AcuoMed Image Manager

Installation and Operations Guide

Release 6.0

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Chapter 1 – Introduction

In this chapter:

Purpose of this Installation and Operations Guide

Who Should Read this Guide

How to Use this Guide

Related Documents and Reference Sources

Conventions Used in this Guide

Purpose of this Installation and Operations Guide

Acuo Technologies prides itself on the customized assistance it provides to customers in support of the installation and implementation of new systems. This guide is to be used in conjunction with that process and serves as a reference for how to perform many routine, daily operational tasks – such as how to install databases, configure delivery routes for images, configure batch processing, perform remote management, and handle system backup and recovery planning.

The guide describes all available AcuoMed features. However, certain features are individually licensed and may, therefore, not be part of your currently installed AcuoMed system. Please contact Acuo Technologies if you would like to add more capabilities to your current AcuoMed implementation.

Who Should Read this Guide

This guide is written primarily for a system administrator level person who may typically work with a database administrator charged with maintaining the Acuo Technologies server and applications. Much of what is involved with actually operating Acuo Technologies' products is installing and configuring them. So someone such as a system administrator or database administrator who is experienced using these types of products on a daily basis will best be able to perform the tasks described in this guide.

How to Use this Guide

If you are simply referring to this guide at some point after the initial installation and implementation of the product, you will probably not need to revisit material such as the Getting Started information. However, if you are new to Acuo Technologies' products, it is recommended that you read the Overview to get a better understanding of the general environment in which the products operate and the functions they perform. After that, refer to the other chapters of the guide for specific information on the tasks you need to perform.
The following topic summarizes by chapter the types of information this book contains.

Contents of this Guide

Here is a summary of the information provided in this document:

Chapter 1 - Introduction: This chapter provides an overview of the information that you will find in this document along with information about how to best use the document. In addition, it provides key information such as how to contact technical support.

Chapter 2 – AcuoMed Overview: This chapter describes the overall environment in which the AcuoMed product works and provides valuable insight into how it can be used to your advantage. In addition, it also summarizes the product's key functions.

Chapter 3 – Getting Started: This chapter provides hardware, software, and network configuration recommendations. It also gives step-by-step procedures for installing AcuoMed, creating an MMC console, and installing AcuoMed's required databases.

Chapter 4 – AcuoMed Configuration Example: This chapter provides an AcuoMed configuration example that includes step-by-step instructions of how to build the sample configuration.

Chapter 5 – Patient Management: This chapter describes the patient management functionality that is available within AcuoMed. Reconciliation, which is part of patient management functionality, is a separately licensed feature.

Chapter 6 - DICOM Modality Worklist HIS/RIS Connectivity: This chapter describes AcuoMed's capability to connect to and interact with a HIS/RIS system. HIS/RIS connectivity is a separately licensed feature.

Chapter 7 – Acuo Batch Processing Managers: This chapter summarizes the capabilities of the batch processing managers used to control batch stores, batch moves, and batch reprocessing.

Chapter 8 - IHE Audit Log/Recycle Bin Manager: This chapter describes the functionality of the IHE Audit Log Manager stand-alone application providing patient information confidentiality, data integrity and user accountability.

Chapter 9 – Remote Management: This chapter provides information describing the various ways in which you can manage AcuoMed functionality from a remote site.

Chapter 10 – System Backup and Recovery: This chapter covers system backup and recovery procedures and other procedures required to keep databases in sync and their contents protected.

Chapter 11 – Advanced Functionality: This chapter covers AcuoMed features and functionality that is considered advanced and not necessarily included within the basic configuration example in Chapter 4.

Appendix A – Frequently Asked Questions: This appendix includes a number of answers to frequently asked questions.

Appendix B – Troubleshooting: This appendix describes available troubleshooting aids and the various steps you can take if you encounter problems using Acuo products.

Appendix C – Storage Analysis: This appendix describes Acuo Technologies' Storage Analysis spreadsheet tool that you can use to determine storage sizing requirements according to the types of modalities that will be supported, the numbers of images that need to be stored, and the time periods over which they need to be stored.

Appendix D – Optional Settings – This appendix describes optional configuration settings. Please contact Acuo Technologies for more information.

Glossary: The glossary contains definitions of terms and acronyms used in Acuo Technologies' product environments.

Related Documents and Reference Sources

There are a number of very useful related documents and reference sources that you may want to review. These include the following:

- The *AcuoStore Digital Asset Manager Installation and Operations Guide*
- The *AcuoMed Image Manager DICOM Conformance Statement*. This document is available in PDF format at the Acuo Technologies Web site at http://www.acuotech.com.
- Appropriate DICOM station conformance statements.
- The DICOM 3.0 Standard.
- The Windows Server Help System and the Microsoft SQL Server Help System, accessed by choosing Help from the Windows Start menu.
- If you are using tape for nearline or offline storage, refer to the documentation supporting these products. This includes device documentation and related HSM (Hierarchical Storage Management) information such as Microsoft RSS and RSM information in the Microsoft Windows Help System, or other vendor's tape-based storage management systems.
- If you are using tape or other HSM products used as a backup utility, please refer to the documentation supporting these products.

Conventions Used in this Guide

It is important to keep in mind a few basic conventions used for presenting information in this document. These conventions are summarized below.

Procedures

As much as possible, instructions for performing installation and operational tasks are presented by means of procedures. A procedure consists of several numbered steps to be performed in sequence. Procedure steps are numbered and may include additional explanatory information as is appropriate. Here is an example of how procedure steps appear in this manual:

1. Before beginning installation, review configuration recommendations.

   Chapter 3 – Getting Started provides hardware, software, network, and offline storage configuration information.

2. Back up the target system before starting Setup.

   Make sure a full backup of the system and its registry is done before proceeding with installation.

Optional Procedure Steps

Certain steps in a procedure may not be required in all cases. Procedure steps that contain optional actions are indicated by the word (Optional) in parenthesis at the beginning of the procedure step, as shown in the example here:

1. (Optional) For maximum protection, make a second backup of your current data before beginning installation.

What Keys and Buttons Look Like

Specific keyboard keys that you are instructed to press appear in boldface type, as in the following example:

Press **Enter** to continue.

On-screen buttons that you are instructed to click appear in two ways:

- For labeled buttons, the button's label appears in boldface type, as in: Click **OK** to continue.
- For icon buttons, the icon appears in the text, as in: Click to save your file.

Notes, Cautions, and Warnings

Notes provide additional explanatory information or special instructions that apply to the process you are currently doing. Notes can also contain tips and special instructions about things you need to do under certain conditions. Here is an example Note.

NOTE: You should read all notes to be sure not to miss any important installation or operations information.

Caution messages call your attention to conditions or actions that may result in damage to hardware or software systems or that may jeopardize operational integrity or your data. An example caution looks like this:

Caution

Close Microsoft Windows before powering off your workstation. Powering down with Windows running may cause future operational problems in your Windows environment.

Warning messages alert you to conditions or actions that may result in personal injury to you or serious damage to your system, operational environment, or data. An example Warning looks like this:

Warning

It is possible to delete assets using the pop-up menu that is accessed by right-clicking an AcuoStore application. This will actually remove the digital assets from the system. Be careful **NOT** to select Delete Assets from the pop-up menu unless you intend to permanently remove the application's digital assets from the Acuo system.

How to Get Assistance

Recommended Support Process

In order to appropriately track your support requests, during or after business hours, please use our online web portal located at www.acuotech.com/support.html. New cases can be created and tracked via this online support tool.

Other ways to contact Acuo Support

In the event that your web portal request is not being handled appropriately please feel free to contact us via email or phone:

- support-escalations@acuotech.com
- Calling 866-272-2286 (Acuo) will prompt callers to:
    - Press 1 for Software Support
    - Press 2 for Migration Support
    - Press 0 for all other inquiries

Chapter 2 – AcuoMed Overview

In this chapter:

AcuoMed Architecture

SOP Classes and Compression

Storage Commitment

Duplicates Processing

Move/Route Mapping

Controlling Routing with Tag Rules

The AcuoMed Image Manager

The AcuoMed Image Manager (or AcuoMed for short) is Acuo Technologies' medical imaging product that provides an open-systems solution for transporting, storing, tracking, and retrieving digital medical images across an entire storage system network. AcuoMed is a DICOM 3.0 Level 2 compliant server that uses Microsoft Windows as a platform. In this way, AcuoMed implements the DICOM specification in a very cost-effective manner while still providing the key features of a distributed, secure file system that implements remote storage services and removable storage management. In addition, AcuoMed supports operation with Microsoft SQL Server.

AcuoMed is an open system that provides archive storage that is both collaborative and extensible. An AcuoMed customer can continue to access existing non-Acuo archiving equipment (provided it is DICOM 3.0 compatible) and can incrementally add AcuoMed Servers to their enterprise as needed. The collaborative nature of the AcuoMed system provides a path for migration of digital assets. And the extensibility of the AcuoMed system provides a path for migration of both existing and new hardware systems. Figure 1 shows the concept of multiple Acuo and non-Acuo systems comprising of an enterprise's total image archive. This total enterprise image archive can be distributed across many departments, facilities, and geographic locations.

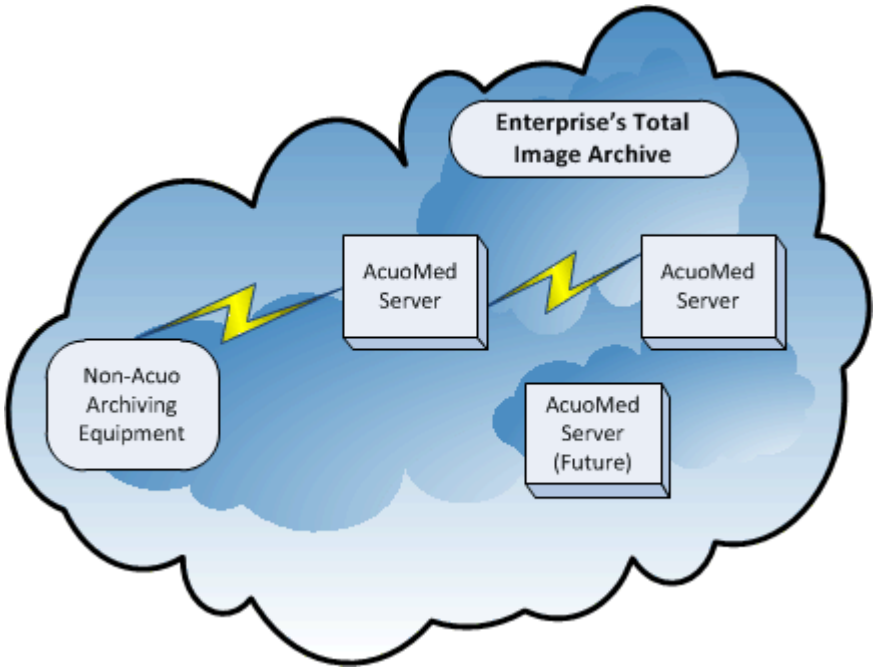

Figure 1: AcuoMed is collaborative and extensible

AcuoMed works in concert with Acuo Technologies' AcuoStore product. AcuoStore is a digital asset management service that AcuoMed uses to store and retrieve digital medical images based on a Globally Unique Asset ID (GUID). AcuoStore is discussed as needed in this document to explain AcuoMed capabilities and operations. The AcuoStore product is described in detail in the separate document *AcuoStore Installation and Operations Guide*.

The following topics provide additional AcuoMed information including:

- Who Needs AcuoMed?
- Basic Usage Scenario
- Password-Level Security
- Configuration Security – Microsoft Management Console

Following these topics, the remainder of the chapter discusses AcuoMed's architecture and additional enterprise features.

Who Needs AcuoMed?

Hospital and clinics are the main AcuoMed users. AcuoMed works in conjunction with the AcuoStore data storage archive manager to provide routing and storage capability to a range of DICOM-compatible imaging devices (modalities) and view stations. These devices are connected to imaging LANs at hospitals and their associated clinics. The imaging LANs can be interconnected between hospitals and clinics by means of virtual private networks (VPNs) across Internet connections or via private wide-area networks (WANs).

AcuoMed is installed and configured by hospital and clinic IS Department staff personnel. AcuoMed then works behind the scenes to provide image routing, storage, tracking, and retrieval. AcuoMed does not adversely impact the day-to-day activities or responsibilities of people such as hospital and clinic administrators, radiologists, or modality operators.

The following diagram summarizes the main entities and types of personnel that comprise the overall environment of which AcuoMed is a part.

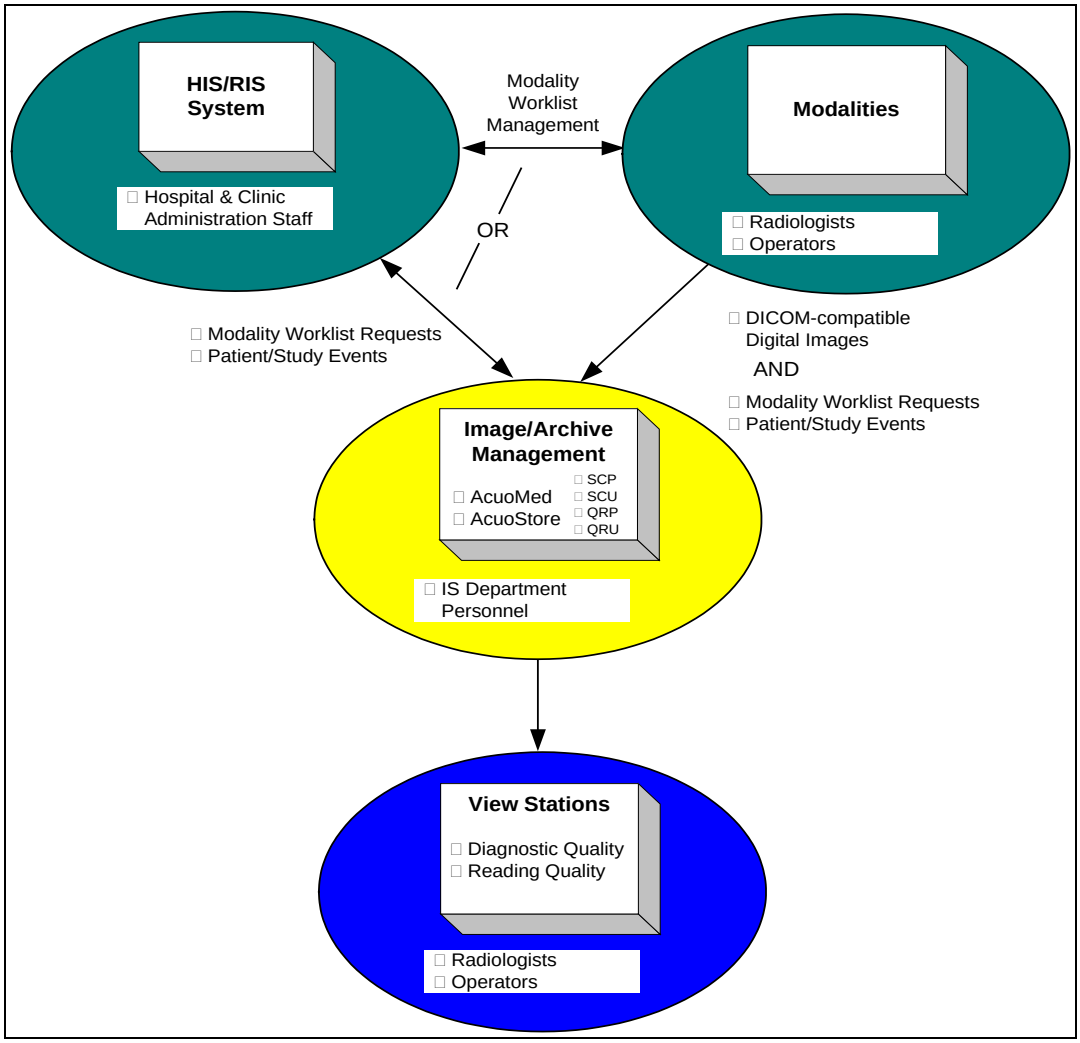

Figure 2: AcuoMed's Environment

Figure 2 shows, among other things, the kinds of data that flow between entities in the AcuoMed environment. AcuoMed's architecture is both distributed and collaborative, which promotes automated workflow processes and secure integrated access to digital images across an entire enterprise. AcuoMed's PACS accelerator benefits include fast, consistent, automated image distribution, while reducing the number of people needed to manage patient records. AcuoMed provides optional features that enhance federation and provide HIS/RIS connectivity, compression and advanced patient management (quality control) capabilities. AcuoMed can off-load from modalities the handling of modality worklist requests and patient/study events, thereby reducing the cost, traffic, and control and filtering of the modality's HIS/RIS interface. These concepts are discussed further in the remainder of this Overview chapter.

Basic Usage Scenario

The DICOM standard provides point-to-point routing of medical images. AcuoMed adds significant value and functionality in a DICOM environment by providing point-to-multipoint, bi-directional routing and retrieval of images. This capability allows AcuoMed to route an image from a particular modality, such as an MRI or an Ultrasound system, to several destinations concurrently. For example, an image that an MRI station transfers to AcuoMed could be routed to a local image cache, a view station, and a deep-level archive at a different medical facility, all in a single transaction.

AcuoMed is designed to provide an imaging center (clinic, hospital, enterprise) the ability to scale from one storage pool/cluster up to *n* clusters. From a single system at a department level, a single doctor at a single viewing station can request information stored not only locally to that department, but can also request cross specialty information (such as radiology and cardiology images). AcuoMed makes this interchange and federation seamless to the user at the viewing station.

The following diagram shows a basic AcuoMed usage scenario. In this configuration, an AcuoMed Server located at a clinic is connected to several modalities. The AcuoMed Server is configured to route images from these modalities to one or more destinations.

Please notice in this configuration that AcuoMed is routing to a local DICOM database (on the AcuoMed Server), a local image cache (on the clinic LAN), and a deep-level archive tape system connected to another AcuoMed Server. The deep-level archive is located at a central hospital facility and is accessed via a wide-area network connection. The local image cache is typically a large RAID sufficient for holding about six months to one year of image data for its associated modality storage pool. The actual storage and retrieval of images is handled via the AcuoStore Digital Asset Manager that is included as part of an AcuoMed system. For additional information on AcuoStore, refer to the *AcuoStore Digital Asset Manager Installation and Operations Guide*. For a more detailed view of the routing process shown in this scenario and for information about AcuoMed's linkage to AcuoStore, refer to the topic *AcuoMed Architecture* on page *25*.

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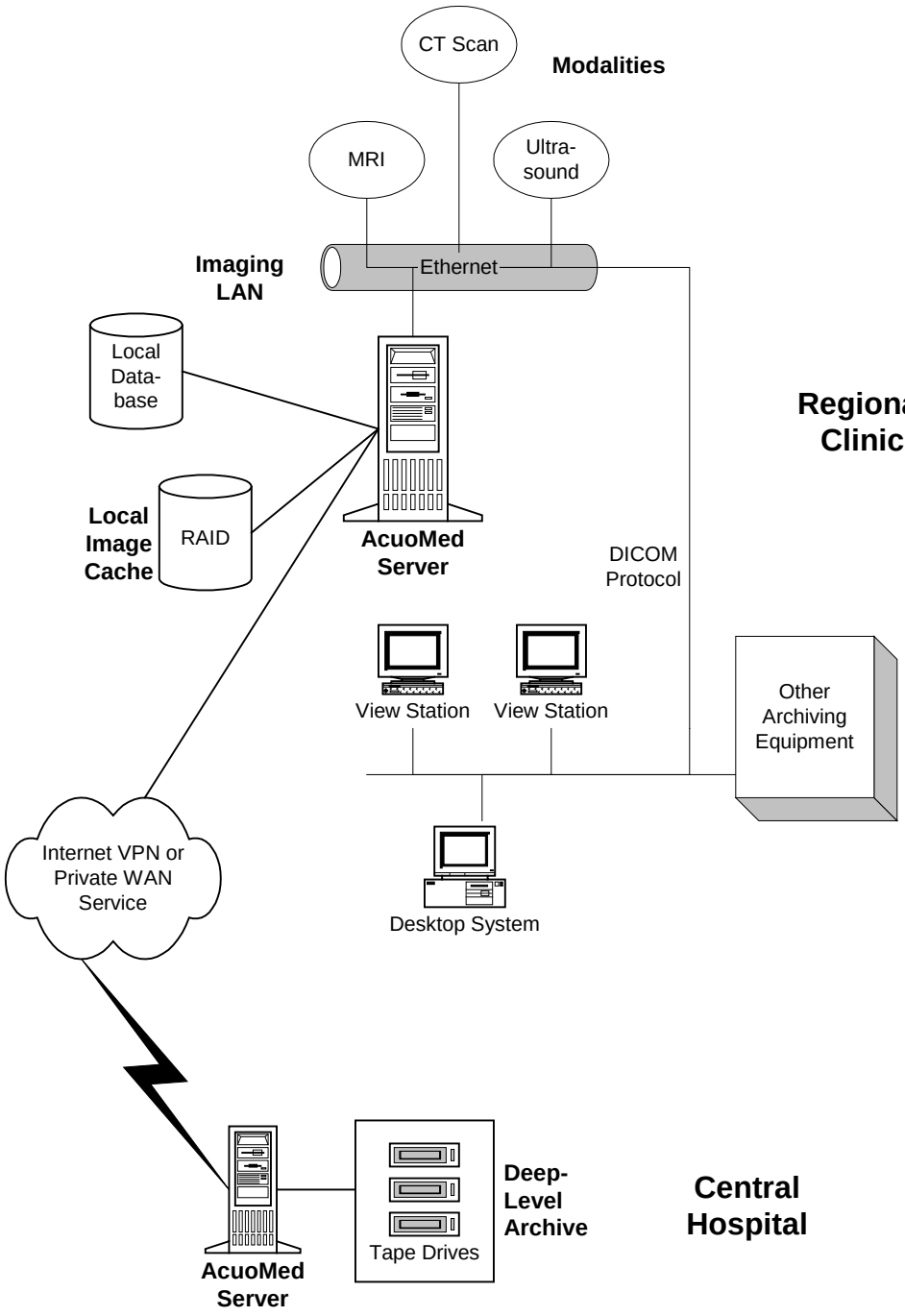

Figure 3: AcuoMed Basic Usage Scenario

Password-Level Security

Password-level security refers to using Login/Password information to control access to the AcuoMed and AcuoStore databases for the AcuoMed and AcuoStore applications themselves. The AcuoMed and AcuoStore applications are the only services that should be allowed to access the AcuoMed and AcuoStore databases.

As a person using AcuoMed, you will not be asked to supply this Login/Password information at any time during day-to-day operation of AcuoMed. However, there may be cases where you need to change the Login/Password information – for example, if your SQL Server administrator requires that passwords be changed every 30 days.

If your login or password information for SQL Server is changed (by an administrator for example), you would need to change the login and/or password for AcuoMed in order for AcuoMed to continue to have access to the AcuoMed database. This change is made by right-clicking on the **Image Manager Server Node** in the MMC console tree and selecting **Change Database Connection** from the pop-up menu. This selection displays the Database Connection Parameters dialog (Figure 4). You then change the Login and/or Password parameters as required to match the new SQL Server Login/Password or Windows Authentication setup.

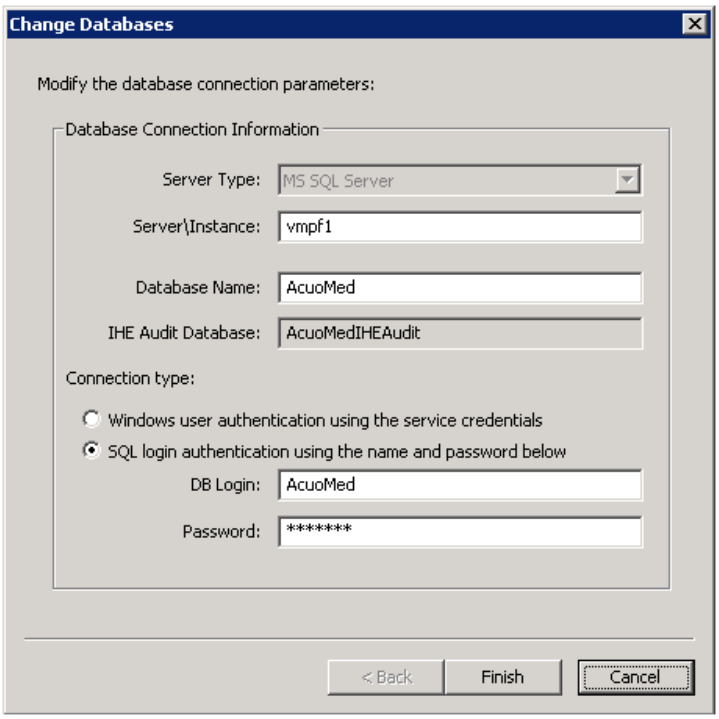

Figure 4: Database Connection Parameters – MS SQL Server Type

AcuoMed password-level security works in conjunction with standard Microsoft SQL Server and Microsoft Windows security to ensure that only users with the proper system privileges can access the AcuoMed database. If you need additional information, contact the SQL Server administrator at your site or refer to the appropriate Microsoft SQL Server documentation.

Configuration Security – Microsoft Management Console

Configuration security refers to an administrator's control over the process of building an MMC console application and using this application to configure the AcuoMed Server. An administrator can reserve these privileges for himself or can assign them to other users. An administrator can also build an MMC console, send it to another user, and then give that user the privilege to configure the AcuoMed service via that MMC console.

AcuoMed's configuration security is integrated with Windows logon security for MMC console applications. Through this integration, AcuoMed's configuration security allows an administrator to build toolboxes of management applications and assign Windows login and password level security to those console applications. Therefore, AcuoMed's configuration security runs within MMC security and observes all the controls and capabilities of MMC security. In addition, AcuoMed's configuration security will leverage any future capabilities that Microsoft may add to MMC security.

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AcuoMed Architecture

In most basic terms, a modality captures a series of images in a digital format. These images are then sent to the AcuoMed Image Manager via a TCP/IP port. AcuoMed "listens" for modalities on one or more of these ports, and each modality sends its images to AcuoMed at a specific port address. The various DICOM parameters associated with each image are extracted and placed in an AcuoMed DICOM Database so that the images can be found and retrieved by searching for information that was entered at the time of the exam (for example, the patient name or patient ID).

In addition to the TCP/IP port address, the modality is assigned an AE name, and each image contains that AE name. AE name stands for "application entity name" and is mapped to a route which can represent either a single-point or multi-point destination. For example, an image may be routed to a reading physician, a referring physician, a local cache at a clinic, and a deep-level archive at a hospital. For each image received from a modality, the AE name is associated with a unique route to one or more destinations. Figure 5 shows the concept of AcuoMed connecting a modality to a route through a TCP/IP port by means of an AE name.

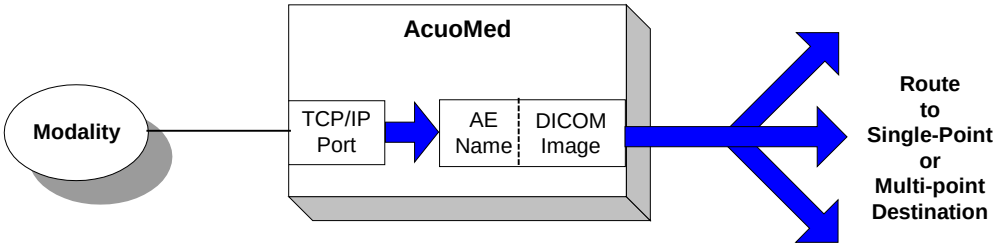

Figure 5: Connecting a modality to a route

In AcuoMed, an AE name can have a 1-to-many association with specific routes. In turn, a route name has a 1-to-many association to one or more destinations. The system is capable of sending images to other servers using push-based technology so that images are available at or near the facility where medical professionals need them.

For example, let's suppose that a particular doctor works in two hospitals and a clinic. After an imaging exam is completed, the image is routed to the AcuoMed Server. Using the Called AE Name of the DICOM association, AcuoMed looks up the route that the image will traverse. The route associates one or more destinations. A destination can be an AcuoMed DICOM database, an external DICOM device, or a continuation of the route to another AcuoMed Server (at this end the image can be routed to further AcuoMed destinations). The routing mechanism is designed so that DICOM tag values that accompany the DICOM image can also be used for routing. For example, the referring physician name could map to a specific route that would deliver the image to that physician's office. In our example in Figure 6, the route consists of destinations at a local hospital, a central hospital, and one clinic. These destinations include a DICOM database, external DICOM devices (such as diagnostic-quality view stations), and another AcuoMed Server at a remote location.

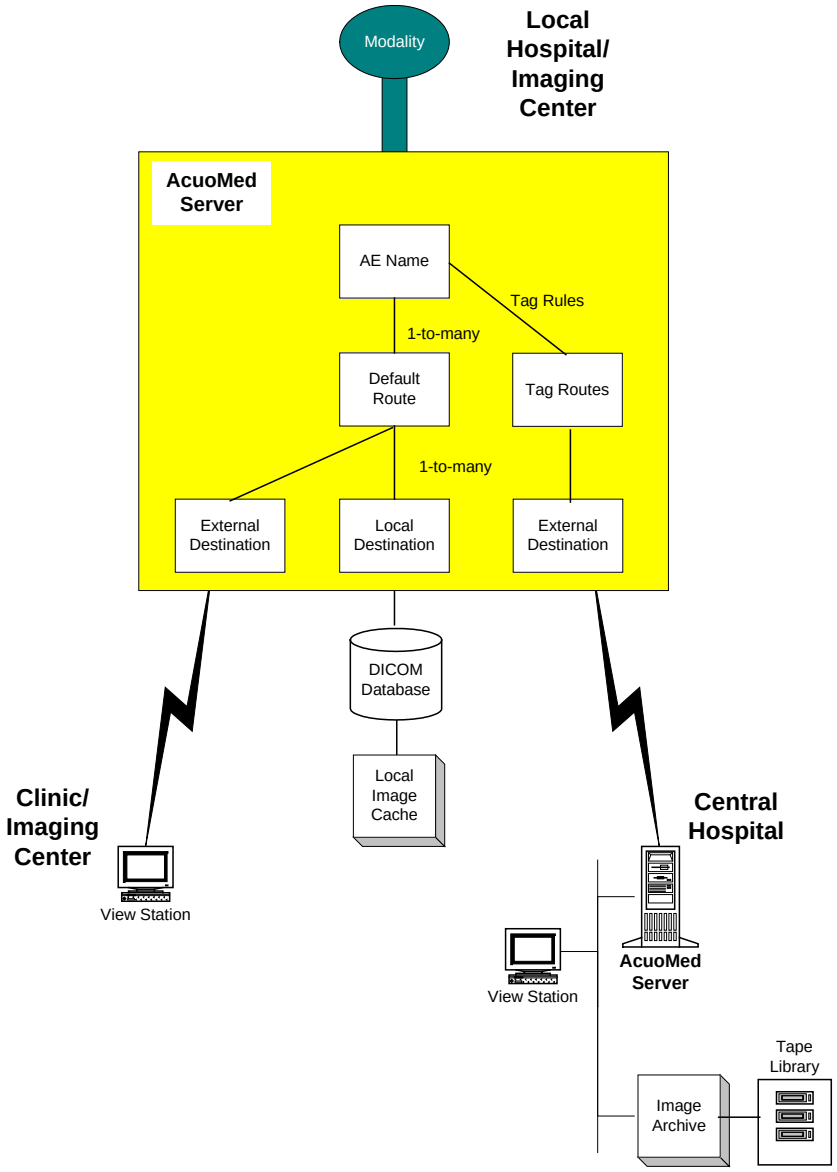

Figure 6: Example route to multiple local route destinations

Search Capabilities

After images are routed and stored in one or more image archives, it is necessary to be able to locate those images again. Searching for images is facilitated by a system-wide routing facility that can operate across multiple local and remote sites. Searches can be configured to search a local server (or servers). Having images on a local server is the normal situation, since they have been pushed to that location by the main collection system. If the user wants to search system wide, the routing facility is used to send search requests to other systems that have been configured for searching (DICOM C_FIND).

The result of a search is patient, study, series, or image level information, and not the physical images themselves. This is done to improve efficiency, since moving a large number of images over a network can be slow, and the user will often search for more images than will be actually inspected. After a search is conducted, the user will request that some number of the images contained in the search results list be displayed at a workstation. Some of the images may be on local servers, while others may be located on servers distributed across the network. (These servers must be DICOM 3.0-capable devices.) The routing system will locate the images and retrieve them from their cached or permanent locations and transfer them to the proper application entities for use. Figure 7 diagrams the AcuoMed search/retrieval concept.

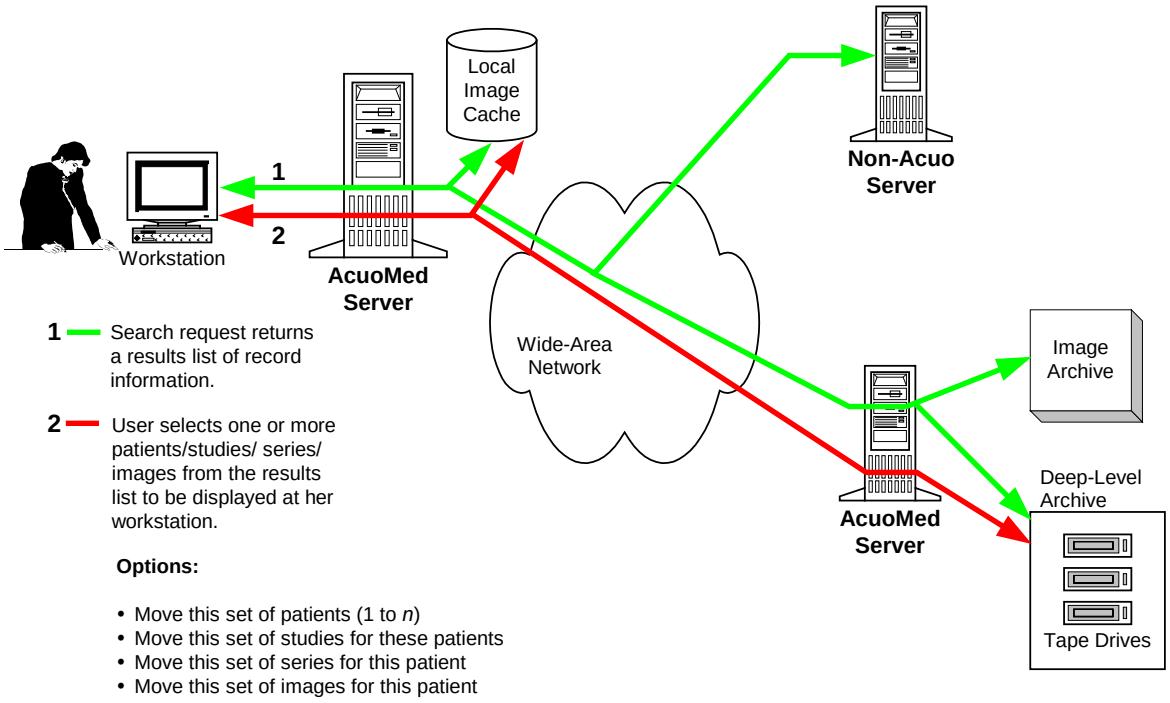

Figure 7: AcuoMed search/retrieval concept

As shown under "Options" in the figure above, AcuoMed supports four levels of Move/Find:

Patient – moves 1 to *n* patients.

Study – moves a particular study or set of studies. A study consists of a group of scans (1 to *n*) from multiple modality types (for example, CT and MR and Ultrasound).

Series – moves a particular series or set of series. A single series consists of a group of scans from a single modality type (for example, CT or MR or Ultrasound).

Image – moves a particular set of images for a patient. A moved image consists of the composite header information (that identifies the patient, study, series, and image) and the image pixel data.

These four levels are related as follows:

1 to *n* number of Studies associated with a single Patient.

1 to *n* number of Series associated with a single Study.

1 to *n* number of Images associated with a single Series.

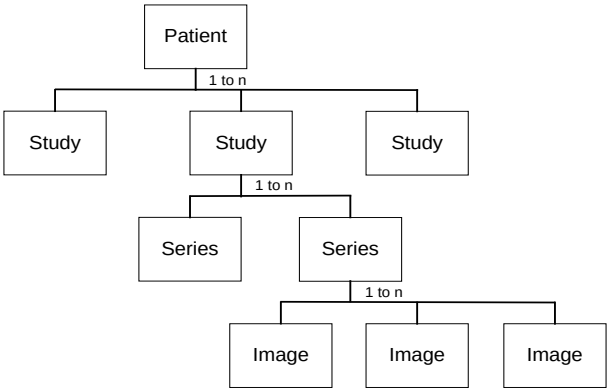

Figure 8: Relationship of Patients, Studies, Series, and Images

AcuoMed uses the AcuoStore Service to perform the actual storage and retrieval of images to and from physical storage. The following topic discusses AcuoMed's linkage to AcuoStore.

Linkage to AcuoStore

AcuoStore is Acuo Technologies' digital bulk storage service that AcuoMed uses to store and retrieve digital medical images based on a digital asset's globally unique ID (GUID). AcuoMed controls image file grouping within the AcuoStore product, allowing AcuoStore to move groups of files online to offline or nearline devices (RAID to CAS for example) and offline/nearline to online (CAS to RAID). Movement of data to tape may require additional hardware and/or software such as an HSM.

AcuoMed's linkage to AcuoStore is via DICOM database connections that are configured to link to AcuoStore applications. These applications, in turn, are mapped to logical shares, and these shares define the physical storage locations where images are archived. Figure 9 summarizes AcuoMed's linkage to AcuoStore.

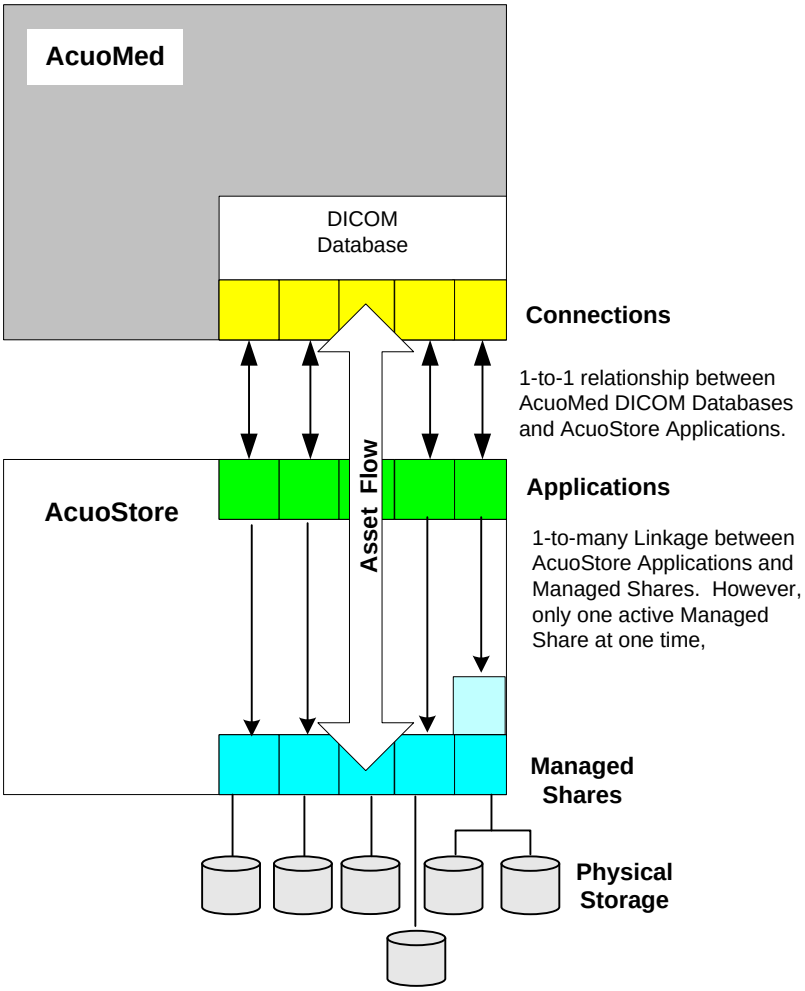

Figure 9: AcuoMed's linkage to AcuoStore

AcuoMed's linkage to AcuoStore involves making connections between AcuoMed and AcuoStore databases that enable storage and retrieval of AcuoMed's medical images to AcuoStore's physical storage resources. The next topic summarizes what these databases contain.

AcuoMed/AcuoStore Database Structure

When AcuoMed and AcuoStore are installed, at least three databases must also be installed and connected to the Acuo applications:

AcuoStore Database – contains information related to the bulk storage of digital images and related data including information about the shares and about the applications that use those shares. One AcuoStore Database can be shared among multiple AcuoMed servers. For example, you could have an AcuoMed system that services retrieval of images only, another AcuoMed system would service inbound connections only, and yet another AcuoMed system could be used primarily for Reconciling data. There must be a single AcuoStore service connected to an AcuoStore database. Contact Acuo Support for details.

AcuoMed Database – contains server configuration and image management information such as connections to modalities, local route definitions, and remote server configurations. There is one AcuoMed Database per AcuoMed Image Manager.

AcuoMed DICOM Database – contains the patient, study, and series record information that describes the images that are physically present on the AcuoMed archive system. There can be multiple different AcuoMed DICOM Databases in use concurrently on an AcuoMed Image Manager. In addition, the AcuoMed DICOM Database contains information shared with and assigned by AcuoStore. It is this information that acts as a lookup (or "coat check") for image access and retrieval.

NOTE:	One AcuoMed DICOM Database must be installed for each AcuoStore Application. There is a 1-to-1 relationship between AcuoMed DICOM Databases and AcuoStore Applications.

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SOP Classes and Compression

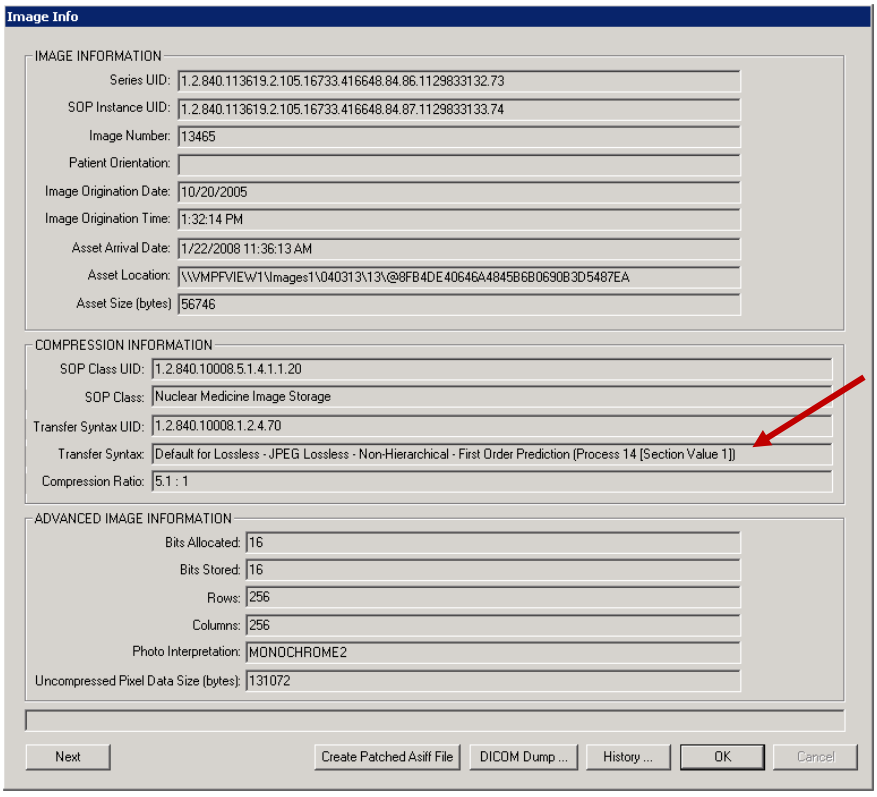
Application entities select SOP classes to establish an agreed upon set of capabilities that will support the interaction of the application entities.

A compression engine is available for each licensed AcuoMed system and can be used to control the format of image data that is stored and delivered. Although additional system requirements are needed such as memory to compensate for compressing and decompressing the image data, the benefits for using compression can include faster transmission times, a reduction in bandwidth used, and the reduction of storage space required. AcuoMed supports several compression algorithms described later in this chapter.

Compression can be used in AcuoMed as an **SCP** for Data Storage and/or an **SCU** for Data Delivery by applying supported Transfer Syntaxes to SOP classes.

Data Storage

As data arrives to an AcuoMed system, compressed data can be accepted or not accepted according to how each application entity's SOPs are configured. For example, you may want to configure one AE's SOP(s) to accept the Transfer Syntax JPEG Lossless (compressed) and Implicit VR Little Endian (uncompressed) images and another AE's SOP(s) to only accept Implicit VR Little Endian (uncompressed) images.



The above figure shows that this particular image was stored in a compressed format. This is indicated by the JPEG-2000 Lossless Transfer Syntax and Compression Ratio noted in the **Compression Information** section, the Asset Size in the **Image Information** section, and the Uncompressed Pixel Data Size noted in the **Advanced Image Information** section.

Data Delivery

Each AcuoMed SCU allows compression options for each SOP class that will evaluate the stored image data and compress or decompress the image data as necessary according to how the external device is configured. It is important to note that it is most efficient for the system to send the data in the format that it is stored. For example, by using AcuoMed Personal,

image data can be stored first into an AcuoMed Temporal system in a compressed state such that any retrieval of compressed data from the AcuoMed Temporal system does not require the system to perform the compression before the data is sent. Figure 10 illustrates this concept.

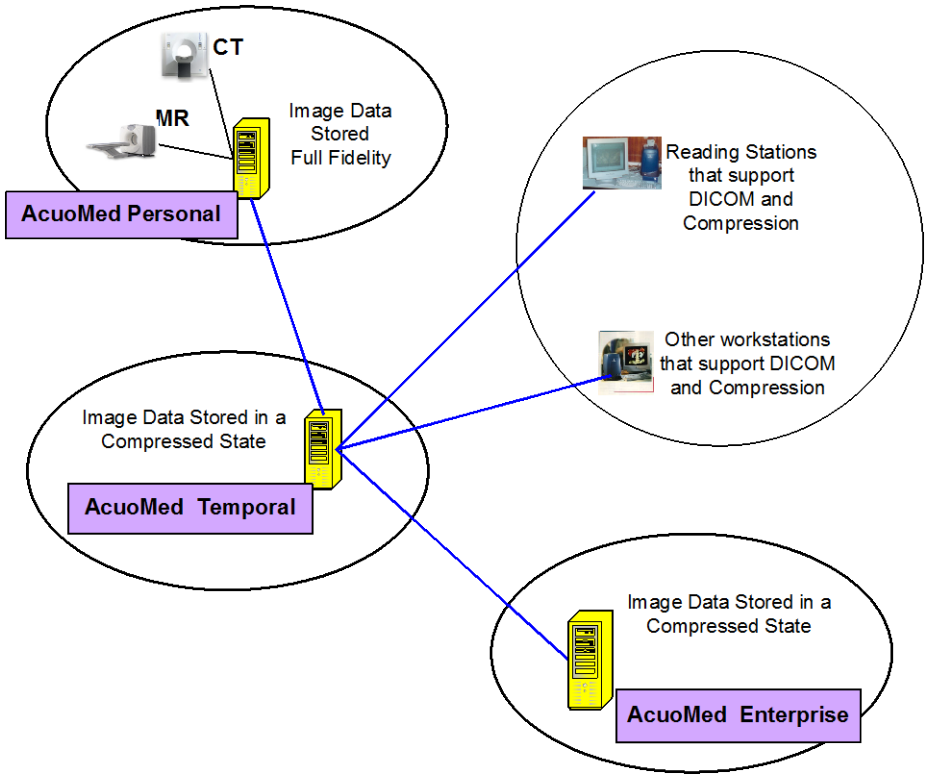


Figure 10: Compression Usage

IMPORTANT NOTE:	Should the data need to be sent in a compressed format different from the compressed format the image data is already stored, AcuoMed will be required to first decompress the data fully then apply the appropriate compression being requested by the external configuration. This compressing/decompressing of the data to be sent is recorded in the AcuoMed Activity Log. For more information on the Activity Log, please refer to the ***Activity Log*** on page 444 .

Transfer Syntaxes Available in AcuoMed

Transfer Syntax	UID	Description
Implicit VR Little Endian Full Fidelity	1.2.840.10008.1.2	Implicit VR Little Endian is included in every inbound and outbound negotiation. Little Endian is often referred to as full fidelity or uncompressed.
Explicit VR Little Endian	1.2.840.10008.1.2.1	Explicit VR Little Endian is automatically enabled by default as an SCU. It is not added to existing SCU configurations but it is included when the Acuo defaults are selected for a new SCU connection. The acceptance of Explicit VR Little Endian can be disabled via registry option.
JPEG Lossless	1.2.840.10008.1.2.4.70	Lossless compression guarantees there is no data lost during the process and is ideally suited for critical document storage such as Medical Image Data.
JPEG Lossy 8-bit	1.2.840.10008.1.2.4.50	Lossy compression can be used to achieve very high compression ratios, for example 10:1, 20:1, and higher. When the resulting compressed data set is decompressed there will be data loss. The lost data is unrecoverable; therefore, Lossy compression should be used only where appropriate.
JPEG Lossy 12-bit	1.2.840.10008.1.2.4.51	See above comments for Lossy compression 8-bit image depth.
JPEG-2000 (Lossless Only)	1.2.840.10008.1.2.4.90	Lossless compression guarantees there is no data lost during the process and is ideally suited for critical document storage such as Medical Image Data.
JPEG-2000 (Lossy Only)	1.2.840.10008.1.2.4.91	Lossy compression can be used to achieve very high compression ratios, for example 10:1, 20:1, and higher. When the resulting compressed data set is decompressed there will be data loss. The lost data is unrecoverable; therefore, Lossy compression should be used only where appropriate. Unlike the Standard JPEG compression this single Transfer Syntax supports 6, 12 and 16-bit image depth data.

NOTE: Standard JPEG Lossy compression does not support 16-bit image depth data, therefore, 16-bit image depth data will be stored and sent Lossless or Full Fidelity based on your configuration. JPEG-2000 does support 16-bit image depth data.

Lossy Compression - Global Quality Factor (Ratio)

For the Standard JPEG Transfer Syntax, the Lossy Global Quality Setting, a value of 1 thru 9, is configurable and determines a Lossy quality factor that is applied on an image-by-image basis as it is stored to an external device. The following diagram explains this in more detail.

For the JPEG-2000 Transfer Syntax, the Lossy Global Setting is noted as a percentage rather than a quality factor setting. See Acuo Technologies for assistance with these settings.

JPEG Standard Lossy Quality Factor Matrix

Global Quality Setting	12 bit Image Original Size	Lossy Image Size	Ratio	
1	524288	102,240	5.1:1	← Least Data Lost = Higher Quality
2 (default)	524288	64260	8.1:1	
3	524288	44676	11.7:1	
4	524288	40284	13:1	
5	524288	33888	15.4:1	
6	524288	26394	19.8:1	
7	524288	23508	22.3:1	
8	524288	19528	26.8:1	
9	524288	8806	59.5:1	← More Data Lost = Lower Quality

The Quality of an image is always calculated at the point it arrives to an Acuo system based on its own unique characteristics. The quality ratio and its size on disk are then displayed at the Image Level in Patient Management (patient view).

NOTE: To preserve image quality, when a Lossy image is stored to an Acuo system, regardless of the quality factor setting, it will be transmitted to an external DICOM device in the same format as it arrived.

Lossy Compression - Modality Quality Factor (Ratio)

In conjunction with the above global setting, a different value ranging between 1 and 9 can be applied on a per modality basis to override the global setting for Lossy compression 8 bit and 12 bit images. For example, if an 8 bit CT image is to be stored by Lossy compression and the default global setting is set to 5, you can override that setting by giving the 8 bit CT images a value of 2, in which case all 8 bit CT images will compress Lossy at a factor of 2 instead of a factor of 5.

Please contact Acuo Technologies for assistance on setting the following values:

- Acuo Adjust Lossy 8
- Acuo Adjust Lossy 12
- Acuo Adjust J2K Lossy

Storage Commitment

The **DICOM Storage Commitmen**t service is used to confirm that a destination AE Title (SCP provided by AcuoMed) takes responsibility for storage and management of a set of DICOM instances (SOP instances). Modalities typically use DICOM Storage Commitment to confirm images are delivered to destinations prior to automatic deletion from the modality cache.

Storage Commitment deals with the issue of ownership of SOP instances, usually images, but could also cover other items, such as reports. The generator of a SOP instance would like to transfer ownership of an instance to an archive to make space for new items. It therefore transmits instances to an archive, and in a separate transaction asks the archive to verify that it has safely stored the instance or instances. If the archive verifies via the commit response that it has the SOP instance(s), the instance generator can then delete those instances if it chooses.

In AcuoMed, local database destinations are selected and ordered for Storage Commitment at the Image Manager Server Property node. The DICOM system (for example Modality) sends an N-ACTION REQUEST to AcuoMed on an SCP AE (listening AE) which has the Storage Commit SOP class enabled. AcuoMed responds with an N-ACTION RESPONSE. An N-EVENT REPORT is then generated and sent to the requester on a new association containing the SOP instance UID(s) in the original request along with the status of each, including an AE name where the images can be retrieved. An external destination and route must also be configured in AcuoMed with the SOP for Storage Commitment enabled so the report (success or fail) can be sent to the requestor.

Figure 11 shows the Storage Commitment tab from the Image Manager Server Properties node. In our example, we have selected one local database destination to be searched for Storage Commitment and left the other parameters at their default settings. More than one local database destination can be selected and then ordered accordingly to improve search efficiency. Storage Commitment stops searching once the instance(s) has been found. Other server node parameter descriptions are as follows:

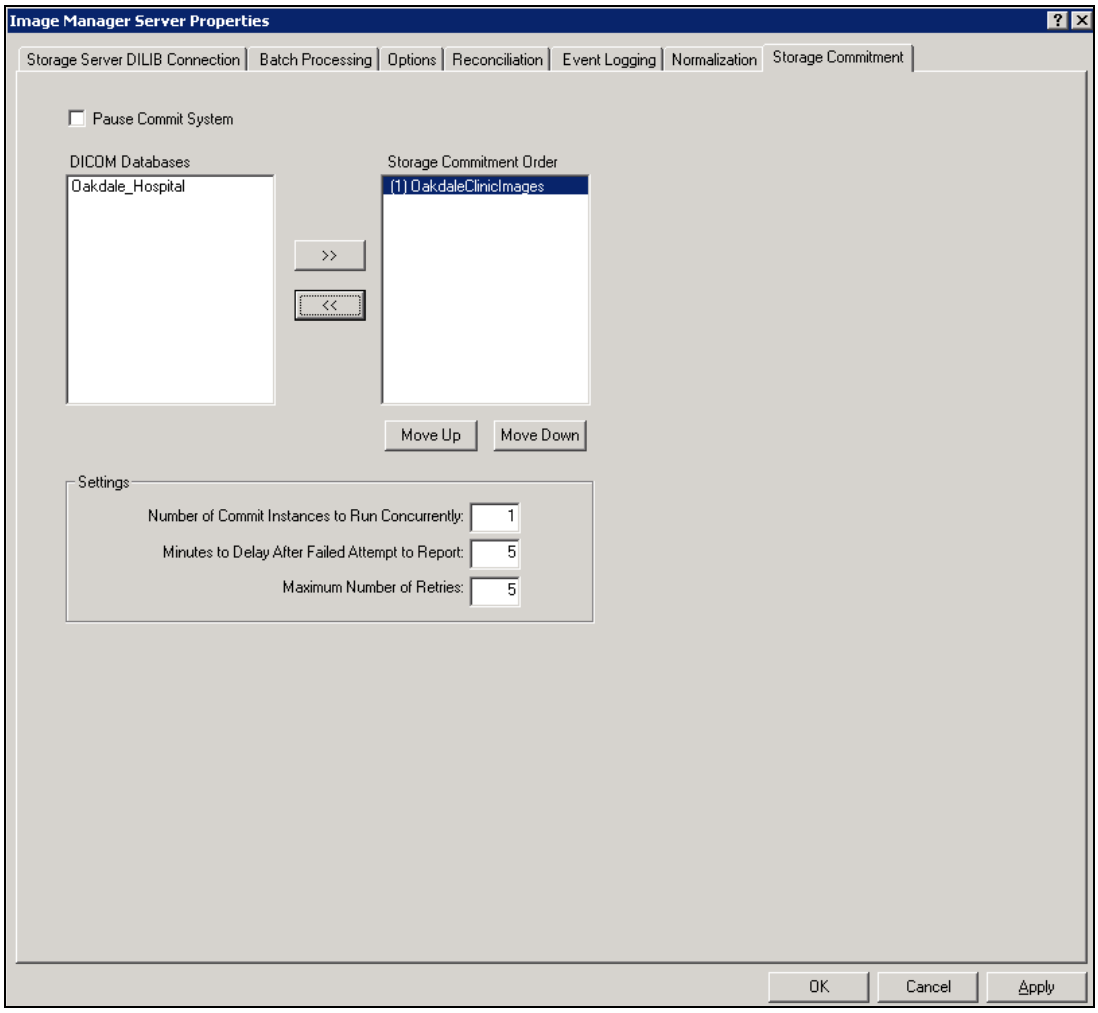


Figure 11: Storage Commitment Server Node properties

Pause Commit System – Unchecked by default. If checked this will halt the Storage Commitment system from processing N-ACTION requests. N-ACTION requests can still be received by AcuoMed but they will not be processed until the Commit System is enabled.

AcuoMed DICOM Databases – Select and order the local databases (destinations) that Commit will search. Once the instance has been found, Storage Commit stops searching and responds appropriately.

Storage Commitment Order - More than one local database destination can be selected and then ordered accordingly to improve search efficiency. The Storage Commitment SOP class will also need to be enabled at the SCP/AE (listening AE) node under DICOM Configuration in AcuoMed.

Settings:

Number of Commit Instances to Run Concurrently – Change this setting from its default setting of 1 to run more than one Commit Instance at the same time. A setting of 1 should be sufficient in most cases, but can be increased if necessary. Please make sure the system is properly sized to run additional concurrent instances.

Minutes to Delay after Failed Attempt to Report – This setting reflects the number of minutes a retry will occur on a failed attempt to report the commit. Five minutes is the default setting.

Maximum Number of Retries – This setting is the maximum number of times a Commit will try to be successful. Once this number has been reached an event will be generated, retries will be exhausted and a FAIL report will be sent to the requester.

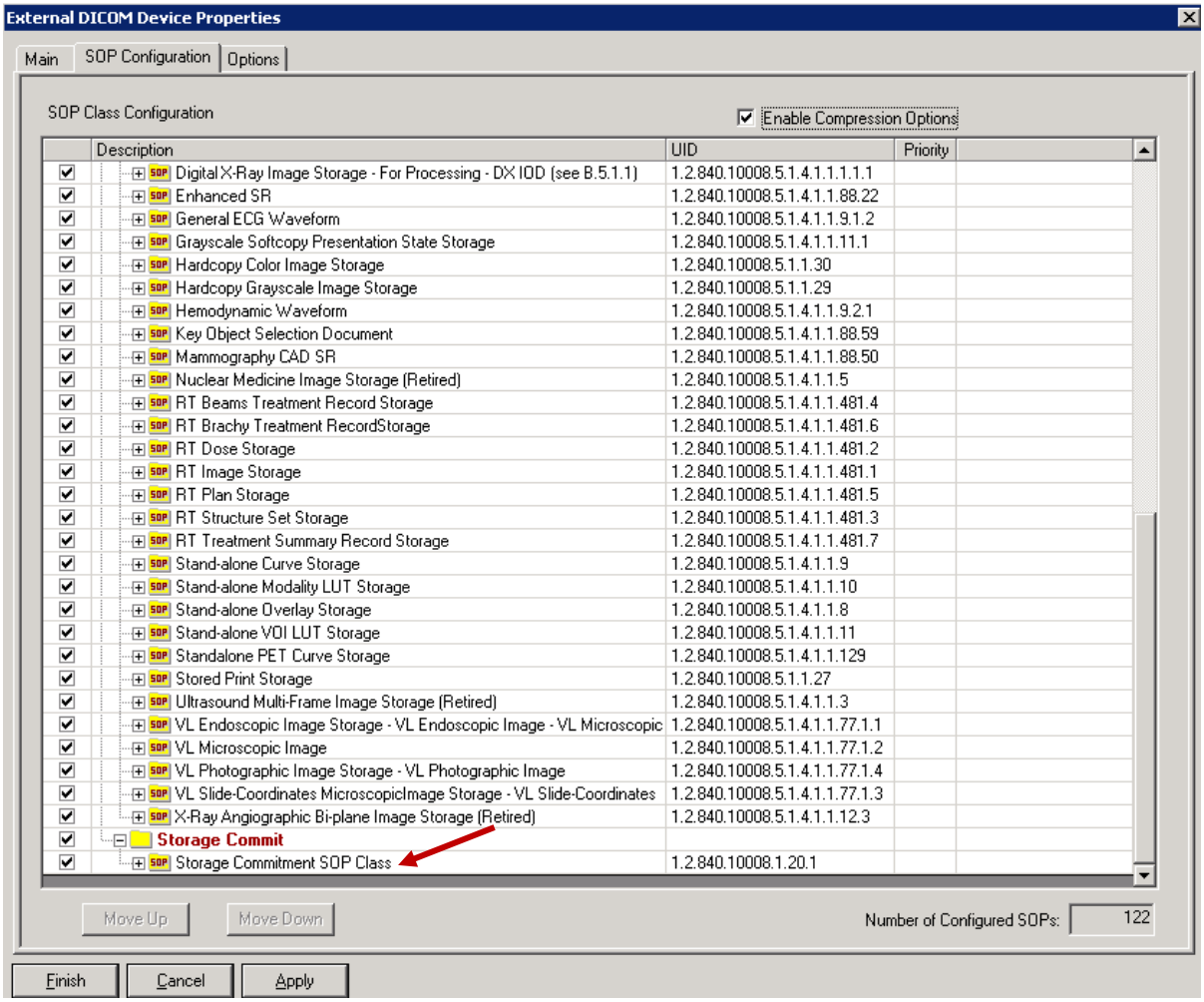


Figure 12: Storage Commit SOP class enabled for an External Destination.

This allows the report to be sent back to the requestor. This SOP class will also need to be enabled at the SCP/AE (listening AE) node under DICOM Configuration in AcuoMed.

Duplicates Processing

The duplicates processing subsystem is available to allow automatic handling of duplicate images in any AcuoMed system. Traditional duplicate images are either discarded by an archive or the existing image is overwritten by an archive. With an AcuoMed Image Manager it is possible to configure each DICOM database with separate duplicate image processing rules. The processing of duplicate images occur when a potential duplicate image is stored to an AcuoMed DICOM Database that has been configured by an administrator one of two ways; Keep Unique Asset by UID (keep first stored, keep last stored, lockdown an asset based on a defined DICOM tag), or Keep All Assets.

The Pixel Data Cyclic Redundancy Check (CRC) looks for a duplicate image UID first then looks for changes in the pixel data before a duplicate is discarded. One pixel is the smallest element of any digital image. If even one pixel is different from the pixel data of the image already stored, the newly arrived asset is not considered a duplicate and is therefore stored. If all pixels are exactly the same as in the already stored image, then the new image is handled according to the CRC configuration. This check is always ON, therefore grayed out in the GUI.

The UID option looks for changes in the Image UID. The device producing the image generates the Image UID. If the Image UID is unique, the asset will be stored. If it is NOT unique, the image will be handled according to the configuration.

The following Duplicates Processing priority settings, checked ON by default, take priority over the above Duplicate Option settings.

Always Keep Higher Quality Asset: When an image is calculated to be of higher quality than the existing stored image, the higher quality image will always be retained. Implicit VR Little Endian, Explicit VR Little Endian, Standard JPEG Lossless, and JPEG-2000 Lossless are of the SAME quality for this option.

Always Keep Lossless Compressed Assets over Full Fidelity (not compressed): AcuoMed will always keep the Lossless version of the image over the Full Fidelity image. This option is ideal in preserving disk space.

To configure Duplicates Processing start at the Image Manager Server Node→Router Configuration→Local Route Destinations→AcuoMed DICOM Database → right click on the AcuoMed DICOM Database of choice and select update. Click on the DICOM Database Duplicates Tab as shown below.

Keep Unique Assets by UID: When encountering duplicate assets, AcuoMed will keep the asset as determined by this setting.

> **First** – When encountering duplicate assets, AcuoMed will keep the initial (or first) asset and discard the newly received asset.
>
> **Last** – When encountering duplicate assets, AcuoMed will keep the most recent (or Last) asset and discard the initial (or first) asset.
>
> **Lockdown** – Use lockdown to select a DICOM tag and value. While receiving the asset, if the conditions provided within the lockdown option are present, the asset will be locked down and any new duplicates will be discarded.
>
> **Keep All Assets:** When encountering duplicate assets, AcuoMed will keep all duplicates received.

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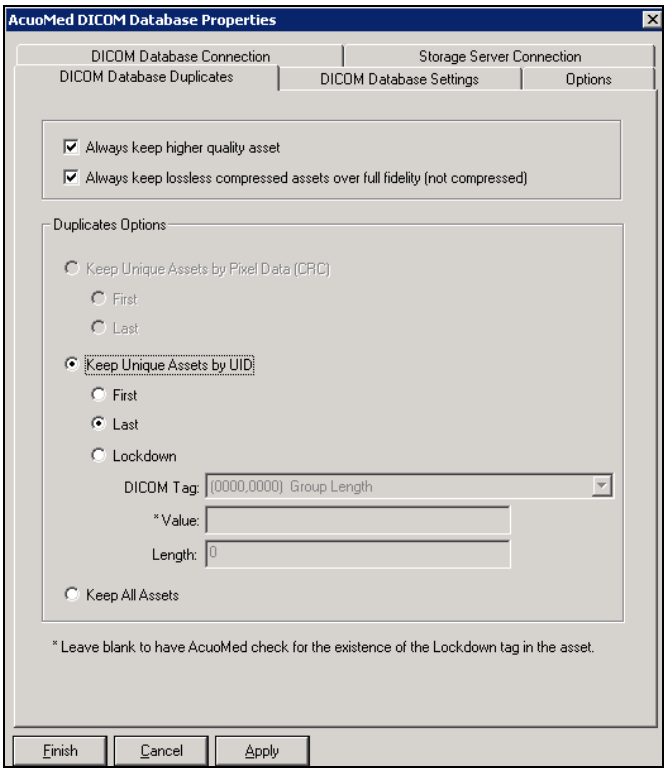


Figure 13: DICOM Database Duplicates (default settings shown)

Acuo Duplicate Deletion Log

AcuoMed logs each duplicate asset processed. The Audit Log is named ACUO_Duplicate_Deletion_Audit.LOG and can be found in Program Files\Acuo Technologies\AcuoMed\AuditLogs. (Program Files (x86) for 64 bit systems)

The log shows the date and time the image was deleted, the machine name, a message that indicates the image has been deleted, the path to the file that was deleted, the patient ID, Study, Series and Image UIDs, Duplicate Setting, and the Arrival Date and Time.

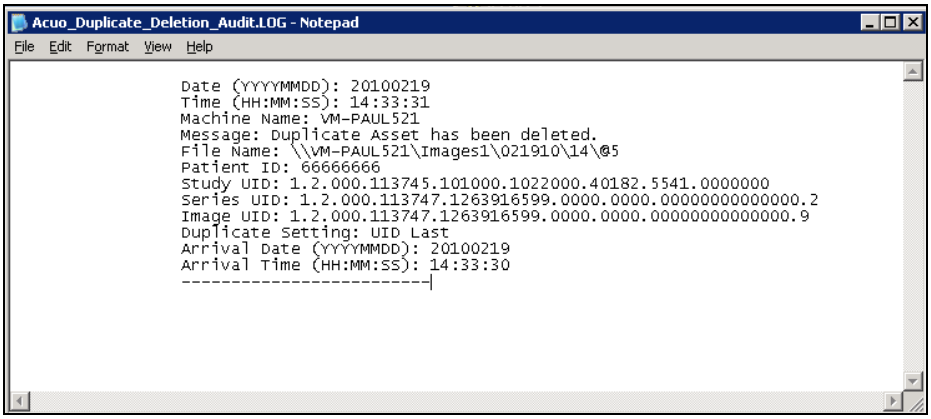


Figure 14: Acuo Duplicate Deletion Audit Log

Move/Route Mapping

Move/Route Mapping provides a facility for moving medical images from a local AcuoMed DICOM Database to one or more DICOM devices on a preconfigured route. For example, an image, or set of images, can be moved from a local image cache (DICOM database) to a view station. Another example would be moving images from a deep-level archive on a remote AcuoMed Server to a local AcuoMed Server image cache and view station. The key concept is that the image is being moved from an Acuo DICOM database and routed to any DICOM 3.0-compatible device that is configured as a local route destination.

Move/Route Mapping configuration is done by associating a Move Request AE name to a route name with associated destination(s). Refer to the earlier topic *AcuoMed Architecture* on page 25 for more general information about this process. Basically, AcuoMed performs a Move by managing requests to an AE name. To do this, AcuoMed locates the images, determines the Move AE and the associated route for that name, than subsequently Stores the images to one or more authorized destinations on that route.

For example, let's say that you want to move an image to all 3-D viewing stations. To do this, a move destination AE name of "VitreaStations" is mapped to a route. The route, in turn, defines all 3-D stations that will receive the image. Since AcuoMed is capable of handling multi-point destinations as a single route, a DICOM device only needs to send an image or request once, before AcuoMed can deliver the image to one or many route destinations. (Destinations can include 1 to many Local and/or External Destinations.) This provides much better performance and convenience than if the DICOM device had to process multiple separate move operations to many devices.

Figure 15 shows this example in more detail.

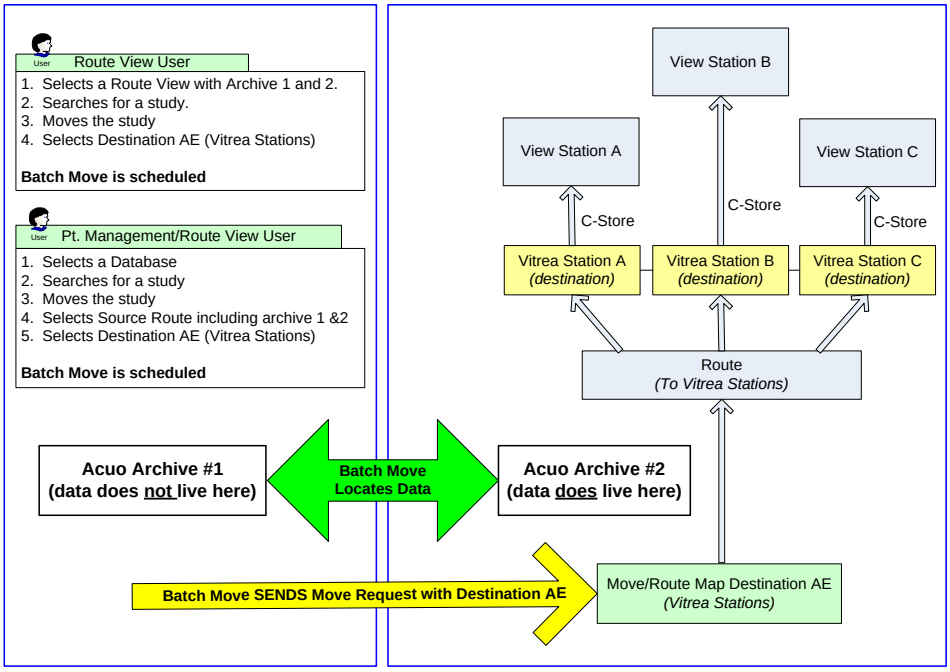


Figure 15: Move Route Mapping

Route destinations are defined under Routes which are under Router Configuration in the MMC console tree. Figure 16 shows the Route Destinations dialog where the route name is set up.

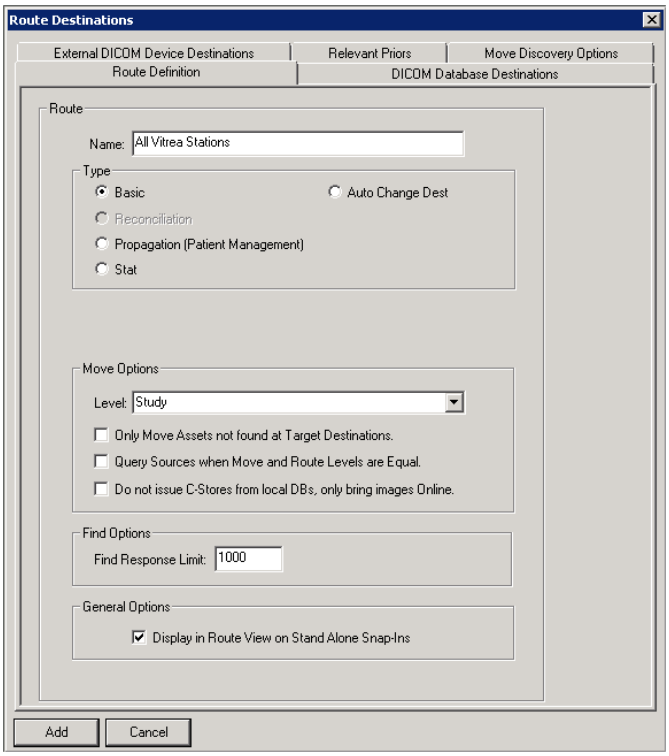


Figure 16: Route Destinations dialog

A New move destination AE name can be associated with any existing route name. To do this, right-click Move/Route Mapping in the MMC console tree and select "New" and then "New Move Name" from the pop-up menu to display the Move Route Mapping dialog (Figure 17). To add a new Move Route Assignment, you simply type in an arbitrary name for the "Move Route Name" and then type a Move Destination AE Name (VitreaStations in our example is the Move Request AE Title) and then pick a route name from the Route Name drop down list (All Vitrea Stations, in our example). This creates the association of the AE name to the route name. The "Move Route Name" is the arbitrary name that can be selected from Patient Management to submit move requests.

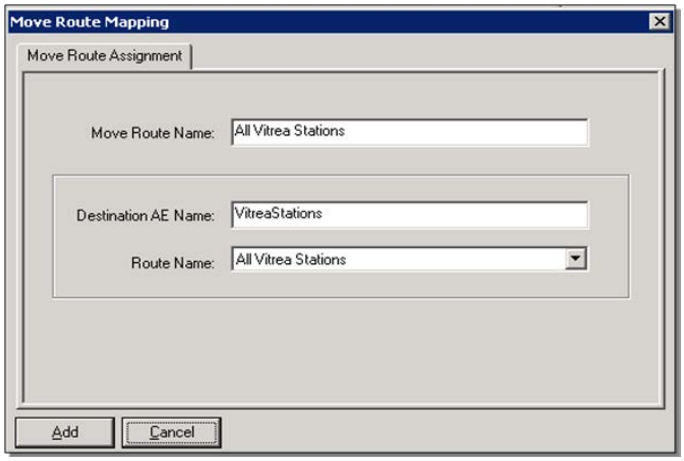


Figure 17: Move Route Mapping dialog

Controlling Routing with Tag Rules

AcuoMed provides customizable, advanced control of image routing through its Tag Rule Routing functionality. Tag Rule Routing allows you to, first, customize DICOM tags and tag values to match the needs of your site and, second, create tag rule definitions to control image sources and routing to destinations. AcuoMed is preset with a number of DICOM tags that Acuo Technologies feels will be useful for most of your tag building needs. Advanced users can add other tags to be used for routing control as needed. In addition, you can centralize customized tag value data on one AcuoMed Server to greatly reduce data.

NOTE: In addition to Routing Tag Rules there are Reconciliation Tag Rules. Refer to **Chapter 5 – Patient Management** for information on Reconciliation Tag Rules which refer to normalizing image data rather than routing.

If an AcuoMed Server is HIS/RIS-connected, it is able to derive DICOM tag information from HIS/RIS events and save this information in an XML database maintained by AcuoMed. AcuoMed uses its HIS/RIS connection to "learn" information that then makes it possible to build, update, and populate DICOM tag information that is stored on and used by the AcuoMed Server. This capability allows DICOM tag customization information to be built automatically from the events and data that the AcuoMed Server gathers by monitoring traffic on a HIS/RIS system connection.

Tags are the control information carried along with a DICOM message that identify and delimit the types of information in the DICOM data stream. In other words, tags identify the image itself and all of its associated information (such as: who the patient is, who the physician is, the institution, the modality, etc.). The DICOM standard defines many tags; refer to the topic *DICOM Data Dictionary* on page 46 for more information.

There are two main types of DICOM tags:

DICOM-standard tags – examples are Patient Sex, Study Status, Body Part, and Modality. Normally you do not need to customize the DICOM-standard tags, since the values of these tags are predefined by the DICOM standard (for example, the tag values that define the various body parts such as CHEST, SKULL, LEG, and so on). However, you may encounter certain incoming tags that do not follow the standard exactly; and in these cases AcuoMed allows you to customize items as needed (for example, to add lower case "male" and "female" as recognized tag values in addition to the DICOM-standard upper case values "MALE" and "FEMALE").

Site-specific tags – examples are Name of Physician(s) Reading Study, Referring Physician's Name, and Institution Name. Tags such as these have no predefined tag values. So, it is necessary to customize these tags with the values that are appropriate for your site (that is, your institution names, physician names, etc.). There are two types of site-specific tags: standardized tags that appear in the DICOM Data Dictionary, or private tags that are determined by the source device's Conformance Statement. AcuoMed is able to route by a private tag's existence. For example, a reading station marks key images with a private tag. So, when the Key Images private tag is present for an image, AcuoMed will route the image to the referring physician. Additional information about these types of tags and how you can customize them is given in Chapter 4 – AcuoMed Configuration Example. Also see the topic *DICOM Data Dictionary* on page 46 for more information.

Figure 18 shows the default DICOM-standard and site-specific tags that are preset in AcuoMed. These are tags that Acuo Technologies feels you are likely to want to use for routing. However, you can customize any of these tags, add tags, or delete tags as needed at your site.

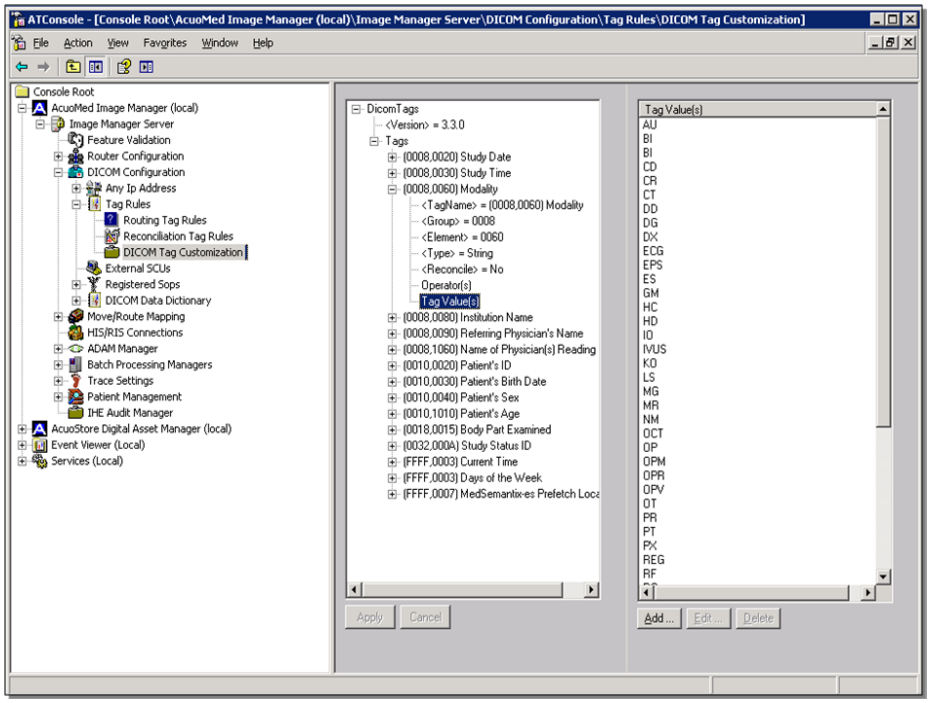


Figure 18: DICOM Tag Customization

Once you have customized tags as needed for your site, you can then create any number of different rules based on these tags to give you a high level of specific control over routing. Tag rules can use any available tags to control routing according to the operators and values that you specify when you create tag rules. Also, when you set up each tag rule, you select the sources (inbound configured AE names) for which the rule will apply to control routing.

The following two figures show a sample tag rule with its associated route mapping. In this example, if the reading physician is Dr. Karen Green **AND** the source is the CT Scanner **AND** the body part is Head **AND** it is either Wednesday or Friday (see Figure 19), inbound images will be routed to the view station at the Oakdale Clinic (see Figure 20). We show how to set up this rule in our configuration example (see *Set up Routing by Tag* on page 151). The Tag Rule is read from TOP to BOTTOM. At any time if the statement becomes false, the rule will fail and images will not be stored to any destination(s) on the route specified. If configuration and failure to route images is of concern, then it might be a good idea to configure a Tag Failure Route.

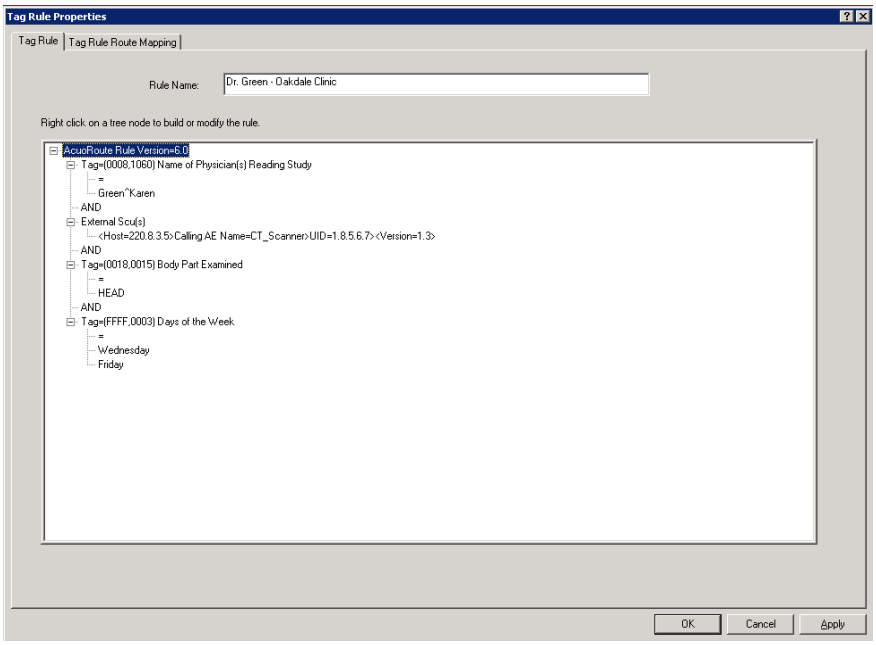


Figure 19: Sample tag rule

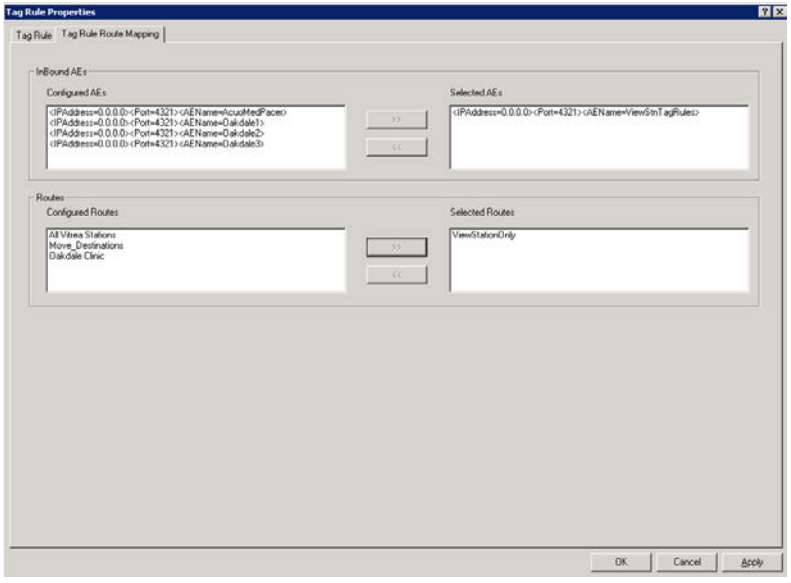


Figure 20: Sample tag rule route mapping

Tag rule configuration can be as simple or as complex as you need. For sample procedures showing how to customize tags and configure routing according to tag rules, refer to the topic *Set up Routing by Tag* on page 151.

Centralizing Tag Value Data

AcuoMed's Tag Rule Routing functionality allows you to set up a single repository of tag value data on one AcuoMed Server and then access that tag value data from multiple other AcuoMed Servers when configuring Tag Rule Routing on those other servers. This capability eliminates the need for multiple, redundant sets of data and reduces the likelihood of problems due to incorrect or out-of-date tag values. For example, you can set up and maintain one set of tag values for "Referring Physician" that contains the names of all valid referring physicians who can be used in tag rule routing for your AcuoMed network.

To implement this centralized tag value data, you need to specify the name of the AcuoMed Server that defines the site specific DICOM tag values to be used when defining Tag Rule Routing. This must be done on each AcuoMed Server that will access the centralized tag value data. To specify the tag value server, right-click the **Image Manager Server Node** (on each system that needs to access the tag values) and select **Properties** from the pop-up menu. In the AcuoMed Server Properties dialog, click the **Options** tab. In the Database Instance field, type the name of the DB instance that holds the centralized tag value data (see Figure 21).

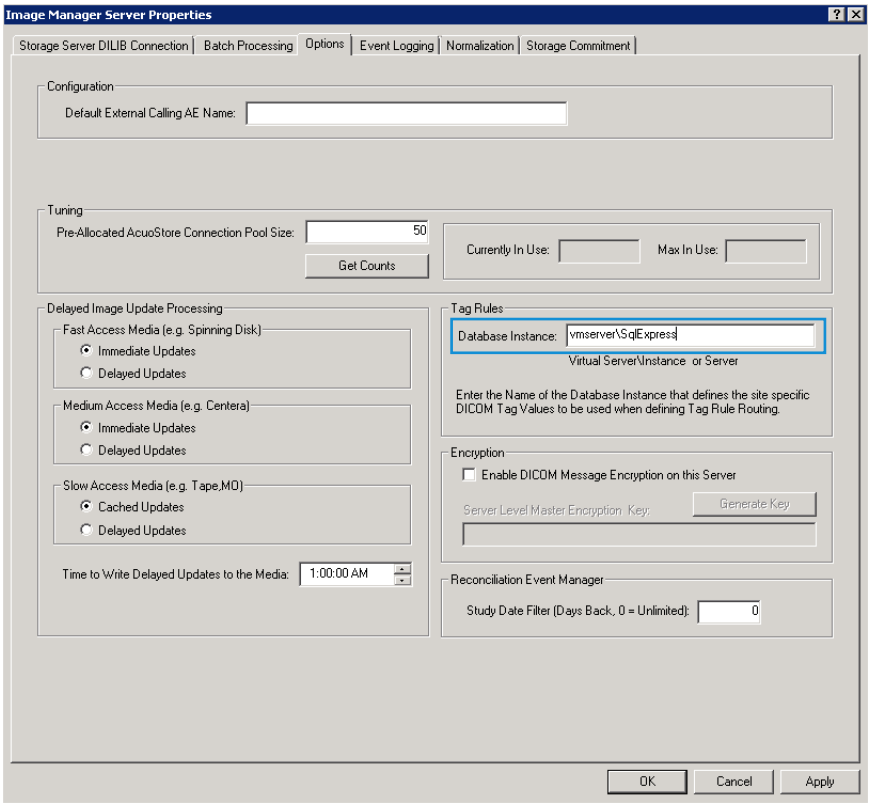


Figure 21: Specifying a centralized tag values server name in Tag Rules section

DICOM Data Dictionary

The DICOM Data Dictionary is an AcuoMed function which provides a summary of all standard tags that are valid in DICOM and non-standard tags being used by devices in your network. This information is useful both as general reference information and for use in customizing tags and building tag rules to control image routing in special ways. The Data Dictionaries let you see the tags that are available for use in tag rules (refer to *Controlling Routing with Tag Rules* on page 42). AcuoMed validates all incoming tags against the DICOM Data Dictionaries.

The DICOM Data Dictionary comprises two separate dictionaries:

Standard Data Dictionary – contains a complete listing of all standard tags that are valid in DICOM. This dictionary allows you to quickly look up any standard tag information you need to reference. Plus the contents of this dictionary are linked to AcuoMed's DICOM Tag Customization functions to automate the process of adding tags to be used in tag rules.

Acuo Override Data Dictionary – a learning dictionary that is updated from information flowing in the DICOM network. This dictionary contains two types of non-standard tag information; 1.) Private tags used by devices in the network and 2.) Standard DICOM tags being used in a non-standard way (for example, using a different Value Multiplicity). This second case is called an override and is useful to flag that there is a difference from the standard DICOM tag. For example, if a reading station is not accepting images from a modality, the Acuo Override Data Dictionary helps you determine that the modality is causing the problem by sending a non-standard tag. As well, in an enterprise environment, the deep-end Acuo system can keep in sync its Override Dictionary with all temporal Acuo systems Override Dictionaries. **The Acuo Override dictions is disabled by default and required a registry setting to enable.** Please contact Acuo Technologies Support for more information.

To access either of the DICOM Data Dictionaries, expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ DICOM Configuration→ DICOM Data Dictionary. Click either the **Standard Data Dictionary** or **Acuo Override Data Dictionary** to display its contents in the right pane. The following figure shows an example with the Standard Data Dictionary displayed.

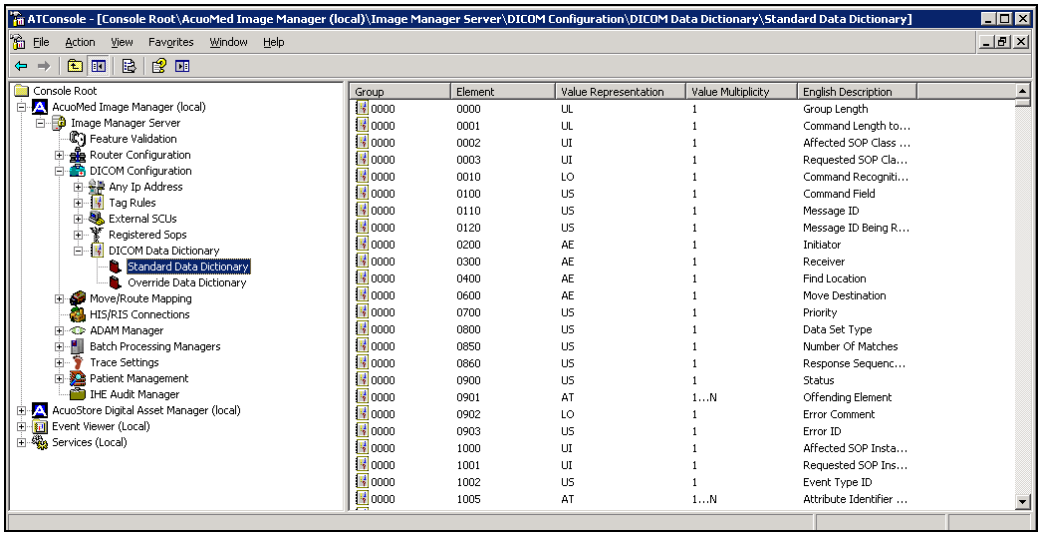


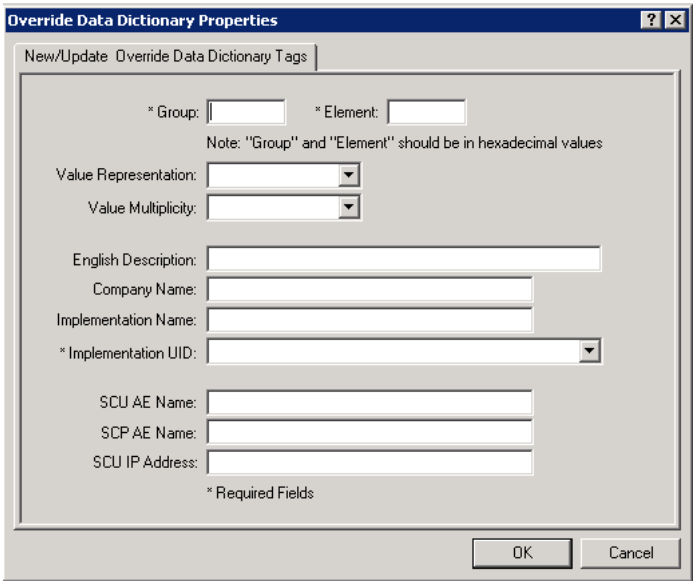
Figure 22: DICOM Data Dictionary

To make it easier to locate tag definitions, you can sort the DICOM Data Dictionary contents by any of the column headers. Just click the column header to sort by that column in ascending order. Click the column header again to toggle to a descending sort order. A column header shows an arrow pointing up when the dictionary is currently sorting by that column in ascending order, or an arrow pointing down when the dictionary is being sorted by that column in descending order.

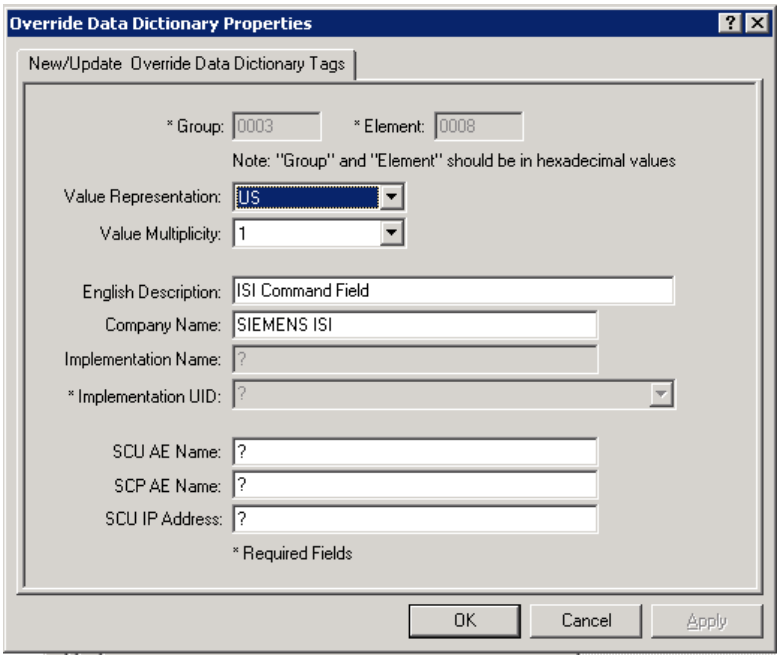
Create or Update Acuo Override Dictionary Tags

In the case of the Acuo Override Dictionary, it is possible to modify the tags listed in this dictionary. You can create new tags, update existing tags, or delete existing tags:

Create a new tag – right-click **Acuo Override Data Dictionary** in the console tree and select **New→ New Acuo Override Node**. A blank copy of the Acuo Override Data Dictionary Properties dialog displays. Select values from the drop-down lists and type in values as needed to create the new tag. At a minimum enter Group and Element numbers, select a DICOM Implementation, and provide an English description. Click **OK** to save the new tag.



Update an existing tag – in the list of tags in the right window pane, right-click the tag to update and select **Update** from the pop-up menu. The Acuo Override Data Dictionary Properties dialog displays. Modify values as needed and click **OK** to save the changes.



Delete an existing tag – in the list of tags in the right window pane, right-click the tag to delete and select **Delete** from the pop-up menu. A message asks you to confirm that you want to delete the Acuo Override Node; click **Yes** to continue.

AcuoMed Feature Validation

AcuoMed features are packaged incrementally. This is in keeping with Acuo Technologies' philosophy of matching AcuoMed capabilities to the specific needs of each individual customer. Feature validation allows a customer to match licensed features to the collaborative asset management requirements of each AcuoMed Server in a network. Feature validation allows a customer to purchase an appropriate set of capabilities at each Image Manager Server Node.

Feature validation, by the use of an Acuo-supplied feature key, controls storage size or study count limits for Managed Digital Assets, the number of supported IP Addresses (network interfaces); the maximum number of Routes, Tag Rules, and DICOM databases that can be configured; and additional Enterprise Configuration Options for Federation, Reconciliation, HIS/RIS Connectivity, Compression and Encryption. Other optional features include ADAM (Acuo DICOM Assisted Migration). Following initial installation, AcuoMed will operate with a minimal configuration of one IP Address, ten routes, ten tag rules, five DICOM databases.

To change your feature licensing, click the **Feature Validation** node in the MMC console tree (under Image Manager Server). The right pane displays the current licensed configuration. To change your licensed features, you will need to provide your Server Identification Number (at the top of the right pane) to Acuo Technologies. Copy the Server Identification field contents and then paste this number in an email to support@acuotech.com. You will then receive a new feature key by email that you will copy and paste into the Feature Key field. When you click **Apply**, the new licensed features configuration will display. Figure 23 shows an example configuration consisting of 1,000 studies, 1 IP address, unlimited configured routes, tag rules, and DICOM databases, and all Enterprise Configuration Options enabled, including ADAM.

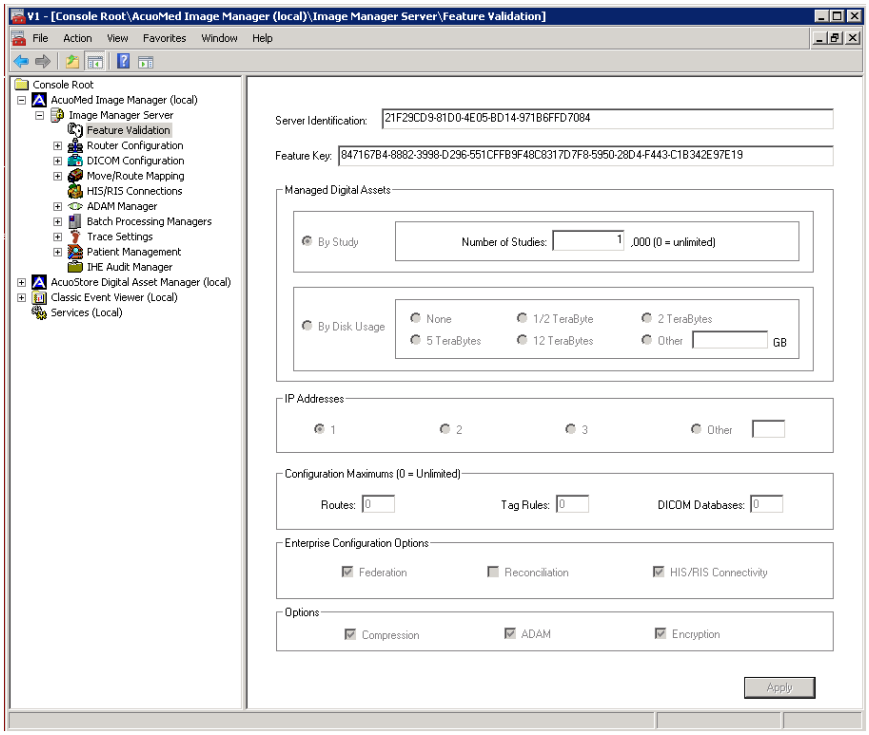


Figure 23: Sample licensed features configuration

Federation Feature

The Federation feature allows an AcuoMed Server to interoperate with an unlimited number of external Acuo or supported non-Acuo DICOM devices in order to locate and retrieve images for a requesting device. When the Federation feature is not enabled, an AcuoMed Server is limited to performing Store operations only to local databases and external devices. Federation greatly expands AcuoMed functionality by allowing an AcuoMed Server to perform Find and Move operations with local databases and external devices and to return a consolidated result to the requesting system. In other words, Acuo Technologies' Federation feature can broker Move operations across multiple devices in an enterprise and intelligently collect and return the requested information in a priority fashion.

By gathering, sorting, and collaborating search (Find) results from multiple local databases and external devices, AcuoMed Federation allows you to only move what you need to move, saving time and bandwidth. AcuoMed allows you to define a number of local databases and external devices on a route. Federation adds the ability to do Finds and Moves with external devices; allowing images to be located, collaborated, and moved peer-to-peer from various devices to the requesting device.

