict available disk capacity in a non-static environment.

B. REQUIRED APPLICATIONS BASED ON FUNCTIONALITY

RIdistribute requires the following applications and versions to function:

- **RIdistribute**: Required for disk balancing and scheduled image distribution.
- **RIdistribute & RIdicom**: Required for remote DICOM image distribution.
- **RIdistribute & RIArchive**: Required for automatic threshold archiving.

Version 4.0.0r or greater is required of each of these applications. The Rational Imaging version on all the workstations must be Version 4.0 or greater.

C. DEDICATION

We would like to take this opportunity to thank Dr. Michael Albert of Thomas Jefferson University. Many of the load balancing concepts were derived from a prototype developed by him for their extensive multi-facility imaging network. The ability to define sub-nets of available systems for image distribution is ingenious, and creates clarity in a fairly complex subject. This conceptual simplification makes configuration easy, yet is versatile enough to support complex wide-area-networks where mixed communications equipment is used (ISDN, Frame Relay, T1, 10 and 100baseT). Dr. Albert… many thanks for your efforts and dedication to PACS.

D. GETTING STARTED

The following chapters will describe each of the fundamental operations provided by RIdistribute. They will discuss installation, configuration options, and provide examples to
simplify common installations. If you are familiar with the configuration of RI-distribute, proceed to the chapter which covers the functionality you wish to implement.
II. Installation

A. REQUIRED APPLICATIONS

RIdistribute is available for Rational Imaging Version 4.0 and greater. For disk balancing, the RIdistribute application is all that is required. If remote image distribution via DICOM is desired, then a license for the RIdicom application is also required. If threshold archiving is desired, then a license for the RIarchive application is required.

B. RIDISTRIBUTE INSTALLATION

RIdistribute version 4.0.0r or greater should be used. To check the current version, issue the following command in a shell tool.

```
/opt/ISTri/bin/get_version /opt/ISTri/bin/ridistribute
```

The get_version program will extract the application level version of the RIdistribute application. If the current version is below 4.0.0s, then download the newest version from the IST website:

(Note: Rational Imaging Upgrade 4.0 should have been applied)

```
http://www.IntuitiveSoftware.com/upgrades (ridistribute400s.tar.Z)
```

Copy ridistribute400s.tar.Z to the /img partition and run the following commands:

```
uncompress ridistribute400s.tar
tar xvf ridistribute400s.tar
mv ridistribute /opt/ISTri/bin
su
```

```
/opt/ISTri/bin/risetmode
```

The “risetmode” script will change the permissions and mode of sensitive applications. Rational Imaging applications which handle images (riupdate, ridistribute, riport, rilocate…) must be owner = imaging, group = imaging, and mode = 6775 so that these applications are run with the correct permissions to move and delete the images.

Run the get_version application once more to make sure that the correct version of RIdistribute is now in the /opt/ISTri/bin directory. If RIdicom and RIarchive are not required, then proceed to the configuration sections.
C. RIDICOM INSTALLATION

RIDicom version 4.0.0r or greater should be used. In addition, ritodicom version 4.0.0r should also be present. To check the current version of these applications, issue the following commands in a shell tool.

```
/opt/ISTRi/bin/get_version /opt/ISTRi/bin/ridicom
```

```
/opt/ISTRi/bin/get_version /opt/ISTRi/bin/ritodicom
```

The get_version program will extract the application level version of the applications. If the current version is below 4.0.0r, then download the newest version from the IST website: (Note: Rational Imaging Upgrade 4.0 should have been applied)

```
http://www.IntuitiveSoftware.com/upgrades (ridicom400r.tar.Z)
```

Copy ridicom400r.tar.Z to the /img partition and run the following commands:

```
uncompress ridicom400r.tar
tar xvf ridicom400r.tar
mv ridicom /opt/ISTRi/bin
mv ritodicom /opt/ISTRi/bin
su
/opt/ISTRi/bin/risetmode
```

To initialize the database and reset the image directory capacities, use the following exam. This command is useful to make sure that the database has accurate image directory capacities.

```
ridistribute -v -r //server/db/radiology
```

D. RIArchive INSTALLATION

RIarchive version 4.0.0r or greater should be used. To check the current version, issue the following command in a shell tool.

```
/opt/ISTRi/bin/get_version /opt/ISTRi/bin/riarchive
```

The get_version program will extract the application level version of the application. If the current version is below 4.0.0r, then download the newest version from the IST website: (Note: Rational Imaging Upgrade 4.0 should have been applied)

```
http://www.IntuitiveSoftware.com/upgrades (riarchive400r.tar.Z)
```

Copy riarchive400r.tar.Z to the /img partition and run the following commands:

```
uncompress riarchive400r.tar
tar xvf riarchive400r.tar
mv riarchive /opt/ISTRi/bin
su
/opt/ISTRi/bin/risetmode
```
III. Configuration

A. SUMMARY

This section will present an overview of the basic operations and define all of the parameters that are available to RIDistribute. Read the following chapters for individual configuration tips regarding a particular function.

B. DISTINCT FUNCTIONS PERFORMED

There are currently seven distinct functions that RIDistribute can perform as follows:

- **SelectMove**: Move exams based on a pre-defined SQL select statement (Scheduled distribution)
- **SelectRemove**: Delete exams based on a pre-defined SQL select statement (Remove old exams which have been archived twice and remain unaltered).
- **SelectSend**: Send exams based on a pre-defined SQL select statement to a remote “DICOM storage class provider” workstation. (Scheduled remote distribution)
- **ThresholdArc**: Archive exams when a critical threshold has been reached.
- **ThreshMove**: Move exams based on specified thresholds (Disk Balancing).
- **ThreshRemove**: Remove exams when a critical threshold has been reached.
- **ThreshWarn**: Issue a warning via email when a critical threshold is reached.

These functions are specified in the “Process:” tag as defined in the section “Parameter Definitions”.

C. COMMAND FILE

RIDistribute operates on a command file specified on the RIDistribute commandline.

```
ridistribute -c /path/cmdfile
```

The elements in this command file determine the operation of RIDistribute. RIDistribute may have only 1 commandfile per workstation if disk balancing is the only operation invoked. Or it may have several commandfiles if different operations are scheduled at varying times during the day. Generally you should use 1 commandfile and 1 lockfile (explained later in this chapter) per scheduled event in the crontab (scheduling is discussed in the next chapter).
If load balancing is desired every 15 minutes, and a scheduled RIdistribute event is activated at 6pm every day to move dictated exams off of the local disk, then 2 crontab entries will be required with 2 separate commandfiles and 2 lockfiles.

0,15,30,45  *  *  *  *  exec csh –c “/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid.balance”
0  18  *  *  *  exec csh –c “/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid.movedictexms”

Read the following sections discussing the use of lockfiles, and the next chapter for an explanation of how to schedule processes in the crontab.

D. Parameter Definitions

The following parameters may be used in the RIdistribute commandfile to configure RIdistribute capabilities on a particular workstation. Use this section in combination with some of the example chapters to help understand the fundamentals of RIdistribute.

DebugOn: This parameter determines the verbosity of the reporting that RIdistribute does during operation. The range of values is 0 (minimal reporting) to 10 (maximal reporting). Error reporting is done through the syslog process. This must be configured on the workstation in order to log user application errors. Configuration for the syslog process is described at the end of this chapter.

DbSource: Specify the path and name of the informix patient database. Use informix’s notation when specifying this (//$serverhostname/dbpartition/dbname). An example of this would be (//$pacs1/db/radiology).

LockFile: Specify the name of a lockfile (path/filename) which can be used to ensure that multiple scheduled RIdistribute processes do not overlap. If you have RIdistribute scheduled to check the disk capacity every 15 minutes, and the last RIdistribute is still moving exams, then the next RIdistribute process will exit and allow the first RIdistribute to finish. Use a separate lockfile name for distinct operations. For example, the disk balancing operation is scheduled every 15 minutes in the crontab and uses 1 lockfile (/opt/ISTri/etc/rid.bal.lck). At 6:00 every day, a scheduled RIdistribute event occurs to move all the dictated exams from the image partition and may run simultaneously with the balancing routine. Therefore, specify a new lockfile (/opt/ISTri/etc/rid.mv.lck) for this operation. If multiple processes do occur on the same workstation, they will not harm the integrity of the data, or conflict in any way, however they will consume CPU operations and increase network traffic unnecessarily. At 6:00 in the evening, most of the exams have been read and the network should be quiet. This is an acceptable time to schedule multiple RIdistribute processes (balancing and scheduled move operations).

MailTo: Specify the email address of the administrator who will be notified when an error occurs. This email address can be an alias for a group of people. If the unix email system has not been configured, do not use this parameter. If the server has been established as the main mailhost, (using /etc/mail/main.cf as sendmail.cf), then a simple email address would be imaging@pacs1 where pacs1 is the server hostname and no Internet Domain has been established.
**AvailDir:** Specify an image partition that may be used for available disk space. Include the directories that are being checked “CheckDir”. Multiple “AvailDir” lines may be used to specify all of the available image partitions. The parameter list for this command is as follows (AvailDir: hostname /net/hostname/img 300 200 100 LAN100 All.FacilityA.Pacs1.A):

**Hostname:** Name of the image partition’s host  
**NFS Directory:** Directory Name (/net/hostname/img)  
**Desired:** Minimum desired disk space in MBytes. This value specifies the disk capacity that you would prefer to have available if there is extra space on other disks.  
**OK:** The OK capacity is the next threshold to maintain available space at (specified in Mbytes). If all the disks are below the desired capacity, try to maintain disk space at the OK level. A warning message is sent to the administrator when this level is reached.  
**Minimum:** The minimum capacity is the final threshold to maintain available space at (also in Mbytes). If all the disks are below the minimum capacity, then the administrator will be notified that a critical level of disk capacity has been reached. If there are any remove statements defined (Remove, RemMbytes, RemNexams), then exams will be deleted at this time to create available disk capacity.  