Figure 24 shows an example Federation configuration consisting of a local DICOM database on the AcuoMed Server, an external DICOM device at the St. Paul Clinic (External 1), a second external DICOM device that is a non-Acuo archive (External 2), and an Acuo deep-end archive (Remote 1). In our example here, the user requests a Head study for a patient from the Oakdale_Clinic route. This study consists of three different series (that we will just call Series 1, Series 2, and Series 3). As shown in Figure 24, federation is done with four destinations to locate and retrieve all the needed images. Images will be found and moved as summarized in the following table:

Destination	Series/ Images Found	Series/ Images Moved
Oakdale_Clinic_DICOMDB (Acuo Local 1)	All images for Series 3. (No images found for Series 2 or 3)	All Series 3 images.
St Paul Clinic (External 1)	One image for Series 1 and one image for Series 2.	One image for Series 1 and one image for Series 2.
OldDicomArchive (External 2)	All images for Series 1. (No images found for Series 2 or 3)	Series 1 images except for the one image found and moved from External 1.
ToAcuoDeepEndArchive (External 3)	All images for Series 2 and 3. (No images for Series 1)	Series 2 images except for the one image found and moved from External 1.

To fully understand the collaborative find/move operation described by the table above, see the following example Federation configuration shown in Figure 24 and the route Find/Move order shown in Figure 25.

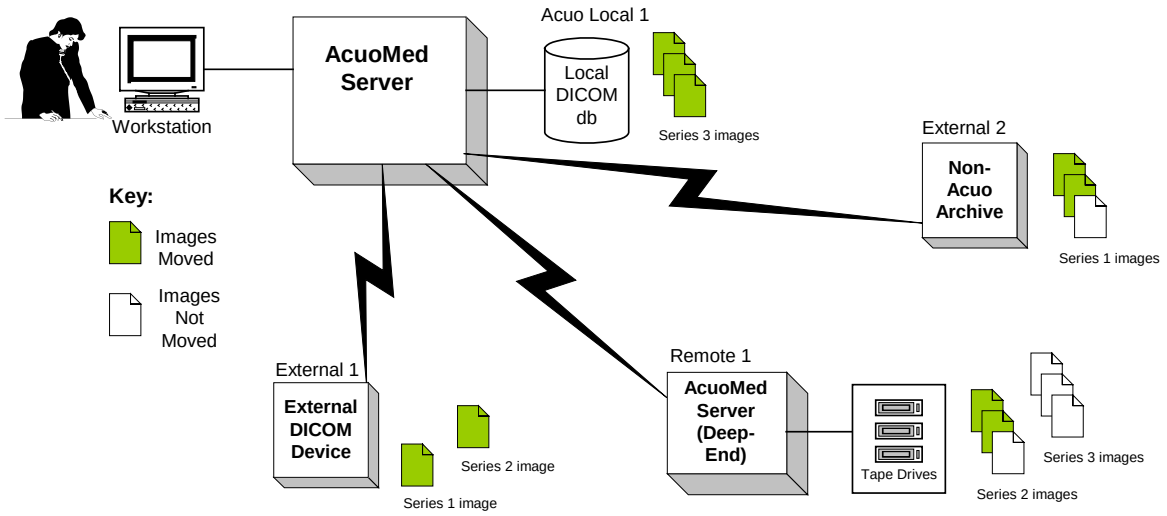


Figure 24: Example Federation configuration

The following figure shows the order in which devices will be accessed for Find and Move operations on the Oakdale_Clinic route. The current route order is the local AcuoMed DICOM database (Acuo Local 1), the St Paul Clinic (External 1), the old DICOM archive (External 2), and the Acuo Deep-End Archive (External 3). To change the route order, right-click the external DICOM device you want to move in the list and select either **Move Order Up** or **Move Order Down**. Devices that you cannot move do not have a move option available on the pop-up menu. When you change the order of items in this list, the Move Order designations also change. For example, if you select OldDicomArchive and select **Move Order Up**, OldDicomArchive will now become External 1 and St. Paul Clinic will move down and become External 2.

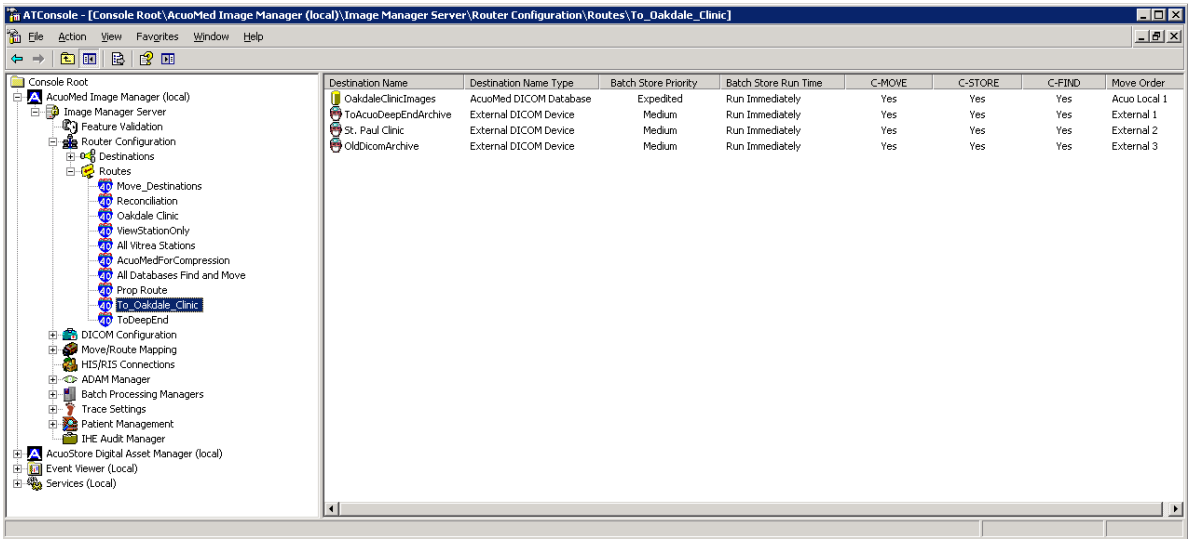


Figure 25: Setting route Find/Move order

Encryption

Encryption refers to algorithmic schemes that encode plain text into non-readable form, providing privacy. The receiver of the encrypted text uses a "key" to decrypt the message, returning it to its original plain text form. The key is the trigger mechanism to the algorithm. AcuoMed currently supports two types of Encryption (TLS, Acuo-Acuo).

TLS Encryption

Acuo Technologies supports TLS encryption based on the Secure Sockets Layer (SSL) protocol. The SSL protocol supports the use of a variety of different cryptographic algorithms, or ciphers, for use in operations such as authenticating the server and client to each other, transmitting certificates, and establishing session keys.

Support of Transport Layer Security (TLS) has been added to enable the secure transmission of DICOM data between:

- Acuo system and a Modality
- Acuo system and a View Station
- Two Acuo systems

TLS involves three basic phases:

1. Peer negotiation for algorithm support
2. Public Key encryption-based key exchange and certificate-based authentication
3. Symmetric cipher-based traffic encryption

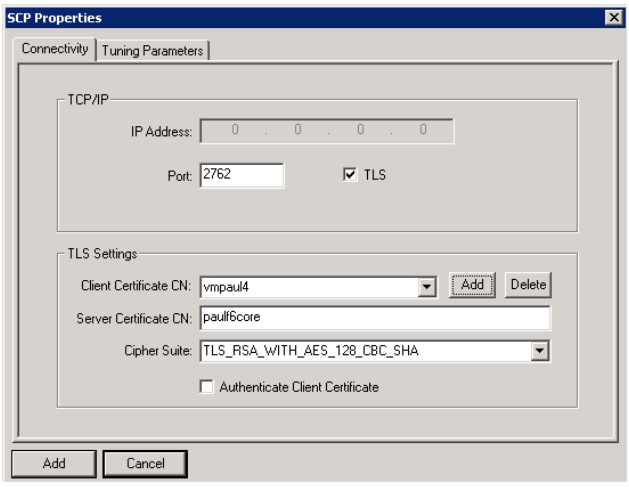
During these phases, the client and server negotiation uses cryptographic algorithms. This implementation of TLS supports the following choices:

- TLS_RSA_WITH_AES_128_CBC_SHA
- TLS_RSA_WITH_AES_256_CBC_SHA
- TLS_RSA_WITH_3DES_EDE_CBC_SHA
- TLS_RSA_WITH_NULL_SHA
- Use the System Defaults (provided for overseas use; uses the system Cipher Suite priority)

TLS Configuration – SCP

The following steps detail the process of configuring an SCP with TLS encryption enabled. In the example below, the client name is vmpaul4 and the server name is paulf6core.

1. Create New SCP for TLS encryption



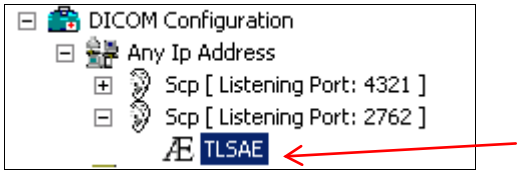
TCP/IP

a. Check the TLS checkbox to activate all fields.
b. The default port is 2762.

TLS Settings

c. Enter Client Certificate CN.
d. Enter the Server Certificate CN.
e. Cipher Suite: (i.e., TLS_RSA_WITH_AES_128_CBC_SHA)
f. Authenticate Client Certificate

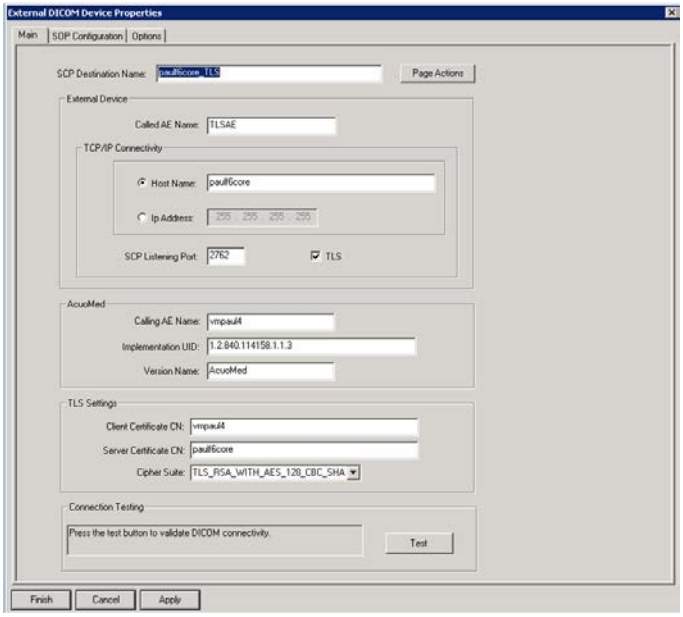
2. Create CalledAE within the newly created SCP.



TLS Configuration – External SCU

The following steps detail the process of configuring an External SCU with TLS encryption enabled. In the example below, the client name is vmpaul4 and the server name is paulf6core.

1. Create New External SCU with TLS enabled



TCP/IP

a. Check the TLS checkbox to activate the TLS Settings.
b. Enter the SCP Listening Port (2762 by default)

TLS Settings

c. Enter the SCP Listening Port (2762 by default)
d. Enter Client Certificate CN: (SCU)
e. Enter the Server Certificate CN: (SCP)
f. Select Cipher Suite.

Acuo-Acuo Encryption

Acuo also supports an AcuoMed-to-AcuoMed encryption algorithm without the use of a certificate server. Several layers of encryption provide a high level of security, including public key/private key, bit swapping, and RC4. The Master key is only one essential key used for decrypting the message. Other secret keys are generated dynamically for other blocks of data within the transmission for every single message. Therefore, a dynamically generated unique set of secret keys are used for every message transmitted between AcuoMed systems.

AcuoMed is configured for a Server Level Master Encryption Key at the Image Manager Server node → Properties → Option Tab as noted in *Figure 26: Server Level Master Encryption Key* Enable encryption by checking the checkbox and generate a Master key. Copy the generated key and paste it into the same place on the other AcuoMed systems in your enterprise that have a need to share this key.

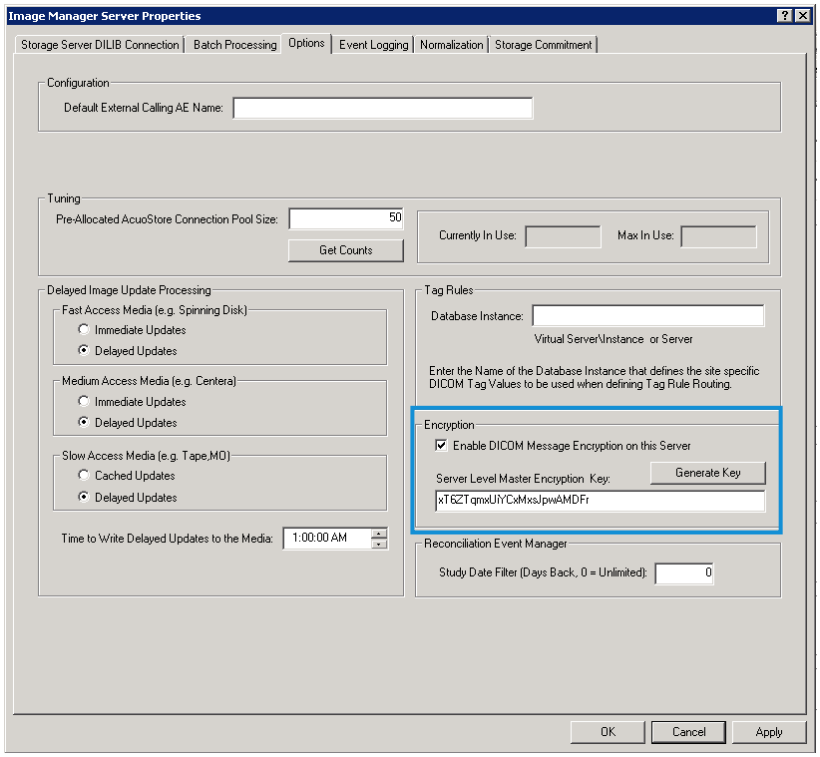


Figure 26: Server Level Master Encryption Key

The "Best Practices" configuration for client based security in addition to the Server Level Master Encryption Key configuration is to check the "Enable Outbound Encryption to other AcuoMed Destinations" at the External Destination of the sending AcuoMed system and check the "Accept Only Encrypted DICOM Messages" at the SCP/AE of the Receiving AcuoMed system. Generate a new key on the AcuoMed sending system and then copy it the AcuoMed receiving system. Check the "Override Server Level Secret Key" to use the newly generated key configuration. If Override is not selected, the Server Level Master key is used by default.

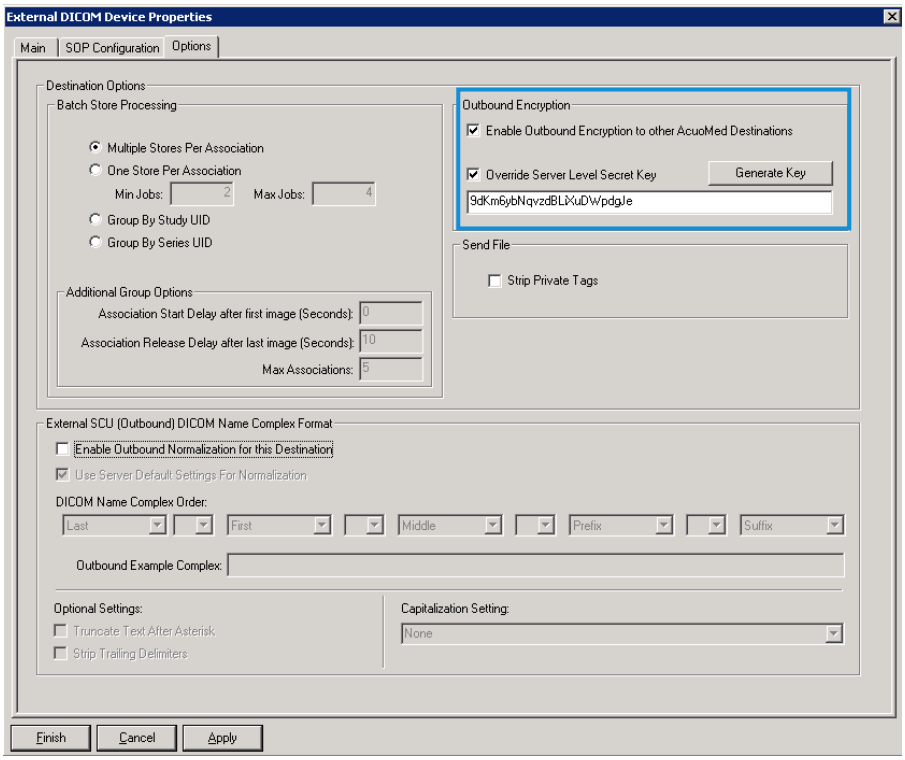


Figure 27: Outbound Encryption to other AcuoMed Destinations.

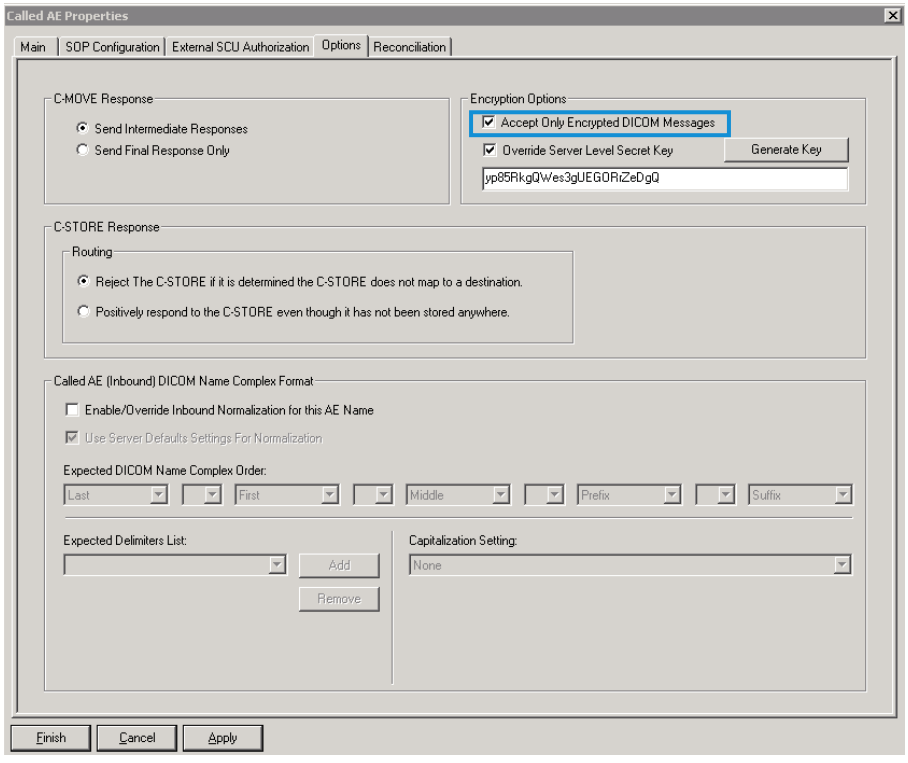


Figure 28: Accept Only Encrypted Messages

Figure 29: Encryption Configuration Options shows the different ways encryption can be configured for success and an example of a failed configuration.

Server A to Server B: Use of the Master Key for both servers. The master key is generated on Server A at the Image Manager Server node and is copied to the same place on Server B. All External Destinations and SCP/AE's are set to use the Master Key.

Server A to Server C: Master Key on Server C was copied to the External Destination on Server A. External destination configuration is set to override the Master Key on Server A.

Server A to Server D: Key generated at the External Destination and copied to the SCP/AE on Server D. Master key is set to be overridden on both Servers for External Destination and SCP/AE.

Server A to Server E: Key generated at External Destination but not copied to Server E, so keys are different, and encryption fails, therefore the transmission fails.

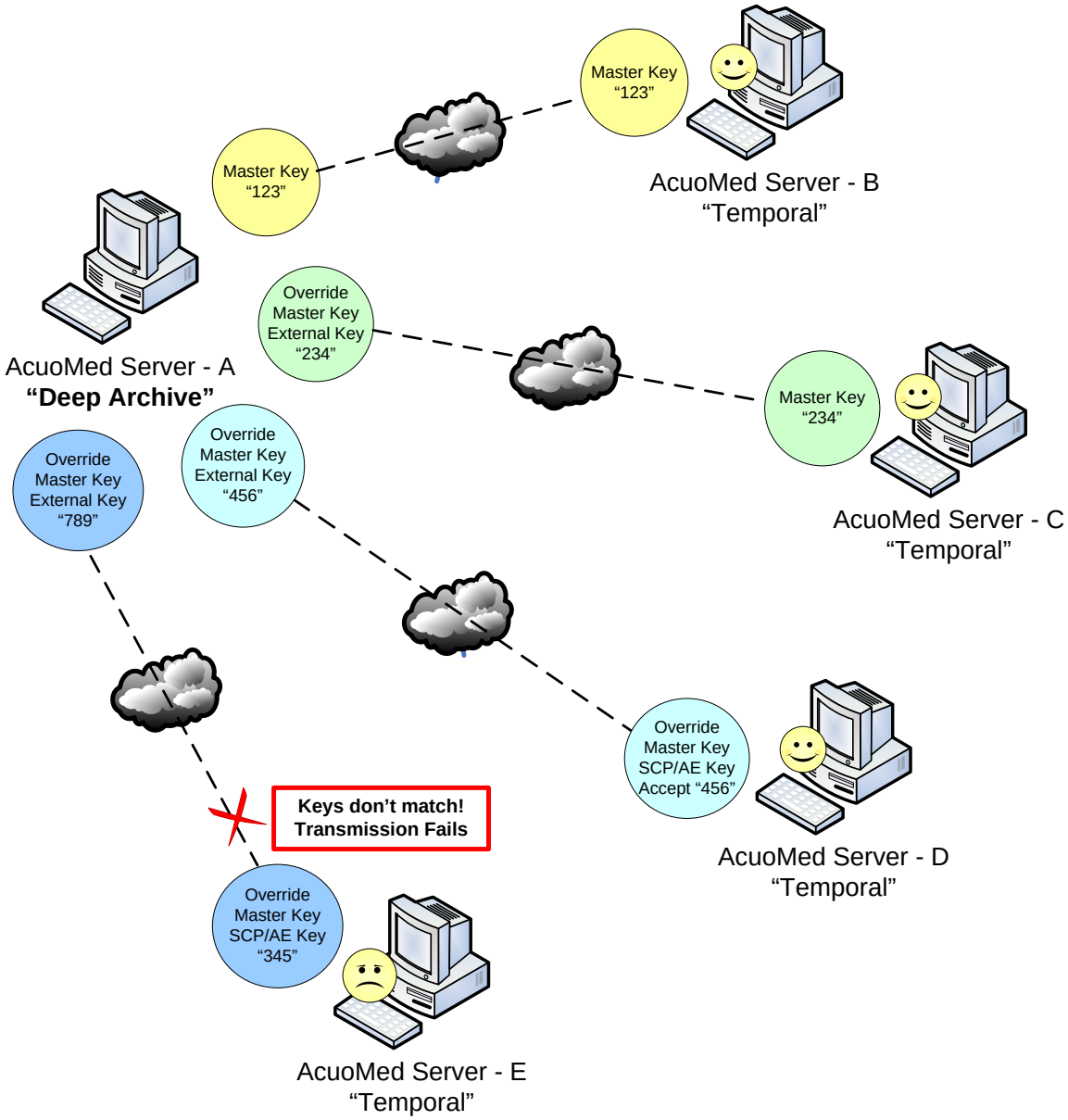


Figure 29: Encryption Configuration Options

Patient Management

AcuoMed's Patient Management functionality allows you to perform a number of quality control operations at multiple levels of patient data to ensure data integrity. Quality control includes managing patient data (by means of view, edit, move, merge, and delete operations) plus correcting problems due to software-detected (reconciliation) events.

You can search any available DICOM database to locate the patient or patients you need to manage. For any particular patient, you can edit, delete, merge, view and move patient data. Depending on the operation, this can be done at several different levels of patient data including patient information, study information, series information, and image information.

The Patient Management Snap-in allows users to edit, view and move patient data, as well as access the Reconciliation Event Manager for more automated editing. Merge and Delete capabilities are also allowed if the AcuoMed server that Patient Management is connected to has it enabled. Route view is included in the Patient Management Snap-in and its primary use is viewing and moving study data.

Patient Management can be configured to individual personal settings. For example, appending search items with a wildcard, search view preference, and allowing the "Delete All" button at the Patient Level. At each Database level and Route View level, you can specify a search response limit and display a warning if the response exceeds the limit, as well as batch move settings for a default source route and destination AE.

NOTE: Keep in mind that Patient Management Snap-In users who will need to edit and utilize the Reconciliation Event Manager will need to be part of an Administrator Group that has full write access to the image shares on the target server.

AcuoMed provides different facilities for performing Patient Management:

DICOM Database Management

This is AcuoMed's standard patient management functionality. DICOM database management allows you to access and modify patient data stored in a DICOM database. You can edit, delete, merge, view and move patient data**.** This is dependent on the type of database and the level of patient data.

Route View Management

Route View Management allows a user to access and move patient data stored in many sources (destinations) set on a route. This can include database(s) and/or external DICOM device(s), Acuo or non-Acuo. However, the external DICOM device must support the standard query/retrieve SOP class (Please review your DICOM conformance statement).

Reconciliation

The retrieval and storage of medical assets is extremely different from the processing of other Binary Large Objects (BLOBs) because a human life could be at risk should the asset become corrupted, misrepresented, misread, misplaced, or completely lost. The DICOM standard was developed by modality, printer, and digital archive companies to provide a common communication mechanism between modalities (the sources of digital medical data) and printers/archives (the destinations of digital medical data). Even though the DICOM standard has been in use for many years, it is still subject to implementation errors and misinterpretations by modality, printer, and archive vendors. For these reasons, AcuoMed's Patient Management functionality and the Reconciliation feature in particular, give an Administrator the means to identify, correct, pass through, and track abnormalities within a DICOM data stream.

Unlike DICOM Database Management (which involves a manual process of finding and fixing bad data after it is already in an AcuoMed DICOM database), reconciliation is an automated process that tries to prevent incorrect data from coming into a DICOM database in the first place. Reconciliation auto-detects differences from a master patient data source (like a RIS) and queues Reconciliation events if a difference is noted. The Reconciliation process allows the editing of incorrect data within the Reconciliation Event Manager (REM) by selecting the correct information from the "golden" data source (a RIS). The events are then submitted for reprocessing. Reprocessing either fails reconciliation a second time which puts the data back into the Reconciliation Event Manager (REM) or the data passes reconciliation and is then transmitted onto final destination(s). To maintain data integrity throughout an enterprise configuration, Data Synchronization Events are generated when a propagation route is configured on a database that is being reconciled either by a HIS/RIS or manually through the Patient Management GUI. The edits, in the form of a DICOM message, are then sent to any destination listed on the propagation route. Refer to *Set up a 4th Route*: Propagation Route on page 131 to configure a propagation route.

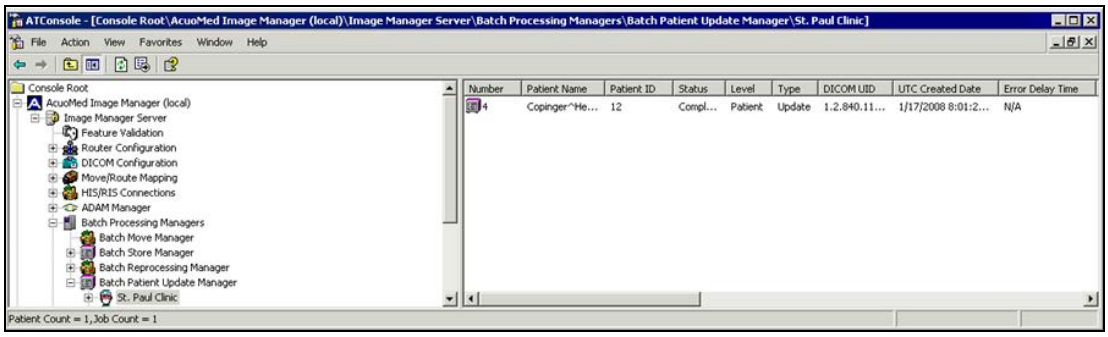


Figure 30: Batch Patient Update Manager

The events can then be tracked using the Batch Patient Update Manager. Refer to Batch Patient Update Manager on page 323.

Figure 31 shows the Patient Management node in the MMC console tree. The Reconciliation Event Manager only appears under the Patient Management node when the Reconciliation feature is licensed. It also shows a configured route view.

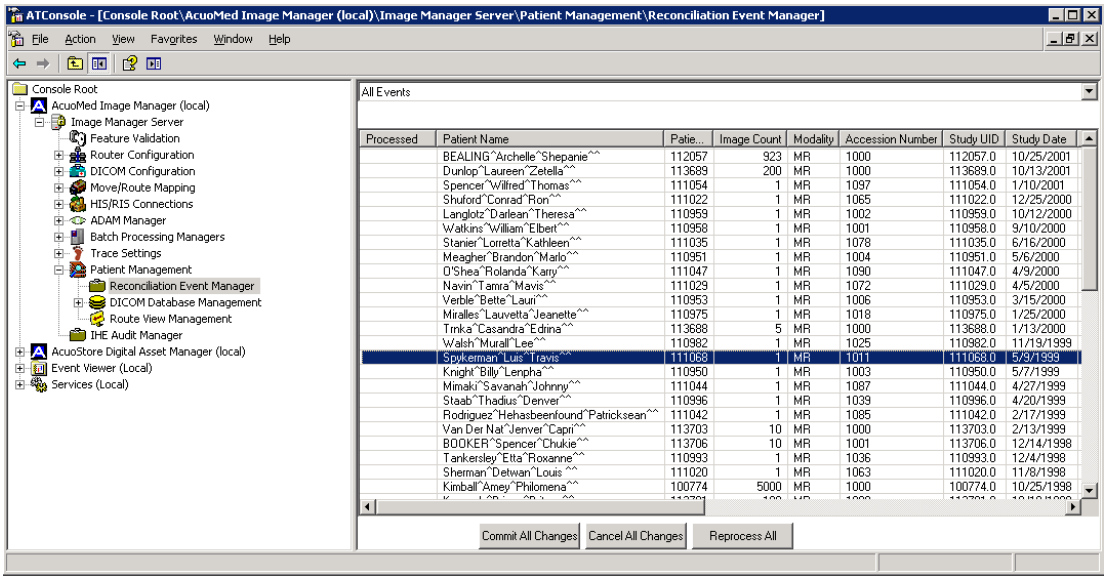


Figure 31: Patient Management

Refer to **Chapter 5 – Patient Management** for detailed information about Patient Management features, operation, and configuration.

HIS/RIS Connectivity (HL7)

The HIS/RIS Connectivity feature is a separately licensed feature that enables an AcuoMed Server to support a connection to a HIS/RIS system. The HIS/RIS connection is the interface point between an AcuoMed Server and a HIS/RIS system. (Currently, an AcuoMed Server is limited to supporting a single, local connection to one HIS/RIS system per server.) However, it is possible to remotely schedule batch move jobs to any AcuoMed Server/Batch Move Manager in the network.

The AcuoMed Server uses the HIS/RIS connection to automatically obtain information from the HIS/RIS system about pending patient/study events that are scheduled for modalities connected to the AcuoMed Server's network. AcuoMed is able to use this information, in turn, to determine what existing prior patient studies (patient priors) will be needed at patient/study locations at the time of the events. AcuoMed, via its Prefetch functionality, can then locate the required patient images and ensure that these images are moved to the patient/study locations prior to scheduled patient/study events.

AcuoMed's Prefetch functionality uses HIS/RIS patient/study events information it receives from a connected HIS/RIS system to schedule batch move jobs for required patient images. You need to set up Prefetch Station AE Title Rule properties for all modalities that are connected to an AcuoMed Server. Once you have done this, Prefetch is able to invoke the Acuo Batch Move Manager to perform the automated movement of required images from their source locations to their destinations. There can be both multiple sources and destinations involved in a move; and this configuration is defined on a per-modality basis.
AcuoMed's Tag Mapping functionality also uses the HIS/RIS patient/study events information to attempt to make an exact match on a minimum of five DICOM tags (patient name/patient ID/modality/scheduled procedure step start date/accession number) in order to automatically map the potential for incorrect data with the correct patient information, thus reducing the need for manual correction within the Reconciliation Event Manager. For more information, refer to ***Tag Mapping*** on page *281.*

In addition to the patient/study event information that AcuoMed obtains across the HIS/RIS connection, AcuoMed is also able to derive DICOM tag data from HIS/RIS events and use this data to build and maintain DICOM tag information stored on the AcuoMed Server. For more information, refer to *Controlling Routing with Tag Rules* on page 42.

Figure 32 shows a sample configured HIS/RIS connection (AcuoRis). Notice that information about this connection (such as Name, connection Type, Host Name, Connection Port, etc.) displays in the right windowpane.

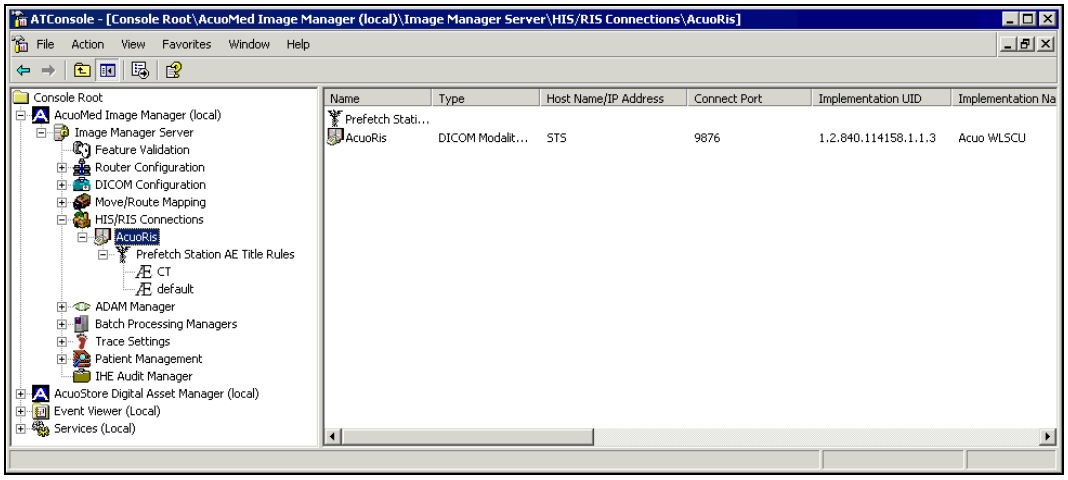


Figure 32: Configured HIS/RIS connection

Refer to Chapter 6 for detailed information about HIS/RIS features and configuration.

Acuo Batch Processing Managers

The Acuo Batch Processing Managers provide four key batch management capabilities. The Batch Store Manager and Batch Move Manager provide batch storing and moving of images that need to be delivered to one or more local route destinations. The Batch Reprocessing Manager works in coordination with Acuo Technologies' Reconciliation functionality to provide batch reprocessing of corrected patient data. The Batch Patient Update Manager tracks edits being sent on a propagation route to other AcuoMed systems in an enterprise to maintain data integrity.

The Acuo Batch Processing Managers Snap-In is available for MMC deployment allowing users throughout your enterprise to manage the batch queues.

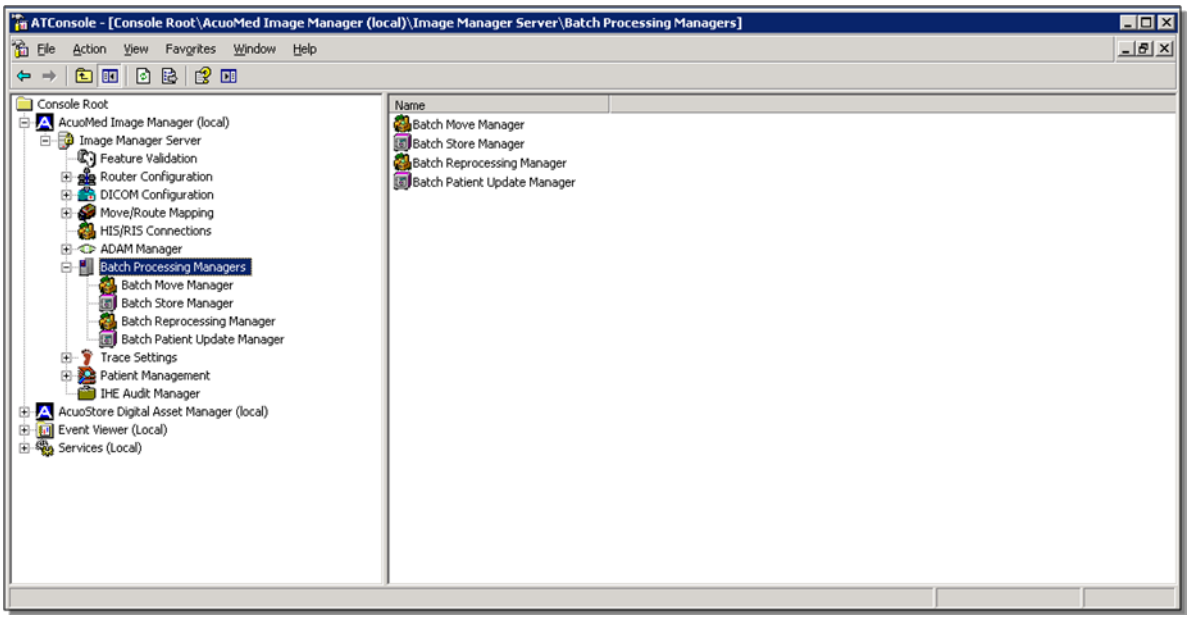


Figure 33: Acuo Batch Processing Managers

Refer to ***Chapter 7 – Acuo Batch Processing Managers*** for detailed information about AcuoMed's batch management capabilities.

IHE Audit Log/Recycle Bin Manager

The IHE Audit Log/Recycle Bin Manager's function is to establish measures which, together with the Security Policy and Procedures of an enterprise, provide patient information confidentiality, data integrity and user accountability.

The IHE Audit log service is installed as part of the AcuoMed installation and allows multiple AcuoMed/IHE Audit Logs on one database server, based on the prefix established for each AcuoMed installation.

The Acuo Recycle Bin functionality has been introduced in 6.0 to provide a data recovery option when deleting patient data. When a patient record (e.g., image, series, study, patient) is deleted from Patient Management or via HL7 feeds it is now placed in the Recycle Bin. The deleted data can then be reviewed and/or restored from the Recycle Bin. This functionality is enabled by default.

Acuo Delete's, Edit's and Merges are always audited by default and a configuration GUI is available to turn on other auditing features. The GUI also offers an easy-to-use search function for all data audited.

The IHE Audit Log Manager Snap-In is available for MMC deployment as well.

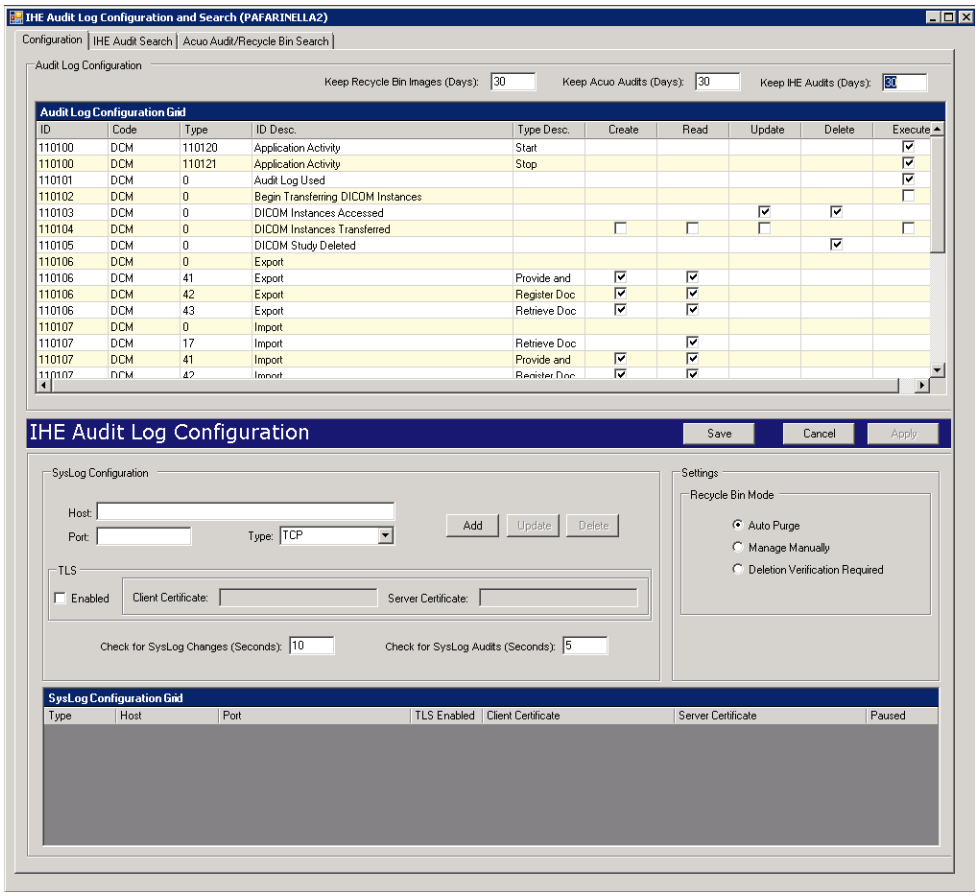


Figure 34: IHE Audit Manager

Refer to Chapter 8 - IHE Audit Log/Recycle Bin Manager on page 330 for detailed information about the IHE Audit Log Manger capabilities.

Name Normalization

Name Normalization has two important functions. The first is to maintain the database and image files with standard DICOM Name Complex formatting on inbound C-Stores (on by default), and secondly to allow formatting of the Name Complex on outbound C-Stores, C-Finds and/or C-Moves (off by default). Ultimately, Name Normalization provides greater interoperability between DICOM devices such as modalities, workstations, and other archives.

An example for using the Inbound setting is as follows: On an incoming C-Store, with this feature enabled, the **Expected DICOM Name Complex Order** is configured as 'First, Last, Middle, Prefix, Suffix'. The ',' is added to the **Expected Delimiters List**. "All Uppercase Capitalization" is selected for the **Capitalization Setting**. The expected format of the data on the C-Store would look like **JANE, DOE, A,,**. Before inserting the data into the database, AcuoMed massages the data to the DICOM Name Complex format so it will be found in the database as **Doe^Jane^A^^**. The example settings can be noted in Figure 35.

An example for using the Outbound setting is as follows: On an outbound C-Store, with this feature enabled, the **DICOM Name Complex Order** is configured as 'Last, First, Middle, Prefix, Suffix'. "Strip Trailing Delimiters" is checked for **Optional Settings**. The DICOM Family Name Complex is already stored in the database as **Doe^Jane^A^^**, and is delivered to the requesting DICOM device as **Doe, Jane, A**.

"Truncate Text After Asterisk" is another **Optional Setting** used mainly to truncate any data beyond the '*' on an outbound C-Find, C-Move or C-Store.

Navigation: Right click Image Manager Service node and select properties. Select the Normalization tab. The inbound Normalization is enabled by default, and the outbound Normalization is not enabled by default as noted in Figure 35**.**

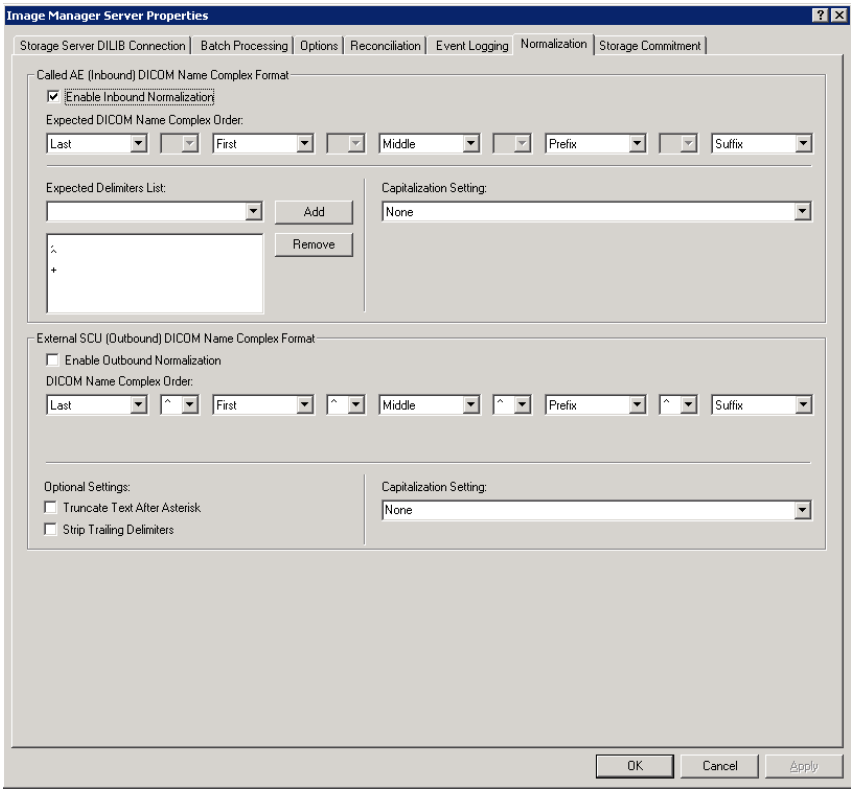


Figure 35: Name Normalization

AcuoMed Setup Summary

Here is a quick summary of the steps that are required to install and configure an AcuoMed system.

1. Install Prerequisites and Host Server Setup. Refer to the *AcuoStore Installation and Operations Guide.*
2. Install AcuoStore service. Refer to the *AcuoStore Installation and Operations Guide*.
3. Install AcuoMed service.
4. Install the AcuoStore database. Refer to the *AcuoStore Installation and Operations Guide*.
5. Create Physical Image Shares. Include a separate Dilib share if you wish. (One Dilib Share per System)
6. Configure AcuoStore Managed Shares and Applications. Include a separate Managed Share and Application for Dilib. (1:1 relationship with created shares) Refer to the *AcuoStore Installation and Operations Guide*.

Note: If you are installing AcuoMed/AcuoStore for Routing purposes only and only configuring one Dicom Database, the Dilib Managed Share/Application can also be used for the Dicom Database configuration.

7. Install the AcuoMed database.
8. Configure the AcuoMed Server Properties to the AcuoStore Dilib application.
9. Install and connect AcuoMed DICOM database(s).
10. Configure the Local AcuoMed Server

Image Manager Server Properties	AcuoStore Connection Batch Processing Batch Store Batch Move Batch Reprocessing Options Default External Calling AE Name Delayed Image Update Processing Server Specific for Tag Rule Values Server Level Master Encryption Key Reconciliation Event Manager Filter Reconciliation Server Selection Patient ID Normalization Event Logging Event Cache Stop Tracing Triggers Sever Level Name Normalization Inbound External Storage Commitment Patient Management WADO Access Batch Move Time Periods Time Period Definitions TagMapper Global TagMapper Configuration Global TagMapper Settings

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Set up Destinations	AcuoMed DICOM databases (installation already completed) **Local Destination** DICOM Database Connection AcuoStore Connection Dicom Database Duplicates Dicom Database Settings Database Type Patient Management Propagation Route Patient Name Match - Soundex Batch Store Queue Options Retention/Purge Policies Domain/XDS-i Configuration **External Destination** Destination Name Called AE Name (no spaces) Host/IP Port Calling AE Name (no spaces) SOP Classes/Compression applied outbound BatchStore Queue Options Send File Option – Strip Private Tags Batch Store Processing mode Outbound Name Normalization Outbound Encryption Outbound TagMapper
Set up Routes	**Routes to Local and External Destinations** Route Types – Basic/Reconciliation/Propagation/Stat/Auto Change Move Options Find Response Limit Option Check box for display in Route View on Stand Alone Snap-Ins Relevancy Filtering Move Discovery Options Move Order Supported Commands: C-Move/C-Store/C-Find Priority Level: direct/low/medium/high/expedite Run Time schedule if applicable
Set up Sources	**DICOM Configuration: SCP Port/AE Title/TLS Settings** Collaborative Route Tag Rule Routing Tag Failure Route Stat Route SOP Classes/Compression/Storage Commitment External SCU Authorization C-Move Response C-Find Response C-Store Response Inbound Name Normalization Accept Encryption Option Inbound-Instance TagMapper Reconciliation Postfetch Properties Domain/XDS-i Configuration

Set up Move/Route Mapping	Move Route Name Move Destination AE Name Route Name
Patient Management MMC	Create MMC Snap in AcuoMed Patient Management Create Route Views Snap in AcuoMed IHE Audit Manager Snap in Batch Processing Managers
Set up Routing by Tag	Tag Customization and Values AcuoMed can Learn Tags and Tag Values while Connected to a RIS Create Tag Rule Definitions Apply rule to Sources (inbound SCP/AE) and Configured Routes Centralize Customized Tag Values on one AcuoMed server DICOM Data Dictionary – Standard/Override
Set up HIS/RIS Connectivity (HL7)	Configure HIS/RIS connection – one connection per AcuoMed server HIS/RIS Name Called AE Name Host/IP Port Calling AE Name HIS/RIS Type: DICOM Modality Worklist Management SOP: Modality Worklist Management Tag Match and Map from RIS to Image DICOM Search Order Scheduled Station AE Title Scheduled Station Name Scheduled Procedure Step Location C-Find Request Control Request Timer (minutes) Delete Events After (Days) Search Previous (Days) Search Forward (Days) Force Patients to REM Prefetch Station AE Title Rule Prefetch Station AE Title Schedule Prefetch Jobs (days prior to the scheduled event) Use Default Config Batch Queue Information Database Instance Run Time Priority Routing Information Route Name Move Destination AE Title Move Criteria Date Range

11. Configure other AcuoMed Servers in the network (for example, a Deep-End Server).

For details instructions about how to perform these tasks, refer to Chapter 3 – Getting Started and Chapter 4 – AcuoMed Configuration Example.

Chapter 3 – Getting Started

In this chapter:

MMC Console Creation

Database Installation

Database Update Procedure

User Account

Recommended Configurations

Before installing an AcuoMed/AcuoStore implementation, review the following information regarding recommended configurations for hardware and software, as well as network considerations:

- Network Profile
- Other Hardware Considerations

RAID-ready, rack-mounted enclosure designed for external direct-attached storage solution with a locking front door.

NOTE:	The Health Insurance Portability and Accountability Act (HIPAA) require that security be maintained, for example, by having locking access doors on enclosures that contain patient records and information.

- Server with dual quad core processor or better and as many open card slots as possible. Memory: 6 Gigabyte minimum recommended, 12 Gigabyte for systems that are also running SQL Server. More memory may be required for compression enabled systems.
- 17" monitor running at a minimum screen area of 1024 x 768 pixels
- Three separate RAID storage units:

1. System Drive - 80 Gigabytes of RAID 1
2. Database Drives
    a. Database Files - RAID 10 on its own physical drive/bus
    b. Transaction Logs - RAID 1 on its own physical drive/bus
    c. Database Backups - RAID 5 on its own physical drive, possibly sharing this with the Image Drive
3. Image Drive
    a. RAID 5 scaled over time. (See *Appendix C – Storage Analysis* for information on calculating space requirements for standard modalities over set periods of time.)

- CD-ROM/DVD read/write drive for writing trace files
- Mouse and Keyboard

NOTE:	Based on how often you store and retrieve images and/or your required response times—you may have additional hardware requirements in order to optimize the performance of your system.

Network Profile

The following Network Profile for AcuoMed (and related services) should be used as a reference when planning or troubleshooting Anti-virus, firewall, VPN, load balancing or other network related technologies in conjunction with an AcuoMed or AcuoStore deployment.

AcuoMed Service

AcuoMed			
Role	**Protocol**	**Port**	**Function**
Server	TCP – DICOM	Configurable	General Communication
Client	TCP - DICOM	Configurable	General Communication
Client	TCP - DCOM	Configurable	AcuoStore
Server	TCP - DCOM	Dynamically Assigned (135, 1024-65535) *	MMC
Client	TCP/UDP-ADO	1433, 1434	SQL Server
Client	TCP - CIFS	445	Network Storage

Connection Usage Profile

Some client connections are managed in a pool, but most are dynamically requested and released as needed. The result on heavily loaded systems can be hundreds of connections per second being established or released, and thousands of open connections at a time. Some of this is mitigated or hidden by caching or pooling inherent to ADO & CIFS.

(*) DCOM assigns 1 listening port per server process, and relies on the Service Control Manager listening on TCP/UDP port 135 for DCOM port discovery. A more narrow range can be specified, though this is a server level specification, and Microsoft recommends a range of 100 or greater. Refer to the following documentation for more detail.

How to configure RPC dynamic port allocation to work with firewalls -- http://support.microsoft.com/kb/154596

Network Considerations

Network considerations for all system levels are as follows:

1 Gigabit Ethernet (switched topology preferable)

Network cards as needed for load balancing – for example, multi-port Ethernet network interface cards (NICs) with a minimum of 2 ports each. Additional NICs can be added to the system as needed (including a hot spare).

NOTE: Based on how often you store and retrieve images and/or your required response times—you may have additional hardware requirements in order to optimize the performance of your system.

Other Hardware Considerations

Disk Space Needed for the Dilib Share
To configure the maximum amount of disk space needed for the Dilib Share, multiply the amount of daily storage by 14 days. If Reconciliation is enabled, also consider how often the Reconciliation Event Manager is maintained. An Asset will remain in Dilib until the Asset has passed Reconciliation. It is important to place the Dilib share on the most stable, highly available drive, RAID 5 or 1+0 recommended.

Network Attached Storage and Archive Devices
Many innovative technologies, such as Network Attached Storage and Archive Devices like EMC Centera and NetApp/Bycast Grid Solutions, which can be presented as a single large volume with a high level of data integrity provided by the storage subsystem, are available on the market today. Acuo's Universal Clinical Platform provides a natively integrated approach to these devices through AcuoStore and recommends the use of these devices for your long term image storage needs.

Dynamic Disks in a RAID configuration for Volume Spanning
***IMPORTANT*:** By initializing RAIDs as dynamic disks instead of basic disks, the disk drives can be expanded under the Windows Disk Administrator in the facility called Volume Spanning. Without volume spanning, the share name would need to point at a different volume to expand storage space. Or if the user wanted to "span volumes" he or she would need to copy the stored data offline, reinitialize the disk volume to dynamic, extend the drive, and then restore the data from its offline location. Dynamic Disks are not supported in a clustered configuration and should only be used with caution. See Microsoft Online Help for more information.
It is recommended that each RAID device be supported by optical fiber channel cards using separate SCSI 2 busses which support transfer rates from 10 to 20 megabytes per second. By placing the system, databases, and images on separate RAID devices, you achieve improved performance as well as greater flexibility if you need to add more storage space for images, for example, NTFS Compression

Windows supports data compression. Compressing files, folders, and programs decreases their size and reduces the amount of space they use on your drives or removable storage devices. You can compress individual files and folders using NTFS compression, as well as entire NTFS drives. You may notice a decrease in performance when working with NTFS-compressed files as you would with any other data compression facility. When you open a compressed file, Windows automatically decompresses it for you, and when you close the file, Windows compresses it again. NTFS-compressed files and folders only remain compressed while they are stored on an NTFS drive. If you do not have a NTFS drive, this option is not available. To determine whether your drive is formatted with NTFS, right-click a drive, and then click Properties. The file system is indicated on the General tab. For more information see Windows Online Help for this topic.

Optional use of an HSM (Hierarchical Storage System)
HSM is policy-based management of file backup and archiving in a way that uses storage devices economically and without the user needing to be aware of when files are being retrieved from backup storage media. The hierarchy represents different types of storage media, such as redundant array of independent disks systems, optical storage, or tape, each type representing a different level of cost and speed of retrieval when access is needed. Using an HSM product, an administrator can establish and state guidelines for how often different kinds of files are to be copied to a backup storage device. Once the guideline has been set up, the HSM software manages everything automatically.

Example Configuration Recommendations:

SCSI-attached **library** with at least three internal drive units that supports the formats supported by your Hierarchical Storage Management (HSM). SCSI differential adapter card for the library – refer to your library documentation for SCSI types and recommendations.

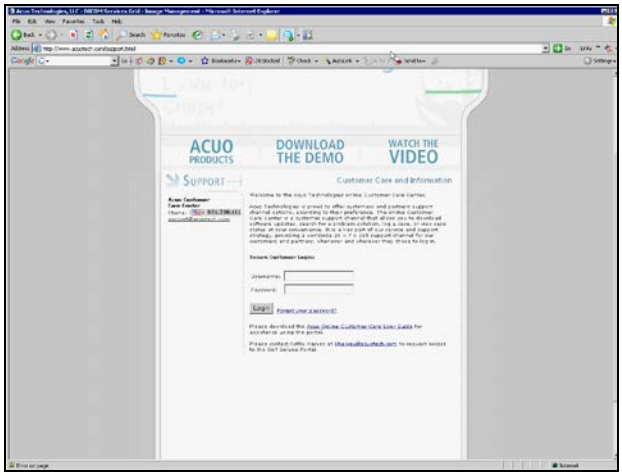
AcuoMed Installation

The full AcuoMed installation must be done after AcuoStore installation has been completed. Refer to the *AcuoStore Digital Asset Manager Installation and Operations Guide* for the AcuoStore installation procedure. For an overview of AcuoMed setup and configuration refer to ***AcuoMed Setup*** on page 62.

Follow these steps to install AcuoMed.

1. Start the AcuoMed Install Shield Wizard.

   Access the Acuo Installation CD-ROM or download the software from the Acuo Support Portal at http://portal.acuotech.com/ (click Downloads).



NOTE:	If you do not have a Username or Password, please contact Acuo Technologies to request access as noted on the website.

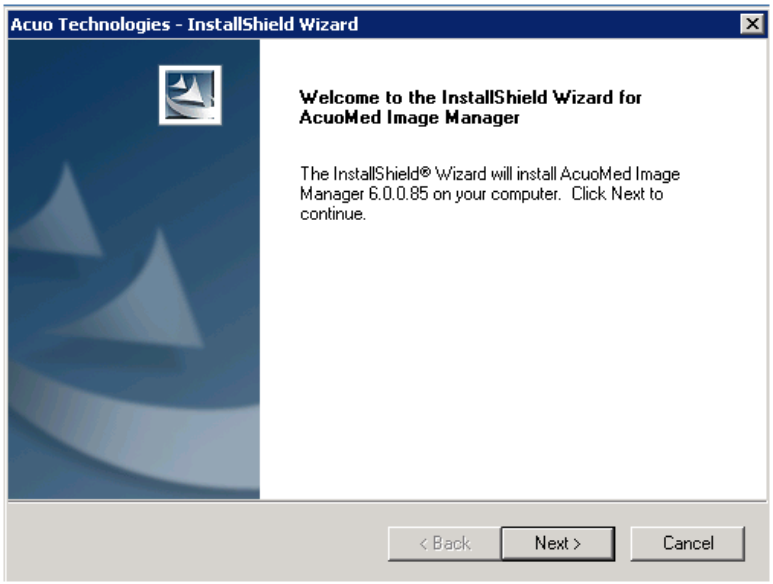
   Expand the folder structure as follows:

   AcuoMed Image Manager [Release # Build #]→AcuoMed Image Manager [Release # Build # Service Pack #]→DiskImages→DISK1

   Locate and double-click the file **Setup.exe.**

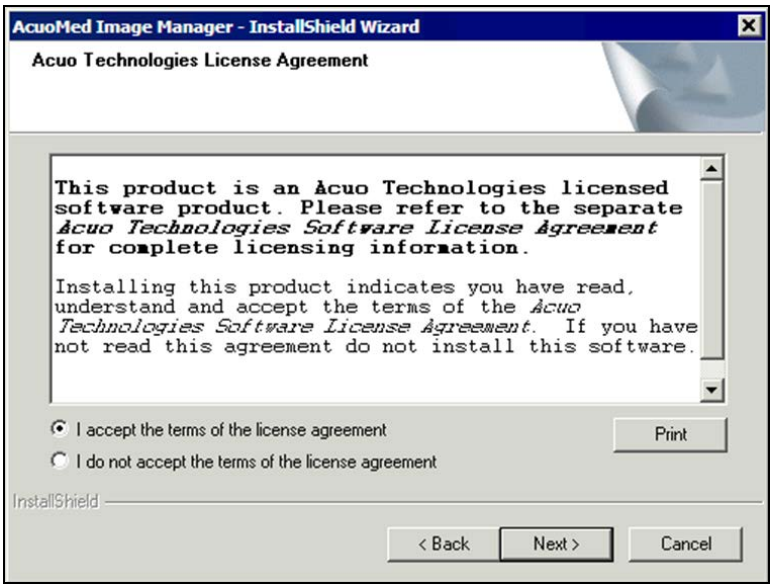
NOTE:	If you are installing Patient Management only, you may want to install Patient Management utilizing SMS or via a network share. Please contact Acuo Technologies for more information.

   The InstallShield Wizard Welcome screen displays.

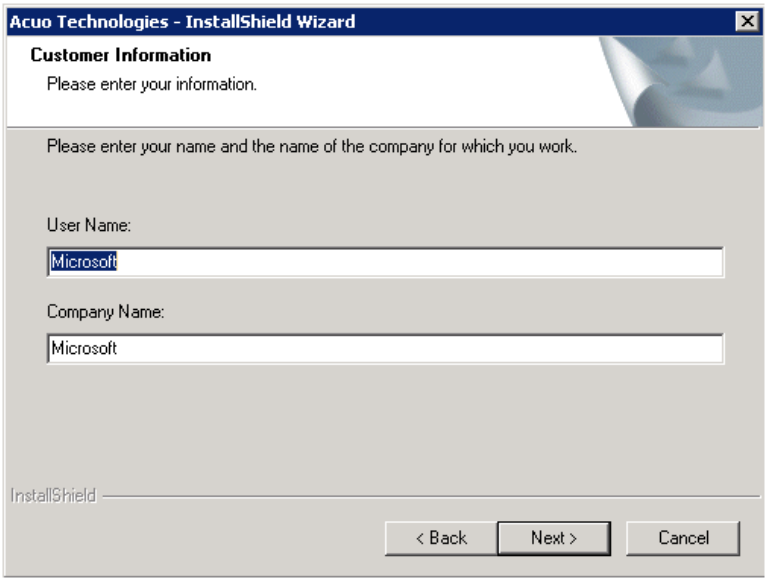


2. Click **Next** to begin the installation.

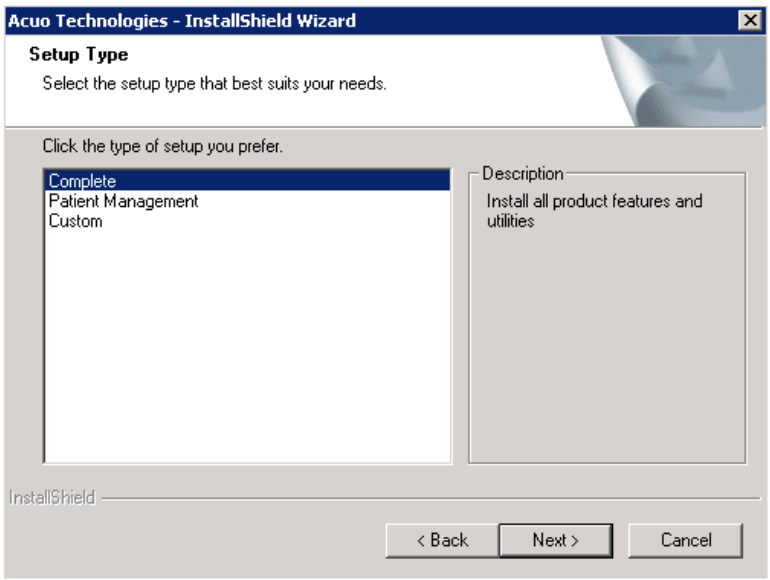
   The license agreement displays.



3. After reviewing the License Agreement, if you accept it, click **Next** to continue. The Customer Information screen displays.



4. Type your User Name and Organization. Click **Next** to continue. The Setup Type screen displays.



5. To install all program features, click **Complete** and then click **Next** to continue (go to Step 9).

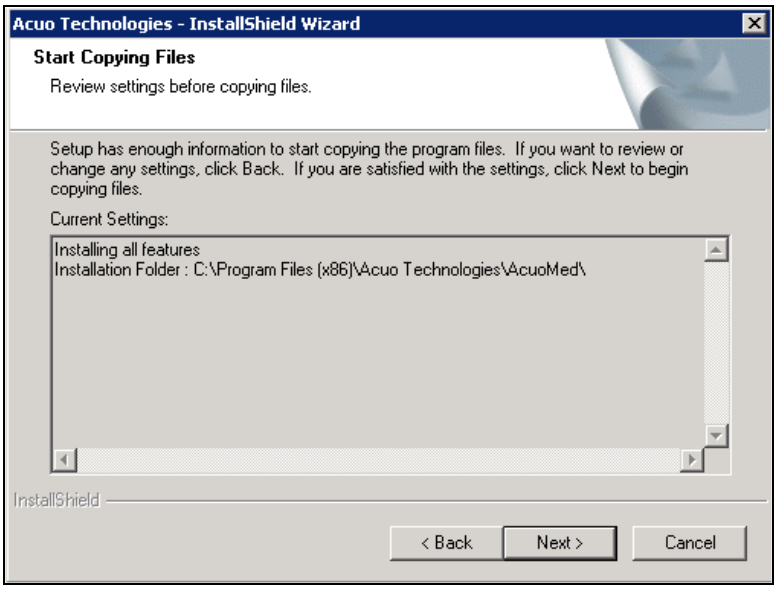
   To install Patient Management only, choose **Patient Management** and then click **Next** to continue. (go to Step 9) Refer to

Patient Management Snap-In in Chapter 5 on page 225 for more information.

To choose install location and program features select **Custom** and then click **Next** to continue (go to Step 6).

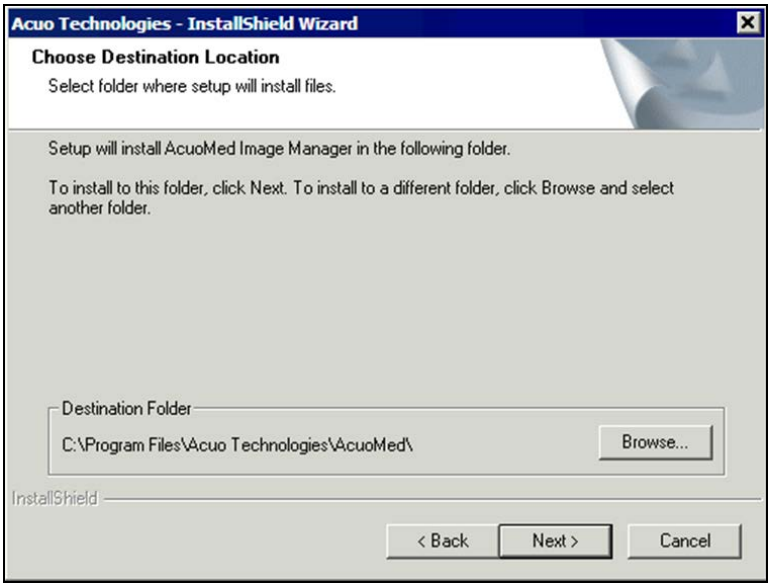
6. (Optional – for Custom Setup) – If you chose **Custom**, and select the **Browse** button you can modify the **Installation** location.

   You might want to do this, for example, if there is limited space available for the default install location.



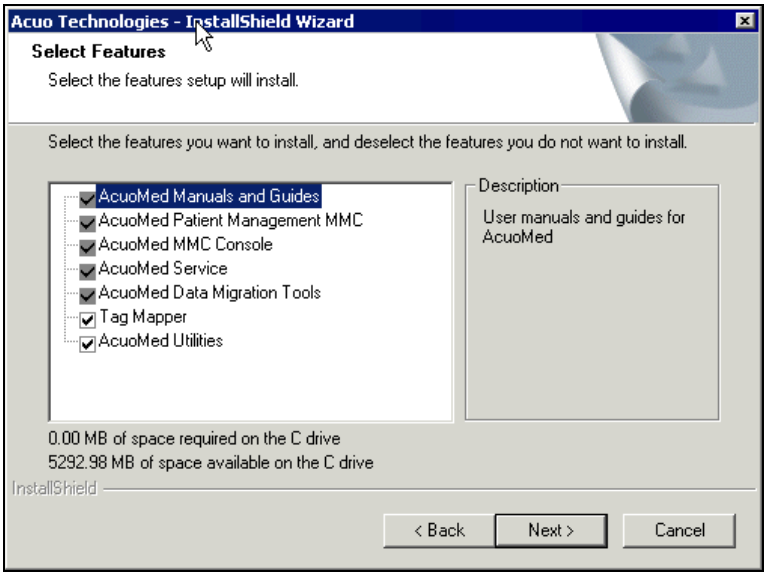
   Should you want to install the software on a drive other than the C drive, click **Back** and choose Custom as noted in the next step. When changing the **Destination Folder** location, be sure to keep the AcuoMed installation on the AcuoMed Server system drive (that is, do not install AcuoMed on the drive where images will be stored).

7. (Optional – for Custom Setup) Click the Browse button to install the software in a different location on the system.



   Browse for the new Destination Folder and then click NEXT.

8. (Optional – for Custom Setup) Click one or more icons in the list to change how features will be installed (as shown in the sample below). The disk space requirement is noted as features are selected and/or deselected. Click **Next** to continue.



The features that can be configured by clicking the icons in the Custom Setup list have the following basic functionality:

- **AcuoMed Manuals and Guides**
- **AcuoMed Patient Management MMC** – AcuoMed product that provides limited remote management capabilities. Systems Management Server Files (SMS) – Files to distribute software using Systems Management Server
- **AcuoMed MMC Console** – the Microsoft Management Console, which is required to set up and operate AcuoMed and which provides remote management capabilities.
- **AcuoMed Service** – the AcuoMed product that is installed as an MMC snap-in.
- **AcuoMed Data Migration Tool** – An embedded technology that is used to migrate legacy data from one archive to another.
- **Tag Mapper** – An embedded technology that allows for the modification of DICOM tags as data is processed by an AcuoMed system.
- **AcuoMed Utilities** – an AcuoMed program group that resides on the Windows desktop and provides quick access to a number of useful functions.

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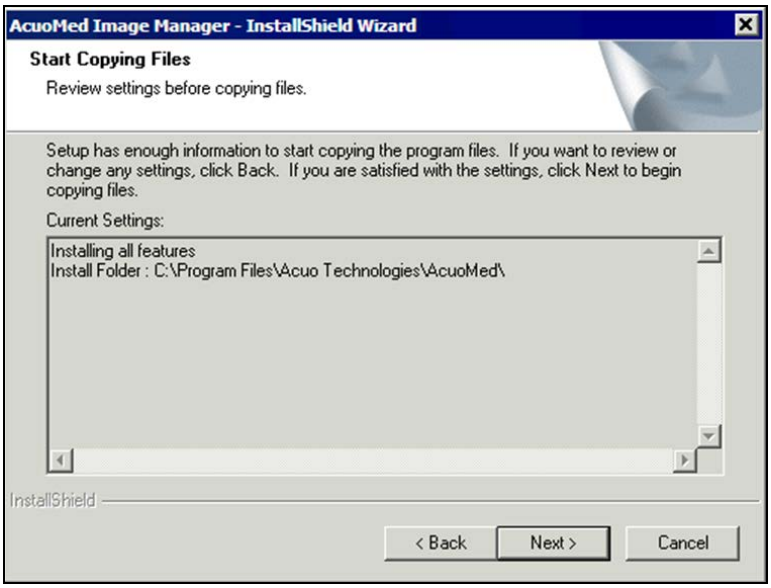
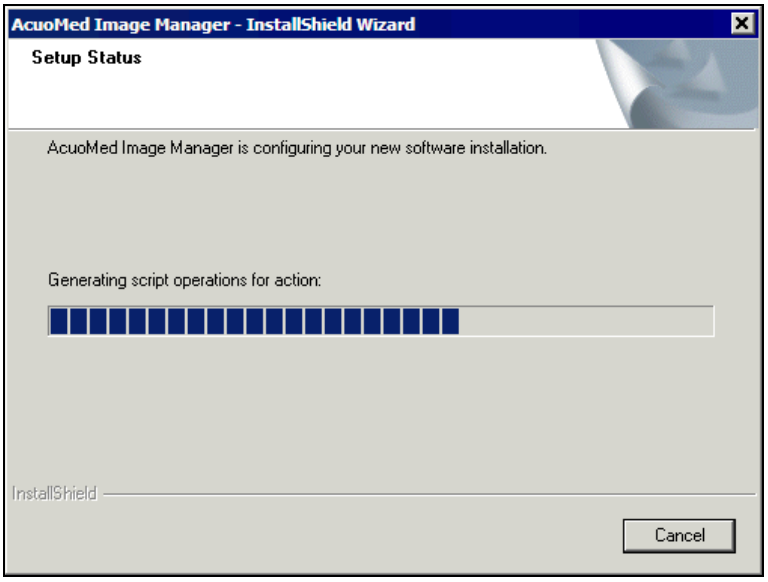
9. Before installing, you can review any of your installation selections and can change your selections by clicking **Back** to return to previous screens.

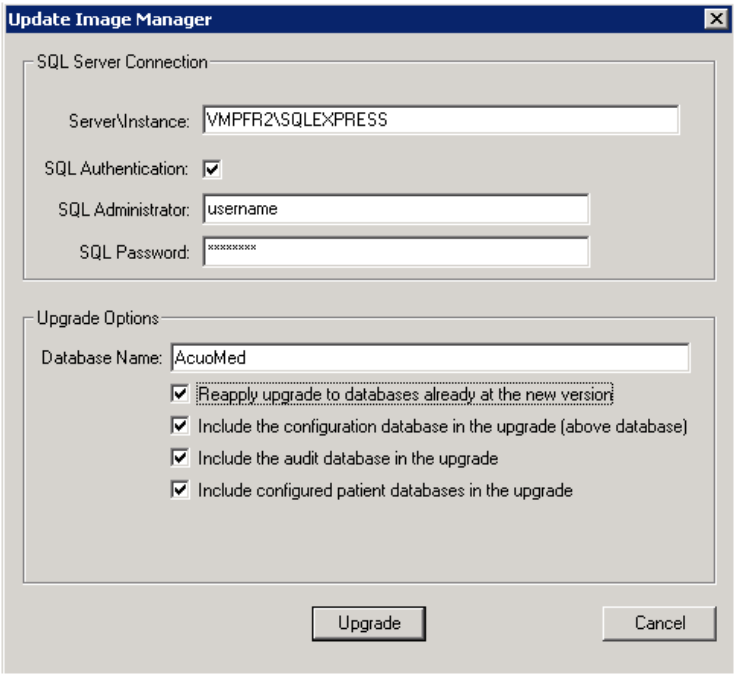


When you are ready to install the program, click **Next** to continue.

10. You can monitor the installation progress during the install process (as shown below).



4. Towards the end of an (**upgraded) installation** you will be prompted for SQL information and upgrade options.

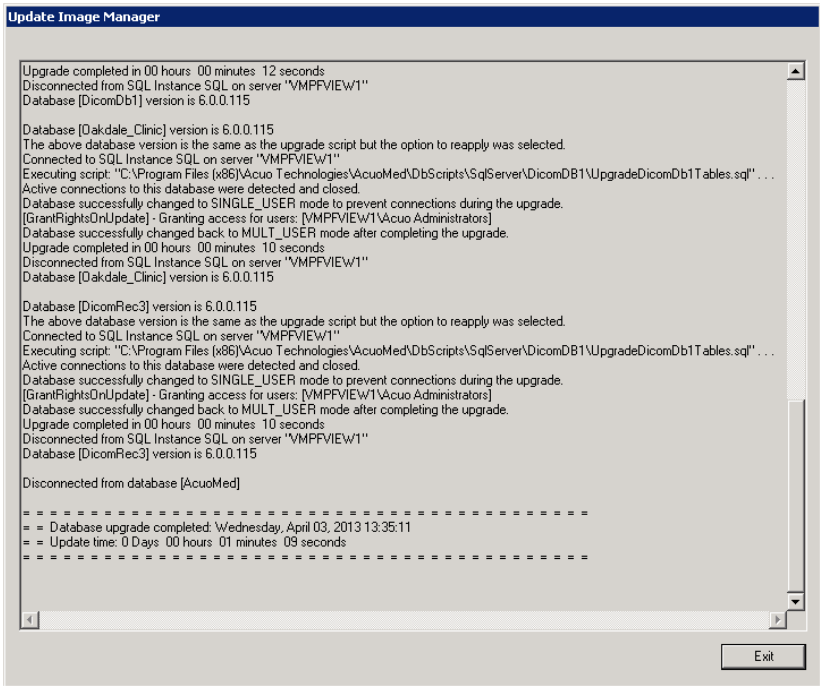


Enter your SQL Server Super User Login and Password information. If not already entered or different from the local system, enter the SQL Server Instance (server name\instance name) where your SQL database(s) exist and the Database Name you are updating (typically AcuoMed). Click **Upgrade** to continue.

The Upgrade Options section allows for additional customization of the AcuoMed Upgrade including:

- An option to reapply (or not reapply) the upgrade for databases already at the same version.
- An option to bypass the upgrade for the AcuoMed configuration database.
- An option to bypass the upgrade for the IHE Audit database.
- An option to bypass the upgrade for ALL DICOM (Patient) databases. This option is applicable to ALL DICOM databases.

Please contact Acuo Technologies Support for additional information regarding the functionality, configuration and implementation of these options.

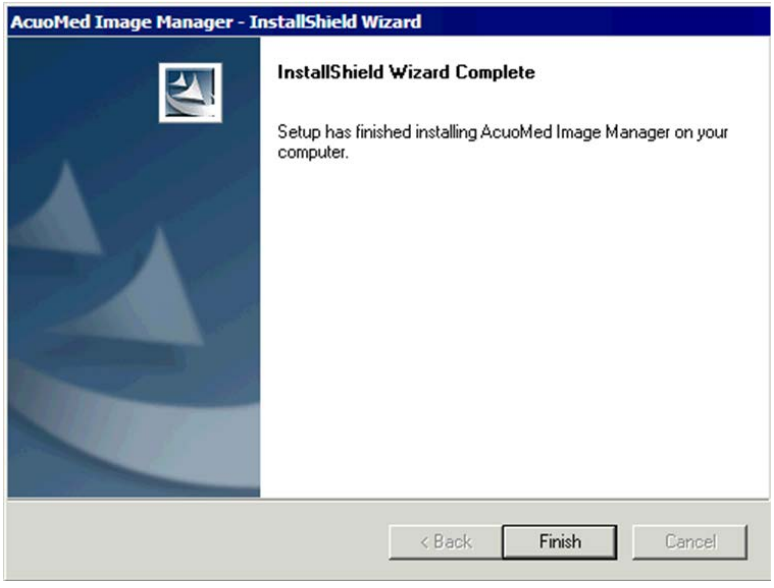


When the Update has completed review the message closely to confirm a successful upgrade. Click the **Close** button to close the dialogue box.

NOTE: The **UpdateAcuoMed.exe** can be executed manually in the event that the update component does not launch automatically as part of the upgrade process or the update failed to complete successfully, for example, the SQL password was not typed in correctly. **To run Update manually, navigate to the AcuoMed directory and execute UpdateAcuoMed.exe.**

---

5. When installation is finished, the InstallShield Wizard Complete screen displays.



Click **Finish** to exit the wizard.

Acuo Technologies Program Group

AcuoMed installation adds an Acuo Technologies folder to the Windows desktop. Double-clicking this folder icon launches the Acuo Technologies utilities screen which provides quick access to a number of useful Acuo program functions.

The Acuo utilities are used for performing Acuo-wide program functions. Notice that there is a separate folder for AcuoMed Image Manager. For information about the AcuoMed-specific utilities, see the next topic, *AcuoMed Utilities (folder).*

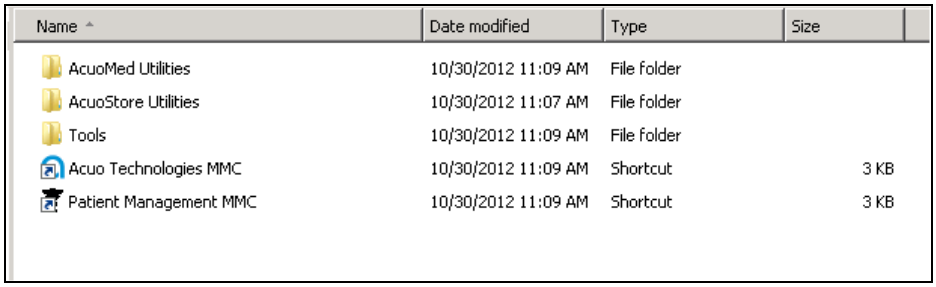


Figure 36: Acuo Technologies folder located on desktop after installation

The Acuo Technologies folder includes the following Microsoft Management Consoles:

Acuo Technologies MMC – an MMC console that includes both the AcuoStore Digital Asset Manager and the AcuoMed Image Manager Application snap-ins. If there is current AcuoStore or AcuoMed configuration data on this system, this configuration will display in the MMC console.

Patient Management MMC – creates a new MMC console that includes the AcuoMed Patient Management snap-in. If there is current Patient Management configuration data on this system, this configuration will display in the new MMC console.

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AcuoMed Utilities (folder)

The AcuoMed Image Manger provides quick access to a number of useful AcuoMed-specific program utilities.

To access these utilities, navigate to the **AcuoMed Image Manager** folder within the **Acuo Technologies** folder icon on the Windows desktop.

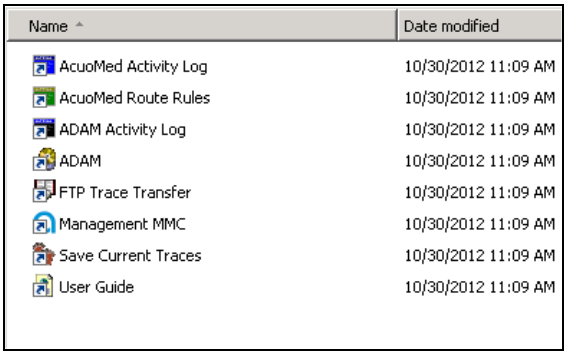

Figure 37: AcuoMed Utilities

The AcuoMed utilities perform the following functions:

- **AcuoMed Activity Log** – provides quick access to the AcuoMed Activity Log.
- **AcuoMed Route Rules –** provides a quick summary of the route tag rule status of your running system by displaying the AcuoMed Route Rules log file (refer to Set up Routing by Tag on page 151).
- **ADAM Activity Log –** provides quick access to the ADAM Activity Log.
- **ADAM –** Migration utility used by Acuo Technologies to migrate legacy data via DICOM from one archive to another.
- **AcuoMed FTP Trace Transfer –** provides a quick and easy way to send trace files to Acuo Technologies to review. Please contact Acuo Technologies for more information.
- **Management MMC –** creates a new MMC console that includes the AcuoMed Image Manager Application snap-in. If there is current AcuoMed configuration data for the AcuoMed Server, this AcuoMed configuration will display in the new MMC console.
- **Save Current Traces** – prompts you for a folder name in which all relevant AcuoMed traces are saved.
- **AcuoMed User Guide –** opens an electronic copy of the AcuoMed User Guide.

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MMC Console Creation

MMC, which stands for Microsoft Management Console, is a framework for hosting administrative tools called consoles within the Windows environment. MMC provides the tools and commands that you need to build new consoles. A console is an administrative structure that can contain tools, folders, Web pages, and other administrative items. You can set up different consoles to manage different parts of your AcuoMed/AcuoStore network (for example, a local and remote AcuoMed/AcuoStore console and SQL server console). Consoles are hosted within MMC.

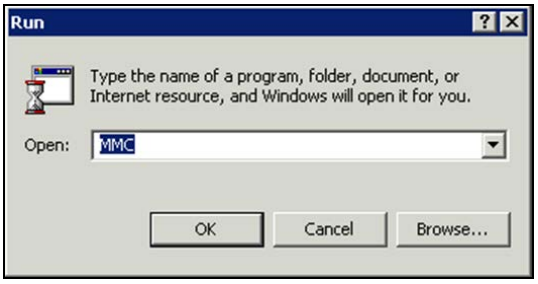
You can set up multiple consoles for different purposes and restrict their use by means of Windows security features. Using different consoles to manage different parts of your network is a good example of a case when you might want to set up more than one console. You can set up one console for local administration plus one or more additional consoles for remote administration.

Since you will operate AcuoMed and AcuoStore from an MMC console, you must create at least one console to which you will add the AcuoMed and/or AcuoStore service. It is also fine to add them to an existing console, if you prefer.

NOTE: A default AcuoMed console (AcuoMed MMC.msc is located in the Acuo Technologies folder on the desktop) ships with the AcuoMed product. You can either customize the AcuoMed MMC.msc console, or you can use the procedure below to create a new console. Keep in mind that upon an upgrade, any changes to the default AcuoMed MMC will be lost, so please create and/or rename the MMC and save the .msc file with a different name to assure safekeeping of changes made to the console.

Follow these steps to create an Acuo console.

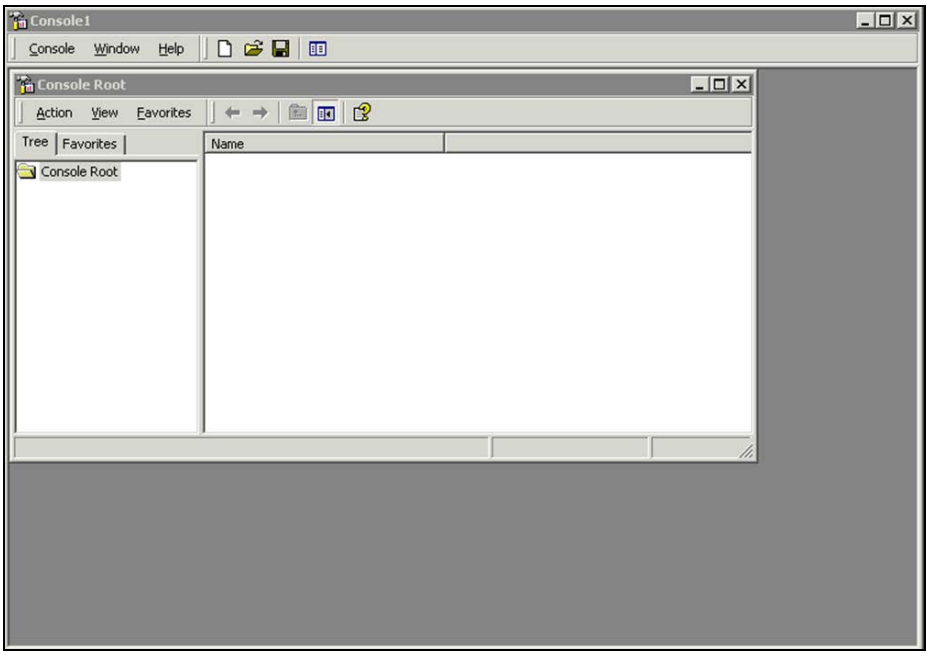
1. Click the Windows **Start** menu and then click **Run**.



2. In the Run dialog, type MMC (as shown above) and click **OK**.

   A new blank console displays.

NOTE: If creating the MMC on a 64 Bit Operating System, in the Run dialog, type MMC -32 and click ok.

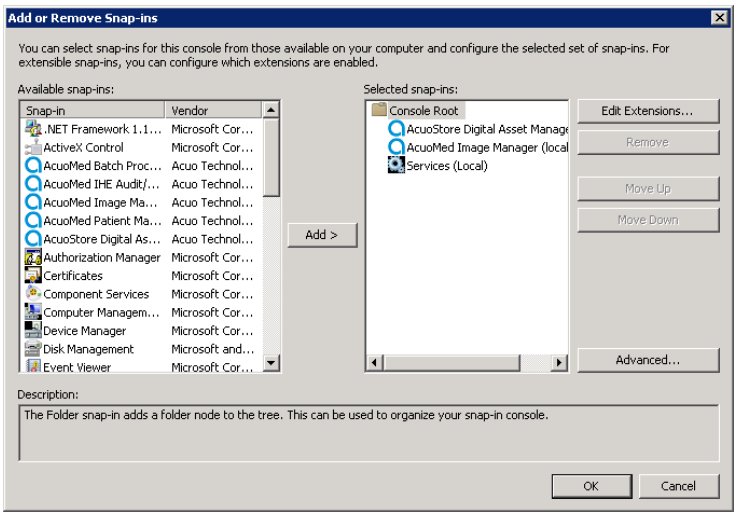


3. From the Console menu choose **Add/Remove Snap-in**.

   The Add/Remove Snap-in dialog displays.

4. Click the **Add** button.

   The Add Standalone Snap-in dialog displays. By selecting items from this list you are basically choosing a set of applications that you can run through the virtual console that you are creating.



5. Locate and click the **AcuoStore Digital Asset Manager** snap-in to select it and click **Add**.

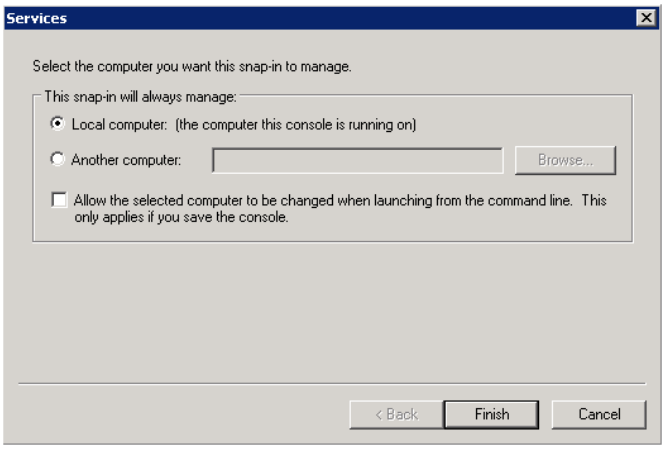
   The AcuoStore Digital Asset Manager is added to the Snap-ins list in the Add/Remove Snap-in dialog.

6. Locate and click the **AcuoMed Image Manager** snap-in to select it and click **Add**.

   The AcuoMed Image Manager is added to the Snap-ins list in the Add/Remove Snap-in dialog.

7. Locate and click the **Services** snap-in to select it and click **Add**.

   The Services dialog displays. The services snap-in is used to start, stop, and configure Windows services. Since AcuoStore and AcuoMed run as Windows services, you need to use the Services snap-in to manage them.



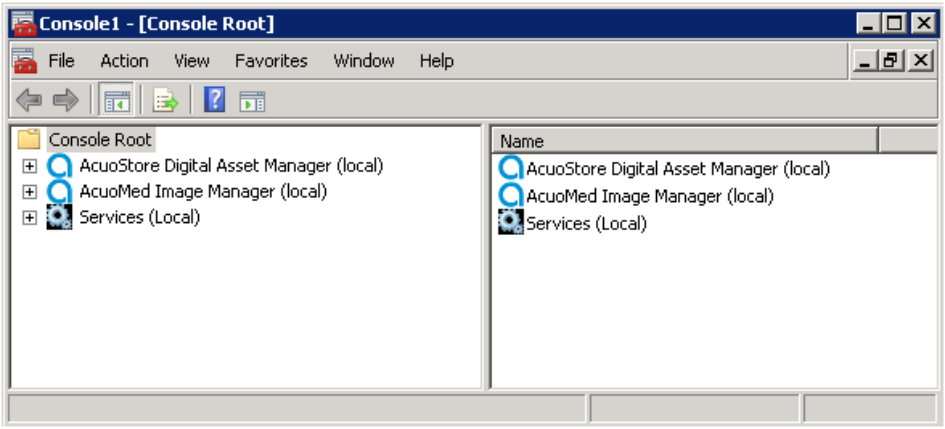
8. To have this console manage the local computer, select **Local computer** and click **Finish**.

9. (Optional) To have this console manage a remote computer, select **Another computer**, type the path (or Browse and select the path) to the remote computer, and click **Finish**.

10. (Optional) You can add any other snap-ins you may need for system management to the Acuo Console you are creating (for example, Microsoft SQL Enterprise Manager or Removable Storage Management).

11. When you are done adding snap-ins, click **OK** to close the Add Standalone Snap-in dialog.

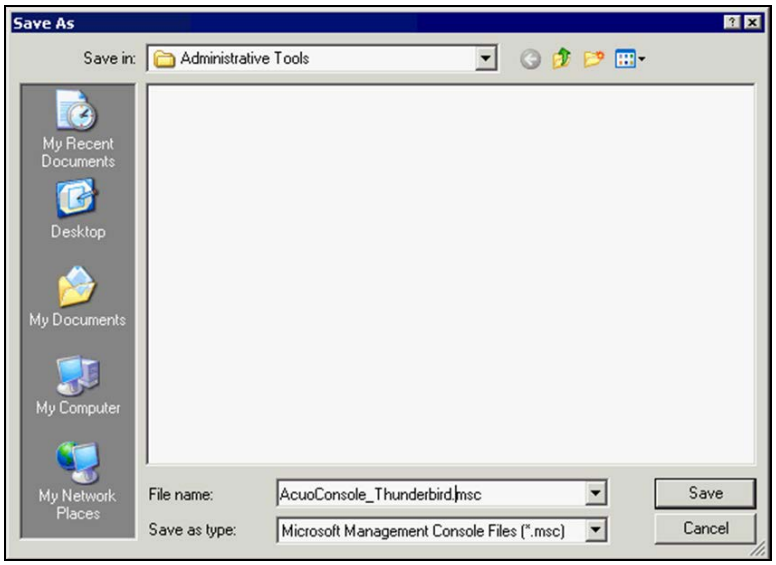
12. You now should see the snap-ins you added in the Console Root tree (as shown below).



13. To save your new console, click the **Console** menu and choose **Save As**.

    The default "Save in" folder Administrative Tools is fine unless you have a reason to change it.

    File name – a file name that is a combination of a console name and a system name is a good choice. In our example below, the existing local console "AcuoConsole_Thunderbird" already exists and we are adding the new console "AcuoConsole_Apollo_Remote" that will be used to manage a remote system.



14. Test to see that your newly created and saved console shows up under Start Menu→ Programs→ Administrative Tools.

15. Create a shortcut on your desktop to the new console by right-clicking it in the Start Menu and clicking Create Shortcut in the pop-up menu...

    A shortcut icon is placed on your desktop.

16. (Optional) Rename the desktop shortcut as desired.

For information on how to add a Custom MMC Taskpad view for Acuo Patient Management see Chapter 5.

Database Installation

Database installation includes both creating a database and connecting to the newly created database. For SQL databases, connection happens automatically as part of the installation process.

Allow plenty of disk space when installing your databases. *Recommended Configurations* are outlined in Chapter 3 of this manual. This RAID should be separate from the RAID that serves as the system drive, and from the RAID that is used to store images. For SQL, Acuo databases are set up by default to grow automatically in 1 megabyte increments. This allows the databases to start small and then grow as needed. For a more accurate disk analysis and configuration, please review the Acuo **Volume and Server Analysis Worksheet** which can be found at www.acuotech.com (click on Resources and it can be found under Other Resources)

NOTE: When upgrading your current installation of AcuoMed, it is necessary to uninstall the current product version (via Windows Add/Remove Programs) before installing the new product version. The uninstall operation does not remove any currently installed databases that AcuoMed is using. However, it may be necessary to reconnect to these databases after you have installed the new version of the AcuoMed product. Refer to the topic

Changing a Database Connection on page 89 for instructions on how to do this.

SQL Database Installation

For Microsoft SQL, you create a new database through the Acuo MMC console applications. You cannot install the initial database for an MMC application remotely. That is, you must install the AcuoStore and/or AcuoMed databases on a machine that you are actually logged onto. However, you can use Terminal Services Client to connect to another computer as if you are local (logged onto) that machine. Refer to for more information.

There is a minimum of four database installations required to use AcuoMed:

- AcuoStore Database – procedure given in the AcuoStore Installation and Operations Guide
- AcuoMed Database – procedure given below
- AcuoMedIHEAudit Database – Installed automatically with the installation of the AcuoMed Database.
- AcuoMed DICOM Database – procedure given below

Refer to *AcuoMed/AcuoStore Database Structure* for an overview of the types on information these databases contain.

It is possible to install multiple DICOM databases, but only one AcuoStore Database and one AcuoMed database, for an AcuoMed Image Manager.

Installing an AcuoMed Database

The initial installation of the AcuoMed database creates an empty database to be used by the AcuoMed Image Manager. This new database contains blank tables for Router Configuration, DICOM Configuration, and Move/Route Mapping Configuration information.

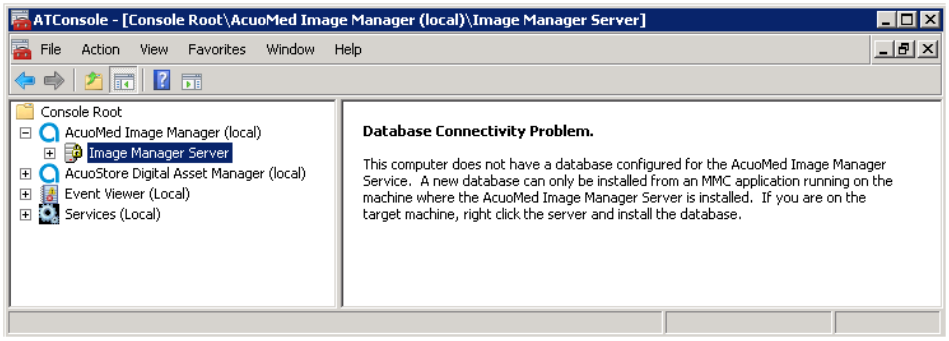
NOTE: When a new version of AcuoMed is installed, the existing AcuoMed database remains on the system. You use the "Change Database Connection" process to reconnect the existing database to the new installation of AcuoMed. Refer to the topic

Changing a Database Connection on page 89.

Follow these steps to perform the initial installation of an AcuoMed database.

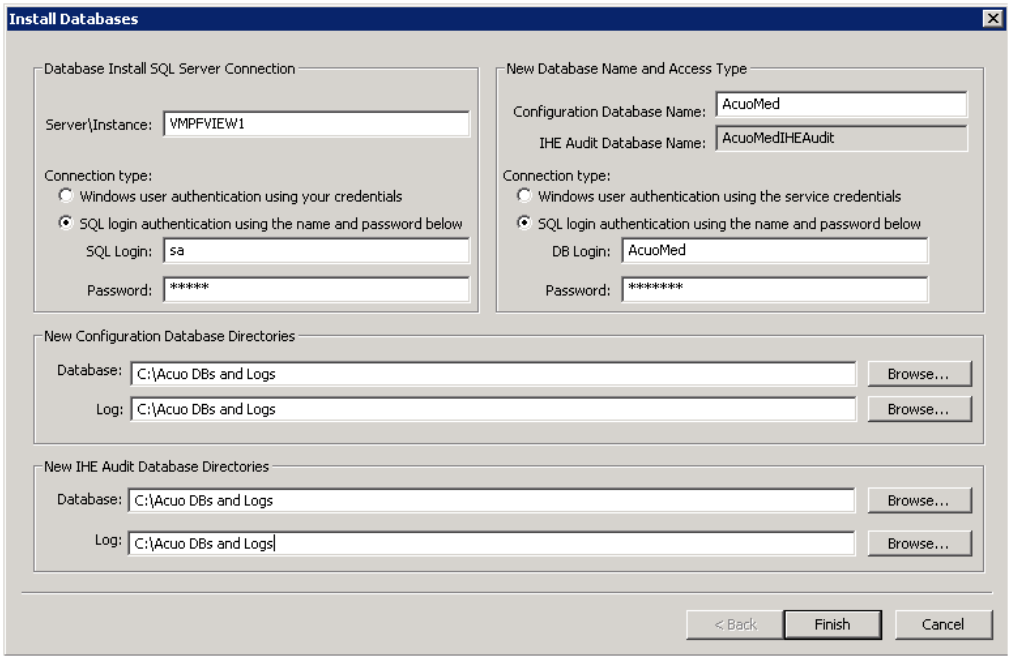
1. Start the Acuo MMC console, if it is not already running.

   If no AcuoMed database is currently installed, the following message displays to notify you. This happens when you click **AcuoMed Server** under the AcuoMed Image Manager node in the console.



2. Right-click on **AcuoMed Server,** under AcuoMed Image Manager in the console, and select **Install Database**.

   The Install Databases dialog displays.



3. For the Database Install SQL Server Conncetion, do the following:
   - Type the SQL Server Instance this database will be installed.
   - Choose Connection Type
     - Login/Password: type in your unique SQL Server administrative login and password. (This is the administrative authentication that allows you to install a new database in the Database Server.)

       OR
     - Select Windows User Authentication using your windows credentials.
4. For the New Database Name and Access Type, do the following:
   - Database name: enter a name for the new database. You can use AcuoMed or some other name that you prefer for your installation. The database name must be unique within your SQL Server installation.
   - An IHE Audit database will be installed along with the AcuoMed database.
   - Choose Connection Type
     - Login/Password: type in the login name and password that will be required for a user to gain access to this database.

       OR
     - Select Windows User Authentication using your windows credentials.
5. Set the New Database Directories to determine where the database files will be installed.
   - Database: You can either type in a location or click **Browse** and select an existing location. Do not install database files to your system drive (where your Windows installation is located), because it is not possible to span volumes to expand the system drive as your database grows. Instead, install the database on a separate partition or different physical drive (be sure the database install location is a dynamic disk to allow Volume Spanning for database growth).
   - Log: Microsoft recommends that you save log files on a different drive than where the database files are saved (but this is not a strong recommendation); so, you can save them in the same directory as the database files if you prefer.
6. Click **Finish** to complete the installation.

   You can verify that the database is installed and connected. In the MMC console tree, click **AcuoMed Image Manager** to select it. In the right pane for the AcuoMed Server/Database Server, you should see a Configuration Database Status of **Connected**.

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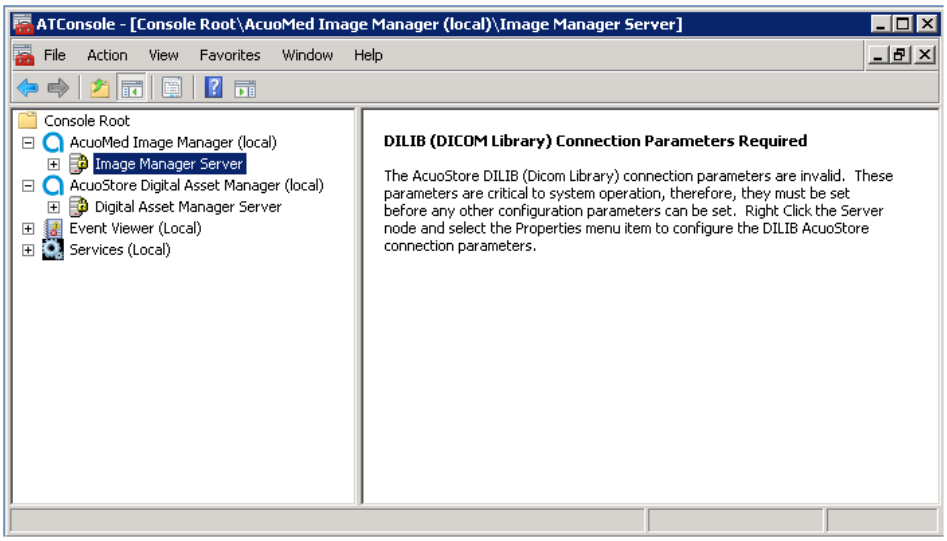
Configuring the AcuoStore Dilib Connection

Dilib (DICOM Library) needs an AcuoStore application associated with it before you can proceed with AcuoMed configuration. Configure the AcuoStore Dilib connection after you have finished the *AcuoMed Database Installation* procedures earlier in this chapter.

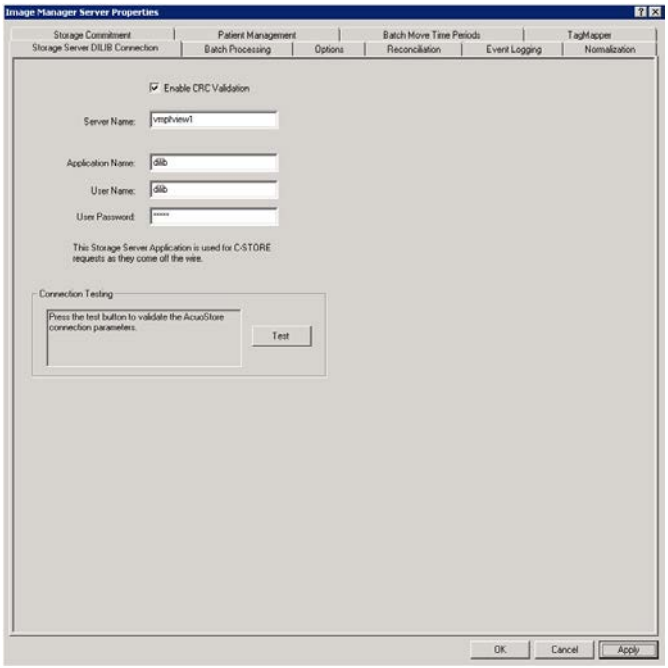
If you do not currently have a configured AcuoStore Dilib connection, you will see the following message when you attempt to configure AcuoMed.



To configure the AcuoStore Dilib connection, follow these steps:

1. Expand the **AcuoMed Image Manager** node and Right-click the **Image Manager Server** node and select **Properties** from the pop-up menu.

   The AcuoMed Server Properties dialog displays with the AcuoStore Dilib Connection tab selected.



2. Enter the AcuoStore Dilib connection parameters.

   This connection information designates the AcuoStore application that is to be used for this AcuoMed Server's received C-STORE requests.

   - Enable CRC Validation (Cyclic Redundancy Check) – This is a mathematical calculation of the pixel data as an image arrives off the wire on a C-Store. The calculation is stored with the image and can be used in conjunction with Duplicates Processing. This process is very low in overhead, and the recommendation is that it is enabled at all times. This is ON by default.
   - Server Name– the server where the AcuoStore application resides.
   - Application Name – the AcuoStore application name
   - User Name – the AcuoStore user authentication name.
   - User Password – the AcuoStore user authentication password.

3. Click the **Test** button to validate the AcuoStore connection parameters.

   If the connection is not successful, modify the connection parameters and test again.

4. Click **OK** to complete AcuoStore Dilib connection configuration.

NOTE:	The Dilib connection is used as a location for data as it arrives off the wire. Therefore, it is important that this be highly available disk-based storage.

You can now configure AcuoMed. Refer to Chapter 4 – AcuoMed Configuration Example. Please note that a valid feature key is necessary before proceeding.

Installing an AcuoMed DICOM Database

The AcuoMed DICOM database contains the patient administrative, study, series, and image record information that describes the images that are physically present on the archive. This tag data contained in the DICOM database is extracted from each received image prior to archiving that image (that is, who the patient is, what study this is for, and what the series is (for example, CT, MRI, X-Ray, etc.) An AcuoMed Image Manager can concurrently use multiple DICOM Databases.

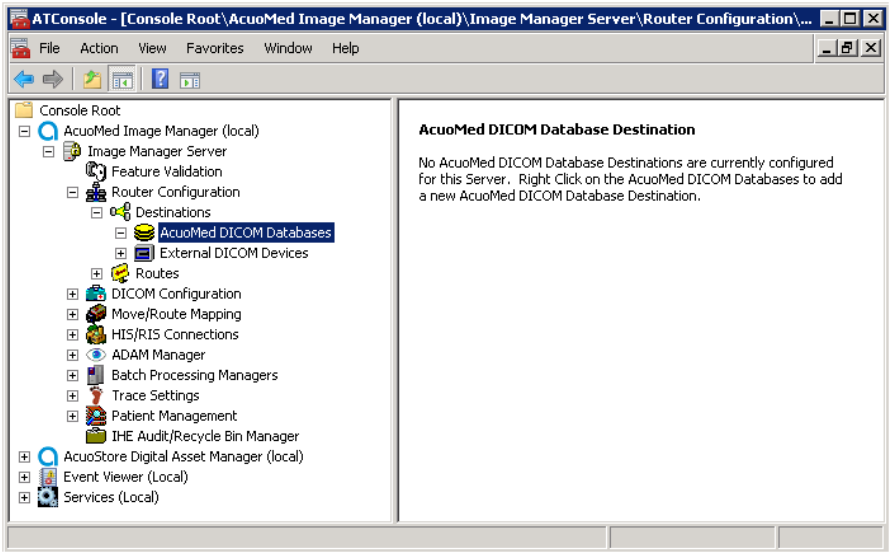
Follow these steps to perform the initial installation of a DICOM database:

1. Start the Acuo MMC console, if it is not already running.
2. Expand the console tree under AcuoMed Image Manager to locate AcuoMed DICOM Databases.

   Click the **+** symbol to expand AcuoMed Server [YOUR SERVER NAME]→ Router Configuration→ Destinations→ AcuoMed DICOM Databases.

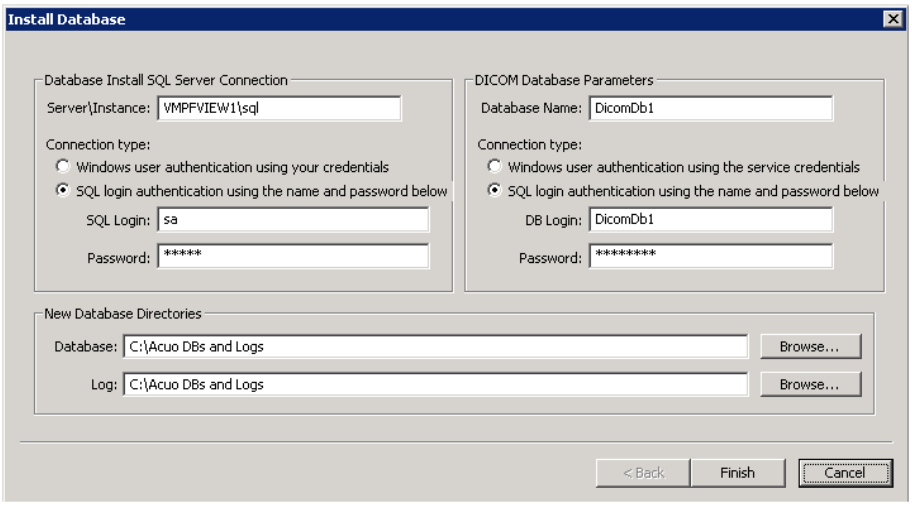
3. Click **AcuoMed DICOM Databases** to select it.

   If no DICOM database is currently installed, the following message displays to notify you.



4. Right-click **AcuoMed DICOM Databases** and select **Install A DICOM Database** from the pop-up menu.

   The Install Database dialog displays.



5. For the Database Install SQL Server Connection:

   - Choose Connection Type
     - Login/Password: type in your unique SQL Server administrative login and password. (This is the administrative authentication that allows you to install a new database in the Database Server.)

       OR

     - Select Windows User Authentication using your windows credentials.

6. For the DICOM Database Parameters, do the following:

   - Database name: enter a name for the new database. You can use DicomDb1 or some other name that you prefer for your installation. The database name must be unique within your SQL Server installation.
   - Choose Connection Type
     - Login/Password: type in your unique SQL Server administrative login and password. (This is the administrative authentication that allows you to install a new database in the Database Server.)

       OR

- Select Windows User Authentication using your windows credentials.

7. Set the New Database Directories to determine where the database files will be installed.

   - Database: You can either type in a location or click **Browse** and select an existing location. Do not install database files to your system drive (where the Windows installation is located), because it is not possible to span volumes to expand the system drive as your database grows. Instead, install the database on a separate partition or different physical drive (be sure the database install location is a dynamic disk to allow Volume Spanning for database growth).
   - Log: Microsoft recommends that you save log files on a different drive than where the database files are saved (but this is not a strong recommendation); so, you can save them in the same directory as the database files if you prefer.

8. Click **Finish** to complete the installation.

   You can verify that the database is installed by starting SQL Server Enterprise Manager and looking in the MMC console tree under Microsoft SQL Servers→ SQL Server Group→ [YOUR SERVER NAME]→ Databases. For our example procedure above, the database DICOMDb1 should appear.

NOTE: After installing an AcuoMed DICOM database, you must also add the DICOM database to the AcuoMed configuration as a local route **destination**. As part of that process, you can test to ensure the installation is correct. Refer to the sample configuration procedure.

Changing a Database Connection

Changing a database connection allows you to connect to an AcuoMed (or AcuoStore) database that has already been installed on a system. For an AcuoMed (or AcuoStore) database, it is only possible to have one database per application.

SQL databases – database connection is done automatically as part of SQL database installation. So the Changing a Database Connection procedure is not needed following installation of a new SQL database. Also, when an AcuoMed application upgrade is installed, it is not necessary to reconnect to the existing SQL databases by means of the Changing a Database Connection procedure, as long as during the software uninstall process, settings for reinstallation are preserved.

NOTE: This Changing a Database Connection procedure is only used for AcuoMed and AcuoStore databases and is not required for AcuoMed DICOM databases. It is possible for an AcuoMed application to concurrently use multiple AcuoMed DICOM databases. Having multiple DICOM databases allows you to better separate and manage data. For example, you can have different DICOM databases for "Images for Department A" and "Images for Department B." You do not really connect to DICOM databases in the same way you do to AcuoStore and AcuoMed databases. Instead, DICOM databases are associated with routes. Therefore, you do not need to connect, or reconnect, to DICOM databases in the same way that you do for the AcuoMed and AcuoStore databases.

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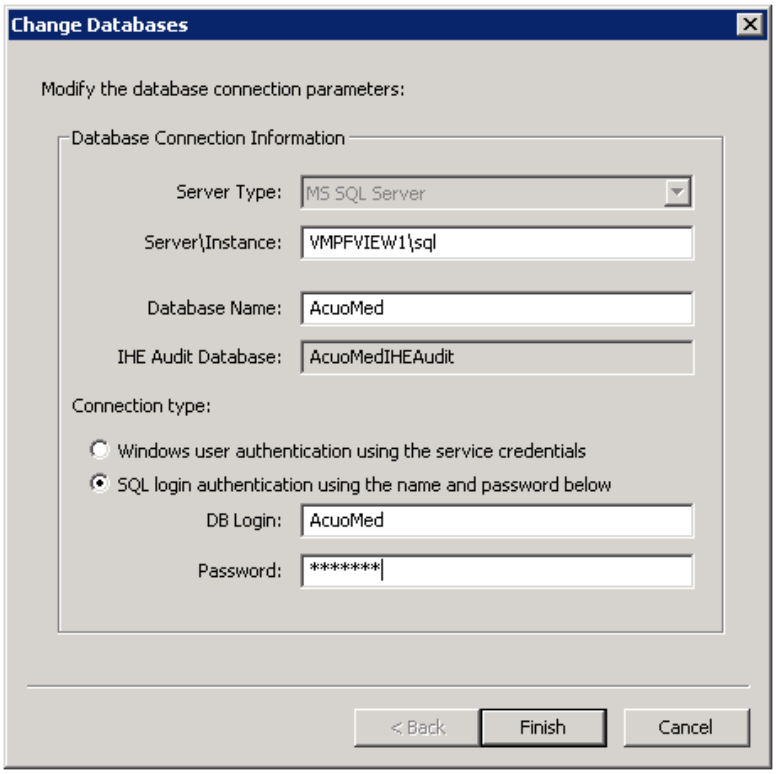
Follow these steps to change a database connection (connect/reconnect) to an AcuoMed database.

1. In the MMC console tree, right-click **Image Manager Server**.
2. From the pop-up menu select **Change Database Connection**.

   The Database Connection Parameters dialog displays.



3. Select the Database Type from the list: **MS SQL Server**.
4. Type the Server name where the database is installed.
5. Type the Database name. This is the Database Name parameter that was specified at database installation.

   The IHE Audit Database Name will be modified automatically should the Database Name change, keeping these two databases in synch.
6. Choose Connection type:

   This is the connection type that was specified at the time of database installation.
7. Type the database Password. (SQL Authentication only)

   This is the Password parameter that was specified at database installation.
8. Click **Finish** to change the database connection.

Database Update Procedure

It is necessary to update your AcuoMed and AcuoStore databases when you install Acuo product updates.

This process is incorporated into the installation process on systems where SQL, AcuoStore and AcuoMed all reside on the same server.

If your databases exist on a separate SQL server, update.exe will need to be run manually for AcuoStore and AcuoMed from the SQL server. The instructions are as outlined below:

1. Copy the **Acuo Technologies** folder from the application server to the SQL Server desktop.
2. After installing the new version of AcuoStore, from the SQL Server desktop, open the Acuo Technologies folder to AcuoStore and double click UpdateAcuoStore.exe.
3. After installing the new version of AcuoMed, from the SQL Server desktop, open the Acuo Technologies folder to AcuoMed and double click UpdateAcuoMed.exe
4. Start AcuoStore Service.
5. Start AcuoMed Service.
6. Verify that the Update was successful.
7. Verify that your Image Manager Server Node indicates the correct upgraded version.
8. Delete the Folder **Acuo Technologies** from the SQL Server desktop only. (Optional)

NOTE:	(OPTIONAL) Give **Everyone** read-only access to Security and Share Permission to the folder and share. This will allow you to connect to the share from the SQL Server system and update the databases. The share and security changes should be removed when the update is complete.

User Accounts

Anytime you need to access a remote database or another AcuoMed system, you need to setup a user account on the remote AcuoMed system. This user account gives you access to the remote database and application. For example, let's say that AcuoMed system 1 needs to access AcuoMed system 2. In this case, the User that the AcuoMed Service is running as on AcuoMed system 1 must have a user account on AcuoMed system 2 that is a member of the local administrators group. This allows the AcuoMed Service User to access the database and application on AcuoMed System 2 (see Figure 38: User account needed for remote database access).

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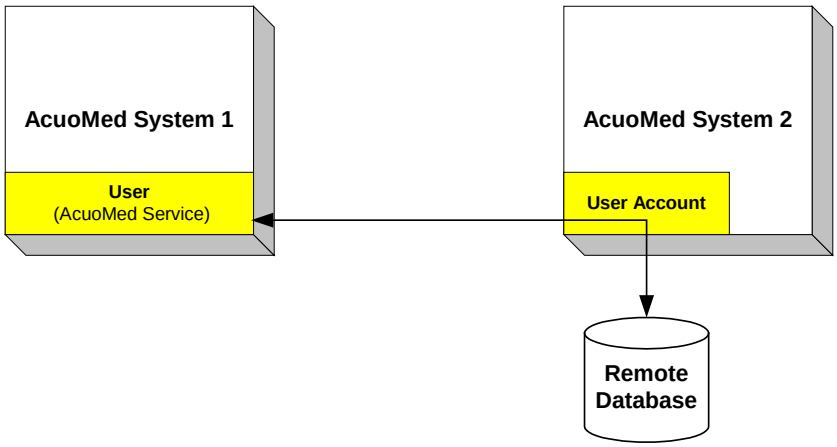
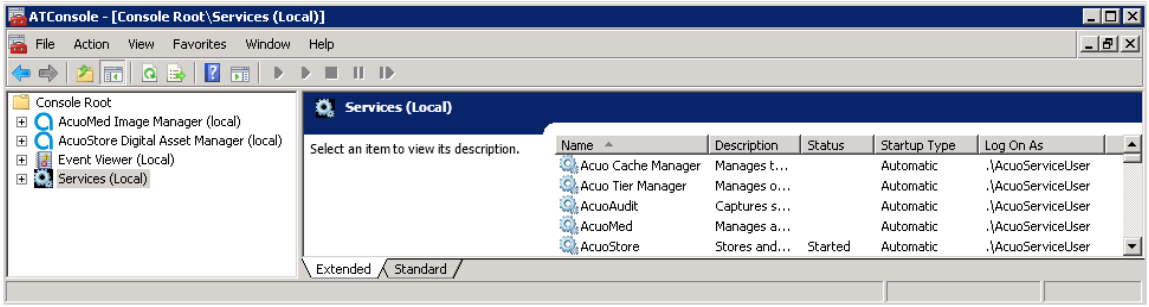
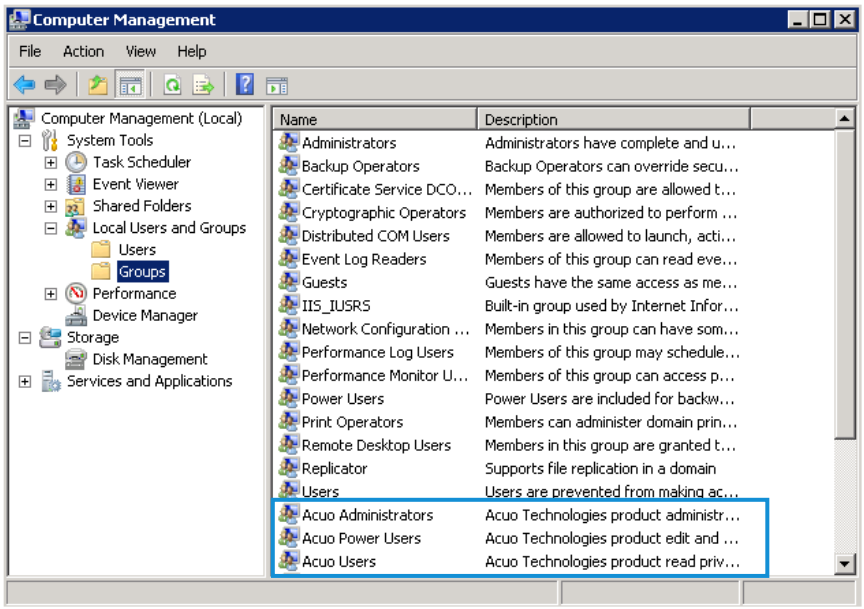


Acuo Technologies has made this easy for you. The Acuo User accounts are installed using its own predefined User Login and Password as noted below (.\AcuoServiceUser) and the passwords are set to never expire.

The **AcuoServiceUser** user account is created and placed in the local Acuo Administrators group upon install. It is set up to run as a service account and will be used to run the Acuo software services. The password is set to never expire. A domain user account can be set up to run the services instead, but it will need to be added to the Acuo Administrators group. The Acuo services must be set up to use the account and the account will need to be granted run as a service rights.



As well, three local User Groups are also predefined upon installation of the software. Users can then be placed within these three groups to maintain security of images as you see fit by adding the appropriate user into the appropriate group. The groups and associated permissions are described as follows.



Acuo Administrators: Users who will have access to the full GUI. Users in this group will need full access to all the shares, since they will have the ability to perform merges, edits, and deletes. The **AcuoServiceUser** is automatically put in the Acuo Administrators Group upon install.

Acuo Power Users: Users who will have access to the Patient Management GUI only. Users within this group will require full access to all shares. They will be able to perform merges, edits, and deletes. They will also be able to view the REM and reconcile images. There are no users put into this group upon install.

Acuo Users: Users who will have access to the Patient Management GUI only. Users within this group will require "read only" access to all the shares. They will be able to perform such tasks as movement of images and viewing of patient information. The REM is not visible to this user and reconciliation cannot be performed by a user in this group.

User Group	Acuo Administrators	Acuo Power Users	Acuo Users
Access to Image Shares	Full	Full	Read Only
Patient Management MMC	X	X	X
• View Patient Info	X	X	X
• Move Images	X	X	X
• View REM & Perform Reconciliation Images	X	X	
• Merges	X	X	
• Edits	X	X	
• Deletes	X	X	
AcuoStore Digital Asset Manager Application MMC	X		
AcuoMed Image Manager Application MMC	X		
AcuoSemantix MMC	X		

NOTE: Although it is possible to use local users and groups to set up the required privileges, it is recommended that Active Directory be deployed where possible. When using Active Directory, groups can be created within the domain and simply placed into the preinstalled Acuo Groups to manage the privilege level of the users in the domain groups being managed.

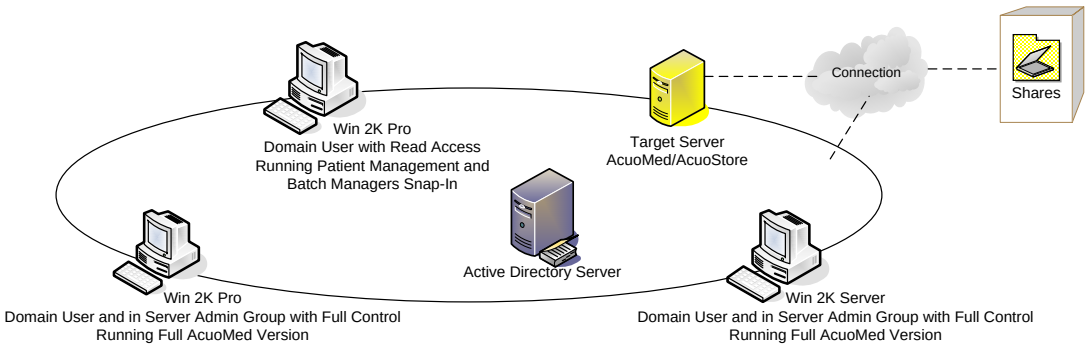


Figure 38: User account needed for remote database access

There are two cases in which a user account is required:

- Accessing a remote reconciliation target database (refer to the topic
- *Reconciliation* Target).
- For Distributed Management, queuing image prefetches from another AcuoMed Server (refer to the topic *Centralized vs. Distributed Management* on page 277 and *Patient Management* Snap-In on page 225)

Chapter 4 – AcuoMed Configuration Example

In this chapter:

Configuration Overview

Set up Destinations

Set up Routes

Set up Sources

Set up Move/Route Mapping

Set up Routing by Tag

Configure the Deep-End AcuoMed Server

Configuration Overview

After you have installed AcuoMed and its related databases (as described in Chapter 3), it is time to configure AcuoMed's image management and archiving capabilities for your environment. This chapter provides an example that demonstrates configuration of the typical components in an AcuoMed environment. This example is shown by way of an overview description of the configuration to be built (along with diagrams) followed by a set of procedures to configure the various components described in the overview.

The example configuration shown in this chapter can be built using basic AcuoMed system functionality. Additional features are available that expand the functionality of your AcuoMed system. For configuration information on these features, refer in particular to *Chapter 5 – Patient Management* (for Reconciliation configuration) and *Chapter 6 – DICOM Modality Worklist HIS/RIS Connectivity.*

Figure 39 shows a high-level conceptual overview of the example configuration. Figure 40 shows a detailed view of this same configuration. Notice that there are alphabetic callouts in Figure 40 that reference the detailed procedures for creating this configuration. This allows you to easily follow which procedures apply to configuring which parts of the example configuration. Therefore you can use Figure 40 as a reference into the detailed configuration information in this chapter.

The example configuration illustrated in Figure 39 and Figure 40 is as follows. An AcuoMed system implementation is installed and configured across two different physical locations: a hospital and one of its associated clinics.

At the clinic, we are configuring a department AcuoMed Server that has a local image cache and is networked to the following DICOM devices:

A modality that sends the AcuoMed Server medical images (a CT scanner in this case)
A view station
A non-Acuo archive (this is an existing DICOM 3.0-compatible archive)

In addition, the AcuoMed Server at the clinic has a wide-area network connection to another AcuoMed Server that is located at the hospital. This AcuoMed Server at the hospital is a deep-end server that is networked to a deep-level archive that manages a tape jukebox. Figure 39 shows a high-level view of this configuration.

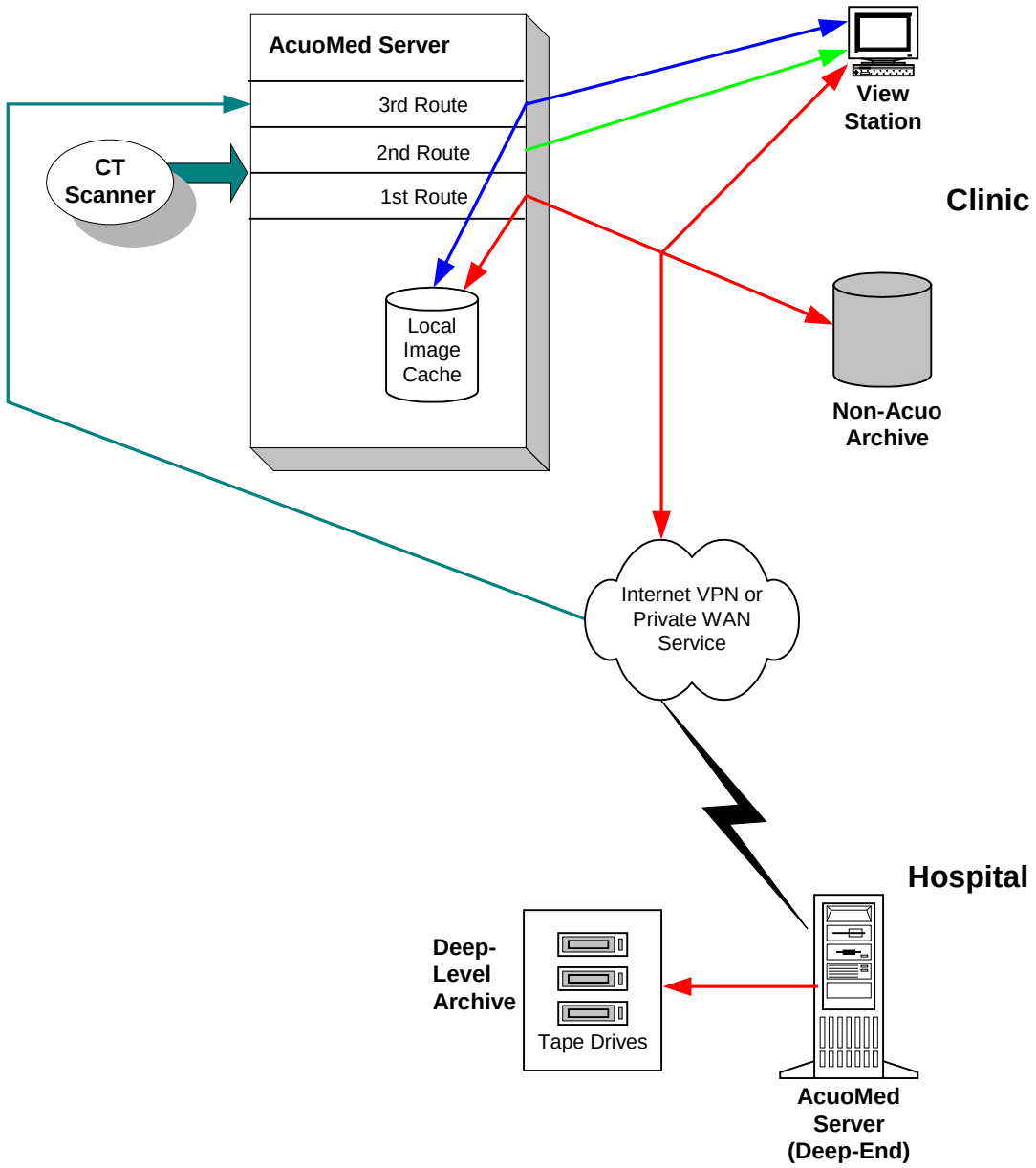
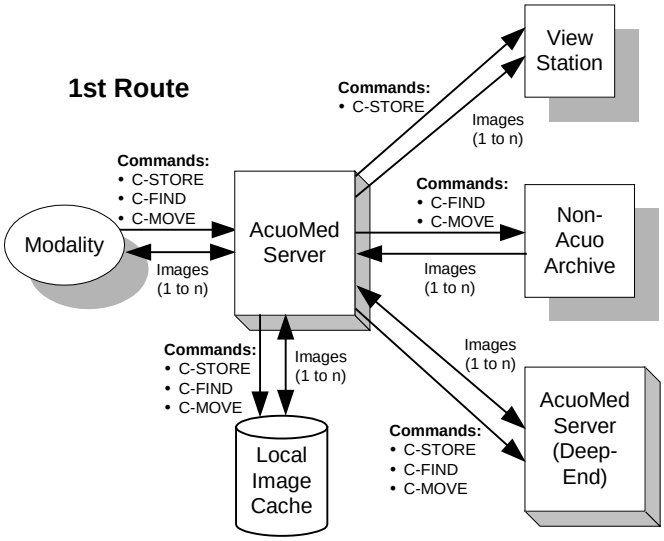


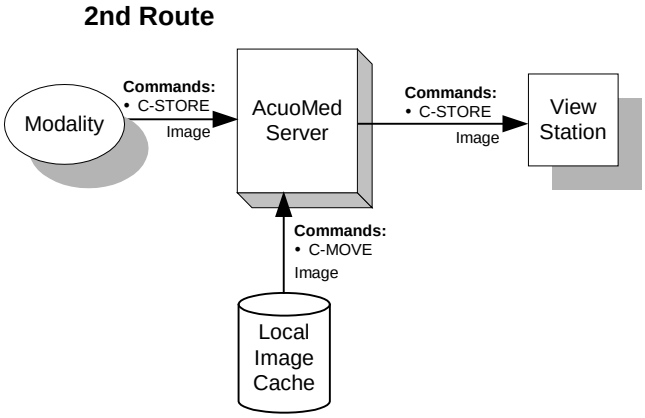
Figure 39: High-level view of the configuration example

Three routes are configured for the example configuration shown in Figure 39:

The first route is used for storing images to the local cache on the department AcuoMed Server, to the view station located at the clinic, and to the deep-end AcuoMed Server located at the hospital (via C-STORE commands). In addition, this route can be used to query the local cache on the department AcuoMed Server at the clinic, the deep-end AcuoMed Server at the hospital, and the old non-Acuo archive at the clinic with one FIND request to the AcuoMed Server.

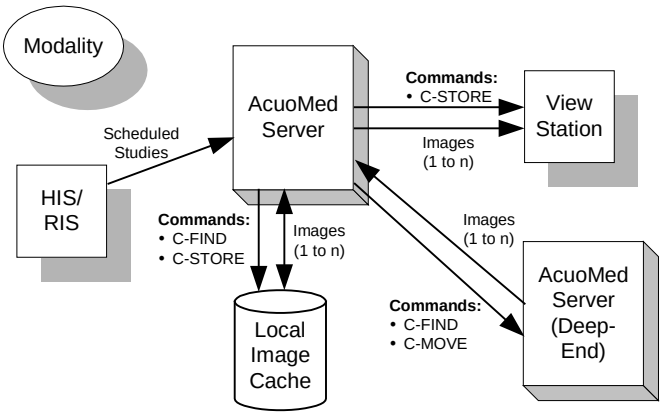


The second route is used for accessing only the view station at the clinic. This could be used, for example, to send an image directly from a modality to a doctor without archiving that image, or to move an image from the local image cache to the view station.



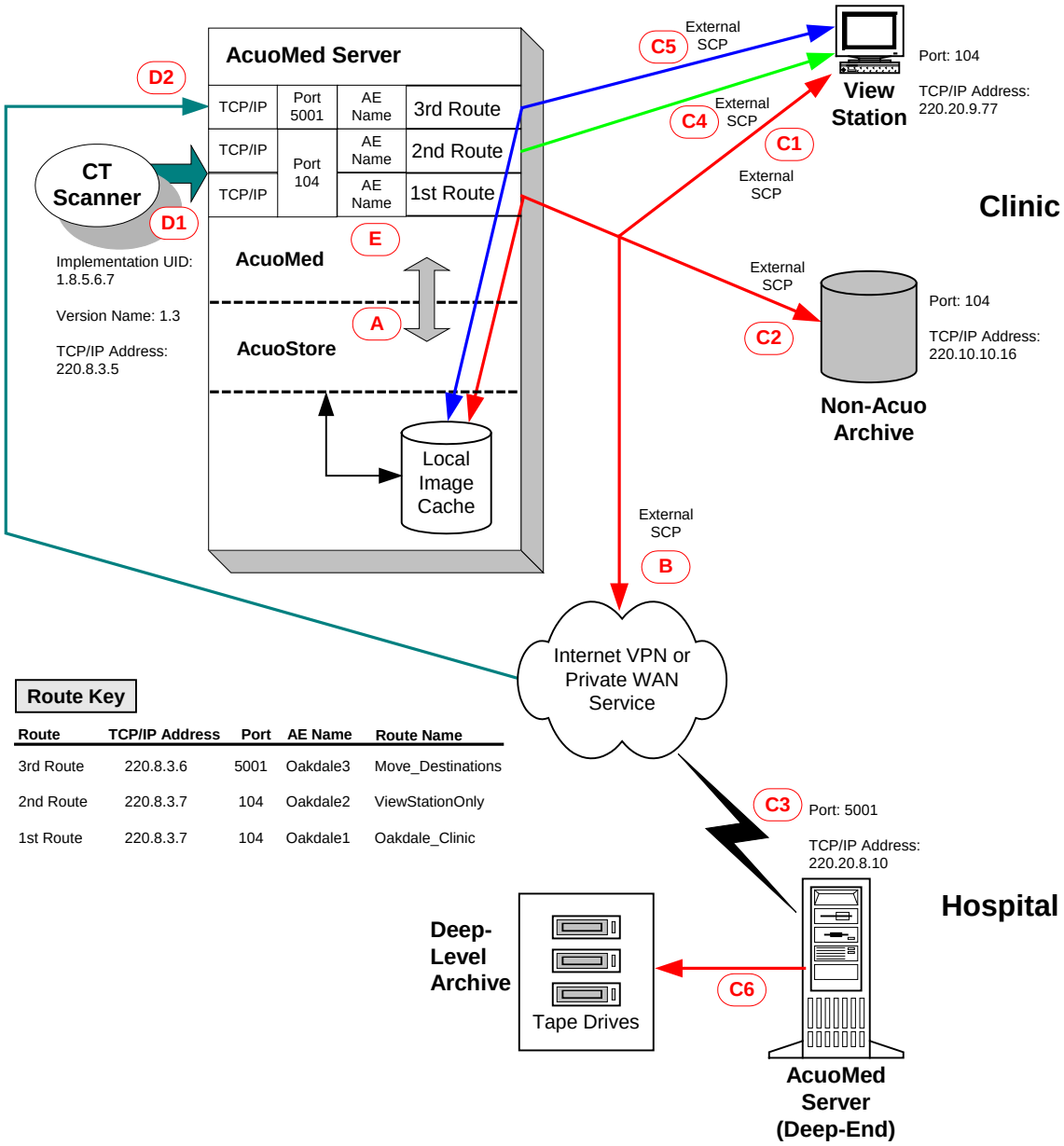
The third route is used for moving images located on the AcuoMed deep-level tape archive at the hospital to the clinic view station and AcuoMed Server local image cache in a single operation. This might be required, for example, by HIS/RIS scheduled studies, or by a doctor wishing to view historical patient information.

3rd Route



NOTE:	In this configuration example, when we discuss moving and storing images, the term "images" is used generically and also includes the related items patients, series, and studies.

Figure 40 shows the same example configuration as Figure 39. However, Figure 40 adds specific information needed to configure these routes such as Implementation UID and IP address for the modality and IP addresses and port addresses for the DICOM devices that are configured for these routes. In addition, Figure 40 contains callouts that make linkages from this diagram to the example configuration procedures that make up the remainder of this chapter (for navigation, look up the callouts on the *Procedure Map* on page 99).



Route Key

Route	TCP/IP Address	Port	AE Name	Route Name
3rd Route	220.8.3.6	5001	Oakdale3	Move_Destinations
2nd Route	220.8.3.7	104	Oakdale2	ViewStationOnly
1st Route	220.8.3.7	104	Oakdale1	Oakdale_Clinic

Figure 40: Detailed view of the configuration example

Procedure Map

In order to create the example configuration shown in Figure 40, the following procedures are required. The callouts reference Figure 40.

Configure AcuoStore		Refer to the *AcuoStore Installation and Operations Guide*, Chapter 4, for this part of the configuration example
Configure AcuoMed		Refer to the following specific procedures
Set up Destinations Local and External		See procedure on page 102
AcuoMed DICOM Database	Callout **A**	See procedure on page 102
External DICOM Devices		See procedure on page 108
Configure the View Station	Callout **C1**	See procedure on page 108
Configure the Non-Acuo Archive	Callout **C2**	See procedure on page 112
Configure the Acuo Deep End Archive	Callout **B** Callout **C3**	See procedure on page 113
Set up Routes		See procedure on page 115
Set up First Route		See procedure on page 140
Reconfigure First Route		See procedure on page 119
Set up Second Route	Callout **C4**	See procedure on page 125
Set up Third Route	Callout **C5**	See procedure on page 128
(Procedure Map continues next page)		

*****Callouts reference configuration items in Figure 40

	Set up Sources		See procedure on page 134
	New SCP	Callout **D1**	See procedure on page 163
	Set up SCP for 220.8.3.6		See procedure on page 163
	Set up SCP for 220.8.3.7		See procedure on page 163
	External SCU		See procedure on page 137
	New AE Name	Callout **E**	See procedure on page 138
	Set up AE Name for Oakdale_Clinic Route		See procedure on page 138
	Set up AE Name for ViewStationOnly Route		See procedure on page 142
	Set up AE Name for Move_Destinations Route		See procedure on page 146
	Set up Move/Route Mapping		See procedure on page 150
	Set up Routing By Tag		See procedure on page 151
	(Procedure Map continues next page)		

*****Callouts reference configuration items in Figure 40

	Configure the Deep-End AcuoMed Server		See procedure on page 167
	Configure the deep-end AcuoMed Server as an external DICOM device on the department AcuoMed Server		See procedure on page 168
	Add a New AE Name for the deep-end Server route to the deep-end AcuoMed Server configuration		See procedure on page 168
	Add a DICOM Database Local Route to the Deep-End Server		See procedure on page 169
	Add a Local Route to the Deep-End Server	Callout **C6**	See procedure on page 174
	Create a Connection from the Deep-End Server to the Clinic	Callout **D2**	See procedure on page 176
	Add a New Route Definition to Clinic Move Destinations		See procedure on page 180
	Set up Move/Route Mapping for the Deep-End Server		See procedure on page 183

***Callouts reference configuration items in Figure 40

The procedures that are shown from here to the end of this chapter provide specific step-by-step instructions on how to set up the required elements of our AcuoMed configuration example. Refer to the preceding *Procedure Map* for a summary of the procedures involved in building the configuration example. Also, to see sample AcuoConsole screens that show completed department server and deep-end server configurations refer to the topics *Department Server Configuration Summary* on page 166 and *Deep-End Server Configuration Summary* on page 184. It may be useful to refer to these summary topics periodically while you are reviewing the configuration procedures that show how to build this example configuration.

Set up Destinations

Setting up routes to destinations involves two basic steps:

- Setting up the destinations themselves (Destinations) – this is described in this procedure Set up Destinations
- Setting up the routes to those destinations – this is described in the procedure Set up Routes.

Figure 41 shows our starting point before anything has been created or configured for the example configuration.

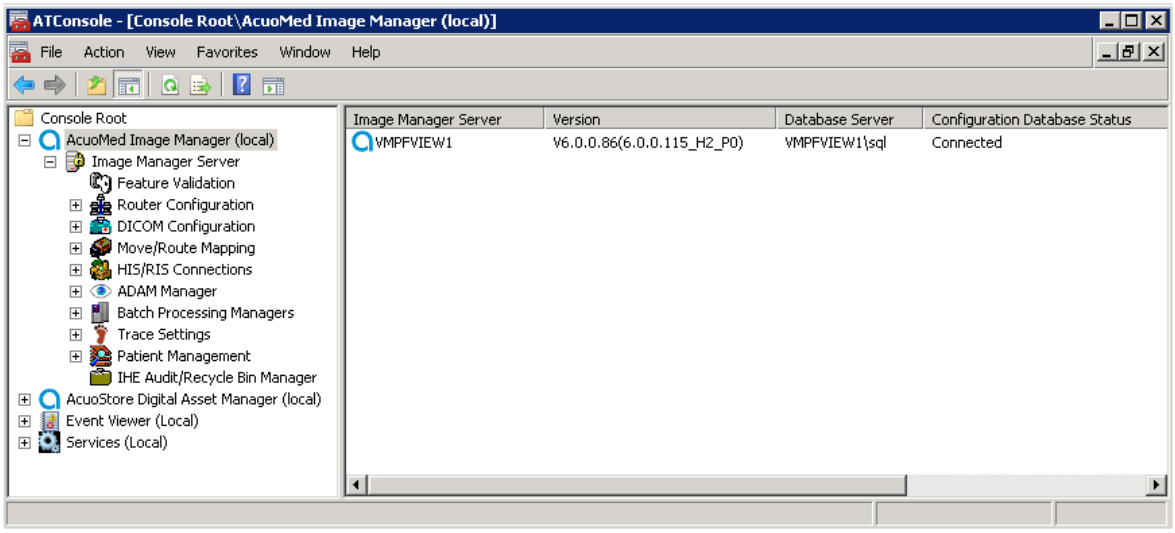


Figure 41: Configuration example starting point

From the starting point shown in **Figure 41**, we must configure two things to set up Destinations:

- **AcuoMed DICOM Database Properties** (see the next topic)
- **External DICOM Device properties** (see page 108)

AcuoMed DICOM Database

Configuring the AcuoMed DICOM Database involves setting up the DICOM database connection, the AcuoStore connection, DICOM database settings, DICOM Database Duplicates and Options.

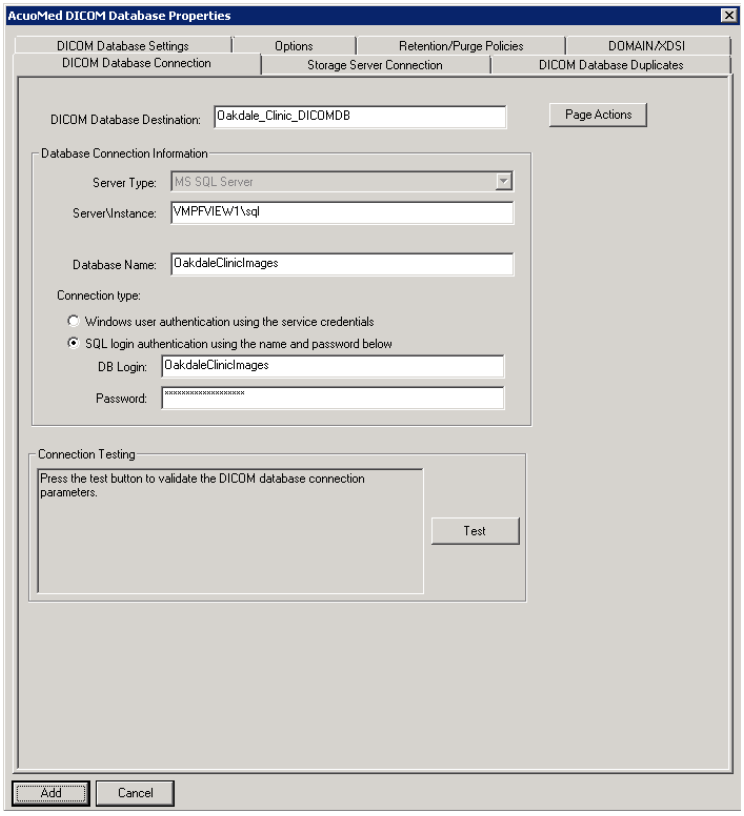
NOTE: You must install a DICOM database prior to creating a DICOM Database Destination. Please refer to Chapter 3 for instructions on how to install a DICOM database.

To configure the AcuoMed DICOM Database, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ Image Manager Server→ Router Configuration→ Destinations.

2. Under Destinations, right-click **AcuoMed DICOM Databases** and select **New→ AcuoMed DICOM Database Destination**.

   The AcuoMed DICOM Database Properties dialog displays with the DICOM Database Connection tab selected.



3. Set up a new connection to the database for the particular application (Oakdale_Clinic in our example).
   - Type the DICOM Database Destination Name (Oakdale_Clinic_DICOMDB). This is a user-defined name.
   - Enter the Database Connection Information including the database Type, Server Name, and Database Name.
   - Choose Connection Type
     - Type the Database Login that includes the Login and Password (these parameters were set up when the DICOM database was installed).

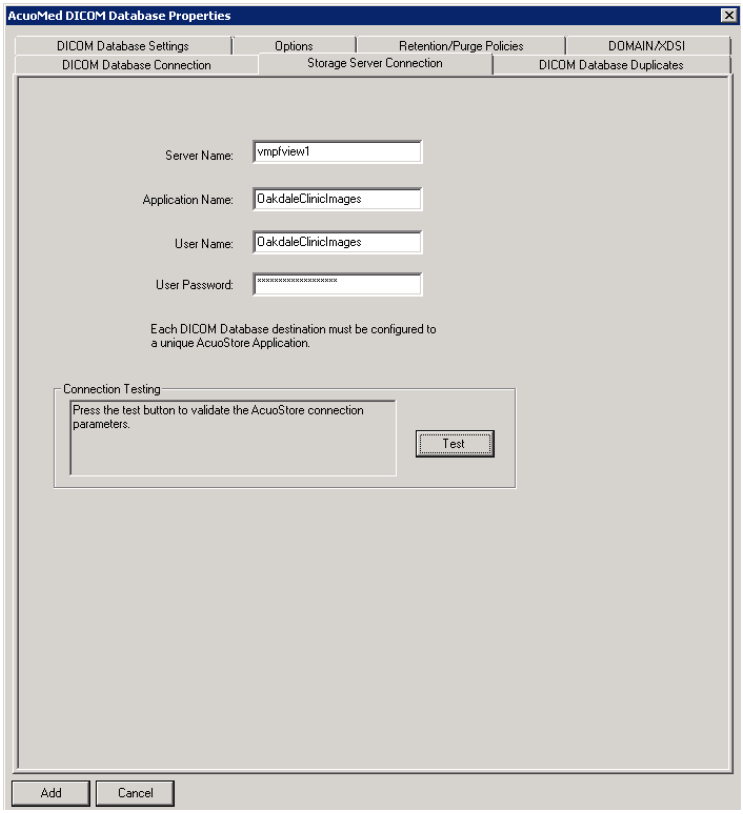
       OR

     - Select Windows User Authentication using your windows credentials.

- Click **Test** to validate the DICOM database connection. If the connection is not successful, check and change your database connection parameters and test the connection again.

4. Click the **Storage Server Connection** tab and set up the AcuoStore connection.

   This is how you set up the mapping between the local DICOM database and the AcuoStore application (see callout **A** in Figure 40).

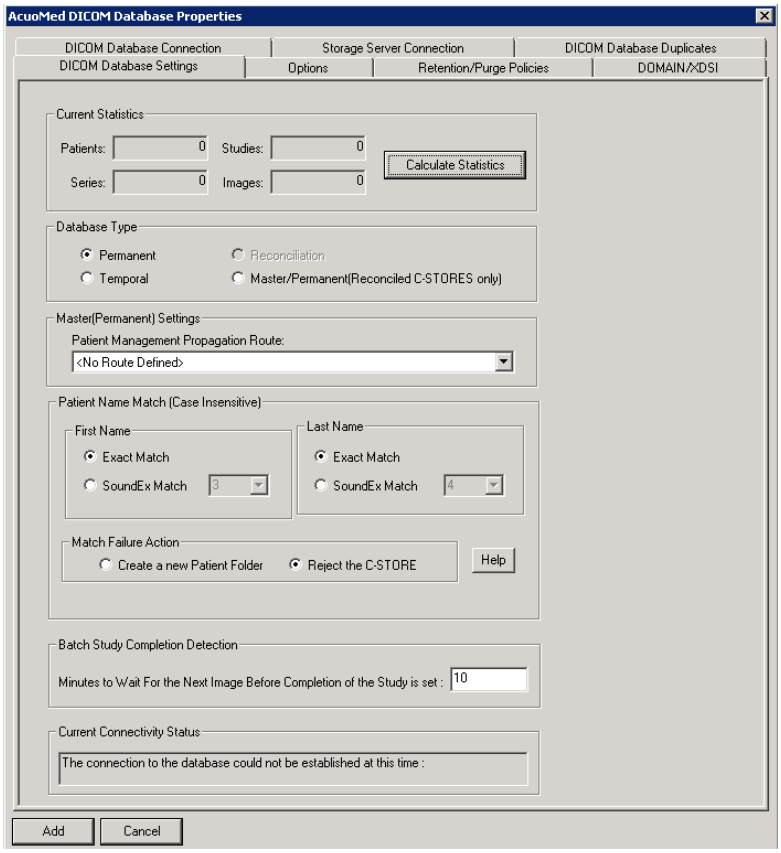


- Type a Server name only if AcuoStore is located on a different server than AcuoMed.
- Type the Application Name.

NOTE: Each AcuoMed DICOM Database on an AcuoMed Server must use a different AcuoStore Application.

- Type the User Name.
- Type the User Password.
- Click **Test** to validate the AcuoStore connection parameters. If the connection is not successful, check and change your AcuoStore connection parameters and test the connection again.

5. Click the **DICOM Database Settings** tab and set up these parameters.



There are four types of databases:

a. **Permanent**: This type of database can maintain both unreconciled and reconciled data forever.

b. **Temporal**: A database type in which a pruner can be scheduled to delete data based on a high water mark.

c. **Reconciliation**: This database type is used for temporary storage of unreconciled data enabling an administrator to manage the reconciliation events.

d. **Master/Permanent**: A database type used in concert with Acuo's reconciliation feature that maintains reconciled or clean data.

In our example here, we are setting up a Temporal Server, so you will want to select the **Temporal** database type. A Temporal Server is an AcuoMed Server with a DICOM database that describes images that are present on an archive (usually a local image cache). This self-maintaining system deletes images on a least recently used basis (if they are needed again, they can be retrieved from a DICOM permanent archive). Normally, you would make this selection for an AcuoMed Server that is a department server, but you would not for an AcuoMed Server that is a deep-end server (permanent archive).

In an effort to retain integrity of your data between AcuoMed servers, a **Patient Management Propagation Route** can be configured and then applied to the AcuoMed DICOM Database Properties. Any manual Patient Management related Edit, Merge, and/or Delete performed on a database type of temporal, permanent or master/permanent that also has a propagation route selected in the drop down menu will receive the fix. HIS/RIS event changes will also cause a fix to be propagated, however, only from a Master/Permanent Database type. Only routes configured as propagation routes are available for selection in the dropdown menu.

In our example, we have chosen not to put a propagation route on this temporal database type.

Configure the **Patient Name Match** properties. By default, the First and Last name match properties are set to Exact Match. (Soundex disabled) Please refer to *Chapter 11* for more detailed information about Soundex functionality.

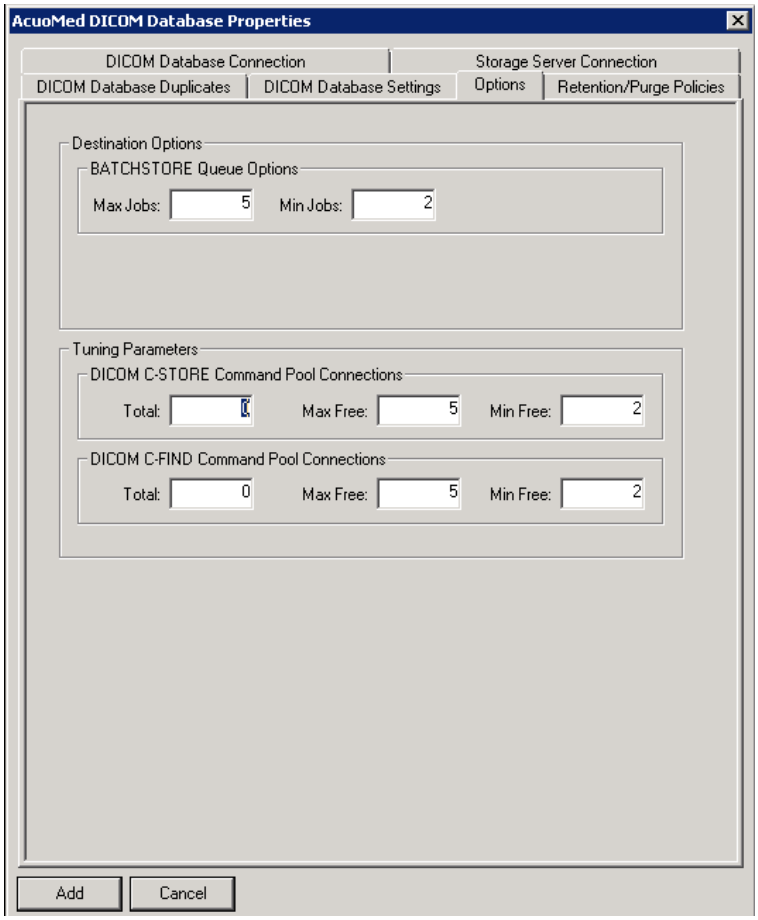
Match Failure Action
Two options are available if there is a Patient Name mismatch based on the configured parameters. The Images (C-STORE negative response) can be rejected or a new Patient Folder with the same Patient ID will be created.

a. **Create a New Patient Folder:** Accepting the images will result in multiple Patient ID folders. That is there may be more than one record in Patient Management with the same patient ID.

b. **Reject the C-Store:**
Rejecting the image will cause the image to be paused in the Batch Store Queue if the Database Destination is configured for Batch processing. Patient Management will be needed to edit the Patient's First and Last Name in the database to match the incoming image. The image stored can then be resumed in the Batch Store queue.

Batch Study Completion Detection
This setting allows the configuration of a delay (in minutes) to wait for the next image before completion of the study is set. This is intended to allow additional time to assure all images for a study have been received.

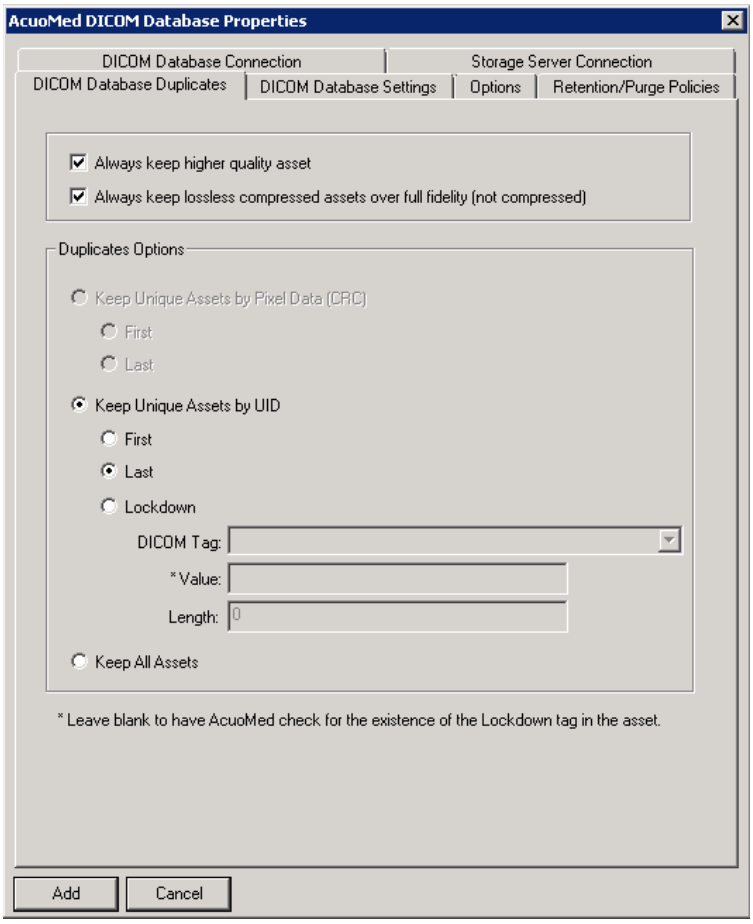
6. Click the **Options** tab and configure the **BATCHSTORE Queue Options** and database **Tuning Parameters**.



- **BATCHSTORE Queue Options** allow you to configure a maximum and minimum number of jobs that will run for each destination. The destination in this example is the database Oakdale_Clinic_DICOMDB. The anti-starvation logic ensures that Batch Store jobs are not starved out of running queued jobs under normal operations. The default settings are indicated in the above figure.
- The **Tuning Parameters** allow you to pre-allocate a number of database connections for improved performance. A Max Connections value of 0 = unlimited connections. Acuo Technologies recommends using the default

settings as noted above. If you want to change the Tuning Parameters values, please contact Acuo Technologies for assistance.

7. Click the **DICOM Database Duplicates** tab to set up your preference for handling duplicate Images as they are stored to the Acuo system. In this example, we show the default configuration. Please Refer to Chapter 2 for additional information on setting up Duplicates Processing.



8. Click the **Retention/Purge Policies** tab to set up purge/retention policies. (Optional) These policies are responsible for the purging of images based on specified criteria. Policies can be created and assigned to individual DICOM databases and/or a set of selected DICOM databases. The time the policies run on each assigned database is configured by creating an Image Deletion Manager Task. This AcuoMed configuration example does not use a retention/purge policy. For more information please see *Retention/Purge Policies in Chapter 11.*

External DICOM Device

The next thing to do in the configuration example is to configure three **External DICOM Devices**: a View Station, a Non-Acuo Archive and an Acuo Deep End Archive. An External DICOM Device is basically a device that communicates as a DICOM SCU (Storage Class User), whereby Acuo acts as a Storage Class User when communicating with this new device. Configuring an External DICOM Device involves setting up a connection to an SCP destination, setting up Service Object Pair (SOP) Authorization, and setting up options to Batch Store Queue Options, strip private tags for stations that cannot support private tags, Outbound Normalization, Outbound Encryption. The Calling AE can also be persisted if you want. AcuoMed will act as an SCU when connecting to these SCP (external DICOM device) destinations.

NOTE: Refer to the external DICOM device vendor's *Conformance Statement* to obtain any needed information about the SCP such as Listening Port, AE Name, supported SOPs, etc.

Continue with the next procedure to configure the View Station

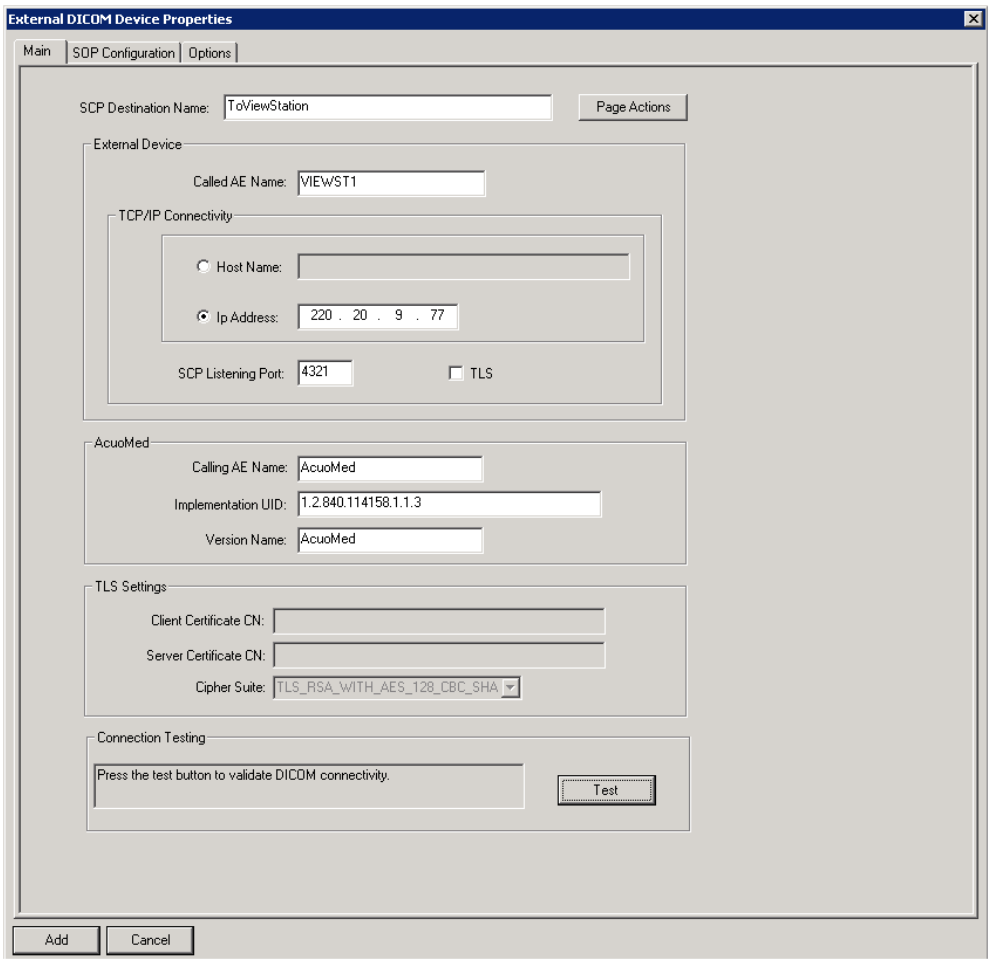
Configure the View Station

To configure the View Station External DICOM Device, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Router Configuration→ Destinations.

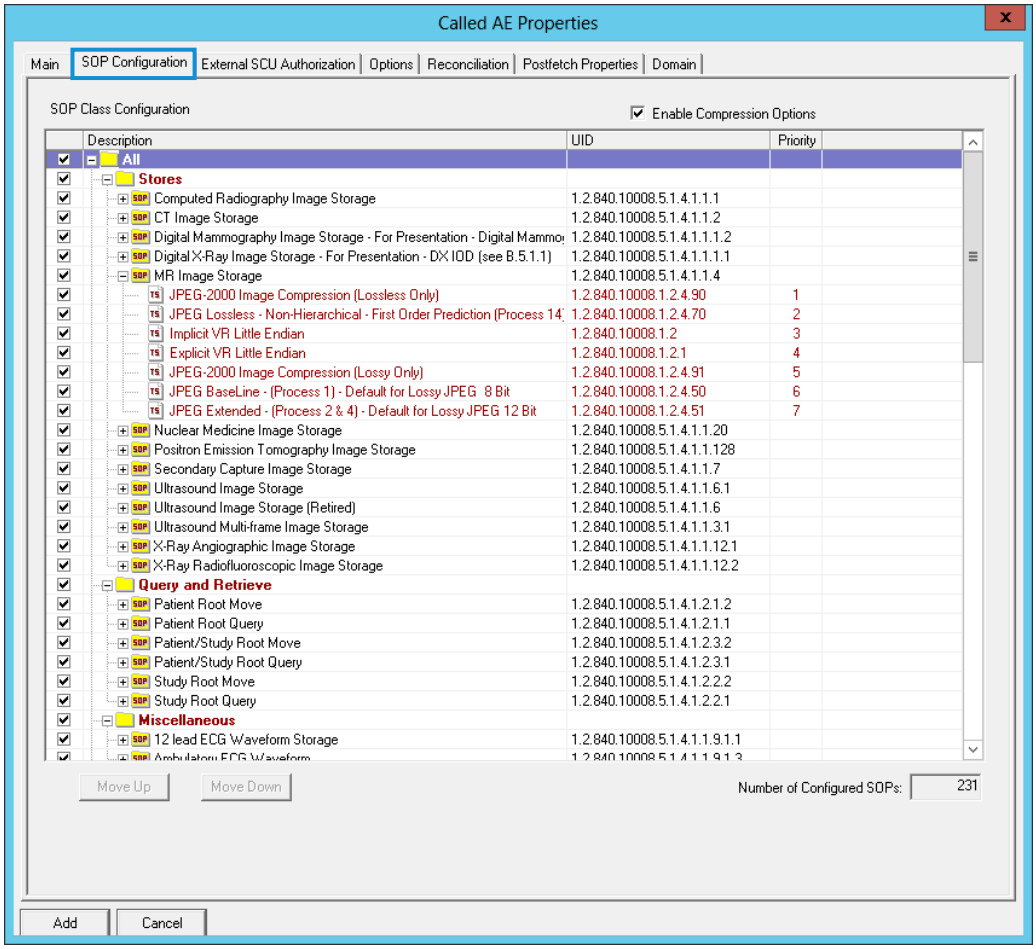
2. Under Local Route Destinations, right-click **External DICOM Devices** and select **New→ New External DICOM Device**.

   The External DICOM Device Properties dialog displays with the Main tab selected.



3. Using the Main tab, set up the connection to the View Station.
   - Type the SCP Destination Name (ToViewStation in our example).
   - Set up the External Device including the Called AE Name (VIEWST1 in our example).
   - Set up TCP/IP Connectivity by entering either a Host Name or an IP Address (220.20.9.77 in our example).
   - Enter the SCP Listening Port number (104 in our example).
   - Enable/Disable TLS Encryption. For more information see *Encryption in Chapter 2 – AcuoMed Overview*
   - Set up AcuoMed including the Calling AE Name (AcuoMed in our example), the Implementation UID, and the Version Name. If you decide to use a different Calling AE other than AcuoMed, you can still use the default Implementation UID and Version Name values that apply to AcuoMed. The Calling AE that describes the Acuo Server can be helpful when viewing the Activity Log. A Calling AE name can be persisted by setting a value in the GUI under Image Manager Server → Properties → Options Tab. In the configuration section, the option is labeled "Default External Calling AE Name". The DICOM standard AE Title Rules apply.

4. Click the **SOP Configuration** tab and set up the service object pairs.

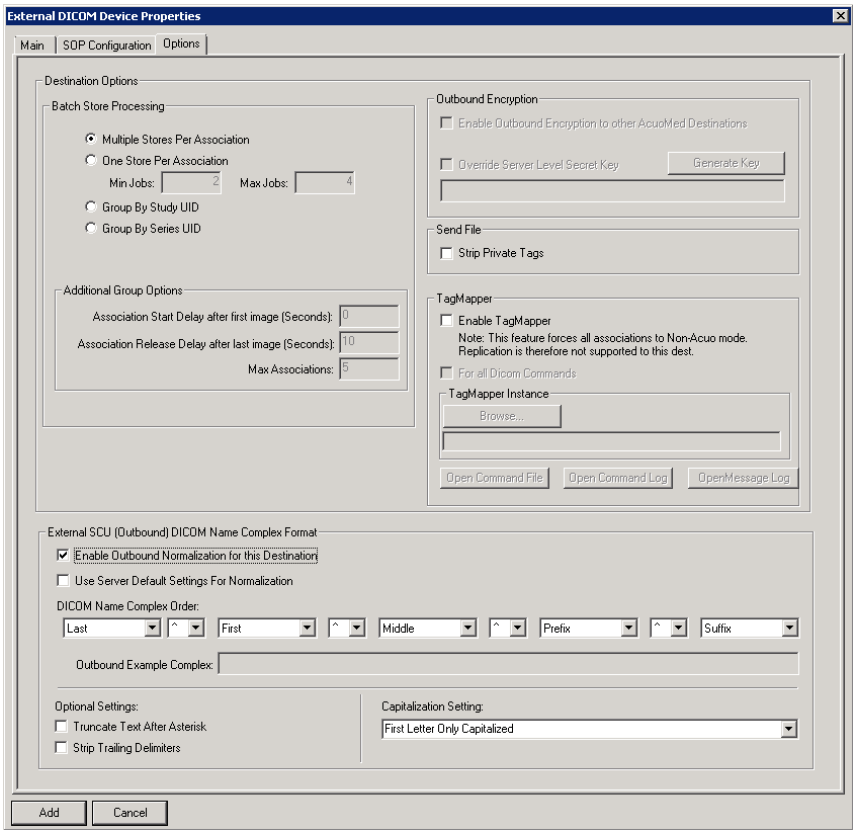


- Check the far left checkbox for each SOP that you want to authorize from the Available Registered SOPs list. These are the SOP classes that will be supported (or accepted) by the external DICOM device you are configuring. It is possible to select **all** SOPs. However, by selecting specific SOPs, you may improve performance by cutting down on the negotiation of the SOPS and Transfer Syntaxes that is required between DICOM stations. Also, by restricting which SOPs are accepted, you can limit which devices queries can be accepted or limit the devices images that can be distributed. In our example, select the CT Image Storage class only.

- Each SOP also has a number of supported Transfer Syntaxes which can be negotiated. These Transfer Syntaxes can also be ordered in priority so that the association negotiation requests the Transfer Syntax in the order indicated. For this example, select the Transfer Syntaxes for JPEG-2000 Lossless first, and secondly JPEG Lossless. For more information about Transfer Syntaxes please refer to Transfer Syntaxes Available in AcuoMed in Chapter 2.

NOTE: You can choose to view SOPs supported Transfer Syntax by expanding the plus sign next to the SOP Class Name.

5. Configure the External DICOM Device Options



- Select a **Batch Store Processing** mode:

  Multiple Stores Per Association – the destination is limited to establishing a single association with a device, but can then process a series of Store operations with that device. In other words, Stores are done in a serial fashion via a single association. This is the default mode of operation for performing Batch Store Processing with an External DICOM Device. All devices should support this mode.

  One Store Per Association – the destination is capable of establishing multiple associations (4) with the same device and then processing a single Store operation concurrently on each of the multiple associations. In other words, Stores are done in a parallel fashion via multiple concurrent associations. This method increases throughput if the destination can operate this way. If you are transmitting data to another Acuo node, this mode is recommended.

  - The **BATCHSTORE Queue Options** are only displayed if in **Batch Store Processing** "One Store per Association" is selected. The maximum and minimum number of jobs that will run for each destination is then configurable. The destination in this example is "ToViewStation". The anti-starvation logic ensures that Batch Store jobs are not starved out of running queued jobs under normal operations.

  Group By Study UID – Grouping by the same Study per association allows AcuoMed to deliver images as if it were emulating a modality. Some vendors work more efficiently and make decisions based on an association being opened and all of the images for that study being sent in the same association.

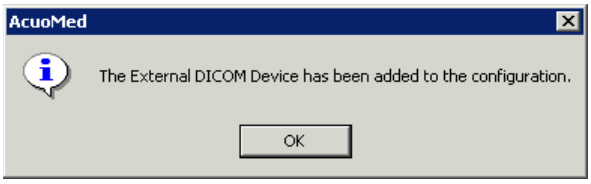
Group by Series UID – Grouping by the same Series per association allows AcuoMed to deliver images as if it were emulating a modality. Some vendors work more efficiently and make decisions based on an association being opened and all of the images for that Series being sent in the same association.

If the Group by Study/Series UID option is selected, the following "Additional Group Options" fields become active:

- **Association Start Delay** is the delay time before the outbound association is started.
- **Association Release Delay** is the time to wait for more images (in a study/series) before the association will be closed.
- **Max Associations** sets the maximum number of simultaneous associations that can be used for a particular destination (each association is unique by Study/Series UID) in the case multiple Studies/Series are awaiting delivery.

- If the DICOM station to which you are configuring a connection does not support private tags, select the **Strip Private Tags** option. This feature is disabled upon installation.
- **External SCU (Outbound) DICOM Name Complex Format** is disabled upon installation. In our example, we have left it disabled, and so our data will be transmitted according to how it was stored. See Chapter two for more information on **Server level and External level Normalization**.
- **Outbound Encryption** is disabled upon installation. In our example, we have left it disabled and so outbound data will not be encrypted. See Chapter two for more information on **Encryption**.
- **Outbound TagMapper** is disabled upon installation. In our example, we have left it disabled so no Tag Mapping will be performed. For more information on TagMapper please reference the Acuo Tag Mapper User Manual.

6. Click **Add** to complete set up of the View Station External DICOM Device and add it to the configuration.



Continue with the next procedure to configure the Non-Acuo Archive.

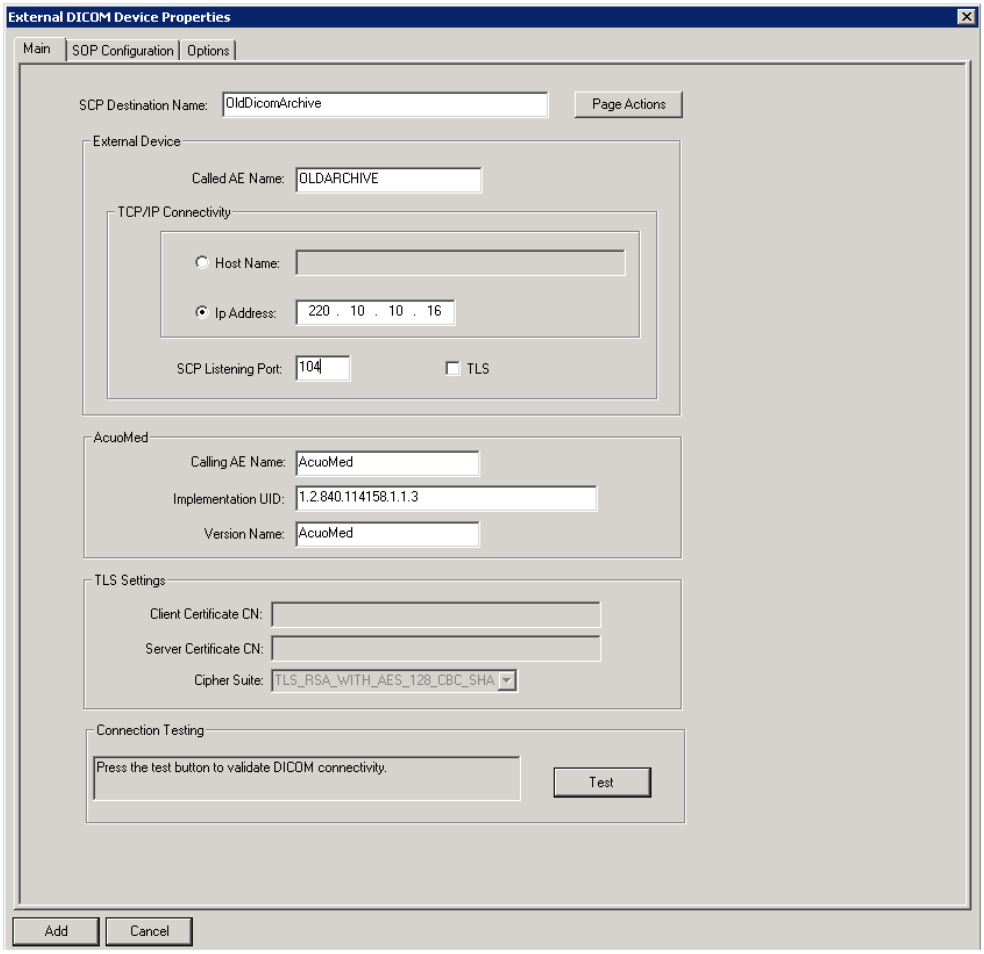
Configure the Non-Acuo Archive

To configure the Non-Acuo Archive External DICOM Device, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Router Configuration→ Local Route Destinations.

2. Under Local Route Destinations, right-click **External DICOM Devices** and select **New→ New External DICOM Device**.

   The External DICOM Device Properties dialog displays with the Main tab selected.



3. Using the Main tab, set up the connection to the Non-Acuo Archive (see callout **C2** in Figure 40).
   - Type the SCP Destination Name (OldDicomArchive in our example).
   - Set up the External Device including the Called AE Name (OLDARCHIVE in our example).
   - Set up TCP/IP Connectivity by entering either a Host Name or an IP Address (220.10.10.16 in our example).
   - Enter the SCP Listening Port number (104 in our example).
   - Enable/Disable TLS Encryption. For more information see *Encryption in Chapter 2 – AcuoMed Overview*
   - Set up AcuoMed including the Calling AE Name, Implementation UID, and Version Name. If you decide to use a different Calling AE other than AcuoMed, you can still use the default Implementation UID and Version Name values that apply to AcuoMed. The Calling AE that describes the Acuo Server can be helpful when viewing the Activity Log. A Calling AE name can be persisted by setting a value in the GUI under Image Manager Server →

Properties → Options Tab. In the configuration section, the option is labeled "Default External Calling AE Name". The DICOM standard AE Title Rules apply.

4. Click the **SOP Configuration** tab and set up the service object pairs. Details for configuration are described in ***step 4*** of the previous destination setup. (***Configure the ViewStation***).

5. Configure the External DICOM Device Options Tab. Details for available options are described in ***step 5*** of the previous destination setup. (***Configure the ViewStation***).

6. Click **Add** to complete set up of the View Station External DICOM Device and add it to the configuration.

   Continue with the next procedure to configure the Acuo Deep End Archive.

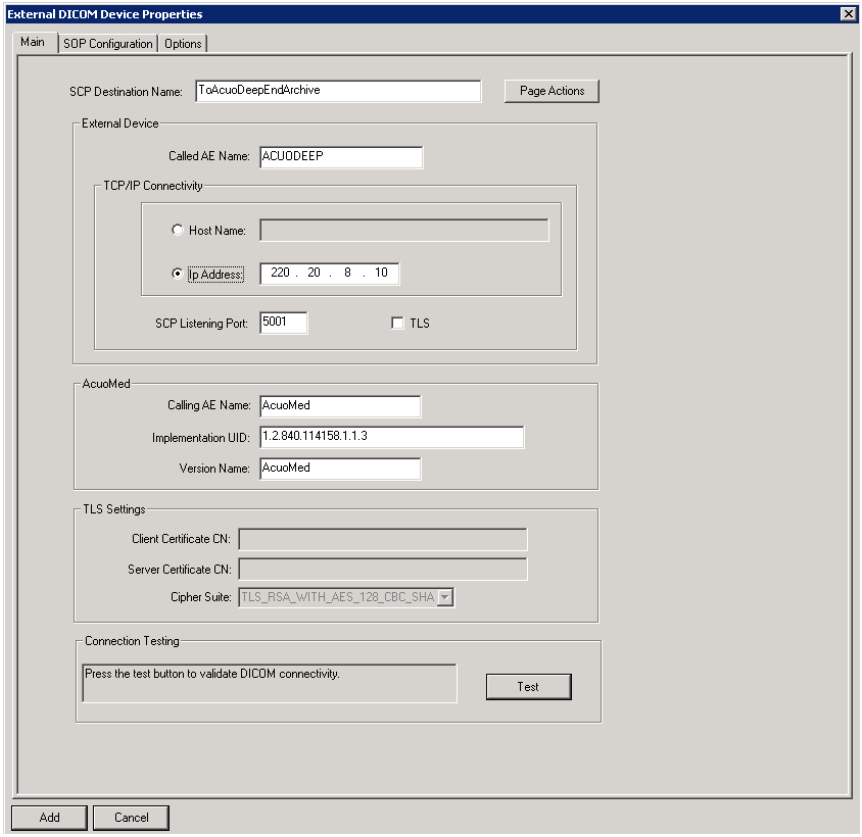
Configure the Acuo Deep End Archive

To configure the Acuo Deep End Archive External DICOM Device, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Router Configuration→ Local Route Destinations.

2. Under Local Route Destinations, right-click **External DICOM Devices** and select **New→ New External DICOM Device**.

   The External DICOM Device Properties dialog displays with the Main tab selected.



3. Using the Main tab, set up the connection to the View Station (see callouts **B** and **C3** in Figure 40).

   - Type the SCP Destination Name (ToAcuoDeepEndArchive in our example).
   - Set up the External Device including the Called AE Name (ACUODEEP in our example).
   - Set up TCP/IP Connectivity by entering either a Host Name or an IP Address (220.20.8.10 in our example).

- Enter the SCP Listening Port number (5001 in our example).
- Set up AcuoMed including the Calling AE Name (AcuoMed in our example), the Implementation UID, and the Version Name. If you decide to use a different Calling AE other than AcuoMed, you can still use the default Implementation UID and Version Name values that apply to AcuoMed. The Calling AE that describes the Acuo Server can be helpful when viewing the Activity Log. A Calling AE name can be persisted by setting a value in the GUI under Image Manager Server → Properties → Options Tab. In the configuration section, the option is labeled "Default External Calling AE Name". The DICOM standard AE Title Rules apply.

4. Click the **SOP Configuration** tab and set up the service object pairs. Details for configuration are described in ***step 4*** of the previous destination setup. (***Configure the ViewStation***).

4. Configure the External DICOM Device Options Tab. Details for available options are described in ***step 5*** of the previous destination setup. (***Configure the ViewStation***).

5. Click **Add** to complete set up of the View Station External DICOM Device and add it to the configuration.

   This completes the procedures required to set up local route destinations. Continue with the next topic to set up routes to these local route destinations.

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Set up Routes

Setting up routes to destinations involves two basic steps:

- Setting up the destinations themselves (Destinations) – this is described in the previous procedure on page 102.
- Setting up the routes to those destinations – this is described in this procedure Sep up Routes.

A route can connect to multiple local and external destinations. Four routes are configured for our configuration example:

- The first route is used for storing images to the local cache on the department AcuoMed Server, to the view station located at the clinic, and to the deep-end AcuoMed Server that is located at the hospital. In addition, this route can be used to query the local cache on the department AcuoMed Server at the clinic, the deep-end AcuoMed Server at the hospital, and the old non-Acuo archive at the clinic.
- The second route is used for storing images only to the view station at the clinic. This could be used, for example, to send (or re-send) an image from a modality directly to a doctor without archiving that image. This second route could also be used to move an image from the local image cache to the view station (for additional information, refer to the topic *Set up Move/Route Mapping* on page 150)
- The third route is used for move operations from the deep-level archive on the deep-end AcuoMed Server at the hospital to the AcuoMed Server at the clinic. In this case, images located on the deep-level archive are moved to both the view station and the AcuoMed Server local cache in a single operation. To do this, the images are moved back to the AcuoMed Server which routes them to the appropriate move destinations (for additional information, refer to the topic *Configure the Deep-End AcuoMed Server* on page 167).
- The fourth route will be used to send edits, in the form of a DICOM message, to any destination listed on the propagation route.

The following procedures provide examples of setting up routes for these different purposes.

NOTE: Refer to the Glossary in this manual for configuration terminology definitions.

Set up First Route

Configuring the first route to be used for storing images and performing queries with several different devices involves specifying a route definition, setting up an AcuoMed DICOM database destination, setting up an external DICOM device destination to the deep-end AcuoMed Server, and setting up an external DICOM device destination to the view station.

To set up the first route, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Router Configuration→ Routes.
2. Right-click **Routes** and select **New→ New Route Name**.

   The Route Destinations dialog displays with the Route Definition tab selected.
3. On the Route Definition tab, type the Route Name for the route you are setting up (Oakdale_Clinic in our example).

   The Route Name is an arbitrary, user-determined name that should distinguish this route from other routes in the AcuoMed configuration.
4. Select a route type.
   - Basic – the default route type appropriate for most routes (and the one selected for our example here).
   - Reconciliation – the route to the Reconciliation database.
   - Propagation (Patient Management) – a route used for propagating updates from a Master/Permanent Database, HIS/RIS, or other manual update to other AcuoMed Servers.

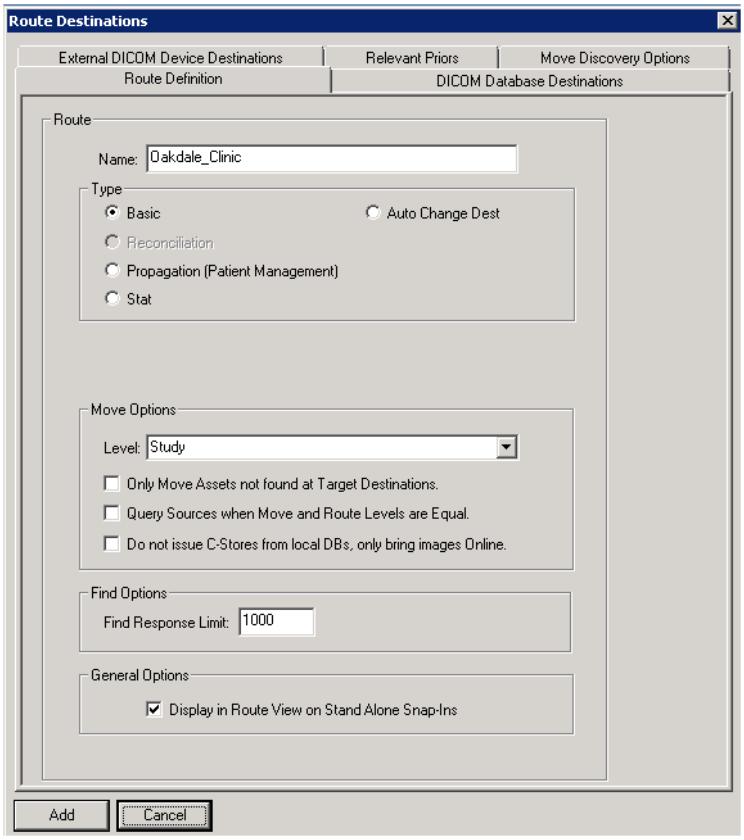
- Stat – a static route. Set up a route of this type when you want assets sent to the route destinations regardless of whether or not those assets pass reconciliation.
- Auto Change Dest – Used in conjunction with the Auto Change Destination functionality. Only one route of this type is supported. Routes of this type have a "Source Clients" tab where users can select which AcuoMed DICOM databases and External DICOM devices will have their stores re-routed in the case of a UID Failure. Multiple Source Clients may be selected.

5. Select a Route Move Level from the drop-down list.

   The Move Level specifies the level at which AcuoMed will process a move operation to the device(s) on a route (patient, study, series, or image).

   You should determine the most widely performed Move Level from devices within your workflow and configure your Route Move Levels accordingly. Acuo recommends that your DICOM devices issue C-Move requests at the STUDY level. In addition, Acuo recommends that both Collaborative and Standard Single Device Route Move Levels be set to STUDY. Although this will result in high performance for C-Find and C-Move commands, it may result in less than desire C-Move results in cases where *different* images from the same study/series could reside on different servers. If this case is common in your configuration/workflow then please consider setting the Move Levels on all associated routes to IMAGE which assures the highest success rate on C-Move results, albeit at the price of performance for C-Find and C-Move commands.

Caution
When utilizing AcuoMed Patient Management to issue C-Moves on a Collaborative Source Route, make sure that all routes on all AcuoMed systems that are used as a result of the initial Federation route are configured with the same move level or lower.



Move Options:

Only Move Assets not found at Target Destinations. – Enabling will prevent assets from being moved when they already exist at the Move Target. This Move Option is described in more detail in Chapter 11 – Advanced Functionality.

Query Sources when Move and Route Levels are Equal. – Enabling will issue a C-Find before the move is forwarded to the destination(s) when the Move Level is equal to the level of the source route. This Move Option is described in more detail in Chapter 11 – Advanced Functionality.

Do not issue C-Stores from local DBs, only bring images Online. – When enabled, no C-Stores will be initiated and any images affected by the move that were offline will be brought online. This feature might be used when an archive device is present and data needs to be staged for more rapid retrieval by another application.

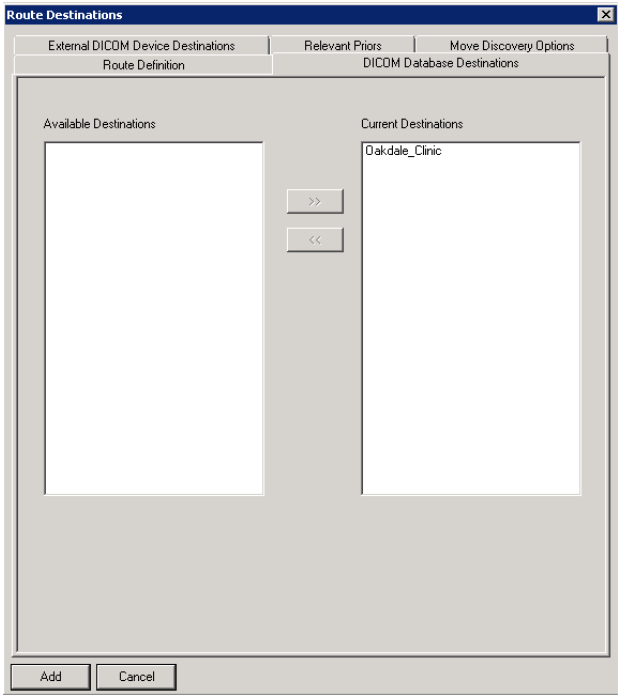
6. Set a Find Response Limit.

   The default value is 1,000 Find Responses returned on a Find Request.

7. Check 'Display in Route View on Stand Alone Snap-Ins' (this is checked by default)

   This will make the route available to your client users.

8. Click the **AcuoMed DICOM Database Destinations** tab and set up the DICOM database destination for the route.



- Move one AcuoMed DICOM Database from the Available Acuo Destinations list to the Current Acuo Destinations list (Oakdale_Clinic in our example) by clicking the name in the left pane and then clicking the **>>** button.

Figure 42 provides three basic Rules to follow when configuring Route Move Levels, two configuration examples, and a section on other configuration options to consider.

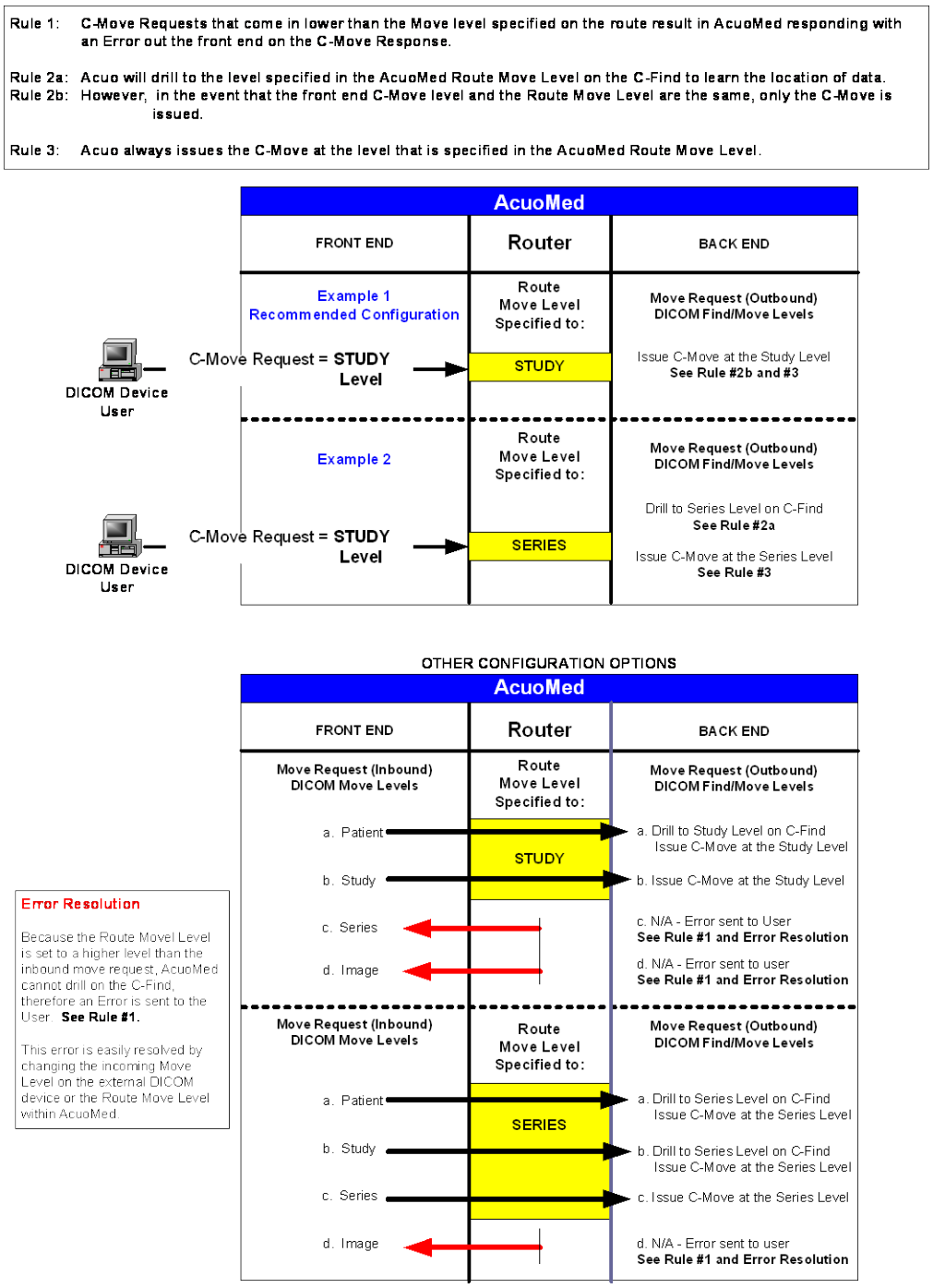
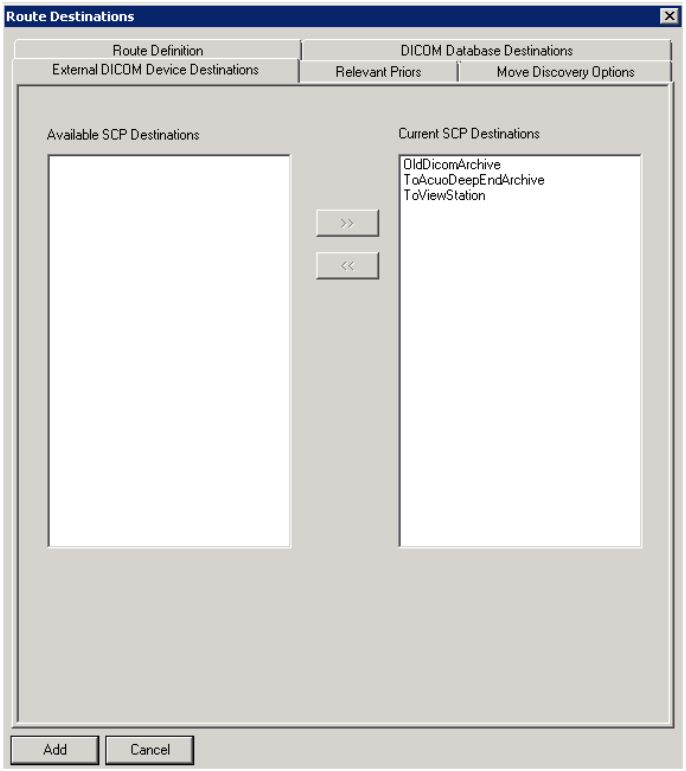


Figure 42: Route Move Levels

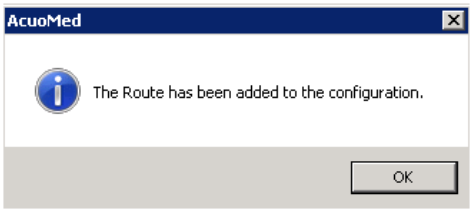
NOTE:	Not all devices support all move levels. Please refer to the device conformance statement for more information.

9. Click the **External DICOM Device Destinations** tab and set up the external SCP destinations for the route.



- Move one or more External DICOM Device Destinations from the Available SCP Destinations list to the Current SCP Destinations list (OldDicomArchive, ToAcuoDeepEndArchive, and ToViewStation in our example).
- For this example we will not include Relevancy Filtering (Relevant Priors tab) or Move Discovery Options. For more information please see *Relevancy Filtering in Chapter 11*.

10. Click **Add** to complete set up of the first route and add it to the configuration.



Continue with the next procedure to reconfigure the first route definition.

Reconfigure First Route

Now that the first route is set up, we will reconfigure the route to add command filtering and define priority.

The command filtering controls how destinations on the route will be set up for Move, Store, and Find operations. By default, when a new destination is set up it supports all three types of operations. For the first route that we have set up, we will want to reconfigure the non-Acuo DICOM archive to filter Store operations. Since no new images are being saved to this legacy archive, it should be set up as read-only. Also, we will want to set up the view station to receive Stores only, but not support Moves or Finds.