**NetSpeed:** The average network transfer time in Kbits/Second from the available disk to the disk being checked (CheckDir command). The following times may be used if no other information is available (100BaseT = 15000, 10BaseT = 1500, T1 = 1000, FR384 = 200, ISDN = 64). These are average transfer rates assuming that there is other traffic on the network. This parameter will help determine how long it will take to transfer the exam to another system. If the exam transfer “hangs” for whatever reason, then the central image manager can “cancel” the request for available disk capacity and remove the overdue request from the queue. This information also allows the image manager to estimate the “future disk capacity” of an image partition when multiple processes are transferring exams to or from it.  

**Priority:** This is the most important parameter in that it specifies the regional priority of an available disk. The priority has been implemented much like the internet’s IP addresses. A facility’s image partition being balanced may be given a priority of All.FacilityA.Pacs1.A. Other available directories may be given priorities of All.FacilityA.Pacs1.B, All.FacilityA.Pacs2 or All.FacilityB.Pacs2.A. The more elements that match from left to right, the higher the priority. Thus, the image partition specified as All.FacilityA.Pacs1.B will have the highest priority because All, FacilityA and Pacs1 match the disk being checked. Then All.FacilityA.Pacs2 will be the next image partition checked since both All and FacilityA match. And finally, if none of these disks have available space, then All.FacilityB.pacs2.A will be checked since the All matches. All of image partitions that match at least 1 level will be checked for the desired space. If no desired space is available, then the threshold is changed to the OK level, and the disks are again checked by priority. If no OK space is
available, then the threshold is changed to the minimum value, and the disks are again checked. If no disk space is above the minimum value, then the administrator is notified via email, and exam removal will be attempted if configured. Also, an error is generated and the administrator is notified each time the threshold is changed. The first change from desired to OK is a warning situation. The last change from OK to minimum generates an error message. If no minimum disk space can be generated (all the disks are below minimum and no exams can be removed), then a critical error message is generated.

**CheckDir:** This parameter specifies the image partition to be checked for available disk capacity. The directory specified here must also be specified in the AvailDir statement prior to this configuration line. The parameters for this command are *(CheckDir: hostname /net/hostname/img):*

- **Hostname:** Name of the image partition’s host
- **NFS Directory:** Directory Name (/net/hostname/img)

**SelDest:** Specify the selected destination partition as a priority value (see the Priority field in the AvailDir parameter section). Only 1 SelDest specification will be used per operation (Process statement). However, this value is specified as a priority, so multiple image partitions may fall into the specified priority category. For example if several AvailDir partitions are specified (bigdisk.pacs1.1, bigdisk.pacs1.2, bigdisk.pacs2.1, bigdisk.pacs2.2, smalldisk.pacs3.1) and the SelDest is specified as “bigdisk”, then the 4 partitions whose priority starts with “bigdisk” will be used for available disk capacity. The “smalldisk.pacs3.1” partition will not be used since it does not match. This parameter is primarily used with the SelectMove command for scheduled image distribution, however it can be used with the ThreshMove disk balancing command also to override the priority of a particular disk (ie: If SelDest is not specified, then the CheckDir priority will be used of the disk to be checked). One difference between ThreshMove and SelectMove is that ThreshMove will use all the priority segments in its matching, and ThreshSelect will only use directories which match ALL the segments in SelDest (ie: if SelDest is All.pacs.A, then SelectMove will only try directories which match All.Pacs.A, however ThreshMove will try All.Pacs.A, then All.Pacs, and finally All).

**Select:** Specify a SQL select statement to filter and sort the exams before they are moved or archived. This parameter allows the customization and prioritization of exams to be distributed. For example, in the disk balancing operation, if disk space is needed, you would want the oldest dictated exams to be removed before the unddictated exams. Or you may want to preserve any locked exams and not move them (select exam_key, dictate_uk, import_date from exam where UNLOCKED) and use the sort parameter to prioritize the exams (Sort: order by dictate_uk DESC, import_date). The exam_key field must be the first field specified in the select statement. In a scheduled move operation, it would be best to move all the dictated exams off of the image partition and leave the unddictated exams to be read the next day (select exam_key from exam where
DICTATED). Add any fields specified in the Sort statement after the exam_key field (separated by commas). This is required because SQL requires that the sort fields be included in the select list.

**Sort:** This parameter is combined with the Select statement to complete the SQL statement. The Sort parameter allows you to prioritize the selection of exams (e.g: “Sort: order by import_date” will order the exams from oldest to newest based on the field “import_date”). If you wish to move the dictated cases before the unddictated cases, then use “Sort: order by dictate_uk DESC” (DESC specifies descending order). You can put these both together to select the oldest dictated exams first “Sort: order by dictate_uk DESC, import_date”. This parameter will be appended onto the Select statement, so if “select exam_key, dictate_uk, import_date from exam where exam_date<today” is specified as the select statement, then the final SQL statement would be “select exam_key, dictate_uk, import_date from exam where exam_date<today order by dictate_uk DESC, import_date”. **If a sort field is added, it must also be added to the fields selected in the Select statement (after with exam_key).** Test these commands in `dbaccess` to verify their validity when configuring RIdistribute.

**Remove:** Specify a SQL selection statement which will be used to filter and sort exams to be removed. This can be used for scheduled deletions, or in combination with the disk balancing to activate exam deletion when critical disk space (below the minimum threshold) has been reached. This will usually be specified as the oldest exams which have been archived twice and remain unaltered since the last archive “select exam_key, dir_key, import_date, dictate_uk from exam where UNLOCKED and NOT_IN_USE and EXAM_COMPLETE and ARCHIVED2 and UNALTERED order by OLDEST_DICTATED_FIRST”.

The exam_key and dir_key fields must be the first 2 fields in the select statement. See the following section on m4 processor simplification for an explanation on the uppercase definitions used in this statement. This command must specify dir_key as 1 of the selected parameters if used with ThreshMove command. This will allow RIdistribute to only delete exams from the disk being checked and in need of space rather than from the entire PACS network. The import_date must also be specified since we are sorting by that parameter.

**RemMbytes:** Specify the maximum number of exams to delete by disk capacity in Mbytes. Once this amount of space has been deleted, RIdistribute will stop deleting exams. Limit the exam deletion to the lesser of the RemNexams (maximum number of exams to remove) or the RemMbytes (maximum image space in Mbytes to delete) parameters.

**RemNexams:** Specify the maximum number of exams to delete. Once this number of exams has been deleted, RIdistribute will stop deleting exams. Limit the exam deletion to the lesser of the RemNexams (maximum number of exams to remove) or the RemMbytes (maximum image space in Mbytes to delete) parameters.

**RemThresh:** Specify the threshold disk capacity (in Mbytes) below which exams will be deleted from a disk. The exams will be deleted in the order specified by the
Remove statement. This parameter can be used to make a specified amount of disk capacity available on the BitBucket or similar disk at a scheduled time each day. The difference between this parameter and the RemMbytes is that RemThresh stops when the available space reaches the threshold, and the RemMbytes stop when that number of Mbytes has been deleted. The RemMbytes does not take into account the starting disk capacity.

**RemDir:** Directory to remove from (specified as a priority segment for ThreshRemove or SelectRemove). This will allow SelectRemove and ThreshRemove to select and delete from multiple directories the oldest exams. It also allows ThreshRemove to calculate disk space based on All of the disks that match this specification. Thus to create 5GB of disk space, you do not need to remove 1GB from each of 5 disks (where the oldest exams may be on only 1 of the disks). Now you can specify All 5 disks simultaneously and the RemThresh should be 5000 MBytes.

**ArcThresh:** Specify the disk capacity threshold (in Mbytes) which will activate the archiving operation. If the disk capacity goes below this threshold, then exams will be archived and deleted until the available disk capacity exceeds this threshold.

**ArcJukebox:** Specify the jukebox Alias name (listed in the Ribox menu). This parameter is required for any archiving operations.

**ArcTapeset:** Specify the tapeset to use for the archiving operation. This is context sensitive and must be spelled exactly as listed in the database (or Ristore). This parameter is required for any archiving operations.

**DicomHost:** Specify the hostname of the “DICOM storage service class provider” which will receive our DICOM images. All four dicom parameters are required for the SelectSend operation.

**DicomRemote:** Called AE Title of the remote DICOM host.

**DicomPort:** Port number for the TCP/IP image communications (Default is 104).

**DicomLocal:** Calling AE Title of the RIdistribute process (Default is RI_DICOM).

**OrigDicom:** Yes or No : Send Canon header if No, or original image header if Yes.

**Process:** Specify the operation that is desired. When RIdistribute reaches this line in the configuration file, it will begin the specified operation. Multiple Process statements can be specified in a single command file. Acceptible parameters for this command are specified in the prior section “Distinct Functions Performed”. For example, to specify a disk balancing operation, use “**Process: ThreshMove**”.