On devices that support Store operations, a priority level can be defined to determine how jobs will be handled in the Batch Store queue. Medium priority is the default but other options such as, Low, High and Expedited can also be selected to meet the needs of your workflow. The direct mode takes ultimate priority; however it bypasses the Batch queue, and is very reliant on the availability of the destination device. We will want to change the Local Database,

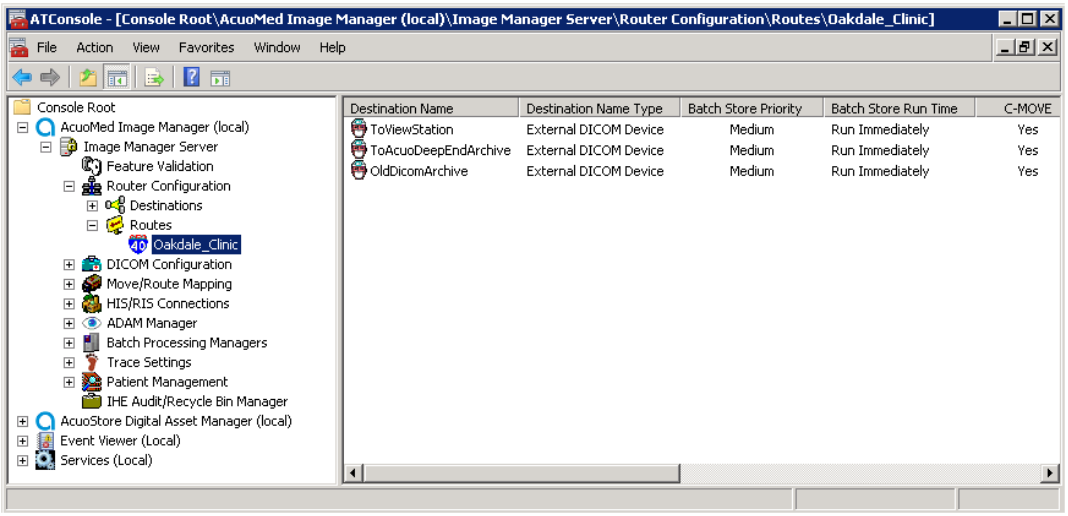
Oakdale_Clinic_DICOMDB, to an Expedite priority status to ensure that all images that need to be stored locally take priority over other devices set to medium priority.

To reconfigure these destinations on the first route, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Router Configuration→ Routes→ Oakdale_Clinic.

2. Click **Oakdale_Clinic** to select it.

   This causes a summary of the Oakdale_Clinic route to display in the right pane. Notice that initially, by default, with the federation feature enabled, all C-MOVEs, C-STOREs, and C-FINDs have a command filter value of Yes. The "Yes" value means that these operations are allowed (that is, they are not filtered out).

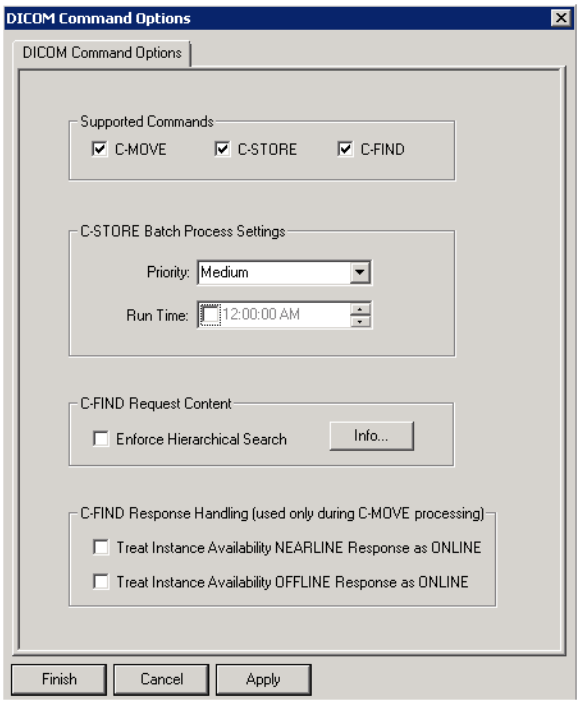


   You can reorder External DICOM Devices destinations in the destination list above, which controls the order for issuing Finds and Moves to these devices. Just right-click a destination and, from the pop-up menu, select either **Move Order Up** or **Move Order Down**. The far right column in the right pane shows the current Move Order.

Note: Local databases remain at the top of the order list and cannot be moved.

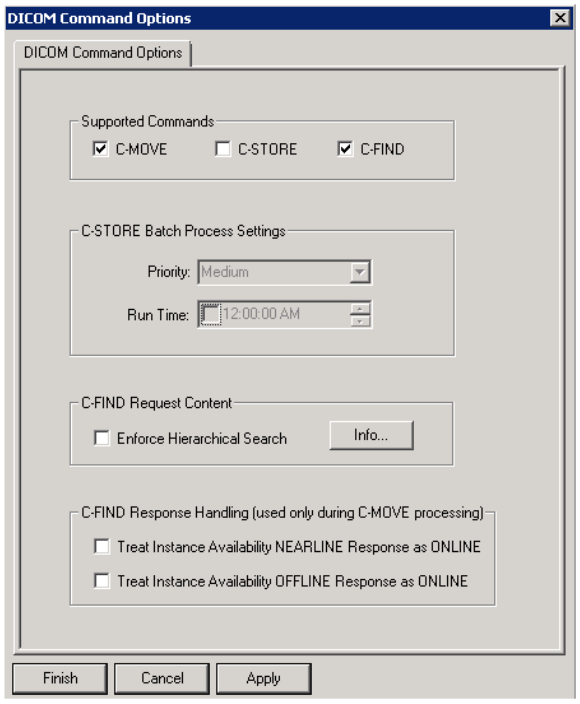
3. In the right pane, right-click **OldDicomArchive** and choose **Properties** from the pop-up menu.

   The DICOM Command Options dialog displays.



4. Click **C-STORE** to deselect it.

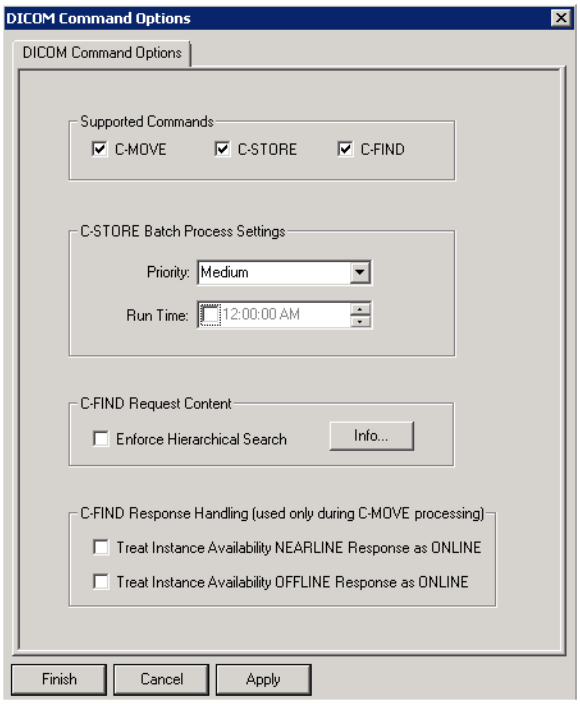
   Unchecking this command filter will prevent stores of any new images to the old non-Acuo archive (that is, C-Stores to the non-Acuo archive will be filtered out).



5. Click **Finish** to apply the change.

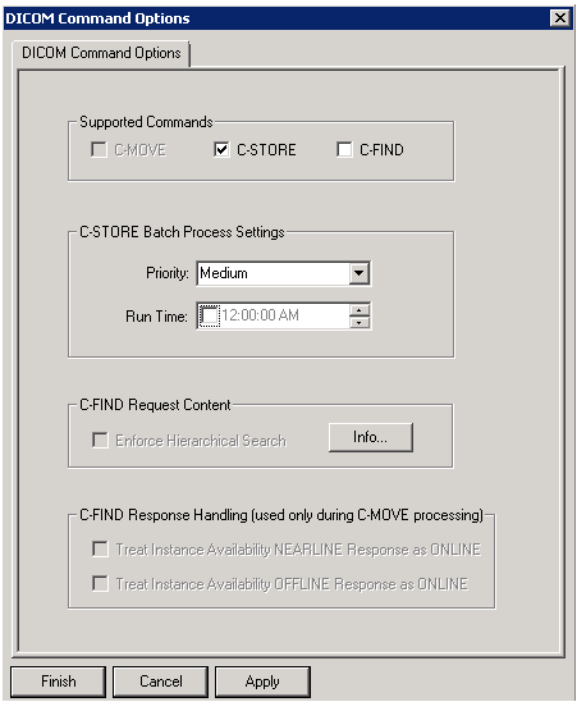
6. In the right pane, right-click **ToViewStation** and choose **Properties** from the pop-up menu.

   The DICOM Command Options dialog displays.



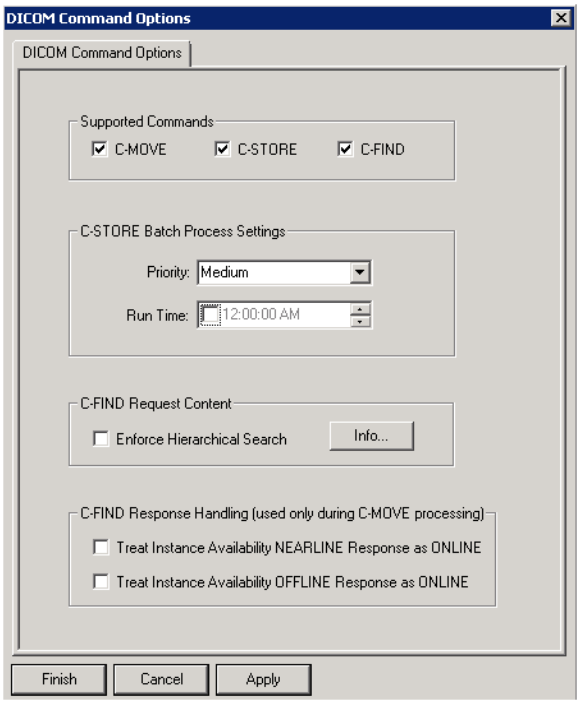
7. Click **C-MOVE** and **C-FIND** to deselect these filters.

   Changing these command filters will allow (C-STORES) of new images to the view station, but will not allow any queries of the view station (C-FIND) or moving of images off the view station (C-MOVE).



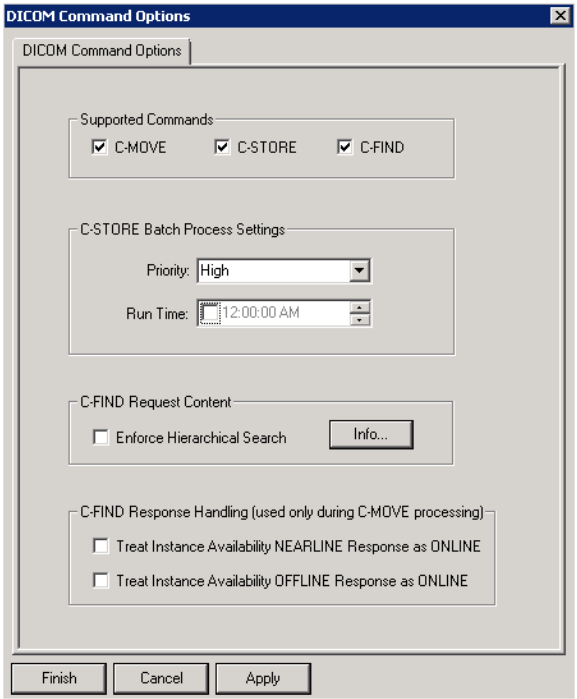
8. Click **Finish** to apply the change.

9. In the right pane, right click **ToAcuoDeepEndArchive** and choose Properties from the pop-up menu. Click the down arrow to select a priority level of High.



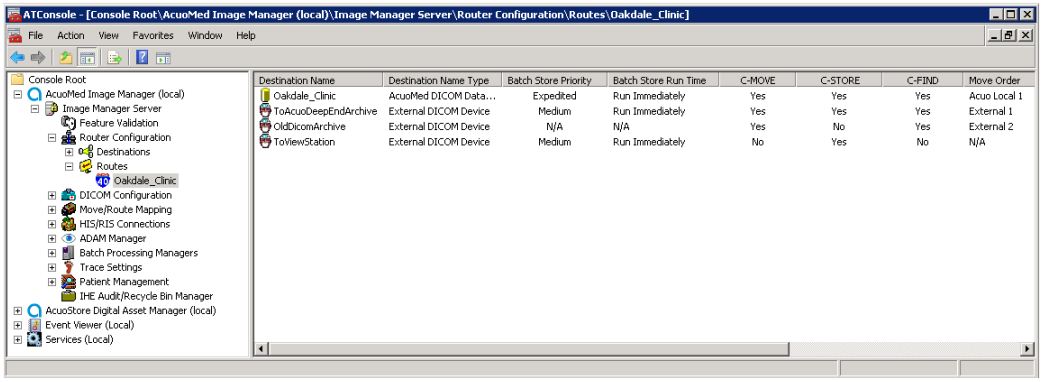
Changing the priority level to High will allow stores of new images to the AcuoDeepEndArchive to be processed at a higher priority in the Batch Store queue. Default priority is Medium.

Note: Images which are transmitted into the system with a higher priority level set from the modality will override this setting.



10. Click **Finish** to apply the change.

    The right pane now displays a summary of the first route reconfigured for the new command filters.



Now that the first route is set up and reconfigured, continue with the next procedure to set up the second route.

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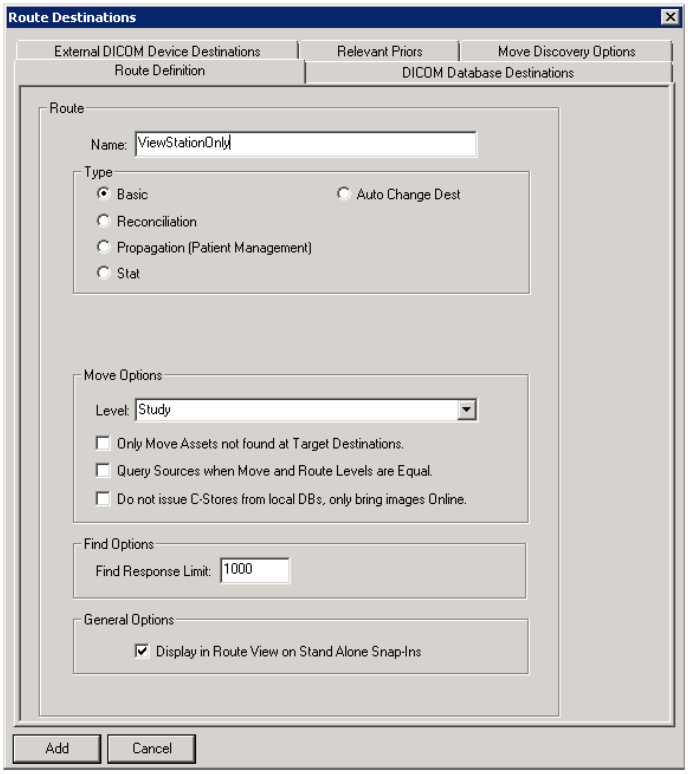
Set up Second Route

Configuring the second route to the view station only involves specifying a route definition and setting up an external DICOM device destination to the view station. This route will be used to do moves, stores, and finds of images with the view station (see callout **C4** in Figure 40).

To set up the second route, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Router Configuration→ Routes.
2. Right-click **Route** and select **New→ New Route Name**.

   The Route Destinations dialog displays with the Route Definition tab selected.



3. On the Route Definition tab, type the Route Name for the route you are setting up (ViewStationOnly in our example).
4. Select a route type.
   - Basic – the default route type appropriate for most routes (and the one selected for our example here).
   - Reconciliation – the route to the Reconciliation database.
   - Propagation (Patient Management) – a route used for propagating updates from one AcuoMed database to another.
   - Stat – a static route. Set up a route of this type when you want assets sent to the route destinations regardless of whether or not those assets pass reconciliation.
   - Auto Change Dest – Used in conjunction with the Auto Change Destination functionality. Only one route of this type is supported. Routes of this type have a “Source Clients” tab where users can select which AcuoMed DICOM databases and External DICOM devices will have their stores re-routed in the case of a UID Failure. Multiple Source Clients may be selected.

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5. Select a Move Level from the drop-down list.

   The Move Level specifies the level at which the device(s) on a route will process a move operation (patient, study, series, or image). Refer to *Figure 42: Route Move Levels* on page 118 for more information.

NOTE: Not all devices support all move levels. Please refer to the device conformance statement for more information.

Move Options:

Only Move Assets not found at Target Destinations. – Enabling will prevent assets from being moved when they already exist at the Move Target.

Query Sources when Move and Route Levels are Equal. – Enabling will issue a C-Find before the move is forwarded to the destination(s) when the Move Level is equal to the level of the source route.

Do not issue C-Stores from local DBs, only bring images Online. – When enabled, no C-Stores will be initiated and any images affected by the move that were offline will be brought online. This feature might be used when an archive device is present and data needs to be staged for more rapid retrieval by another application.

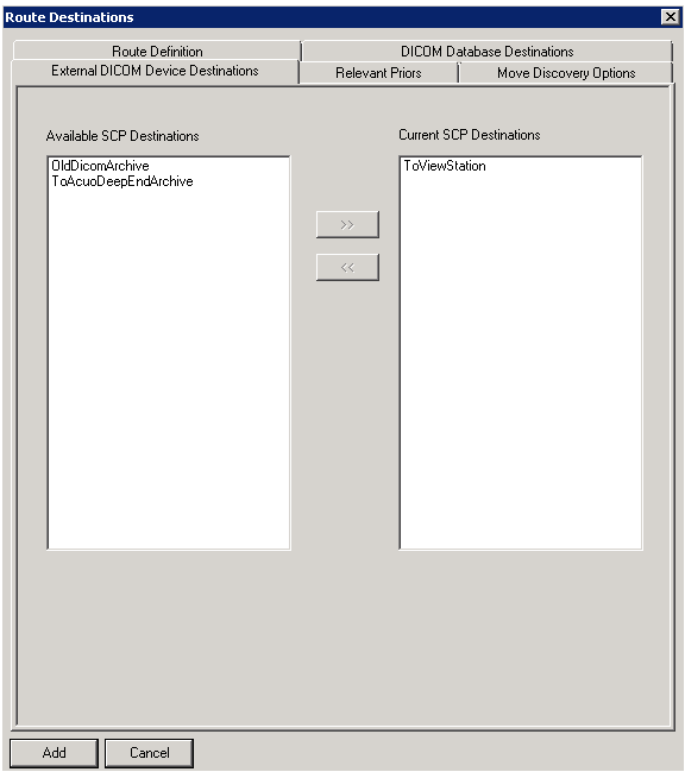
6. Set a Find Response Limit.

   The default value is 1,000 Find Responses returned on a Find Request.

7. Uncheck 'Display in Route View on Stand Alone Snap-Ins' (this is checked by default)

   This will not make the route available to your client users.

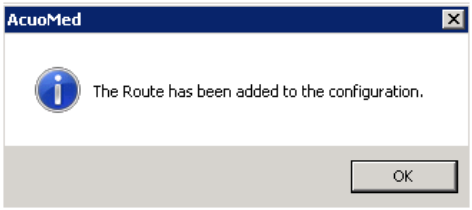
8. Click the **External DICOM Device Destinations** tab and set up the external SCP destination for the route.



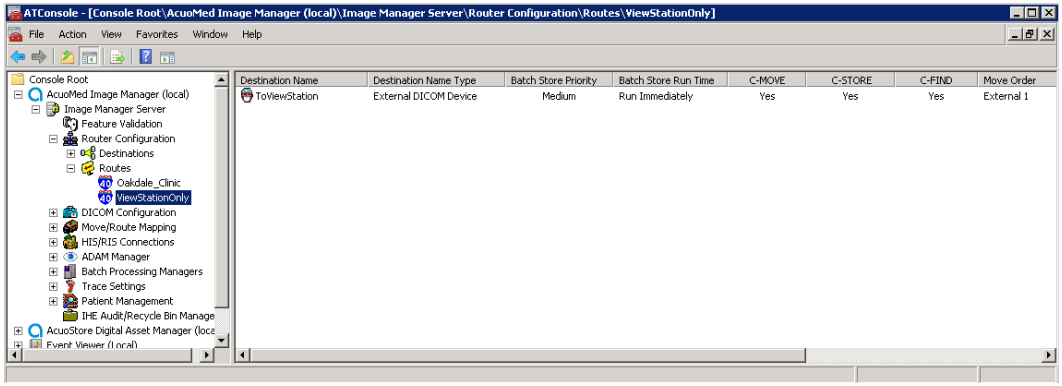
   Move one or more External DICOM Device Destinations from the Available SCP Destinations list to the Current SCP Destinations list (ToViewStation in our example).

9. See Chapter 11 for more information on Relevant Priors and Move Discovery Options.

10. Click **Add** to complete set up of the second route and add it to the configuration.



The right pane now displays a summary of the second route.



The view station on the second route will support moves, stores, and finds (which is the default configuration). Therefore, it is not necessary to reconfigure the second route to add any command filtering (as we did for the first route).

Now that the second route is set up, continue with the next procedure to set up the third route.

Set up Third Route

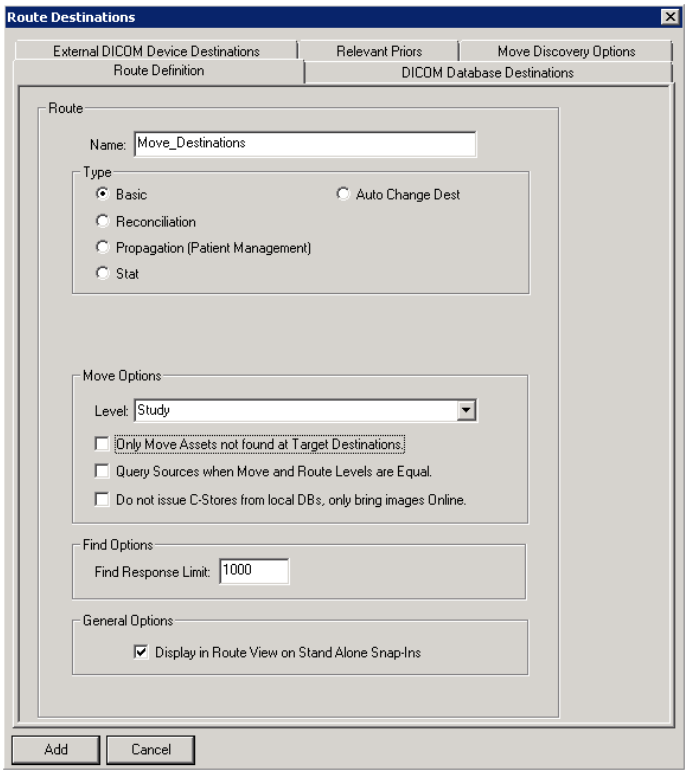
The third route is intended to be used for moving images located on the AcuoMed deep-level tape archive at the hospital to the clinic view station and AcuoMed Server local cache in a single operation. This might be required, for example, by HIS/RIS scheduled studies, or by a doctor wishing to view historical patient information. To do this, the images are moved back to the AcuoMed Server at the clinic which routes them to the appropriate destinations (for additional information, refer to the topic *Configure the Deep-End AcuoMed Server* on page 167).

Configuring the third route to the move destinations (view station and local cache) involves specifying a route definition, setting up an AcuoMed DICOM database destination to the local cache, and setting up an external DICOM device destination to the view station (see callout **C5** in Figure 40).

To set up the third route, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Router Configuration→ Routes
2. Right-click **Routes** and select **New→ New Route Name**.

   The Route Destinations dialog displays with the Route Definition tab selected.



3. On the Route Definition tab, type the Route Name for the route you are setting up (Move_Destinations in our example).
4. Select a route type.
   - Basic – the default route type appropriate for most routes (and the one selected for our example here).
   - Reconciliation – the route to the Reconciliation database.
   - Propagation (Patient Management) – a route used for propagating updates from a Master/Permanent Database to other AcuoMed Servers.
   - Stat – a static route. Set up a route of this type when you want assets sent to the route destinations regardless of whether or not those assets pass reconciliation.

- Auto Change Dest – Used in conjunction with the Auto Change Destination functionality. Only one route of this type is supported. Routes of this type have a "Source Clients" tab where users can select which AcuoMed DICOM databases and External DICOM devices will have their stores re-routed in the case of a UID Failure. Multiple Source Clients may be selected.

5. Select a Move Level from the drop-down list.

   The Move Level specifies the level at which the device(s) on a route will process a move operation (patient, study, series, or image). Refer to *Figure 42: Route Move Levels* on page 118 for more information.

NOTE: Not all devices support all move levels. Please refer to the device conformance statement for more information.

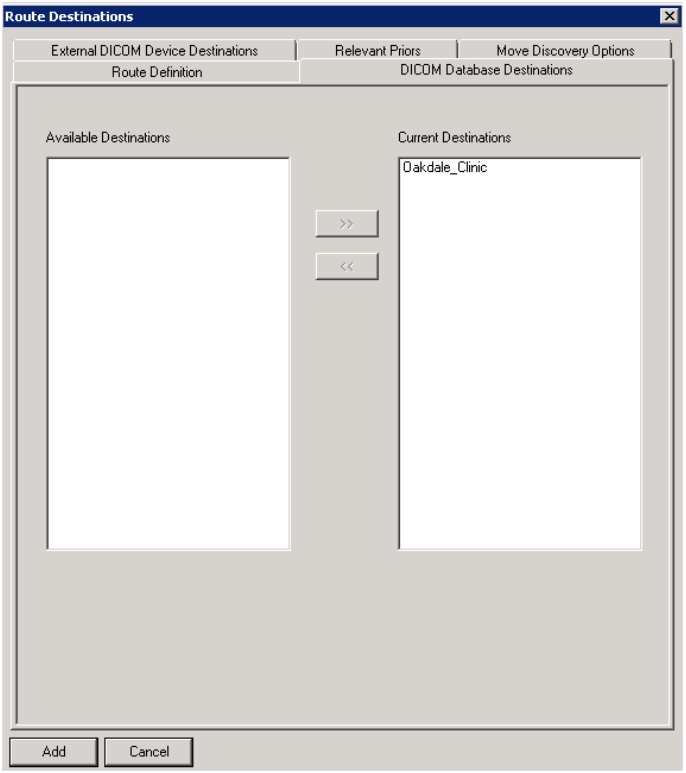
Move Options:

Only Move Assets not found at Target Destinations. – Enabling will prevent assets from being moved when they already exist at the Move Target.

Query Sources when Move and Route Levels are Equal. – Enabling will issue a C-Find before the move is forwarded to the destination(s) when the Move Level is equal to the level of the source route.

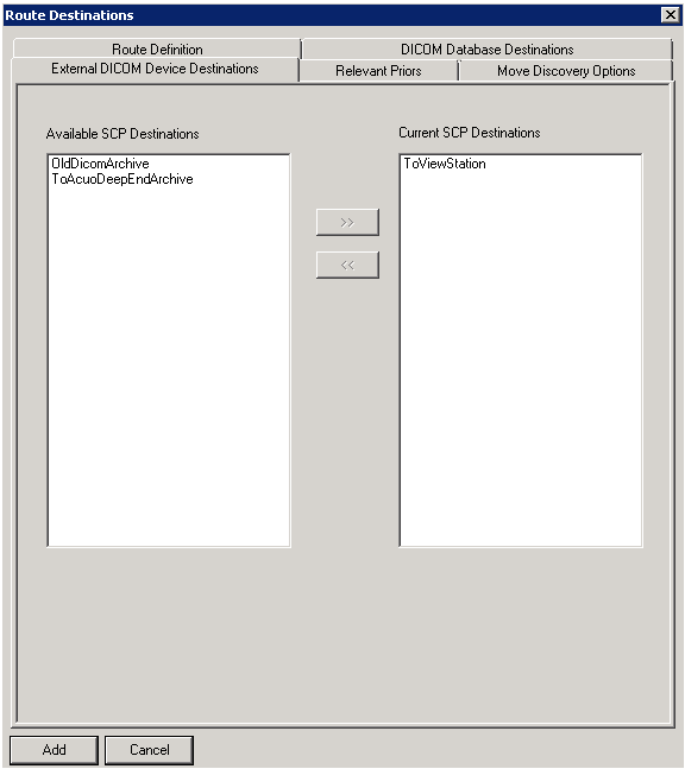
Do not issue C-Stores from local DBs, only bring images Online. – When enabled, no C-Stores will be initiated and any images affected by the move that were offline will be brought online. This feature might be used when an archive device is present and data needs to be staged for more rapid retrieval by another application.

6. Click the **AcuoMed DICOM Database Destinations** tab and set up the DICOM database destination for the route.



Move one AcuoMed DICOM Database from the Available Acuo Destinations list to the Current Acuo Destinations list (Oakdale_Clinic in our example).

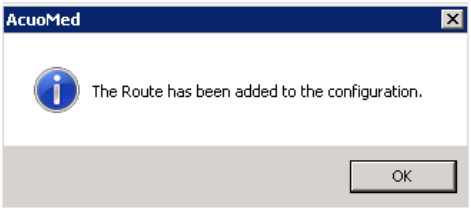
7. Click the **External DICOM Device Destinations** tab and set up the external SCP destination for the route.



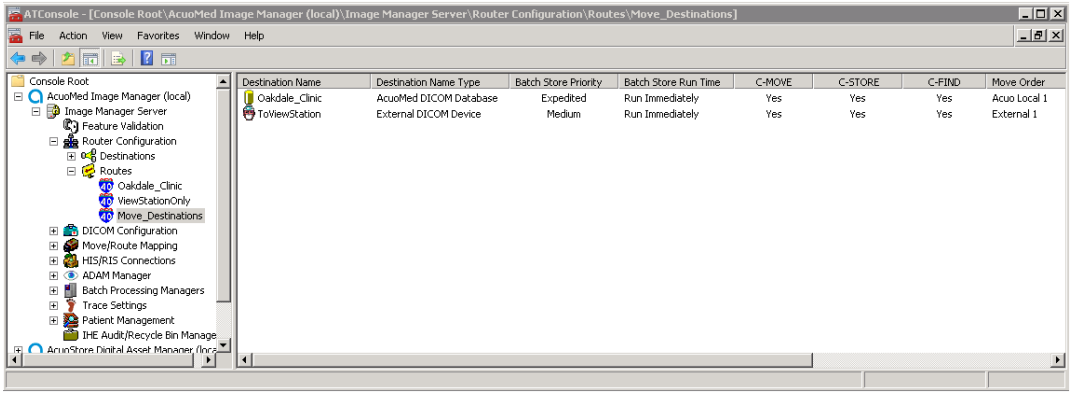
- Move one or more External DICOM Device Destinations from the Available SCP Destinations list to the Current SCP Destinations list (ToViewStation in our example).

8. Please reference Chapter 11 for more information on Relevant Priors functionality.

9. Click **Add** to complete set up of the second route and add it to the configuration.



The right pane now displays a summary of the third route.



The local cache and view station on the third route will support moves, stores, and finds (which is the default configuration). Therefore, it is not necessary to reconfigure the third route to add any command filtering (as we did for the first route).

Set up a 4th Route: Propagation Route

Configuring a propagation route involves specifying a route definition and setting up an external DICOM device destination to the view station. This route will be used to send edits, in the form of a DICOM message, to any destination listed on the propagation route.

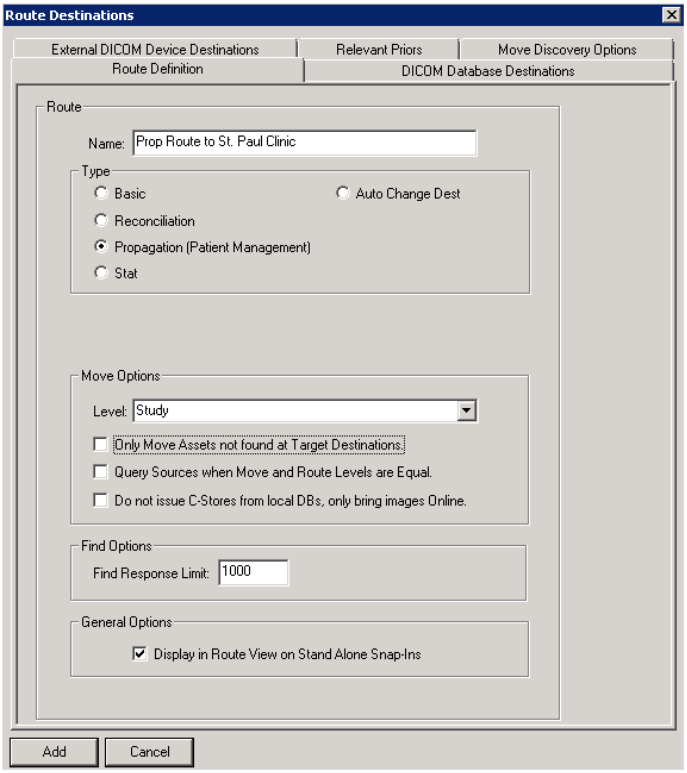
Note: Propagation Routes can only be configured to destinations to other Acuo Devices.

To set up a Propagation Route, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Router Configuration→ Local Route Definitions.

2. Right-click **Route** and select **New→ New Route Name**.

   The Route Destinations dialog displays with the Route Definition tab selected.



3. On the Route Definition tab, type the Route Name for the route you are setting up (**Prop Route to St. Paul Clinic** in our example).

4. Select a route type.

   - Propagation (Patient Management) – a route used for propagating updates from a Master/Permanent Database or HIS/RIS to other AcuoMed Servers. Propagation to non-Acuo destinations is not supported.

5. Select a Move Level from the drop-down list.

   The Move Level specifies the level at which the device(s) on a route will process a move operation (patient, study, series, or image). Refer to *Figure 42: Route Move Levels* on page 118 for more information.

NOTE:	Not all devices support all move levels. Please refer to the device conformance statement for more information.

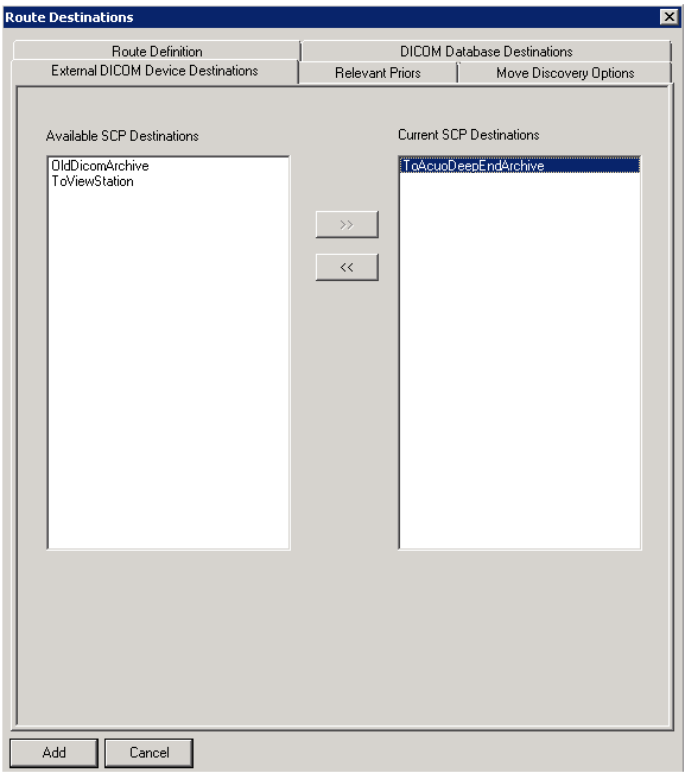
6. Set a Find Response Limit.

   The default value is 1,000 Find Responses returned on a C-Find Request.

7. Uncheck 'Display in Route View on Stand Alone Snap-Ins' (this is checked by default)

   This will hide the route from your client users.

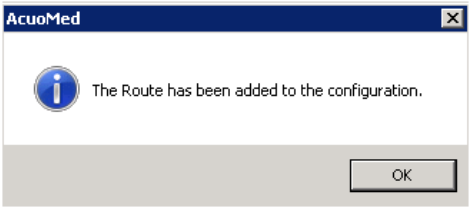
8. Click the **External DICOM Device Destinations** tab and set up the external SCP destination for the route.



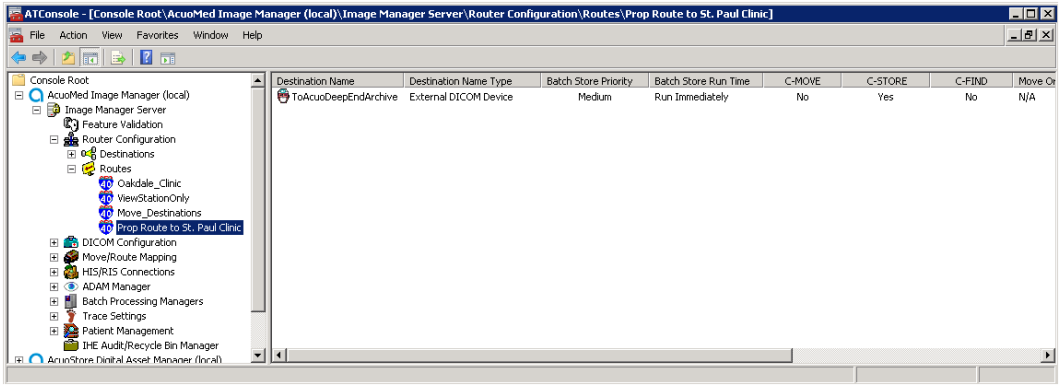
   Move one or more External DICOM Device Destinations from the Available SCP Destinations list to the Current SCP Destinations list (**ToAcuoDeepEndArchive** in our example).

9. Please reference Chapter 11 for more information on Relevant Priors.

10. Click **Add** to complete set up of the second route and add it to the configuration.



The right pane now displays a summary of the prop route.



The external destination on the propagation route will support stores only. The next step is to apply the route to the AcuoMed DICOM Database Properties.

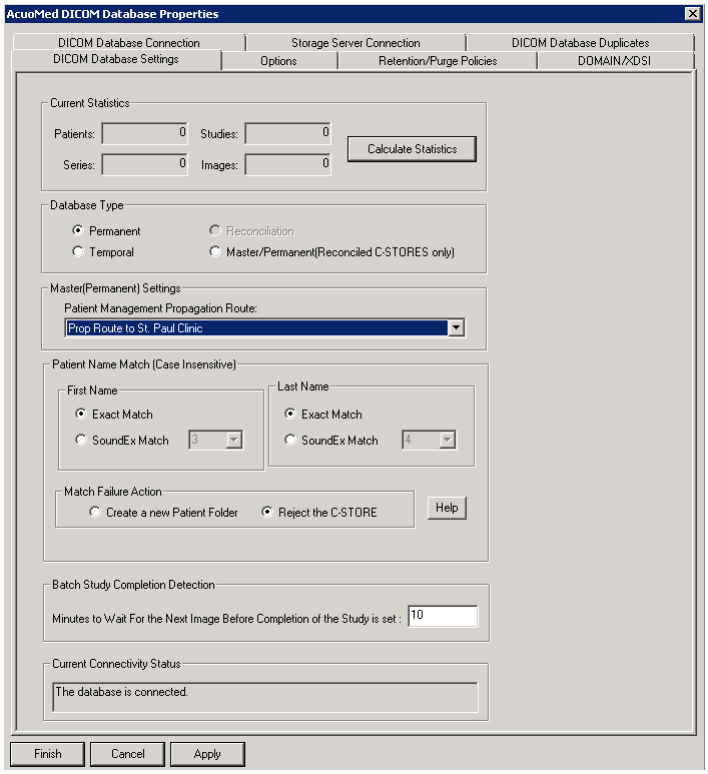


Figure 43: Propagation Route

Now that the fourth route is set up, continue with the next procedure to set up sources.

Set up Sources

In addition to setting up routes to DICOM destinations (via the previous procedures), you must also set up sources. This aspect of DICOM configuration makes it possible for AcuoMed to connect to and communicate with DICOM devices that will be sending images to the AcuoMed Server.

To set up a source, you must configure three things:

- New SCP (see the next topic)
- External SCU (see page 137)
- New AE Name (see page 138)

NOTE: Refer to the Glossary in this manual for configuration terminology definitions.

New SCP

The first thing to do to set up a new source is to set up a new SCP (see callout **D1** in Figure 40). This sets up AcuoMed parameters that source DICOM devices will use to make connections to the AcuoMed Server.

In our configuration example, the two following procedures set up two SCPs corresponding to the two TCP/IP addresses (network interface cards) that are installed in the AcuoMed Server:

- Set up SCP for 220.8.3.6
- Set up SCP for 220.8.3.7

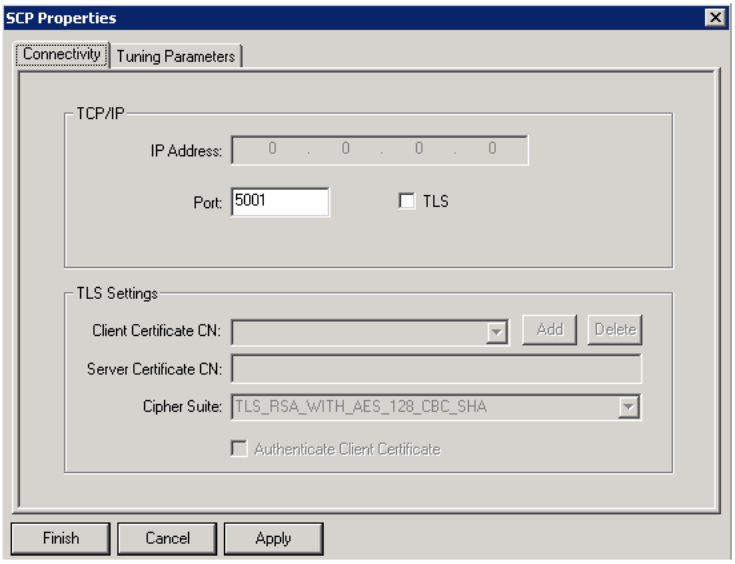
NOTE: These TCP/IP addresses only apply to this configuration example. The addresses that you will use in your AcuoMed configuration depend on your network setup and are configurable in Windows.

Set up SCP for 220.8.3.6

This SCP will be used for connections from the deep-end AcuoMed Server located at the hospital. (For more information, refer to *Configure the Deep-End AcuoMed Server* on page 167.)

To set up a new SCP for 220.8.3.6, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ DICOM Configuration.
2. Under DICOM Configuration, right-click **220.8.3.6** and select **New→ New SCP**.



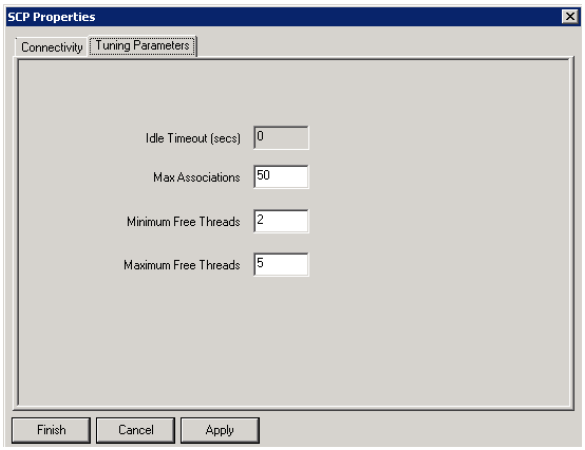
The SCP Properties dialog displays.

NOTE:	Alternatively, you could select **Any IP Address** under the DICOM Configuration tree node which would display an IP address of 0.0.0.0. The Any IP Address selection causes AcuoMed to listen to all network cards connected to the AcuoMed Server. Normally, you will have multiple network cards for load balancing. When this is the case, you can configure AcuoMed to listen on a specific card (IP address) for a specific port or listen on all cards (IP address = 0.0.0.0).

In the sample above, we are configured to listen on IP address 220.8.3.6 at port number 5001. Since we are defining the AcuoMed Server IP address and port that the source (a remote AcuoMed Server in this case) will be calling, it will be necessary to also configure the source to call the proper IP address and port (refer to *Configure the Deep-End AcuoMed* Server on page 167). For other DICOM source devices, refer to the vendor's device-specific *Conformance Statement*.

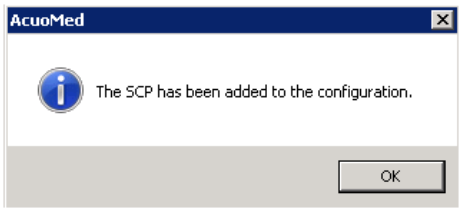
3. Type the port number that this SCP will use as a listening port (port 5001 in our example).

4. Click the **Tuning Parameters** tab and configure the tuning parameter*s as needed.*



Acuo Technologies recommends using the default Tuning Parameters default values. If you want more information about changing these values, please contact Acuo Technologies for assistance.

5. Click **Add** to add the new SCP to the configuration.



This completes the steps to set up a new SCP for 220.8.3.6. Continue with the next procedure to set up a new SCP for 220.8.3.7.

Set up SCP for 220.8.3.7

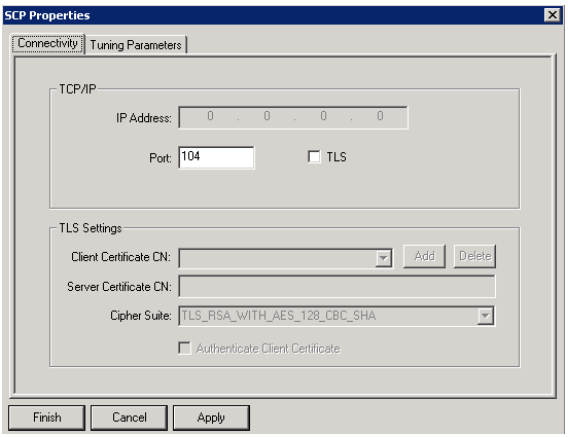
This SCP will be used for connections from the CT Scanner modality located at the clinic.

To set up a new SCP for 220.8.3.7, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ DICOM Configuration.

2. Under DICOM Configuration, right-click **220.8.3.7** and select **New→ New SCP**.

   The SCP Properties dialog displays.

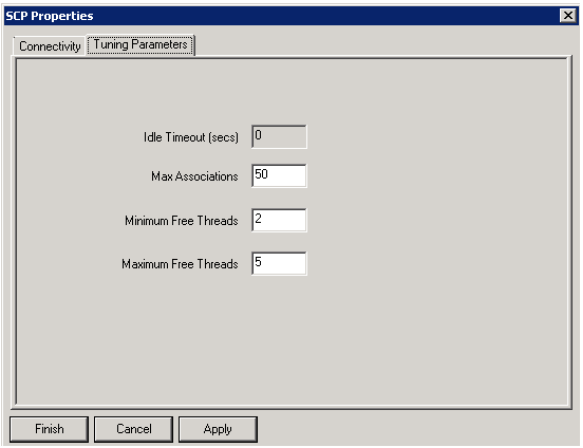


NOTE: Alternatively, you could select **Any IP Address** which would display an IP address of 0.0.0.0. The Any IP Address selection causes AcuoMed to listen to all network cards connected to the AcuoMed Server. Normally, you will have multiple network cards for load balancing. When this is the case, you can configure AcuoMed to listen on a specific card (IP address) for a specific port or listen on all cards (IP address = 0.0.0.0).

In the sample above, we are configured to listen on IP address 220.8.3.7 at the standard port number 104. Since we are defining the AcuoMed Server IP address and port that the source (a modality in this case) will be calling, it will be necessary to also configure the source device to call the proper IP address and port on the AcuoMed Server.

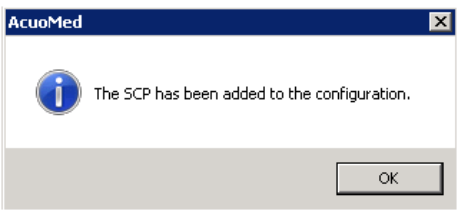
3. Type the port number that this SCP will use as a listening port (port 104 in our example).

4. Click the **Tuning Parameters** tab and configure the tuning parameters as needed.



Acuo Technologies recommends using the default Tuning Parameters values. If you want more information about changing these values, please contact Acuo Technologies for assistance.

5. Click **Add** to add the new SCP to the configuration.



This completes the steps to set up a new SCP for 220.8.3.7. Continue with the next procedure to configure an external SCU.

External SCU

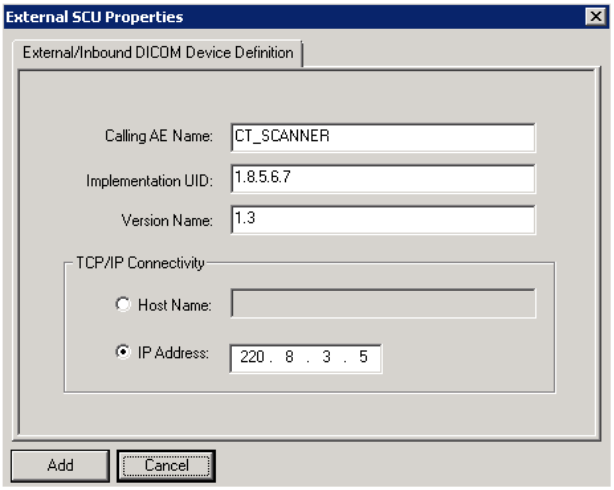
The second thing to do to set up a new source is to set up a new external SCU. This will set up the AcuoMed parameters that will define the inbound DICOM device which needs to make a connection to the AcuoMed Server.

NOTE: Setting up an External SCU is an optional process. There are two reasons why you would want to do this. First, setting up an External SCU provides an added level of security, since only specified SCUs can communicate with the AcuoMed Server. Second, it may be desirable to base a tag rule on an External SCU to control routing. If you have either of these needs, you will want to set up an External SCU as part of setting up a new source.

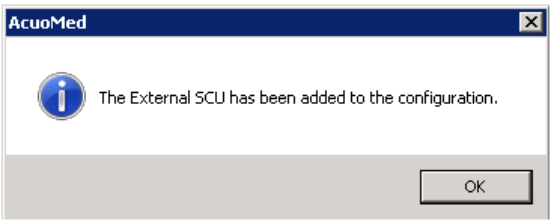
To set up a new external SCU, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ DICOM Configuration.
2. Under DICOM Configuration, right-click **External SCUs** and select **New→ New External SCU**.

   The External SCU Properties dialog displays.



3. Enter the External/Inbound DICOM Device Definition parameters.
   - Type the Calling AE Name to identify the inbound device. (optional)
   - Type the Implementation UID that corresponds to the inbound device type. (optional)
   - Type the Version Name that specifies the software version for the inbound device. (optional)
   - Type either the Host Name or IP Address that corresponds to the inbound device. This is the calling (“from”) IP address. (required)
4. Click **Add** to add the new External SCU to the configuration.



   Continue with the next procedure to configure a new AE name.

New AE Name

The third thing to do to set up a new source is to set up a new AE name (see callout **E** in Figure 40). This will set up the AcuoMed parameters that define the called application entity (AE). The called AE name is associated with a route name, which may in turn have multiple destinations. So, by sending an image to the called AE name, the DICOM device can deliver the image to one or more destinations in a single operation.

In our configuration example, the three following procedures set up three called AE names corresponding to the three routes that were defined earlier in this chapter:

- Set up AE Name for Oakdale_Clinic Route (see next topic)
- Set up AE Name for ViewStationOnly Route (see page 142)
- Set up AE Name for Move_Destinations Route (see page 146)

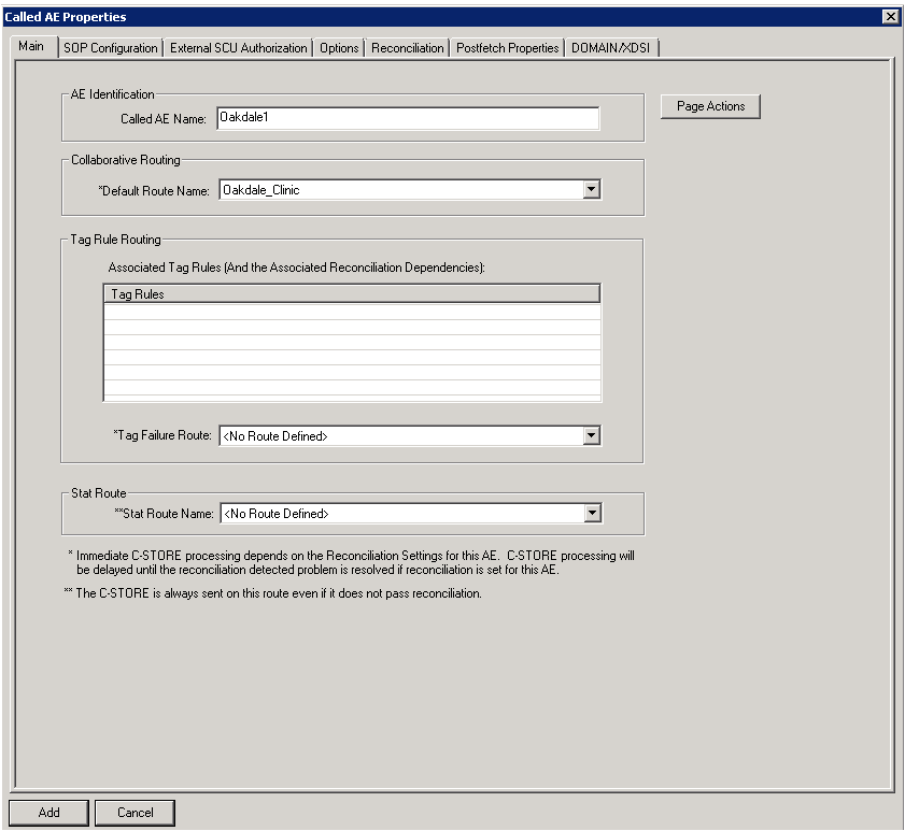
Set up AE Name for Oakdale_Clinic Route

To set up a new called AE name and associate it with the Oakdale_Clinic route, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ DICOM Configuration→ 220.8.3.7.

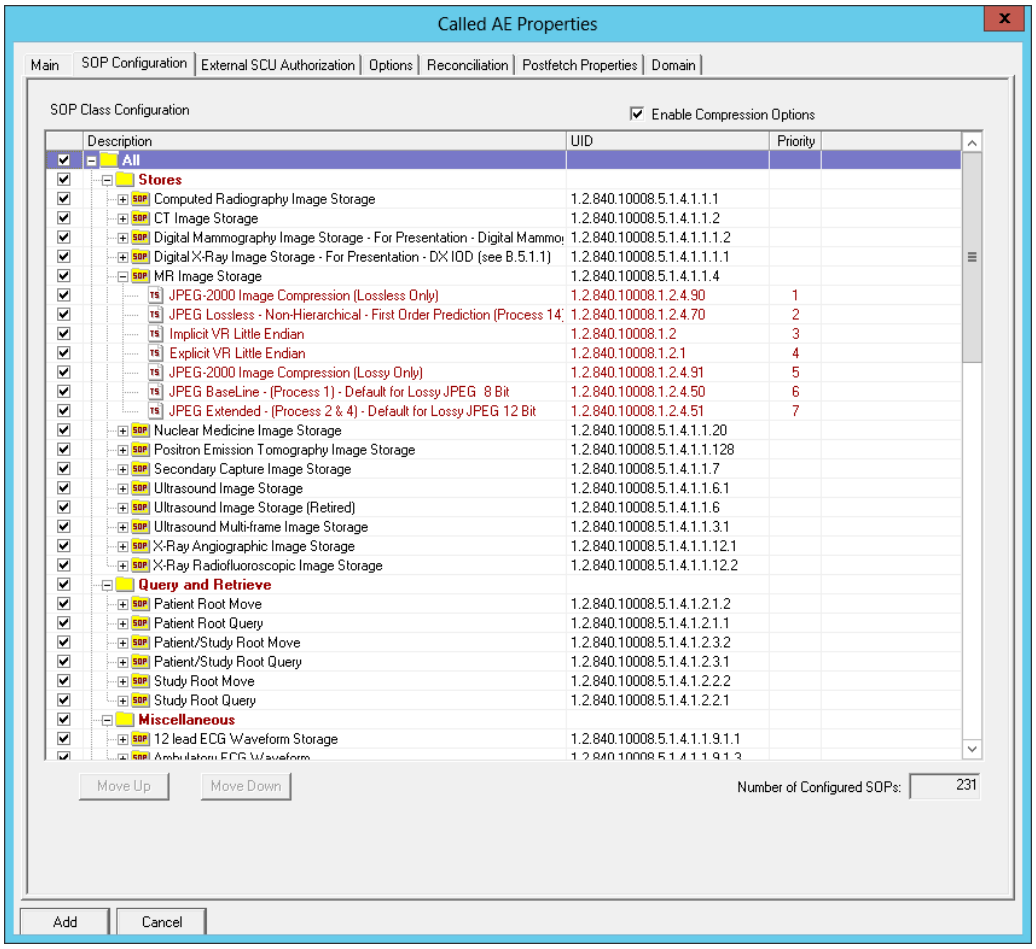
2. Under 220.8.3.7, right-click **SCP [Listening Port: 104]** and select **New→ Called AE**.

   The Called AE Properties dialog displays with the Main tab selected.



3. Using the Main tab, set up the new Called AE name and associate it with a route.
   - Type the Called AE Name (Oakdale1 in our example)
   - From the Default Route Name drop-down list, select the route to which the new called AE name will be associated (Oakdale_Clinic in our example).

4. Click the **SOP Configuration** tab and select the registered SOPs that will be accepted by the called AE.



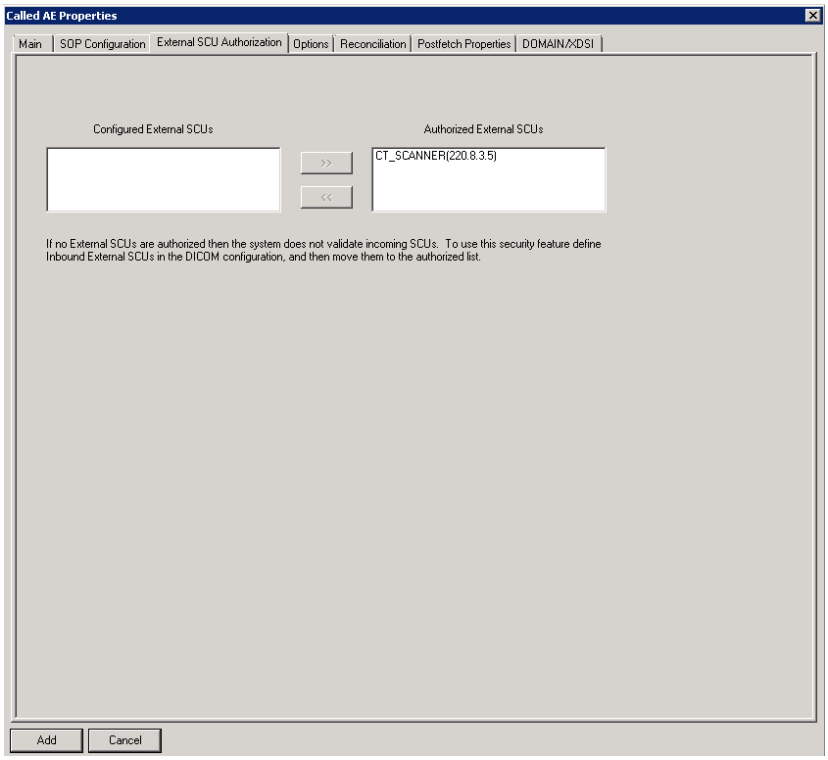
- Check the far left checkbox for each SOP that you want to authorize from the available registered SOPs list. These are the SOP classes that will be supported (or accepted) by the external DICOM device you are configuring. It is possible to select all SOPs. However, by selecting specific SOPs, you can improve performance by cutting down on the negotiation that is required between DICOM stations. Also, by restricting which SOPs are accepted, you can limit the devices queries can be accepted from or limit devices images can be distributed to.
- Each SOP also has a number of supported Transfer Syntaxes which can be negotiated. These Transfer Syntaxes can also be ordered in priority so that the association negotiation requests the Transfer Syntax in the order indicated. For more information about Transfer Syntaxes please refer to Chapter 2.

NOTE: You can choose to view the supported Transfer Syntax for each SOP by expanding the plus sign next to each SOP.

In our example, we have selected All SOPs and applied JPEG-2000 Lossless and JPEG Lossless compression to all supporting SOPS.

- To select ALL SOPs simply check the far left box next to the word **All**.
- To apply compression to SOPS, check the **Enable Compression Option** checkbox followed by a right click on the word **All** and click **Set Acuo Defaults for all SOPS**. This option applies JPEG-2000 Lossless and JPEG Lossless compression to all supporting SOP classes. Another way of accomplishing this is to click on **Set Custom Defaults for all SOPS.** In the dialogue box check the box next to the Transfer Syntax **JPEG Lossless** and/or any other Transfer Syntax to be negotiated. Click **OK** to exit the dialogue box.

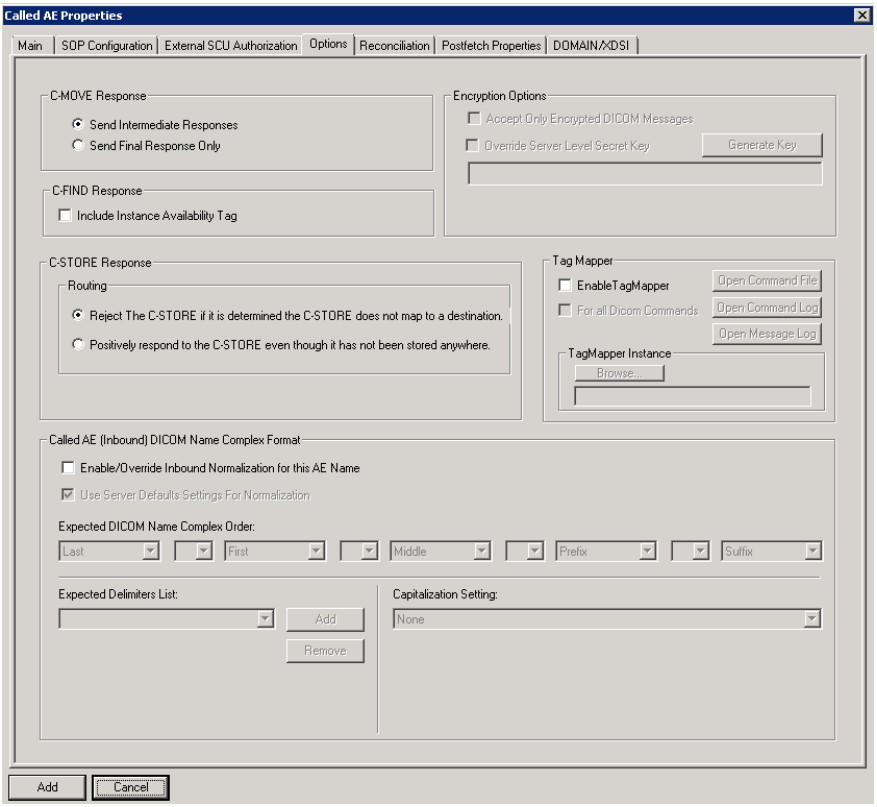
5. Click the **External SCU Authorization** tab and select the configured SCUs that will be accepted by the called AE.



- Move the SCUs that you want to authorize from the Configured External SCUs list to the Authorized External SCUs list.

NOTE: Specifying one or more authorized external SCUs provides additional security. If any external SCUs are authorized, then only the authorized SCUs will be able to access the called AE. For example, someone who knew the IP address, port number, and AE name could not dial-in and access information. Only an authorized external SCU can do this.

6. Click the **Options** tab and configure the Move Response and C-STORE Response for the called AE.



Select C-Move Responses

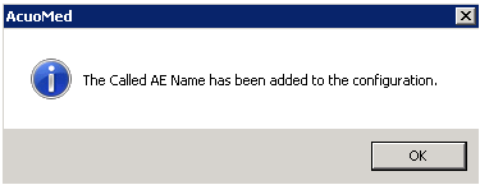
- By clicking, toggle the selection of whether the called AE will send intermediate responses to the requesting device during Move operations, or if it will only send a final response when the entire Move is completed. Sending intermediate responses prevents the requesting device from timing out during the Move operation.
- Determine if you will want to use the Encryption option. Configuration here determines if and how encryption will be accepted. In our example, we will enable encryption at this level to accept encryption from another AcuoMed system configured for outbound encryption configured with the same generated key. See Chapter two for more information on Encryption.
- Select a C-STORE routing response option:

  Reject the C-STORE… (default) causes a C-STORE that does not map to any destination to be rejected. In this case, the modality will normally try the C-STORE again.

  Positively respond to the C-STORE… causes a C-STORE that does not map to any destination to be discarded.
- Determine if you will need to Enable and/or Override Normalization for this AE Name or use the Server Defaults Settings for Normalization which is ON by default. See Chapter two for more information on Normalization. For our example, we will use the default settings.
- Determine if you will use TagMapper on the inbound instance of this AE.

7. The Reconciliation Tab is discussed in Chapter 5.
8. The Postfetch Properties Tab will not be used in this example. Please see *Postfetch in Chapter 11* for more information.
9. The Domain/XDS-i tab will not be used in this example. Please see *XDS-I in Chapter 11* for more information.

10. Click **Add** to add the Called AE Name to the configuration.



This completes the configuration steps required to set up the called AE name Oakdale1. Continue with the next procedure to set up an AE name for the ViewStationOnly route.

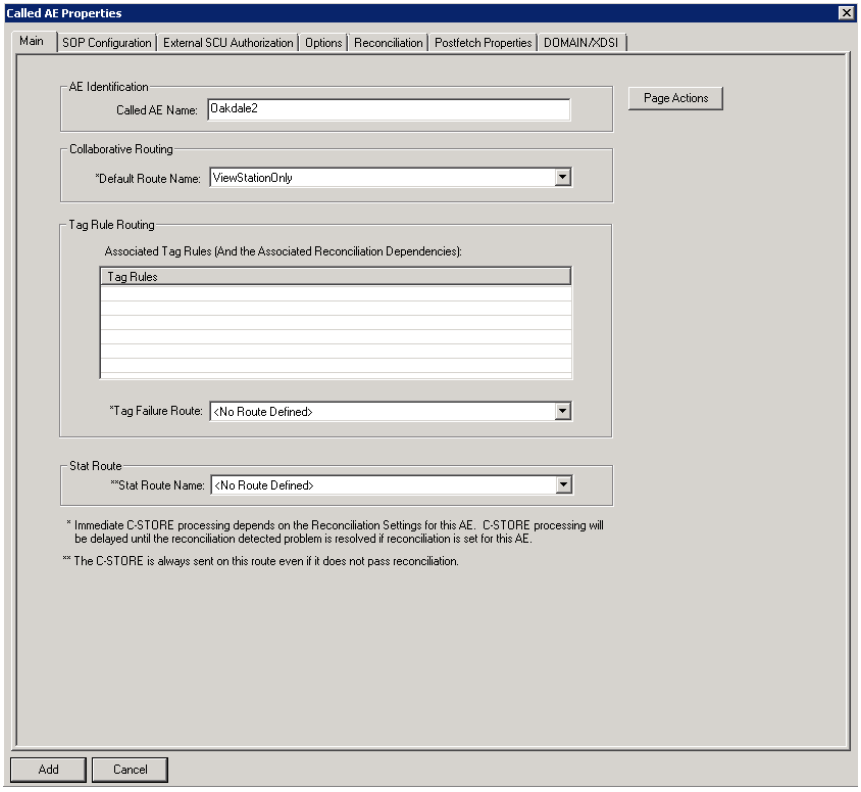
Set up AE Name for ViewStationOnly Route

To set up a new called AE name and associate it with the ViewStationOnly route, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ DICOM Configuration→ 220.8.3.7.

2. Under 220.8.3.7, right-click **SCP [Listening Port: 104]** and select **New→ Called AE**.

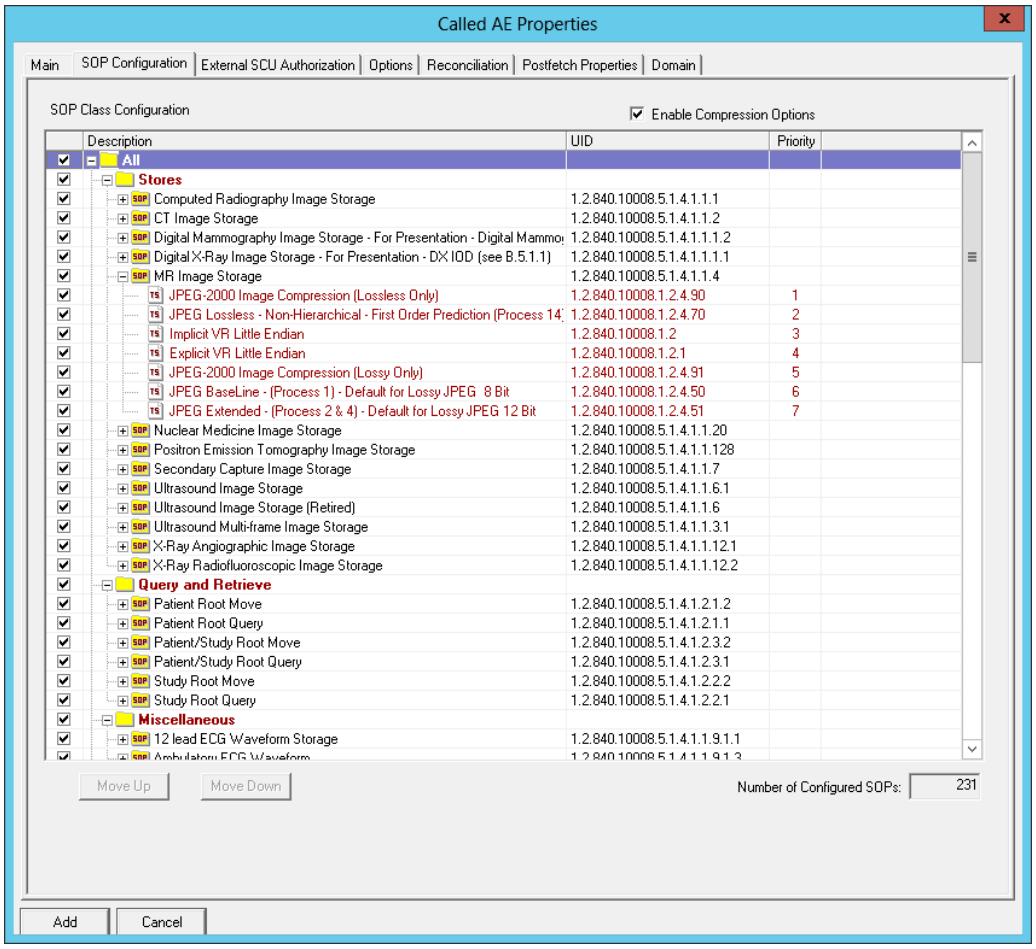
   The Called AE Properties dialog displays with the Main tab selected.



3. Using the Main tab, set up the new Called AE name and associate it with a route.

   - Type the Called AE Name (Oakdale2 in our example)
   - From the Default Route Name drop-down list, select the route to which the new called AE name will be associated (ViewStationOnly in our example).

4. Click the **SOP Configuration** tab and select the registered SOPs that will be accepted by the called AE.



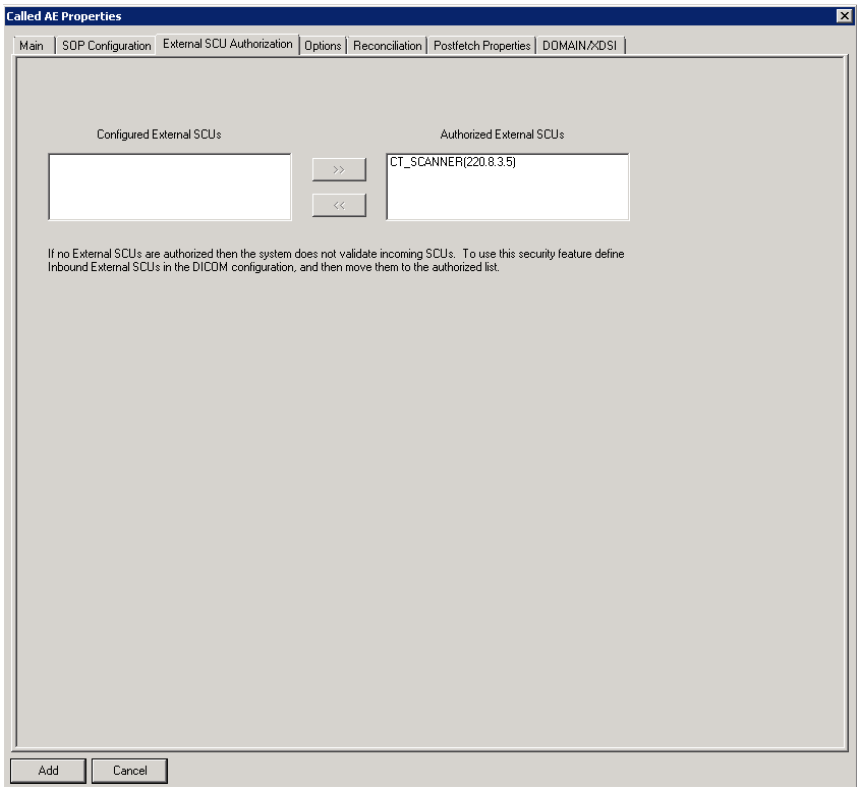
- Check the far left checkbox for each SOP that you want to authorize from the Available Registered SOPs list. These are the SOP classes that will be supported (or accepted) by the external DICOM device you are configuring. It is possible to select **all** SOPs. However, by selecting specific SOPs, you can improve performance by cutting down on the negotiation that is required between DICOM stations. Also, by restricting which SOPs are accepted, you can limit the devices queries can be accepted from or limit the devices images can be distributed to.
- Each SOP also has a number of supported Transfer Syntaxes which can be negotiated. These Transfer Syntaxes can also be ordered in priority so that the association negotiation requests the Transfer Syntax in the order indicated. For more information about Transfer Syntaxes please refer to *Transfer Syntaxes Available in AcuoMed* in Chapter 2.

NOTE: You can choose to view the supported Transfer Syntax for each SOP by expanding the plus sign next to each SOP.

In our example, we have selected All SOPs and applied JPEG-2000 Lossless and JPEG Lossless compression.

- To select ALL the listed SOPs simply check the far left box next to the word **All**.
- To apply compression to SOPS, check the **Enable Compression Option** checkbox followed by a right click on the word **All** and click **Set Acuo Defaults for all SOPS**. This option applies JPEG-2000 Lossless and JPEG Lossless compression to all supporting SOP classes. Another way of accomplishing this is to click on **Set Custom Defaults for all SOPS.** In the dialogue box check the box next to the Transfer Syntax **JPEG Lossless** and/or any other Transfer Syntax to be negotiated. Click **OK** to exit the dialogue box.

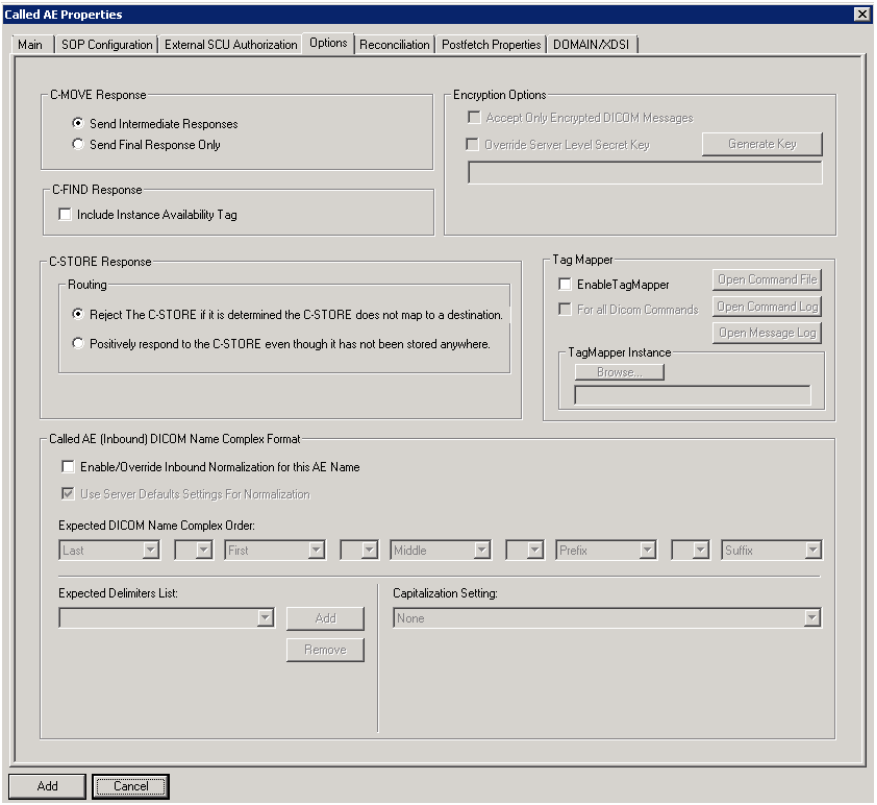
5. Click the **External SCU Authorization** tab and select the configured SCUs that will be accepted by the called AE.



- Move the SCUs that you want to authorize from the Configured External SCUs list to the Authorized External SCUs list. In our example, we are not authorizing any specific external SCUs, so no additional security will be provided by this means.

NOTE: Specifying one or more authorized external SCUs provides additional security. If any external SCUs are authorized, then only the authorized SCUs will be able to access the called AE. For example, someone who knew the IP address, port number, and AE name could not dial-in and access information. Only an authorized external SCU can do this.

6. Click the **Options** tab and configure the Move Response and C-STORE Response for the called AE.



Select a C-Move Response option

- By clicking, toggle the selection of whether the called AE will send intermediate responses to the requesting device during Move operations, or if it will only send a final response when the entire Move is completed. Sending intermediate responses prevents the requesting device from timing out during the Move operation.

Select a C-STORE routing response option:

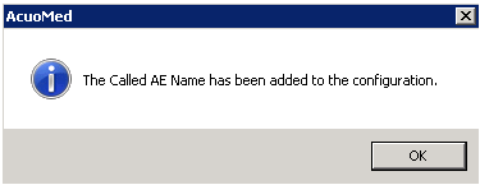
Reject the C-STORE… (default) causes a C-STORE that does not map to any destination to be rejected. In this case, the modality will normally try the C-STORE again.

Positively respond to the C-STORE… causes a C-STORE that does not map to any destination to be discarded.

- Determine if you will need to Enable and Override Normalization for this AE Name or use the Server Defaults Settings for Normalization which is ON by default. See Chapter two for more information on Normalization. For our example, we will use the default settings.
- Determine if you will want to use the Encryption option. Configuration determines if and how encryption will be accepted. For our example, we will accept all data; therefore we will leave it at its default setting, unchecked. See Chapter two for more information on Encryption.

7. The Reconciliation Tab is discussed in Chapter 5.
8. The Postfetch Properties Tab will not be used in this example. Please see *Postfetch in Chapter 11* for more information.
9. The Domain/XDS-i tab will not be used in this example. Please see *XDS-I in Chapter 11* for more information.

10. Click **Add** to add the Called AE Name to the configuration.



This completes the configuration steps required to set up the called AE name Oakdale2. Continue with the next procedure to set up an AE name for the Move_Destinations route.

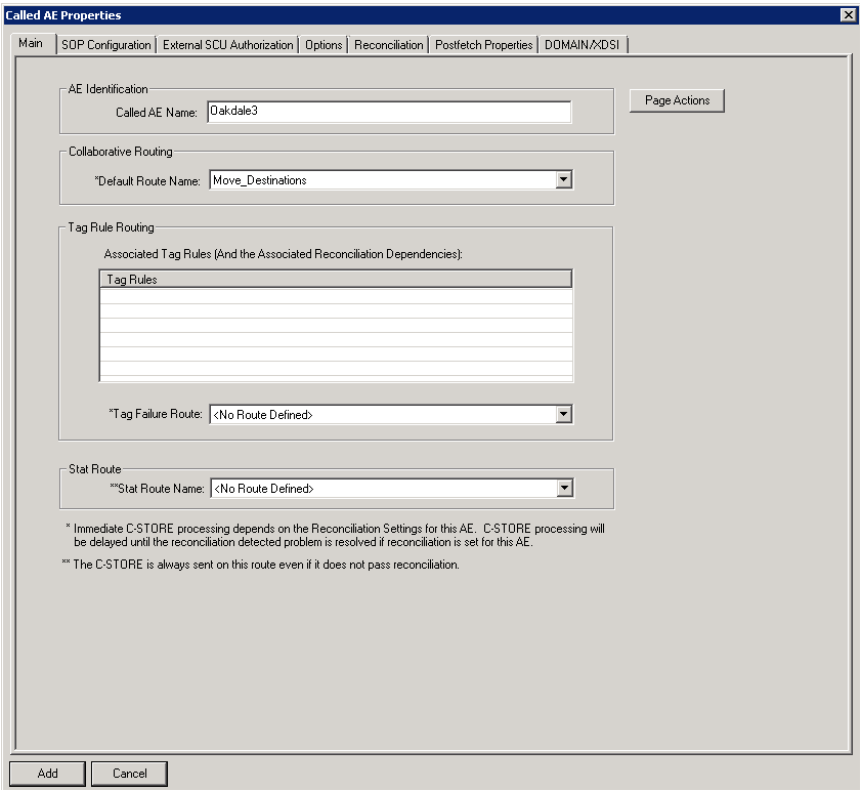
Set up AE Name for Move_Destinations Route

To set up a new called AE name and associate it with the Move_Destinations route, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ DICOM Configuration→ 220.8.3.6.

2. Under 220.8.3.6, right-click **SCP [Listening Port: 5001]** and select **New→ Called AE**.

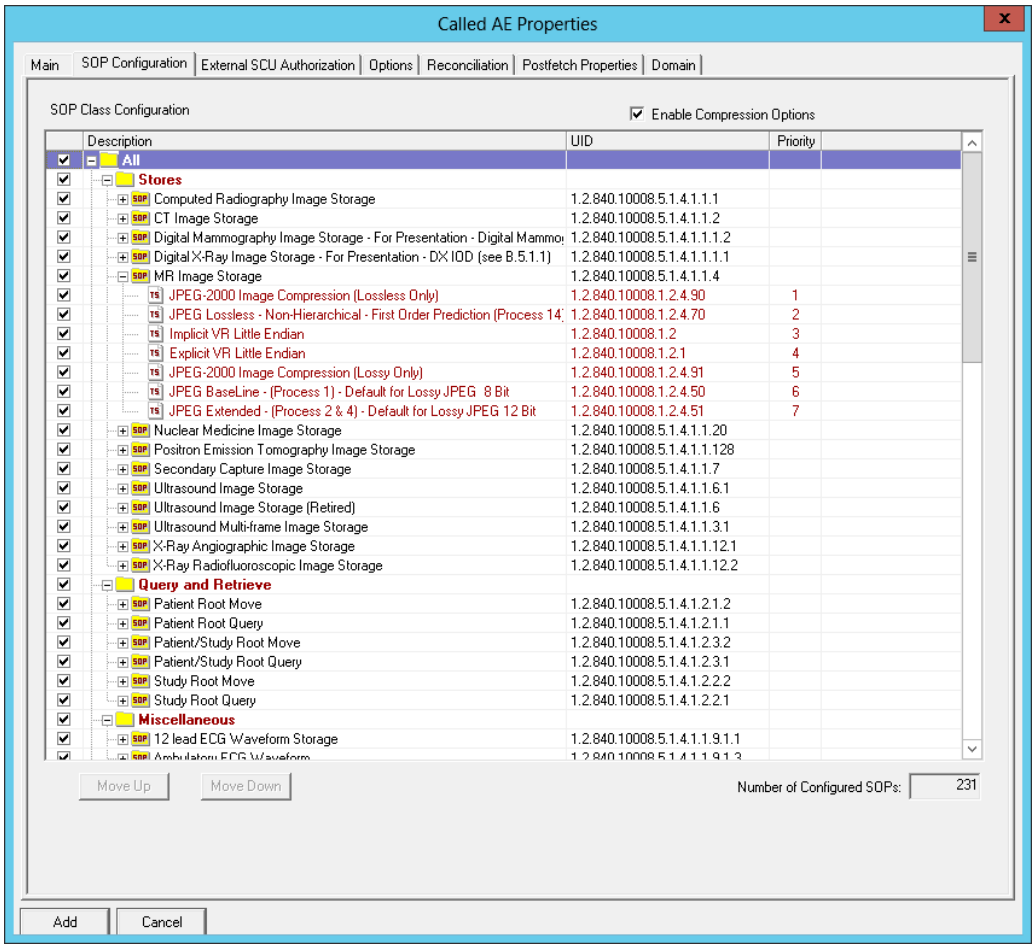
   The Called AE Properties dialog displays with the Main tab selected.



3. Using the Main tab, set up the new Called AE name and associate it with a route.

   - Type the Called AE Name (Oakdale3 in our example)
   - From the drop-down list, select the route to which the new called AE name will be associated (Move_Destinations in our example).

4. Click the **SOP Configuration** tab and select the registered SOPs that will be accepted by the called AE.



- Check the far left checkbox for each SOP that you want to authorize from the Available Registered SOPs list. These are the SOP classes that will be supported (or accepted) by the external DICOM device you are configuring. It is possible to select **all** SOPs. However, by selecting specific SOPs, you can improve performance by cutting down on the negotiation that is required between DICOM stations. Also, by restricting which SOPs are accepted, you can limit the devices queries can be accepted from or limit the devices images can be distributed to.
- Each SOP also has a number of supported Transfer Syntaxes which can be negotiated. These Transfer Syntaxes can also be ordered in priority so that the association negotiation requests the Transfer Syntax in the order indicated. For more information about Transfer Syntaxes please refer to *Transfer Syntaxes Available in AcuoMed* in Chapter 2.

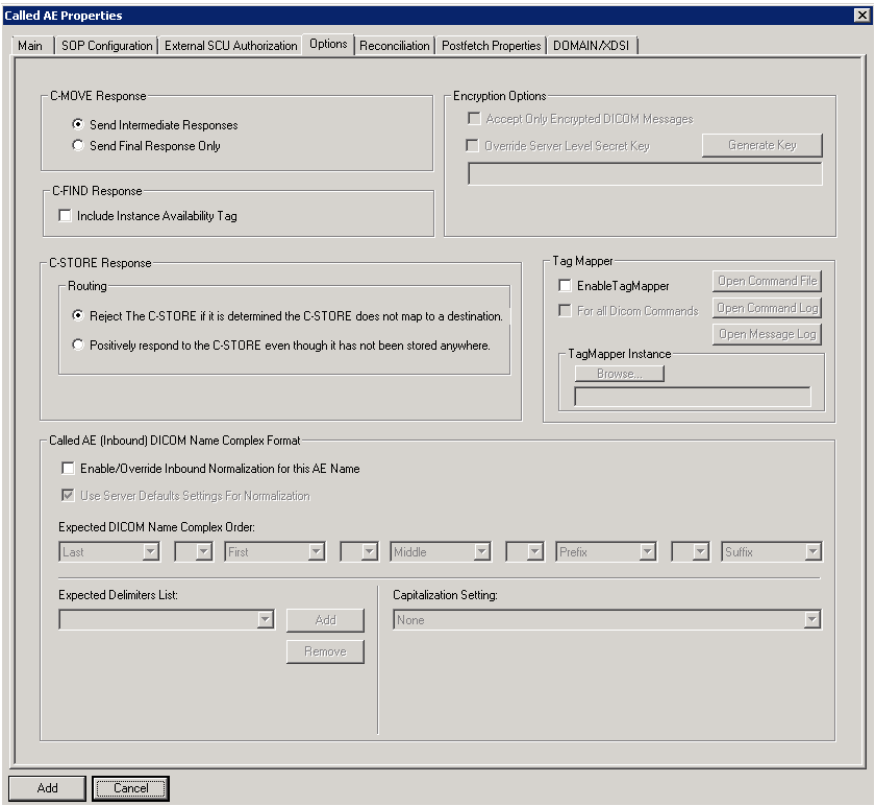
NOTE: You can choose to view the supported Transfer Syntax for each SOP by expanding the plus sign next to each SOP.

In our example, we have selected All SOPs and applied JPEG-2000 Lossless and JPEG Lossless compression.

- To select ALL the listed SOPs simply check the far left box next to the word **All**.
- To apply compression to SOPS, check the **Enable Compression Option** checkbox followed by a right click on the word **All** and click **Set Acuo Defaults for all SOPS**. This option applies JPEG-2000 Lossless and JPEG Lossless compression to all supporting SOP classes. Another way of accomplishing this is to click on **Set Custom Defaults for all SOPS.** In the dialogue box check the box next to the Transfer Syntax **JPEG-2000 Lossless** and/or any other Transfer Syntax to be negotiated. Click **OK** to exit the dialogue box.

5. Skip the External SCU Authorization tab since it is not required for this called AE.

6. Click the **Options** tab and configure the C-Move Response and C-STORE Response for the called AE.



- By clicking, toggle the selection of whether the called AE will send intermediate responses to the requesting device during Move operations, or if it will only send a final response when the entire Move is completed. Sending intermediate responses prevents the requesting device from timing out during the Move operation.
- Select a C-STORE routing response option:

  Reject the C-STORE… (default) causes a C-STORE that does not map to any destination to be rejected. In this case, the modality will normally try the C-STORE again.

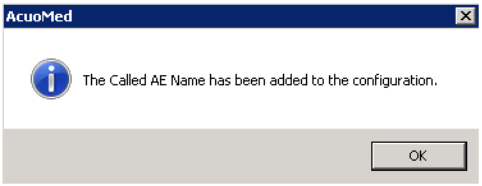
  Positively respond to the C-STORE… causes a C-STORE that does not map to any destination to be discarded.
- Determine if you will want to use the Encryption option. Configuration determines if and how encryption will be accepted. For our example, we will accept all data; therefore we will leave it at its default setting, unchecked. See Chapter two for more information on Encryption.
- Determine if you will need to Enable and Override Normalization for this AE Name or use the Server Defaults Settings for Normalization which is ON by default. See Chapter two for more information on Normalization. For our example, we will use the default settings.

7. The Reconciliation Tab is discussed in Chapter 5.

8. The Postfetch Properties Tab will not be used in this example. Please see *Postfetch in Chapter 11* for more information.

9. The Domain/XDS-i tab will not be used in this example. Please see *XDS-I in Chapter 11* for more information.

10. Click **Add** to add the Called AE Name to the configuration.



This completes the configuration steps required to set up the called AE name Oakdale3.

This completes all configuration steps required to set up new sources for our configuration example.

Set up Move/Route Mapping

Move/Route Mapping provides a facility for moving medical images from a local AcuoMed DICOM database to one or more DICOM devices on a preconfigured route. The key concept is that an image, or set of images, can be moved from an Acuo DICOM database (for example, a local image cache or deep-level archive) and routed to any DICOM 3.0-compatible device that is configured as a local route destination.

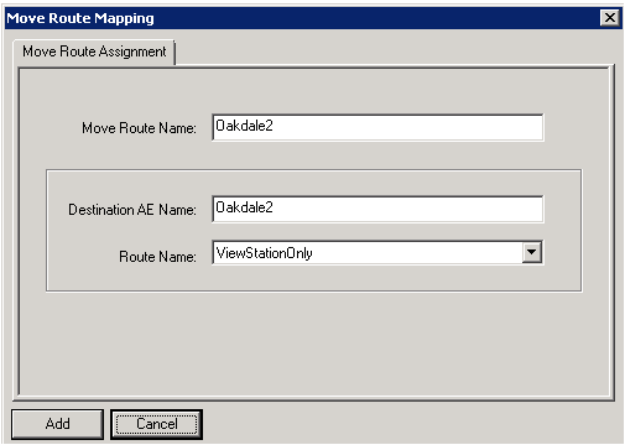
Move/Route Mapping configuration is easily done by associating an AE name to a route name and its local route destination(s). In our configuration example here, we will set up move/route mapping that will allow us to move images within the clinic from the local image cache (AcuoMed DICOM database) to the view station. To do this, we will use the second route (ViewStationOnly) and the AE name "Oakdale2" that we set up earlier in this chapter. In the procedure below, we will set up a new Move Route Assignment that will allow us to move images to a Move Destination AE Name (Oakdale2) that is associated with a Route Name (ViewStationOnly).

NOTE: Refer to the Glossary in this manual for configuration terminology definitions.

To set up the new Move Route Assignment, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Move/Route Mapping.
2. Right-click **Move/Route Mapping** and select **New→ New Move Name**.

   The Move Route Mapping dialog displays.

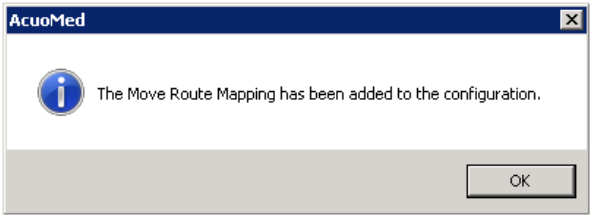


3. Set up the Move Route Assignment parameters.
   - Type the Move Route Name (Oakdale2 in our example). This is an arbitrary name used to describe the destination only. This name will be displayed in Patient Management for move operations.
   - Type the Move Destination Called AE Name (XYZ123 in our example).

NOTE: The AE Name that you enter is case-sensitive.

- From the drop-down list, select the route name to which the Move Destination AE Name will be associated (ViewStationOnly in our example).

4. Click **Add** to add the Move Route Mapping to the configuration.



This completes the procedure to add Move/Route Mapping to the ViewStationOnly route.

Set up Routing by Tag

Tag Rule Routing provides customizable, advanced control of image routing. Tag Rule Routing allows you to, first, customize DICOM tags to match the needs of your site and, second, create tag rule definitions to control image sources and routing to destinations. Advanced users can even set up their own tags to be used in routing control. For an overview of Tag Rule Routing, refer to *Controlling Routing with Tag Rules* on page 42.

NOTE: Refer to the Glossary in this manual for configuration terminology definitions.

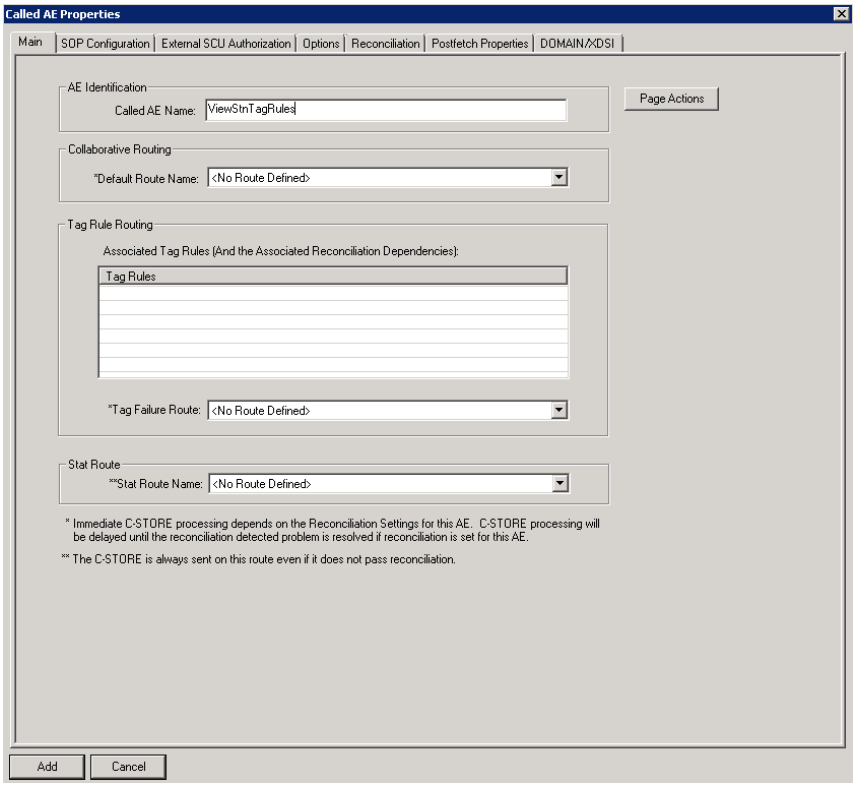
In our configuration example here we will set up Tag Rule Routing for a reading physician named Dr. Green. On Wednesdays and Fridays, Dr. Green is at the Oakdale Clinic and wants any images directed to her from the CT scanner at the clinic to be routed to the View Station at the clinic. To configure this routing, we will do three separate things:

- First, we will create a new AE Name that we will use for our tag rule route mapping. Refer to the next topic *Create AE Name for Tag Rule Route Mapping*.
- Next, we will customize the Reading Physician tag to add a tag value of "Dr. Karen Green." Refer to the topic *Customize Tag Values* on page 153.
- Finally, we will create a tag rule that will check for images to Dr. Green that are HEAD scans. If it is either Wednesday or Friday and if the image is from the CT scanner modality, the image will be routed to the ViewStationOnly route at the Oakdale Clinic. Refer to the topic *Configure Tag Rule Routing* on page 156.

Create AE Name for Tag Rule Route Mapping

To create a new called AE Name for use for tag rule route mapping, follow these steps:

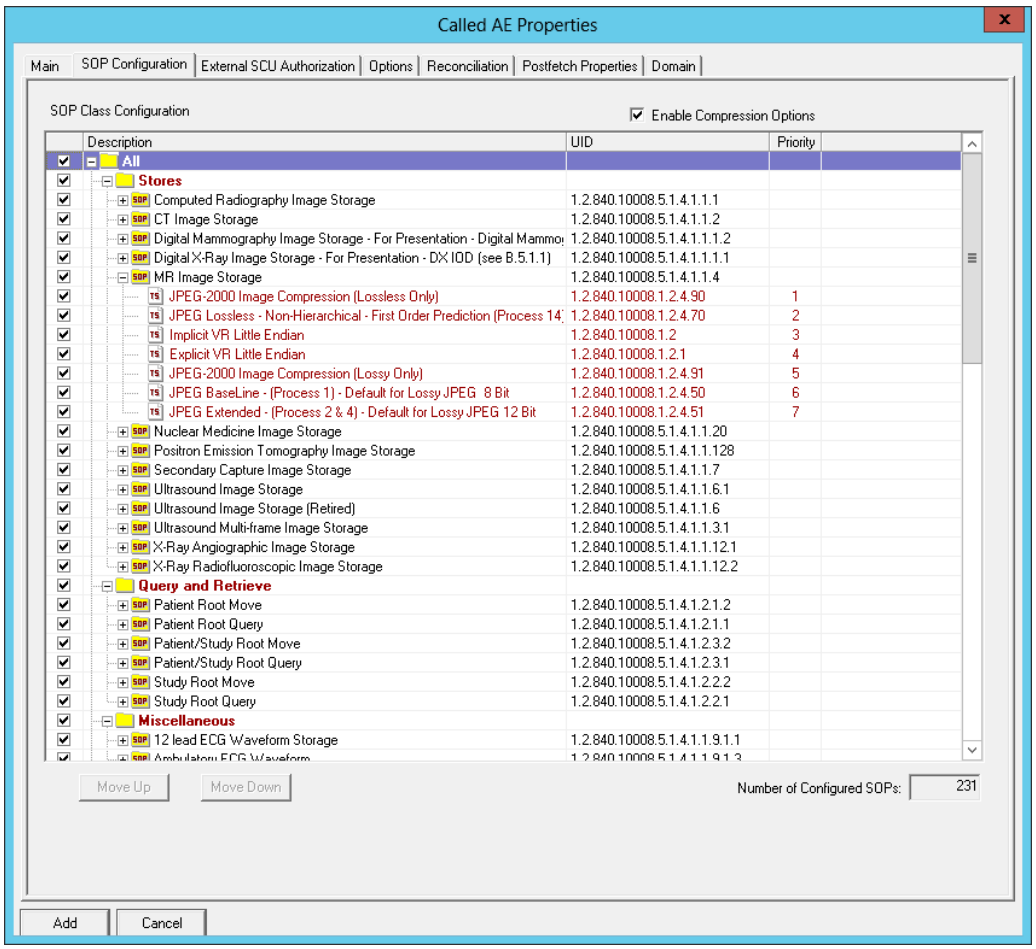
1. Expand the console tree as follows: AcuoMed Image Manager→Image Manager Server→DICOM Configuration→220.8.3.7→SCP[Listening Port: 104].
2. Right-click **SCP [Listening Port: 104]** and select New→**Called AE**.
3. In the Called AE Properties dialog (Main tab) that displays, type in a Called AE Name.



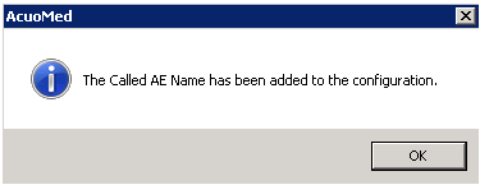
In our example the Called AE Name is ViewStnTagRules. No Route Name is specified since this will be specified when we set up our tag rule.

4. Click the **SOP Authorization** tab and select the acceptable SOPs and Transfer Syntaxes.

   For this example, select all SOPs, enable compression, and select the Acuo default settings for compression.



5. Click **Add** to continue.



This completes the configuration steps required to set up the called AE name ViewStnTagRules. Next we will customize tag values.

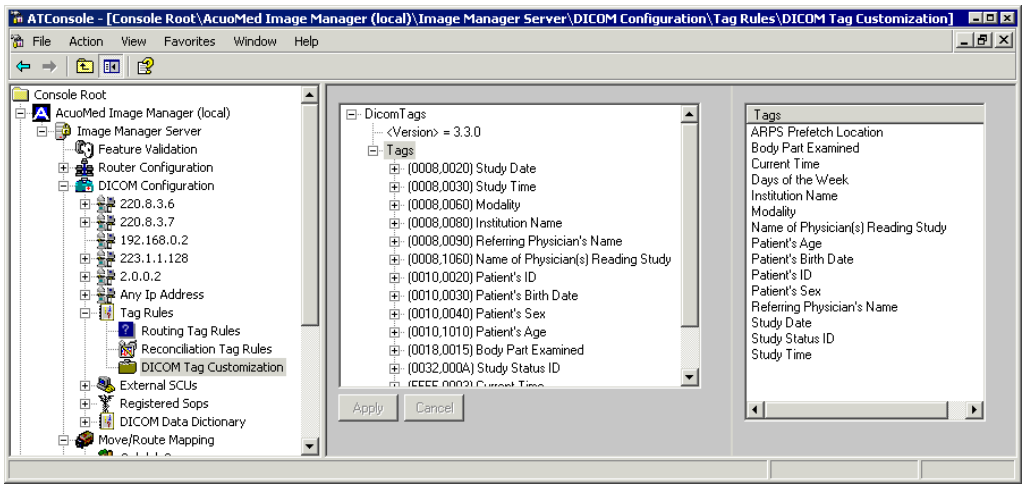
Customize Tag Values

To customize tag values to add Dr. Karen Green as a Reading Physician, follow these steps:

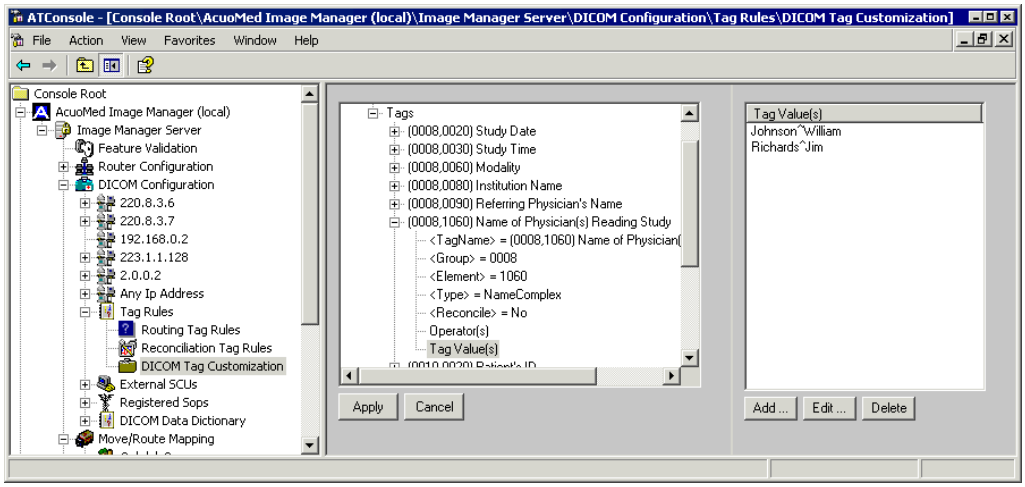
1. Expand the console tree as follows: AcuoMed Image Manager→Image Manager Server→DICOM Configuration→Tag Rules.

2. Under Tag Rules, click **DICOM Tag Customization**.

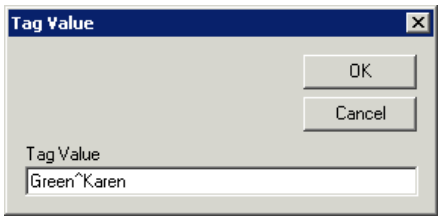
3. In the right pane, expand DicomTags→Tags to display the current tags.



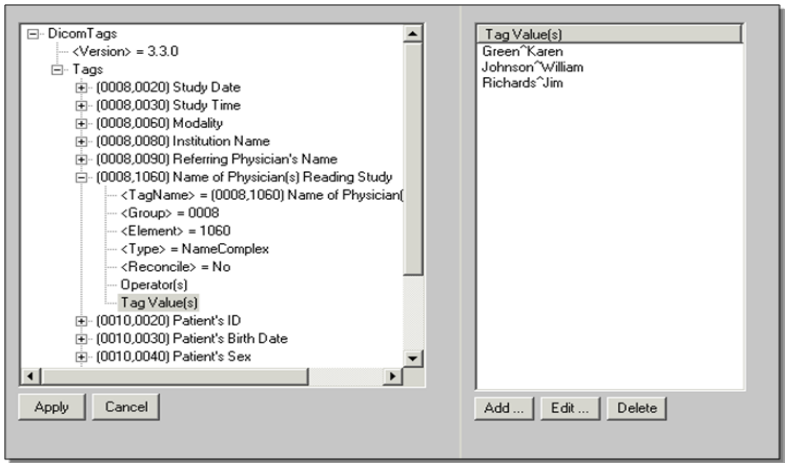
4. In the Tags list, expand the tag **Name of Physician(s) Reading Study** and click **Tag Values** to display any current tag values.



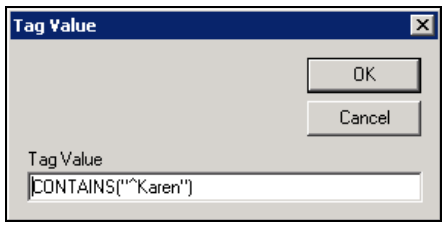
5. Under the TagValue(s) list, click the **Add** button and type "Green^Karen" in the Tag Value dialog and click **OK**.

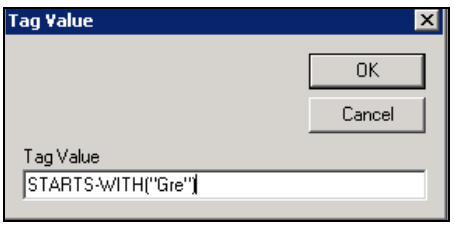


Dr. Green is added to the TagValue(s) list.

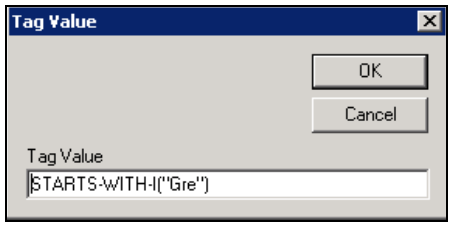


When configuring Tag Value(s), an alternative to setting the tag value to a specific value is to use the "CONTAINS" and/or "STARTS-WITH" criteria options as described below.



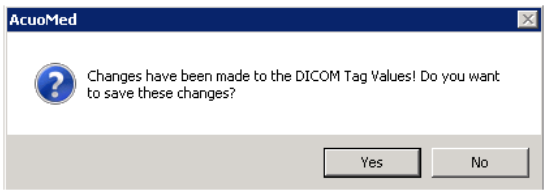


To specify that the string checked for is case insensitive, use a –i parameter directly after the "CONTAINS" or "STARTS-WITH" as seen below:



6. Click the **Apply** button in the right pane to save your changes.

   If you try to leave DICOM Tag Customization without applying changes, you will see the following message. Click **Yes** to save your changes.



Now that you have added Dr. Green as a valid reading physician tag value, you can configure a tag rule to control the routing of images to Dr. Green (continue with the next topic).

NOTE: If you want to set up Tag Rule Routing based on a DICOM tag that is not currently available under DICOM Tag Customization, you can add a new DICOM tag. For an example of how to do this, refer to the topic *Add a Tag* on page 164.

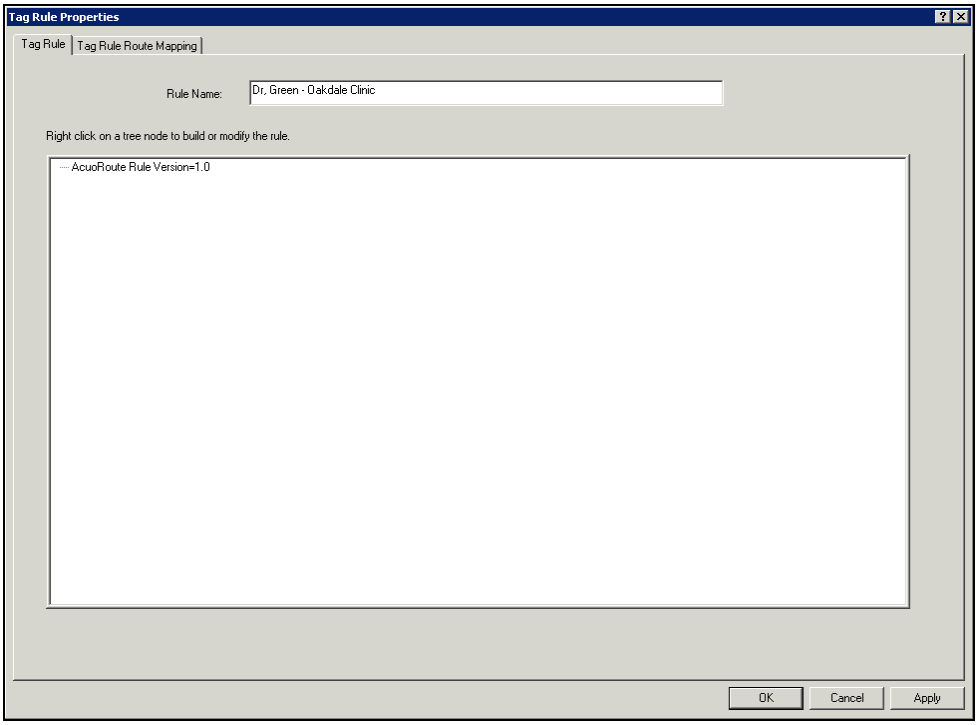
Configure Tag Rule Routing

Next we will create a tag rule that will check for images to Dr. Green that are HEAD scans. If it is either Wednesday or Friday and if the image is from the CT scanner modality, the image will be routed to the ViewStationOnly route at the Oakdale Clinic.

To set up a new tag rule, follow these steps:

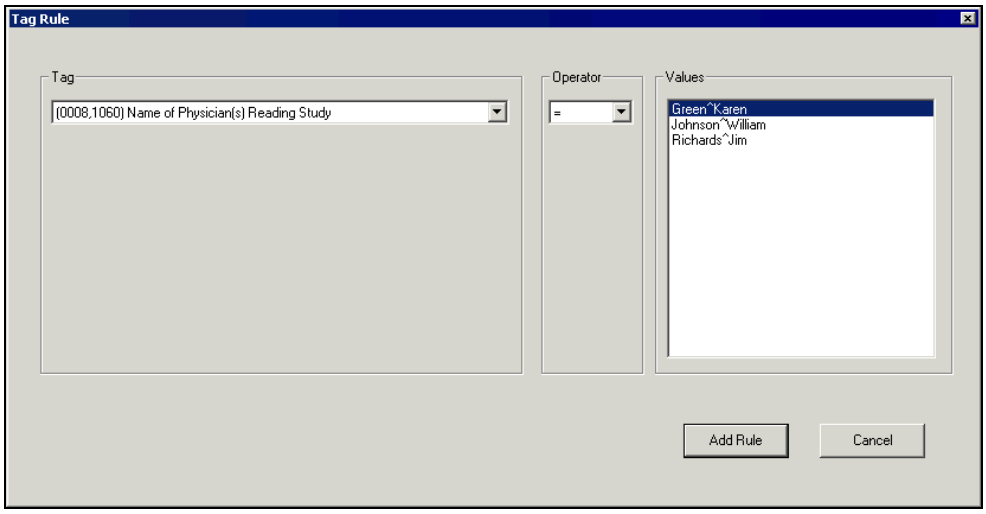
1. Expand the console tree as follows: AcuoMed Image Manager→AcuoMed Server→DICOM Configuration→Tag Rules.
2. Under Tag Rules, right-click **Routing Tag Rules** and select **New→New Tag Rule**.

   The Tag Rule Properties dialog displays.



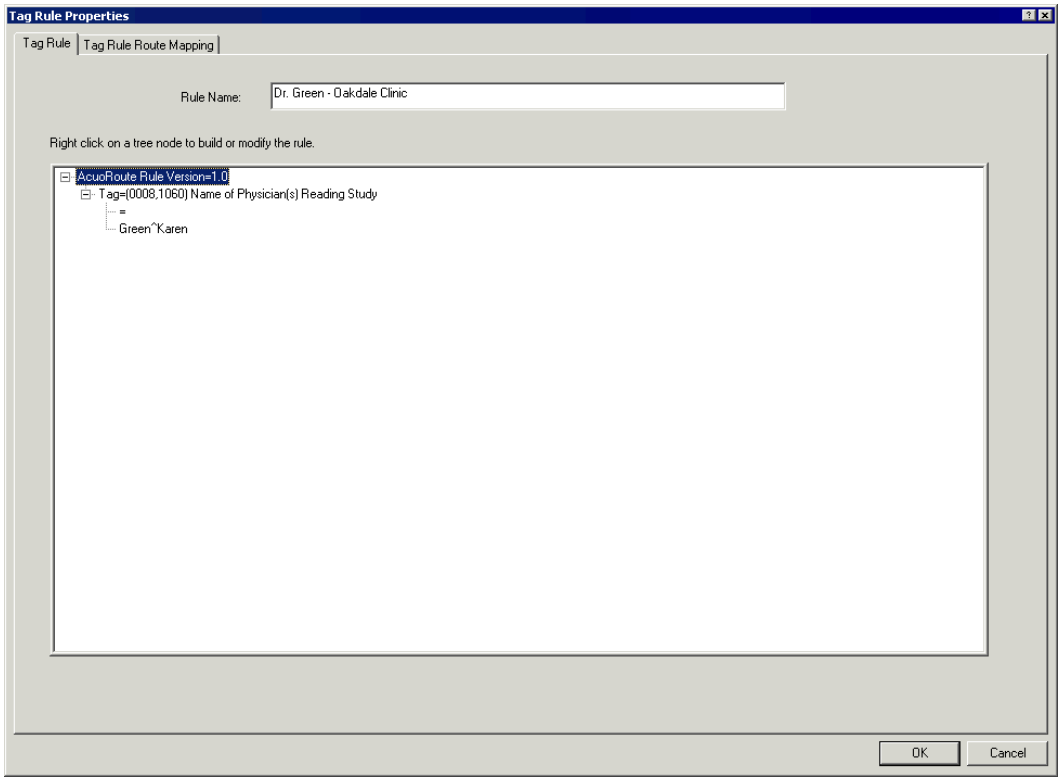
3. Type a Rule Name in the text box.

   We are naming the rule "Dr. Green – Oakdale Clinic" in our example.
4. Right-click **AcuoRoute Rule Version=[number]** and select **New Tag Rule** to begin building the new rule.
5. In the Tag Rule dialog that displays, do the following to build the first rule:
   - Select a Tag from the drop-down list (**Name of Physician(s) Reading Study** in our example).
   - Select an operator if needed (in our example, the default **=** is the only choice).
   - Select a tag value from the Values list (**Green^Karen** in our example).

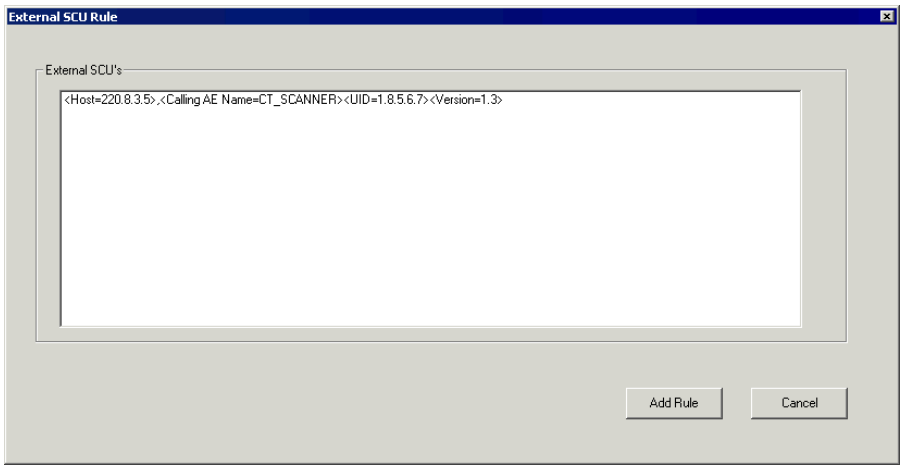


NOTE: If you want to set up Tag Rule Routing based on a DICOM tag that is not currently available under DICOM Tag Customization, you can add a new DICOM tag. For an example of how to do this, refer to the topic *Add a Tag* on page 164.

6. Click **Add Rule** to add the new rule to the tag rule you are building.

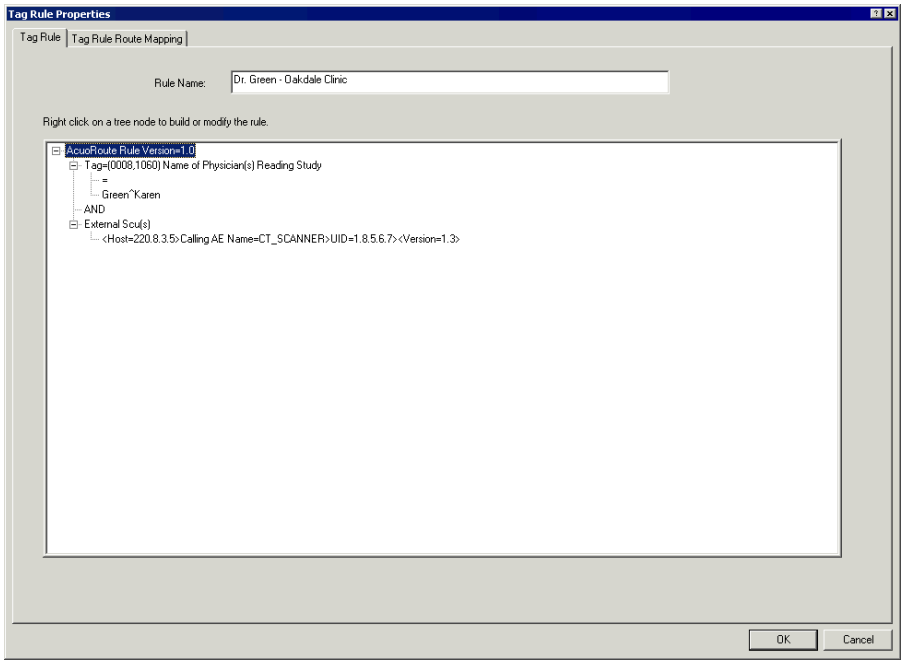


7. Right-click the new rule **Tag=Name of Physician(s) Reading Study** and select **Insert External SCU Rule→ (selected rule) AND (new rule)**.



8. Select the item **<Host=220.8.3.5>,<Calling AE Name-CT_Scanner>…** (the only available External SCU in our example configuration).

9. Click **Add Rule** to add the new rule to the tag rule you are building.



This new rule will limit incoming DICOM messages to the CT Scanner external SCU source we just specified.

10. Right-click the new rule **External SCU(s)** and select **Insert Tag Rule→(selected rule) AND (new rule)**.

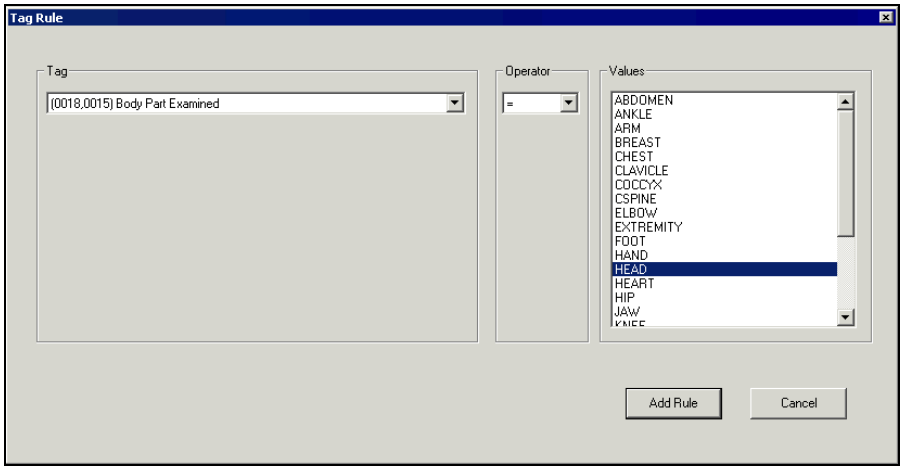
Note: The four available options on the pop-up menu for adding a rule behave as follows:

- **(selected rule) AND (new rule)** – causes the new rule to be added after the selected rule in the rule tree. The selected rule will be evaluated against the new rule via a Boolean AND.
- **(new rule) AND (selected rule)** – causes the new rule to be added before the selected rule in the rule tree. The new rule will be evaluated against the selected rule via a Boolean AND.
- **(selected rule) OR (new rule)** – causes the new rule to be added after the selected rule in the rule tree. The selected rule will be evaluated against the new rule via a Boolean OR.

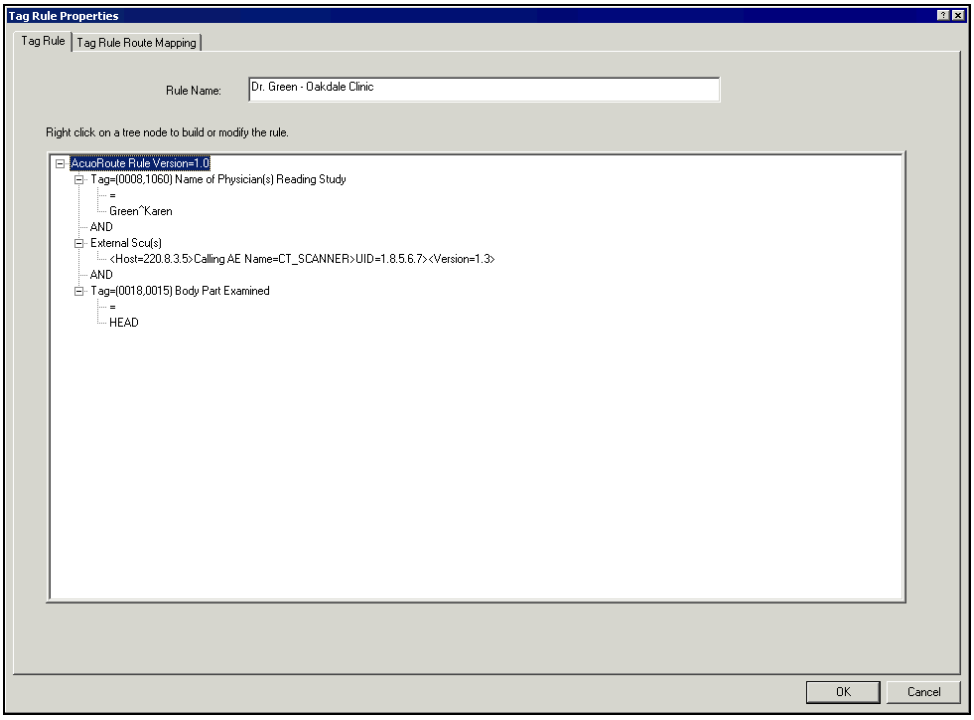
- **(new rule) OR (selected rule)** – causes the new rule to be added before the selected rule in the rule tree. The new rule will be evaluated against the selected rule via a Boolean OR.

The rule tree is evaluated from top to bottom. Evaluation stops at the point that any rule fails (causing the overall rule to fail).

11. In the Tag Rule dialog that displays, do the following to build the next rule:
    - Select a Tag from the drop-down list (**Body Part Examined** in our example).
    - Select an operator if needed (in our example, the default **=** is the only choice).
    - Select a tag value from the Values list (**HEAD** in our example).



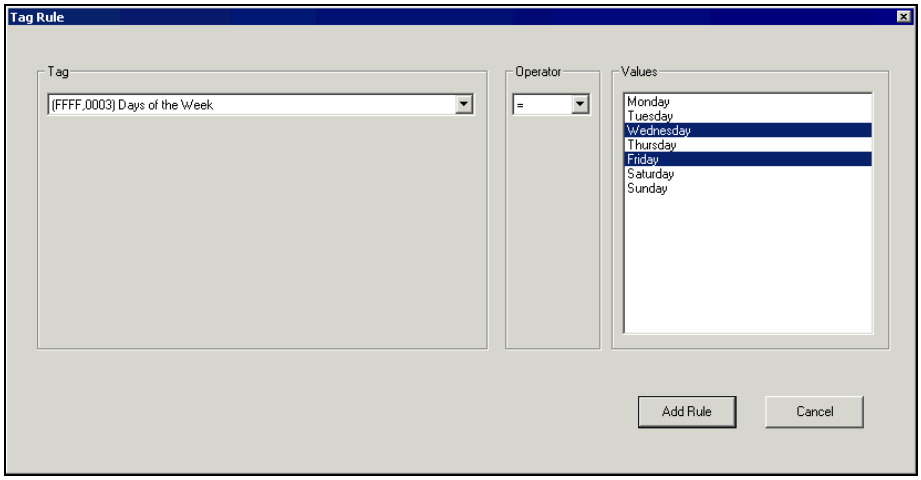
12. Click **Add Rule** to add the new rule to the tag rule you are building.



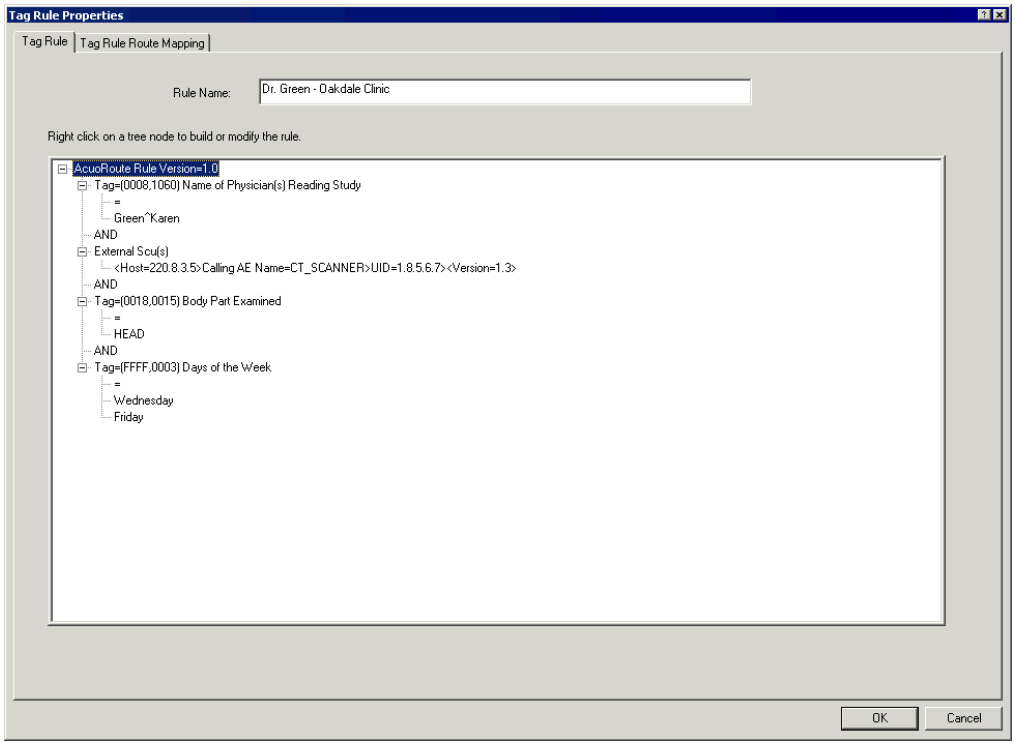
13. Right-click the new rule **Tag = Body Part Examined** and select **Insert Tag Rule→(selected rule) AND (new rule)**.

14. In the Tag Rule dialog that displays, do the following to build the next rule:
    - Select a Tag from the drop-down list (**Days of the Week** in our example).

- Select an operator if needed (in our example, the default **is =**).
- Select tag value from the Values list (**Wednesday** and **Friday** in our example). Press and hold the **Ctrl** key and click to select multiple values.



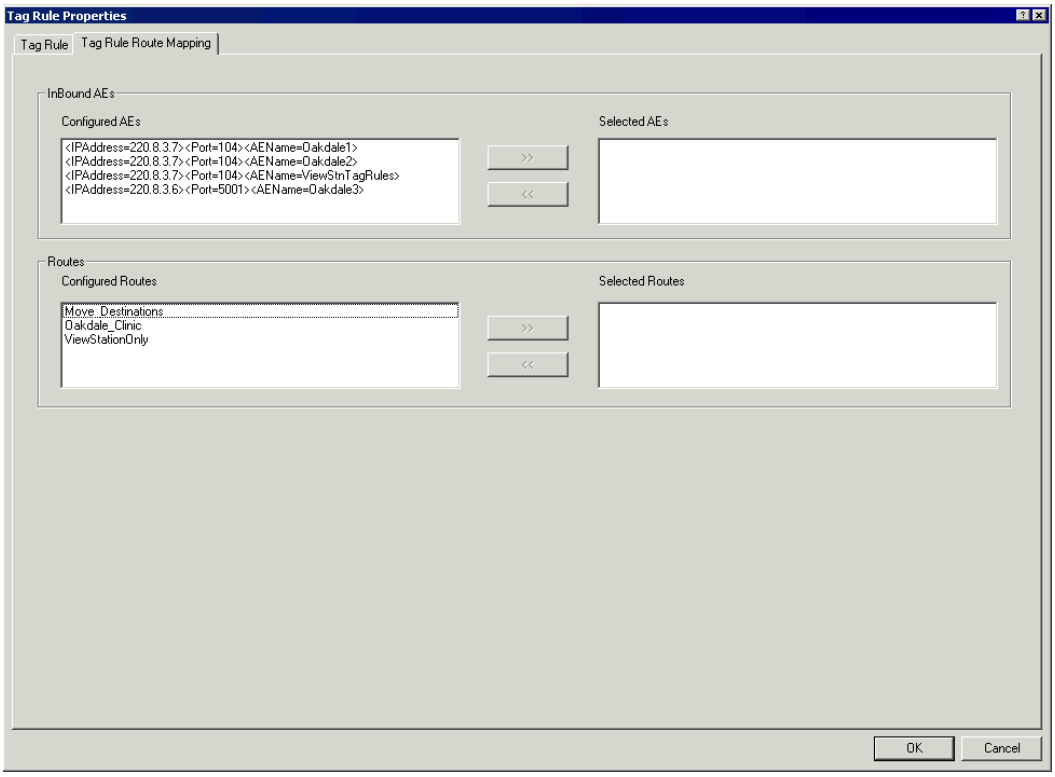
15. Click **Add Rule** to add the new rule to the tag rule you are building.



This “Days of the Week” rule will evaluate TRUE if it is either Wednesday OR Friday.

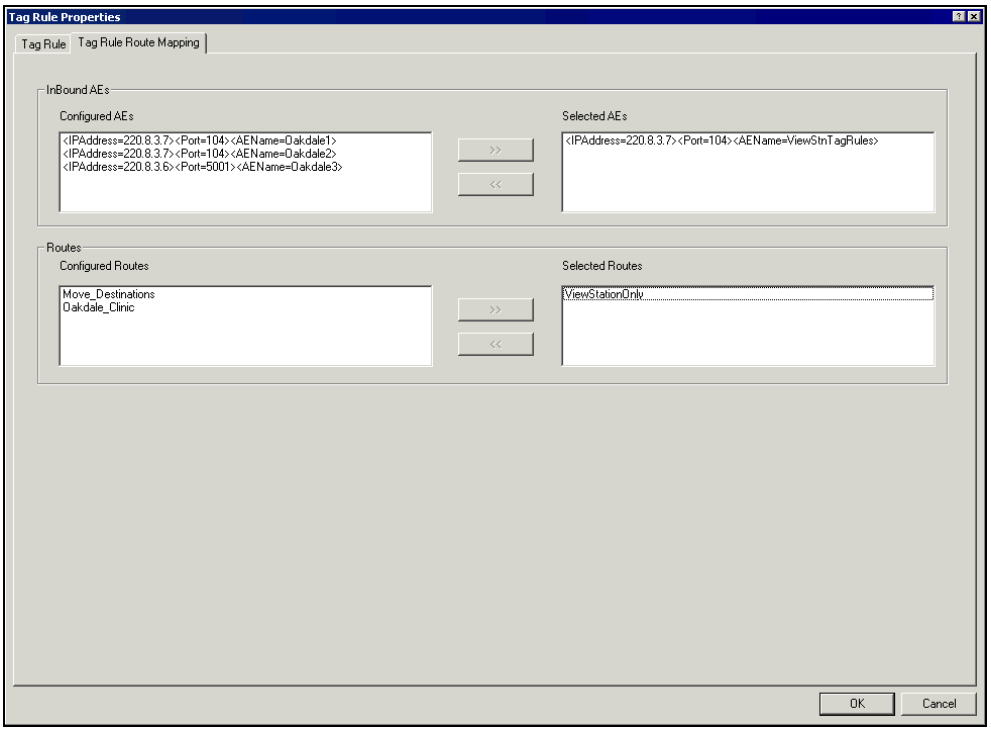
We now have completed building our tag rule to filter HEAD images from the CT Scanner for Dr. Green on Wednesdays and Fridays. But we still need to specify the destination routing that is associated with the rule (see the following steps).

16. Click the **Tag Rule Route Mapping** tab.



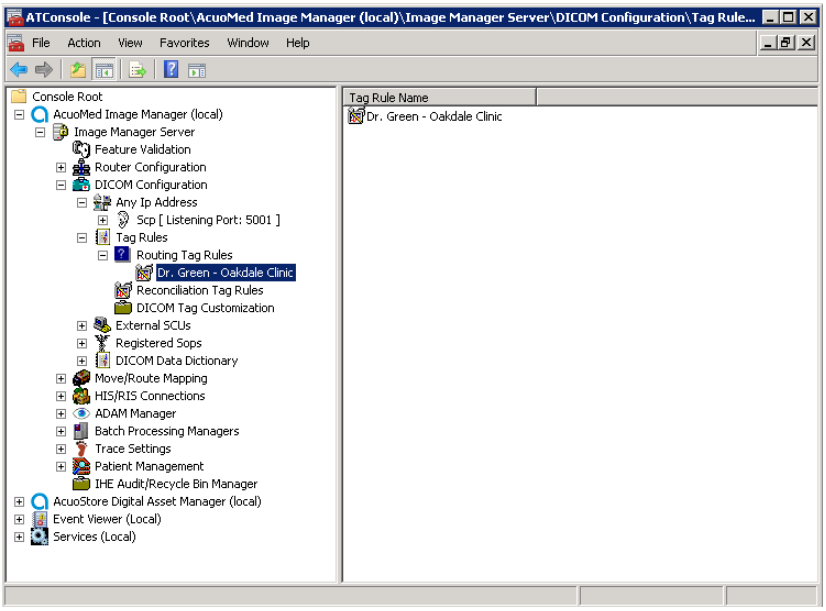
17. Make the following selections to configure Inbound AEs and Routes.

    - Select one or more Inbound AEs by moving them from the Configured AEs list to the Selected AEs list – in our example, **<IPAddress=220.8.3.7><Port=104><AEName=ViewStnTagRules>**. This selection limits the AE name(s) that inbound messages can go to, but does not limit the sources (modalities) that can send messages.
    - Select one or more Routes by moving them from the Configured Routes list to the Selected Routes list – in our example, **ViewStationOnly**. This selection specifies the destination(s) that images will be routed to if the tag rule evaluates as TRUE.

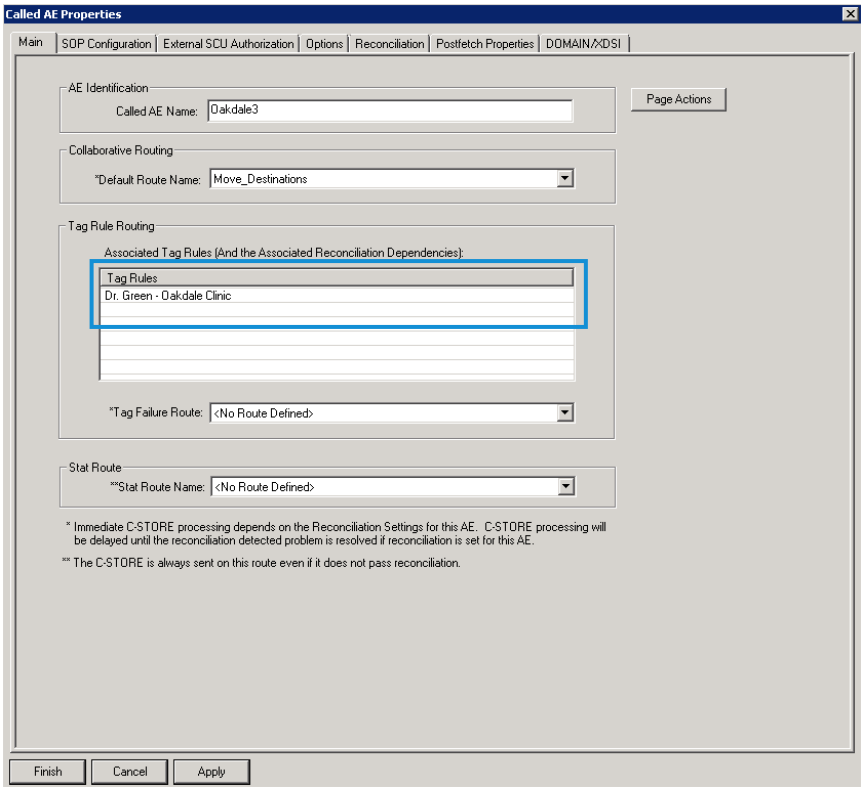


18. Click **OK** to complete and save the new tag rule.

The newly created tag rule appears under Routing Tag Rules in the console tree and in the right pane.



The rule also appears under the DICOM configuration for the rule associated SCP/AE. In our example below, you will notice no default route or tag failure route is configured, therefore, only if the rule passes will the data be delivered to the destinations configured on the Tag Rule. If for example a default route was configured in conjunction with the tag rule routing, the data would always to be delivered to the destinations on the default route and only delivered to the destinations on the route associated with the rule passing.



There may be cases when you want to set up a tag rule based on a DICOM tag that is not in the list of DICOM tags that is preset when you install AcuoMed. In this case, you can add a tag value to be used in your tag rules (refer to the next topic). If no collaborative Route is selected, a Tag Failure Route must be defined.

Add a Tag

AcuoMed is preset with a number of DICOM tags that Acuo Technologies feels will be useful for most of your tag building needs. Advanced users can add other tags to be used for tag rule routing control as needed. In the following example, we will add a tag for Smoking Status.

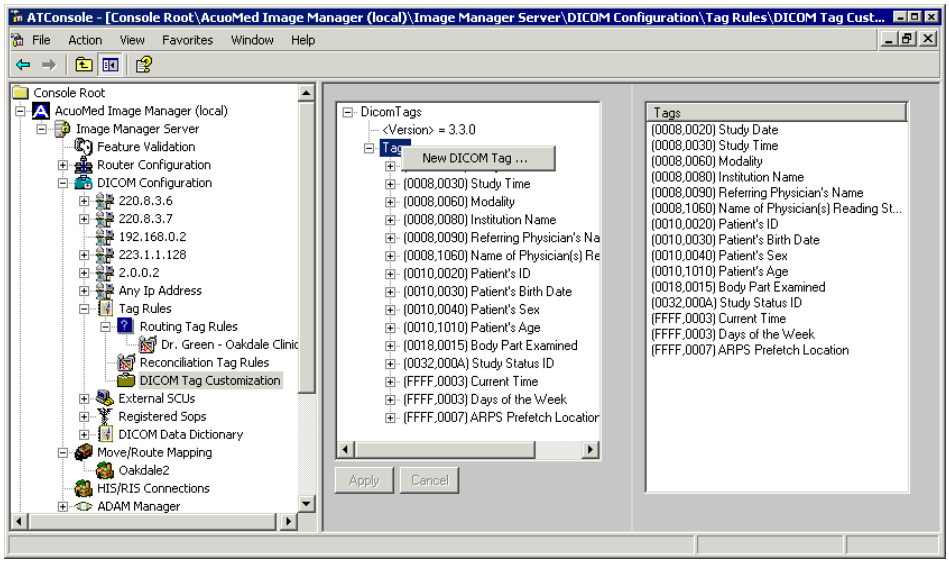
To add a DICOM tag, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→AcuoMed Server→DICOM Configuration→Tag Rules.

2. Under Tag Rules, click **DICOM Tag Customization**.

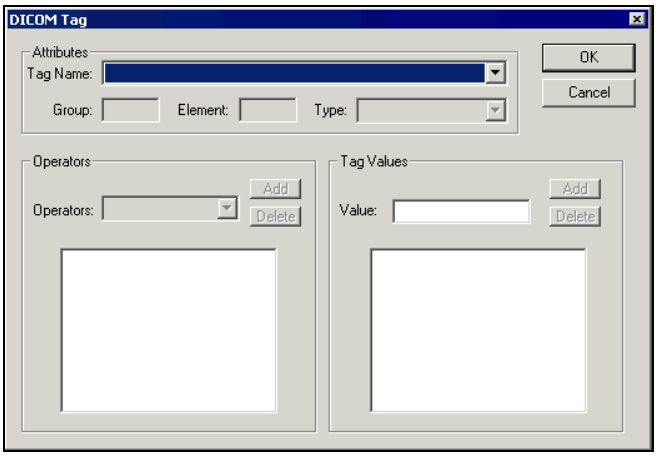
3. In the right pane, expand DicomTags and then click **Tags**.

   The currently available tags display in the Tags list to the far right.



4. Under DicomTags, right-click **Tags** and select **New DICOM Tag**.

   The DICOM Tag dialog displays.



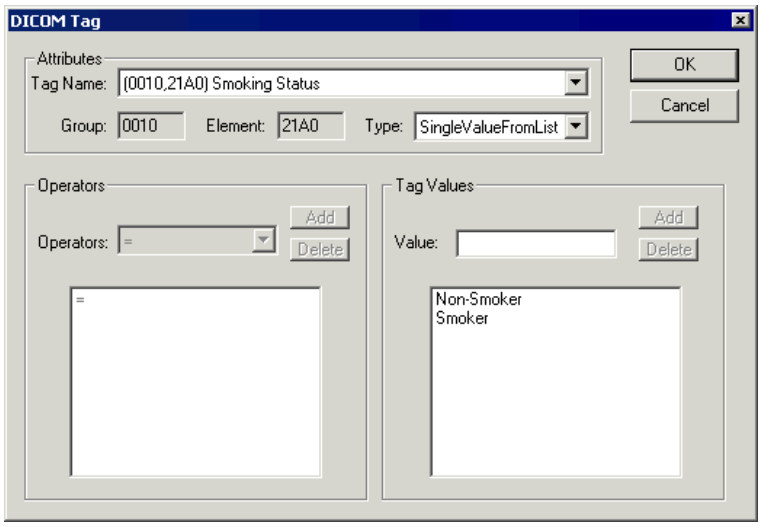
5. Enter the following information in the DICOM Tag dialog.

NOTE: The Group and Element fields are automatically populated from the Standard Data Dictionary.

- **Tag Name** – Click the **Tag Name** list and select the tag to add.
- **Type** – select a data type from the drop-down list (StringValueFromList in our example).

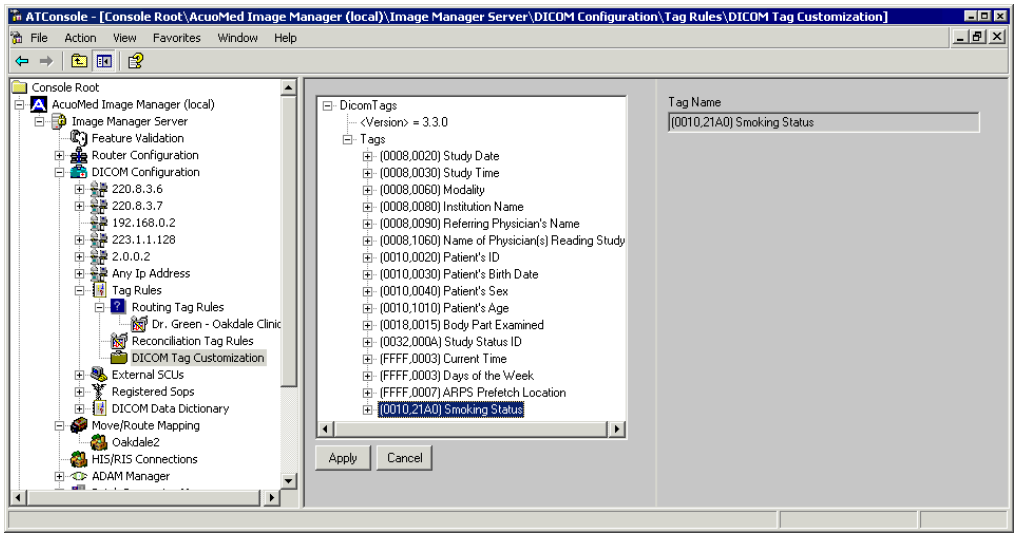
- **Operators** – the appropriate operators default based on the Type selection (if applicable).
- **Tag Values** – add the valid tag values by typing them in the Tag textbox and clicking **Add** for each one. ("Smoker" or "Non-Smoker" in our example).

Here is the completed DICOM Tag dialog for our example:



6. Click **OK** to add the new tag.

The newly added tag displays in the right pane under DicomTags→Tags.



7. Click **Apply** to save the changes.

The new tag "Smoking Status" is now available for building tag rules to control image routing.

NOTE: A HIS/RIS-connected AcuoMed Server is able to derive DICOM tag information from HIS/RIS events and save this information in an XML database maintained by AcuoMed. The gathered information feeds directly into DICOM tag rule customization. This automatic process saves the time and work of having to manually build all this custom tag information and avoids related data entry errors. AcuoMed can then propagate this information throughout the enterprise. For more information, refer to *Automatic Building and Updating of Tag Data from HIS/RIS Events* on page 276.

Department Server Configuration Summary

Figure 44 shows a summary of the AcuoMed Department Server configuration that we have built up to this point. The next step in our configuration example is to configure the deep-end AcuoMed Server (the procedures for this process start on page 167). Please note that this sample shows a few additional items, such as a database, required for the Reconciliation feature configuration.

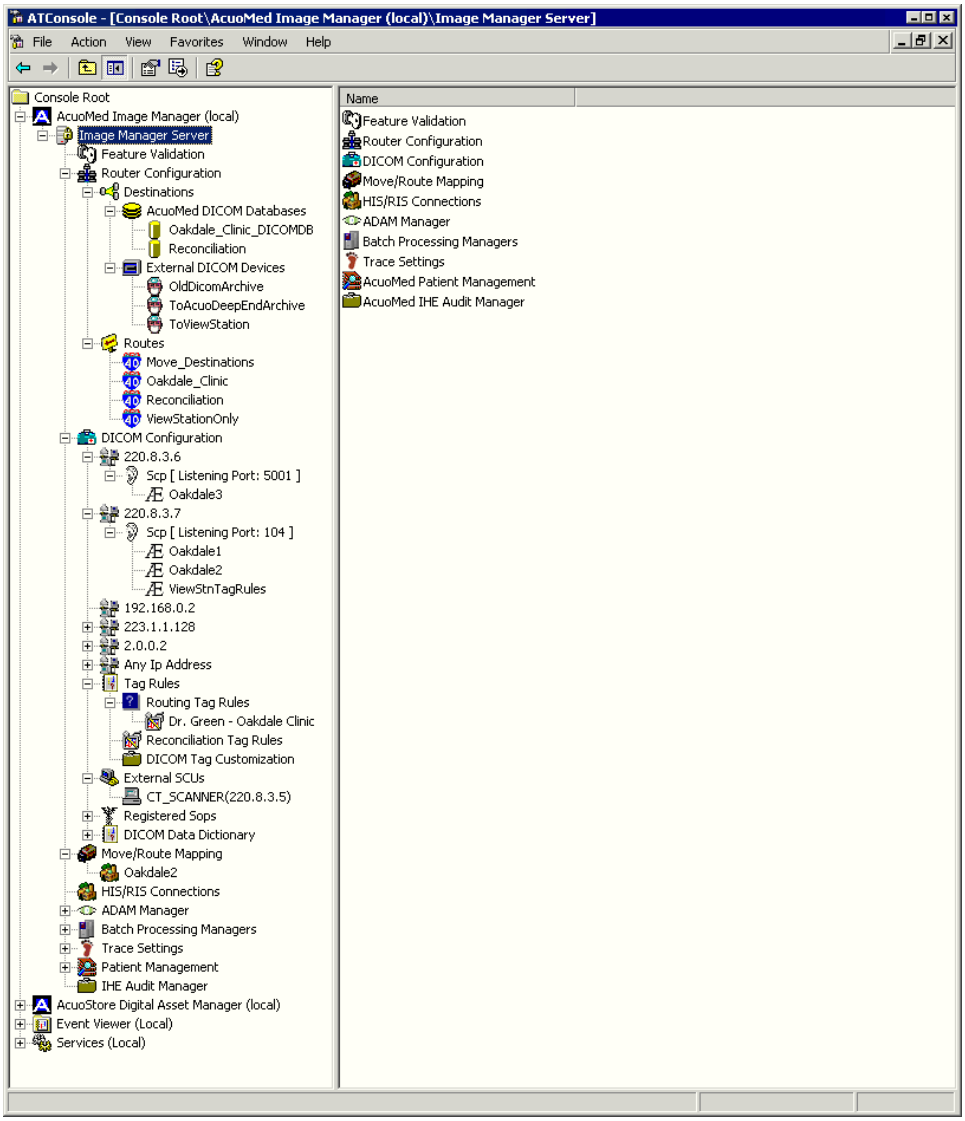


Figure 44: Department Server configuration summary

Restart Required After Configuration

After you have made any configuration changes, you must restart the AcuoMed service in order for these changes to take effect. For the procedure of how to do this, refer to the topic *Restarting the AcuoMed Service After Configuration* on page 185.

Configure the Deep-End AcuoMed Server

In our configuration example, there is a deep-end AcuoMed Server located at a centralized location (the hospital). This deep-end server provides the deep-level archiving function for images originating at the clinic. In order for the AcuoMed Server at the clinic to be able to communicate with the AcuoMed Server at the hospital, it is necessary to configure an AcuoMed Server at the hospital that will function as the deep-end server.

Figure 45 shows our starting point at the deep-end AcuoMed Server before any configuration begins.

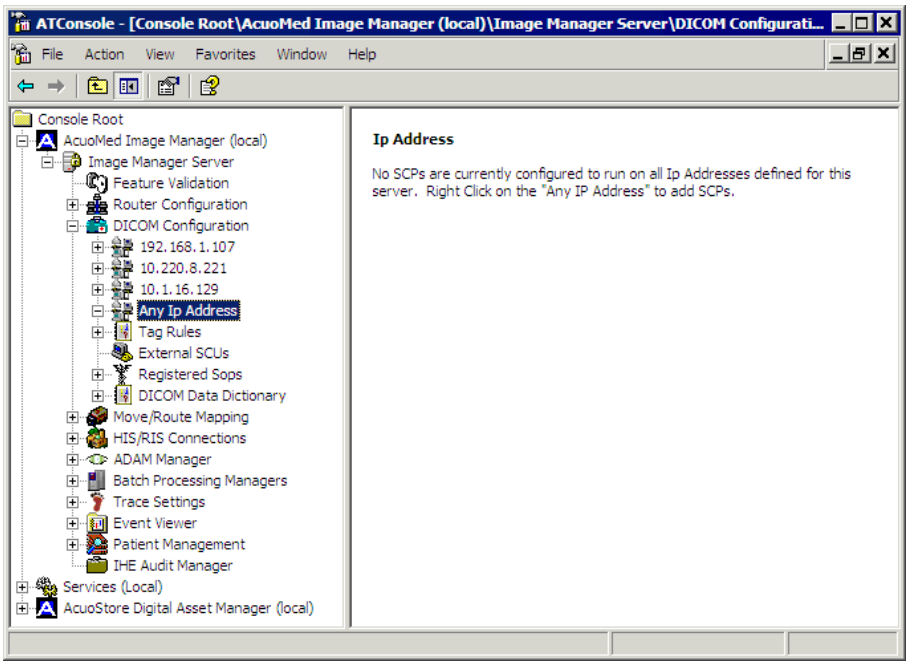


Figure 45: Remote server configuration starting point

Configuring the deep-end server involves the following procedures:

- Configure the deep-end AcuoMed Server (see page 168)
- Add a New AE Name (source) for the deep-end Server route (see page 168)
- Add an AcuoMed DICOM Database and Local Route Destination to the Deep-End Server (see page 169)
- Add a Route to the Deep-End Server (see page 174)
- Create a Connection from the Deep-End Server to the Clinic (see page 176)
- Add a New Route Definition to Clinic Move Destinations (see page 180)
- Set up Move/Route Mapping for the Deep-End Server (see page 183)

The following topics show the procedures needed to configure the deep-end server in our configuration example.

NOTE: Refer to the Glossary in this manual for configuration terminology definitions.

Configure the deep-end AcuoMed Server

For examples, see *Configure the Acuo Deep End Archive* on page 113

Add a New AE Name (source) for the deep-end Server route

For examples, see *New AE Name* on page 138.

In our example, we will enable encryption at this AE level.

Continue with the next topic to add an AcuoMed DICOM database and local route destination to the deep-end server.

Add an AcuoMed DICOM Database and Local Route Destination to the Deep-End Server

The next task in deep-end server configuration is to add an AcuoMed DICOM database and local route destination to the deep-end server. This local route destination is required to access the deep-level tape archive that is connected to the deep-end server.

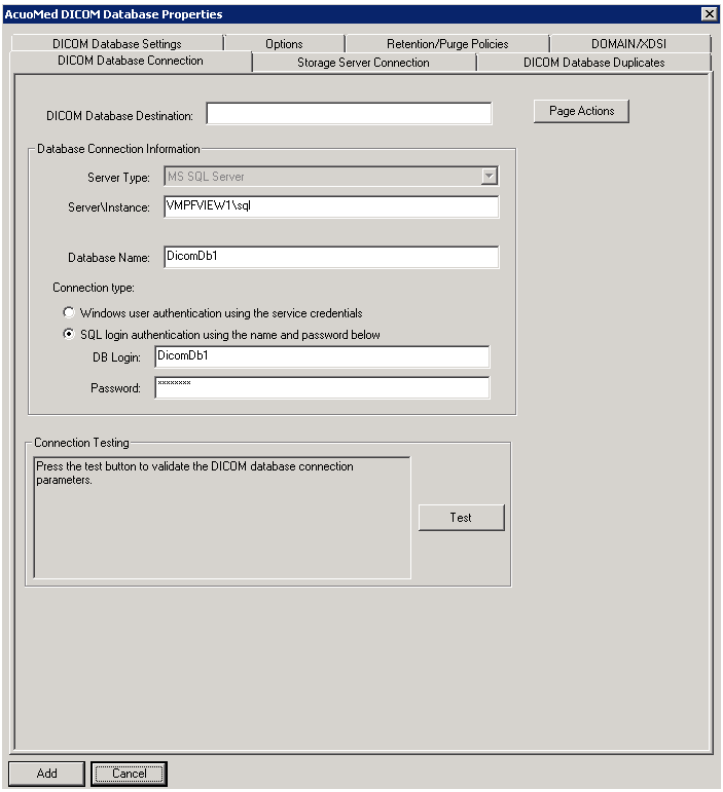
To install an AcuoMed DICOM database follow the procedure on page 84, *Installing an AcuoMed Database*.

To add the local route destination to the deep-end server, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ Image Manager Server→ Router Configuration→ Destinations.

2. Under Destinations, right-click **AcuoMed DICOM Databases** and select **New→ AcuoMed DICOM Database Destination**.

   The AcuoMed DICOM Database Properties dialog displays with the DICOM Database Connection tab selected.



3. Set up a new database connection to the database for the particular application (Oakdale_Clinic in our example).

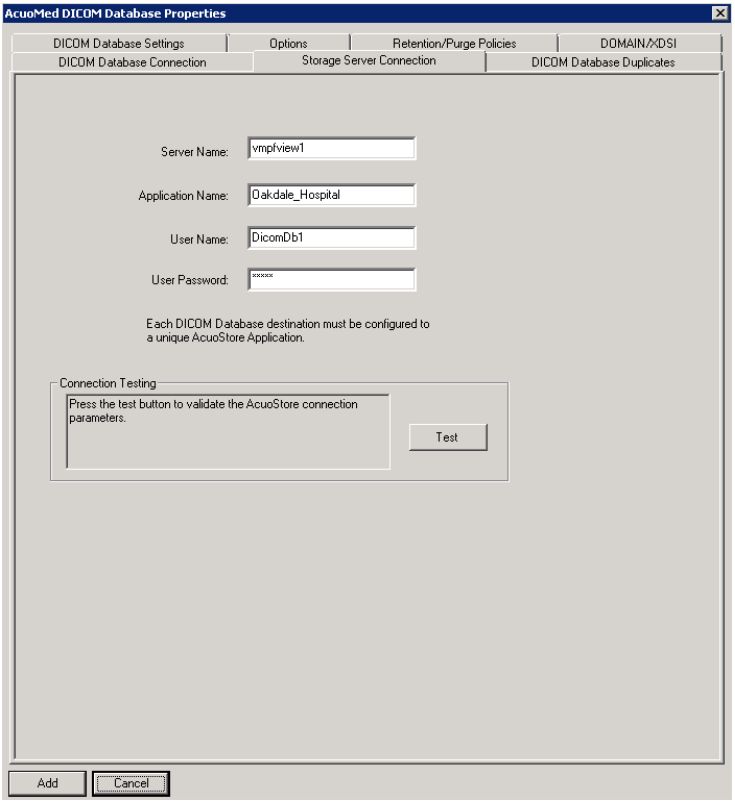
   - Type the Database Name (DeepEndAtOakdaleHospital).
   - Enter the Database Connection Information including the server Type, Server Name, and Database Name.
   - Choose Connection Type:
     - Type the Database Login that includes the Login and Password (these parameters were set up when the DICOM database was installed).

       OR

     - Select Windows User Authentication to use the current user's Windows credentials.
   - Click **Test** to validate the DICOM database connection. If the connection is not successful, check and change your database connection parameters and test the connection again.

4. Click the **AcuoStore Connection** tab and set up the AcuoStore connection.

   This is how you set up the mapping between the local DICOM database and the AcuoStore application.

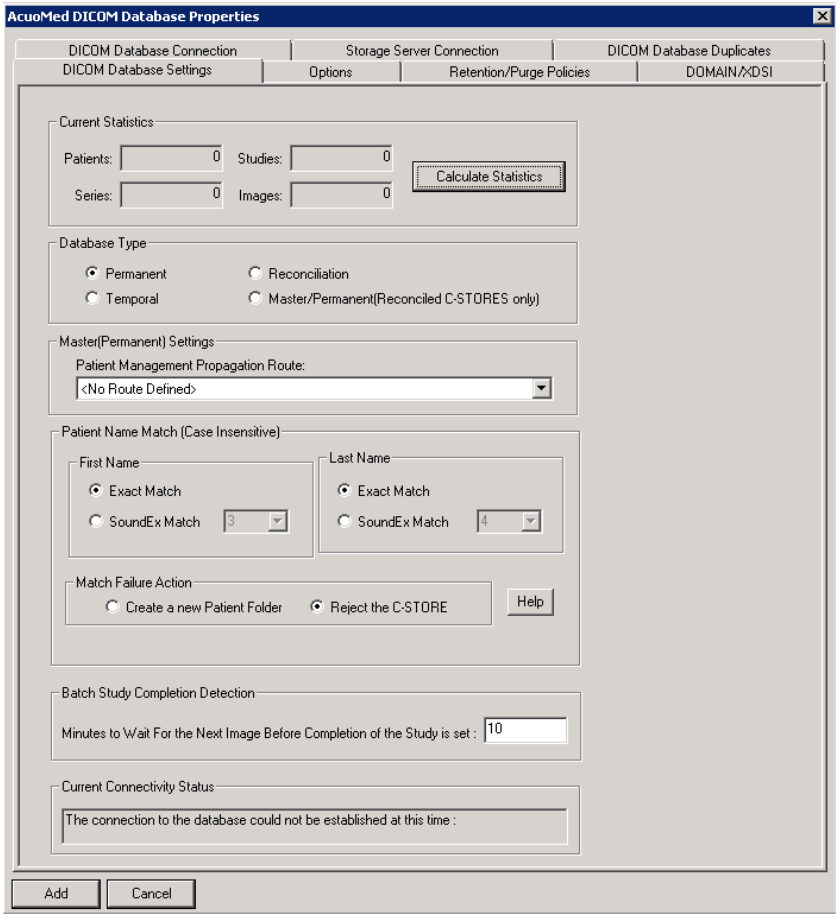


- Type the Server name only if AcuoStore is located on a different server.
- Type the Application Name (Oakdale_Hospital in our example).

NOTE: Each AcuoMed DICOM Database on an AcuoMed Server must use a different AcuoStore Application.

- Type the User Name (DicomDB1 in our example).
- Type the User Password.
- Click **Test** to validate the AcuoStore connection parameters. If the connection is not successful, check and change your AcuoStore connection parameters and test the connection again.

5. Click the **DICOM Database Settings** tab and set up these parameters.



There are four types of databases.

a) **Permanent**: This type of database can maintain both unreconciled and reconciled data indefinitely.

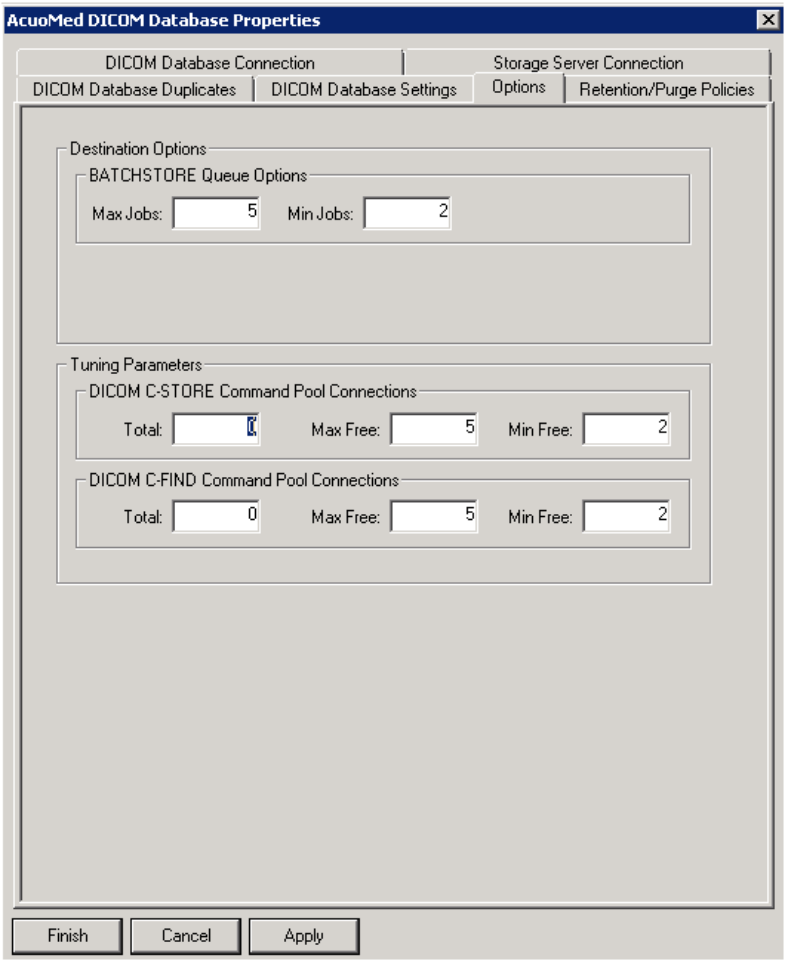
b) **Temporal**: A database type in which a pruner can be scheduled to delete data based on a high water mark.

c) **Reconciliation**: This database type is used for temporary storage of unreconciled data enabling an administrator to manage the reconciliation events.

d) **Master/Permanent**: A database type used in concert with Acuo's reconciliation feature and maintains reconciled or clean data, indefinitely.

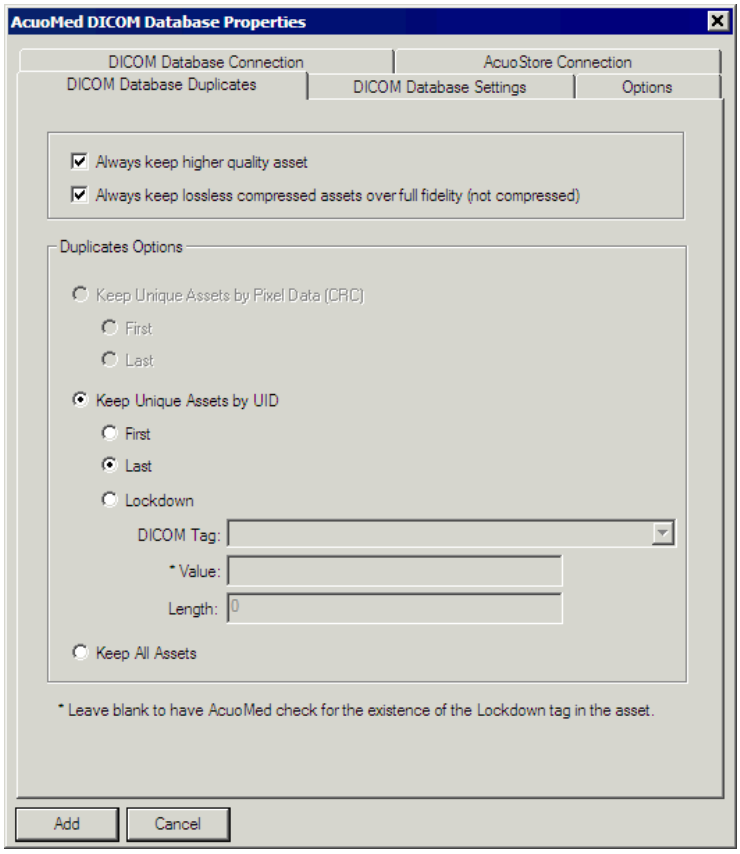
- Since the database you are setting up is a deep-level archive, be sure that the **Permanent** database type is checked.

6. Click the **Options** tab and configure the BATCHSTORE Queue Options and database connection pools.

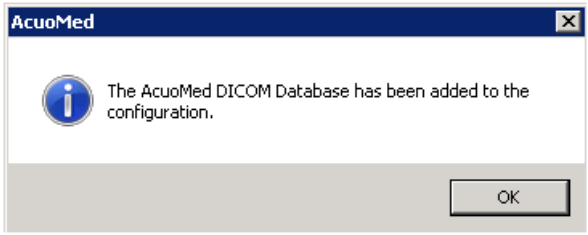


- **BATCHSTORE Queue Options** allow you to configure a maximum and minimum number of jobs that will run for each destination. The destination in this example is the database Oakdale_Hospital. The anti-starvation logic ensures that Batch Store jobs are not starved out of running queued jobs under normal operations. The default settings are indicated in the above figure.
- **Tuning Parameters** allow you to pre-allocate a number of database connections for improved performance. A Max Connections value of 0 = unlimited connections. Acuo Technologies recommends using the default settings as noted above. If you want to change the Tuning Parameters values, please contact Acuo Technologies for assistance.

7. Click the DICOM Database Duplicates tab to set up your preference for handling duplicate Images as they are stored to the Acuo system. In our example, we have kept the default setting. Please Refer to Duplicates Processing on page 38 for additional information on setting up Duplicates Processing.



8. Click **Add** to complete set up and add the AcuoMed DICOM Database to the deep-end server configuration.



Continue with the next topic to add a local route definition to the deep-end server.

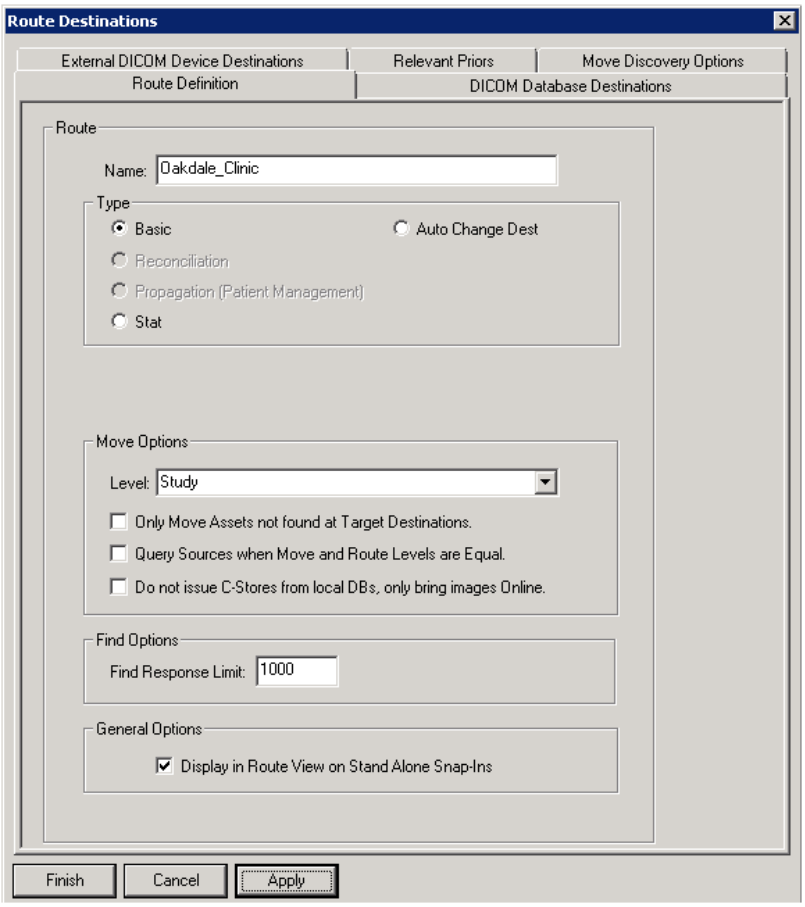
Add a Route to the Deep-End Server

The next task in deep-end server configuration is to add a route to the deep-end server. This route is required to extend the Oakdale_Clinic route configured on the AcuoMed Server at the clinic. Extending this route through the deep-end server makes it possible for the Oakdale_Clinic route to access the deep-level tape archive connected to the deep-end server. In the previous topic, we configured a local route destination for the deep-level tape archive named DeepEndAtOakdaleHospital. In this procedure we will associate that Acuo destination with the Oakdale_Clinic route to extend the route to the deep-level archive (see callout **C6** in Figure 40).

To add a route to the deep-end server, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Router Configuration→ Routes.
2. Right-click **Routes** and select **New→ New Route Name**.

   The Route Destinations dialog displays with the Route Definition tab selected.



3. On the Route Definition tab, type the Route Name for the route you are setting up (Oakdale_Clinic in our example).
4. Select a route type.
   - Basic – the default route type appropriate for most routes (and the one selected for our example here).
   - Reconciliation – the route to the Reconciliation database.
   - Propagation (Patient Management) – a route used for propagating updates from a Master/Permanent Database to other AcuoMed Servers.
   - Stat – a static route. Set up a route of this type when you want assets sent to the route destinations regardless of whether or not those assets pass reconciliation.

- Auto Change Dest – Used in conjunction with the Auto Change Destination functionality. Only one route of this type is supported. Routes of this type have a "Source Clients" tab where users can select which AcuoMed DICOM databases and External DICOM devices will have their stores re-routed in the case of a UID Failure. Multiple Source Clients may be selected.

5. Select a Move Level from the drop-down list.

   The Move Level specifies the level at which the device(s) on a route will process a move operation (patient, study, series, or image). Refer to *Figure 42: Route Move Levels* on page 118 for more information.

6. Set a Find Response Limit.

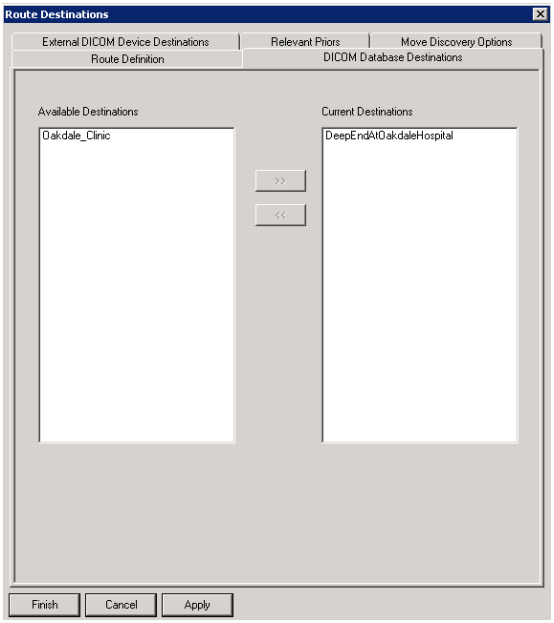
   The default value is 1,000 Find Responses returned on a Find Request.

7. Check 'Display in Route View on Stand Alone Snap-Ins' (this is checked by default)

   This will make the route available to your client users.

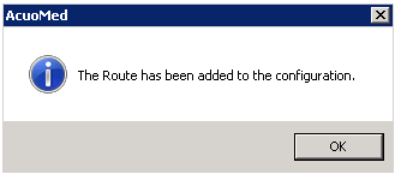
NOTE: Not all devices support all move levels. Please refer to the device conformance statement for more information.

8. Click the **AcuoMed DICOM Database Destinations** tab and set up the DICOM database destination for the route.



- Move one AcuoMed DICOM Database from the Available Acuo Destinations list to the Current Acuo Destinations list (DeepEndAtOakdaleHospital in our example).

5. Click **Add** to complete set up the route and add it to the deep-end server configuration.



NOTE: At this point in the deep-end server configuration, we have defined all the elements that are required to store images to the deep-level archive attached to the deep-end server. The following three procedures define the elements that are required to create the connection, route, and mapping that will allow images to be moved from the deep-end server back to destinations on the clinic's AcuoMed Server.

Create a Connection from the Deep-End Server to the Clinic

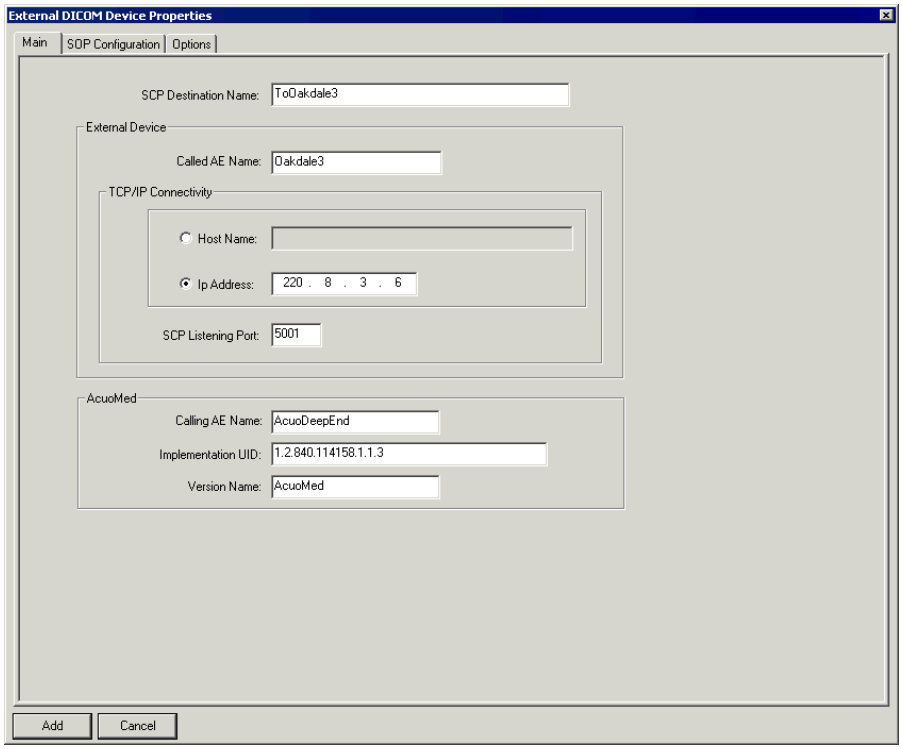
The next task in deep-end server configuration is to create a connection from the deep-end server at the hospital to the AcuoMed Server at the clinic. This connection will be used to move images from the deep-level archive at the hospital back to the AcuoMed Server at the clinic.

To create a connection from the deep-end server to the clinic, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Router Configuration→ Destinations.

2. Under Destinations, right-click **External DICOM Devices** and select **New→ New External DICOM Device**.

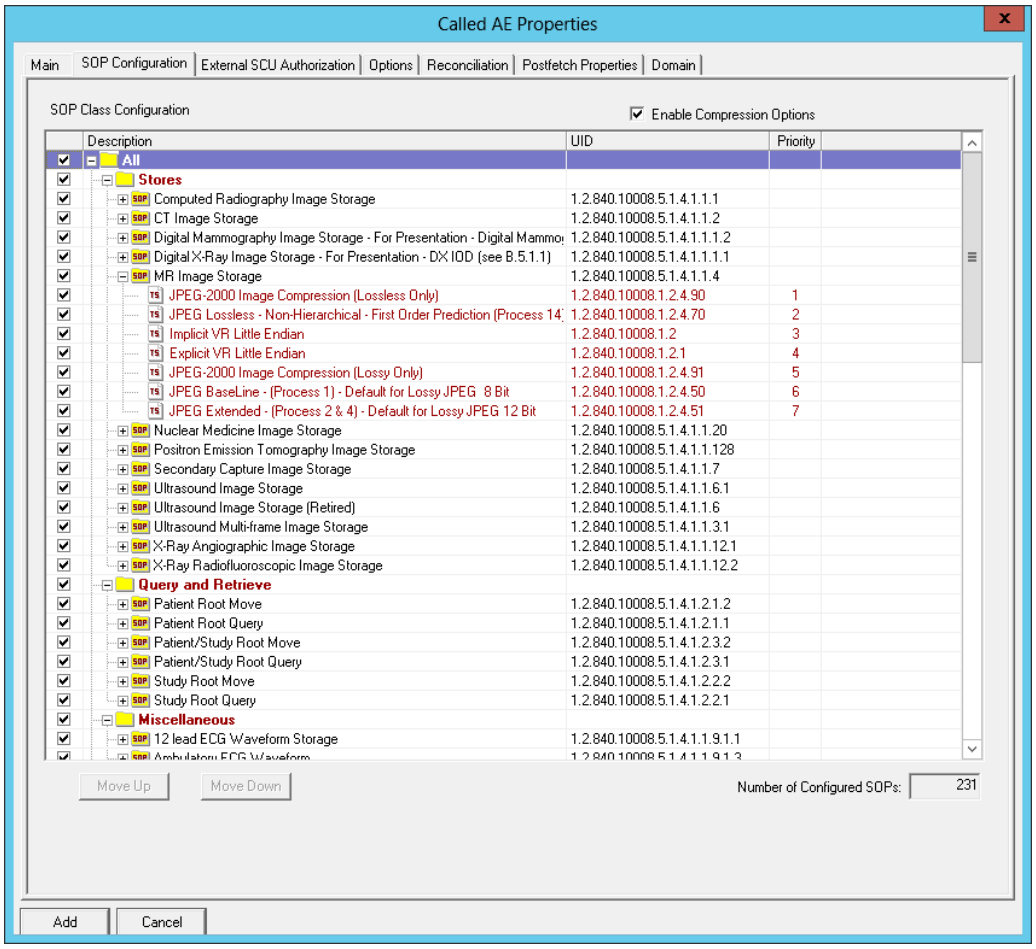
   The External DICOM Device Properties dialog displays with the Main tab selected.



3. Using the Main tab, set up the connection to the AcuoMed Server at the clinic (see callout **D2** in Figure 40).

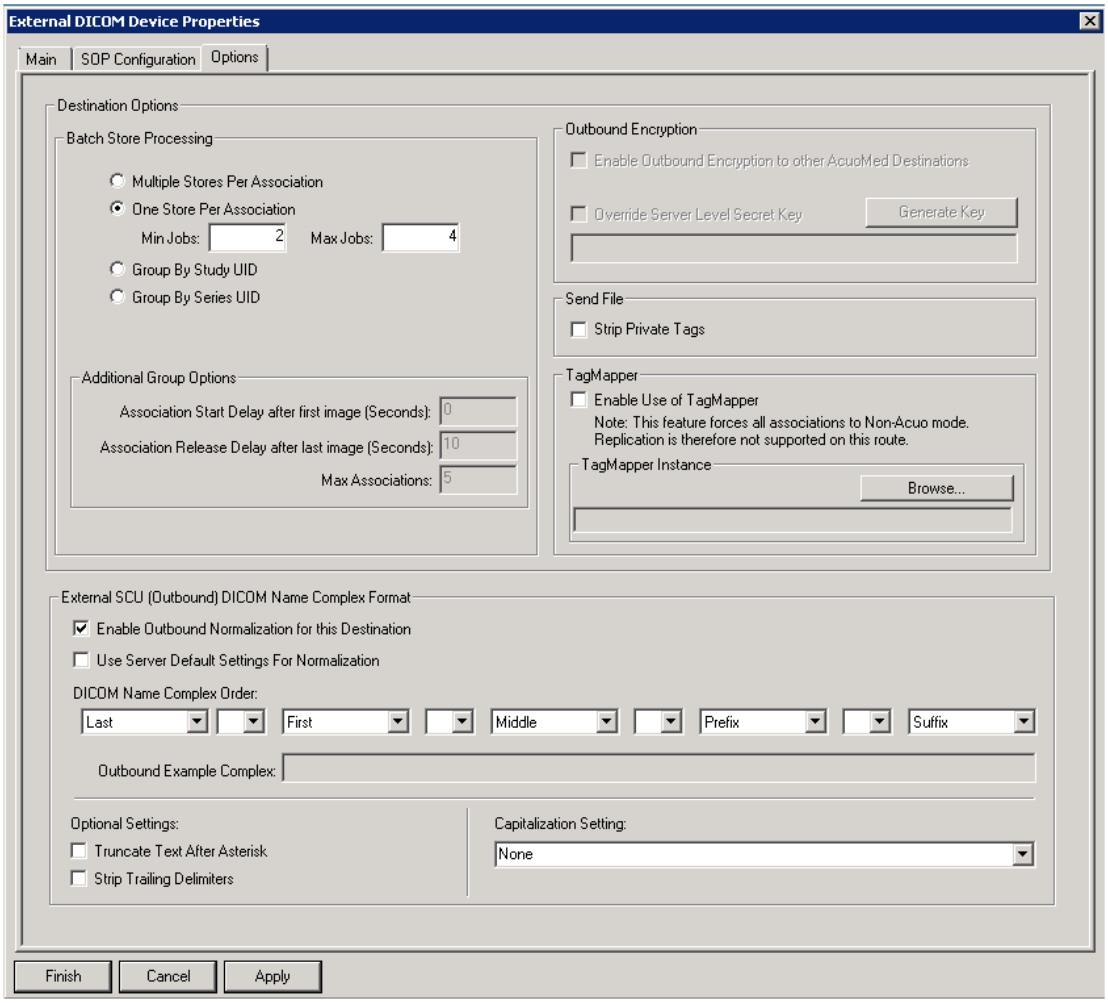
   - Type the SCP Destination Name (ToOakdale3 in our example).
   - Set up the External Device including the Called AE Name (Oakdale3).
   - Set up TCP/IP Connectivity by entering either a Host Name or an IP Address (220.8.3.6 in our example).
   - Enter the SCP Listening Port number (5001 in our example).
   - Set up AcuoMed including the Calling AE Name (AcuoDeepEnd in our example), the Implementation UID, and the Version Name. This is an example of using a Calling AE Name other than AcuoMed and using the default Implementation UID and Version Name values that apply to the AcuoMed Calling AE Name. The Calling AE that describes the Acuo Server can be helpful when viewing the Activity Log. A Calling AE name can be persisted by setting a value in the GUI under Image Manager Server → Properties → Options Tab. The DICOM standard AE Title Rules apply.

4. Click the **SOP Configuration** tab and set up the service object pairs.



- In this case, the External DICOM Device is an AcuoMed Server, so we have configured our example to accept all registered SOPs. We have also enabled the Compression Option.

5. Click the **Options** tab and set up these parameters.



Select a **Batch Store Processing** mode:

Multiple Stores Per Association – the destination is limited to establishing a single association with a device, but can then process a series of Store operations with that device. In other words, Stores are done in a serial fashion via a single association. This is the default mode of operation for performing Batch Store Processing with an External DICOM Device. All devices should support this mode.

One Store Per Association – the destination is capable of establishing multiple associations (4) with the same device and then processing a single Store operation concurrently on each of the multiple associations. In other words, Stores are done in a parallel fashion via multiple concurrent associations. This method increases throughput if the destination can operate this way. If you are transmitting data to another Acuo node, this mode is recommended.

Group By Study UID – Grouping by the same Study per association allows AcuoMed to deliver images as if it were emulating a modality. Some vendors work more efficiently and make decisions based on an association being opened and all of the images for that study being sent in the same association.

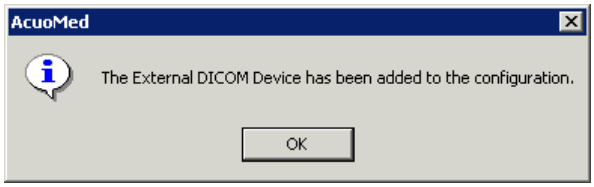
Group by Series UID – Grouping by the same Series per association allows AcuoMed to deliver images as if it were emulating a modality. Some vendors work more efficiently and make decisions based on an association being opened and all of the images for that Series being sent in the same association.

If the Group by Study/Series UID option is selected, the following "Additional Group Options" fields become active:

- **Association Start Delay** is the delay time before the outbound association is started.
- **Association Release Delay** is the time to wait for more images (in a study/series) before the association will be closed.
- **Max Associations** sets the maximum number of simultaneous associations that can be used for a particular destination (each association is unique by Study/Series UID) in the case multiple Studies/Series are awaiting delivery.

- **Outbound Encryption** is disabled upon installation. In our example, the receiving archive is an Acuo Archive, so we have enabled outbound encryption and will override the server level key. This key will also need to be configured on the Acuo Deep End Archive in order to accept the encrypted data. We will configure that later in this chapter. See Chapter two for more information on **Outbound Encryption**.
- **TagMapper** is disabled upon installation. In our example, we have left it disabled so no outbound Tag Mapping will be performed. For more information on TagMapper please reference the Acuo Tag Mapper User Manual.
- **External SCU (Outbound) DICOM Name Complex Format** is disabled upon installation. In our example, we have left it disabled, and so our data will be transmitted according to how it was stored. See Chapter two for more information on **Server level and External level Normalization**.

6. Click **Add** to complete set up of the AcuoMed Server External DICOM Device and add it to the configuration.



This completes the procedure required to create a connection from the deep-end server at the hospital to the AcuoMed Server at the clinic. Continue with the next topic to add a new route definition to clinic move destinations.

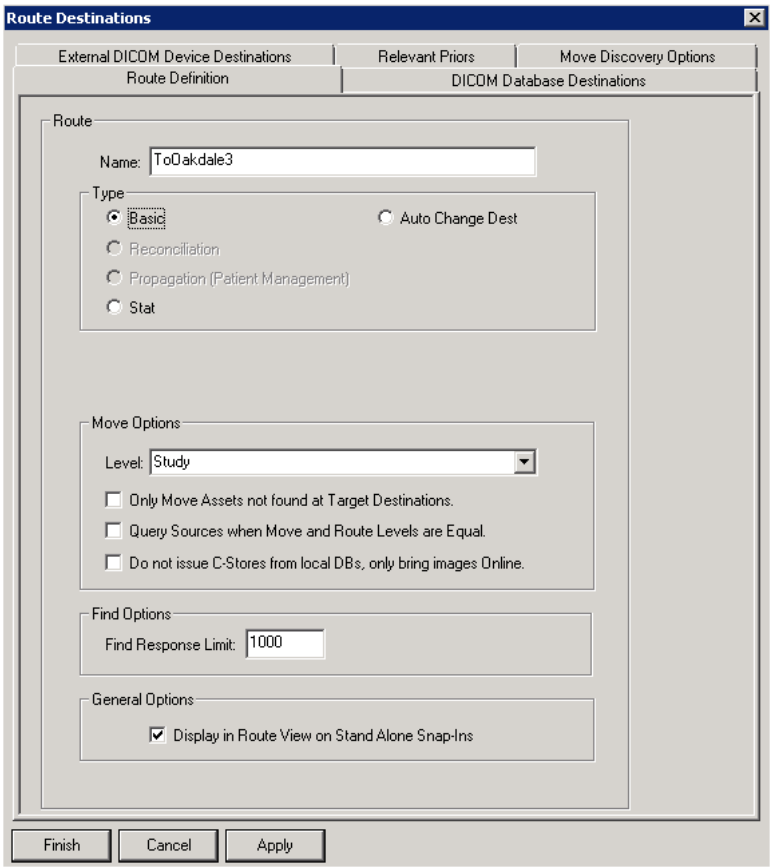
Add a New Route Definition to Clinic Move Destinations

The next task in deep-end server configuration is to add a new route definition from the deep-end server at the hospital to the AcuoMed Server's move destinations at the clinic (the local image cache and the view station). In the clinic's AcuoMed Server configuration earlier in this chapter, we set up the Move_Destinations route definition and associated this route with the called AE name Oakdale3. In the previous topic, we created a connection with the SCP destination name ToOakdale3. In this topic, we will set up a new route (ToOakdale3) and associate this route with the SCP destination ToOakdale3. This will create a route that we can then use to set up move/route mapping from the deep-end server to the called AE name Oakdale3 at the clinic's AcuoMed Server (which we will do in our final deep-end server setup task described in the next topic).

To add a new route definition from the deep-end server to clinic move destinations, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Router Configuration→ Routes.
2. Right-click **Routes** and select **New→ New Route Name**.

   The Route Destinations dialog displays with the Route Definition tab selected.



3. On the Route Definition tab, type the Route Name for the route you are setting up (ToOakdale3 in our example).
4. Select a route type.
   - Basic – the default route type appropriate for most routes (and the one selected for our example here).
   - Reconciliation – the route to the Reconciliation database.
   - Propagation (Patient Management) – a route used for propagating updates from a Master/Permanent Database to other AcuoMed Servers.
   - Stat – a static route. Set up a route of this type when you want assets sent to the route destinations regardless of whether or not those assets pass reconciliation.

- Auto Change Dest – Used in conjunction with the Auto Change Destination functionality. Only one route of this type is supported. Routes of this type have a "Source Clients" tab where users can select which AcuoMed DICOM databases and External DICOM devices will have their stores re-routed in the case of a UID Failure. Multiple Source Clients may be selected.

5. Select a Move Level and Move Options.

   The Move Level specifies the level at which the device(s) on a route will process a move operation (patient, study, series, or image). Refer to *Figure 42: Route Move Levels* on page 118 for more information.

NOTE:	Not all devices support all move levels. Please refer to the device conformance statement for more information

Only Move Assets not found at Target Destinations. – Enabling will prevent assets from being moved when they already exist at the Move Target.

Query Sources when Move and Route Levels are Equal. – Enabling will issue a C-Find before the move is forwarded to the destination(s) when the Move Level is equal to the level of the source route.

Do not issue C-Stores from local DBs, only bring images Online. – When enabled, no C-Stores will be initiated and any images affected by the move that were offline will be brought online. This feature might be used when an archive device is present and data needs to be staged for more rapid retrieval by another application.

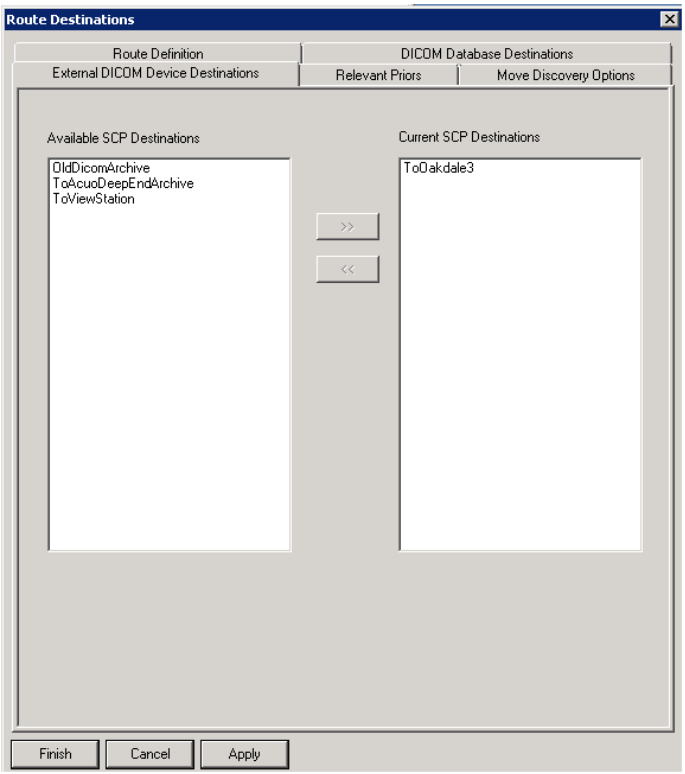
6. Set a Find Response Limit.

   The default value is 1,000 Find Responses returned on a Find Request.

7. Check 'Display in Route View on Stand Alone Snap-Ins' (this is checked by default)

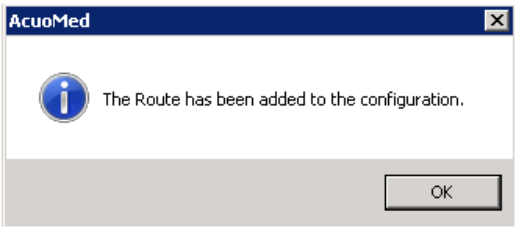
   This will make the route available to your client users.

8. Click the **External DICOM Device Destinations** tab and set up the external SCP destination for the route.



- Move one or more External DICOM® Device Destinations from the Available SCP Destinations list to the Current SCP Destinations list (ToOakdale3 in our example).

6. Click **Add** to complete set up of the route and add it to the deep-end server configuration.



This completes the procedure required to add a new route definition from the deep-end server to clinic move destinations. Continue with the next topic to set up move/route mapping for the deep-end server.

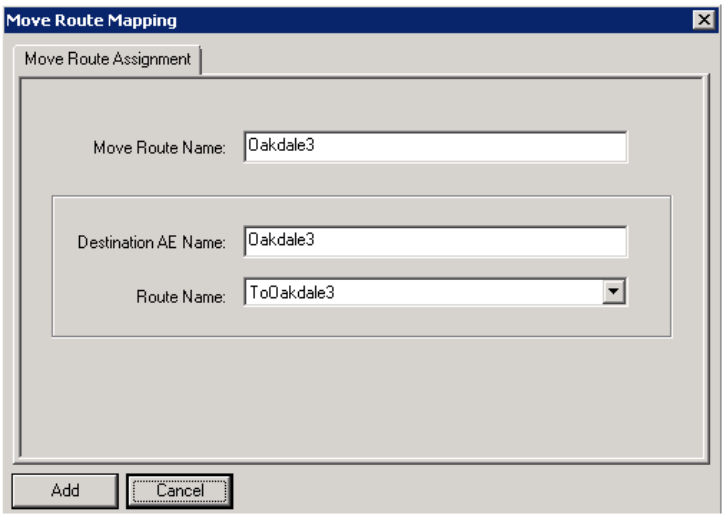
Set up Move/Route Mapping for the Deep-End Server

The final task in deep-end server configuration is to set up move/route mapping that will allow images to be moved from the deep-level tape archive at the hospital to the move destinations at the clinic. We will do this by associating the route definition we set up in the previous topic to the move destination AE name Oakdale3. The AE name Oakdale3 is associated, in turn, to the Move_Destinations route which points to the local image cache and the view station connected to the AcuoMed Server at the clinic.

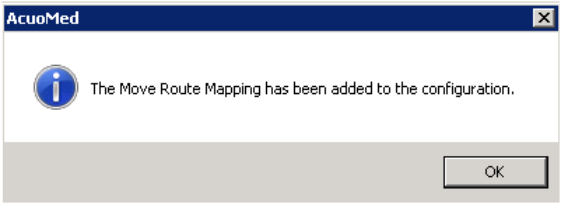
To set up move/route mapping for the deep-end server, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ Move/Route Mapping.
2. Right-click **Move/Route Mapping** and select **New→ New Move Name**.

   The Move Route Mapping dialog displays.



3. Set up the Move Route Assignment parameters.
   - Type the Move Route Name (Oakdale3 in our example). This is an arbitrary name used to describe the destination only. This name will be displayed in Patient Management for move operations.
   - Type the Move Destination Called AE Name (123XYZ in our example).
   - From the drop-down list, select the route to which the Move Destination AE Name will be associated (ToOakdale3 in our example).
4. Click **Add** to add the Move Route Mapping to the configuration.



   This completes the procedure to add Move/Route Mapping to the deep-end server.

This also completes the set of procedures required to configure the deep-end server.

Deep-End Server Configuration Summary

Figure 46 shows a summary of the AcuoMed Deep-End Server configuration that we have built which completes our configuration example. Also see the next topics *Restarting the AcuoMed Service After Configuration* and *Configuration Example Conclusion.*

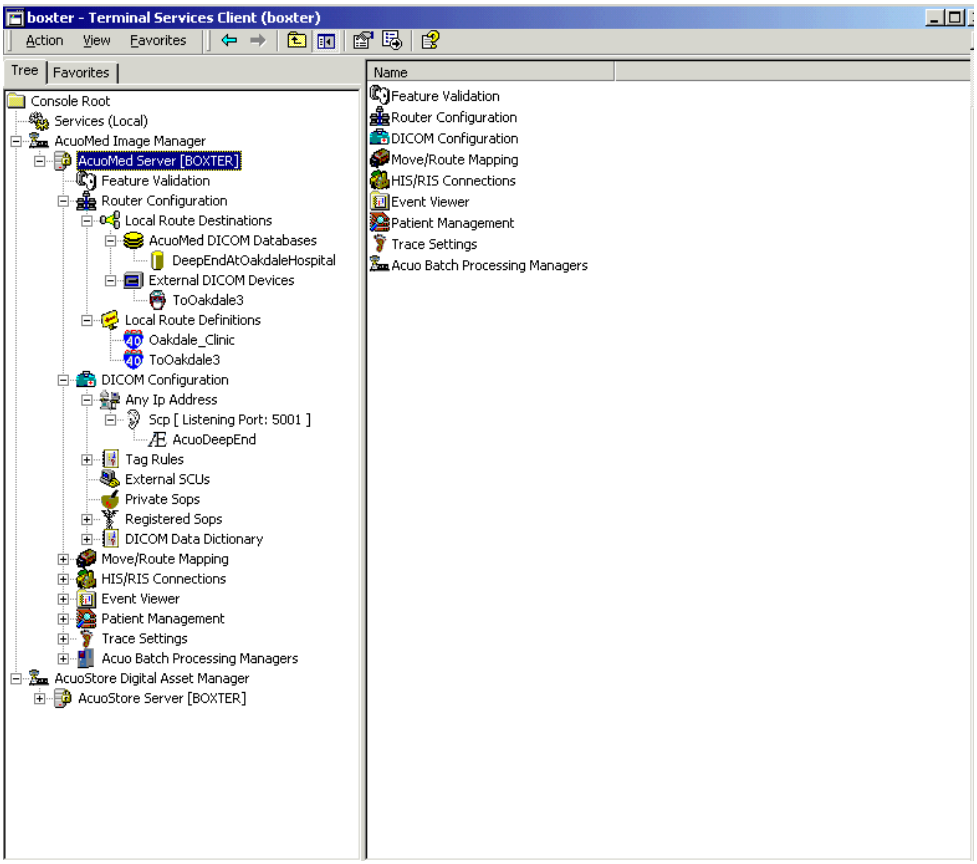


Figure 46: Deep-End Server configuration summary

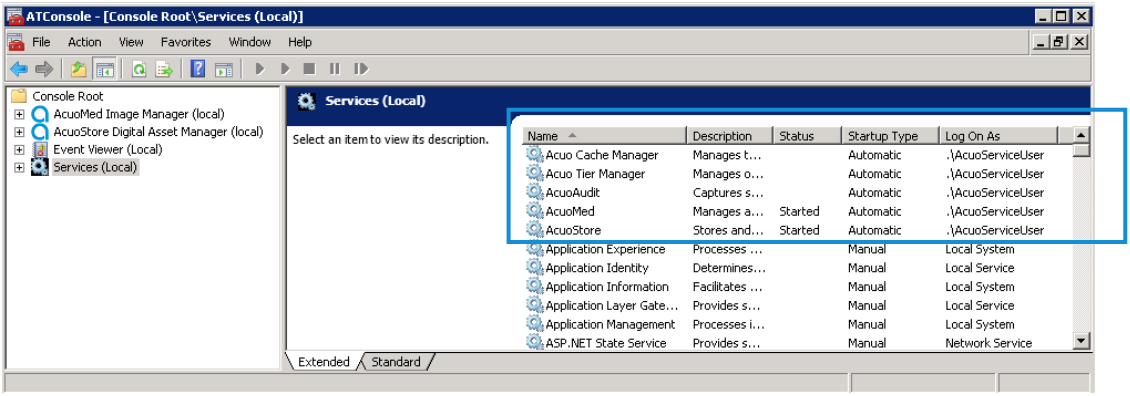
Restarting the AcuoMed Service After Configuration

After you make changes to the AcuoMed configuration, you must restart the AcuoMed Service in order for the changes to take effect.