**Exit:** Exit ridistribute when this line is reached. This feature is included so that ridistribute functionality can easily be turned off during system maintenance and upgrades. Simply add this statement in the default config file on the server, and all the ridistribute processes on the network will stop at this line. Wait until all of the currently active ridistribute processes stop before continuing with maintenance.
E. M4 PROCESSOR STATEMENTS

The RIdistribute application uses the m4 processor to parse the configuration file, thus include statements and other m4 compatible statements may be used to simplify this configuration file. For example, if all of the systems are within a single LAN (local area network), then a file can be created on the server containing the specifications for the available directories and global parameters (/net/server/img/avail_dir). Then an “include statement” can be used in each workstations configuration file to insert this file’s contents “include(/net/server/img/avail_dir)”. You may not want to use include statements on workstations that must open up an ISDN line to read the file. Otherwise the communications costs will be increased unnecessarily. Also limit this file access when the WAN communications bandwidth is limited (Frame Relay 256 or 384).

The complexity of the commandfile can be simplified using “Define statements”. For example, if you wish to configure the Select statement to use only complete exams which are dictated, then the following simplifications could be used:

Define(EXAM_COMPLETE, ‘transfer=0 and ((today>import_date) or (current-import_time>interval(1) hour to hour))’)
Define(DICTATED, ‘dictate_uk>0’)
Define(NOT_IN_USE, ‘use_user=0’)
Define(OLDEST_DICTATED_FIRST, ‘dictated DESC, import_date’)
Select: select exam_key from exam where EXAM_COMPLETE and DICTATED and NOT_IN_USE
Sort: order by OLDEST_DICTATED_FIRST

NOTE: It is very important in the define statements, that the quotation marks used around the definition (2nd parameter) be forward then backward single quotes. See the example file provided: /opt/ISTri/etc/ridist_cmd_options.

You can use the Sun manual to determine other m4 elements that may be helpful. Simply use the statement “man m4” to display this documentation.

There are sample configuration settings included in the distribution which will help you configure RIdistribute:

```
/opt/ISTri/etc/ridist_cmd_options
```

Copy this file to an operational file (eg: /opt/ISTri/etc/ridist_balance) and then modify the new file to provide the desired functionality. Then schedule RIdistribute with this command file in the crontab.

F. SYSLOG ERROR REPORTING

The syslog process allows various levels of error reporting to be directed through the operating system to files, email or the console. The default configuration of syslog only reports errors dealing with operating system functions. In order to enable user level applications such as RIdistribute to report errors through syslog, the /etc/syslog.conf file must be modified.

Login to the workstation as root, and use vi or other editor to add the following line to the “/etc/syslog.conf” file.

```
user.alert,user.crit,user.err,user.warning,user.notice,user.debug /opt/ISTri/log/RIerrors.log
```
Note that there must be a **TAB** character separating the levels of reporting, with the destination for the errors. This line will enable ALL levels of reporting, from critical errors to debugging statements. This will allow you to troubleshoot a particular application. However it will also consume disk space quickly if left in this configuration. There, only use this line when debugging an application or troubleshooting.

**To activate the new syslog config, you can reboot, or issue the following command:**

```
ps  -ef  |  grep syslog
kill  -HUP  #PID#
```

Get the process ID number **#PID#**

Force syslog to rescan the configuration file

Normal error reporting can be obtained with the following line:

```
user.alert,user.crit,user.err  /opt/ISTri/log/Rlerrors.log
```

Additional information can be obtained using the command “man syslog”.
IV. Scheduled Operation

A. CRONTAB ENTRIES

RIdistribute operates from crontab entries so that scheduled operation is facilitated. A typical crontab entry for RIdistribute allowing disk balancing every 15 minutes every day is as follows:

0,15,30,45 * * * * exec csh –c “/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid.balance”

Another crontab entry might start moving dictated exams to a bit-bucket system at 6pm daily.

0 18 * * * exec csh –c “/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid.move.bb”

If you are unfamiliar with the parameters in the crontab file, use “man crontab” to display the configurable parameters. To edit imaging’s crontab, use the following commands to edit it using the vi editor. Use these commands while logged in as imaging (to make them effective for only the imaging user).

setenv EDITOR vi

`crontab -e` (edit the file and then save it using vi editor)

`crontab –l` (Lowercase L - to list the contents of the crontab)

It is recommended to add the RIdistribute crontab entries to the “imaging” user’s crontab. This will ensure that the image files are given the proper access priveleges when they are moved from system to system. Also “imaging” is a mandatory user in the Rational Imaging system, and thus will have access to all the workstations image partitions.

B. SUGGESTED SCHEDULE

RIdistribute has been designed to handle all of the image distribution needs of the system. Some of the following scheduled operations might be used to implement this:

<table>
<thead>
<tr>
<th>Workstation</th>
<th>Schedule</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server</td>
<td>8am</td>
<td>ThreshWarn – Check the available space in the database partition, and notify the administrator if it is too low.</td>
</tr>
<tr>
<td>All</td>
<td>Every 15 minutes</td>
<td>ThreshMove – Disk Balancing on each workstation. If the space becomes low, then move dictated exams to the bit-bucket first, then to other system disks.</td>
</tr>
<tr>
<td>BitBucket</td>
<td>Every 15 minutes</td>
<td>ThreshRemove – Maintain a minimal RemThresh level so that workstations have a place to push exams to. If the minimum threshold can not be obtained by removing exams, then initiate a ThreshArc command following the</td>
</tr>
</tbody>
</table>
ThreshRemove command. This will start archiving to make this space available. This threshold will act as a fail-safe operation to ensure that disk space is available for the disk-balancing operation.

**BitBucket 5pm**

ThreshRemove – Check to make sure that n MB of space are still available on the BitBucket for the incoming daily exams. In the same command file, follow this command with a ThreshArchive command which will activate only if the exam deletion did not create sufficient disk space.

**All 6pm**

SelectMove – Move dictated exams to the bit-bucket(s)

**Storage 7pm**

Begin archiving exams to the Jukebox (RIarchive) – Prioritize bit-bucket exams first. Archive exams which have been archived once and are 1 week old. If you perform the secondary before this, then they may be altered and have to be rearchived. Do not remove these exams (auto-remove=No) since ridistribute will be removing the oldest exams based on required disk capacity not age). Do not archive exams which have been archived twice and remain unaltered (altered flag=0). Archive altered exams that have been archived twice only near the end of their lifespan on the system (60 days for example). Otherwise, they may be archived multiple times unnecessarily (once for each time they are altered).

**All 11pm**

SelectMove – Move any more dictated exams to the bit-bucket(s) which have been completed by the night staff.

**Storage 11pm**

Select all additional exams for archival that were missed by the 7pm operation. This will include new exams done that day for the Initial tapeset. It will also include exams that were in-use or being transferred at the time of the last archival.

These operations could be accomplished using the following crontab entries (and associated configuration files).

**BitBucket crontab for imaging:**

```
0 17 * * * exec csh -c "/opt/ISTRi/bin/ridistribute -c /opt/ISTRi/etc/rid_thresh_rm_desired"
0,15,30,45 * * * exec csh -c "/opt/ISTRi/bin/ridistribute -c /opt/ISTRi/etc/rid_thresh_rm_min"
```

**Archive system crontab for imaging:**

```
0 19,23 * * * exec csh -c "/opt/ISTRi/bin/riarchive /opt/ISTRi/etc/rid_archive"
```

**Server crontab for imaging:**

```
0 8 * * * exec csh -c "/opt/ISTRi/bin/ridistribute -c /opt/ISTRi/etc/rid_threshwarn"
```

**All systems crontab for imaging:**

```
0,15,30,45 * * * exec csh -c "/opt/ISTRi/bin/ridistribute -c /opt/ISTRi/etc/rid_thresh_move"
0 18,23 * * * exec csh -c "/opt/ISTRi/bin/ridistribute -c /opt/ISTRi/etc/rid_select_move"
```
V. Prioritized Disk Balancing

A. **Summary**

Disk Balancing attempts to balance the network’s disk capacity so that no image partition runs out of available disk capacity. This functionality is automated so that technologists and physicians do not need to concern themselves with moving exams off of a full system to create more disk space. Maintaining a minimum capacity on each image partition ensures that space will be available for incoming exams. RIdistribute also adjusts for changes in the disk capacity due to archiving, printing or other applications which may consume temporary disk space.

RIdistribute should be configured and run on a per-workstation basis. This enables the local system to systematically check the disk space without affecting the network or central image manager (database). At pre-determined times throughout the day, RIdistribute will wake up and check the configured disks. If the desired disk capacity is available, then RIdistribute will go back to sleep. If, however, the disk capacity has fallen below the desired level, then RIdistribute will check other available disks for extra disk space to move old or dictated exams to.

An important feature of RIdistribute is the ability to prioritize available disks based on network proximity to the critical system. Disks on the local area network (LAN) should be checked before disks at another facility (wide area network or WAN). This will improve exam distribution efficiency and minimize communications costs on the WAN. Only if all the disks on the LAN have reached a critical disk capacity, will the exams be pushed over the WAN to another remote system. If all of the available disks have become critical, then the administrator will be notified via email at each critical threshold and RIdistribute may attempt to remove exams which have been archived twice and remain unaltered since the last archive.

The following sections will discuss the configuration of RIdistribute.