To restart the AcuoMed Service, follow these steps:

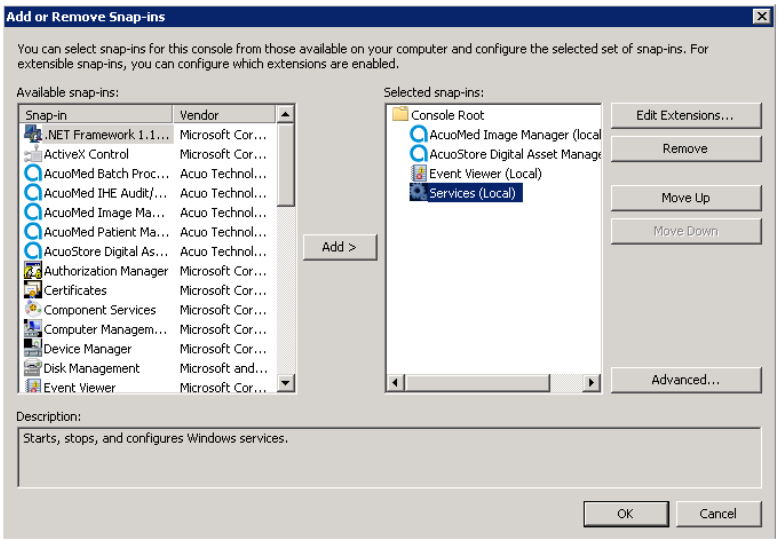
1. Verify if the Services snap-in is already added to the AcuoConsole.

   If it is already added, the Services snap-in appears in the Acuo MMC console tree as shown below (continue at Step 3). If the Services snap-in does not appear in the console tree, continue with Step 2.



2. Add the Services snap-in if not already in the console tree.

   - From the Console menu, select **Add/Remove Snap-in**.
   - In the Add/Remove Snap-in dialog, click **Add**.
   - In the Add Standalone Snap-in dialog, click the **Services** snap-in in the Available Standalone Snap-ins list and click **Add**.



   - Select whether the snap-in will manage the **Local computer** or **Another computer** and click **Finish** to add the Services snap-in to the AcuoConsole.

3. In the console tree, click the **Services** snap-in to display the list of services in the right pane.

   Refer to the screen sample in Step 1.

4. In the right pane, locate and right-click the **AcuoMed Service**.

5. From the pop-up menu, select **Stop** and then select **Start**.

   Windows reports progress as it Stops and then Starts the service.

Note: Acuo recommends that you perform separate Stop and Start operations by selecting these options from the pop-up menu. Acuo does not recommend using the **Restart** option.

Configuration Example Conclusion

The configuration example that we created in this chapter is relatively simple and only one out of unlimited configurations. However, the configuration example shows how to set up an AcuoMed operating environment that includes the standard functions that are required for most AcuoMed installations. Using the same types of configuration elements that we have demonstrated in this chapter, you can build a much larger and more intricate AcuoMed network. You would use multiple iterations of these same techniques to add more devices, more routes, more AcuoMed Servers, more communication connections, etc. In other words, you would need to do more of these same types of procedures to extend and fully define an actual AcuoMed production network.

Prior to beginning AcuoMed configuration, be sure to carefully identify the servers, databases, and devices in your network. Then plan out the connections, routes, naming conventions, and so on, that will be needed to implement your AcuoMed configuration. Next, build the configuration using the techniques you have learned in this chapter. And, finally, test your new AcuoMed configuration to ensure that digital image data is being routed and stored in all the ways that you intended.

After you have built your AcuoMed configuration it is important to analyze and implement any remote management capabilities required for administering your AcuoMed systems. It is also critical to have a System Backup Plan in place to protect your data and a Disaster Recovery Plan to help you quickly recover from any catastrophic events you may encounter.

Chapter 5 – Patient Management

In this chapter:

DICOM Database Management

Route View Management

Patient Management Snap-In

Reconciliation

Patient Management Overview

AcuoMed's Patient Management functionality allows you to perform a number of quality control operations at multiple levels of patient data to ensure data integrity. Quality control includes managing patient data (by means of edit, delete, merge, view and move operations) plus correcting problems due to software-detected (reconciliation) events.

You can search any available DICOM database to locate the patient or patients you need to manage. For any particular patient, you can edit, delete, merge, view and move patient data. Depending on the operation and user privileges, this can be done at several different levels of patient data including patient information, study information, series information, and image information.

The Patient Management Snap-in (installed as a client), can be customized to each individual user and depending upon group membership, can allow the ability to edit, delete, merge, view and move patient data, as well as use the Reconciliation Event Manager feature for more automated editing.

Patient Management also provides moving of patient data using the capabilities of the Acuo Batch Move Manager. Through its integration with Batch Move Manager, Patient Management can automate the movement of patient data and benefit from the automation capabilities of Batch Move Manager.

AcuoMed provides different facilities for performing Patient Management:

- **DICOM Database Management** – DICOM database management allows you to access and modify patient data stored in a DICOM database. You can edit, delete, merge, view and move patient data**.** This is dependent on the type of database, the level of patient data, and user permissions.
- **Route View Management** – Route View Management allows a user to access and move patient data stored in many destinations set on a route. This can include local database destinations and/or external DICOM device destinations for Acuo and/or non-Acuo DICOM destinations. However, the external DICOM device must support the standard query/retrieve SOP classes (Please review your DICOM conformance statement).
- **Reconciliation** – this is a separately licensed AcuoMed feature. Unlike DICOM Database Management (which involves a manual process of finding and fixing bad data after it is already in an AcuoMed DICOM database), Reconciliation is an automated process that attempts to prevent bad data from coming into a DICOM database in the first place. Reconciliation auto-detects differences from master patient data (HIS/RIS or HL7) and queues Reconciliation events. The Reconciliation process allows you to edit incorrect data and submit it for reprocessing.

Search Option settings give users the ability to customize their own Patient Management snap-in. Once these options have been configured, it's a good idea to save the MMC as an .msc file outside the default location. This will protect the settings from getting set back to default upon software upgrades.

The remainder of this chapter discusses these patient management facilities in detail including configuration and operation procedures.

DICOM Database Management

The DICOM Database Management functionality, which is located under Patient Management in the MMC console tree, displays the DICOM databases on an AcuoMed Server. You can perform several data integrity operations on these databases to verify patient data and correct any known errors. Standard DICOM Database Management operations include performing patient searches and viewing, editing, moving, merging, and deleting patient data depending on the type of database you are accessing.

The following DICOM Database Management procedures allow you to view and change patient data contained in any available DICOM database:

- Search for Patients (page 189)
- View Patients (page 200)
- Edit Patient (page 199)
- Move Patients (page 202)
- Move Study (page 202)
- Merge Patients (page 206)
- Delete Patients (page 216)

Search for Patients from DICOM Database Management

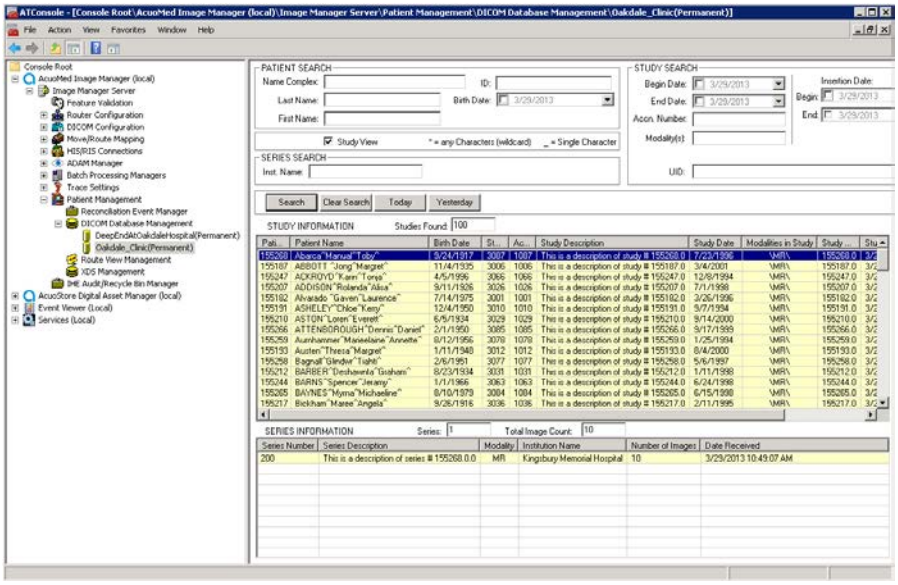
DICOM Database Management provides patient search capabilities that let you quickly locate one or more patients in a DICOM database.

To perform a patient search, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→AcuoMed Server→Patient Management→DICOM Database Management.

2. Under DICOM Database Management, click an available DICOM database to select it.

   The patient search window, displayed at study level by default, displays in the right window pane.



3. Uncheck the **Study View** box to change the display from **Study View** to **Patient View**.

NOTE:	Study View has limited functionality compared to Patient View. For example, a user cannot edit, merge or delete under Study View.

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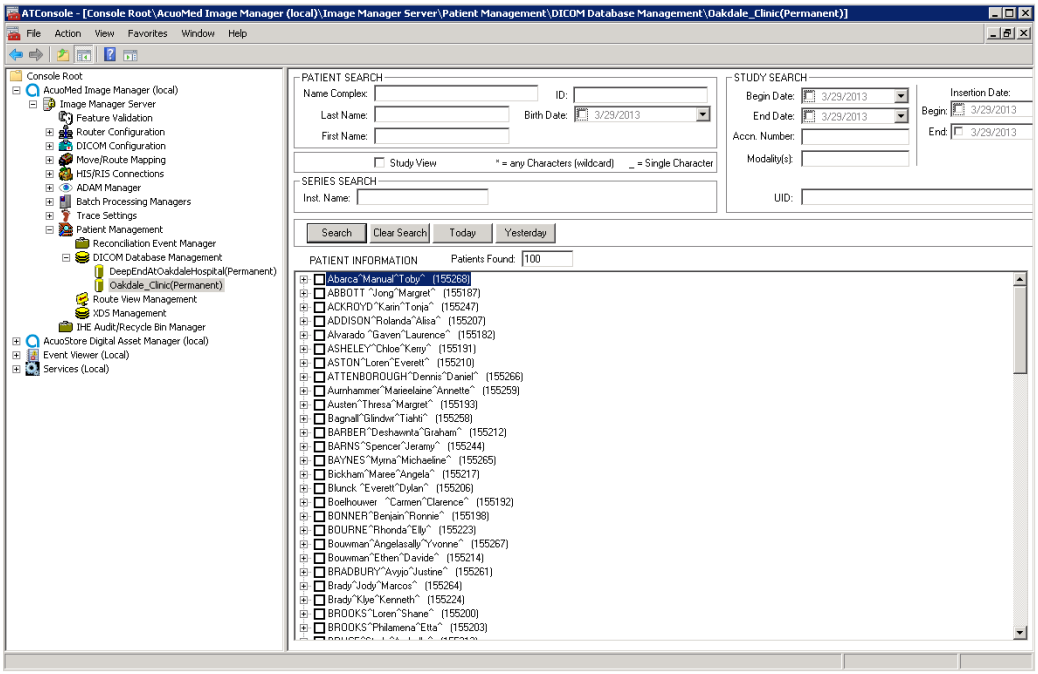
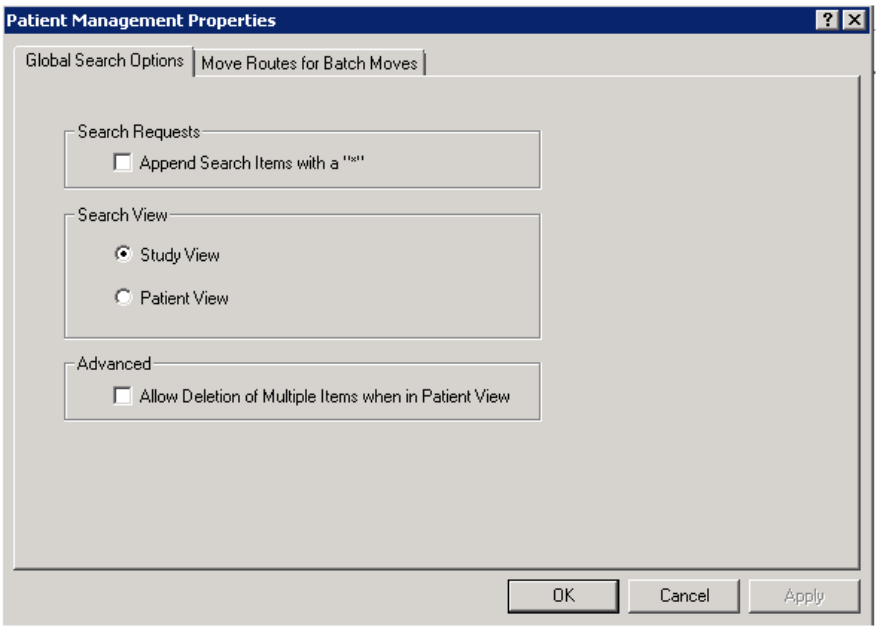


Right Click on the Patient Management node and choose **Properties**. The following figure shows additional Patient Management properties that can be configured.

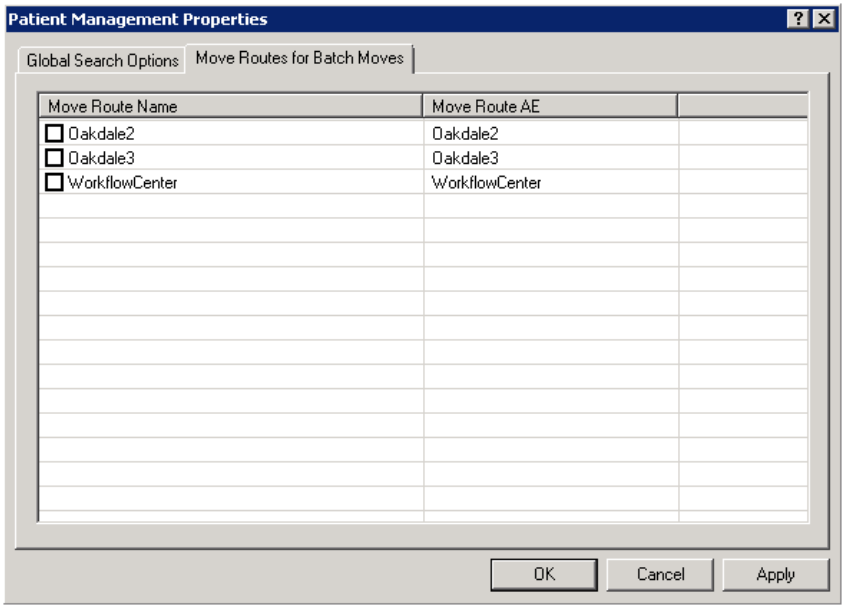


Search Requests – Enabling this setting will automatically append a wildcard (*) to any search criteria entered in Patient Management. (e.g., search of Last Name "A" actually would be sent as "A*").

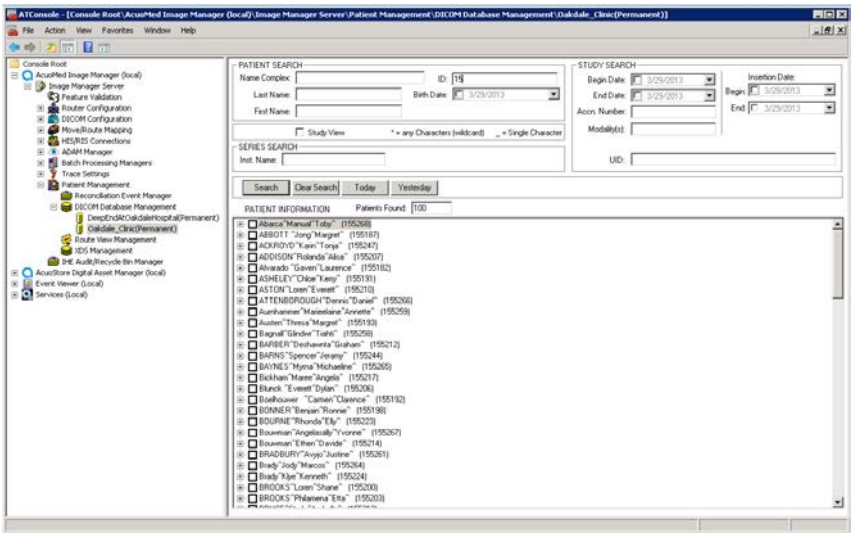
Search View – This allows the Search View to be persisted by setting the Global Search Option "Search View" to either Study or Patient View.

Advanced – Allow Deletion of Multiple Items when in Patient View.

Clicking on the "Move Routes for Batch Moves" tab allows users to select specific Move Routes to be displayed by default when sending studies in Patient Management. If none are selected (default) – then all move routes will be displayed.



4. Click the **Search** button to display patient data.



5. Narrow your search by typing search criteria in the Patient Search and/or Study Search Info fields and clicking the **Search** button again.

   Use one or more of the fields to focus your search. As an example, let's assume there are four patients with the last name of "Jones" in the database. If you enter "Jones" in the Last Name field, all four will be displayed. However, if you enter "Jones" in the Last Name field and "Mary" in the First Name field, only Mary Jones will be displayed.

   You can also search for multiple patients by using wildcards. Refer to the following topic *Using Wildcard Characters in Patient Searches* for more information about this.

6. (Optional) Search Criteria Fields

   You can use any or all of the available search criteria fields to enhance your patient search (note that you can use DICOM wildcard characters in appropriate criteria fields):

- Birth Date – use the pop-up calendar to enter the patient's birthday.
- Begin and End Dates – click on the checkbox to activate each date field and enter Begin and/or End dates manually or by using the pop-up calendar to enter a date. Search will return patient studies within this date range.
- Accn Number – type in an accession number for which you want search results returned. The accession number is assigned by the RIS or imaging modality. This is a unique number commonly used by institutions to locate imaging exams.
- Modality(s) – enter the Modality in Studies tag to specify the modality type for which you want search results returned. This is a DICOM-standard modality abbreviation that is stored in the AcuoMed DICOM Database (such as MR for MRI, CT for Computer Tomography, US for Ultrasound, etc.)
- Institution Name – type the institution name for which you want search results returned. Traditionally, this tag is associated with the modality that generated the patient images and indicates the institution where that modality is located.
- UID – type the Study UID for the study for which you want search results returned. This query only works in Study View.
- Insertion Date – click on the checkbox to activate each date field and event Begin and/or End dates manually or by using the pop-up calendar to enter a date. Search will return patient studies that have an insertion date within this date range.

NOTE: All information you provide in the search criteria fields is combined in the search command used to perform the patient search. Once you have entered search criteria and click **OK**, the criteria will remain in force for future searches until you clear these fields.

7. After locating the patient(s) that you need to access, perform other needed actions on these patients.

   You can edit, delete, merge, view, and move patient data (see the following topics for these procedures).

Using Wildcard Characters in Patient Searches

When searching for patients in an AcuoMed DICOM database, you can type several different search criteria to locate a patient or a group of patients. These search criteria fields include Name Complex, Last Name, First Name, ID, Accession Number and Modality. You can use wildcard characters in any of these criteria fields when performing patient searches:

- To search for a group of characters, use the asterisk ***** wildcard. For example, entering 25* in the ID field will return all patients in the database whose patient ID starts with 25, such as 2501, 25678, 25999, etc.
- To search for any single character, use the underscore **_** wildcard. For example, entering 25_0 in the ID field will return all patients with IDs such as 2530, 2570, 2590, etc.

The Name Complex field allows you to enter search criteria based on DICOM data format. You can use the wildcard characters discussed above to control your search. For example, entering a Name Complex of "Joh*^*im" will return all patients whose last name starts with "Joh" and whose first name ends in "im" such as Johns^Tim, Johnson^Jim, Johnston^Kim, etc.

Please note that not all devices support wildcard searches. Please check with the particular device to verify support is offered.

View Patient Metadata

DICOM Database Management allows you to view a patient's data. You can view patient data at several levels including patient, study, series, or image levels. The following procedures summarize how to do this.

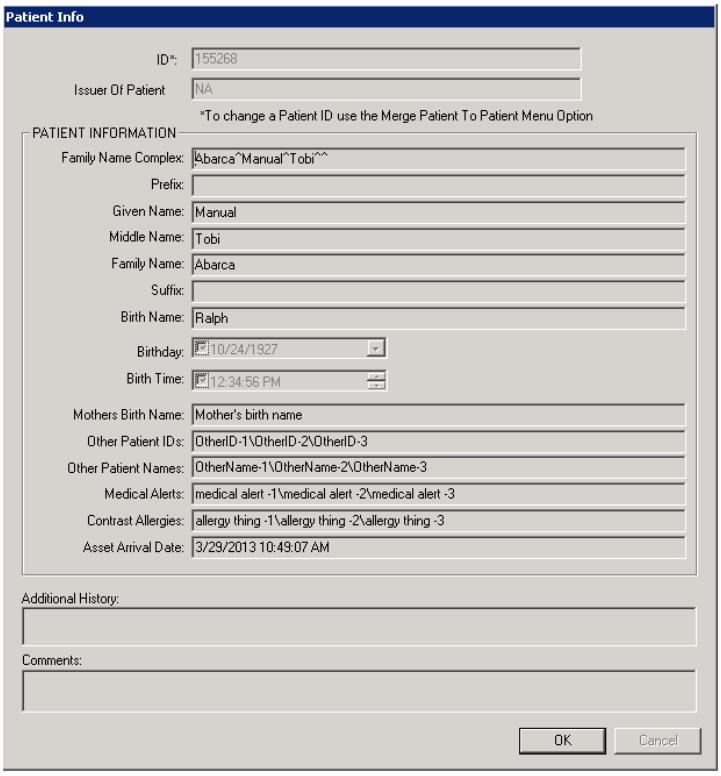
To view a patient, follow these steps:

1. Search for and locate the patient you want to view.

   Use the previous procedure *Search for Patients* to locate the patient you want to view.

2. From **Patient View only**, right-click the patient to view and select **View Patient Metadata** from the pop-up menu.

   The Patient Info dialog displays.



3. When you are done viewing Patient Info, click **OK** to return to the search results window.

4. (Optional) Drill down into the patient's data to view study, series, and image information.

   The following topics describe these procedures.

View Study Metadata

1. Search for and locate the patient you want to view.

   Use the previous procedure *Search for Patients* to locate the patient you want to view.

2. From **Patient View or Study View,** display the studies available for this patient.

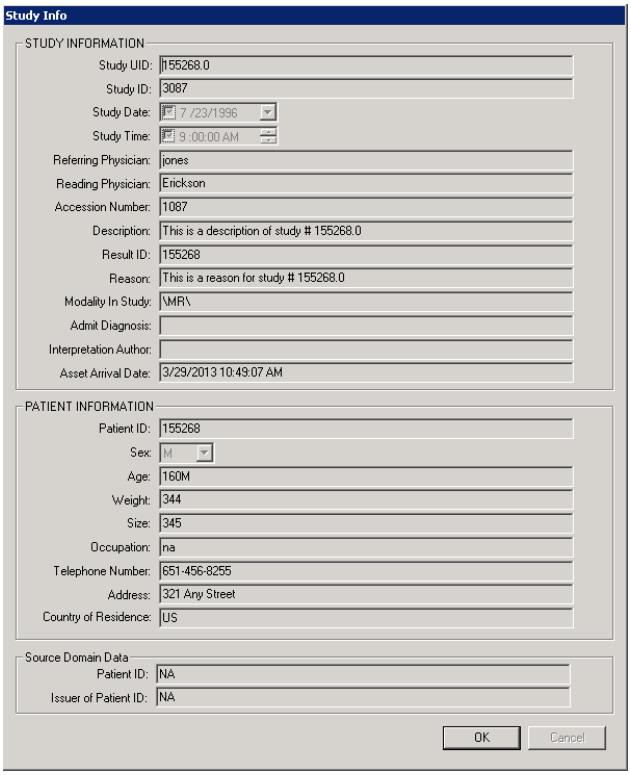
   To display studies from the Patient View, expand the patient by expanding the patient name node "+".

   Studies will be displayed when you search within Study View.

   In Study View, column order for Study and Series Info can be persisted by saving the MSC file.

3. Right-click the study to view and select **View Study Metadata** from the pop-up menu.

   The patient's Study Info dialog displays.



4. When you are done viewing Study Info, click **OK** to return to the search results window.

View Series Metadata

1. Search for and locate the patient you want to view.

   Use the previous procedure *Search for Patients* to locate the patient you want to view.

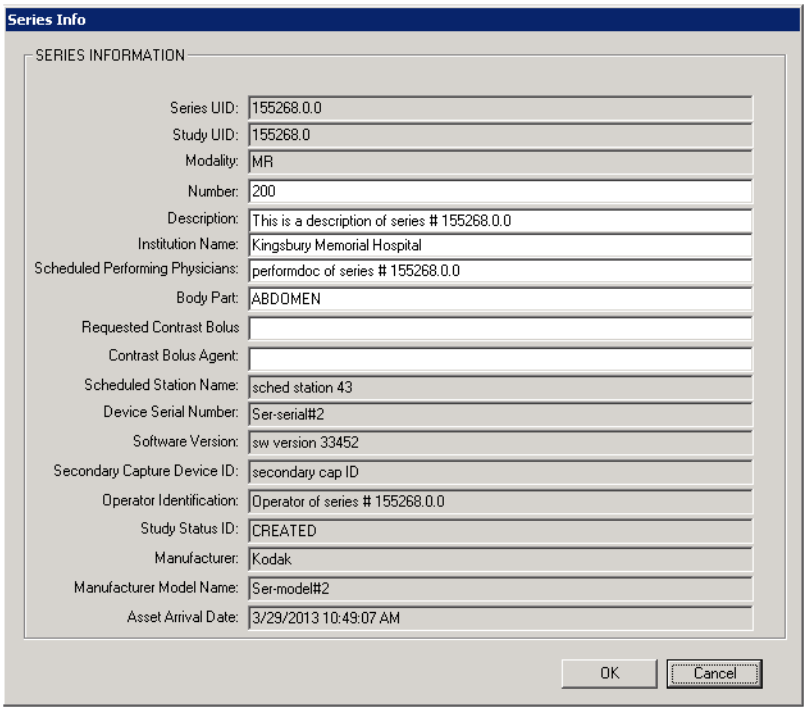
2. From **Patient View or Study View**, display the series available for this patient/study.

   To display series within the Patient View, expand the patient by expanding the patient name node "**+**" and then expand the node for the appropriate study.

   To display the series within the Study View, click on a study within the Study Information and the Series Information will display within the Series Information section.

3. Right-click the series to view and select **View Series Metadata** from the pop-up menu.

   The patient's Series Info dialog displays.



4. When you are done viewing Series Info, click **OK** to return to the search results window.

View Image Metadata

1. Search for and locate the patient you want to view.

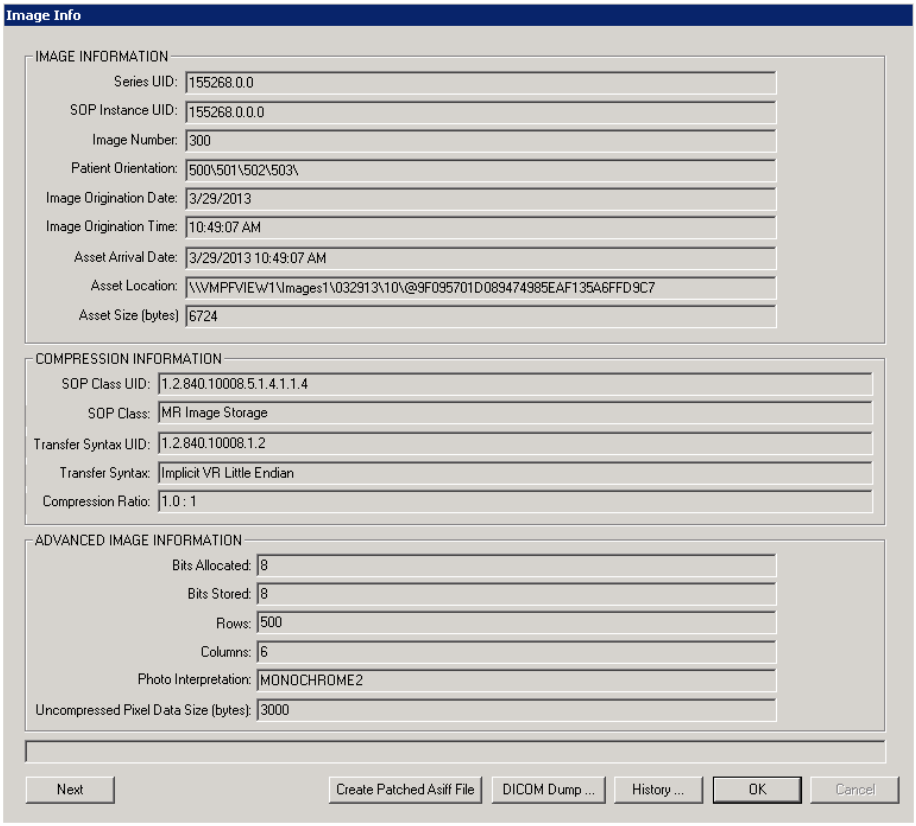
   Use the previous procedure *Search for Patients* to locate the patient you want to view.

2. From **Patient View**, display the images available for this patient/study/series.

   To display images, expand the patient by expanding the patient name node, expand the node for the appropriate study, and then expand the node for the appropriate series.

3. Right-click the image to view and select **View Image Metadata** from the pop-up menu.

   The patient's Image Info dialog displays.



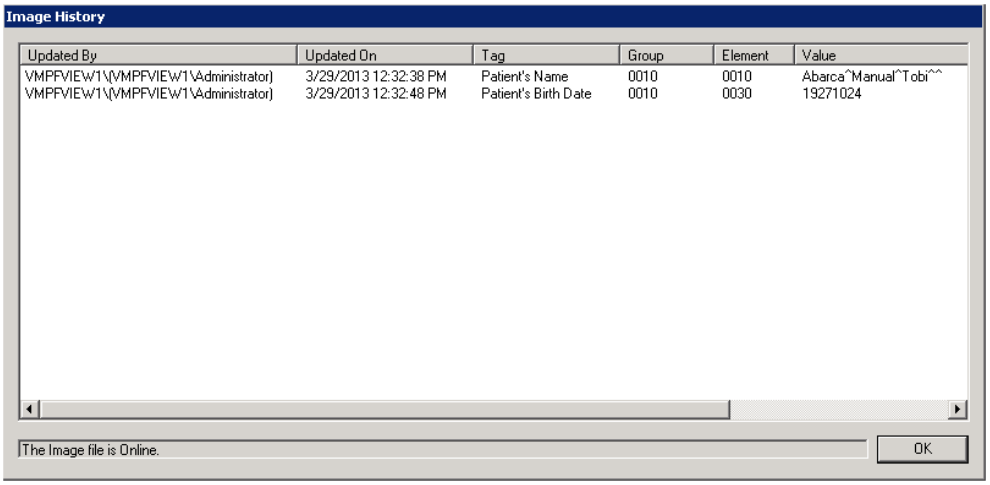
Additional options are available from the Image Info screen. These are detailed below:

4. (Optional) Click the Create Patched Asiff File to generate a copy of an Asiff file that includes updates made since the original storage of the file. The asiff file will be placed in the <Acuo_Install>\PatchedAsiffs folder.

5. (Optional) Click the DICOM Dump button to generate a dump of the contents of an Asiff file and display them in notepad. This feature uses the DumpAsiffContents.exe located in the <Acuo_Install>\Tools folder.

6. (Optional) Click the Next button to navigate to the image metadata for the next image in the series.

7. (Optional) Click **History** to display image history.



The image history tracks manual edits, reconciled and normalized patient information including details on who made the updates, when the updates were made, the updated tag and its related value information. The information provided is displayed in order by tag (group, element) and modification date.

Please note that viewing the history for an image that is offline will bring it online.

8. When you are done viewing Image Info, click **OK** to return to the search results window.

View Image (WADO Required)

It is possible to view an image directly from Patient Management when a WADO server has been configured in Image Manager Server Properties. The configuration of Image View is detailed in Chapter 11 – Advanced Functionality.

1. Search for and locate the patient you want to view.

   Use the previous procedure *Search for Patients* to locate the patient you want to view.

2. From **Patient View**, display the images available for this patient/study/series.

   To display images, expand the patient by expanding the patient name node, expand the node for the appropriate study, and then expand the node for the appropriate series.

3. Right-click the image to view and select **View Image** from the pop-up menu.

   A pop-up window is generated displaying the image in the JPEG format.

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Edit Patient

DICOM Database Management allows you to edit patient information at the patient, study, and series levels. Edits are done from Patient Management in Patient View by Acuo Administrators or Power Users.

NOTE: The Patient ID cannot be edited because it is considered the unique identifier. Changing the patient ID, however, can be accomplished by a Merge operation which will be discussed later in this chapter.

Caution

If Reconciliation is licensed for this AcuoMed System and you change patient data in an AcuoMed DICOM Database after the database has been reconciled to the HIS/RIS System, there is a risk that the data in the Acuo System could become disjoint from the data in the HIS/RIS System. To avoid this, changes should be made to the HIS/RIS patient data and then the AcuoMed DICOM Database should be reconciled to the HIS/RIS System.

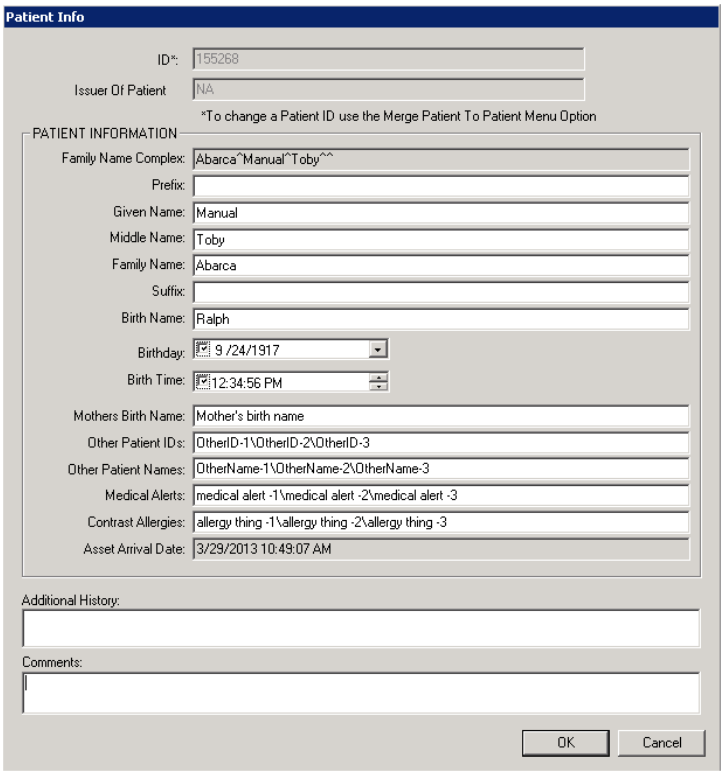
To edit a patient's information, follow these steps:

1. Search for and locate the patient you want to edit.

   Use the previous procedure *Search for Patients* to locate the patient you want to edit.

2. From **Patient View**, right click on the patient and select **Edit Existing Patient** from the pop-up menu.

   An editable version of the Patient Info dialog displays.



3. Edit patient information as needed using the Patient Info dialog.

4. After editing patient information, click **OK**.

   You are returned to the patient search window. If you edited the patient's name you will see this change in the patient search window.

Edit Study

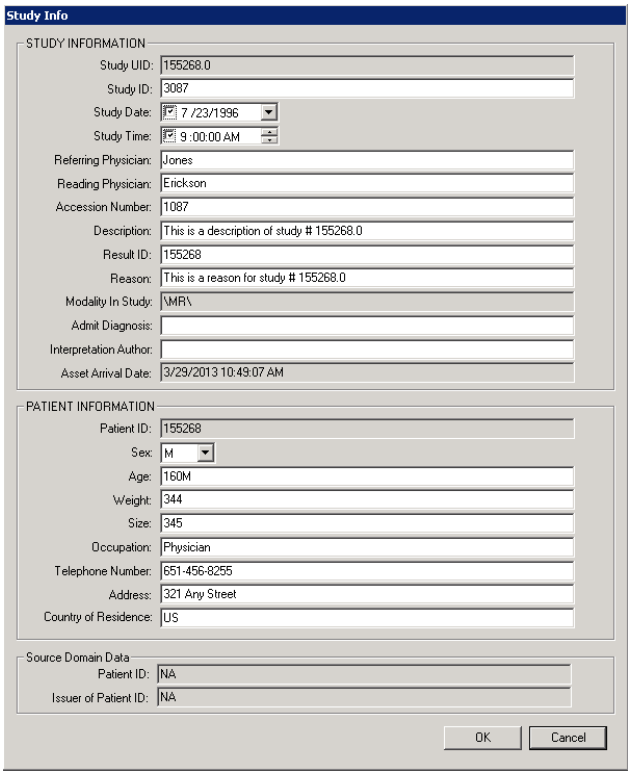
To edit study information, follow these steps:

1. Search for and locate the study you want to edit.

   Use the previous procedure *Search for Patients* to locate the study you want to edit.

2. From **Patient View**, right click on the study and select **Edit Existing Study** from the pop-up menu.

   An editable version of the Study Info dialog displays.



3. Edit study information as needed using the Study Info dialog.

4. After editing study information, click **OK**.

   You are returned to the patient search window.

Edit Series

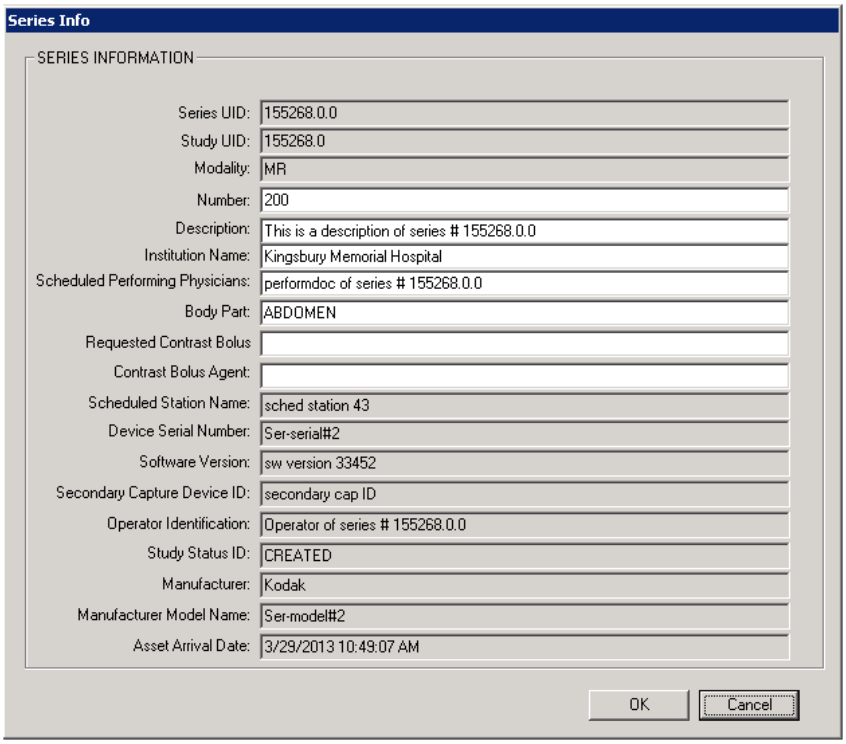
To edit series information, follow these steps:

1. Search for and locate the series you want to edit.

   Use the previous procedure *Search for Patients* to locate the series you want to edit.

2. From **Patient View**, right click on the study and select **Edit Existing Series** from the pop-up menu.

   An editable version of the Series Info dialog displays.



3. Edit series information as needed using the Series Info dialog.

4. After editing series information, click **OK**.

   You are returned to the patient search window.

Move Patients

DICOM Database Management allows you to move patient data. You can either move all of a patient's data by moving the patient or you can move one aspect of the patient's data (such as a study, series, or image). The following procedures summarize how to do this.

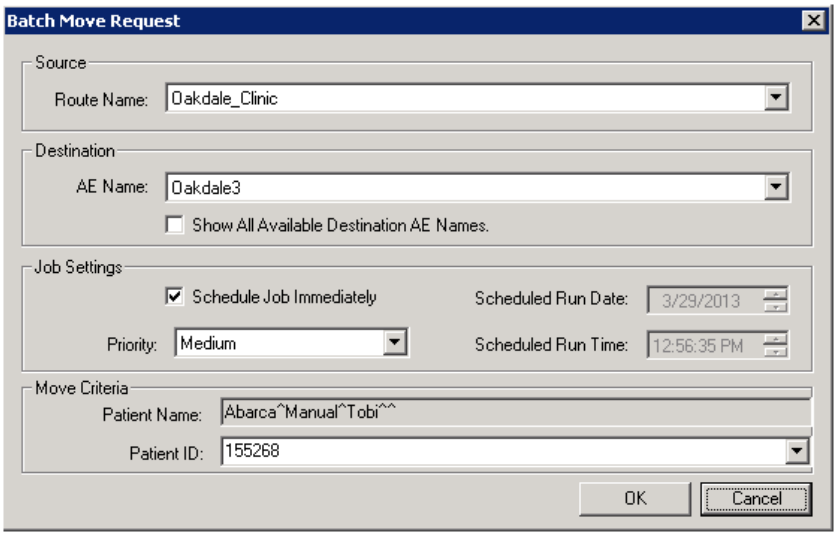
To move a patient, follow these steps:

1. Search for and locate the patient you want to move.

   Use the previous procedure *Search for Patients* to locate the patient you want to move.

2. From **Patient View or Study View**, right-click the patient to move and select **Move Patient To…** from the pop-up menu.

   The **New Batch Move Request** dialog displays.



3. Set up the move by providing information in the New Batch Move Request dialog.

NOTE: Make sure the "Route Name" points to the database source for the patient you want to move. In our example, the data can be found in the database source "Oakdale_Clinic".

4. After setting up the move parameters, click **OK**.

   The patient's move job is queued to the batch move manager.

Move Study

1. Search for and locate the patient whose study you want to move.

   Use the previous procedure *Search for Patients* to locate the patient you want to move.

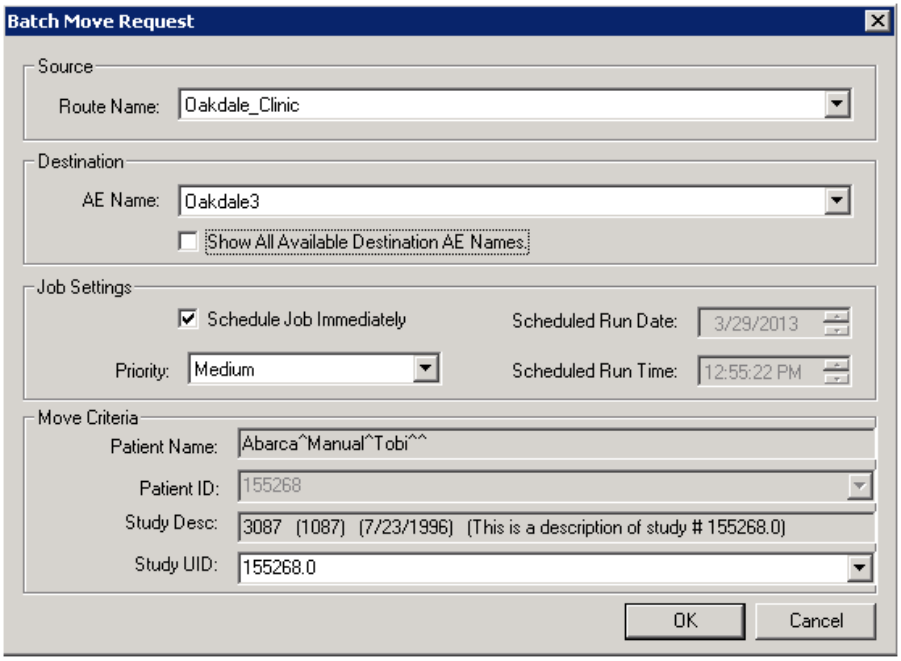
2. From **Patient View or Study View**, display the studies available for this patient.

   To display studies, expand the patient by clicking the **+** sign by the patient name.

   Studies will be displayed when you search within Study View. Use the Shift key or Ctrl key to select multiple studies for a study level move.

3. Right-click the study to move and select **Move Study To…** from the pop-up menu.

   The New **Batch Move Request** dialog displays.



4. Set up the move by providing information in the New Batch Move Request dialog.

5. After setting up the move parameters, click **OK**.

   The study move job is queued to the batch move manager.

Move Series

1. Search for and locate the patient whose series you want to move.

   Use the previous procedure *Search for Patients* to locate the patient you want to move.

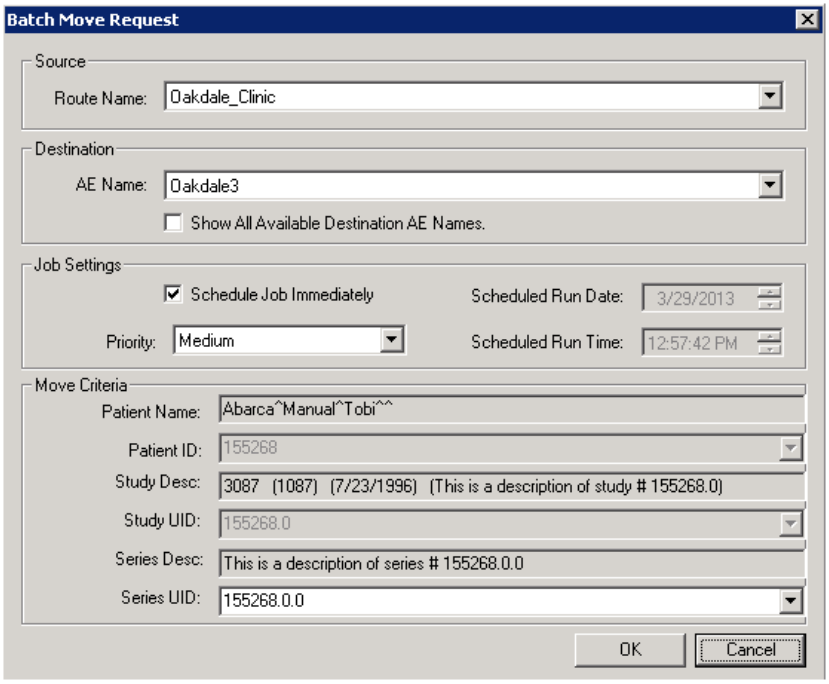
2. From **Patient View or Study View**, display the studies available for this patient.

   To display series, expand the patient by clicking the **+** sign by the patient name and study.

   Series will be displayed when selecting a study within Study View. Use the Shift key or Ctrl key to select multiple series for a series level move.

3. Right-click the series to move and select **Move Series To…** from the pop-up menu.

   The New Batch Move Request dialog displays.



4. Set up the move by providing information in the New Batch Move Request dialog.

5. After setting up the move parameters, click **OK**.

   The series move job is queued to the batch move manager.

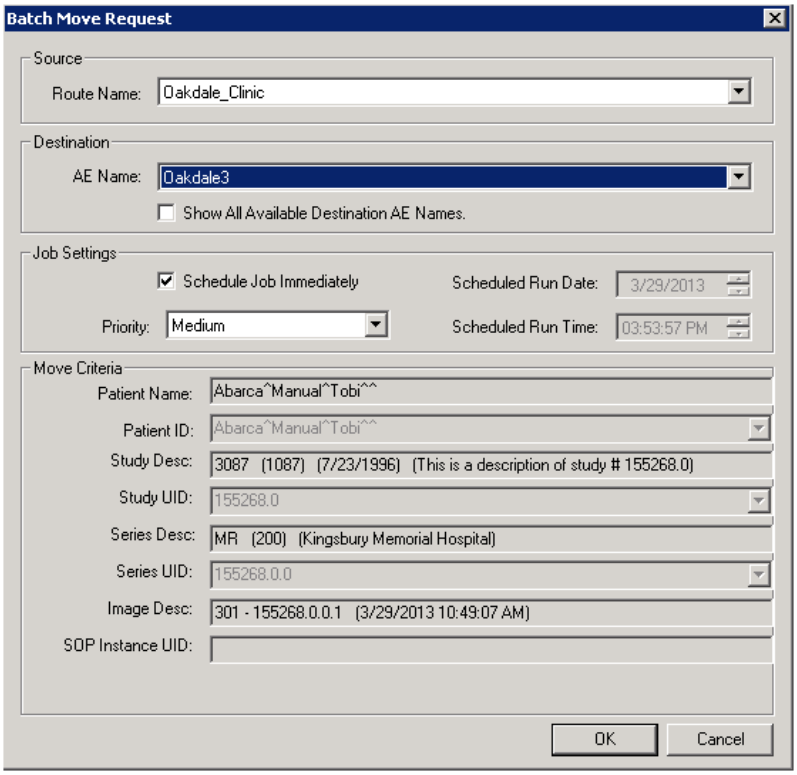
Move Image

1. From **Patient View**, search for and locate the patient whose image you want to move.

   Use the previous procedure *Search for Patients* to locate the patient you want to move.

2. Display the images available for this patient/study/series.
   To display images, expand the patient by clicking the **+** sign by the patient name, clicking the **+** sign by the appropriate study, and then clicking the **+** sign by the appropriate series.

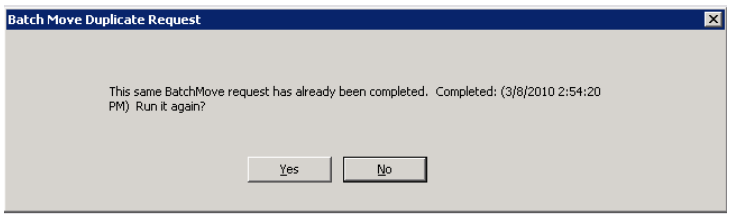
3. Right-click the image to move and select **Move Image To…** from the pop-up menu.
   The New Batch Move Request dialog displays.



4. Set up the move by providing information in the New Batch Move Request dialog.
5. After setting up the move parameters, click **OK**.
   The image move job is queued to the batch move manager.

Duplicate Move Requests

A duplicate Move request is indicated when a user requests a MOVE and the request for that MOVE is exactly the same as another MOVE job already in the queue. In this case, the user will be prompted to answer yes or no to **Add Another Request** or **Run it Again** based on the status of the already existing MOVE request. In the example below the previous status of the duplicate move request is "completed".



Merge Patients

The ability to merge patient records allows you to consolidate records from two separate patients into records for a single patient. Often in a time-critical event such as admitting and treating a trauma patient there is not time to determine if records already exist for the patient being treated. In this case, a John/Jane Doe patient is created to expedite time-critical treatment. If this John/Jane Doe patient is later matched to an existing patient, it is possible to then merge the John/Jane Doe patient records into the existing patient's records. This is done via AcuoMed's merge capability.

Merge can be performed at each level within Patient View:

- Patient to Patient Merge – merges a source patient into a destination patient.
- Study to Patient Merge – merges a source patient study into a destination patient.
- Series to Study Merge – merges a source series into a destination study.
- Image to Series Merge – merges a source image into a destination series.

NOTE: Merge operations cannot be accomplished within Study View. Merge operations can only be accomplished within the same DICOM database.

Patient to Patient Merge

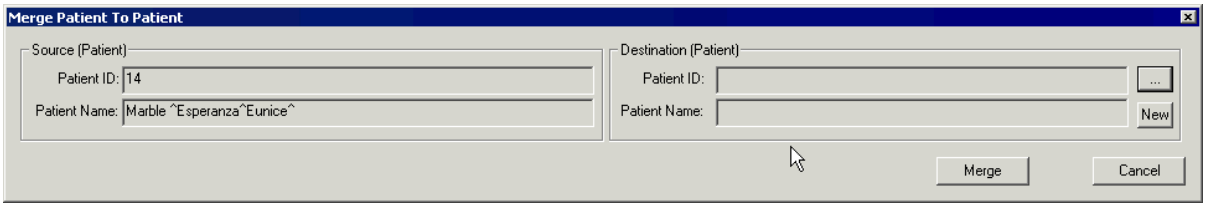
To merge records at a patient-to-patient level, follow these steps:

1. Search for and locate the source patient you want to merge into a destination patient.

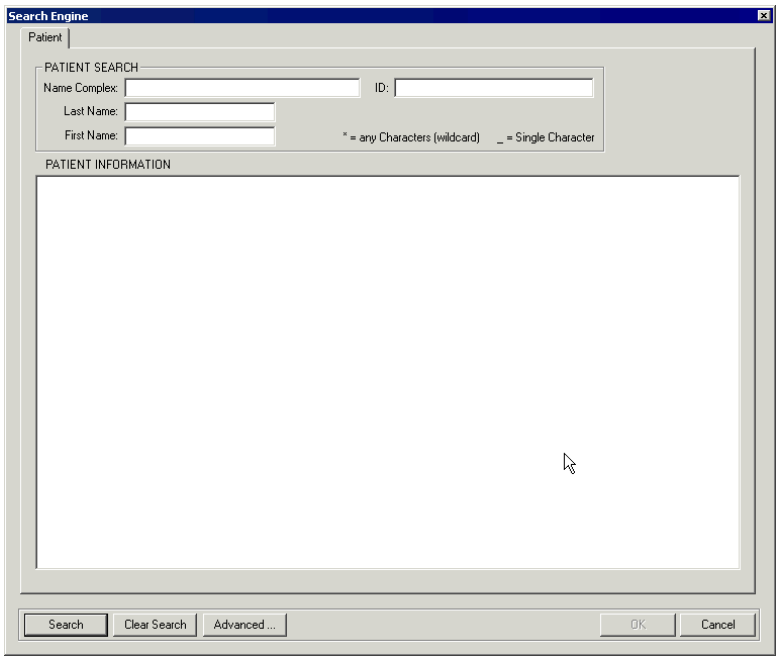
   Use the previous procedure Search for Patients to locate the source patient.

2. From Patient View, right-click the patient to merge and select **Merge Patient With…** from the pop-up menu OR refer to Step 7 to create a new patient ID.

   The Merge Patient To Patient dialog displays.



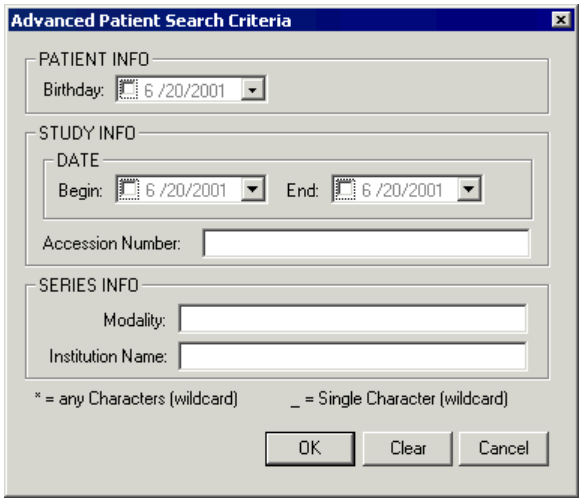
3. To locate an existing destination patient to merge into, click the search (ellipsis **…**) button for the Search Engine dialog to display.



4. Search for and locate the destination patient.

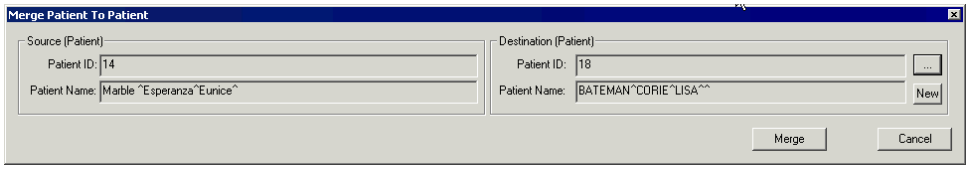
   Use the previous procedure *Search for Patients* to locate the destination patient.

   To specify a more specific search criterion, click on the **Advanced** button and the advanced Search Engine dialog displays. Enter specific search criteria, click **OK** to continue, and you are returned to the main Search Engine. Click Search again to display results.



5. Select the destination patient and click **OK**.

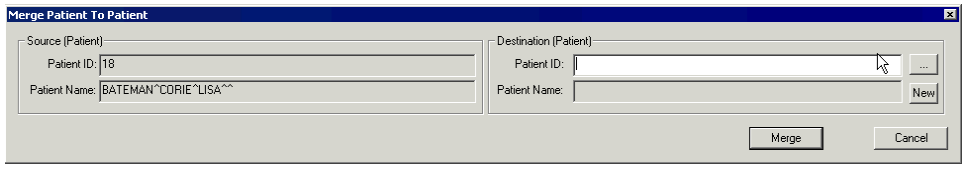
   You are returned to the Merge Patient To Patient dialog which now shows the destination patient ID and name.



6. Click **Merge** to continue.

   The Merge runs and the DICOM database contents displayed in the right window pane are updated to reflect the completed merge. The source patient name is gone and any studies that existed for the source patient are now displayed within the destination patient.

7. (OPTIONAL) Select the **NEW** button to create a new patient ID. The Patient ID field becomes available. Type the new Patient ID and then click Merge to continue.



   A pop-up will let you know if the patient ID you entered already exists in the database.

Study to Patient Merge

To merge records at a study-to-patient level, follow these steps:

1. Search for and locate the source study you want to merge into a destination patient.

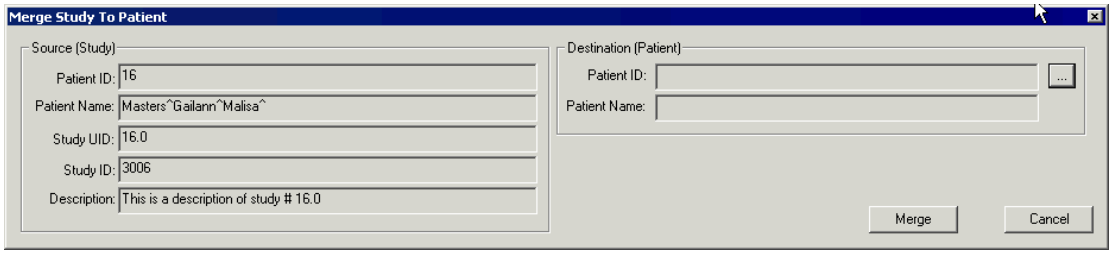
   Use the previous procedure *Search for Patients* to locate the patient and study you want to merge.

2. From Patient View, display the studies available for the source patient.

   To display studies, expand the source patient by clicking the **+** sign by the patient name.

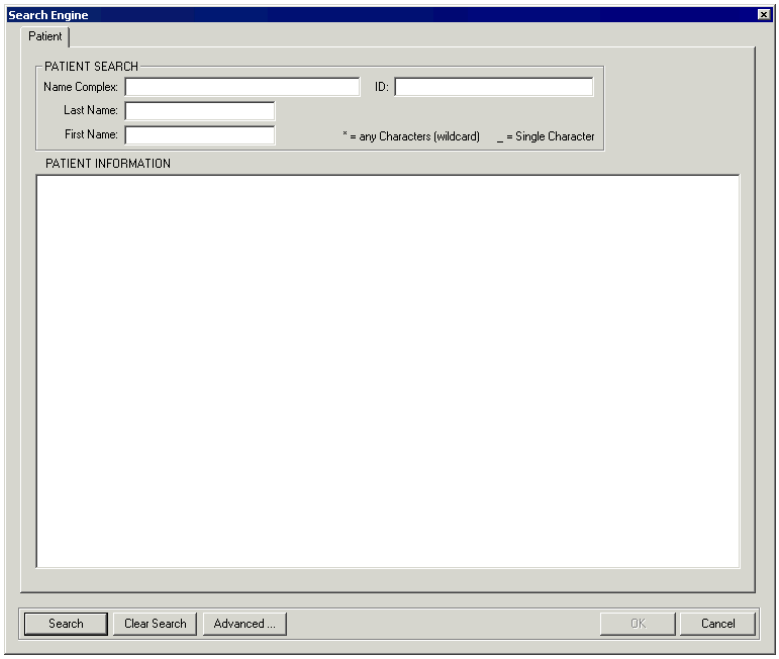
3. Right-click the study to merge and select **Merge Study With → Patient…** from the pop-up menu.

   The Merge Study To Patient dialog displays.



4. To locate the destination patient to merge into, click the search (ellipsis **…**) button.

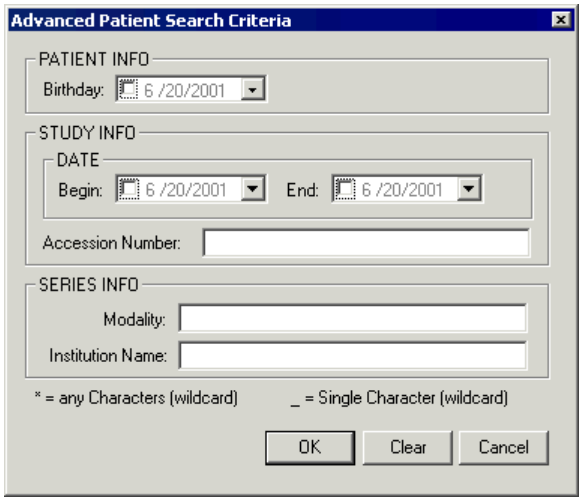
   The Search Engine dialog displays.



5. Search for and locate the destination patient.

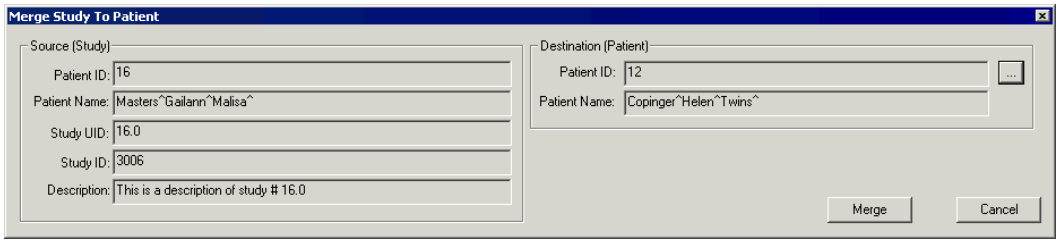
   Use the previous procedure *Search for Patients* to locate the destination patient.

   A more defined search criteria can be accomplished, first click on the **Advanced** button and the advanced Search Engine dialog displays. Define your search criteria and click **OK** to continue, you are returned to the main Search Engine. Click Search again to display results.



6. Select the destination patient and click **OK**.

   You are returned to the Merge Study To Patient dialog which now shows the destination patient ID and name.



7. Click **Merge** to continue.

   The Merge runs and the DICOM database contents displayed in the right window pane are updated to reflect the completed merge: the source patient study is removed from the source patient and is now displayed within the destination patient.

Study to Study Merge

It may be necessary to merge records from one study to another study. To merge records at a study-to-study level, follow these steps:

1. Search for and locate the source study you want to merge into a destination study.

   Use the previous procedure *Search for Patients* to locate the study and multiple series you want to merge.

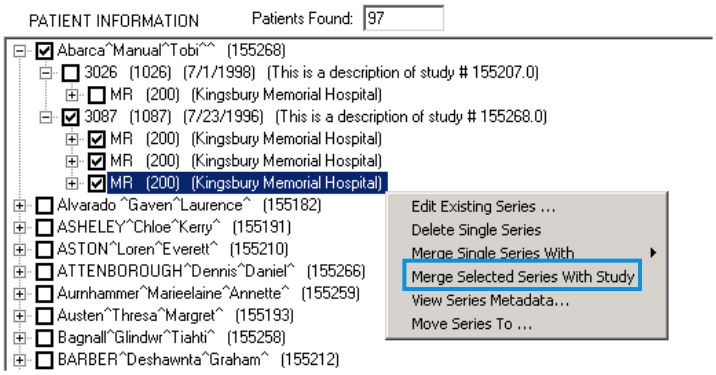
2. From Patient View, display the available series for the source study.

   To display series, expand the source patient and study by clicking the **+** sign by the patient name.

3. Select ALL series within the source study that you would like to merge to the destination study.

4. Right-click a series to merge and select **Merge Selected Series With → Study…** from the pop-up menu.

   The Merge Series to Study dialog displays.



5. Follow the steps in the Study to Patient Merge instructions directly above to identify the merge target study and initiate the merge.

Series to Study Merge

To merge records at a series-to-study level, follow these steps:

1. Search for and locate the source series you want to merge into a destination study.

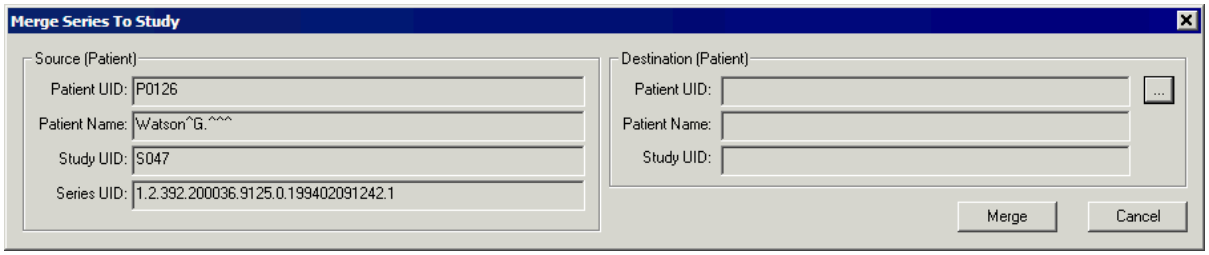
   Use the previous procedure *Search for Patients* to locate the study and series you want to merge.

2. From Patient View, display the series available for the source study.

   To display series, expand the source patient and study by clicking the **+** sign by the patient name.

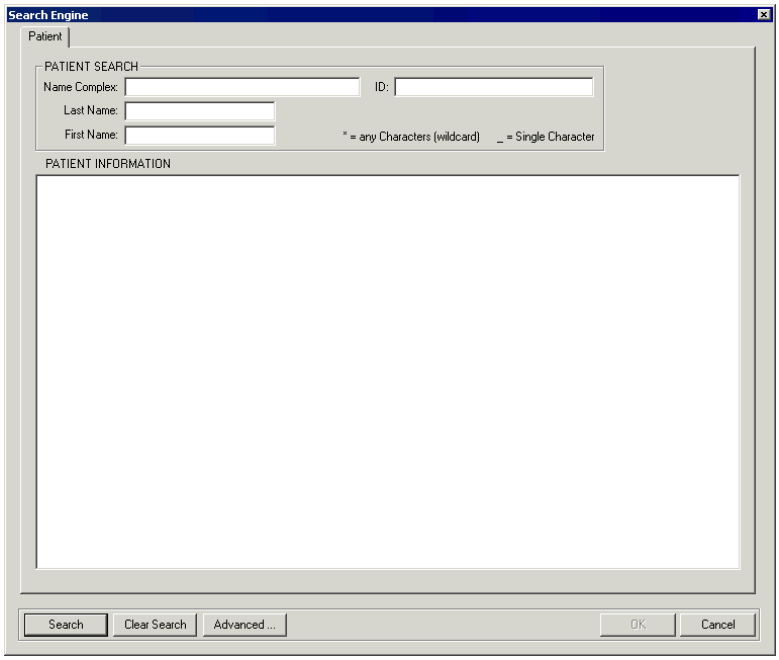
3. Right-click the study to merge and select **Merge Series With → Study…** from the pop-up menu.

   The Merge Series to Study dialog displays.



4. To locate the destination study to merge into, click the search (ellipsis **…**) button.

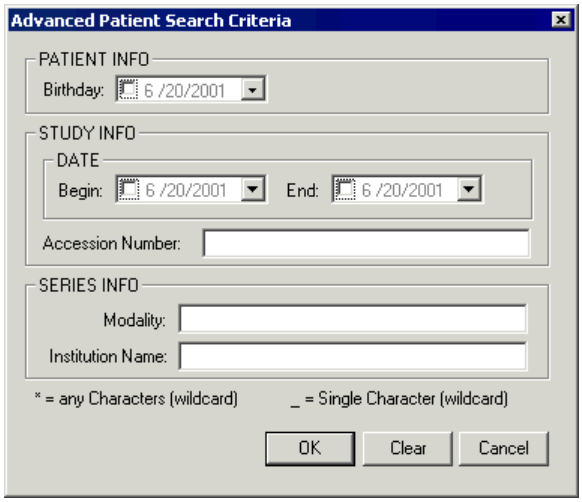
   The Search Engine dialog displays.



5. Search for and locate the destination Study.

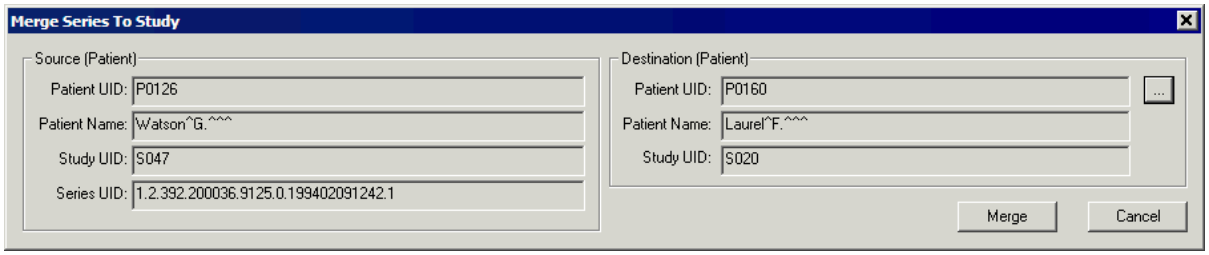
   Use the previous procedure *Search for Patients* to locate the destination patient.

   A more defined search criteria can be accomplished, first click on the **Advanced** button and the advanced Search Engine dialog displays. Define your search criteria and click **OK** to continue, you are returned to the main Search Engine. Click Search again to display results.



6. Select the destination patient and click **OK**.

   You are returned to the Merge Series to Study dialog which now shows the destination patient ID and name and Study UID.



7. Click **Merge** to continue.

   The Merge runs and the DICOM database contents displayed in the right window pane are updated to reflect the completed merge: the source patient series is removed from the source patient and is now displayed within the destination patient.

Multiple Series to Study Merge

To merge multiple records at a series-to-study level, follow these steps:

1. Search for and locate the multiple source series you want to merge into a destination study.

   Use the previous procedure *Search for Patients* to locate the study and multiple series you want to merge.

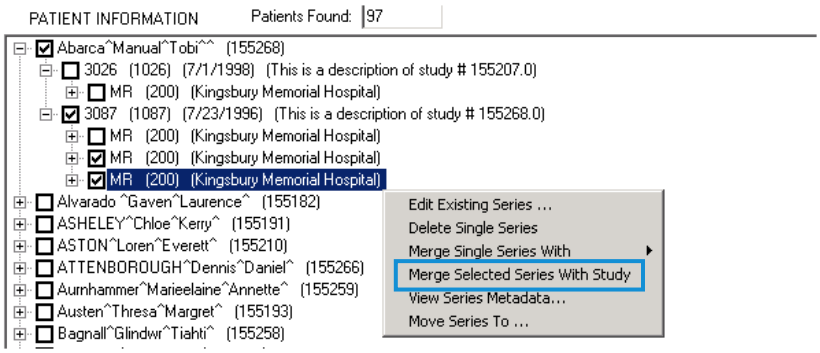
2. From Patient View, display the available series for the source study.

   To display series, expand the source patient and study by clicking the **+** sign by the patient name.

3. Select each series within the source study that you would like to merge to the destination study.

4. Right-click the a series to merge and select **Merge Selected Series With → Study…** from the pop-up menu.

   The Merge Series to Study dialog displays.



5. Follow the steps in the Series to Study Merge instructions directly above to identify the merge target study and initiate the merge.

Image to Series Merge

To merge records at an image-to-series level, follow these steps:

1. Search for and locate the source image you want to merge into a destination study.

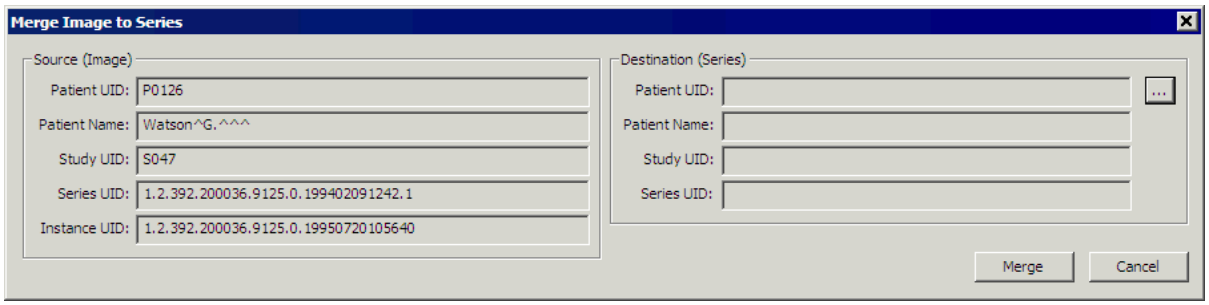
   Use the previous procedure *Search for Patients* to locate the study and series you want to merge.

2. From Patient View, display the image available for the source study.

   To display image, expand the source patient down to the image by clicking the **+** sign by the patient name.

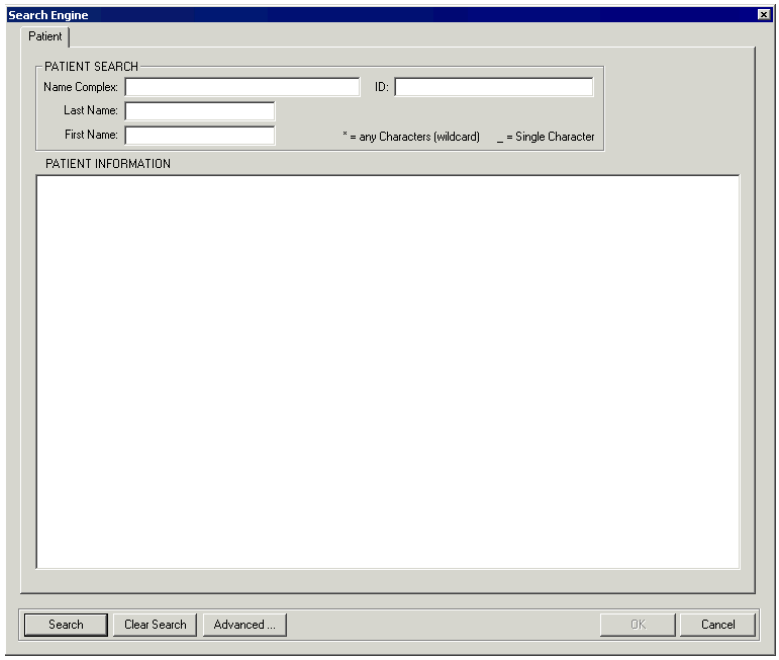
3. Right-click the image to merge and select **Merge Image With → Series…** from the pop-up menu.

   The Merge Image to Series dialog displays.



4. To locate the destination study to merge into, click the search (ellipsis **…**) button.

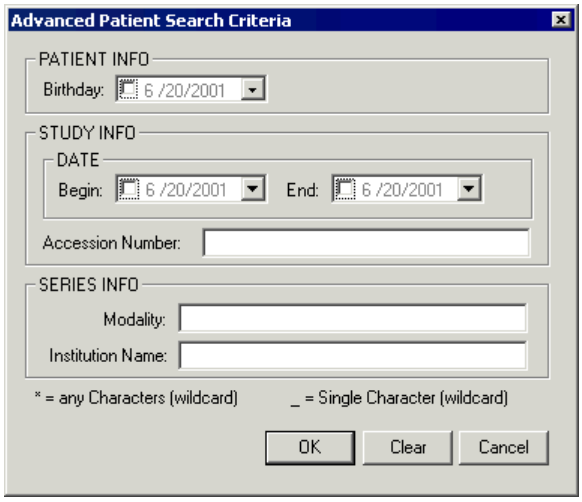
   The Search Engine dialog displays.



5. Search for and locate the destination Study.

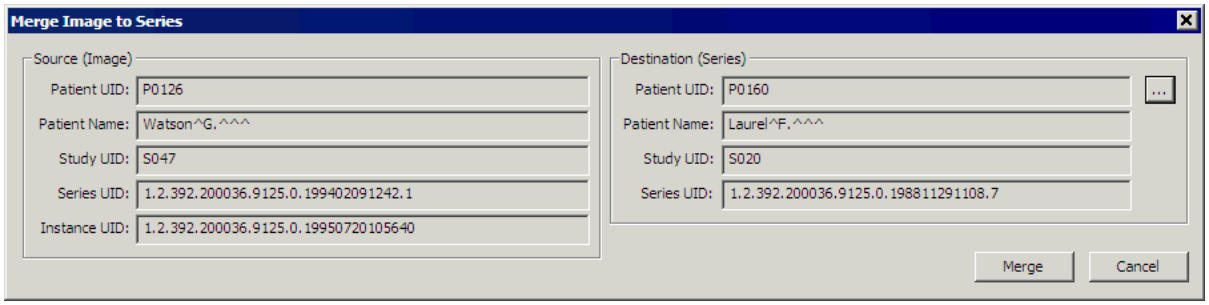
   Use the previous procedure *Search for Patients* to locate the destination patient.

   A more defined search criteria can be accomplished, first click on the **Advanced** button and the advanced Search Engine dialog displays. Define your search criteria and click **OK** to continue, you are returned to the main Search Engine. Click Search again to display results.



6. Select the destination patient and click **OK**.

   You are returned to the Merge Image to Series dialog which now shows the destination patient UID and name, Study UID and Series UID.



7. Click **Merge** to continue.

   The Merge runs and the DICOM database contents displayed in the right window pane are updated to reflect the completed merge: the source patient series is removed from the source patient and is now displayed within the destination patient.

Delete Patients

DICOM Database Management allows you to delete a patient's data within a DICOM Database. Users can either delete all of a patient's data by deleting the patient or you can delete one aspect of the patient's data (such as a study, series, or image).

NOTE: In AcuoMed 6.0 and beyond, deleted assets are placed in a recycle bin that allows for restoration of data. For more information on the Recycle Bin functionality reference *Chapter 8 - IHE Audit Log/Recycle Bin Manager.*

The following procedures summarize how to perform a patient delete:

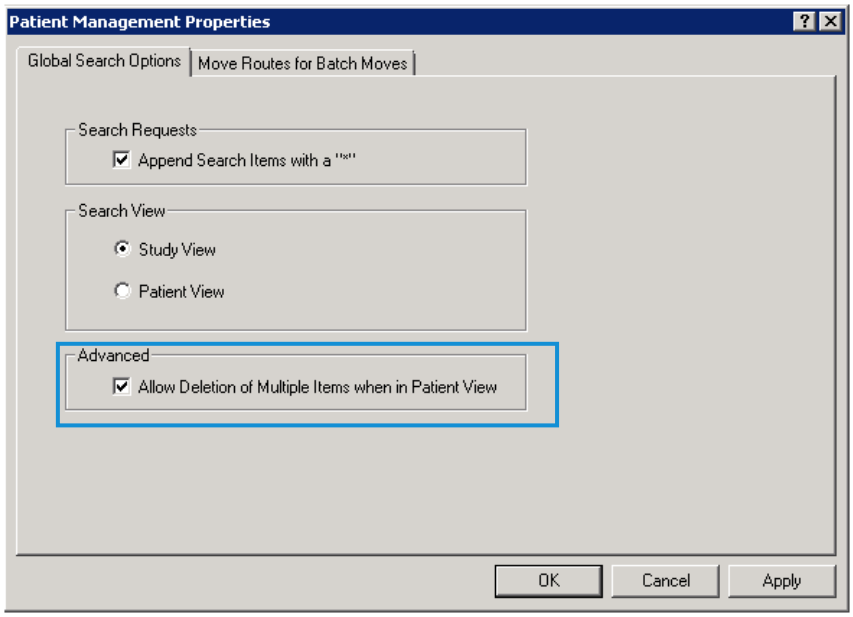
The "Delete Selected" button is a global option in which you can choose to display or not display within Patient management's Patient View. This button allows the ability to select multiple objects for deletion. Users can individually select any combination of Patients, Studies, Series or Images. Alternatively they can select or clear the selections of all nodes by right-clicking on any patient in the tree.

All of the following must be true for the components of this feature to be available:

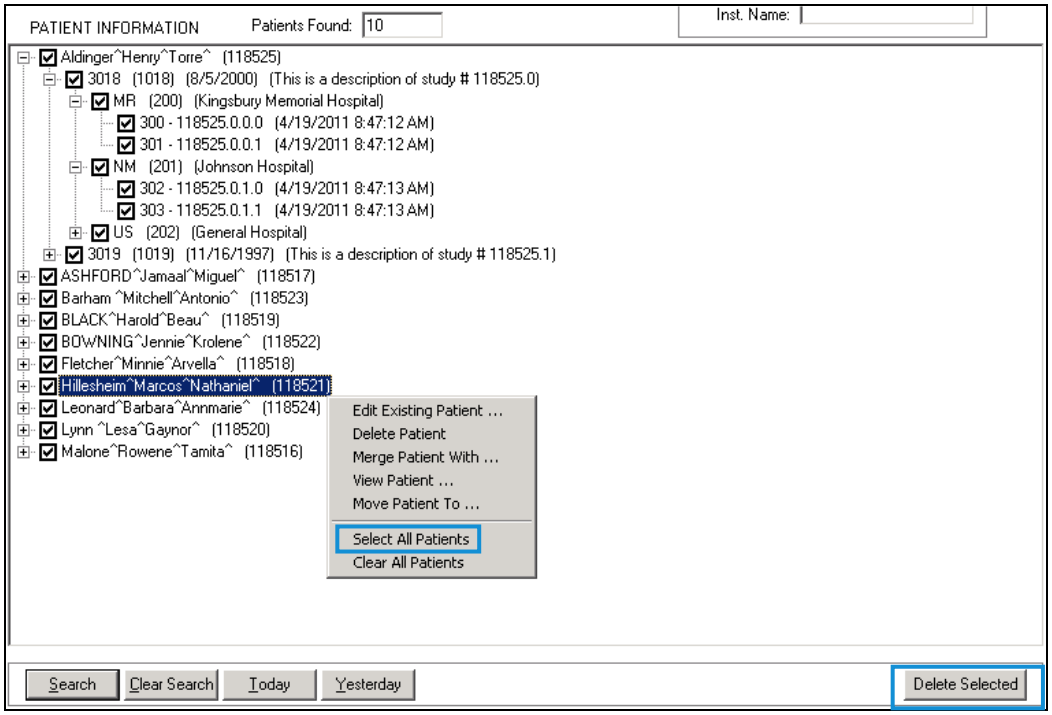
- User must be in the Acuo Administrators group
- User must be using the Full AcuoMed Image Manager MMC snap-in
- User must be in patient view
- The "Delete Selected" button must be enabled in Patient View. This is enabled by right-clicking the Patient Management node and selecting Properties. (see screenshot below)

NOTE: Deleting patients requires the removal of image files from disk as well as updating the DICOM database. Depending on the number of images selected to delete, this procedure could take a while.

Delete Selected



Users can select or clear the selections of all nodes by right-clicking on any patient in the tree and selecting either “Select All Patients” or “Clear All Patients”. Once the images, series, studies and/or patients are successfully marked for deletion, click the “Delete Selected” to process the request.



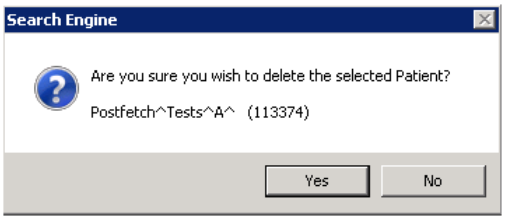
Please note that when a node is checked, all parent nodes and children nodes automatically become checked. For example, if only a single image is selected, the corresponding patient, study, and series containing that image are also selected. The higher level nodes are selected to represent there is at least one image under that patient/study/series that will be deleted. To delete a single patient, follow these steps:

1. Search for and locate the patient you want to delete.

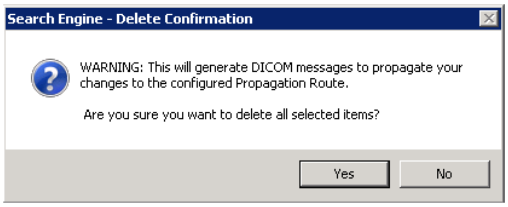
   Use the previous procedure *Search for Patients* to locate the patient you want to delete.

2. Right-click the patient to delete and select **Delete Patient** from the pop-up menu.

   The Patient delete confirmation dialog displays.



   If a Propagation route is assigned to the Dicom database where the delete is being performed, the following pop-up message will also be received:



3. Click **Yes** to delete the patient or click **No** to cancel the delete.

Caution:

Clicking **Yes** at the patient level will delete this patient and all related study/series/image information contained within the patient.

Delete Study

1. Search for and locate the patient whose study you want to delete.

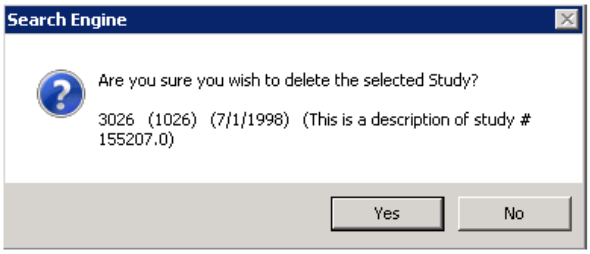
   Use the previous procedure *Search for Patients* to locate the patient you want to delete.

2. Display the studies available for this patient.

   To display studies, expand the patient by clicking the **+** sign by the patient name.

3. Right-click the study to delete and select **Delete Study** from the pop-up menu.

   The Study delete confirmation dialog displays.



4. Click **Yes** to delete the study or click **No** to cancel the delete. (See above Caution)

Delete Multiple Studies

1. Search for and locate the patient whose studies you want to delete.

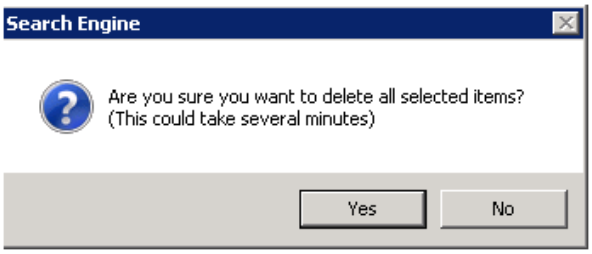
   Use the previous procedure *Search for Patients* to locate the patient you want to delete from.

2. Display the studies available for this patient.

   To display studies, expand the patient by clicking the **+** sign by the patient name.

3. Check all studies to delete and select **Delete Selected** button.

   The Study delete confirmation dialog displays.



4. Click **Yes** to delete the study or click **No** to cancel the delete. (See above Caution)

Delete Series

1. Search for and locate the patient whose series you want to delete.

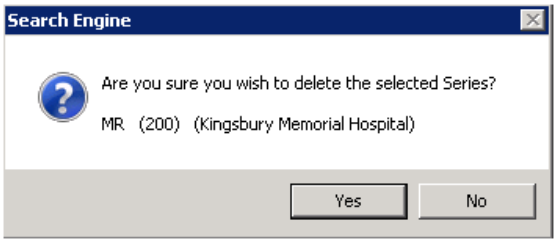
   Use the previous procedure *Search for Patients* to locate the patient you want to delete.

2. Display the series available for this patient/study.

   To display series, expand the patient by clicking the **+** sign by the patient name and then clicking the **+** sign by the appropriate study.

3. Right-click the series to delete and select **Delete Series** from the pop-up menu.

   The Series delete confirmation dialog displays.



4. Click **Yes** to delete the series or click **No** to cancel the delete. (See above Caution)

Delete Multiple Series

1. Search for and locate the patient whose series you want to delete.

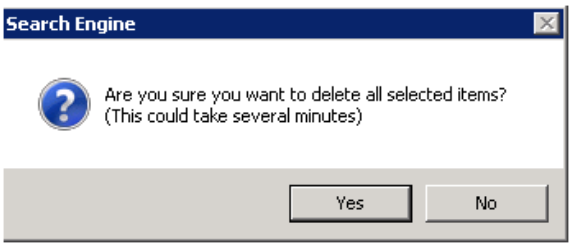
   Use the previous procedure *Search for Patients* to locate the patient you want to delete from.

2. Display the series available for this patient.

   To display series, expand the patient by clicking the **+** sign by the patient name.

3. Check all series to delete and select **Delete Selected** button.

   The series delete confirmation dialog displays.



4. Click **Yes** to delete the study or click **No** to cancel the delete. (See above Caution)

Delete Image

1. Search for and locate the patient whose image you want to delete.

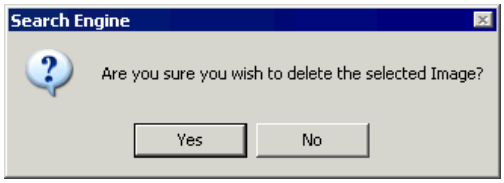
   Use the procedure *Search for Patients* to locate the patient you want to delete.

2. Display the images available for this patient/study/series.

   To display images, expand the patient by clicking the **+** sign by the patient name, clicking the **+** sign by the appropriate study, and then clicking the **+** sign by the appropriate series.

3. Right-click the image to delete and select **Delete Image** from the pop-up menu.

   The Image delete confirmation dialog displays.



4. Click **Yes** to delete the image or click **No** to cancel the delete. (See above Caution)

Delete Multiple Images

1. Search for and locate the patient whose images you want to delete.

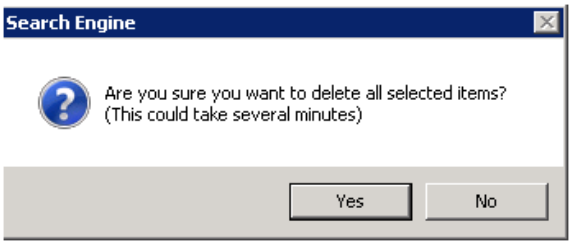
   Use the previous procedure *Search for Patients* to locate the patient you want to delete from.

2. Display the images available for this patient.

   To display images, expand the patient by clicking the **+** sign by the patient name.

3. Check all images to delete and select **Delete Selected** button.

   The series delete confirmation dialog displays.



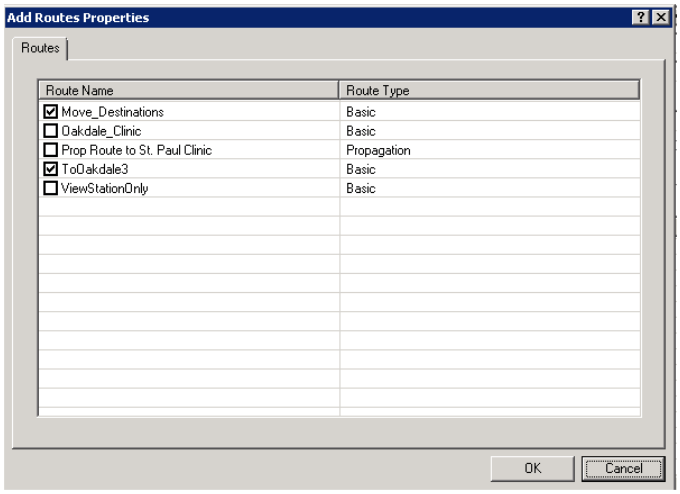
4. Click **Yes** to delete the study or click **No** to cancel the delete. (See above Caution)

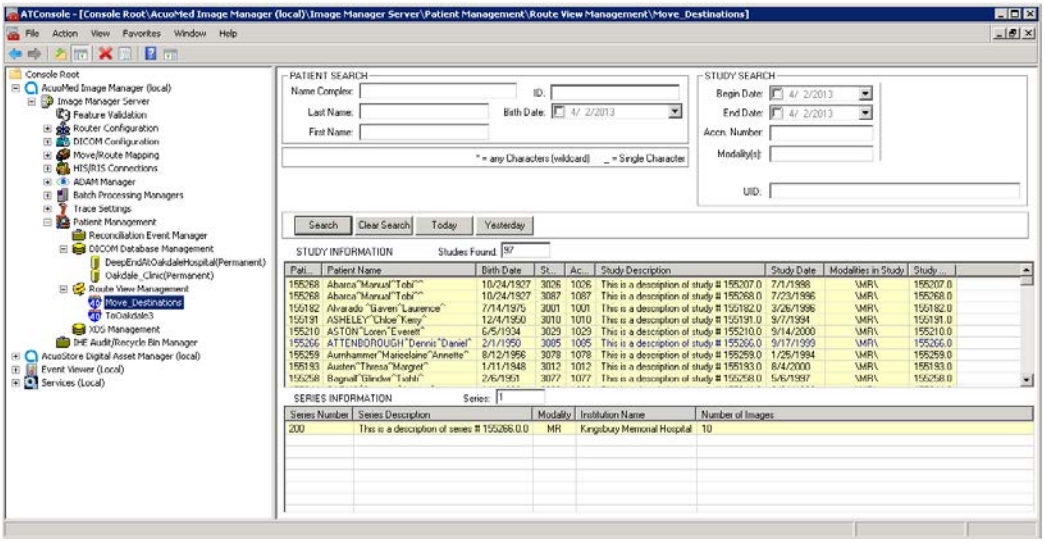
Route View Management

Route View Management allows a user to access and move patient data stored in many destinations set on a route. This can include database(s) and/or external DICOM device(s), Acuo or non-Acuo devices. A non-Acuo external DICOM device must support the standard query/retrieve SOP classes in order to take advantage of this feature. (Please review your DICOM conformance statement.)

All the standard search functions apply. Using Route View Management, patient data can be searched at the study level, Viewed at the Study and Series levels and Moved at the patient, study and series levels.

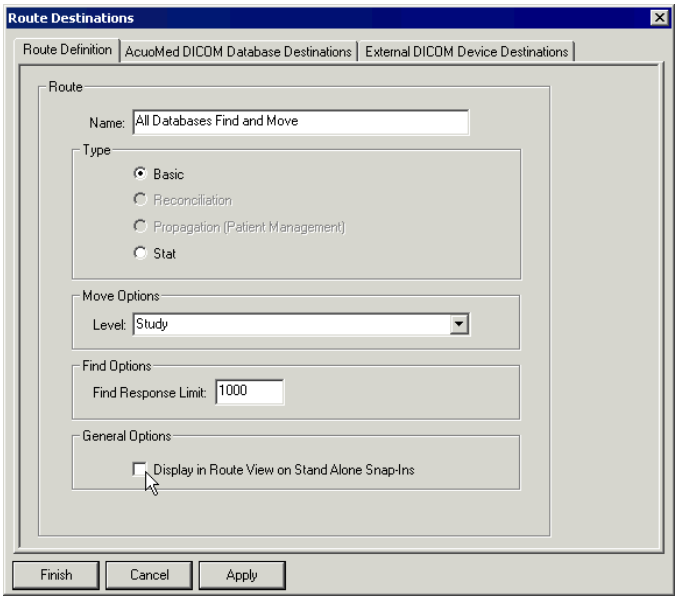
To add a route to Route View simply expand the Patient Management node → Right Click on Route View Management → and select **Add Route Views**. Check the route(s) you wish to view and click OK. Save the MMC to retain the configuration. Refer to Set up Routes to learn more about creating routes.



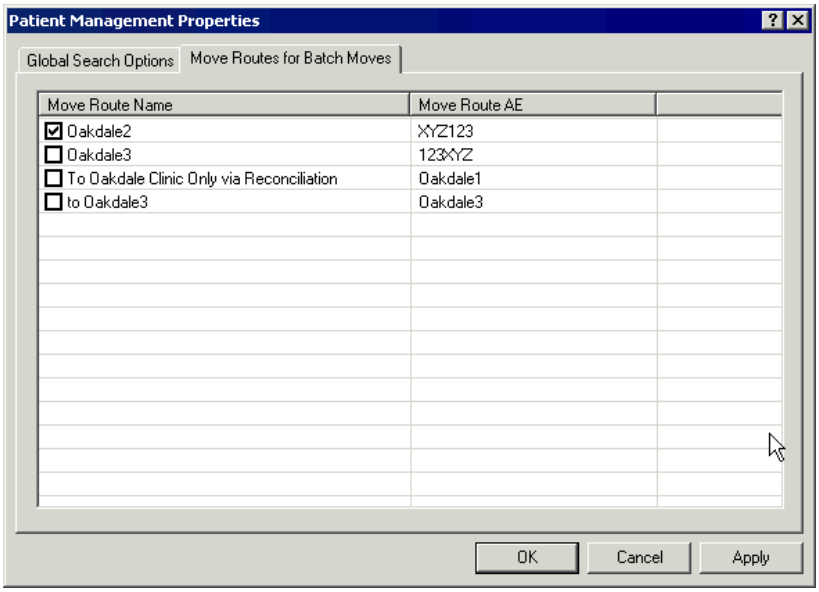


The above figure shows the two routes that have been added to Route View Management.

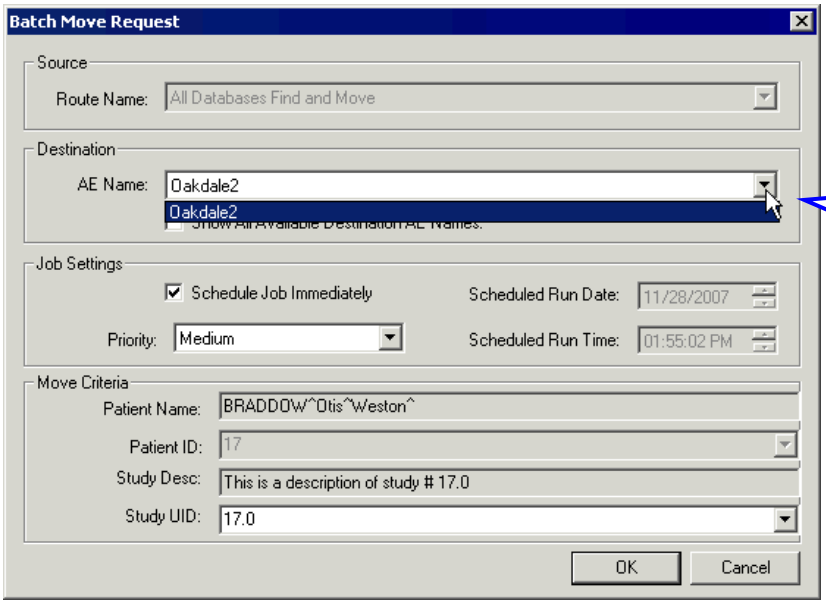
If you don't want a Route to be visible to Patient Management Snap-In users simply uncheck "Display in Route View on Stand Alone Snap-Ins" in the General Options section of the Route Destination dialog of the Route configuration as noted below. All Routes are checked by default.



You can also filter which MOVE Route AEs appear in the GUI when Patient Management or Route View users process a move operation. Configuration for this can be found at Patient Management, right click Properties, "Move Routes for Batch Move" tab.



NOTE: If no routes are checked, all Routes will display for a move operation in Patient Management and Route View. Once one route is checked, only the checked routes will display.



The move AE selected above is now the only route displayed for a move operation here for Snap-In users.

Database and Route View Personal Settings

Within Patient Management each database and/or Route View can be configured and persisted with the following options:

Search Options

- Search Response Limit: This number can be changed to limit the number of responses the system will receive when searching on this database or route.
- Display Limit Exceeding Warning: When this is checked a warning will display indicating that the limit has been exceeded.

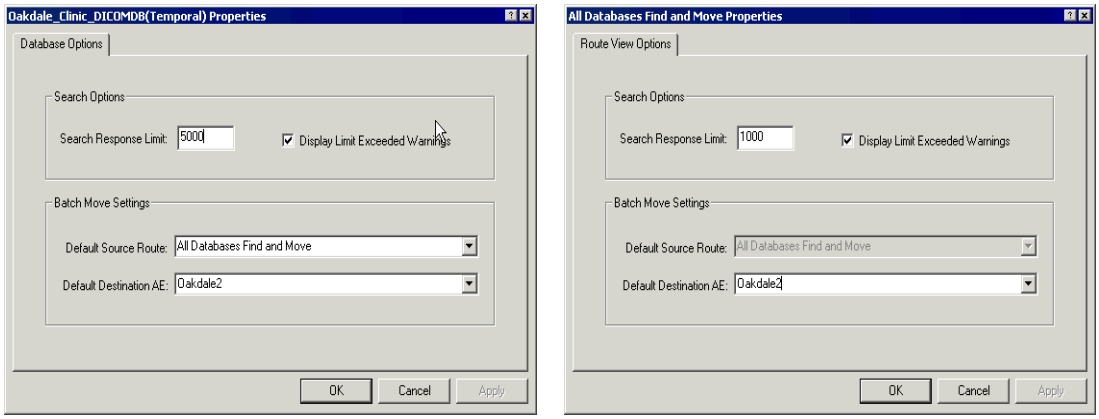
Batch Move Settings

Default Source Route:

- **DICOM Database Management**: A persistent Source Route (a route which defines where the data to be moved is located) can be selected here.
- **Route View Management**: The source route is already defined and is pre-populated.

Default Destination AE:

- **DICOM Database Management**: Select a persistent destination route. This route becomes the default destination on subsequent move requests.
- **Route View Management**: Select a persistent destination route. This route becomes the default destination on subsequent move requests.



The figures above show the property settings for a Database on the left and the property settings for a Route View on the right. The only difference is the Default Source Route.

Patient Management Snap-In

The purpose of the Patient Management Snap-In is to allow users throughout your enterprise to perform clinical tasks such as patient and study level searches, view, edit, delete and move patient data. If the Reconciliation feature is licensed for the AcuoMed Server, users throughout your enterprise can also view and perform reconciliation edits within the Reconciliation Event Manager. The following procedures summarize how this can be deployed with Active Directory:

Requirements:

OS:	Please review Acuo Release Notes for client and server requirements
Network:	Primary Domain Controller / Active Directory (or some other secondary authentication system integrated to Active Directory)

Using Active Directory is the recommended deployment of Patient Management Snap-Ins. Please contact Acuo Technologies if for some reason you cannot deploy Patient Management Snap-Ins in this fashion (integrated to Active Directory).

The Patient Management installer will automatically install pre-requisite software if it is detected that the software does not already exist on the client's system. Please review the Acuo Release Notes prior to installation.

User, Groups and Permissions:

USER: **AcuoServiceUser**

This user is installed and will be the only user to have launch permissions for the AcuoMed, Acuo Audits and AcuoStore services. The password is installed and is set to never expire. It is recommended that this user not be changed or modified in any way.

GROUPS

Acuo Administrators: **Configure, Batch Management, Audit Access, Reconciliation, Search, Edit, Delete, Merge, View and Move Data**

Users in this group have the ability to open a full AcuoMed GUI. The AcuoServiceUser is automatically put into this group. Users in this group essentially have full access to all management functionality, including configuration, reconciliation, search, edit, delete, merge, view, move, batch management, and audit access. Users within this group will require full access to all shares.

Acuo Power Users: **Batch Management, Audit Access, Reconciliation, Search, Edit, Delete, Merge, View and Move Data**

Users in this group essentially have access to all functionality of the management GUI except configuration, including reconciliation, search, edit, delete, merge, view, move, batch management, and audit access. . Users within this group will require full access to all shares.

Acuo Users: **Batch Management, Search, View and Move Data**

Users in this group DO NOT have the ability to view REM (Reconciliation Event Manager) and reconcile images. Users will NOT have access to the full GUI (configuration). Users will only have access to the Patient Management and Batch Management GUI. Users within this group will require "read only" access to all shares.

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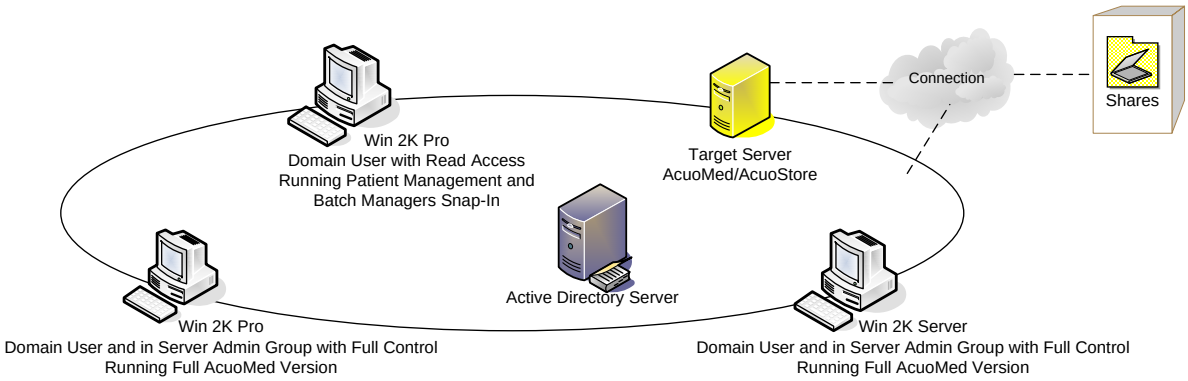
NOTE: Full Control access is required on the Target Server to Delete, Edit or Reconcile Data.



Patient Management Snap-In Installation procedure

Please follow the installation procedure starting in **Chapter 3** selecting the **Patient Management** option.

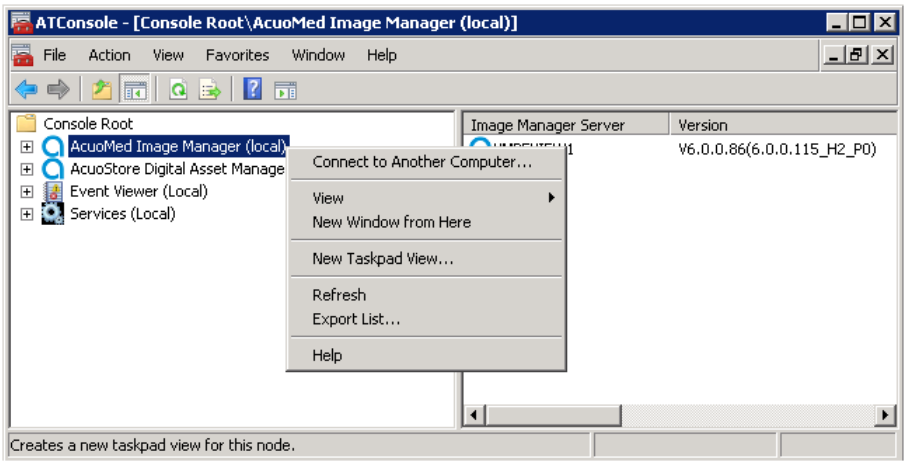
Install the above mentioned groups on your Active Directory Server and add users into the appropriate groups.

NOTE: If you are unable to complete a function in Patient Management or Route View, check permissions for **Sharing** and **Security** on each physical share. See the AcuoStore Manual for more information on setting up shares.

On a fresh install follow the instructions below to connect to the Target Acuo Server. Upon installation of an upgrade to the software, this step is not needed as long as an .msc file has been saved to the system you are upgrading.

Connecting the Snap-In to the Target Acuo Server

1. Right click on the **Patient Management** node and select **Connect to Another Computer**.



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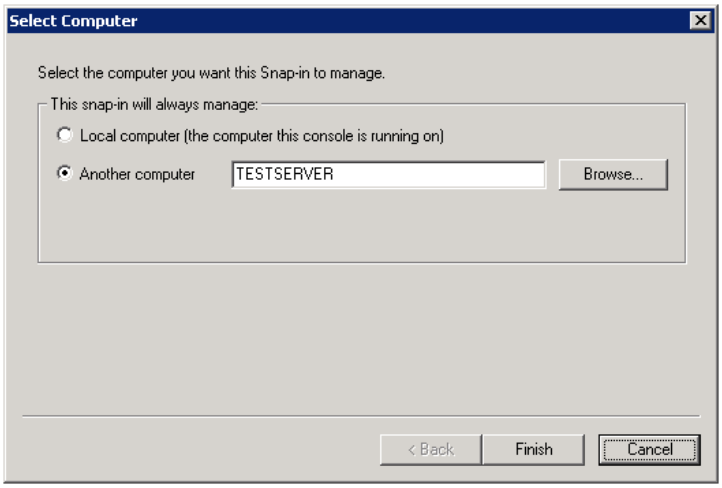
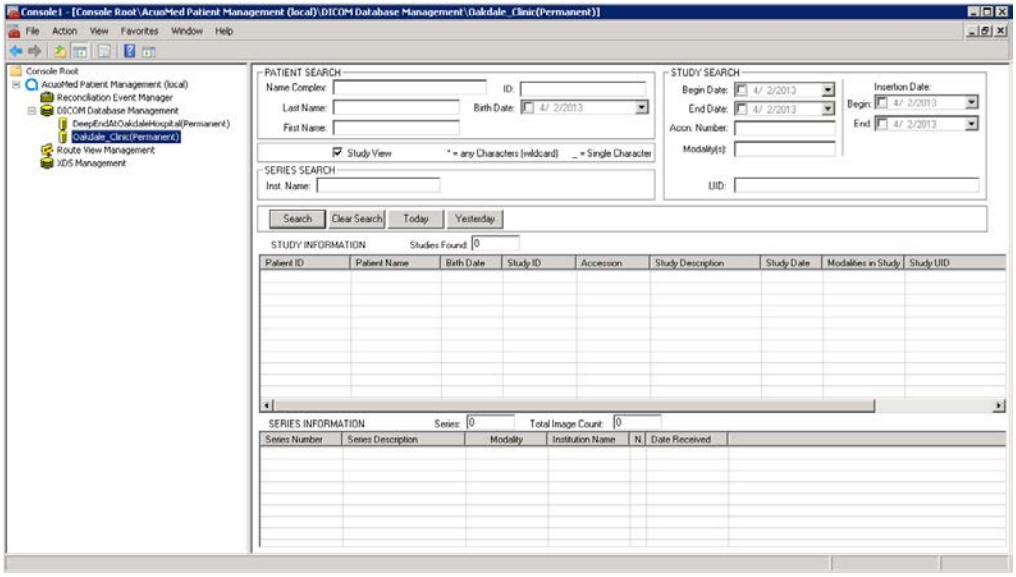
2. Click on **Another Instance**, browse the network for the Target Acuo Server and click **Finish**.



3. Connected Patient Management Snap-In. The user in our example is in the Acuo Power Users group and therefore has access to the Reconciliation Event Manager node in the GUI.



Reconciliation

Unlike the DICOM Database Management Edit function (which involves a manual process of finding and fixing bad data after it is already in an AcuoMed DICOM database), Reconciliation is an automatic process that prevents bad data from coming into a DICOM database in the first place. Reconciliation auto-detects differences from the master patient data and queues reconciliation events. The reconciliation process allows you to edit incorrect data and submit it for reprocessing against a HIS/RIS supporting DICOM Modality Worklist or HL7 (requires separate licensing of AcuoSemantix). Refer to

Patient Management Overview earlier in this chapter for a high-level view of DICOM Database Management and Reconciliation.

When there is a HIS/RIS system connected to the AcuoMed Server, the Reconciliation feature will use a local copy of the HIS/RIS data as its reconciliation target. It is possible to license the HIS/RIS Connectivity feature without the Reconciliation feature. You may decide to use Prefetching, for example. Likewise, it is possible to license Reconciliation without HIS/RIS Connectivity. In this case, RIS data can be manually imported into AcuoMed.

Alternatively, if the RIS supports an HL7 feed, Acuo's AcuoSemantix (separately licensed) platform provides more immediate reconciliation. Unlike a DICOM Modality Worklist feed, an ADT message (for example a change in a patient's name) is sent immediately to AcuoSemantix (via HL7) rather than AcuoMed performing a C-FIND (for example every 15 minutes via DICOM Modality Worklist) to get the same information local to the AcuoMed system. For more information, please refer to a separate document which describes AcuoSemantix in more detail.

Once an edit, delete or merge occurs, either automatically via reconciliation or manually via Patient Management, a route can be configured and applied to local databases to propagate the update to other AcuoMed destinations, synchronizing all related instances of patient information.

Figure 47 shows an example configuration for implementing AcuoMed Reconciliation in an enterprise environment.

The enterprise environment in Figure 47 comprises the following components and routes:

- An AcuoMed Deep-End System that is connected to a DICOM Worklist enabled HIS/RIS System. (Typically, this type of AcuoMed System would be located at a centralized facility, such as a main hospital.) The AcuoMed Deep-End maintains two separate DICOM Master/Permanent databases ("Dicom Db A Master" and "Dicom Db B Master" for storing assets from each of the connected AcuoMed Temporal (Department) Servers.

- AcuoMed Temporal System A that saves assets to a local temporal DICOM database (Dicom Db1) and to a master database on the Deep-End (Dicom Db A Master). There is also a STAT Route to a Review Station; assets are always immediately delivered to the Review Station regardless of their reconciliation status (typically, this is needed for Emergency Room cases). Finally, there is a local reconciliation database (Reconciliation Db) used to temporarily store assets having known data errors that are being reprocessed.

- AcuoMed Temporal System B that saves assets to a local temporal DICOM database (Dicom Db1) and to a master database on the Deep-End (Dicom Db B Master). As for Temporal System A, there is a local reconciliation database (Reconciliation Db) used to temporarily store assets that are being reprocessed.

- Called AE "Route 1" on Acuo Temporal System A – assets sent to this route are delivered to these destinations: Dicom Db1 on Temporal System A, called AE "Route 3" (Dicom DB A Master) on the Deep-End System, and the Review Station (STAT Route) on Temporal System A.

- Called AE "Route 2" on Acuo Temporal System B – assets sent to this route are delivered to these destinations: Dicom Db1 on Temporal System B and called AE "Route 4" (Dicom DB B Master) on the Deep-End System.

- Propagation Route – used to send update messages to Acuo Temporal System A and Acuo Temporal System B needed to keep all Acuo patient data in synch.

A description of the sequence of events that occur in Figure 47 are described following the figure.

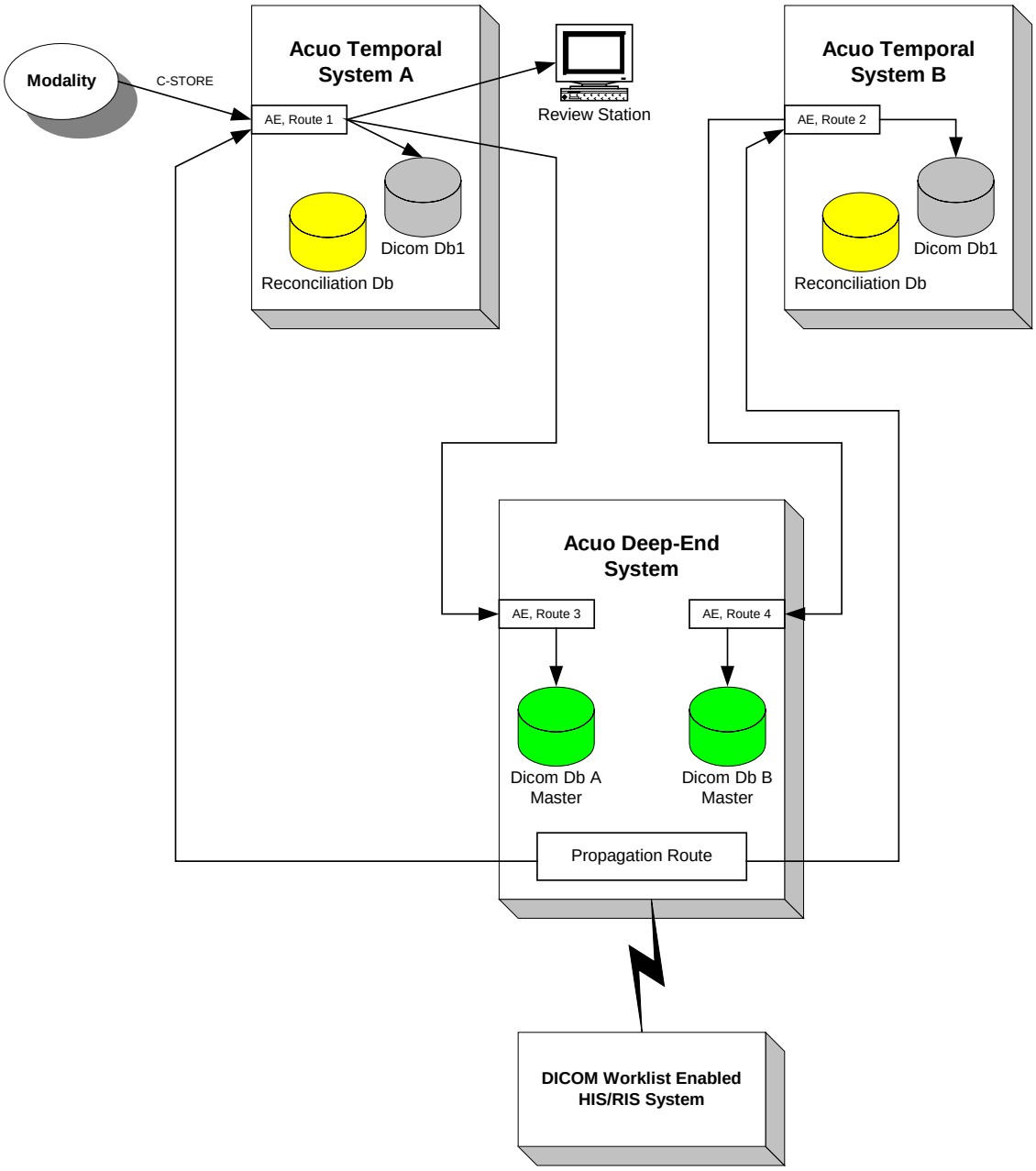


Figure 47: Enterprise Reconciliation example

Here is a summary of a typical sequence of events that would occur in Figure 47:

NOTE:	In the steps below we talk in terms of a single asset, but this may actually include many patient images (assets) that are all within one group of reconciliation events resulting from a single problem with the data.

1. A C-STORE is received into Temporal System **A** (called AE Route 1). Temporal System **A** does a patient data check against the HIS/RIS reconciliation target database on the Deep-End. A patient data error is discovered (for example, the Patient Name does not match).
2. Temporal System **A** queues a reconciliation event, which causes the asset to not get stored to local Dicom DB 1 or to remote Dicom DB **A** Master. However, the asset is immediately sent to the STAT Route (Review Station), and it is stored in System **A**'s local Reconciliation database (where it will be temporarily available should it be needed).
3. The Administrator for Temporal System **A** corrects the incorrect patient data by editing the asset using AcuoMed's Reconciliation Event Manger (see *Reconciliation Event Manager* on page 240).
4. Temporal System **A** submits the edited asset for batch reprocessing (see *Batch Reprocessing Manager* on page 319).
5. The edited asset now passes reconciliation and is marked as "Reconciled."
6. The edited asset is delivered to its route destinations: local Dicom DB 1, called AE Route 3 (remote Dicom DB **A** Master), and the STAT Route so that the Review Station has the most recent data.
7. The Deep-End System receives the asset and confirms the data still matches the HIS/RIS.
8. The Deep-End System stores the asset to Dicom DB **A** Master.
9. The Deep-End System generates a "Fix-It" message to the Propagation Route, which in turn causes the updated patient data to be delivered to Temporal System **A** and Temporal System **B**.
10. The Temporal System **A** and Temporal System **B** storage interfaces check each local system for assets related to the updated patient and correct the appropriate patient data as needed. This process keeps all data in synch across the entire Acuo Systems enterprise.

Related Reconciliation Topics

For more about installing, configuring, and operating the Reconciliation feature, see these topics:

- *Reconciliation Configuration Requirements* on page 232
- *Install a Reconciliation Database* on page 233
- *Reconciliation* Target on page 239
- *Reconciliation Event Manager* on page 240
- *Reconciliation Tag Rules* on page 250

Reconciliation Configuration Requirements

There are a number of steps required to configure the Reconciliation feature. The following procedure describes a general process for configuring AcuoMed Reconciliation. Where appropriate, references are given to other topics in this document.

To configure an AcuoMed Server for Reconciliation, follow these steps:

1. Enable the Reconciliation feature. (This will trigger a wizard which will walk you through part of the configuration.)

   You will contact Acuo Technologies to license the Reconciliation feature. Refer to **AcuoMed Feature Validation** on page 48 for details on how to do this.

2. Install a Reconciliation database.

   As soon as you apply the new feature key in Step 1, the process to install a reconciliation database automatically starts. Refer to the topic *Install a Reconciliation Database* on page 233.

3. Create a new route destination for the Reconciliation database.

   This is an internal system route to the Reconciliation database. The wizard will automatically configure the route called “reconciliation” and will apply the Reconciliation database as an AcuoMed DICOM Database destination.

4. Define the source devices using Reconciliation Tag Rules.

   This process involves defining the tag within DICOM Tag Customization (for example device serial number or institution name) that identifies the remote sending device specifying the Patient Name and Patient ID within Reconciliation Tag Control that will be received (expected) by AcuoMed for each source device, and how to normalize these patient data fields to the AcuoMed System. For more details and an example of this process, refer to *Reconciliation Tag Rules* on page 250.

5. Specify the database against which AcuoMed will perform reconciliation and set up AcuoMed's Tag Normalization for reconciling Patient IDs.

   From the AcuoMed Server tree node, select **Properties**. In the AcuoMed Server Properties dialog use the **Reconciliation** tab to configure global Reconciliation parameters. For more information, refer to the topic *Verify AcuoMed Server Properties for Reconciliation* on page 261 .

6. Configure each Called AE Name on which reconciliation is to be performed.

   For each AE, consider the following:

   - Are the default parameters appropriate for the specified reconciliation target database?
   - Consider any tag rules that may not require reconciliation for this Called AE. You can enable/disable Reconciliation on a per rule basis.
   - Decide if you need to define a Tag Failure Route.
   - Do you need to define a STAT route for delivery of un-reconciled assets that may be held up in Reconciliation?
   - Set Reconciliation Master Info and Server Selection parameters.

7. Restart the Acuo Services.

   From the AcuoMed MMC, select Services and stop/start the AcuoMed Service.

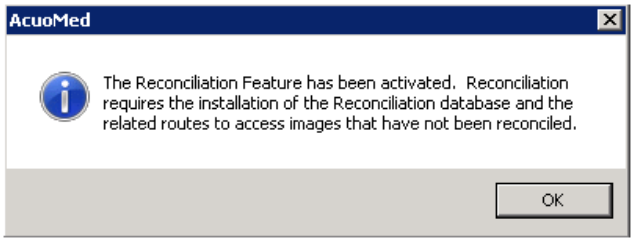
Install a Reconciliation Database

A reconciliation database is required to support the Reconciliation feature. When you enter a Feature Key that enables Reconciliation, you will automatically be prompted to install the reconciliation database.

To install a reconciliation database, follow these steps:

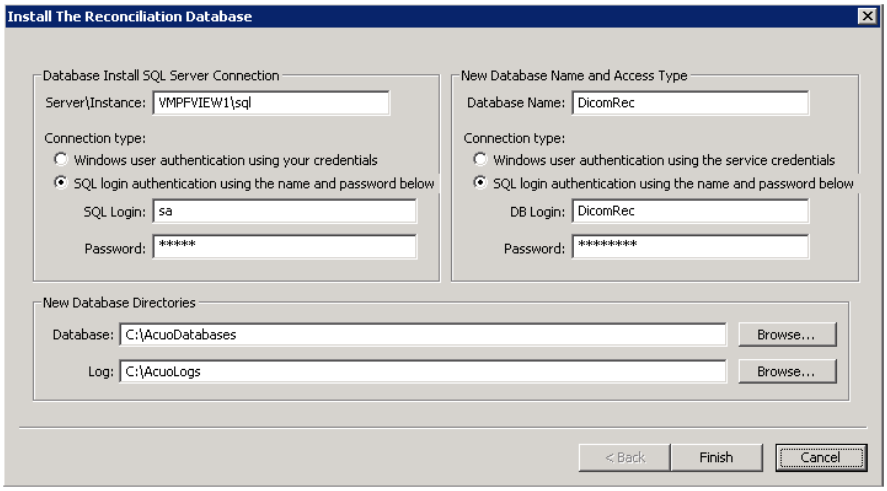
1. In the Feature Validation screen, enter a Feature Key that will enable Reconciliation and click **Apply**.

   You are notified that the Reconciliation Feature has been activated and that a Reconciliation database must be installed.



2. Click **OK** to continue.

   The **Install The Reconciliation Database** dialog displays automatically.



3. For the Database Installation Authentication, do the following:

   - SQL Server Instance: Typically you would use the SQL Server Instance of your local computer which is set by default, but you can also install the database on another computer.
   - Choose Connection Type:
     - SQL Login Authentication: type in your unique SQL Server administrative login and password. (This is the administrative authentication that allows you to install a new database in the Database Server.)

     OR

     - Windows Authentication: Use the current Windows user Authentication.

4. For the AcuoMed Database Parameters, do the following:

   - Database name: enter a name for the new database. You can use the default DicomRec or enter some other name that you prefer for your installation. The database name must be unique within your SQL Server installation.

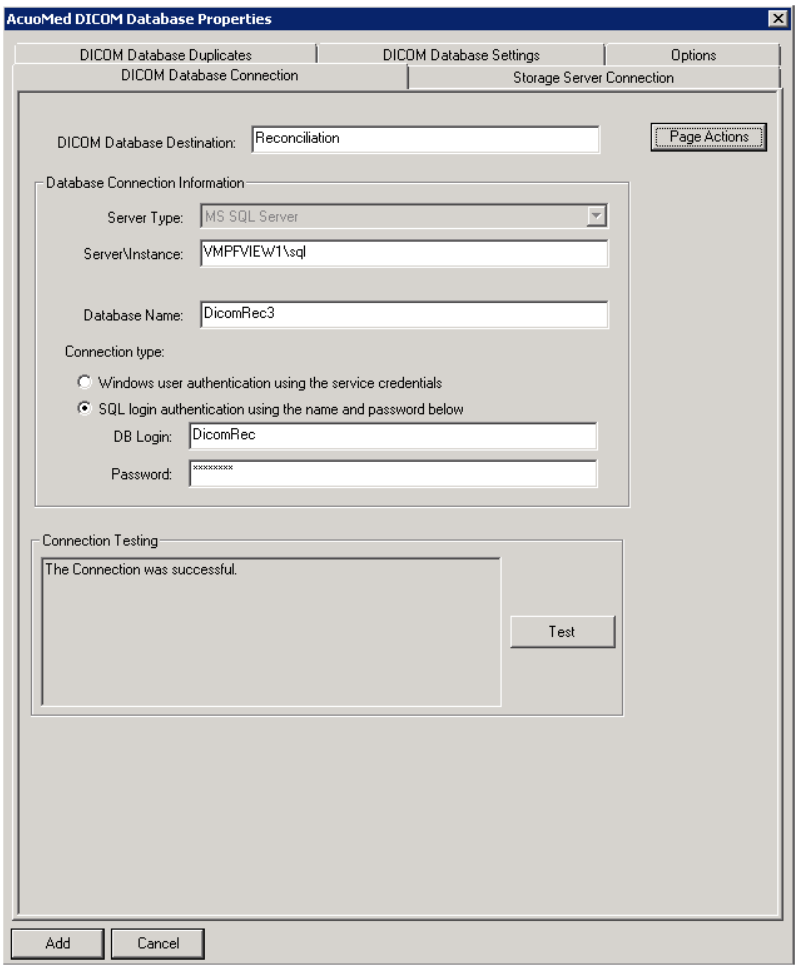
- Choose Connection Type:
    - SQL Login Authentication: type in the DB Login and password that a user will need to enter to gain access to this database.

    OR

    - Windows Authentication: Use the current Windows user Authentication.

5. Set the New Database Directories to determine where the database files will be installed.
    - Database: you can either type in a location or click **Browse** and select an existing location. Do not install database files to your system drive (where your Windows installation is located), because it is not possible to span volumes to expand the system drive as your database grows. Instead, install the database on a separate partition or different physical drive (be sure the database install location is a dynamic disk to allow Volume Spanning for database growth).
    - Log: Microsoft recommends that you save log files on a different drive than where the database files are saved (but this is not a strong recommendation); so, you can save them in the same directory as the database files if you prefer.
6. Click **Finish** to create the database.

    The AcuoMed DICOM Database Properties dialog displays with the DICOM Database Connection tab selected. All required fields are preconfigured with the values you already entered in this procedure.

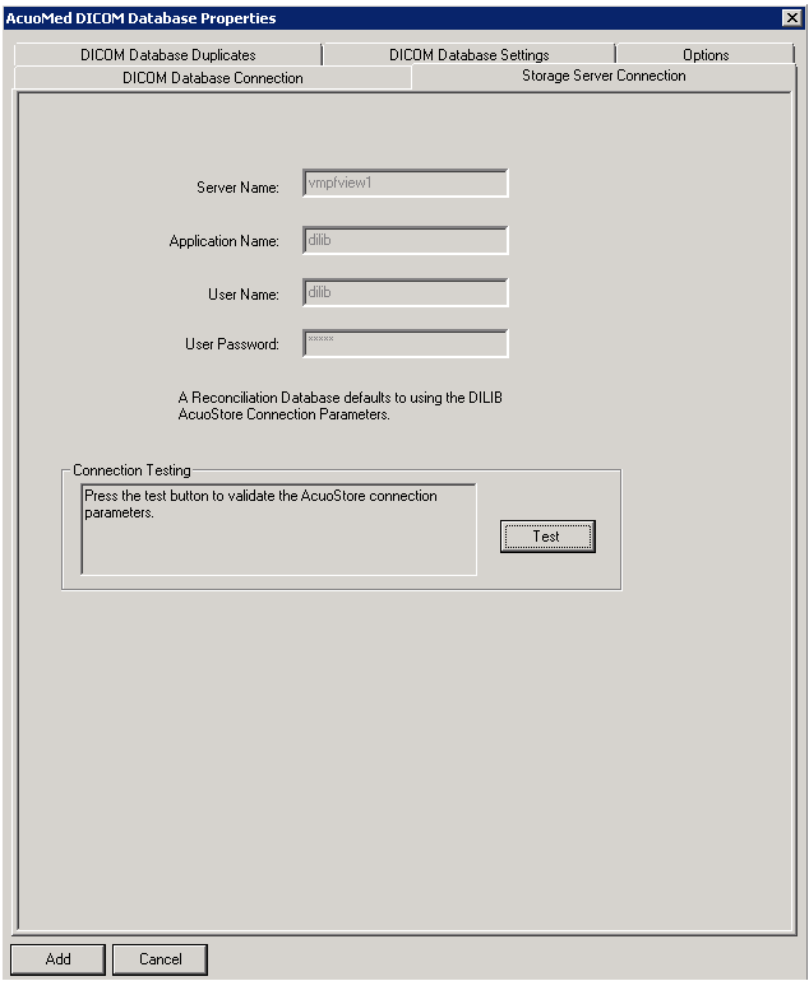


7. Click **Test** to verify that you are able to connect to the new Reconciliation database.

   If the connection is not successful, check and change your database connection parameters and test the connection again. You must pass the connection test in order to continue. If you do not click **Test**, the connection test will run automatically when you click the **Add** button.

8. Click the **AcuoStore Connection** tab and configure the Reconciliation database's AcuoStore connection.

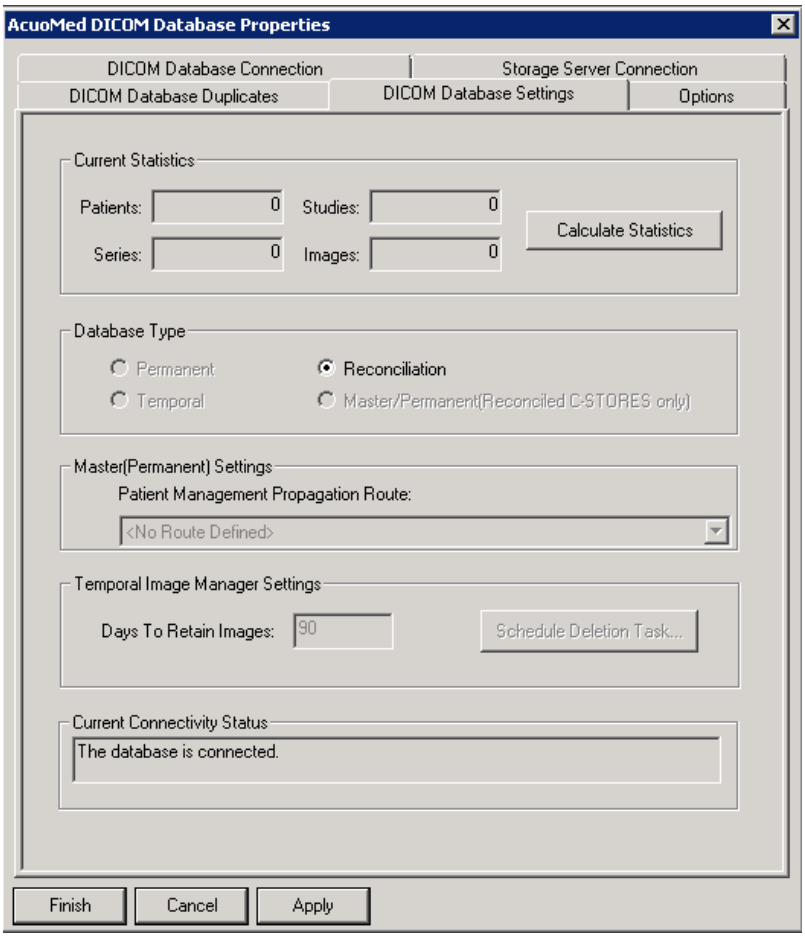
   This is the mapping between the Reconciliation database and the AcuoStore application. Dilib is the required application configuration, therefore, cannot be changed.



   Click **Test** to validate the AcuoStore connection parameters. If the connection is not successful, refer to Configuring the AcuoStore Dilib Connection and change your Dilib connection parameters and test the connection again. You must pass the connection test in order to continue. If you do not click **Test**, the connection test will run automatically when you click the **Add** button.

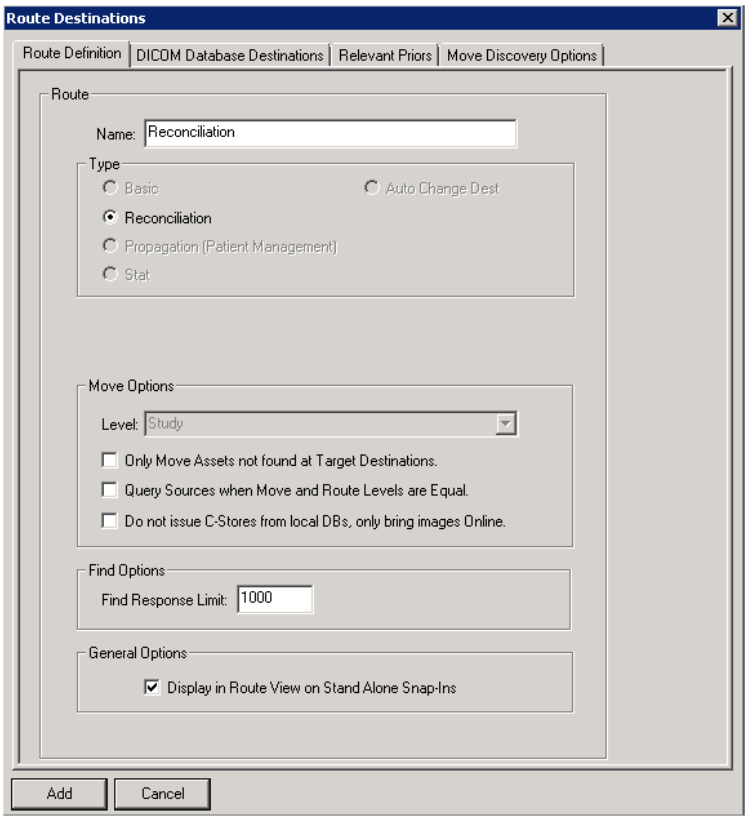
9. Click the **DICOM Database Settings** tab.

   Notice that the selected database type is Reconciliation. You cannot change this selection since you are setting up a Reconciliation database.

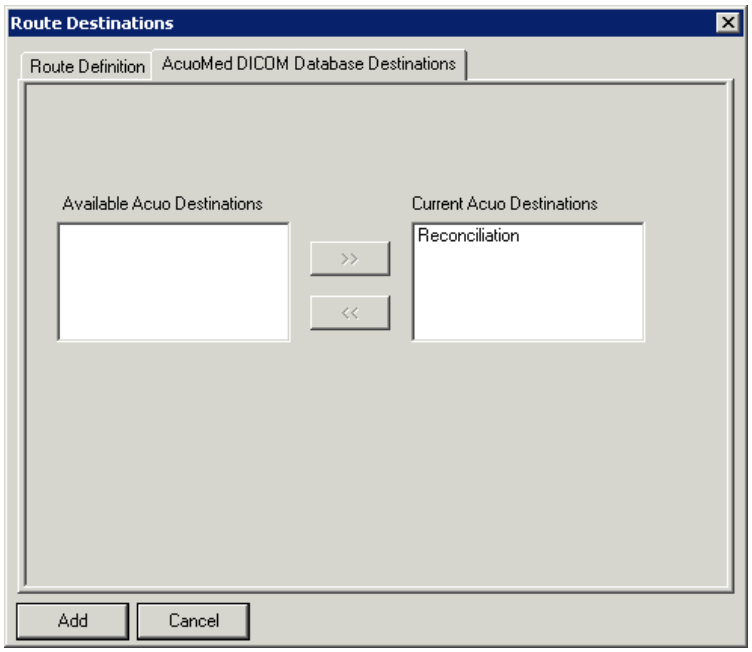


10. Click **Add** to complete set up of the database and AcuoStore connections.

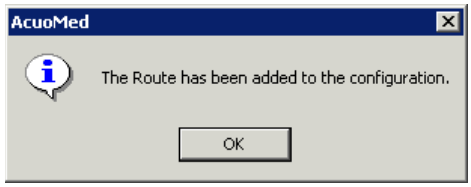
    - The Route Destinations dialog automatically displays with the Route Definition tab selected. The Route Name (Reconciliation) and Type of Reconciliation are pre-selected.
    - The Find Response limit, default of 1000, can be changed to limit the number of responses on a search or C-Find request.
    - The General Options feature filters Routes from Patient Management Snap-In users. In our example, we have made the route available to Patient Management Snap-In users.



11. (Optional) If you click the AcuoMed DICOM Database Destinations tab, you will see that the current Acuo destination is the Reconciliation database.



12. Click **Add** to set up the Reconciliation route.



13. Click **OK** to complete the setup of the Reconciliation database setup procedure.

    You can verify that the database is installed by starting SQL Server Enterprise Manager and looking in the MMC console tree under Microsoft SQL Servers→ SQL Server Group→ [YOUR SERVER NAME]→ Databases. For our example procedure above, the database "Reconciliation" should appear.

Purpose of a Reconciliation Database

A reconciliation database contains all the images (assets) for a single AcuoMed Reconciliation Event Manager. The assets on a reconciliation database are assets that require editing to correct errors (such as a wrong patient name) before they can be forwarded onto their proper route destinations. While an asset is temporarily being stored on a reconciliation database, during error identification and correction, it is still available by Patient Management for example should it be needed by someone, such as a physician.

NOTE: An AcuoMed Server can only have one database of this type. In our examples in this document, this database has the name "Reconciliation" but it can have any user-defined name. For example, you could name it "Unreconciled Images" or some other useful name.

As an example, let's assume that a reading physician named Dr. Mary Jones has not received a series of patient images she was expecting. Dr. Jones can do a search that includes the reconciliation database for all images with a reading physician tag of "Jones^Mary" on her destination route. This search, like any other database search, can be done from anywhere in the network. This will allow Dr. Jones to retrieve any assets currently in reconciliation processing that are destined for her, even though these assets have not yet completed reconciliation and been sent on to their route destinations. Please note, the images she will receive are not reconciled.

Once an asset has been reconciled and delivered to its destination, AcuoMed automatically deletes it from the reconciliation database.

For more information on the reconciliation database and its function in the reconciliation process, refer to *Reconciliation Event Manager* on page 240.

Reconciliation Target

Reconciliation target refers to the patient master data that AcuoMed's Reconciliation feature uses to verify patient information and to reconcile assets with incorrect patient data. There is one possible reconciliation target, the HIS/RIS data (this may be referred to as the golden data or the most accurate), although the data can be generated by DICOM Modality Worklist, AcuoSemantix (HL7) or manually imported into the AcuoMed database. The Reconciliation Target can be located on a separate AcuoMed server.

HIS/RIS Patient Information

HIS/RIS Patient Information

If the AcuoMed Server is HIS/RIS connected, reconciliation is performed against the HIS/RIS patient information. A copy of this patient information resides on the AcuoMed Server in the Acuo HIS/RIS Database. No new or changed patient information is allowed to be stored in the Acuo HIS/RIS Database unless it is registered in the external HIS/RIS system. HIS/RIS patient data, available via a HIS/RIS system connection, is the recommended reconciliation target.

Reconciliation Event Manager (REM)

The Reconciliation Event Manager, via the Reconciliation Queue (right window pane) provides a quickly accessible summary of reconciliation event information. The Reconciliation Event Manager allows you to view a reconciliation event's properties in order to determine what caused the event and to edit tag values to fix incorrect data. All assets that fail reconciliation are temporarily stored in the Reconciliation database. For additional information on the Reconciliation Database, refer to the topics *Install a Reconciliation Database* on page 233 and *Purpose of a Reconciliation* Database on page 239.)

After you have applied an edit, the modified asset is moved to the Batch Reprocessing Manager's Batch Reprocessing Queue. Jobs in the Batch Reprocessing Queue are resubmitted to AcuoMed for reprocessing. If, on reprocessing an asset now passes reconciliation, it is sent onto its route destination(s) and is automatically deleted from the Reconciliation database. If the reprocessed asset does not pass reconciliation, it must be re-edited and resubmitted again. Figure 48 shows how assets flow through the Reconciliation Event Manager.

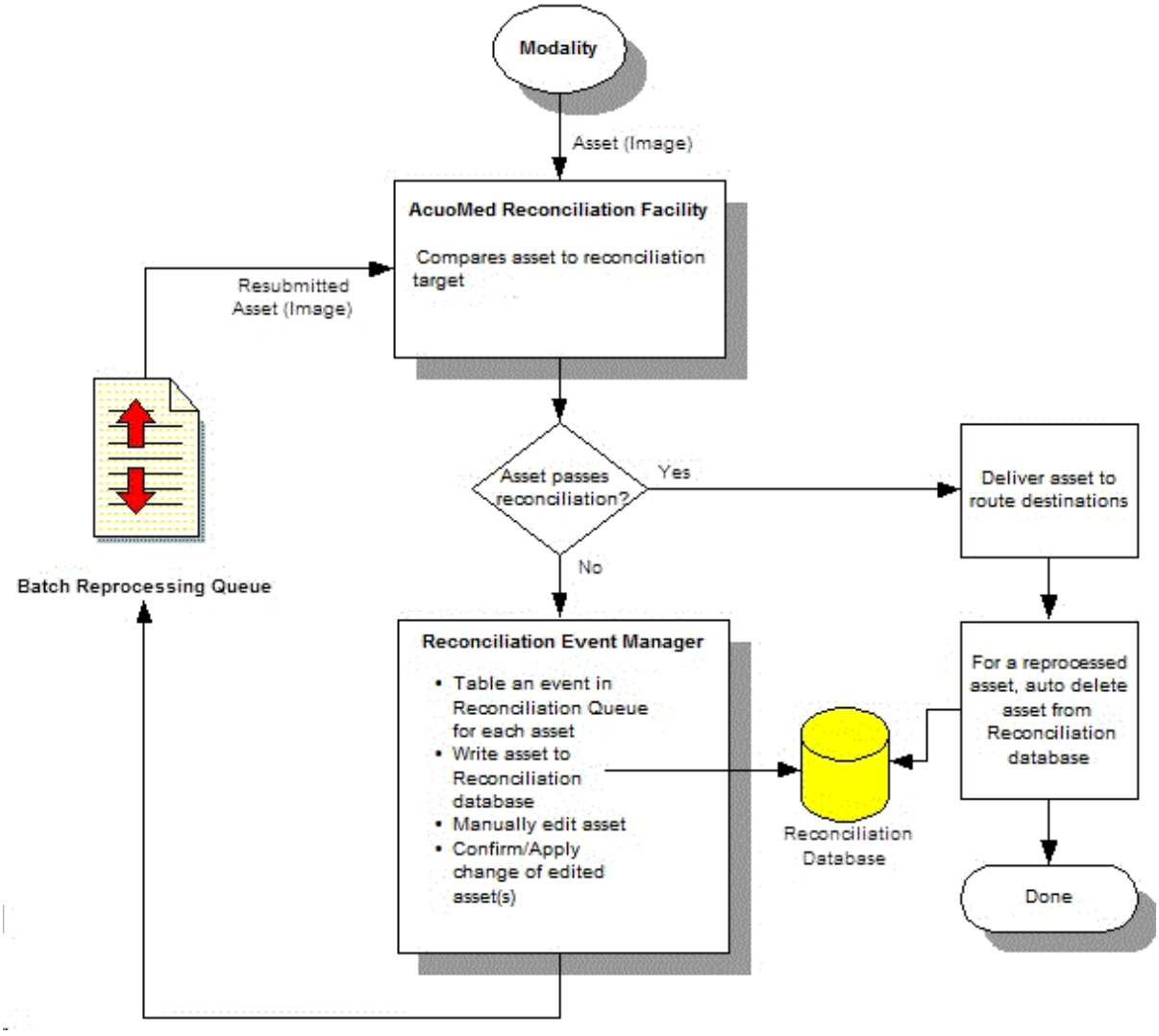
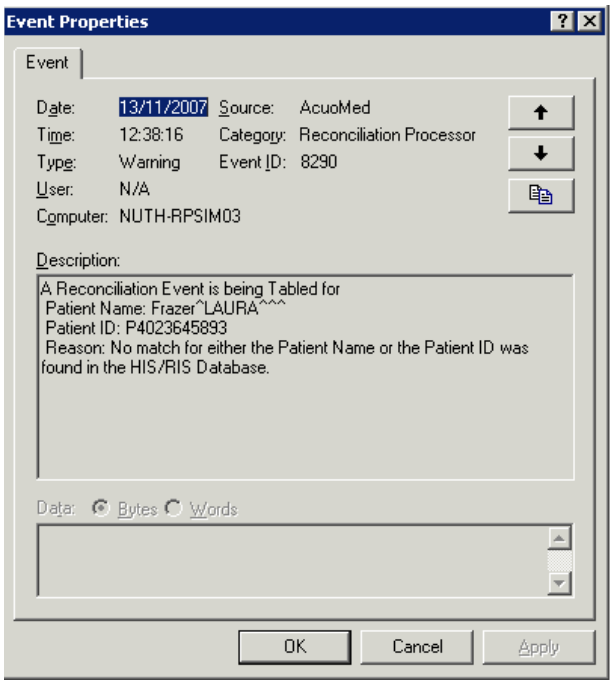


Figure 48: Reconciliation Event Manager flow diagram

Reconciliation Event Manager Interface

To access the Reconciliation Event Manager expand the Patient Management node of the console tree and click **Reconciliation Event Manager** under Patient Management. Current reconciliation events display in the Reconciliation Queue (right window pane), as shown in *Figure 50* below. Typically, someone is responsible for reviewing the Reconciliation Queue periodically (daily for example) to identify and fix problems, and the following event output also acts as a reminder.



The Reconciliation Event Manager is limited to one user. Other users will receive a message that the REM is in use and unavailable. The functionality is limited to users in the Acuo Administrators Group or Acuo Power Users Group.

AcuoMed uses a HIS/RIS target to perform reconciliation processing. AcuoMed, using its reconciliation target data, generates a reconciliation event when a mismatch is encountered. For example, an image has incorrect information, such as a Patient Name or Patient ID that does not match the HIS/RIS information that AcuoMed knows about in its database.

You can select an event type filter to control the event type that displays in the reconciliation queue. To select a filter, click **Event Type** to display the drop-down list (Figure 49 below) and then choose one of the available event filters.

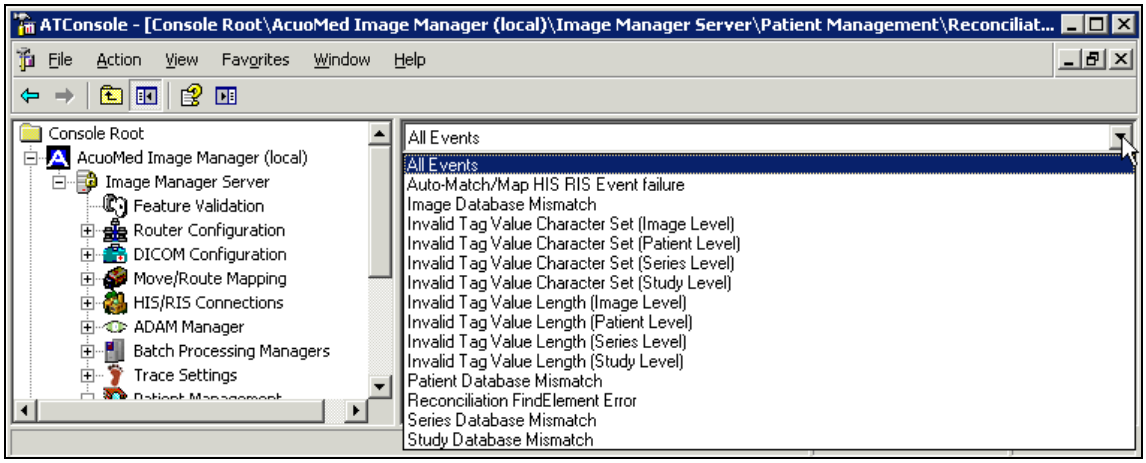
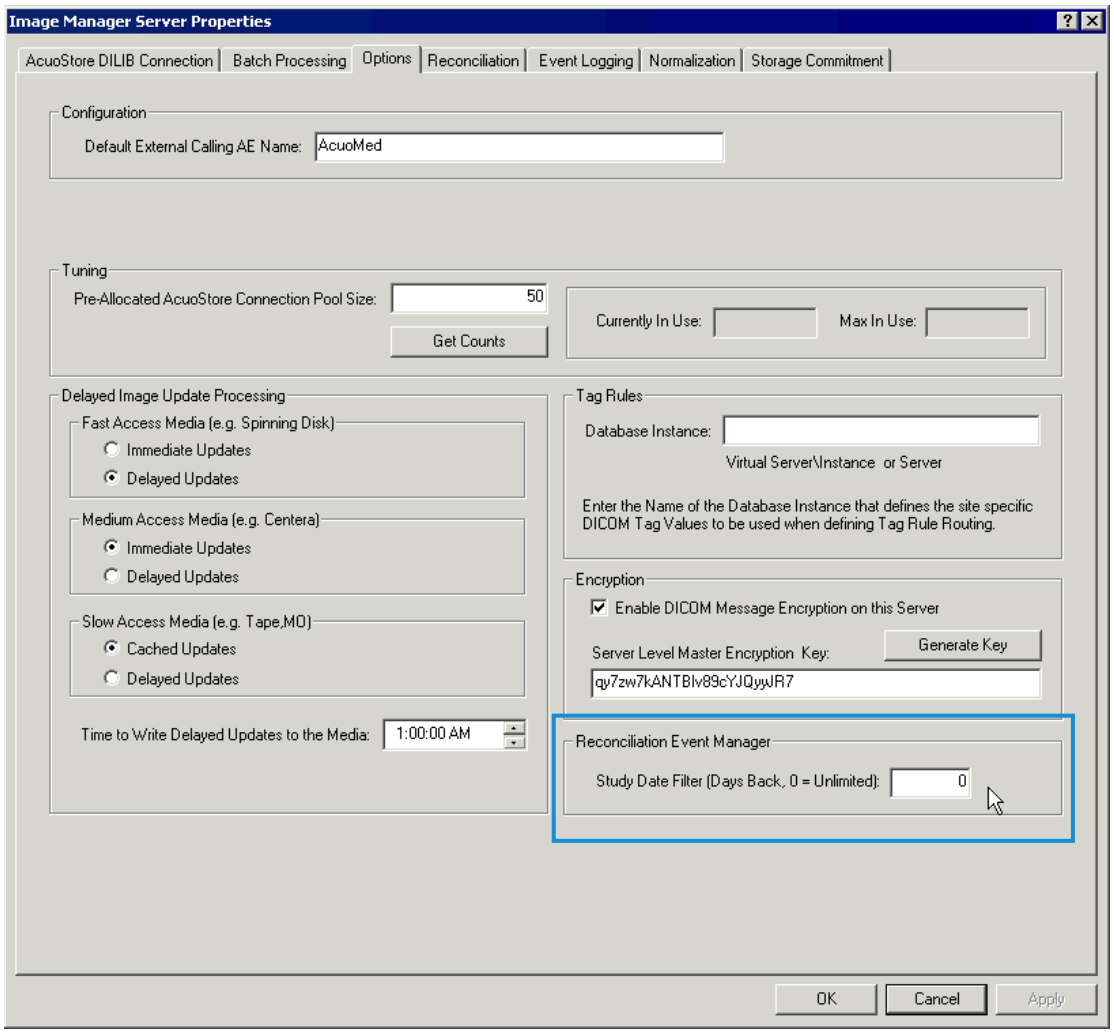


Figure 49: Reconciliation Event Manager – Event Type filters

To filter the number of events that display in the REM, Right click on Image Manager Server and select properties. In the Options Tab, configure the Study Date Filter for the number of day's back you wish to display REM events.



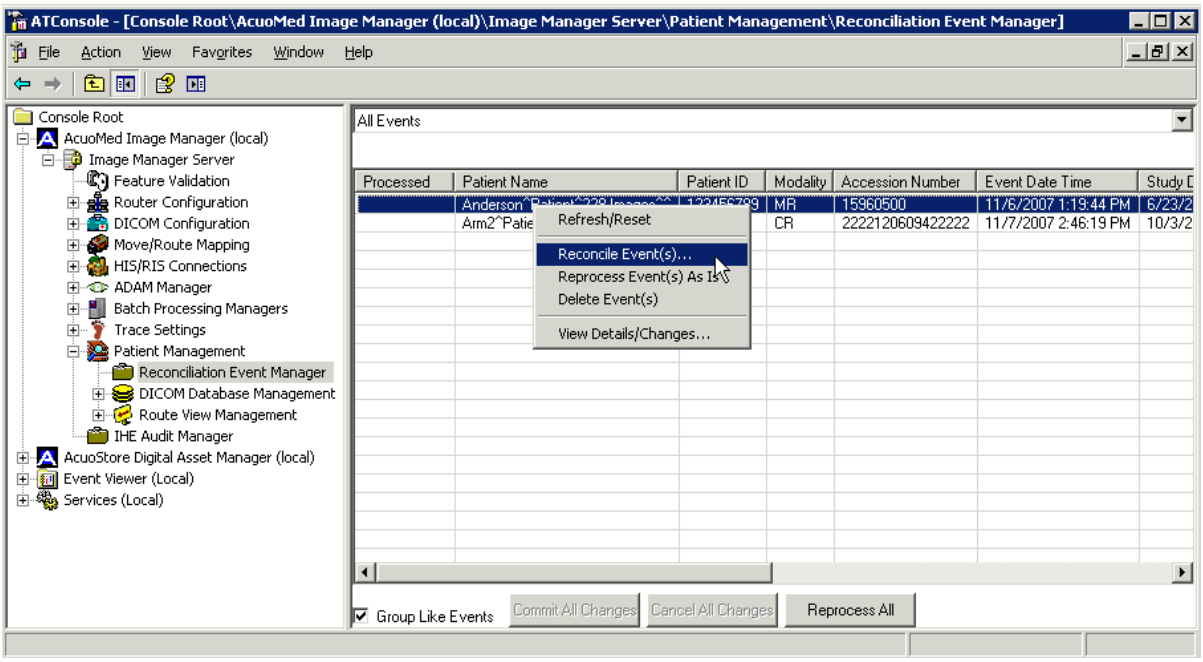
Editing Reconciliation Event Assets

When AcuoMed receives an inbound asset that does not pass reconciliation, it is placed in Reconciliation Event Manager's Reconciliation (REM) Queue and saved in the Reconciliation database (for interim access before the asset is delivered to its route destinations). Once an asset is in the REM, it will be necessary for you to edit the asset and submit it for reprocessing. Refer to the topic *Reconciliation Event Manager* on page 240 for an overview of this process.

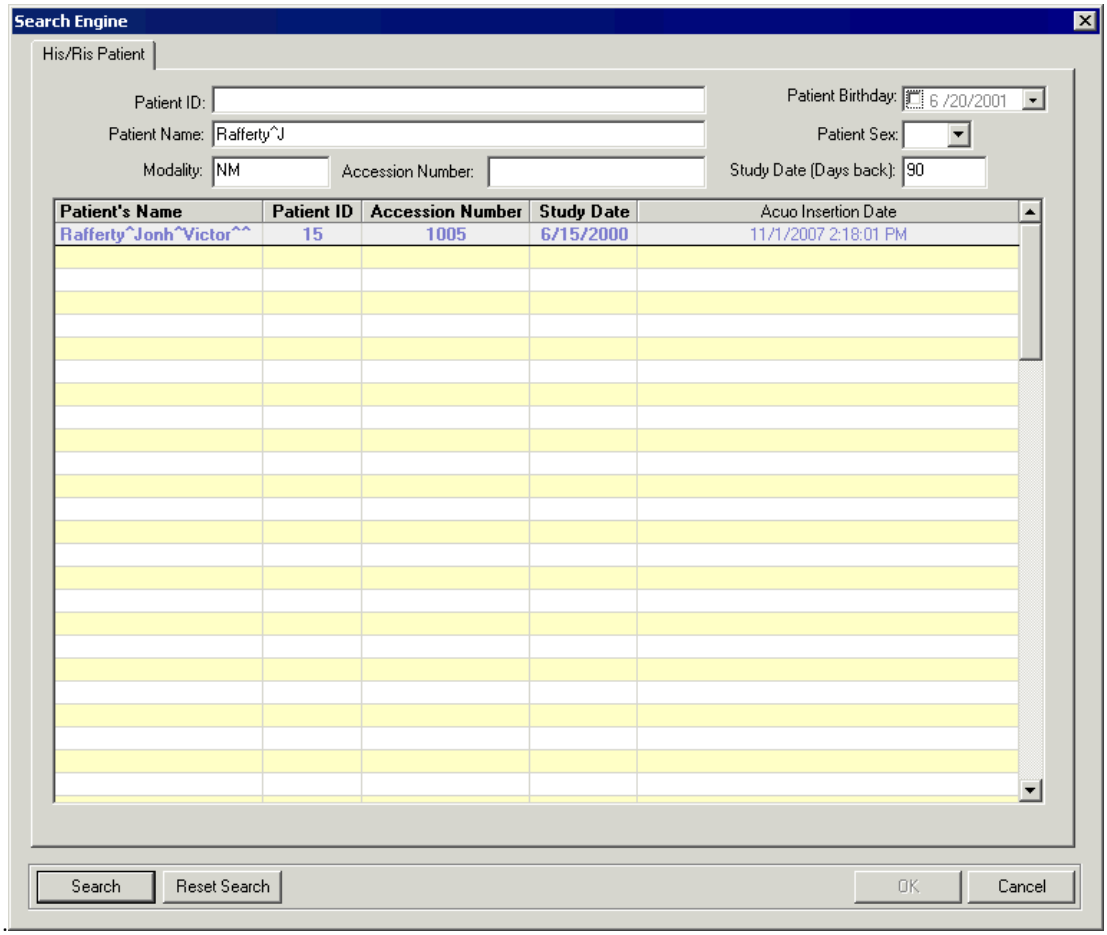
Follow these steps to edit a reconciliation event and submit the asset for reprocessing.

1. Expand the console tree as follows: AcuoMed Image Manager→ Image Manager Server→ Patient Management.
2. Under Patient Management, click **Reconciliation Event Manager**.

   The Reconciliation Queue displays in the right window pane.



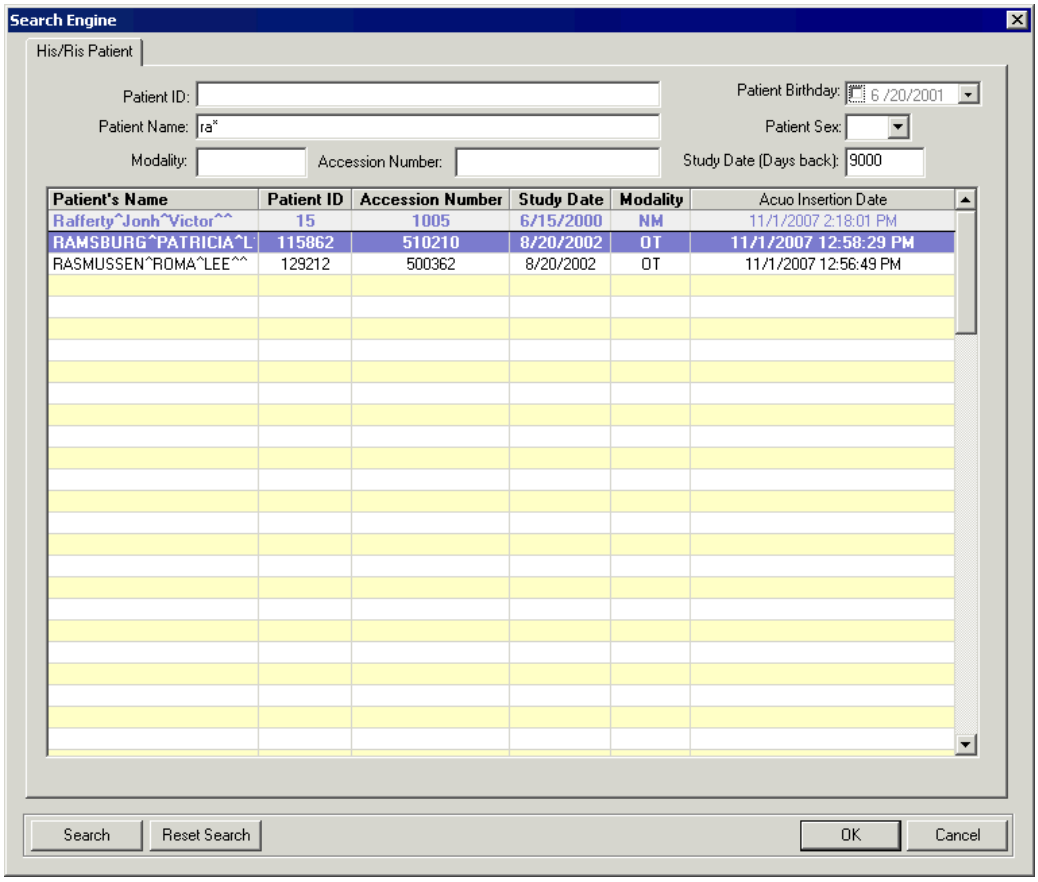
3. Right-click the event you want to edit and select **Reconcile Event(s)** from the pop-up menu or double-click the event. The HIS/RIS Search Engine dialog displays.



In the HIS/RIS Patient Search Engine tags configured for reconciliation are displayed in bold.

The entry highlighted in blue is the Image information. When a RIS entry is selected, it will be positioned underneath the Image Info entry so the two entries can be easily compared and the correct entry can be selected for processing.

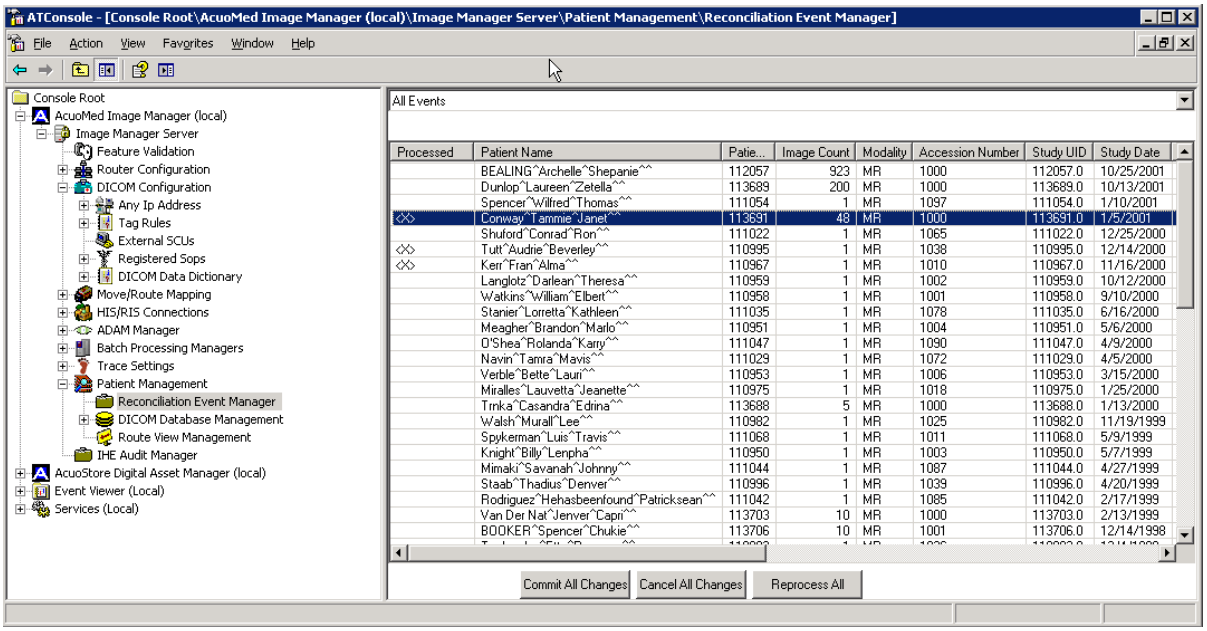
4. Using the Search Engine, find the most appropriate RIS entry. The data will be reconciled to match the RIS entry.



5. When a match has been selected, Click **OK** to finish editing the group of images.

If a match is not found in the Reconciliation target, as noted in the above figure, the REM entry can be skipped to be dealt with at a later date.

You are returned to the Reconciliation Queue. The Processed column of the Reconciliation Queue displays an **<X>** flag for each edited REM entry.

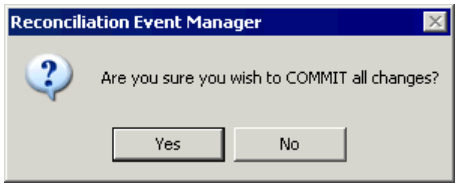


6. Commit your changes.

   Click **Commit All Changes** at the bottom of the screen. The Commit All Changes button saves changes for all edited event groups. You can only commit changes for event groups. You cannot commit changes for an individual event within a group.

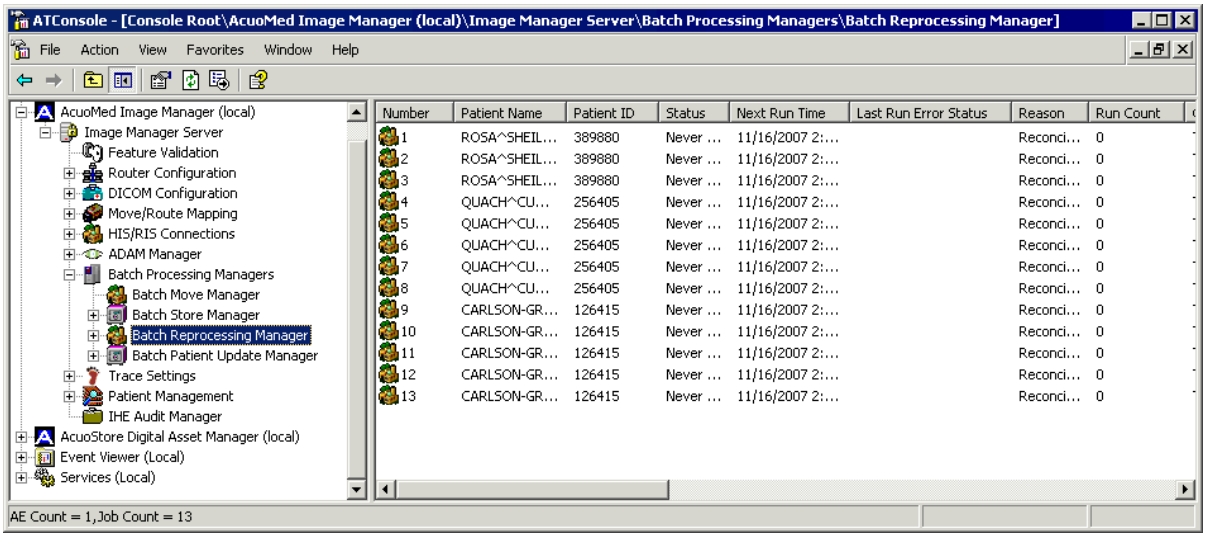
   Note: If you try to leave the Reconciliation Event Manager screen without committing your edit changes, you will be warned that you need to commit the changes in order to save them. You can click **Cancel All Changes** to discard your edits, but you must do this before committing any changes.

   A message asks that you confirm you want to commit your changes.



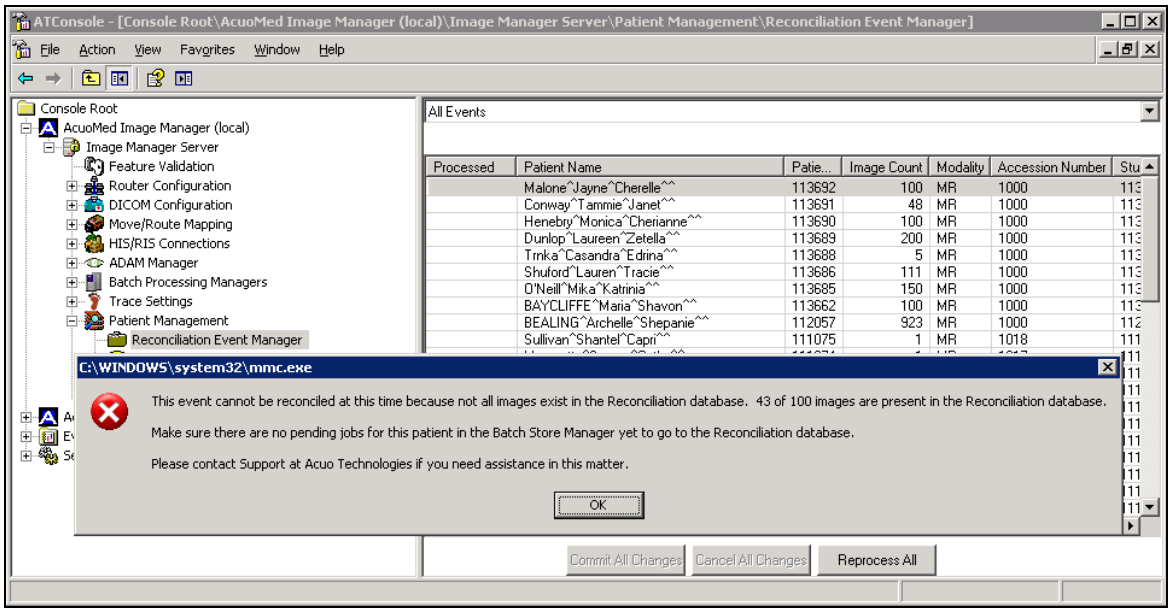
6. Click **Yes** to continue and save the edit changes.

   All events in the Reconciliation Event Manager that have an "X" in the processed column are now automatically moved from the Reconciliation Database (REM) to the Batch Reprocessing Manager.



If batch reprocessing is successful, the edited image(s) will be sent on to their route destinations. If batch reprocessing is not successful (the image data still does not appropriately match a scheduled RIS record), the edited image(s) will reappear in the REM. In this case, repeat this procedure and re-edit the REM entry until it passes reconciliation.

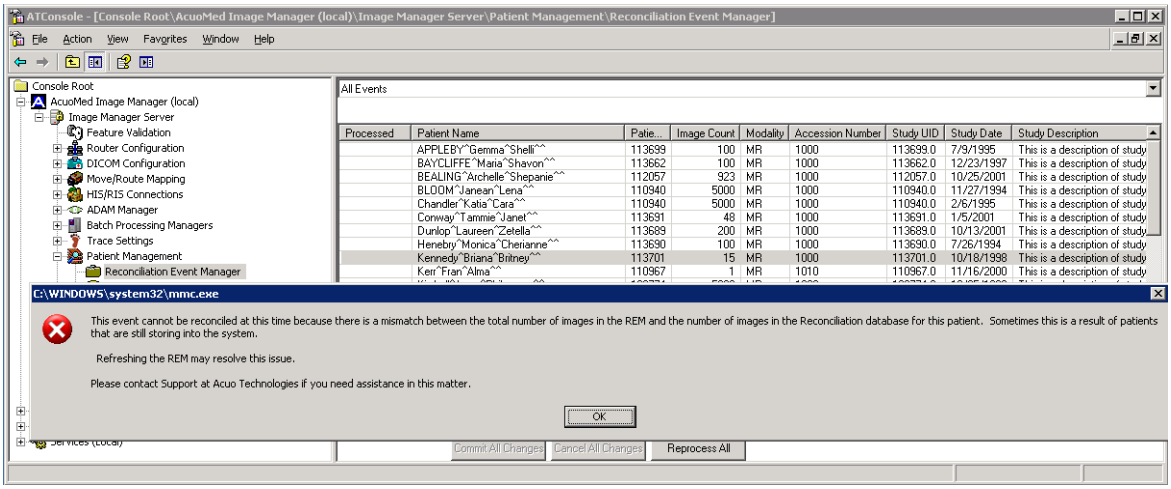
IMPORTANT NOTE:
The ability to reconcile an event is allowed only after all associated images have been stored to the Reconciliation database. The pop-up message below will be displayed when a user attempts to reconcile an event when only a portion of that event's images exist in the Reconciliation Database.



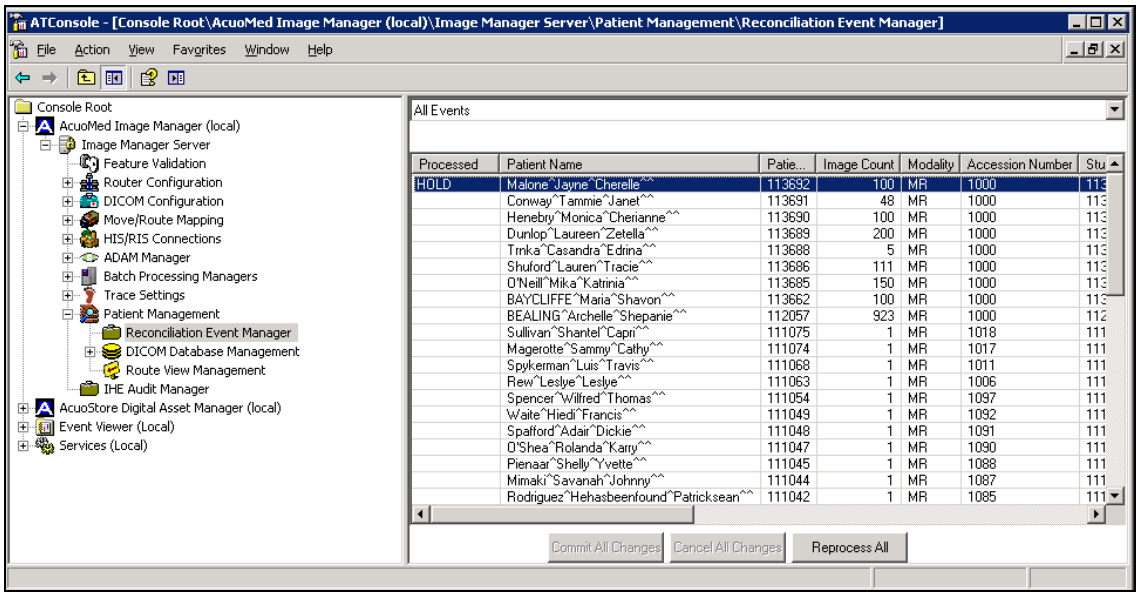
This message states that reconciliation cannot yet be performed and lists the amount of images that have been stored to the reconciliation database out of the total amount of images that have failed reconciliation (at the time of loading the REM). In the screenshot above 100 images have failed reconciliation at the time the REM was loaded, however only 43 have reached the Reconciliation DB.

In the event that the number of images in the Reconciliation database exceeds the number of images that have entered the REM (at the time the REM is loaded) for a specific patient, the message below is displayed. This could occur when 1 or

more images for a patient has reached the REM and there is a delay between the time the REM is launched and when the patient is reconciled (the number in the Reconciliation DB is re-calculated when the patient is reconciled, the Image Count from the REM is not).



After clicking "OK", the "Processed" column within the Reconciliation Event Manger for the event in question will be labeled "HOLD" as seen in the screenshot below. Reloading the Reconciliation Event Manager once all of the event's images have successfully stored to the reconciliation database will remove the HOLD status.



Other Options

Select **Refresh/Reset** to see new REM entries.

Select **Reprocess Event(s) As Is** if you want to run the selected event through the reconciliation process. You might do this if you know the RIS entry for this patient is now in the AcuoMed Database. If more than one event requires reprocessing, select the **Reprocess All** button.

Select **Delete Event(s)** if you want to delete the REM entry and the images associated with it.

IMPORTANT NOTE:	Deleting REM entries renders the image data inaccessible. The images are no longer available on the Acuo System and therefore the image data may need to be re-transmitted to the Acuo system.

Select **View Details/Changes** if you want to review your edits.

Reconciliation Tag Rules

Reconciliation tag rules give the user the ability to normalize inbound Patient Names and Patient IDs to a standard format, based on the presence of a DICOM tag or contents within a DICOM tag. This applies to all SCP AE's where reconciliation is turned ON. Inbound data that does not conform to the DICOM standard will otherwise cause a reconciliation event. Certain devices send data that does not conform to either a DICOM standard data format or AcuoMed's expected format. In these cases, the non-conforming data would normally cause reconciliation events to be tabled. Reconciliation tag rules allow you to identify a non-conforming device and then normalize or massage the non-conforming data to an accepted format. After normalization is performed, the data is reconciled and, if it passes reconciliation, it is delivered to its destination.

As an example, we will set up a reconciliation tag rule that will identify when a modality with a device serial number of "123" is sending data to AcuoMed. This sending device is an MR modality at the Oakdale Clinic which uses the patient's social security number (SSN) as the Patient ID and formats the SSN with spaces instead of dashes between the number groups (that is, NNN NN NNNN). AcuoMed needs to normalize this format to add the dashes (that is, NNN-NN-NNNN) in order to pass reconciliation.

The following process shows how to configure AcuoMed for this example and has three component procedures:

- **Add the Device Serial Number Tag**, for example Device Serial Number or Institution Name, via Use DICOM Tag Customization, and make it available for reconciliation.
- **Set up the Reconciliation Tag Rule** to identify the Oakdale Clinic MR and define its non-conforming SSN format.
- **Verify AcuoMed Server Properties for Reconciliation** is configured with the proper tag normalization format (that is, the format into which normalizing the data will be done).

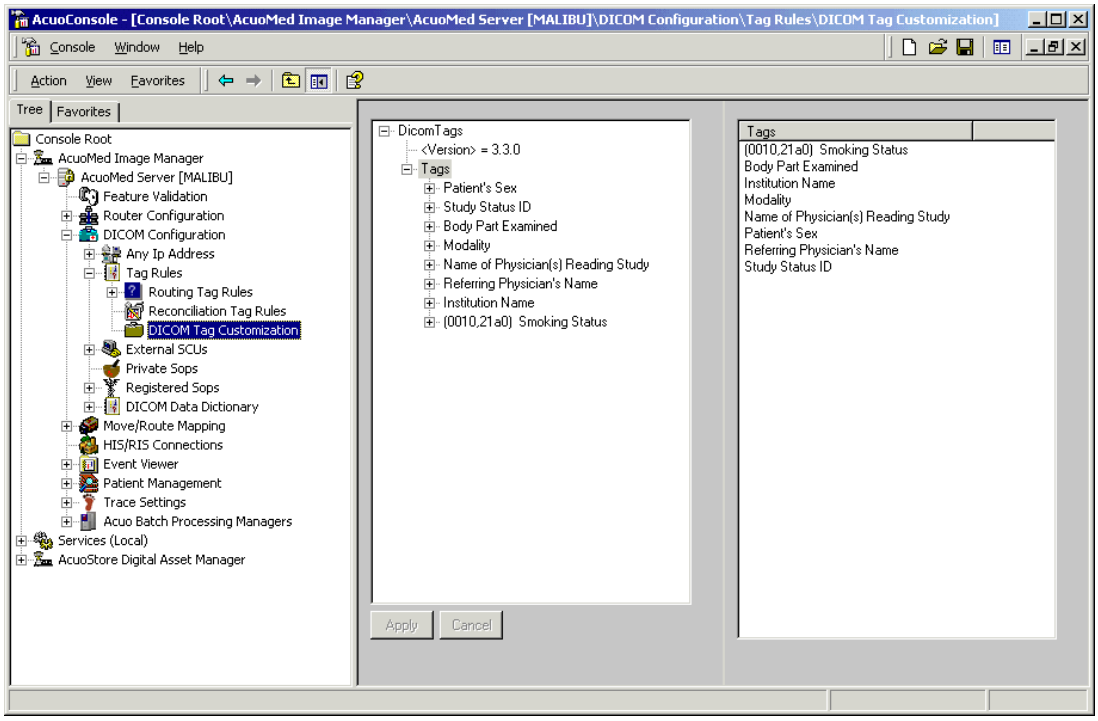
Add the Device Serial Number Tag

Follow these steps to add the Device Serial Number tag and make it available for reconciliation.

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ DICOM Configuration→ Tag Rules.

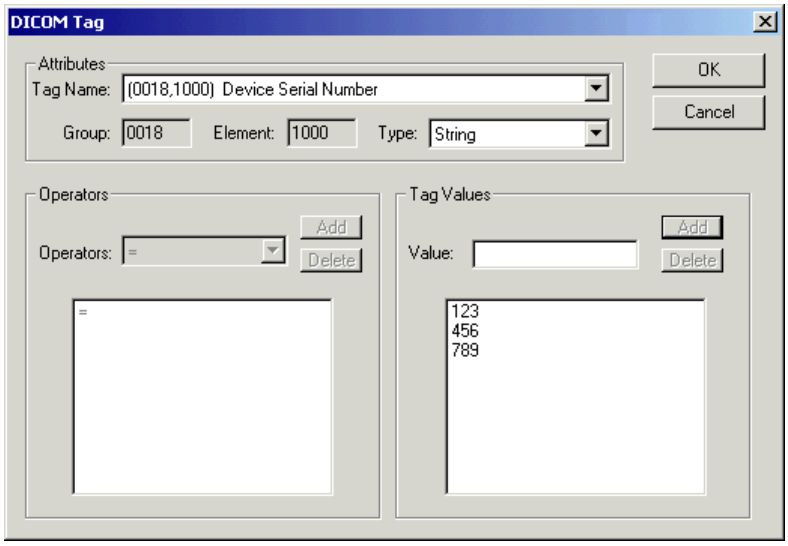
2. Under Tag Rules, click **DICOM Tag Customization**.

   DICOM tag information displays in the right window pane.



3. In the Dicom Tags tree, right-click **Tags** and then click **New DICOM Tag**.

   The DICOM Tag dialog displays.



4. Configure the DICOM Tag dialog as shown in the sample in the previous step.

   - Click the **Tag Name** list and select **Device Serial Number**.
   - Click the **Type** list and select a data type. (String will allow the user to select multiple values from a list, StringValueFromList will allow the user to select a single value from a list, and SingleValue will allow the user to type in one value only.)
   - If not HIS/RIS connected, type values in the Tag textbox and click **Add** for each value to populate the Tag list (in our example, we have entered three different values).

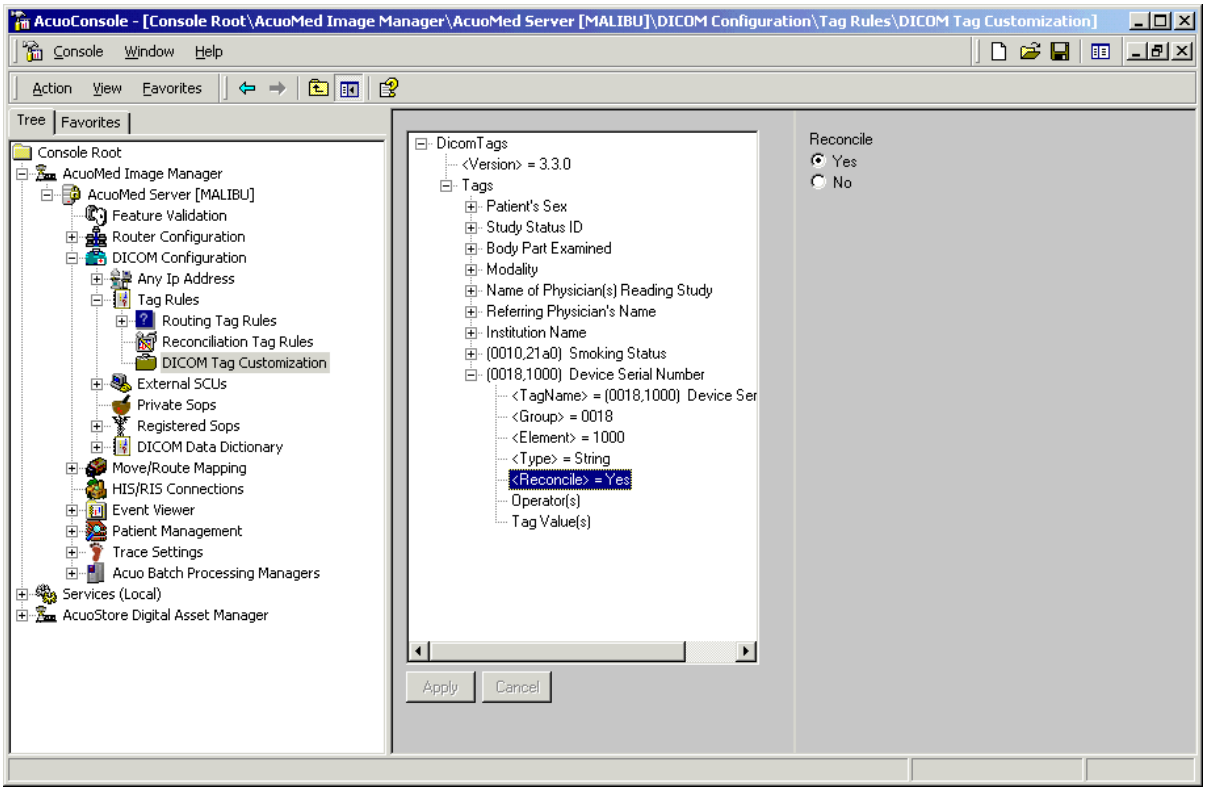
NOTE: If this AcuoMed Server is HIS/RIS connected, tag values can be automatically populated from HIS/RIS data.

5. Click **OK** to add the Device Serial Number tag.

   Device Serial Number is added to the Dicom Tags tree.

6. In the Dicom Tags tree, expand **Device Serial Number** by clicking the + sign.

7. Under Device Serial Number, click **<Reconcile>**; then, using the toggle control in the far right side of the window, change the Reconcile value to **Yes**.



8. Click **Apply** to save your changes.

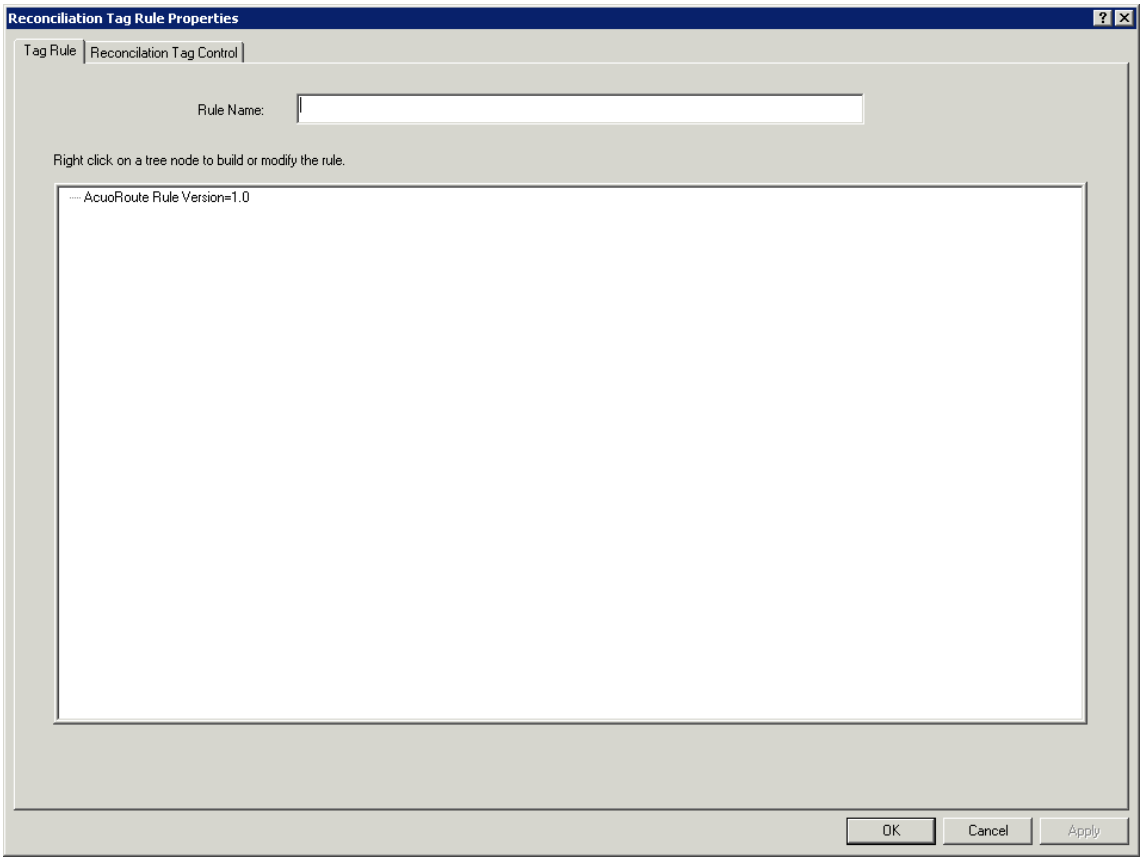
Set up the Reconciliation Tag Rule

Follow these steps to build the reconciliation tag rule to identify the Oakdale Clinic MR and define its non-conforming SSN format.

1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server→ DICOM Configuration→ Tag Rules.

2. Right-click **Reconciliation Tag Rules** and select **New→ New Tag Rule**.

   The Reconciliation Tag Rule Properties dialog displays with the Tag Rule tab selected.

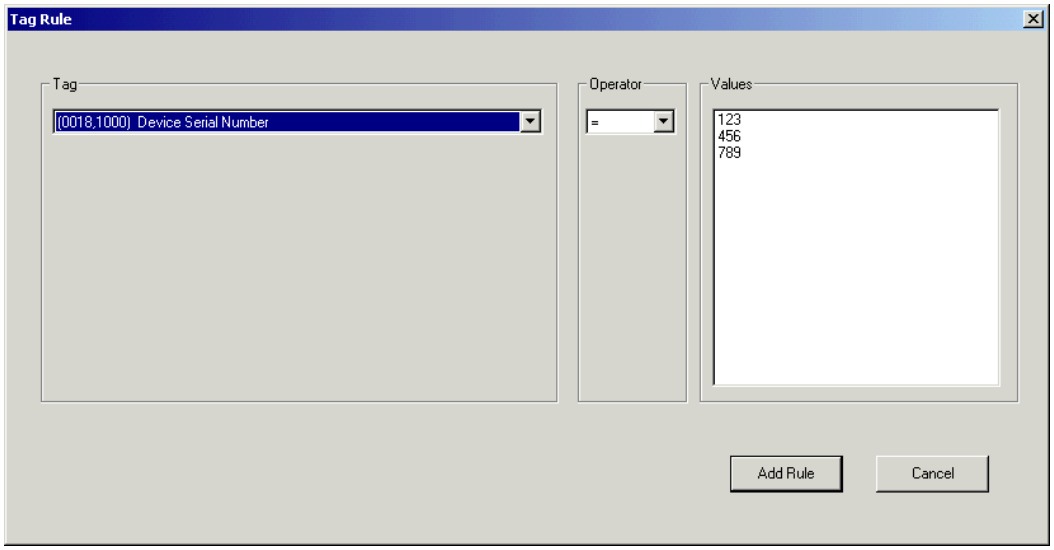


3. Type a Rule Name in the text box.

   We are naming the rule "MR_Oakdale Clinic" in our example.

4. Right-click **AcuoRoute Rule Version=[number]** and select **New Tag Rule** to begin building the new rule.

   The Tag Rule dialog displays.



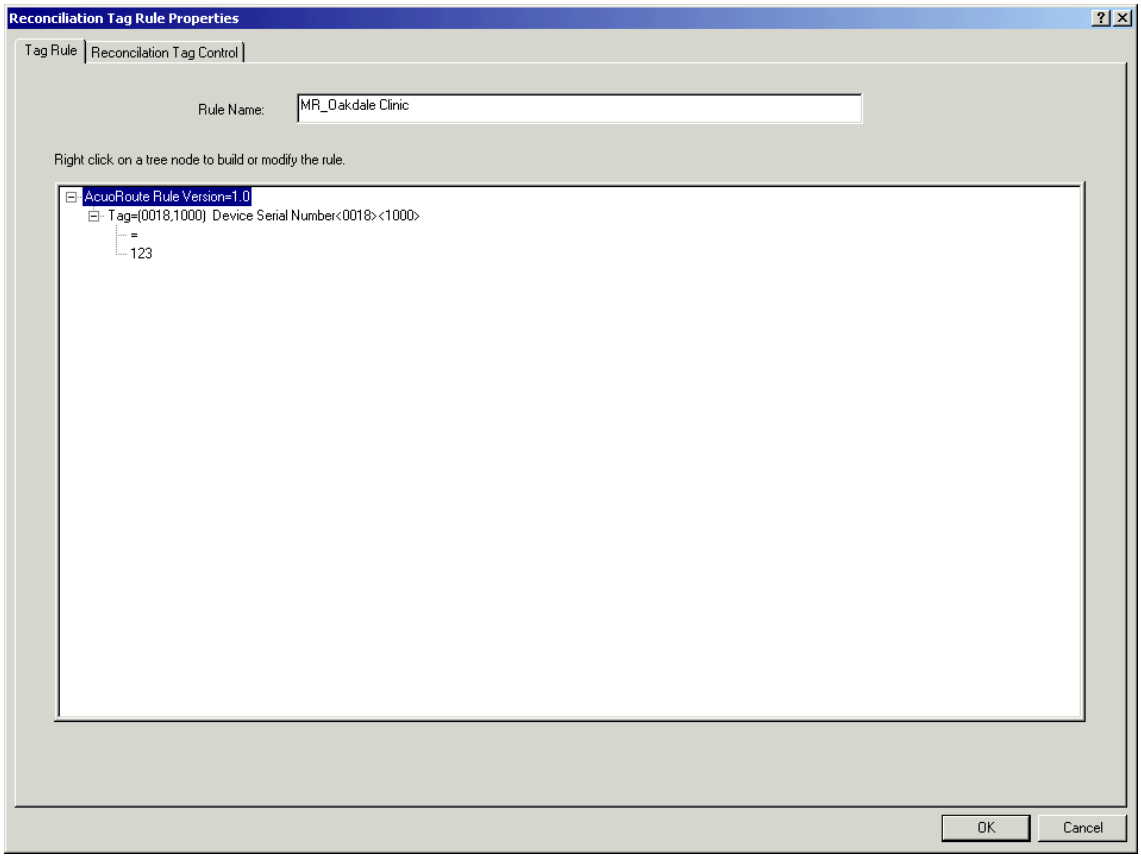
5. Click the **Tag** list and select a tag.

   A tag must be available for reconciliation to appear in this list (refer to the earlier topic *Add the Device Serial Number Tag* on page 250).

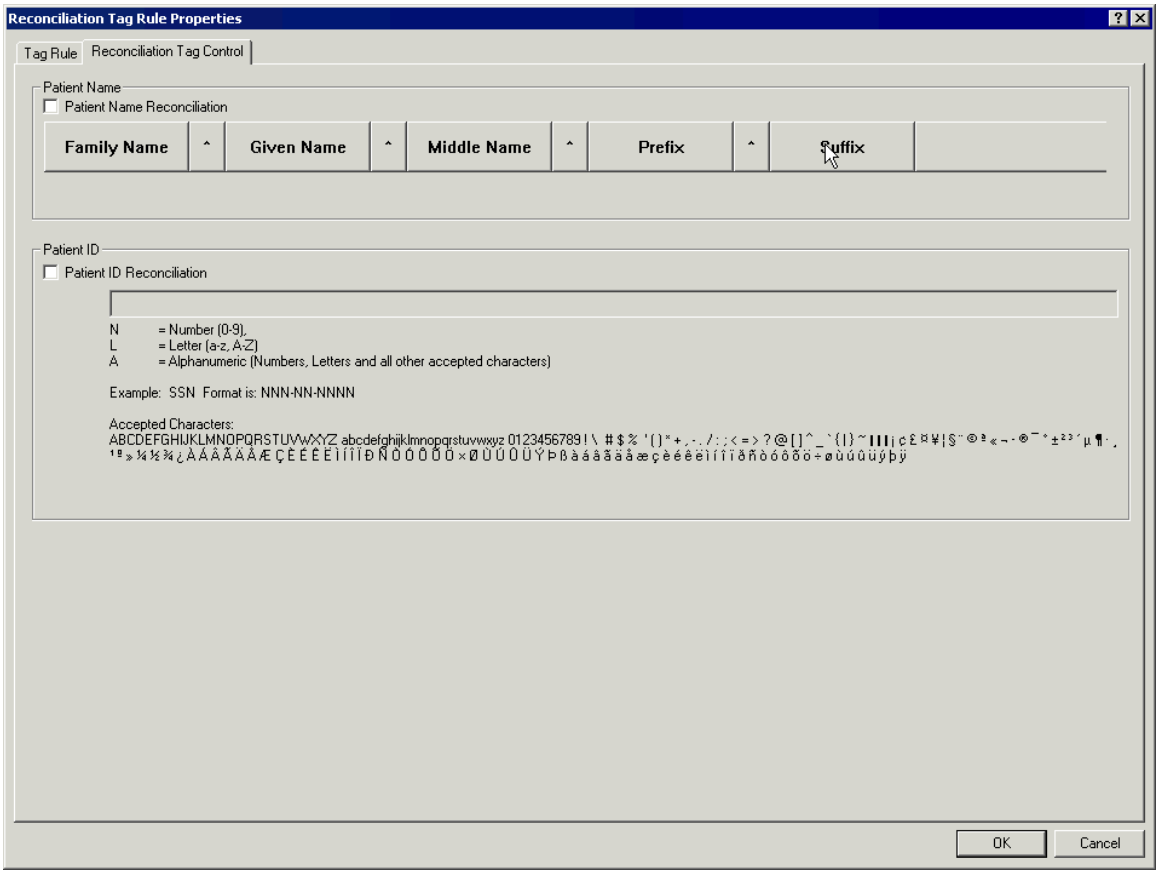
6. In the Values list, select the value(s) that you want this rule to filter on.