B. **Configuration Basics**

Disk balancing requires the following configurable parameters:

- **DbSource**: Specify database
- **AvailDir**: One entry for each disk supported
- **LockFile**: File to be used to ensure singular RIdistribute operation
- **Select**: SQL statement for exam selection (filter exams using where syntax)
- **CheckDir**: Directory to evaluate
- **Process**: ThreshMove (initiates the command based on the prior config statements)
Optional configurable parameters (must be specified prior to the Process statement):

- **DebugOn:** Turn on syslog debugging (syslog must be configured also)
- **MailTo:** email address or email alias of administrator(s)
- **Sort:** SQL statement appended to Select statement (order by syntax)
- **SelDest:** May be used to specify the AvailDir directories priority
- **Remove:** SQL statement to filter exams to delete (includes order by sort)
- **RemMbytes:** Remove only up to this number of Mbytes of image space
- **RemNexams:** Remove only up to this number of exams

The configuration file should be put in `/opt/ISTri/etc`, and imaging’s crontab should have an entry for periodic operation. An example file “/opt/ISTri/etc/ridist_cmd_options” has been included to help configure each system. Do not use this file, but rather copy it to an operational command file “eg: /opt/ISTri/etc/ridist_threshmove” and edit it to include the desired functionality.

Once this file has been created, test RIdistribute using this command file to make sure that it performs the correct tasks. Once you have verified that the operation is correctly configured, and you receive no errors, you may schedule periodic operation in imaging’s crontab.

### C. Examples

The following command file syntax will provide disk balancing from 2 image partitions on a local workstation, to 4 other workstations with single drives on the local area network.

```sql
define(EXAM_COMPLETE, 'transfer=0 and ((today>import_date) or (current-import_time>interval(1) hour to hour))')
define(NOT_IN_USE, 'use_user=0')
define(OLD_DICTATED_FIRST, 'order by dictate_uk DESC,import_date')
define(LAN100, '15000')
DebugOn: 0
DbSource: //pacs1/db/radiology
MailTo: imaging@pacs1
AvailDir: pacs1 /net/pacs1/img 300 200 100 LAN100 LAN.PACS1
AvailDir: pacs1 /net/pacs1/img2 300 200 100 LAN100 LAN.PACS1
AvailDir: pacs2 /net/pacs2/img 300 200 100 LAN100 LAN.PACS2
AvailDir: pacs3 /net/pacs3/img 300 200 100 LAN100 LAN.PACS3
AvailDir: pacs3 /net/pacs3/img2 300 200 100 LAN100 LAN.PACS3
AvailDir: pacs4 /net/pacs4/img 300 200 100 LAN100 LAN.PACS4
AvailDir: pacs5 /net/pacs5/img 300 200 100 LAN100 LAN.PACS5
LockFile: /opt/ISTri/etc/.rid_threshmv.lck
Select: select exam_key,dictate_uk,import_date from exam where NOT_IN_USE and EXAM_COMPLETE
Sort: OLD_DICTATED_FIRST
SelDest: LAN.PACS1
CheckDir: pacs1 /net/pacs1/img
Process: ThreshMove
```
The following command file syntax will provide disk balancing from 3 image partitions on a local workstation, to 2 bitbucket systems (pacsbb1 and pacsbb2) and 2 other workstations (pacs1 and pacs3) with single drives on the local area network. It will finally distribute images to the other facility if all of the disks in facilityA are critical:

```
define(EXAM_COMPLETE, 'transfer=0 and ((today>import_date) or (current-import_time>interval(1) hour to hour))')
define(NOT_IN_USE, 'use_user=0')
define(OLD_DICTATED_FIRST, 'order by dictate_uk DESC,import_date')
define(LAN100, '15000')
DebugOn: 0
DbSource: //pacs1/db/radiology
MailTo: imaging@pacs1
AvailDir: pacs1 /net/pacs1/img 300 200 100 LAN100 WAN.FacilityA.PACS1
AvailDir: pacs2 /net/pacs2/img 300 200 100 LAN100 WAN.FacilityA.PACS2
AvailDir: pacs2 /net/pacs2/img2 300 200 100 LAN100 WAN.FacilityA.PACS2
AvailDir: pacs2 /net/pacs2/img3 300 200 100 LAN100 WAN.FacilityA.PACS2
AvailDir: pacs3 /net/pacs3/img 300 200 100 LAN100 WAN.FacilityA.PACS3
AvailDir: pacsbb1 /net/pacsbb1/img1 300 200 100 LAN100 WAN.FacilityA.BitBucket
AvailDir: pacsbb1 /net/pacsbb1/img2 300 200 100 LAN100 WAN.FacilityA.BitBucket
AvailDir: pacsbb1 /net/pacsbb1/img3 300 200 100 LAN100 WAN.FacilityA.BitBucket
AvailDir: pacsbb2 /net/pacsbb2/img1 300 200 100 LAN100 WAN.FacilityA.BitBucket
AvailDir: pacsbb2 /net/pacsbb2/img2 300 200 100 LAN100 WAN.FacilityA.BitBucket
AvailDir: pacsbb2 /net/pacsbb2/img3 300 200 100 LAN100 WAN.FacilityA.BitBucket
AvailDir: pacs4 /net/pacs4/img 300 200 100 LAN100 WAN.FacilityB.PACS4
AvailDir: pacs5 /net/pacs5/img 300 200 100 LAN100 WAN.FacilityB.PACS5
LockFile: /opt/ISTri/etc/.rid_threshmv.lck
Select: select exam_key,dictate_uk,import_date from exam where NOT_IN_USE and EXAM_COMPLETE
Sort: OLD_DICTATED_FIRST
SelDest: WAN.FacilityA.PACS1
CheckDir: pacs1 /net/pacs1/img2
Process: ThreshMove
CheckDir: pacs2 /net/pacs2/img
Process: ThreshMove
CheckDir: pacs2 /net/pacs2/img2
Process: ThreshMove
CheckDir: pacs2 /net/pacs2/img3
Process: ThreshMove

The following command file syntax will provide disk balancing from 2 image partitions on a local workstation, to 2 bitbucket systems (pacsbb1 and pacsbb2) and 2 other workstations (pacs1 and pacs3) with single drives on the local area network. It will not distribute images to the other facility under any circumstances. This script will begin deleting exams from the CheckDir disk if RIdistribute can not find another available disk above the minimum disk capacity to send images to:
define(EXAM_COMPLETE, 'transfer=0 and ((today>import_date) or (current-
import_time>interval(1) hour to hour))')

define(NOT_IN_USE, 'use_user=0')

define(ARCHIVE2, 'archive_uk>1')

define(UNALTERED, 'altered=0')

define(OLD_DICTATED_FIRST, 'order by dictate_uk DESC,import_date')

#define(LAN100, '15000')

DebugOn: 0

DbSource: //pacs1/db/radiology

MailTo: imaging@pacs1

AvailDir: pacs1 /net/pacs1/img 300 200 100 LAN100 FacilityA.PACS1
AvailDir: pacs2 /net/pacs2/img 300 200 100 LAN100 FacilityA.PACS2
AvailDir: pacs2 /net/pacs2/img2 300 200 100 LAN100 FacilityA.PACS2
AvailDir: pacs3 /net/pacs3/img 300 200 100 LAN100 FacilityA.PACS3
AvailDir: pacsbb1 /net/pacsbb1/img1 300 200 100 LAN100 FacilityA.BitBucket
AvailDir: pacsbb1 /net/pacsbb1/img2 300 200 100 LAN100 FacilityA.BitBucket
AvailDir: pacsbb1 /net/pacsbb1/img3 300 200 100 LAN100 FacilityA.BitBucket
AvailDir: pacsbb2 /net/pacsbb2/img1 300 200 100 LAN100 FacilityA.BitBucket
AvailDir: pacsbb2 /net/pacsbb2/img2 300 200 100 LAN100 FacilityA.BitBucket
AvailDir: pacsbb2 /net/pacsbb2/img3 300 200 100 LAN100 FacilityA.BitBucket
AvailDir: pacs4 /net/pacs4/img 300 200 100 LAN100 FacilityB.PACS4
AvailDir: pacs5 /net/pacs5/img 300 200 100 LAN100 FacilityB.PACS5

LockFile: /opt/ISTri/etc/.rid_threshmv.lck

Select: select exam_key,dictate_uk,import_date from exam where NOT_IN_USE and

EXAM_COMPLETE

Sort: OLD_DICTATED_FIRST

SelDest: FacilityA.PACS2

Remove: select exam_key,dir_key,dictate_uk,import_date from exam where UNLOCKED and

NOT_IN_USE and ARCHIVE2 and UNALTERED order by OLD_DICTATED_FIRST;

RemMbytes: 200
RemNexams: 20

CheckDir: pacs2 /net/pacs2/img
Process: ThreshMove

CheckDir: pacs2 /net/pacs2/img2
Process: ThreshMove

D. Scheduling of the Examples

The following crontab entries will allow any of the prior examples to check the image directories

every 15 minutes:

0,15,30,45 * * * * exec csh –c “ridistribute –c /opt/ISTri/etc/cmdfilenam”

See the section on crontab, or perform a “man crontab” to get more details on this configuration.
VI. Scheduled Image Distribution

A. SUMMARY

It is often desirable to have the dictated exams moved from the diagnostic workstations to a high capacity “bit-bucket” at the end of each day. In the past, technologists were trained to perform this task using Riport. However, RIdistribute can be scheduled to perform this task automatically at the end of each day.

B. CONFIGURATION BASICS

Scheduled image distribution requires the following configurable parameters:

- **DbSource:** Specify database
- **AvailDir:** One entry for each disk supported
- **LockFile:** File to be used to ensure singular RIdistribute operation
- **Select:** SQL statement for exam selection (filter exams using where syntax)
- **SelDest:** Must be used to specify the AvailDir directories priority
- **CheckDir:** Directory to evaluate
- **Process:** SelectMove (initiates the command based on the prior config statements)

Optional configurable parameters (must be specified prior to the Process statement):

- **DebugOn:** Turn on syslog debugging (syslog must be configured also)
- **MailTo:** email address or email alias of administrator(s)
- **Sort:** SQL statement appended to Select statement (order by syntax)

The configuration file should be put in /opt/ISTri/etc, and imaging’s crontab should have an entry for periodic operation. An example file “/opt/ISTri/etc/ridist_cmd_options” has been included to help configure each system. Do not use this file, but rather copy it to an operational command file “eg: /opt/ISTri/etc/ridist_selectmove” and edit it to include the desired functionality.

Once this file has been created, test RIdistribute using this command file to make sure that it performs the correct tasks. Once you have verified that the operation is correctly configured, and you receive no errors, you may schedule periodic operation in imaging’s crontab.
C. **Examples**

The following command file syntax will provide image distribution from 3 image partitions on a local workstation, to a bit-bucket with 4 high capacity drives.

```plaintext
define(EXAM_COMPLETE, 'transfer=0 and ((today>import_date) or (current-import_time>interval(1) hour to hour))')
define(NOT_IN_USE, 'use_user=0')
define(DICTATED, 'dictate_uk>0')
define(OLD_DICTATED_FIRST, 'order by dictate_uk DESC,import_date')
define(LAN100, '15000')
DebugOn: 0
DbSource: //pacs1/db/radiology
MailTo: imaging@pacs1
AvailDir: pacs1 /net/pacs1/img 300 200 100 LAN100 LAN.PACS1
AvailDir: pacs1 /net/pacs1/img2 300 200 100 LAN100 LAN.PACS1
AvailDir: pacs1 /net/pacs1/img3 300 200 100 LAN100 LAN.PACS1
AvailDir: pacsbb1 /net/pacsbb1/img1 300 200 100 LAN100 LAN.BitBucket
AvailDir: pacsbb1 /net/pacsbb1/img2 300 200 100 LAN100 LAN.BitBucket
AvailDir: pacsbb1 /net/pacsbb1/img3 300 200 100 LAN100 LAN.BitBucket
AvailDir: pacsbb1 /net/pacsbb1/img4 300 200 100 LAN100 LAN.BitBucket
LockFile: /opt/ISTri/etc/.rid_selectmv.lck
Select: select exam_key,dictate_uk,import_date from exam where DICTATED and NOT_IN_USE and EXAM_COMPLETE
Sort: OLD_DICTATED_FIRST
SelDest: LAN.BitBucket
CheckDir: pacs1 /net/pacs1/img
Process: SelectMove
CheckDir: pacs1 /net/pacs1/img2
Process: SelectMove
CheckDir: pacs1 /net/pacs1/img3
Process: SelectMove
```

The following command file syntax will provide image distribution from 3 image partitions on a local workstation, to a bit-bucket with 4 high capacity drives. If all of the dictated exams can not be put on the local bitbucket, then the additional 3 processes will attempt to push the images over the WAN to another facility’s bit-bucket (pacsbb2). This commandfile will reach the minimum critical capacity before pushing images to WAN.BitBucket.

```plaintext
define(EXAM_COMPLETE, 'transfer=0 and ((today>import_date) or (current-import_time>interval(1) hour to hour))')
define(NOT_IN_USE, 'use_user=0')
define(DICTATED, 'dictate_uk>0')
define(OLD_DICTATED_FIRST, 'order by dictate_uk DESC,import_date')
define(LAN100, '15000')
DebugOn: 0
DbSource: //pacs1/db/radiology
```
MailTo: imaging@pacs1
AvailDir: pacs1 /net/pacs1/img 300 200 100 LAN100 LAN.PACS1
AvailDir: pacs1 /net/pacs1/img2 300 200 100 LAN100 LAN.PACS1
AvailDir: pacs1 /net/pacs1/img3 300 200 100 LAN100 LAN.PACS1
AvailDir: pacsbb1 /net/pacsbb1/img1 300 200 100 LAN100 LAN.BitBucket
AvailDir: pacsbb1 /net/pacsbb1/img2 300 200 100 LAN100 LAN.BitBucket
AvailDir: pacsbb1 /net/pacsbb1/img3 300 200 100 LAN100 LAN.BitBucket
AvailDir: pacsbb1 /net/pacsbb1/img4 300 200 100 LAN100 LAN.BitBucket
AvailDir: pacsbb2 /net/pacsbb2/img1 300 200 100 LAN100 WAN.BitBucket
AvailDir: pacsbb2 /net/pacsbb2/img2 300 200 100 LAN100 WAN.BitBucket
LockFile: /opt/ISTri/etc/.rid_selectmv.lck
Select: select exam_key,dictate_uk,import_date from exam where DICTATED and NOT_IN_USE and EXAM_COMPLETE
Sort: OLD_DICTATED_FIRST

SelDest: LAN.BitBucket
CheckDir: pacs1 /net/pacs1/img
Process: SelectMove
CheckDir: pacs1 /net/pacs1/img2
Process: SelectMove
CheckDir: pacs1 /net/pacs1/img3
Process: SelectMove

SelDest: WAN.BitBucket
CheckDir: pacs1 /net/pacs1/img
Process: SelectMove
CheckDir: pacs1 /net/pacs1/img2
Process: SelectMove
CheckDir: pacs1 /net/pacs1/img3
Process: SelectMove

D. Scheduling of the Examples

The following crontab entry will allow any of the prior examples to distribute images at 6 pm and 11 pm each day:

0 18,23 * * * exec csh –c “RIdistribute –c /opt/ISTri/etc/cmdfilename”

See the section on crontab, or perform a “man crontab” to get more details on this configuration.
VII. Automated Exam Removal

A. SUMMARY

RIdistribute can automatically remove unaltered exams from the system each day at a predetermined time. These exams should only be removed if they have already been archived twice (active and initial tapesets) and remain unaltered since the last archive (exam altered field = 0). This task is usually configured on a bit-bucket system to make sure that disk capacity is available the following day. It will delete the exams based on the SQL filter provided in the configuration file. Make sure not to remove the SQL filters which ensure that the exams have been archived twice “ARCHIVE2” and remain unaltered “UNALTERED”.

Three types of exam deletion can be scheduled. The first is SelectRemove, which will use a select statement to delete exams. It will delete ANY exams which match the preconfigured select statement. It will also use RemNexams and RemMbytes to limit the deletion if these are specified. The second is ThreshRemove, which will remove exams up to a pre-configured disk capacity or “threshold”. The third is ThreshArchive, which will archive the selected exams and then remove them.

B. SELECTED REMOVAL BASICS

SelectRemove requires the following configurable parameters:

- **DbSource**: Specify database
- **AvailDir**: One entry for each disk supported
- **LockFile**: File to be used to ensure singular RIdistribute operation
- **Remove**: SQL statement for exam selection (includes order-by sort and must include the “exam_key,dir_key” fields in the SQL)
- **RemMbytes**: Remove only up to this number of Mbytes of image space
- **RemNexams**: Remove only up to this number of exams
- **RemDir**: Directory to remove from (specified as a priority segment for ThreshRemove or SelectRemove). This will allow SelectRemove and ThreshRemove to select and delete from multiple directories the oldest exams. It also allows ThreshRemove to calculate disk space based on All of the disks that match this specification. Thus to create 5GB of disk space, you do not need to remove 1GB from each of 5 disks (where the oldest exams may be on only 1 of the disks). Now you can specify All 5 disks simultaneously and the RemThresh should be 5000 MBytes.
CheckDir: Directory to remove exams from

Process: SelectRemove (initiates the command based on the prior config statements)

Optional configurable parameters (must be specified prior to the Process statement):

DebugOn: Turn on syslog debugging (syslog must be configured also)

MailTo: email address or email alias of administrator(s)

The configuration file should be put in /opt/ISTri/etc, and imaging’s crontab should have an entry for periodic operation. An example file “/opt/ISTri/etc/ridist_cmd_options” has been included to help configure each system. Do not use this file, but rather copy it to an operational command file “eg: /opt/ISTri/etc/ridist_selectremove” and edit it to include the desired functionality.

Once this file has been created, test RIdistribute using this command file to make sure that it performs the correct tasks. Once you have verified that the operation is correctly configured, and you receive no errors, you may schedule periodic operation in imaging’s crontab.

### C. Threshold Removal Basics

ThreshRemove requires the following configurable parameters (Include the RemThresh rather than the RemMbytes and RemNexams parameters):

- **DbSource**: Specify database
- **AvailDir**: One entry for each disk supported
- **LockFile**: File to be used to ensure singular RIdistribute operation
- **Remove**: SQL statement for exam selection (includes order-by sort and must include the “exam_key,dir_key” fields in the SQL)
- **RemThresh**: Remove only up to this number of Mbytes of image space
- **CheckDir**: Directory to remove exams from
- **Process**: ThreshRemove (initiates the command based on the prior config statements)

Optional configurable parameters (must be specified prior to the Process statement):

- **DebugOn**: Turn on syslog debugging (syslog must be configured also)
- **MailTo**: email address or email alias of administrator(s)

The configuration file should be put in /opt/ISTri/etc, and imaging’s crontab should have an entry for periodic operation. An example file “/opt/ISTri/etc/ridist_cmd_options” has been included to help configure each system. Do not use this file, but rather copy it to an operational command file “eg: /opt/ISTri/etc/ridist_threshremovet” and edit it to include the desired functionality.

Once this file has been created, test RIdistribute using this command file to make sure that it performs the correct tasks. Once you have verified that the operation is correctly configured, and you receive no errors, you may schedule periodic operation in imaging’s crontab.
D. **Threshold Archiving and Removal Basics**

ThreshArc requires the following configurable parameters (Do not include the RemThresh parameter):

- **DbSource**: Specify database
- **AvailDir**: One entry for each disk supported
- **LockFile**: File to be used to ensure singular RIDistribute operation
- **Select**: SQL statement for exam selection (includes order-by sort and must include the “exam_key, dir_key” fields in the SQL)
- **ArcThresh**: Use thresholding to determine the number of exams removed (Mbytes)
- **ArcJukebox**: Alias name of the Jukebox which appears in the Ribox application
- **ArcTapeset**: Alias name of the tapeset to archive to (Active). Since this will archive and remove the exams, you do not want to make this the initial tapeset.
- **CheckDir**: Directory to archive and remove exams from
- **Process**: ThreshArc (initiates the command based on the prior config statements)

Optional configurable parameters (must be specified prior to the Process statement):

- **DebugOn**: Turn on syslog debugging (syslog must be configured also)
- **MailTo**: email address or email alias of administrator(s)
- **Sort**: SQL statement appended to Select statement (order by syntax)

The configuration file should be put in /opt/ISTri/etc, and imaging’s crontab should have an entry for periodic operation. An example file “/opt/ISTri/etc/ridist_cmd_options” has been included to help configure each system. Do not use this file, but rather copy it to an operational command file “eg: /opt/ISTri/etc/ridist_thresharc” and edit it to include the desired functionality.

Once this file has been created, test RIDistribute using this command file to make sure that it performs the correct tasks. Once you have verified that the operation is correctly configured, and you receive no errors, you may schedule periodic operation in imaging’s crontab.

E. **Select Remove Example**

The following command file syntax will remove any unaltered, dictated, unlocked exams which have been archived twice and have not been accessed in 30 days. There is no need for a sort option on the Remove statement because all the exams selected will be removed. This is only true because RemNexams an are RemMbytes were not specified. If these are declared, then they will limit the amount of data deleted.

```plaintext
define(NOT_IN_USE, 'use_user=0')
define(ARCHIVE2, 'archive_uk>1')
define(DICTATED, 'dictate_uk>0')
define(UNALTERED, 'altered=0')
define(UNLOCKED, 'lock_uk=0')
```
define(OLD30, 'today-last_access > 30')
define(OK_TO_REMOVE, 'UNLOCKED and ARCHIVE2 and UNALTERED and NOT_IN_USE')
define(LAN100, '15000')
DebugOn: 0
DbSource: //pacs1/db/radiology
MailTo: imaging@pacs1
AvailDir: pacs1 /net/pacs1/img 300 200 100 LAN100 LAN.PACS1
AvailDir: pacs1 /net/pacs1/img2 300 200 100 LAN100 LAN.PACS1
LockFile: /opt/ISTri/etc/.rid_selectrm.lck
Remove: select exam_key,dir_key from exam where DICTATED and OK_TO_REMOVE and OLD30;
CheckDir:  pacs1  /net/pacs1/img
Process: SelectRemove
CheckDir:  pacs1  /net/pacs1/img2
Process: SelectRemove

By modifying several lines in this commandfile, you can have the oldest files deleted from both disks at the same time. The RemDir option allows multiple disks to be selected simultaneously for exam deletion. Only 1 SelectRemove statement is required in this example.
CheckDir:  pacs1  /net/pacs1/img
RemDir: LAN.PACS1
Process: SelectRemove

F.  THRESHREMOVE EXAMPLE

The following command file syntax will remove any unaltered, dictated exams which have been archived twice. It will delete the oldest exams first (based on date of last access), and will only delete exams until the RemThresh Mbytes limit has been reached (2 Gb in this example). It will delete from the 3 directories that match the RemDir specification. Note: it will calculate the 2 GBytes as the sum of the freespace on all three matching directories.

 define(NOT_IN_USE, 'use_user=0')
 define.ARCHIVE2, 'archive_uk>1')
 define(DICTATED, 'dictate_uk>0')
 define(UNALTERED, 'altered=0')
 define(UNLOCKED, 'lock_uk=0')
 define(OK_TO_REMOVE, 'UNLOCKED and ARCHIVE2 and UNALTERED and NOT_IN_USE')
 define(LAN100, '15000')
 DbSource: //pacs1/db/radiology
 MailTo: imaging@pacs1
 AvailDir: pacs1 /net/pacs1/img 300 200 100 LAN100 LAN.Diagnostic
 AvailDir: bb1 /net/bb1/img1 300 200 100 LAN100 LAN.BitBucket
 AvailDir: bb1 /net/bb1/img2 300 200 100 LAN100 LAN.BitBucket
 AvailDir: bb1 /net/bb1/img3 300 200 100 LAN100 LAN.BitBucket
 AvailDir: pacs2 /net/pacs2/img 300 200 100 LAN100 LAN.Diagnostic
 LockFile: /opt/ISTri/etc/.rid_threshrm.lck
By changing 2 lines in this command file, you can modify the operation of redistribute to remove
the oldest exams from all disks on the system until 7 GB of free capacity has been made
available. This may be useful in a system where there is no large capacity device (bit-bucket),
and the daily workload is around 5 GB per day. It will also ensure that the oldest exams are
removed from the system first.

RemThresh: 7000
RemDir: LAN

By specifying “LAN” as the RemDir category, all of the available disks now match this
parameter. And the freespace will be calculated as the sum of all the available disks.

G. THRESHARC EXAMPLE

The following command file syntax will archive and remove any unlocked, dictated exams which
have only been archived once or have been archived twice and have been altered. It will archive
and delete the oldest exams first (based on date of last access), and will only archive and delete
exams until the ArcThresh Mbytes limit has been reached (500Mb in this example). This exam is
not intended to replace RI’archive’s auto-archive capabilities. But rather it is intended to
supplement them especially for the Active tapeset where exams need to be removed to create
available image capacity.

define(NOT_IN_USE, ‘use_user=0’)
define(ARCHIVE2, ‘archive_uk>1’)
define(DICTATED, ‘dictate_uk>0’)
define(UNLOCKED, ‘lock_uk=0’)
define(ALTERED, ‘altered>0’)
define(OK_TO_REMOVE, ‘UNLOCKED and ARCHIVE2 and UNALTERED and NOT_IN_USE’)
define(OK_TO_ARCHIVE, ‘UNLOCKED and ARCHIVE2 and NOT_IN_USE and ALTERED’)
define(LAN100, ‘15000’)

DebugOn: 0
DbSource: //pacs1/db/radiology
MailTo: imaging@pacs1
AvailDir: pacs1 /net/pacs1/img 300 200 100 LAN100 LAN.PACS1
AvailDir: pacs1 /net/pacs1/img2 300 200 100 LAN100 LAN.PACS1
LockFile: /opt/ISTri/etc/.rid_threshrm.lck
Select: select exam_key,d dir_key from exam where DICTATED and OK_TO_ARCHIVE)
Sort: order by last_access
ArcThresh: 500000
ArcJukebox: Pacs3Juke
ArcTapeset: Active
CheckDir: pacs1 /net/pacs1/img
Process: ThreshArc
CheckDir: pacs1 /net/pacs1/img2
Process: ThreshArc
VIII. Threshold Warning Notification

A. SUMMARY

This capability was added to RIdistribute to check ANY directory for critical disk capacity and report errors. It is especially useful to watch the /db partition on the server. The warning can come as an email to the administrator, or a group of individuals (using an email alias).

B. CONFIGURATION BASICS

The threshold warning operation requires the following configurable parameters:

- **DbSource**: Specify database
- **AvailDir**: One entry for each disk supported
- **LockFile**: File to be used to ensure singular RIdistribute operation
- **CheckDir**: Directory to evaluate
- **Process**: ThreshWarn (initiates the command based on the prior config statements)

Optional configurable parameters (must be specified prior to the Process statement):

- **DebugOn**: Turn on syslog debugging (syslog must be configured also)
- **MailTo**: email address or email alias of administrator(s)

The configuration file should be put in /opt/ISTri/etc, and imaging’s crontab should have an entry for periodic operation. An example file “/opt/ISTri/etc/ridist_cmd_options” has been included to help configure each system. Do not use this file, but rather copy it to an operational command file “eg: /opt/ISTri/etc/ridist_threshwarn” and edit it to include the desired functionality.

Once this file has been created, test RIdistribute using this command file to make sure that it performs the correct tasks. Once you have verified that the operation is correctly configured, and you receive no errors, you may schedule periodic operation in imaging’s crontab.

C. EXAMPLES

The following command file syntax will check the database partition “/db” and issue an email to the administrator.

```plaintext
define(LAN100, '15000')
  DebugOn: 0
  DbSource: //pacs1/db/radiology
```
MailTo: administrator@pacs1
AvailDir: pacs1 /db 50 25 10 LAN100 LAN.DB
LockFile: /opt/ISTri/etc/.rid_threshwarn.lck
CheckDir: pacs1 /db
Process: ThreshWarn
IX. Scheduled Remote Distribution

A. SUMMARY

The SelectSend operation allows RIdistribute to send exams to other DICOM Storage Class providers based on a pre-defined select statement. This can send every exam to other systems, or only send specified exams (CT or MR for example) to a particular workstation.

B. CONFIGURATION BASICS

The threshold warning operation requires the following configurable parameters:

- **DbSource**: Specify database
- **AvailDir**: One entry for each disk supported
- **LockFile**: File to be used to ensure singular RIdistribute operation
- **DicomHost**: hostname of remote DICOM Storage Class Provider
- **DicomPort**: TCP/IP Port number used (104)
- **DicomRemote**: Called AE_TITLE for the remote DICOM station
- **DicomLocal**: Calling AE_TITLE for the Rational Imaging send station
- **OrigDicom**: Use original image header or create new uniform header
- **Select**: SQL statement to filter exams so that they are not sent multiple times
- **Process**: SelectSend (initiates the command based on the prior config statements)

Optional configurable parameters (must be specified prior to the Process statement):

- **DebugOn**: Turn on syslog debugging (syslog must be configured also)
- **MailTo**: email address or email alias of administrator(s)
- **Sort**: Sort SQL to order the Select statement previously defined

The configuration file should be put in /opt/ISTri/etc, and imaging’s crontab should have an entry for periodic operation. An example file “/opt/ISTri/etc/ridist_cmd_options” has been included to help configure each system. Do not use this file, but rather copy it to an operational command file “eg: /opt/ISTri/etc/ridist_selectsend” and edit it to include the desired functionality.

Once this file has been created, test RIdistribute using this command file to make sure that it performs the correct tasks. Once you have verified that the operation is correctly configured, and you receive no errors, you may schedule periodic operation in imaging’s crontab.
C. **EXAMPLES**

The following command file syntax will send any exams from the radiology database which have not been sent to the “advwin1” workstation before. The sending process will update the history field with the statement “Sent DICOM exam to advwin1”. This history entry can then be used to make sure that the exam is not sent again.

```plaintext
define(DICOMHOST, 'advwin1')
define(NEW_IMPORT, 'import_date > today-5')
define(NOT_SENT, 'exam_key not in (select exam_key from dcm_examsent)')
define(EXAM_COMPLETE, 'transfer=0 and ((today>import_date) or (current-import_time>interval(1) hour to hour))')
define(NOT_IN_USE, 'use_user=0')
DebugOn: 0
DbSource: //pacs1/db/radiology
MailTo: administrator@pacs1
LockFile: /opt/ISTri/etc/.rid_selectsend.lck
DicomHost: DICOMHOST
DicomPort: 104
DicomRemote: GE_ADV
DicomLocal: RI_DICOM
OrigDicom: Yes
Select: select exam_key,import_date from exam where NOT_IN_USE and EXAM_COMPLETE and NOT_SENT and NEW_IMPORT
Sort: order by import_date
Process: SelectSend
```
X. Sample LAN Config Files

A. SUMMARY

This chapter illustrates the configuration required for a fairly simple Local Area Network. The first section describes the imaging network architecture, and the following sections describe the configuration required on each workstation.

B. DATABASE INITIALIZATION

To initialize the database and reset the image directory capacities, use the following exam. This command is useful to make sure that the database has accurate image directory capacities. You can use this command at any time when you may think that the database directory capacities have gotten out of sync. This command is especially important when initially configuring the network.

```bash
ridistribute -v -r //server/db/radiology
```

C. NETWORK ARCHITECTURE

The following imaging network has been established. It consists of 7 workstations, 4 of which are used for diagnostic interpretation. There is 1 large capacity bit-bucket system and 2 clinical RIdisplay workstations. In addition, only 3 of the workstations are used to receive images from the scanners.

<table>
<thead>
<tr>
<th>Hostname</th>
<th>Description</th>
<th>Image Partitions</th>
<th>Receive Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>pacs1</td>
<td>Server/Diag</td>
<td>img</td>
<td>No</td>
</tr>
<tr>
<td>pacs2</td>
<td>Diagnostic</td>
<td>img, img2</td>
<td>Yes</td>
</tr>
<tr>
<td>pacs3</td>
<td>Diagnostic</td>
<td>img, img2</td>
<td>Yes</td>
</tr>
<tr>
<td>pacs4</td>
<td>Archive/Diag</td>
<td>img, img2</td>
<td>Yes</td>
</tr>
<tr>
<td>pacs5</td>
<td>Bit-Bucket</td>
<td>img, img2, img3, img4</td>
<td>No</td>
</tr>
<tr>
<td>clin1</td>
<td>Clinical</td>
<td>img</td>
<td>No</td>
</tr>
<tr>
<td>clin2</td>
<td>Clinical</td>
<td>img</td>
<td>No</td>
</tr>
</tbody>
</table>

1. Server/Diagnostic Workstation (pacs1)

The server should be concentrating on database queries, and not on image distribution. Thus it is not recommended to have the server receiving images from the scanners. It can be used for additional disk space in the event that the network capacity becomes critical.
It should also have a ridistribute process running to check minimum capacity in the event that exams are manually pushed to this workstation. It should also have a ridistribute process check the database partion size regularly.

2. **Diagnostic Workstations (pacs2, pacs3)**

The diagnostic workstations should receive images from the scanners, and ensure that sufficient disk capacity is available for this import. It also should offload the dictated exams at the end of the day to a high-capacity bit-bucket or archive and remove sufficient space for the next day’s exams.

3. **Archive/Diagnostic Workstation (pacs4)**

The archive will also function as a good receptor of images, however it must have sufficient disk capacity to archive the system’s exams. Since the archive copies the exams locally before putting them on tape, there is a critical need to maintain a threshold capacity on this system. For this reason, the archive system will be given a slightly higher OK and MINIMUM disk capacity threshold compared to the other systems.

4. **Bit-Bucket High Capacity System (pacs5)**

High capacity Bit-Bucket’s are designed to hold exams for an extended period of time to make these exams available to the radiologists for comparison, and to the clinicians on the floors for inpatient care. It is important to make space available on this system to receive dictated exams from each of the diagnostic workstations. During the day, it’s main responsibility will be in serving images to all workstations, however in the evening it should make space available and receive the dictated exams from the other workstations. It should also maintain a minimum capacity by removing or archiving exams rather than distributing these images back to other systems. This is the final image repository before the robotic archive.

5. **Clinical Workstations – RIdisplay (clin1, clin2)**

The clinical workstations contain disk capacity which is rarely used. It could provide a large cache of disk space in the event that the rest of the system reached a critical capacity. Thus we will configure these systems to be used as a last resort.

**D. RECOMMENDED GLOBAL CONFIGURATION FILES**

The following sections will illustrate the configuration files required to support the functionality defined in the previous section. These configuration files will use the m4 processor include statements with a global configuration file on the server containing the parameters used by the rest of the network. This will make updating the disk capacities of the available directories easier since only 1 file will need to be modified.

The following information should be put in a global file “/img/ridistribute_defaults”. This file will be available to all the other workstations.

```
# Purpose: Global Defaults for RIdistribute
# Filename: /net/pacs1/img/ridistribute_defaults
#---------------------------------------------------------------
# Uncomment the following line to disable RIdistribute on All systems
```
Start configuring the system with equal desired levels, assuming that the images will be equally distributed from the scanners to the workstations. If, after some clinical operation, a disk runs out of disk space before ridistribute can make available space, then consider upping the desired levels for those disks.

The following information will also be put in a global include file and will provide the global parameters necessary for disk balancing “/img/ridistribute_balance”. This file will be included in each of the balancing configuration files.
include(/net/pacs1/img/ridistribute_defaults)
LockFile: /opt/ISTri/etc/.rid_balance.lck
Select: select exam_key,dictate_uk,import_date from exam where NOT_IN_USE and EXAM_COMPLETE
Sort: OLD_DICTATED_FIRST
SelDest: All.Diag.BitBucket

The following information will also be put in a global include file and will provide the global parameters necessary for moving dictated exams to the bitbucket on a scheduled basis “/img/ridistribute_move2bb”. This file will be included in each of the SelectMove configuration files.

include(/net/pacs1/img/ridistribute_defaults)
LockFile: /opt/ISTri/etc/.rid_move2bb.lck
Select: select exam_key, import_date from exam where NOT_IN_USE and EXAM_COMPLETE and DICTATED
Sort: order by import_date
SelDest: All.Diag.BitBucket

E. SERVER (PACS1)

1. Disk Balancing

Disk Balancing will be provided on this workstation using the following config file “/opt/ISTri/etc/rid_balance”. This file is very similar to the other workstations, except for the CheckDir line.

include(/net/pacs1/img/ridistribute_balance)
CheckDir: pacs1 /net/pacs1/img
Process: ThreshMove
CheckDir: pacs1 /net/pacs1/img2
Process: ThreshMove

2. Move Dictated Exams to Bit-Bucket

The following configuration file “/opt/ISTri/etc/rid_move2bb” will allow ridistribute to move dictated exams to the bit-bucket.

include(/net/pacs1/img/ridistribute_move2bb)
CheckDir: pacs1 /net/pacs1/img
Process: SelectMove

3. Check Database Partition Space

The following file “/opt/ISTri/etc/rid_checkdb” will check the database partition space, and issue a warning if the current space falls below 20MB.

include(/net/pacs1/img/ridistribute_defaults)
4. Scheduled Operation

RIdistribute will be run on this workstation every 15 minutes to ensure that the disk capacity is maintained. At the end of each day (6pm and 11pm), it will offload any dictated exams to the bit-bucket. It will also run every day at 8am to check the database partition size. These capabilities are accomplished by adding the following lines to imaging’s crontab.

0,15,30,45 * * * * exec csh –c "/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid_balance"
0 18,23 * * * exec csh –c "/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid_move2bb"
0 8 * * * exec csh –c "/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid_checkdb"

F. Diagnostic Workstation (PACS2)

1. Disk Balancing

Disk Balancing will be provided on this workstation using the following config file “/opt/ISTri/etc/rid_balance”. This file is very similar to the other workstations, except for the CheckDir line.

include(/net/pacs1/img/ridistribute_balance)
CheckDir: pacs2 /net/pacs2/img
Process: ThreshMove
CheckDir: pacs2 /net/pacs2/img2
Process: ThreshMove

2. Move Dictated Exams to Bit-Bucket

The following configuration file “/opt/ISTri/etc/rid_move2bb” will allow ridistribute to move dictated exams to the bit-bucket.

include(/net/pacs1/img/ridistribute_move2bb)
CheckDir: pacs2 /net/pacs2/img
Process: SelectMove
CheckDir: pacs2 /net/pacs2/img2
Process: SelectMove

3. Scheduled Operation

RIdistribute will be run on this workstation every 15 minutes to ensure that the disk capacity is maintained. At the end of each day (6pm and 11pm), ridistribute will move the dictated exams to the bit-bucket. This is accomplished by adding the following lines to imaging’s crontab.

0,15,30,45 * * * * exec csh –c "/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid_balance"
G. Diagnostic Workstation (PACS3)

1. Disk Balancing

Disk Balancing will be provided on this workstation using the following config file “/opt/ISTri/etc/rid_balance”. This file is very similar to the other workstations, except for the CheckDir line.

```
include(/net/pacs1/img/ridistribute_balance)
CheckDir: pacs3 /net/pacs3/img
Process: ThreshMove
CheckDir: pacs3 /net/pacs3/img2
Process: ThreshMove
```

2. Move Dictated Exams to Bit-Bucket

The following configuration file “/opt/ISTri/etc/rid_move2bb” will allow ridistribute to move dictated exams to the bit-bucket.

```
include(/net/pacs1/img/ridistribute_move2bb)
CheckDir: pacs3 /net/pacs3/img
Process: SelectMove
CheckDir: pacs3 /net/pacs3/img2
Process: SelectMove
```

3. Scheduled Operation

RIdistribute will be run on this workstation every 15 minutes to ensure that the disk capacity is maintained. At the end of each day (6pm and 11pm), ridistribute will move the dictated exams to the bit-bucket. This is accomplished by adding the following lines to imaging’s crontab.

```
0 18,23 * * * exec csh –c "/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid_move2bb"
```

H. Archive/Diagnostic Workstation (PACS4)

1. Disk Balancing

Disk Balancing will be provided on this workstation using the following config file “/opt/ISTri/etc/rid_balance”. This file is very similar to the other workstations, except for the CheckDir line.

```
include(/net/pacs1/img/ridistribute_balance)
CheckDir: pacs4 /net/pacs4/img
Process: ThreshMove
CheckDir: pacs4 /net/pacs4/img2
```
Process: ThreshMove

2. **Move Dictated Exams to Bit-Bucket**

The following configuration file “/opt/ISTri/etc/rid_move2bb” will allow ridistribute to move dictated exams to the bit-bucket.

```plaintext
include(/net/pacs1/img/ridistribute_move2bb)
CheckDir:  pacs4  /net/pacs4/img
Process: SelectMove
CheckDir:  pacs4  /net/pacs4/img2
Process: SelectMove
```

3. **Auto-archive initiated at the end of the day**

The following configuration file “/opt/ISTri/etc/rid_archive.dat” will allow riarchive to backup the day’s exams. RIarchive will backup new exams to the Initial tapeset and backup exams that have been archived once to the Active tapeset if they are 1 week old. The likelihood that the exams will be modified (altered) after 1 week will be minimal and thus the exam will be less likely to require more than 2 archives. Old exams that have been altered and archived twice will be archived again to preserve any changes. This should be done near the end of the lifespan of these exams. For example, if the system capacity is sufficient to hold 60 days worth of exams, then the altered exams should be rearchived around 55 days where the likelihood of them being altered again is minimal.

Notice that RIarchive DOES NOT remove the exams anymore. This is because ridistribute now handles this function and will maintain the maximum number of exams in the system based on disk thresholds, not exam age.

```plaintext
Database: //pacs1/db/radiology
Mail: imaging@pacs1
Jukebox: Pacs4Juke
Tapeset: Initial
Remove: N
Priority: 6
Select: select exam_key,import_date,import_time from exam where archive_uk=0 and
(import_date<today or ((current-import_time)>interval(30) minute to minute))
order by import_date,import_time;
Tapeset: Active
Remove: N
Priority:7
Select: select exam_key from exam where archive_uk=1 and exam_date<today-7;
Select: select exam_key from exam where archive_uk>1 and exam_date<today-55 and
altered>0;
```

4. **Scheduled Operation**

RIdistribute will be run on this workstation every 15 minutes to ensure that the disk capacity is maintained. At the end of each day (6pm and 11pm), ridistribute will move
the dictated exams to the bit-bucket. At 8pm, the archive will be started to backup new exams to the Initial tapeset and backup exams that have been archived once to the Active tapeset if they are 1 week old. The likelihood that the exams will be modified (altered) after 1 week will be minimal and thus the exam will be less likely to require more than 2 archives. This is accomplished by adding the following lines to imaging’s crontab.

```
0,15,30,45  *  *  *  *  exec csh –c "/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid_balance"
0  18,23  *  *  *  exec csh –c "/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid_move2bb"
0  20,23  *  *  *  exec csh –c "/opt/ISTri/bin/riarchive /opt/ISTri/etc/rid_archive.dat"
```

I. **BIT-BUCKET WORKSTATION (PACS5)**

1. **Maintain Minimum Available Disk Capacity**

Exams will be deleted from each disk on this system if the total disk capacity should fall below a designated threshold of 1000MB (RemThresh specified in Mbytes). You should keep this minimum value greater than the average Desired value of each of the system disks so that exams will be pushed here first. You can also reduce the desired value of the bit-bucket disk to increase the priority that exams will be sent here first. Create the file “/opt/ISTri/etc/rid_threshrm” as follows:

```
include(/net/pacs1/img/ridistribute_defaults)
LockFile: /opt/ISTri/etc/.rid_threshrm.lck
Remove: select exam_key,dir_key,last_access from exam where DICTATED and
        OK_TO_REMOVE order by last_access;
RemThresh: 1000
RemDir: All.Diag.BitBucket
CheckDir: pacs5 /net/pacs5/img1
Process: ThreshRemove
```

2. **Scheduled Removal to Create Available Disk Space**

At the end of the workday, space on the bit-bucket should be made available for the dictated exams which will be coming from the workstations. If the average daily workload is 4 GB, then the RemThresh should be set to 5000 Mbytes (4GB above the minimum 1GB level) and RemDir set to All.Diag.BitBucket so that all 4 disks will be included in the operation. If the workload increases due to periodic variations, then the previous command will still maintain the minimum capacity of 250 MB per disk. The scheduled exam deletion should be done prior to the scheduled move operation, and allows the bit-bucket to prepare for the incoming images. If each workstation starts sending images at 6:00, then start this operation at 5:30. Create the file “/opt/ISTri/etc/rid_schedrm” as follows:

```
include(/net/pacs1/img/ridistribute_defaults)
LockFile: /opt/ISTri/etc/.rid_schedrm.lck
Remove: select exam_key,dir_key,last_access from exam where DICTATED and
        OK_TO_REMOVE order by last_access;
RemThresh: 5000
RemDir: All.Diag.BitBucket
```
CheckDir: pacs5 /net/pacs5/img1
Process: ThreshRemove

3. **Scheduled Operation**

RIdistribute will be run on this workstation every 15 minutes to ensure that a minimum disk capacity of 1000MB is maintained. It will also run at 5:30pm to prepare for the incoming dictated exams by making 5000MB of disk capacity available. This is accomplished by adding the following line to imaging’s crontab.

0,15,30,45 * * * * exec csh –c “/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid_threshrm”

30 17 * * * * exec csh –c “/opt/ISTri/bin/ridistribute –c /opt/ISTri/etc/rid_schedrm”

J. **CLINICAL WORKSTATIONS (CLIN1 AND CLIN2)**

Since exams are not being sent from the scanner to the clinical workstations, these disks should never fill up except that they may hold exams for overflow when the system becomes critical. RIdistribute will not overload these workstations, so no disk balancing or scheduled distribution is required.