7. Click **Add Rule** to continue.

   You are returned to the Tag Rule tab which displays the new rule.



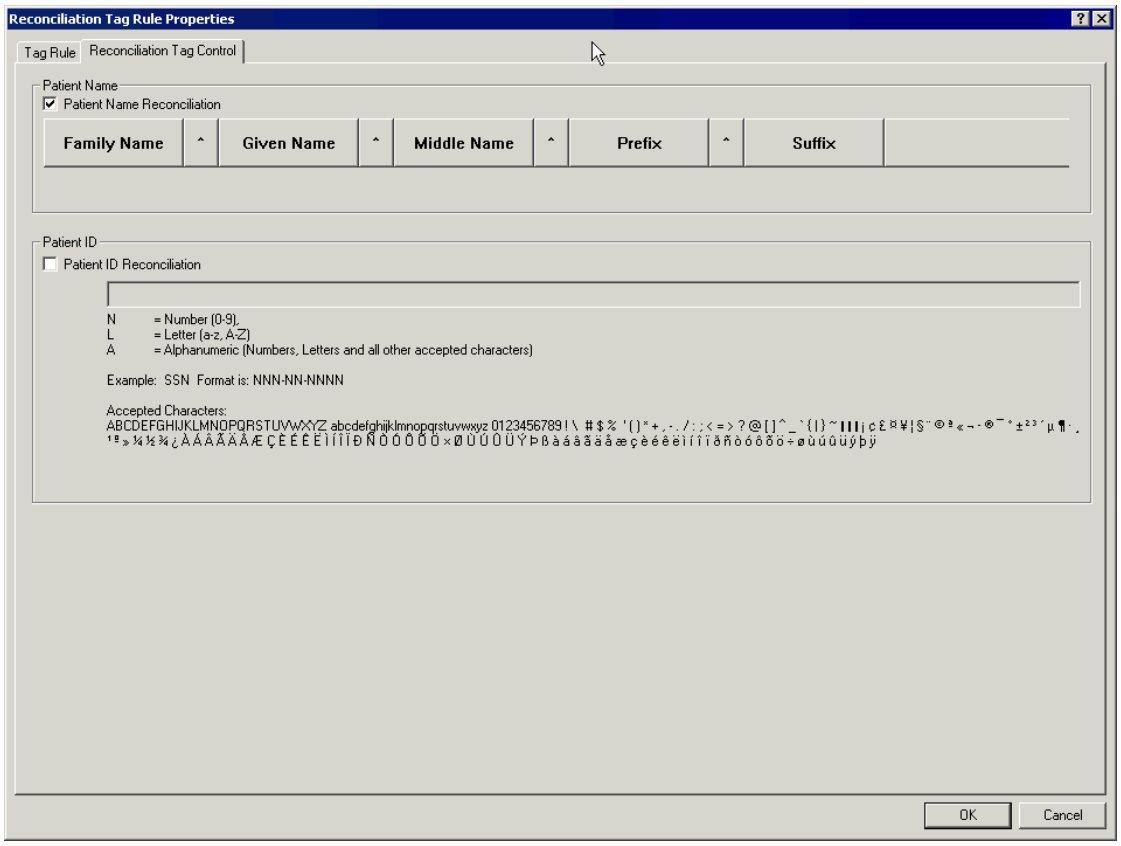
8. Click the **Reconciliation Tag Control** tab.



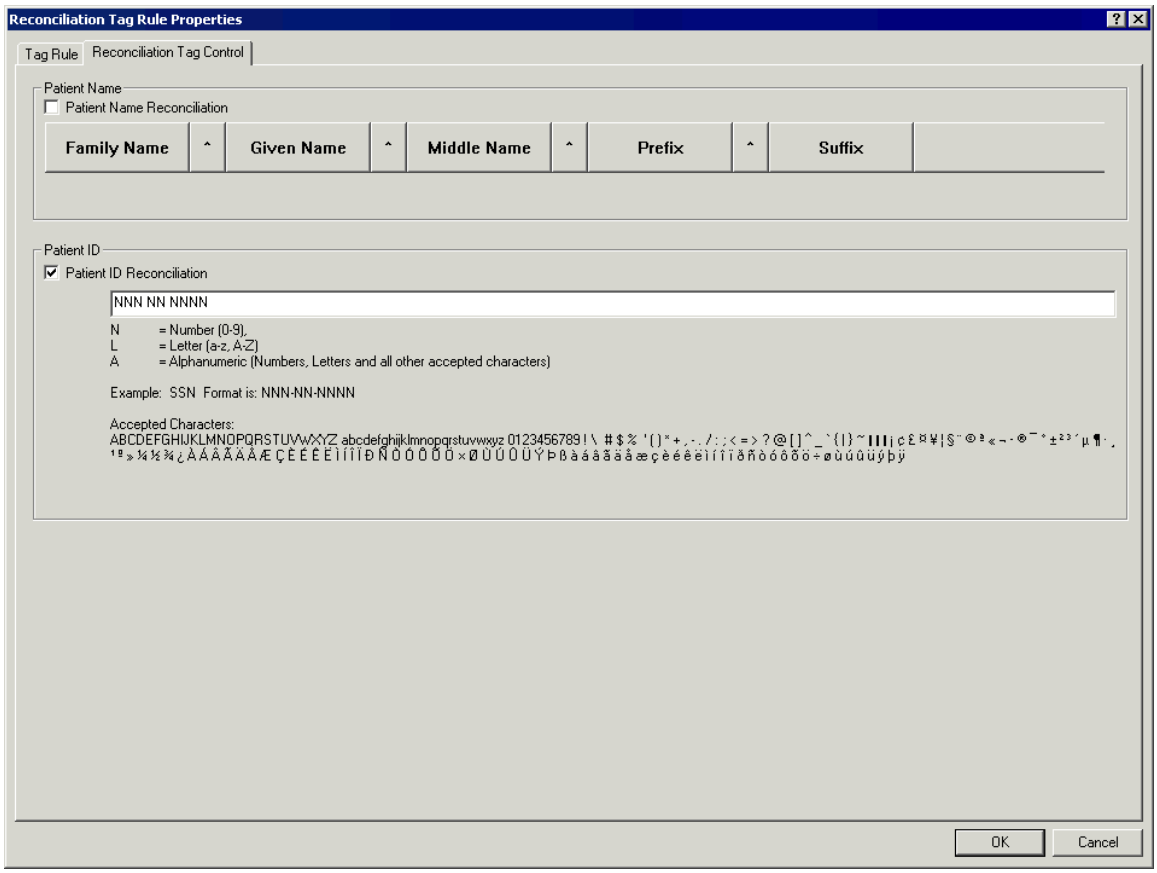
9. Select the type of reconciliation to control by clicking the appropriate checkbox.

   Select either **Patient Name Reconciliation** or **Patient ID Reconciliation, or both**.

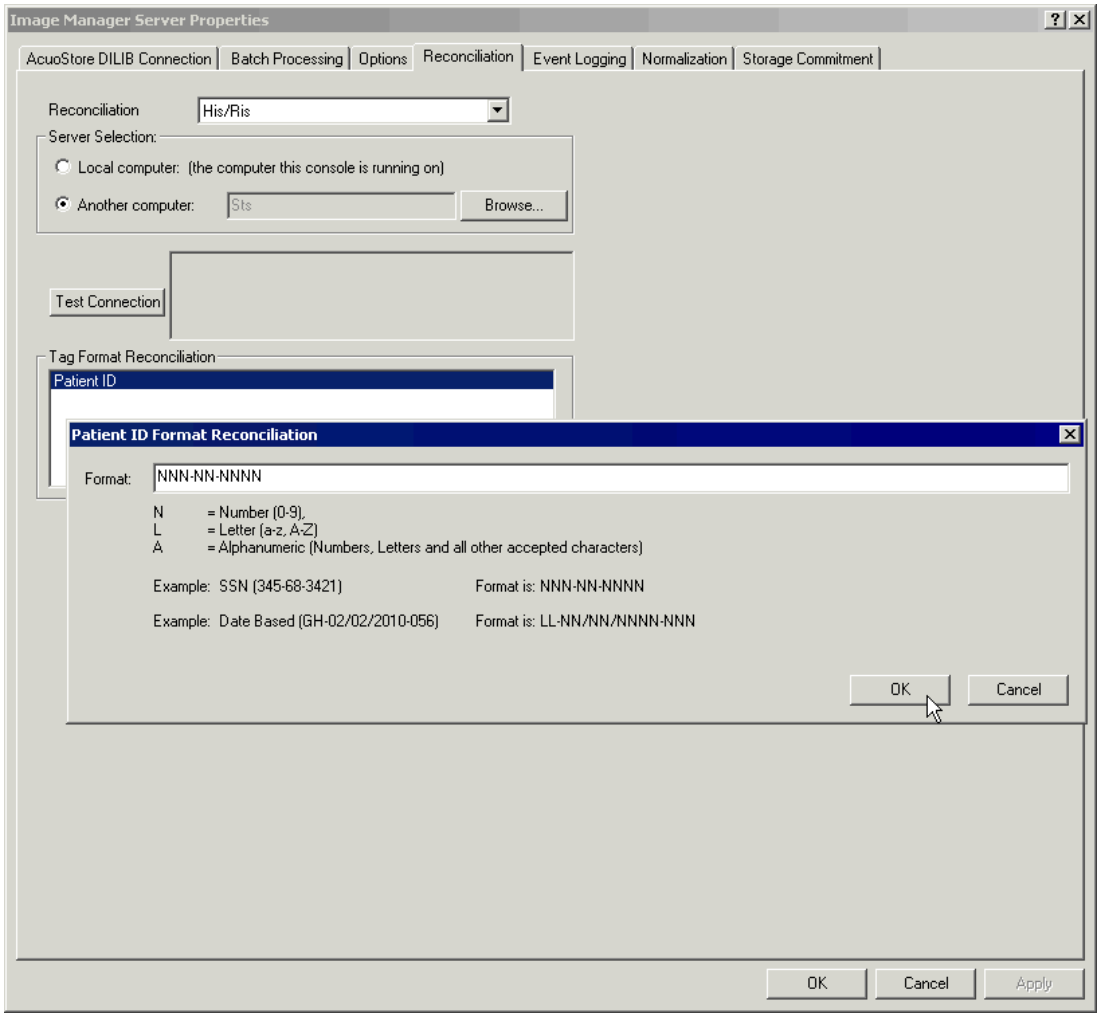
   In our first example we have selected Patient Name Reconciliation only. If the inbound Patient Name format matches that which is configured here, the Patient will be normalized according to the DICOM standard for Patient Name (Last Name^First Name^Middle Name^Prefix^Suffix^).



   In our second example, we have selected Patient ID Reconciliation only. If the inbound Patient ID format matches the format configured here, the Patient ID will be normalized to the format configured at the *Image Manager Server Properties → Reconciliation Tab → Tag Format Reconciliation → Patient ID* (double click Patient ID to configure).



Alternatively, if a Reconciliation Tag Rule is not configured, reconciliation is turned ON for an SCP AE Name and the **Tag Format Reconciliation** setting is turned ON with an expected format specified, for example NNN-NN-NNNN, the patient will go into the REM (and Reconciliation DB) if the incoming Patient ID format does not match the expected Patient ID format configured.

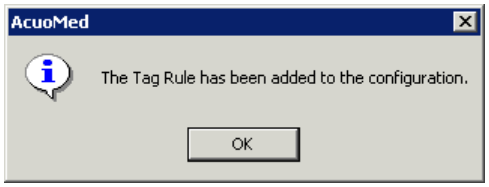


10. Specify the non-conforming data format that is expected from the sending device.

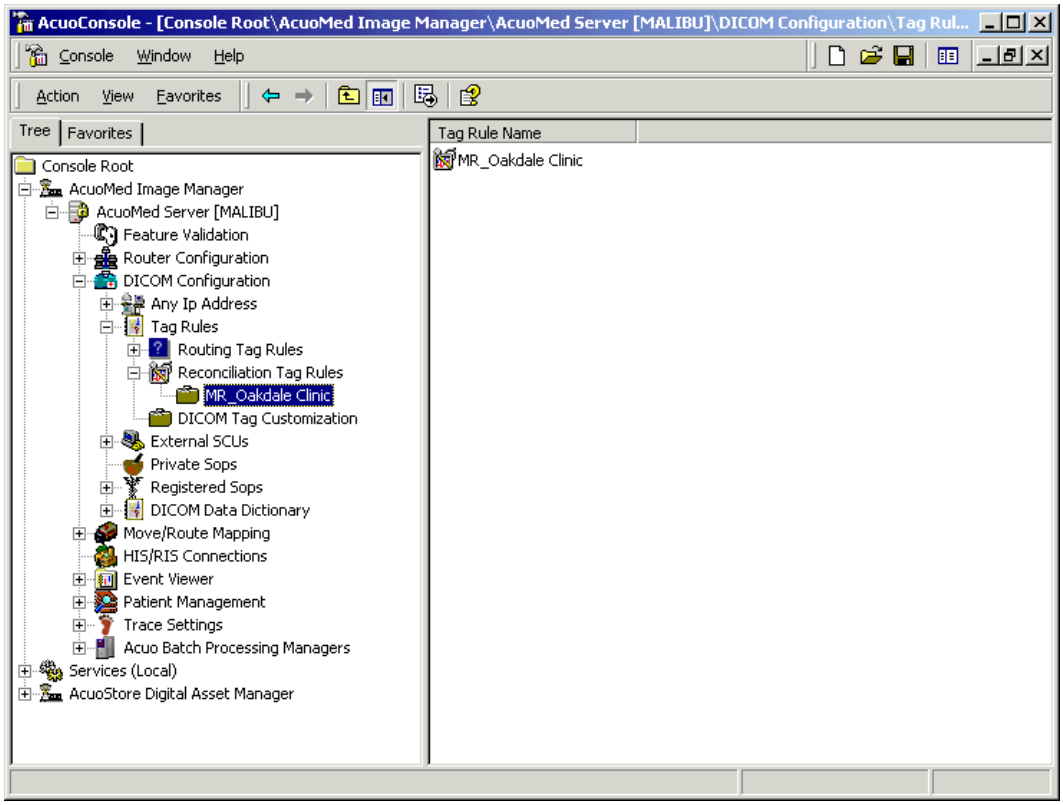
    For Patient Name we can specify an expected Patient Name format by dragging the name fields to new locations and selecting new delimiters by right-clicking the delimiter buttons.

    For Patient ID we can specify an expected Patient ID format, **NNN NN NNNN** in our example**,** which is a Patient ID that uses a social security number formatted without dashes.

11. Click **OK** to save the new tag rule.



The newly created tag rule appears under Reconciliation Tag Rules in the console tree and in the right pane.

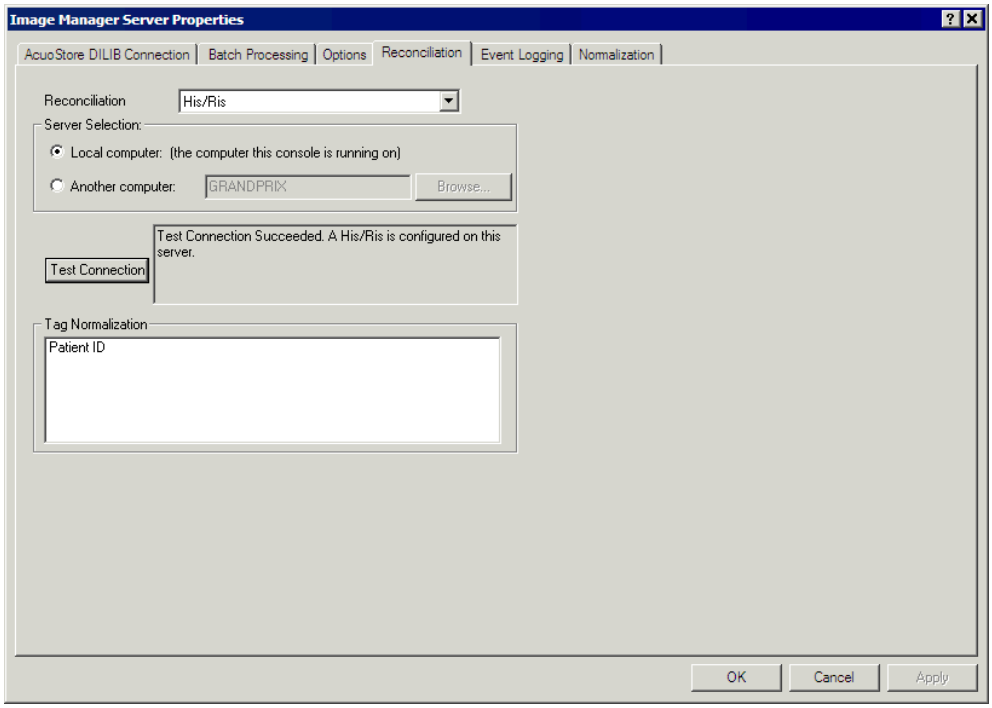


Verify AcuoMed Server Properties for Reconciliation

Follow these steps to verify that AcuoMed Server properties for reconciliation are configured with the proper tag normalization format.

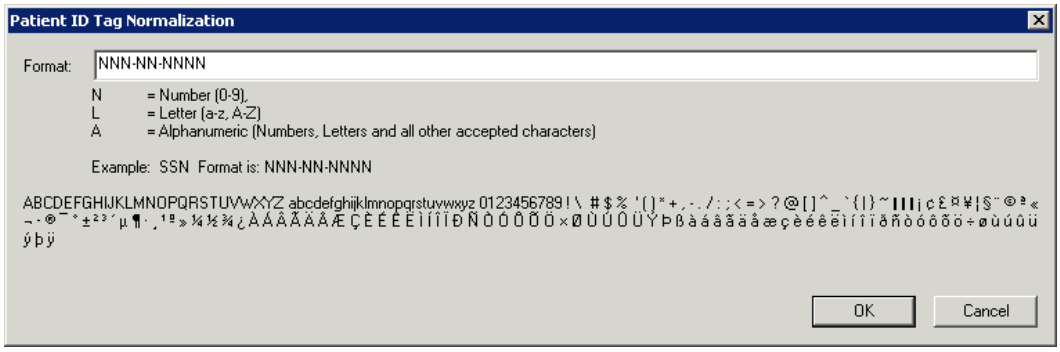
1. Expand the console tree as follows: AcuoMed Image Manager→ AcuoMed Server.
2. Right-click AcuoMed Server and select Properties from the pop-up menu.

   The AcuoMed Server Properties dialog displays.
3. Click the **Reconciliation** tab.



4. Under Tag Normalization, double-click **Patient ID**.

   The Patient ID Tag Normalization dialog displays.



5. In the Format text box, type the format to which you want non-conforming data normalized.

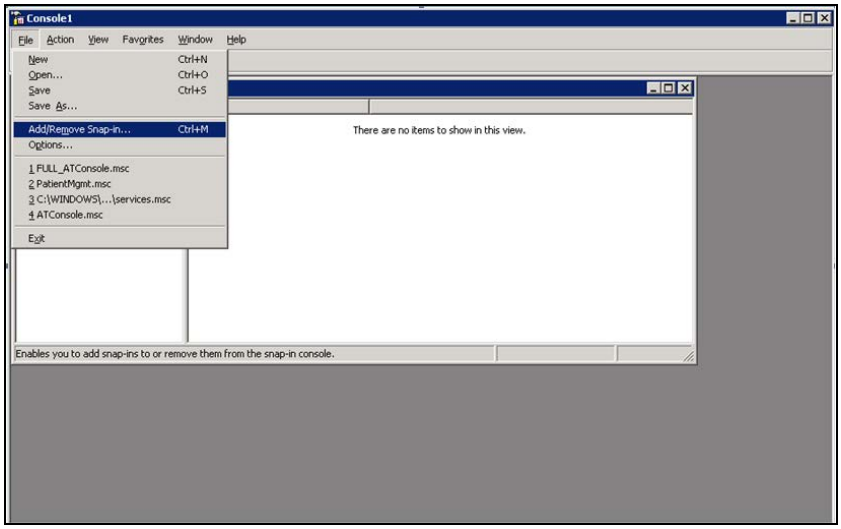
   In our example, we are normalizing to **NNN-NN-NNNN** (that is, a social security number with dashes).
6. Click **OK** to save the format and return to the AcuoMed Server Properties dialog.
7. Click **OK** to save the AcuoMed Server Properties changes and exit.

Patient Management – Custom MMC Taskpad

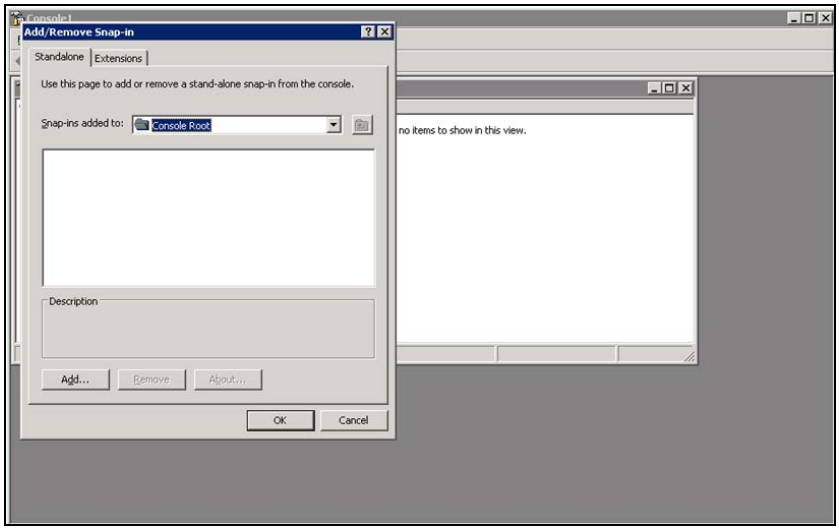
This section explains the process of creating a custom tool called Taskpad within the AcuoMed Patient Management snap-in and how to use this custom tool to ease some of the daily user management tasks.

To create a custom MMC Taskpad for ACUO patient management

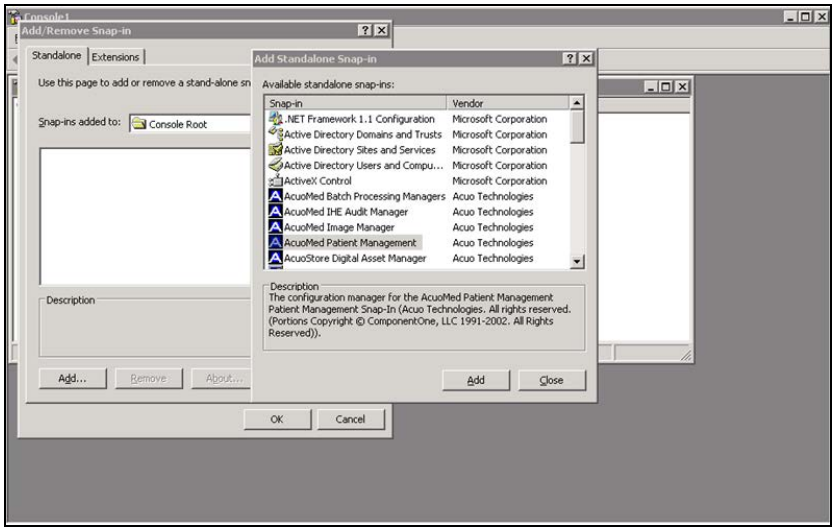
1. Click Start > Run, type MMC and click Enter.
2. In the new MMC window, click File > Add/Remove Snap-in.



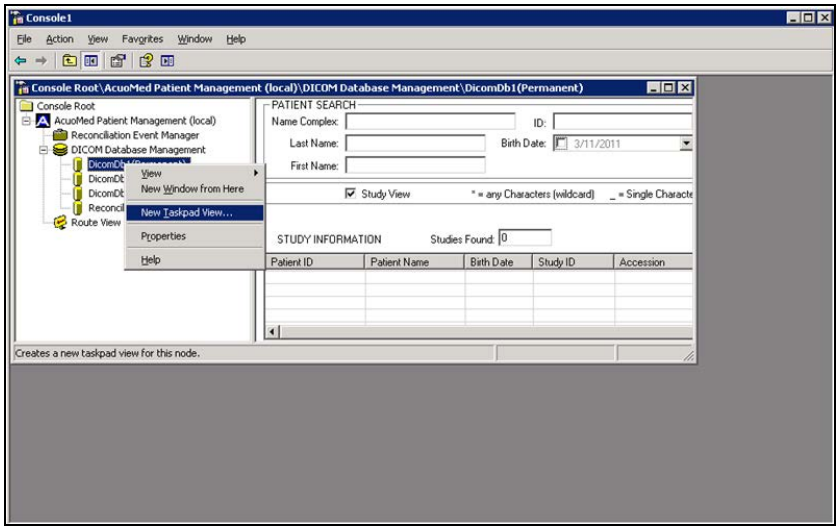
3. In the Add/Remove Snap-in window click on Add.



4. In the Add Standalone Snap-in window, click on AcuoMed Patient Management and then click on the Add button.

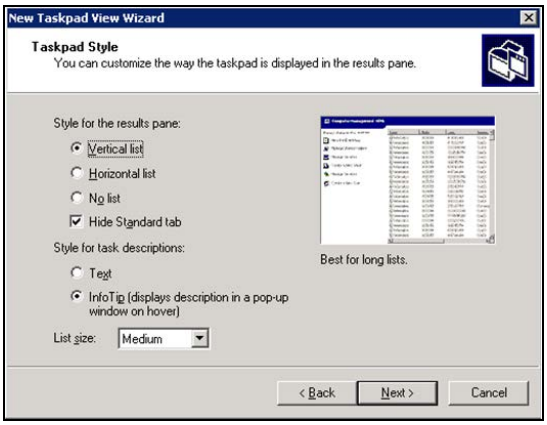


5. Back in the MMC window, click to expand AcuoMed Patient Management, click to expand DICOM Database Management. Now select a DICOM Database in this view. Right-click on that DICOM Database and select New Taskpad view.

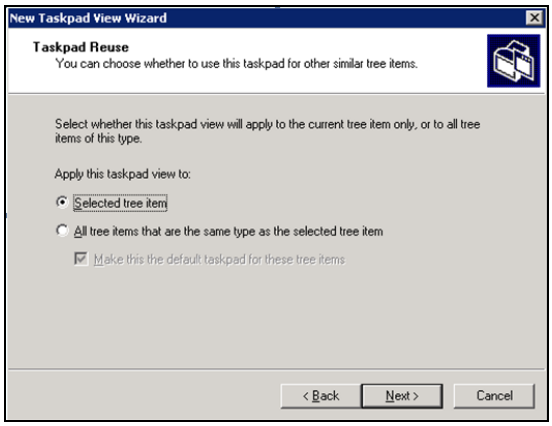


6. In the Welcome screen click Next.

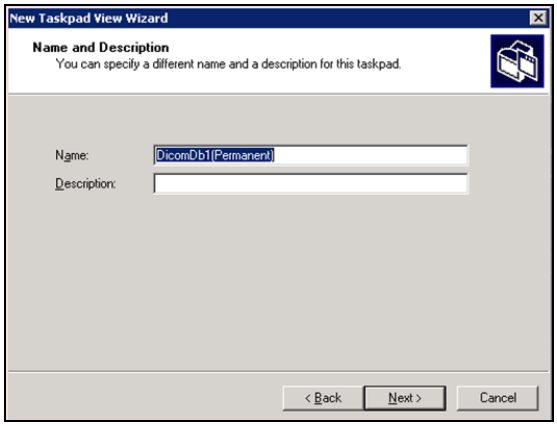
7. In the New Taskpad wizard page customize the view you want to retain. You can select a various sizes for the display, and other options related to the button captions and so on. When done, click Next.



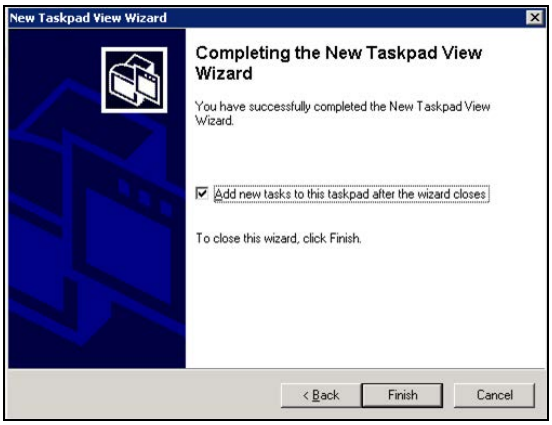
In the Taskpad Target window select “Selected tree item” then click Next.



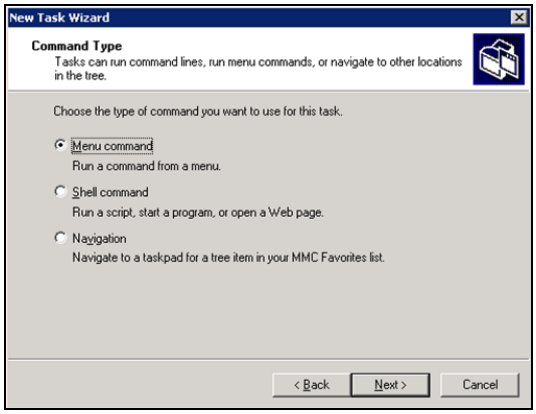
8. In the Name and Description window leave the database or change the name and description you want to appear in the Taskpad view. Click Next.



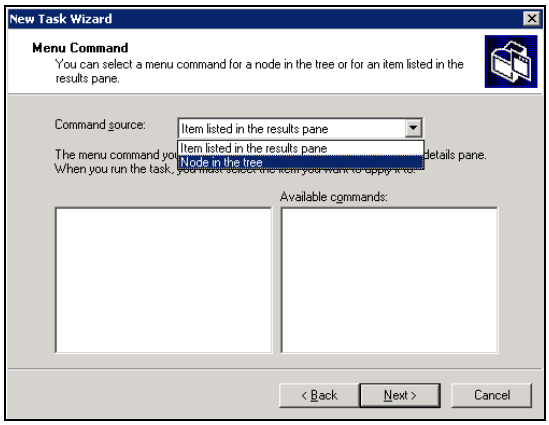
9. In the Completing wizard page make sure that the Start New Task Wizard checkbox is selected and click Next.



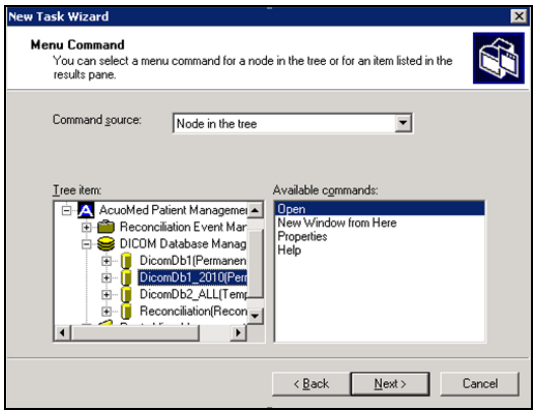
10. In the Command Type window leave the Menu Command selection and click Next.



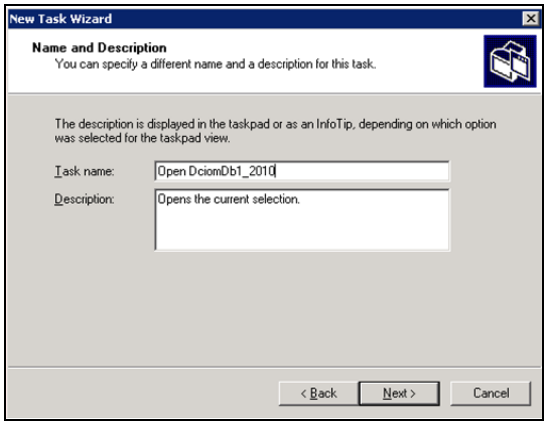
11. In the Shortcut Menu Command window select the drop down for Command source and select Node in the tree. Notice how each tree item has action associated with the object available for selection in the right-hand side window.



12. In this step choose another database that you want to display in the view then select the Open task. When done click Next.

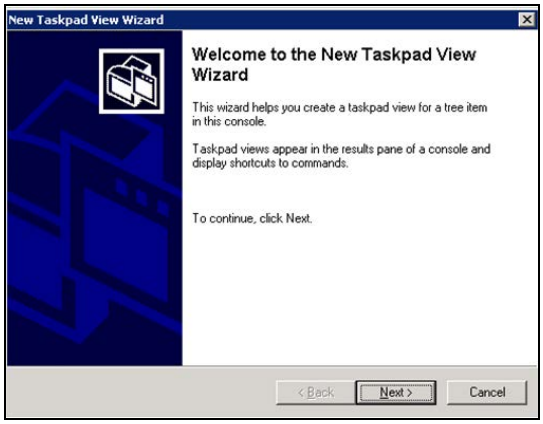


13. In the Name and Description window type or modify the needed info and click Next.



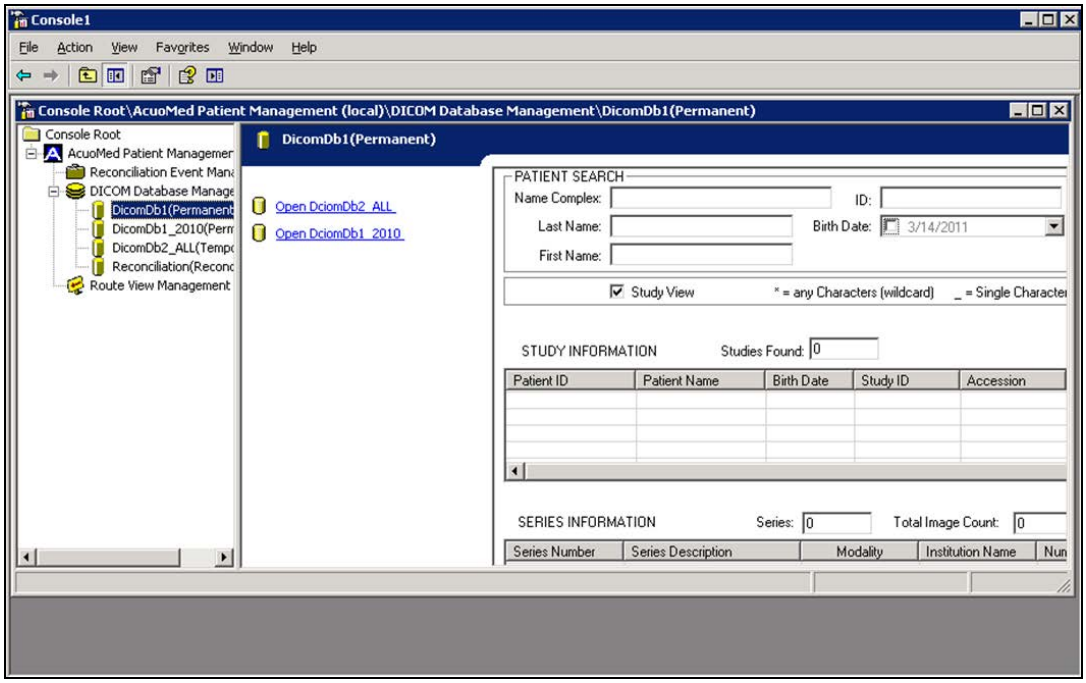
14. In the Task Icon window browse to find the most appropriate icon (or add your own) and click Next.

15. In the Completing the task wizard page select the Run this wizard again checkbox (only check this box if you want to continue adding database to this view) and click Finish.

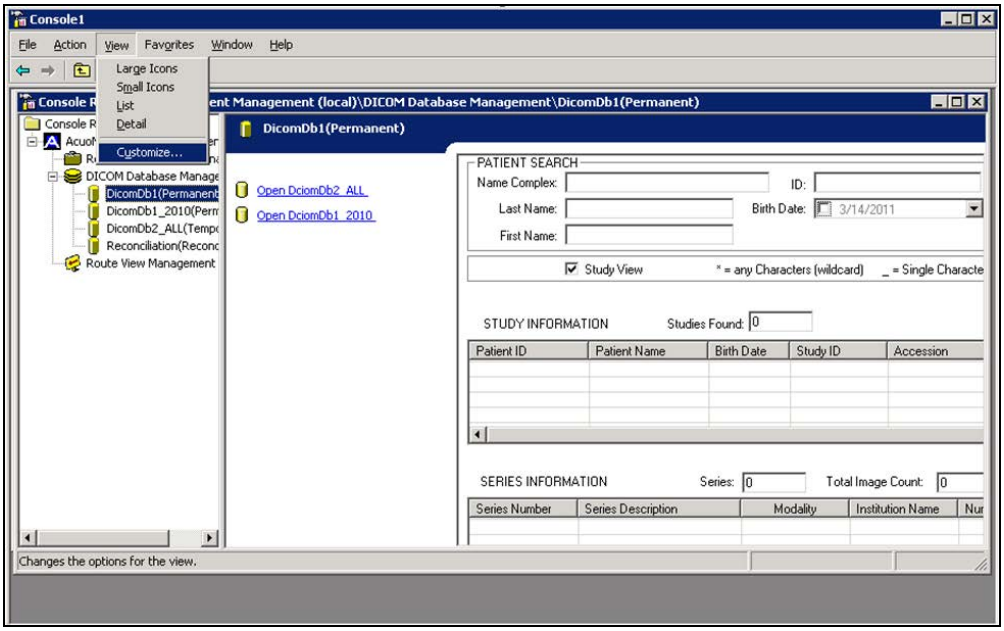


16. Repeat steps 10 – 15 to add more database views. When you are finished In the Completing the task wizard page click Finish.

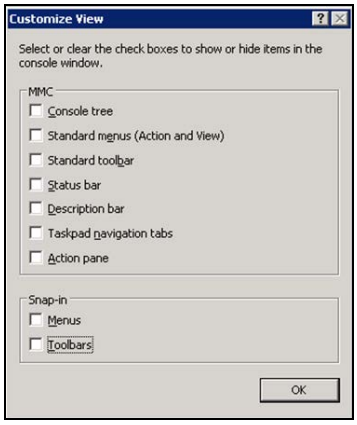
17. Now you have the option to add an additional taskview to a second DICOM Database just like we did above. Just select another DICOM Database in this view. Right-click on that DICOM Database and select New Taskpad view Follow steps 5-16 until all additional taskview to all the DICOM Databases have been completed. When finished adding all the required tasks and buttons, click Finish and look at what we've done:



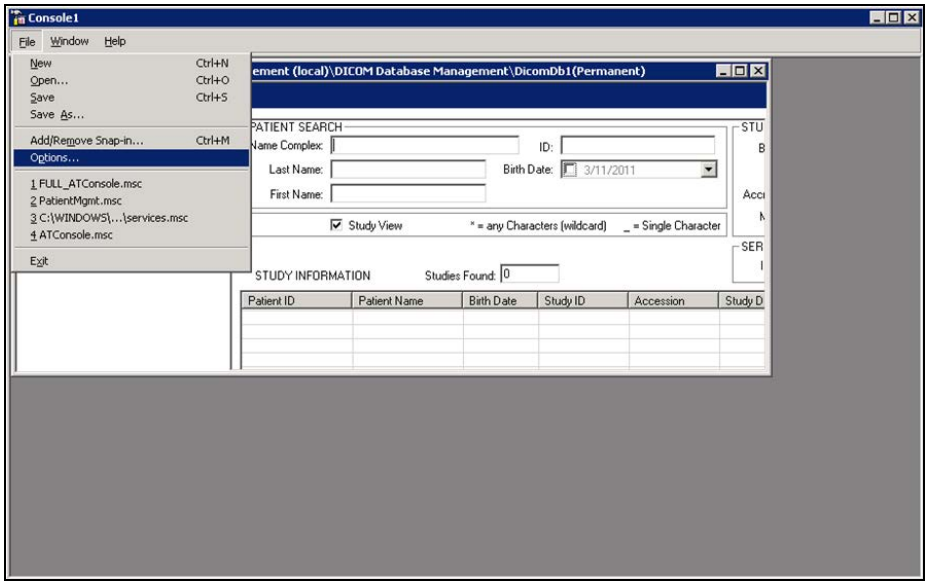
18. Click on the View menu, and then select Customize.



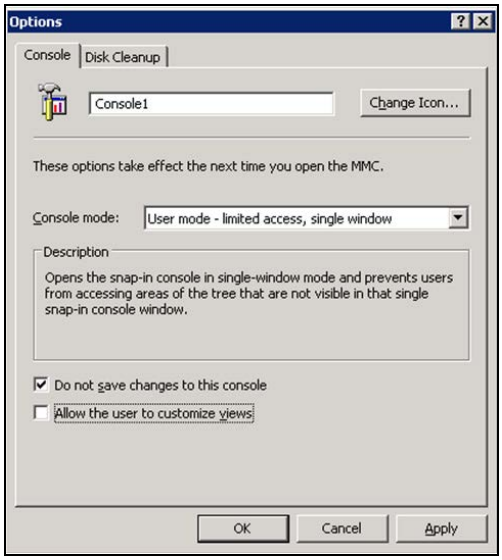
19. In the Customize View window clear all checkboxes. Click Ok. Notice how all menus and the tree display have vanished.



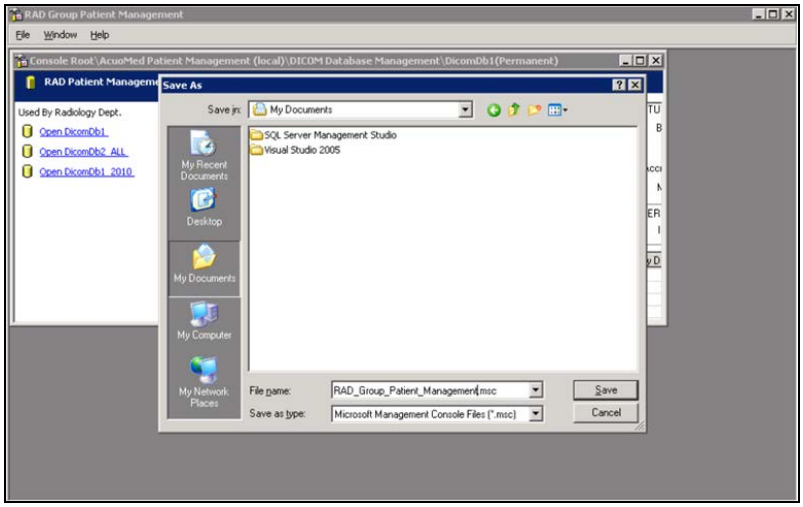
Now, we need to customize the tool's icon and settings before we save it. On the File menu click Options.



20. In the Options menu give the Taskpad a good descriptive name and change the icon if you want. Also, in the Console Mode list, select User Mode - Limited Access, Single Window. Next, select the Do Not Save Changes checkbox, and clear the Allow the User to Customize Views checkbox. Click Ok.

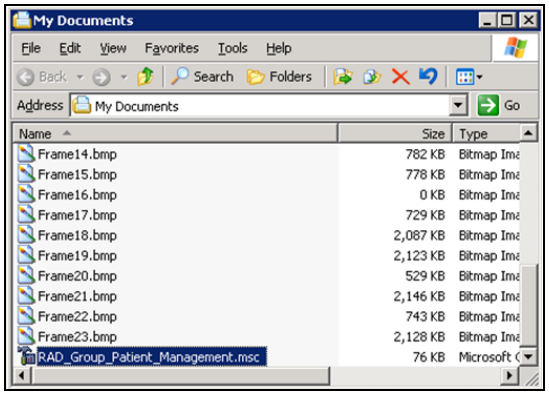


21. Next, save the Taskpad to anywhere you want. You can also send the Taskpad (which in fact is an .MSC file) by mail to the user responsible for the management of the OU. However remember that this user must also have the AcuoMed Patient Management snap-in installed on his or her computer.

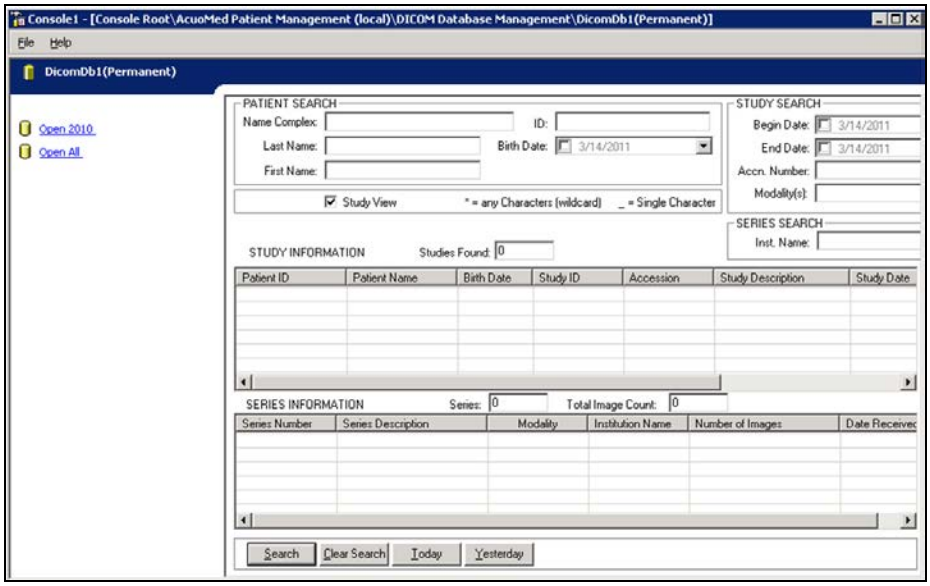


Now, test the Taskpad:

1. Click on the saved Taskpad and run it.



2. You will notice the list of available tasks is on the left. See how the available tasks and DICOM database change as you click on various objects. For example, when you click on a task you will see the title bar change to the selected DICOM database:



The Taskpad views are powerful add-ons and can be used in various scenarios. Remember as a security measure; do NOT rely on the Taskpad's available buttons to prevent a user from doing harm. Use good permission strategy to protect your resources and only use the Taskpad as a method of easing your administrative burden, not as a security measure.

Chapter 6 – DICOM Modality Worklist HIS/RIS Connectivity

In this chapter:

Overview of HIS/RIS and Prefetch
Tag Mapping
HIS/RIS Procedures
Prefetch Procedures

Overview of HIS/RIS and Prefetch using DICOM Modality Worklist

The HIS/RIS Connectivity feature enables an AcuoMed Server to support a connection to a HIS/RIS system via DICOM Modality Worklist. The AcuoMed Server uses this HIS/RIS connection to automatically obtain information from the HIS/RIS system about pending patient/study events that are scheduled for modalities connected to the AcuoMed Server's network. AcuoMed is able to use this information, in turn, to determine what existing prior patient studies (patient priors) will be needed at patient/study locations at the time of the events. AcuoMed, via its Prefetch functionality, can then locate the required patient images and ensure that these images are moved to the patient/study locations prior to scheduled patient/study events.

The overall elements required to perform this process include:

- A configured HIS/RIS connection between the AcuoMed Server and the HIS/RIS system via a DICOM worklist connection or HL7 (requires separate licensing for AcuoSemantix).
- A number of Station AE Title Rules that define (among other things) the source routes and destination AE names to use for moving patient images.
- An integrated linkage between AcuoMed and the Acuo Batch Move Manager that allows for automated batch moving of images during prefetch.

In addition to the patient/study event information that AcuoMed obtains across the HIS/RIS connection, AcuoMed is also able to derive DICOM tag data from HIS/RIS events and use this data to build and maintain DICOM tag information stored on the AcuoMed Server.

Figure 50 shows the structure of a typical HIS/RIS connection. In this figure, a DICOM worklist provider (a DICOM Broker in this case) is used to map HIS/RIS messages to DICOM tags. This Broker is a hardware/software component that allows a HIS/RIS system that does not directly support DICOM worklist management to communicate with the AcuoMed Server. (Please note that a HIS/RIS system that does directly support DICOM worklist management will not need the broker component. This type of HIS/RIS is referred to as a "brokerless" system.) In Figure 50, the HIS/RIS system functions as a Worklist SCP (service class provider) and the AcuoMed Server functions as a Worklist SCU (service class user, or requestor). Refer to the topic *HIS/RIS Connectivity Overview* on page 274 for detailed explanations of these concepts and a summary of the types of data that flow across the HIS/RIS connection.

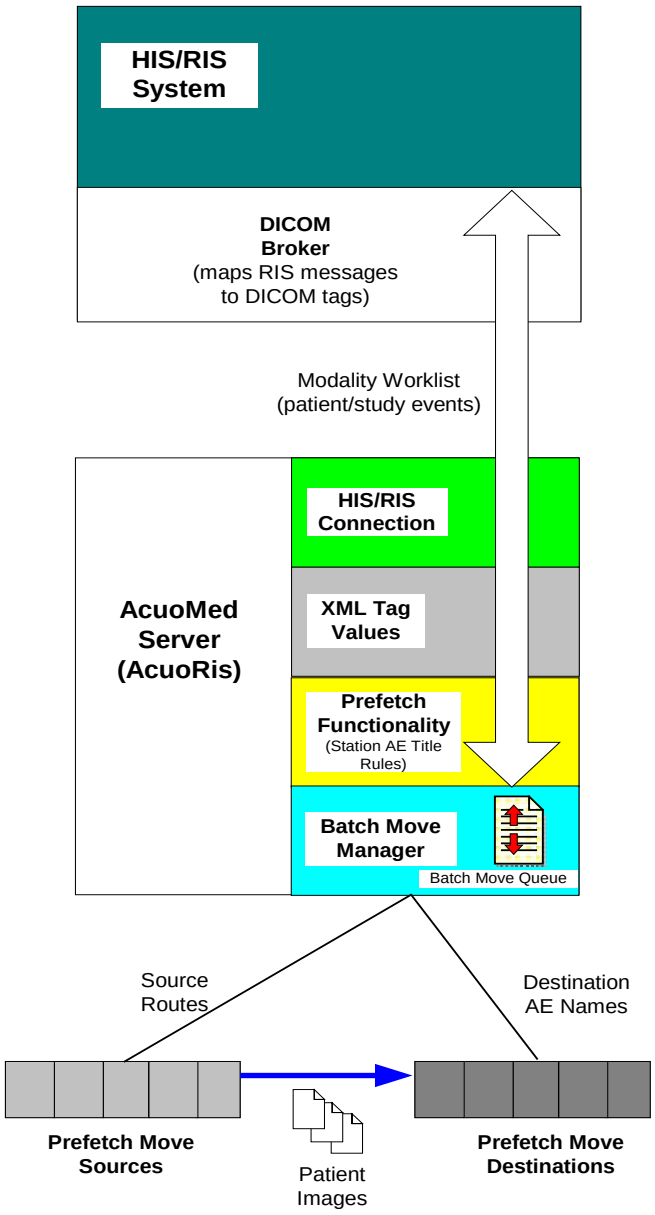


Figure 50: Typical Structure of HIS/RIS and Prefetch

The following topics provide more detailed overview information specific to HIS/RIS connectivity and prefetch. Following these overviews, procedures are given showing how to configure a HIS/RIS connection and related prefetch functionality. For detailed information about the operation of the Batch Move Manager, refer to the topic Batch *Move* Manager on page 311.

HIS/RIS Connectivity Overview

The HIS/RIS connection is the interface point between an AcuoMed Server and a HIS/RIS system. Currently, an AcuoMed Server is limited to supporting a single, local connection to one HIS/RIS system. However, it is possible to remotely schedule batch move jobs to any AcuoMed Server/Batch Move Manager in the network. The following figure illustrates this concept. Notice that AcuoMed Server 1 and AcuoMed Server 3 are each locally connected to a HIS/RIS system. These two AcuoMed Servers can each queue their prefetch batch move jobs to any AcuoMed Server in the network. That is, AcuoMed Server 1 can queue to itself or to AcuoMed Server 2 or AcuoMed Server 3. Similarly, AcuoMed Server 3 can queue to itself or to AcuoMed Server 2 or AcuoMed Server 1. For detailed explanation of the concept of remote batch queuing, refer to the topic *Centralized vs. Distributed Management* on page 277.

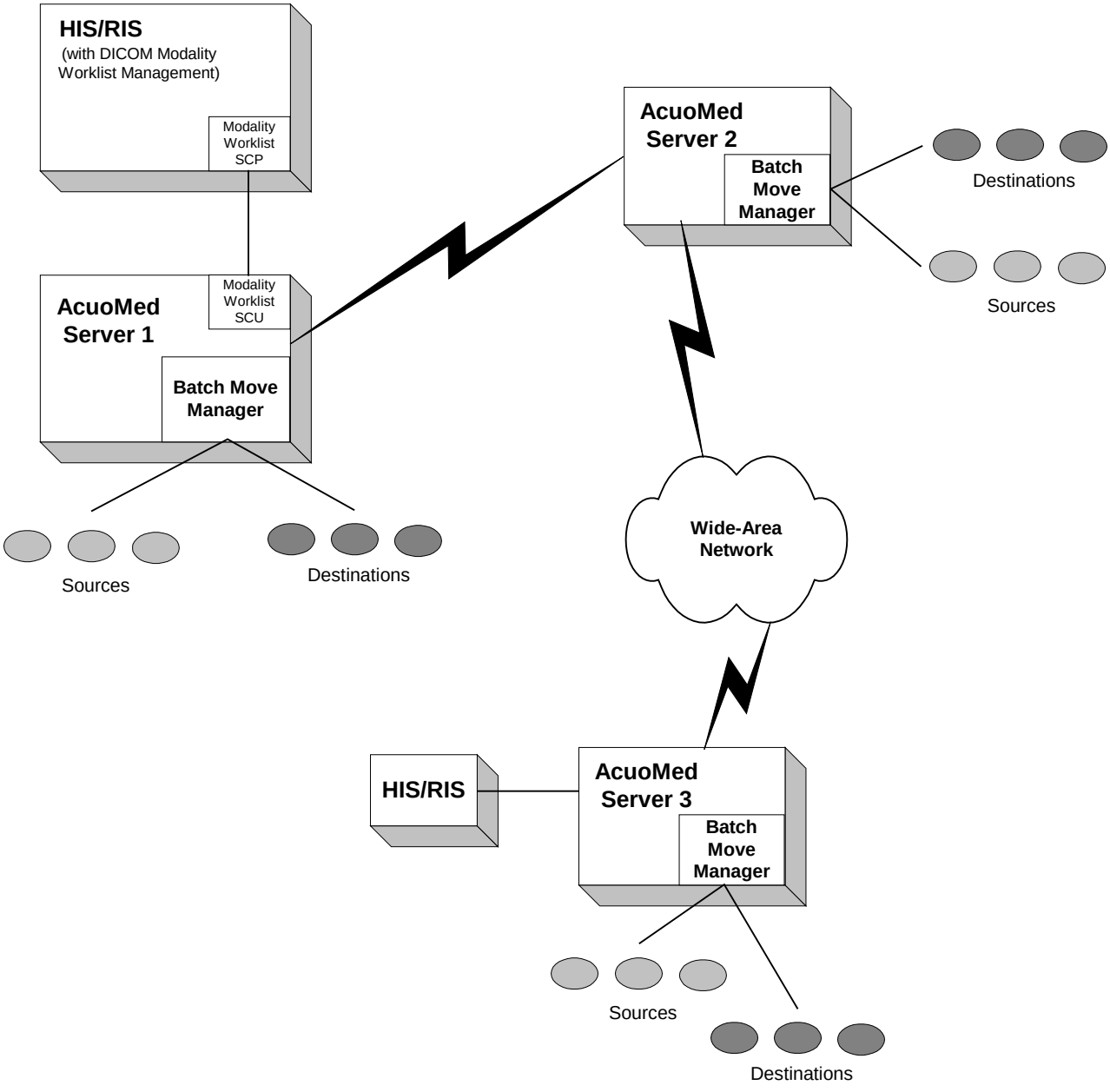


Figure 51: Local HIS/RIS connection and remote batch job queuing

To establish HIS/RIS connectivity, you must set up the HIS/RIS connection in the AcuoMed Server configuration. This involves defining a number of parameters such as the connection name, called AE name of the connected HIS/RIS system, required TCP/IP and listening port connectivity information, DICOM tag and DICOM search order information, and options that govern C-FIND request control. The procedure *Set up a New HIS/RIS Connection* on page 282 describes this process in detail. The following figure shows HIS/RIS connection data flow.

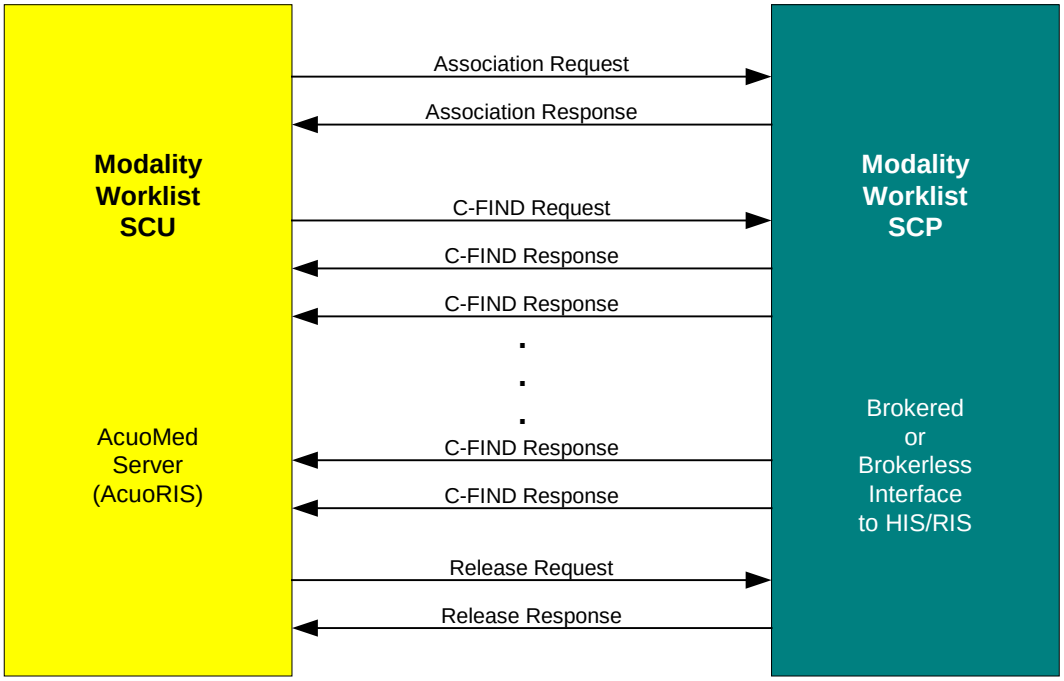


Figure 52: HIS/RIS connection data flow

The HIS/RIS connection supports two SOPs: Modality Worklist Management and Mitra-Specific Reporting. At the highest level, AcuoMed requests patient scheduling information from the HIS/RIS system via modality worklist requests (C-FIND Requests) and the HIS/RIS responds with patient schedule events (C-FIND Responses). The C-FIND Request consists of a sequence of DICOM tags that have a combined meaning. The C-FIND Responses sent back from the SCP are patient schedule events that match the parameters specified by the C-FIND Request. Normally, there will be many C-FIND Responses returned for a single C-FIND Request.

NOTE: The HIS/RIS is a scheduling system. The AcuoMed Server does not interface directly to the HIS/RIS, but instead interfaces with either a brokered or brokerless technology that extracts requested information out of the HIS/RIS via DICOM Modality Worklist.

AcuoMed evaluates each received C-FIND Response to determine whether or not the response is unique. A response in NOT unique if a patient is scheduled back-to-back for more than one exam on the same modality. For example, two non-unique patient scheduled events that are back-to-back on the same modality will require that the same patient study information be prefetched; so it is not necessary to move (prefetch) this same data twice. However, each unique C-FIND Response requires that a batch move request be queued to handle the needed prefetch operation.

NOTE: If a patient is scheduled back-to-back on different modalities, these are considered two unique events and each will require the scheduling of a batch job. For example, if a patient is scheduled back-to-back for an MR and a CT, a batch move job will be scheduled to prefetch the MR images and a second batch move job will be scheduled to prefetch the CT images.

An added major benefit of including the HIS/RIS feature in your AcuoMed configuration is its ability to use HIS/RIS events to automatically build and maintain tag customization information (see the next topic for more details).

Automatic Building and Updating of Tag Data from HIS/RIS Events

A HIS/RIS-connected AcuoMed Server is able to derive DICOM tag information from HIS/RIS events and save this information in an XML database maintained by AcuoMed. AcuoMed uses its HIS/RIS connection to "learn" information that then makes it possible to build, update, and populate DICOM tag information that is stored on and used by the AcuoMed Server. Examples of the types of DICOM tag data that AcuoMed can gather include such items as referring physician's names, reading physician names, station AE titles, modality types, procedure step status, or any tag supported by DICOM Modality Worklist.

AcuoMed's capability to derive DICOM tag data allows DICOM tag customization information to be built automatically from the events and data that the AcuoMed Server gathers by monitoring traffic on a HIS/RIS system connection. The gathered information feeds directly into DICOM tag rule customization. This automatic process saves the time and work of having to manually build all this custom tag information and avoids related data entry errors.

An enterprise can maintain a single, central location (a HIS/RIS system) where identification information about the enterprise is defined. AcuoMed can then propagate this information throughout the enterprise. AcuoMed can also derive and build a complete procedure description dictionary for the enterprise from site-specific procedure codes AcuoMed learns from HIS/RIS events.

For more information on the DICOM tag data and its use in tag rules, refer to the topics *Controlling Routing with Tag Rules* on page 42 and *Set up Routing by Tag* on page 151.

Prefetch Overview

AcuoMed's Prefetch functionality uses HIS/RIS patient/study events information it receives from a connected HIS/RIS system to schedule batch move jobs for required patient images. You need to set up Prefetch Station AE Title Rule properties for all modalities that are connected to an AcuoMed Server. Once you have done this, prefetch is able to invoke the Acuo Batch Move Manager to perform the automated movement of required images from their source locations to their destinations. There can be both multiple sources and destinations involved in a move; and this configuration is defined on a per-modality basis. A prefetch station name may be duplicated and occur on multiple destinations and on different routes (that is, it is possible to queue the same job on different batch move queues).

The following figure shows prefetch sources and destinations. The goal of prefetch is to deliver required patient priors (images) to destinations where patient/study events are scheduled. Prefetch is actually performed to an SCP where the modality's Station AE Title is defined. This SCP is where the prefetched images will be available for viewing side-by-side comparisons. Prefetch destination SCP types include AcuoMed Servers, study servers, and non-Acuo archives. Prefetches can also be done to view stations. Typical prefetch sources are DICOM image caches attached to AcuoMed Servers, deep-level archives attached to deep-end AcuoMed Servers, and non-Acuo image archives.

Both source and destination routes can have multiple end nodes per route such that searches of multiple sources can be mapped to move located images to multiple destinations. For example, you can define a prefetch to search for required patient/study images on a local DICOM image cache and a deep-level AcuoMed archive, and then move located images to an AcuoMed Server SCP and a view station.

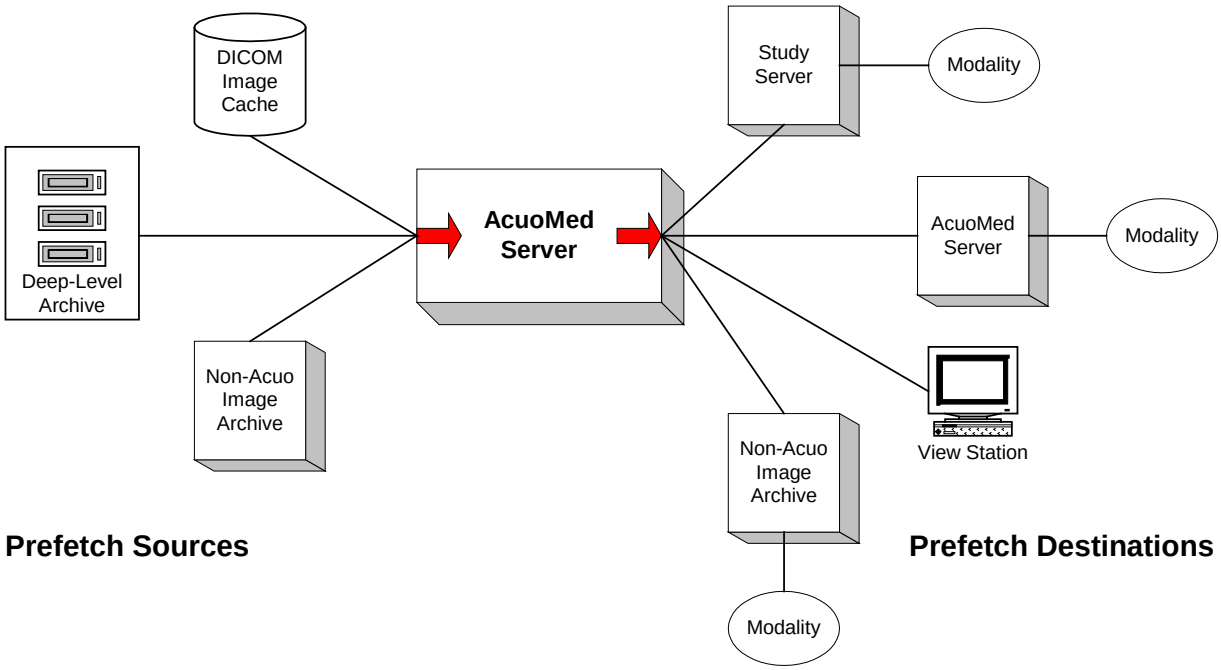


Figure 53: Prefetching patient images to patient/study locations

NOTE:	Figure 53 shows data flowing through the AcuoMed Server. However, queries and images are not required to pass through the AcuoMed system, and images could be sent directly from the prefetch source to the destination.

The Acuo prefetch facility uses worklist data to determine that patients are scheduled on certain modalities at certain times. The prefetch facility then prefetches images needed by the scheduled modalities. As stated above, prefetch involves locating the images at their source locations and then routing them to required destinations.

Prefetch is needed for a number of reasons. First of all, prefetch allows use of HIS/RIS information to verify patient demographics and, thereby, ensures that the correct prior patient study is retrieved. Also, a patient database could be down the day of an event, so prefetch gets required data to the patient/study location early to guarantee that it will be available, or a tape containing needed images could be discovered to be bad, requiring that a backup tape be retrieved from long-term storage and be mounted to a tape library, which requires more time. Basically, prefetch ensures that the correct prior patient study has been retrieved and provides some lead-time to take care of any logistical problems. Take these issues into consideration when configuring your prefetch rules.

Prefetch batch jobs can either be queued to run on the local AcuoMed Server or can be queued to run on a remote AcuoMed Server. The next topic explains this concept.

Centralized vs. Distributed Management

AcuoMed prefetch batch jobs can be managed by either a centralized or distributed means. Management is "centralized" with respect to the HIS/RIS system to which an AcuoMed Server is locally connected. Batch Queue information that is part of Prefetch Station AE Title Rule Properties, determines whether the prefetch job will be queued locally to the HI/RIS-connected AcuoMed Server or queued remotely to another network-attached AcuoMed Server. Here are the key concepts:

Centralized Management – a HIS/RIS-connected AcuoMed Server queues the job locally (that is, queues the job to its own Batch Move Manager). The routes on the local AcuoMed Server are used to define prefetch routing. For example, an AcuoMed Server that is connected to a HIS/RIS system at a central hospital queues prefetch jobs to itself, so its route definitions and Batch Move Manager are used for prefetching.

Distributed Management – a HIS/RIS-connected AcuoMed Server queues the job remotely (that is, queues the job to the Batch Move Manager on another AcuoMed Server). The routes on the remote AcuoMed Server are used to define prefetch routing. For example, an AcuoMed Server that is connected to a HIS/RIS system at a central hospital queues jobs to

another AcuoMed Server (normally at a different location such as a clinic). In this case, the other server's route definitions and Batch Move Manager are used for prefetching.

NOTE:	For Distributed Management, queuing prefetches from another AcuoMed System requires that a user account be set up to enable access to the remote AcuoMed System database. For more on this concept and configuration instructions, refer to *User Account* on page 91.

Centralized Management Example

Figure 54 below shows a centralized management approach. In this configuration, Station 1 is an AcuoMed Server (AcuoRIS) that is locally attached to the HIS/RIS System. Station 1 is queuing required prefetch batch move jobs to its own batch move queue. When a job in this local queue gets triggered to run, Station 1 issues a Move Request to Station 2 that specifies Station 3 as the ultimate prefetch move destination. The prefetch move destination and source route are defined by the Station AE Title Properties routing information defined for AcuoMed Server Station 1, where the move job is queued.

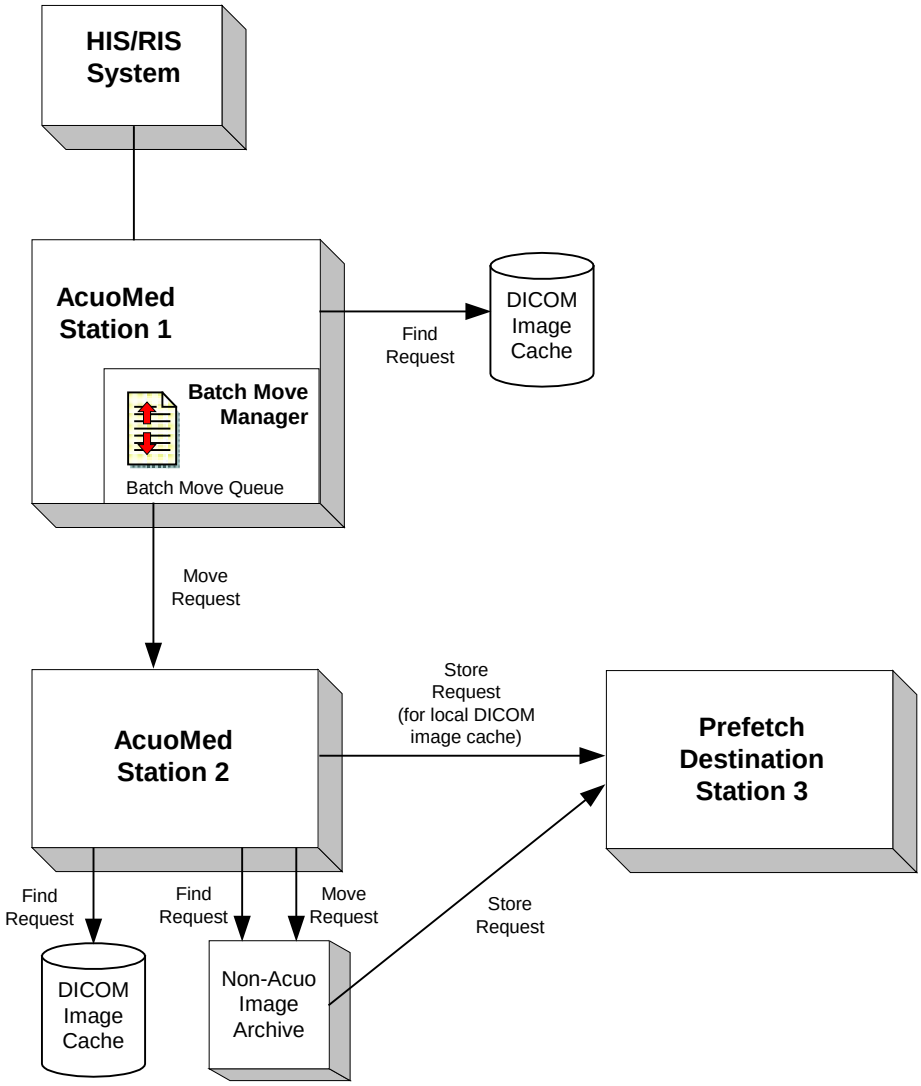


Figure 54: Locally queuing prefetch batch move jobs

In our example in Figure 54, the source route includes Station 1's local DICOM image cache (AcuoMed DICOM database), Station 2's local DICOM image cache, and a non-Acuo image archive connected to Station 2. Find Requests are submitted to these three data sources and results are returned and filtered. The required patient/study images are located on Station 2's local DICOM image cache and on the attached non-Acuo image archive. Station 2 issues Move Requests to the non-Acuo image archive. Station 2 then issues Store Requests to Station 3 to move images from Station 2's local DICOM image cache. The non-Acuo image archive also issues Store Requests to Station 3 to enable moving its images to Station 3. As Store operations are completed, Station 3 returns Store Responses to Station 2 and to the non-Acuo archive. Finally, Move Responses are returned from the non-Acuo archive to Station 2 and from Station 2 to Station 1 to complete the operation.

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Distributed Management Example

Figure 55 below shows a distributed management approach. In this configuration, Station 1 is an AcuoMed Server (AcuoRIS) that is locally attached to the HIS/RIS System. Station 1 is remotely queuing required prefetch batch move jobs to Station 2's batch move queue. After Station 1 has remotely queued a prefetch batch move job to Station 2, Station 1 is no longer involved in the operation (Figure 55 indicates this by showing Station 1 in a shadowed light gray).

The two real differences in a distributed, remotely queued configuration are that 1.) The prefetch batch move job is actually queued to run on a remote AcuoMed Server that is not connected to the HIS/RIS System and 2.) The prefetch routing information on this remote AcuoMed Server is used to control the move operation. You might want to use the distributed management approach because Station 2 has more bandwidth than Station 1 and can handle the move operations more quickly, or because Station 1 is a standalone AcuoRIS that cannot do move operations itself.

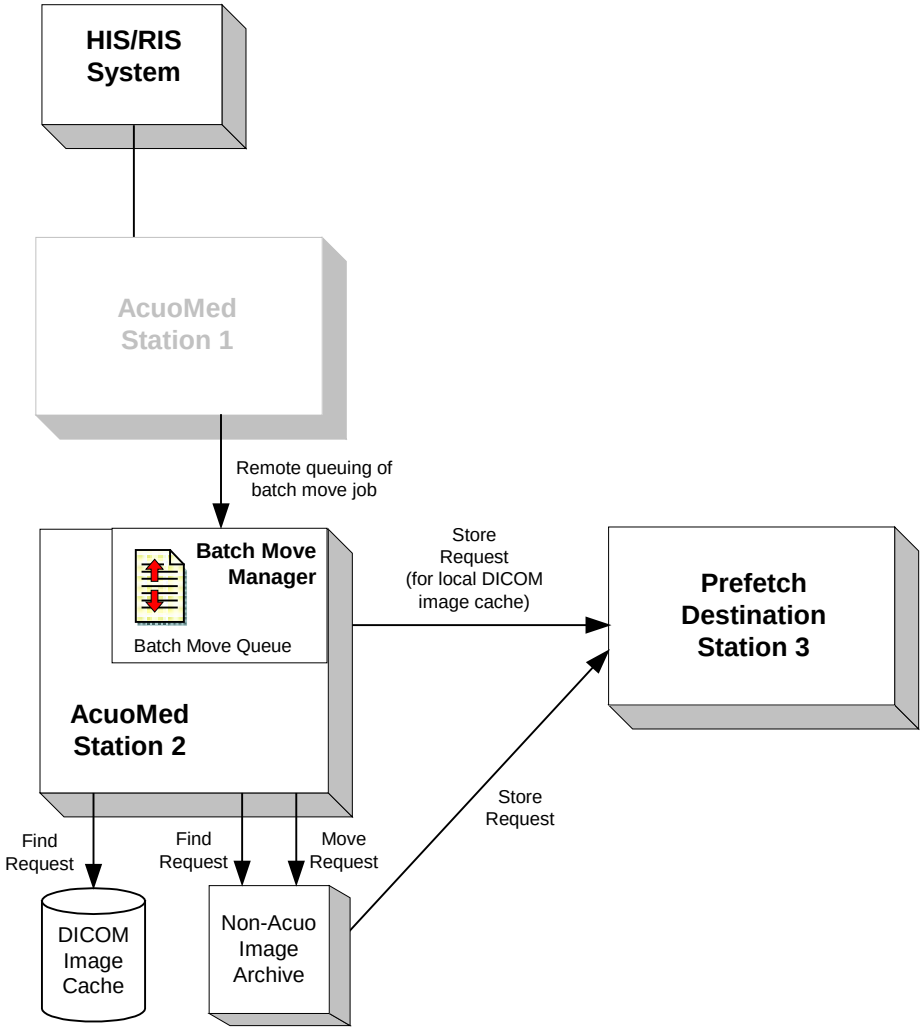

Figure 55: Remotely queuing prefetch batch move jobs

In our example in Figure 55, the source route includes Station 2's local DICOM image cache and a non-Acuo image archive connected to Station 2. Find Requests are submitted to these data sources and results are returned and filtered. As shown in the previous Centralized Management Example (Figure 54), the required patient/study images are located on Station 2's local DICOM image cache and on the attached non-Acuo image archive. Station 2 issues Move Requests to the non-Acuo image archive. Station 2 then issues Store Requests to Station 3 to move images from Station 2's local DICOM image cache. The non-Acuo image archive also issues Store Requests to Station 3 to enable moving its images to Station 3. As Store operations are completed, Station 3 returns Store Responses to Station 2 and to the non-Acuo archive. Finally, the non-Acuo archive returns Move Responses to Station 2 to complete the operation. No additional responses are required to Station 1 that initially queued the job, since Station 1 in no longer involved in the operation.

Tag Mapping

AcuoMed's Tag Mapping functionality uses the HIS/RIS patient/study events information to attempt to make an exact match on the following minimum four specific DICOM tags:

- Patient Name (0010,0010)
- Patient ID (0010,0020)
- Scheduled Procedure Step Start Date *[study date]* (0040,0002)
- Accession Number (0008,0050)
- Modality (0008, 0060)

These DICOM tags in conjunction with other possible tags are configured to automatically map potentially incorrect data with correct patient/study information, thus reducing the need for manual correction within the Reconciliation Event Manager.

Unlike the Reconciliation feature where all images that fail reconciliation are sent to the Reconciliation Event Manager for manual tag data correction, Tag Mapping will first try to match a set of configurable tags. As long as all tags are matched successfully, the tags set for Auto Mapping will be populated with the correct patient/study information derived from the HIS/RIS events. These changes are then noted and retained in the Image History. The data is then stored to the appropriate DICOM database. Should the image fail the match criteria, the data will be stored to the Reconciliation database until a user accesses the Reconciliation Event Manager to manually correct the information.

Note: Although Tag Mapping can be accomplished without the Reconciliation Feature enabled, Acuo does **NOT** recommend its usage in this manner.

Overview Summary

The preceding overview information and diagrams explain the concepts you need to understand in order to configure and use AcuoMed's HIS/RIS connection and prefetch capabilities, as well as the Tag Mapping functionality. The following topics, *HIS/RIS Procedures* on page 282 and *Prefetch Procedures* on page 290 explain how to actually perform HIS/RIS and prefetch configuration.

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HIS/RIS Procedures

AcuoMed HIS/RIS procedures include the processes that are needed to create and maintain the AcuoMed Server's connection to a HIS/RIS system via Dicom Modality Worklist:

Set up a New HIS/RIS Connection (next topic)

Update an Existing HIS/RIS Connection (page 289)

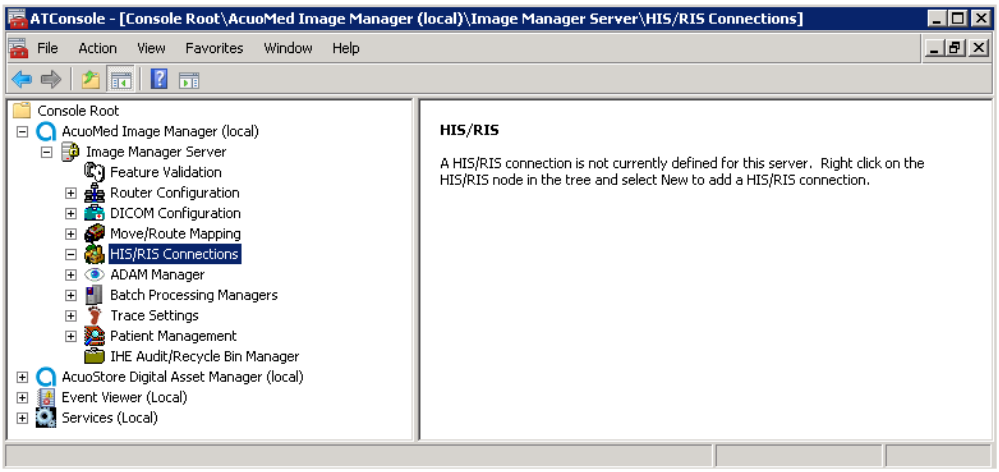
Delete an Existing HIS/RIS Connection (page 289)

Set up a New HIS/RIS Connection

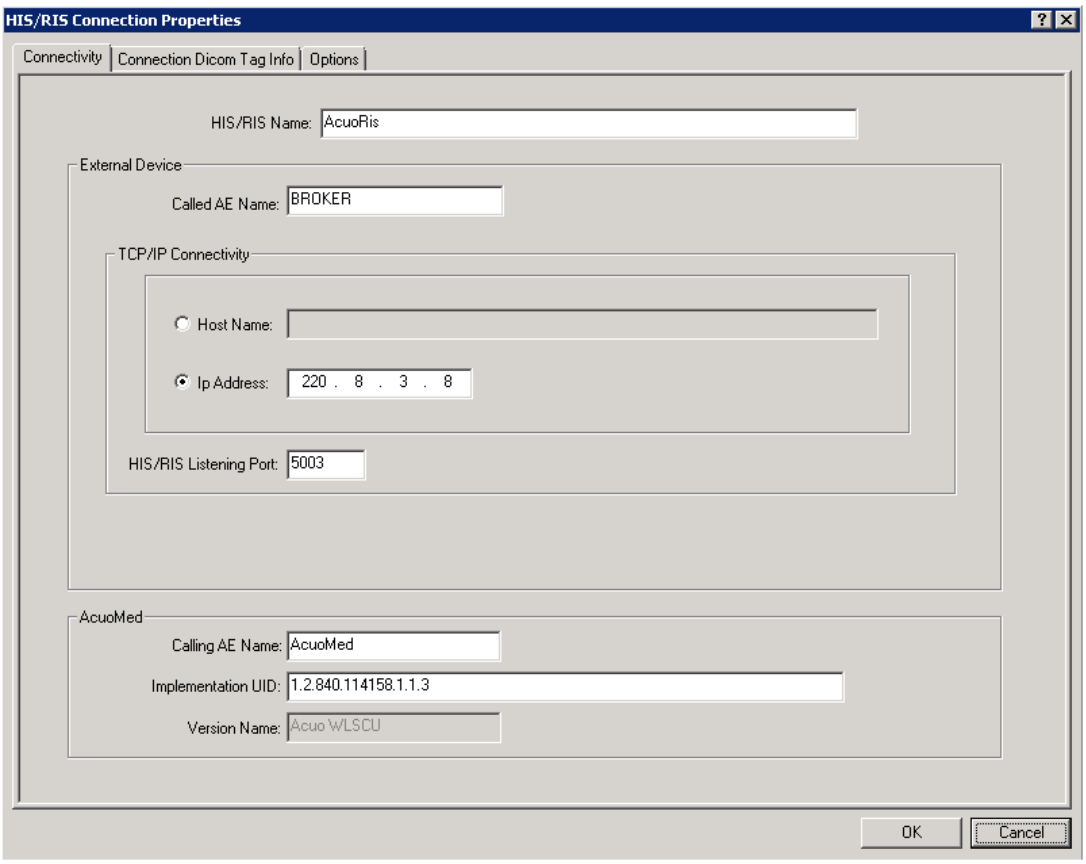
A HIS/RIS connection enables interoperation and information transfer between an AcuoMed Server and a HIS/RIS system. Currently, an AcuoMed Server can support one HIS/RIS connection.

To set up a new HIS/RIS connection, follow these steps:

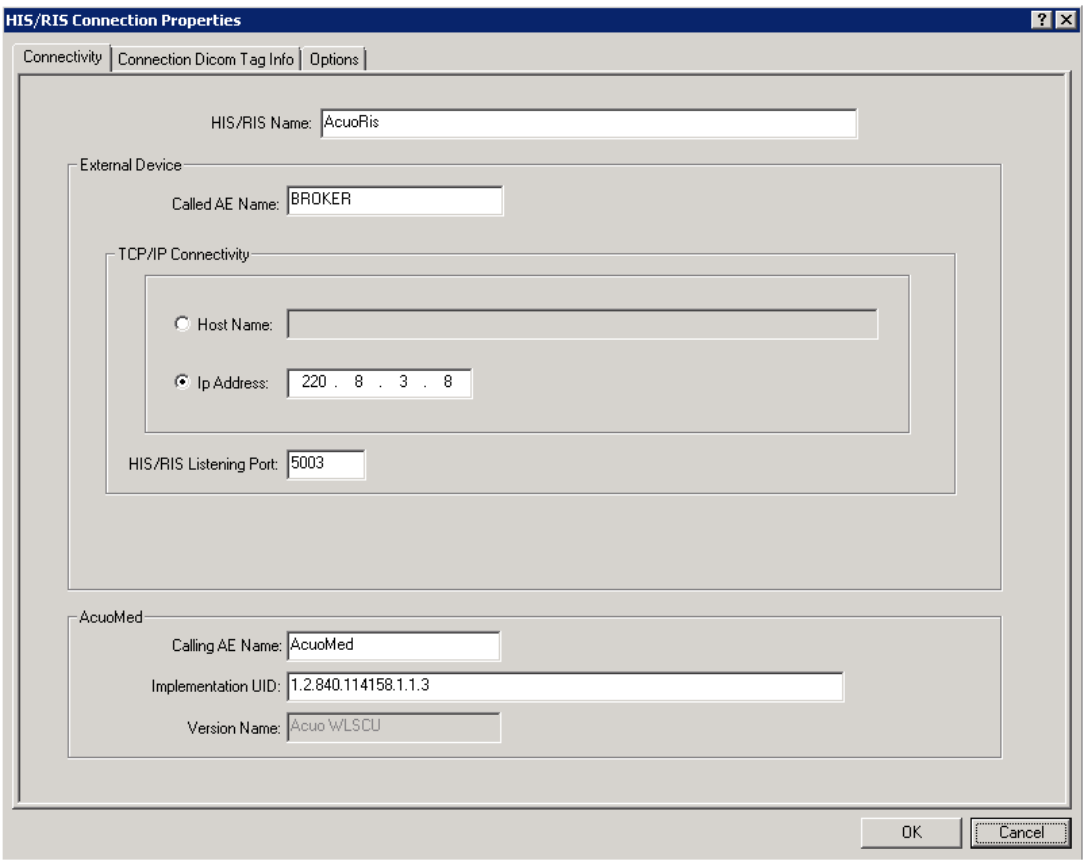
1. Expand the console tree as follows: AcuoMed Image Manager→AcuoMed Server→HIS/RIS Connections.



2. Right-click **HIS/RIS Connections** and select **New→New HIS/RIS connection**.



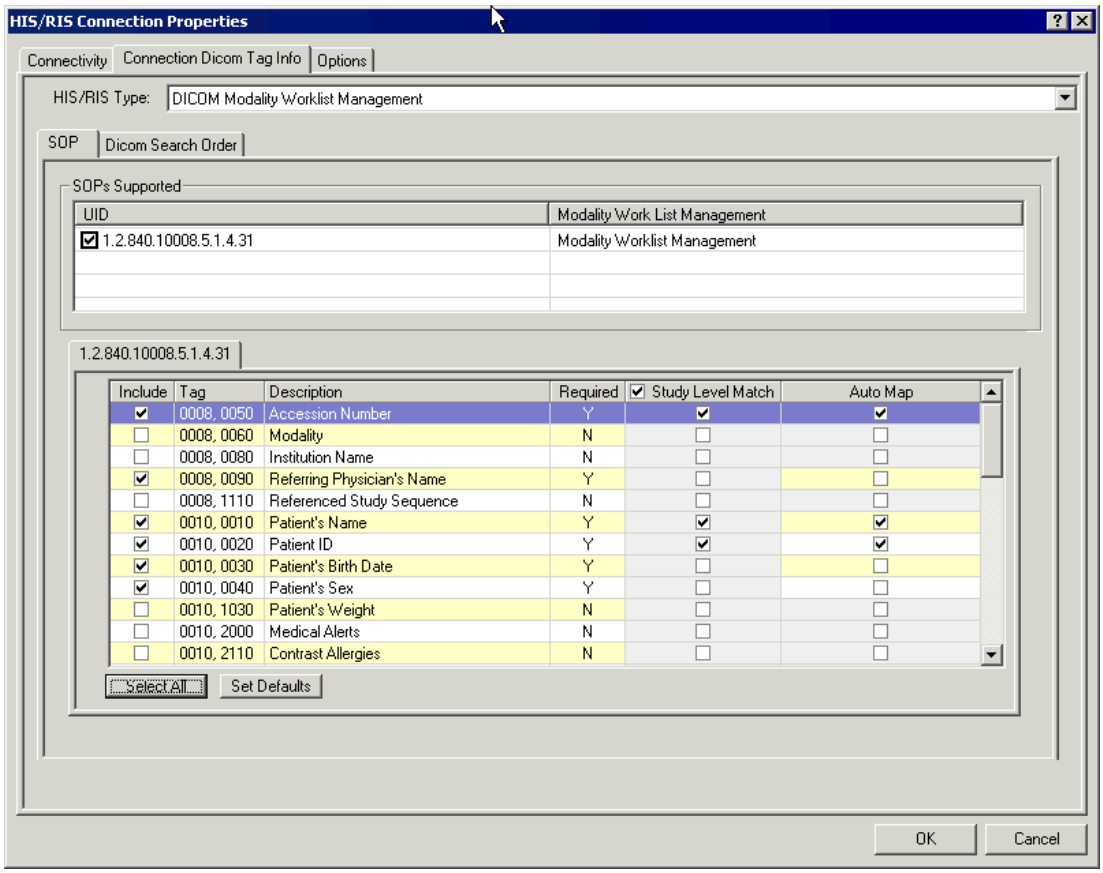
The HIS/RIS Connection Properties dialog displays with the Connectivity tab selected.



3. Using the Connectivity tab, set up the HIS/RIS connection.

   - HIS/RIS Name – you can use the default name AcuoRis, or type another name to identify this new HIS/RIS connection.
   - Called AE Name – type the AE name that identifies the external device, which is a DICOM-based HIS/RIS system such as a DICOM broker. This is the name that is configured for the external device (this name is configured by the person who set up the external device, not by the Acuo user).
   - TCP/IP Connectivity – enter either a Host Name or an IP Address (220.8.3.8 in our example). If you are using DHCP, be sure to enter a Host Name.
   - HIS/RIS Listening Port – type the number of the port on which the external device will listen for traffic coming from this AcuoMed Server.
   - Calling AE Name – type the user-defined AE Name to identify this AcuoMed Server. You can use "AcuoMed" which is the default name.
   - Implementation UID – this is the implementation UID of this AcuoMed Server (calling AE name). You can use the AcuoMed default that is displayed.
   - Version Name – this is the version name of this AcuoMed Server (calling AE name).

4. Click the **Connection Dicom Tag Info** tab and set up these parameters.



- **HIS/RIS Type** – choose a HIS/RIS type from the drop-down list. Currently, the only choice is DICOM Modality Worklist Management.
- **SOP tab** – select Modality Worklist Management by clicking the UID checkbox to check it. When this UID is checked, the related tag data displays beneath the SOPs Supported list (see the next item).
- **UID tag data** – includes the DICOM Tag (Group number, Element number), Description, and Required field. This tag list displays the available tags that the AcuoMed Server can request from the modality worklist management entity (selected SOP). Checked items indicate required tags (that is, tags that are required by the DICOM standard). AcuoMed will issue the selected tags in the C-FIND request, and results from the C-FIND will come back from the modality worklist management entity if the RIS supports this tag.

NOTE: If a modality worklist management entity does not provide a required tag, the AcuoMed Server will log an event. If you want to stop this event, you must uncheck the appropriate required tag Group item. The items that are checked in the Group list are the tags that AcuoMed uses to build a value list in the XML database available for routing tag rules.

The Match and Auto Map columns define the configuration for Tag Mapping. The optional checkmark next to the word Match in the column header shows that Tag Mapping has been enabled, and the checkmarks next to the required tags (which cannot be unchecked) indicate the four tag minimum configuration for matching.

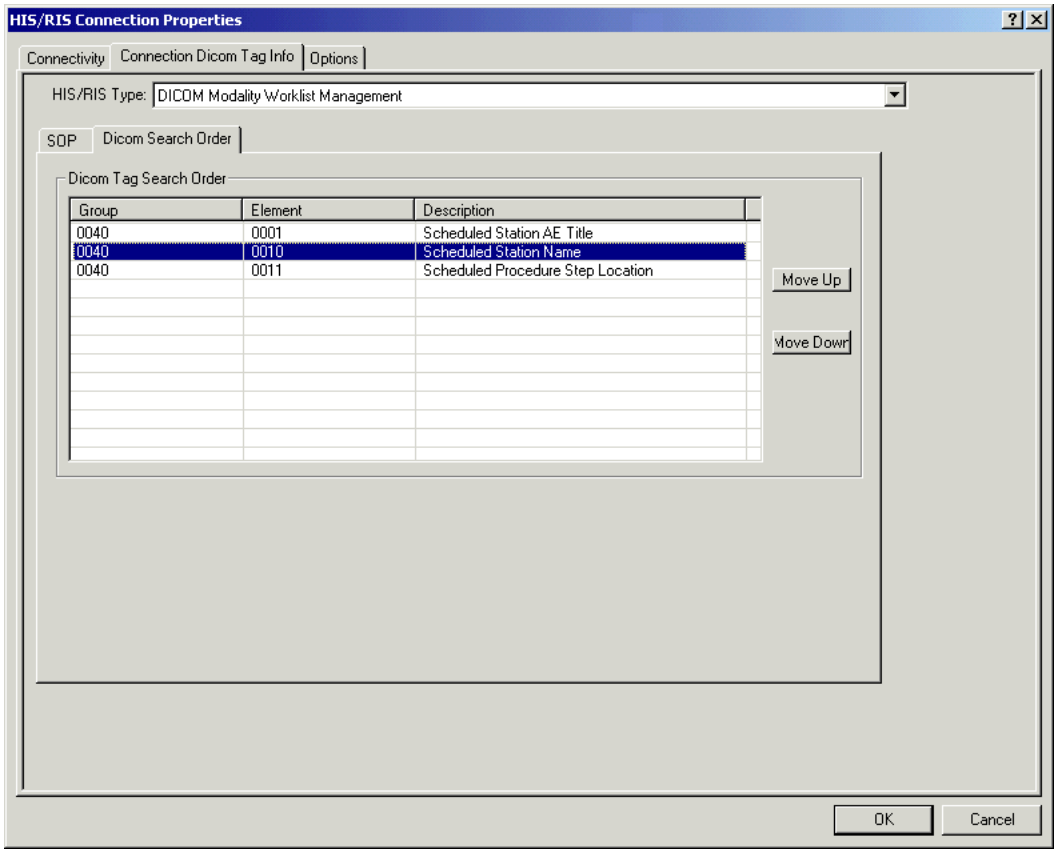
Additional tags for matching can be designated. This would make the matching of appropriate patient/study information more strict, thus reducing the potential for false/positives in the Tag Mapping process. However, a stricter configuration may result in a greater need for manual Reconciliation through the Reconciliation Event Manager. Select additional tags in the Match column to increase the sensitivity of the matching algorithm used by AcuoMed prior to Tag Mapping occurring.

The Auto Map column indicates the tags that will be pulled from the derived HIS/RIS events and mapped into the DICOM data stream as it moves through AcuoMed. Any tags selected by the Auto Map column that do not exist in the

data stream will be added, and any tags that do exist will be overwritten by the HIS/RIS data. All changes are recorded in the Image History as the images move through the AcuoMed enterprise.

Dicom Search Order tab – click this tab (see the following figure) to specify the order in which DICOM tag data will be searched to find the location of the station to which data will be prefetched.

To change the search order, select the row in the list that you want to move and then click either the **Move Up** or **Move Down** button. Set up a search order that is most probable for the type of station for which you are setting up the search control.



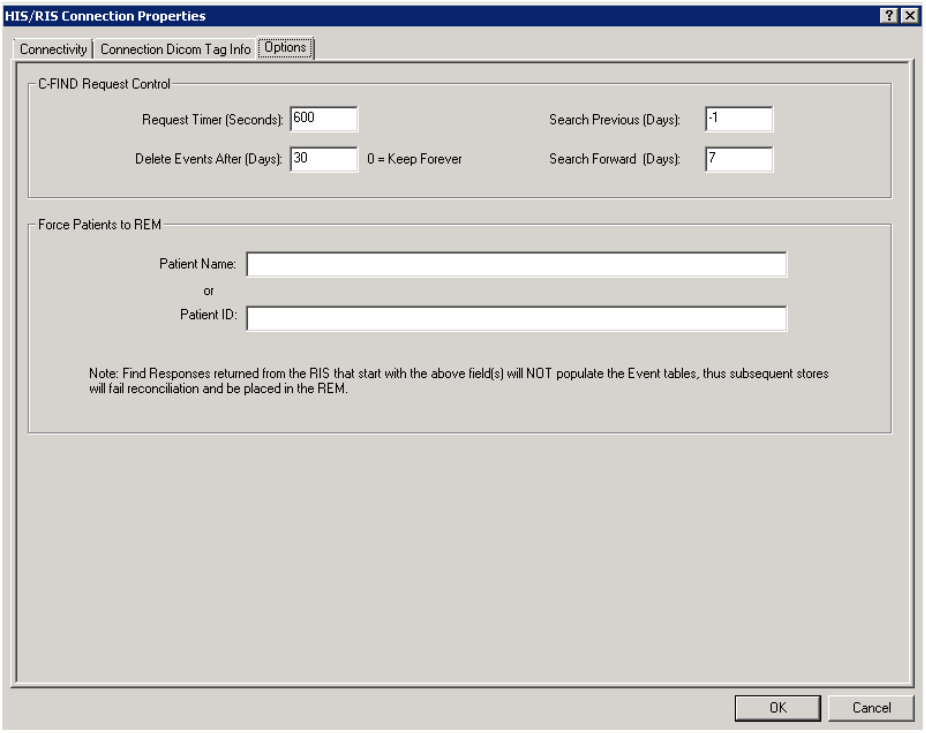
DICOM Modality Worklist Management determines what to prefetch and when. The three tags in the previous figure (Scheduled Station AE Title, Scheduled StationName, and Scheduled Procedure Step Location) contain the ultimate destination to where data will be prefetched. The search order specifies which tag to look for first. For example, if Scheduled Station AE Title tag data is available, use this data first to find the location of the station to which data will be prefetched. If this first tag is not available, then search by the second tag in the DICOM Tag Search Order list if it is available, and so on.

IMPORTANT: It is critical that you test and confirm your prefetch settings. Restarting the AcuoMed service will initiate MWL. If your configuration is not operating as you intended, contact Acuo Technical Support to assist in clearing your HIS/RIS directory if required.

You can use the Worklist SCU Trace to better determine the prefetch values to use. For example, you can use this type of process:

– Set up a 1-day configuration.
– Test everything using the 1-day configuration.
– Use the Worklist SCU Trace to ensure that you have mapped everything correctly.
– Set up the C-FIND Request Control for the desired search period (see the next step).

5. Click the **Options** tab and set up these parameters.



C-Find Request Control

- Request Timer (Minutes) – how often the AcuoMed Server reconnects with the worklist SCP and sends a C-FIND request to the modality worklist management entity to determine if there are any new worklist events to be processed.
- Delete Events After (Days) – specifies when events will be cleaned out of the AcuoMed Server's event worklist table.
- Search Previous (Days) – specifies the number of previous days for which to request events. For example, typing "-2" in field will request all events for today plus the previous two days.
- Search Forward (Days) – specifies the number of future days for which to request all scheduled events.

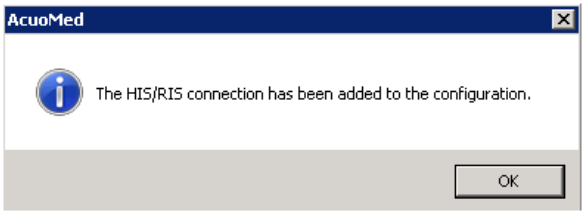
Force Patients to the Reconciliation Event Manager (REM)

Emergency Care Patients sometime arrive into a care facility where the Patient's name and ID are unknown.

Acuo provides a way to force these types of patients into the REM by configuring a designated Name or ID to identify them. Enter either the designated fake patient name or ID such as Doe^Jane^^^ or ER1234, also consider using only a prefix, such as DOE, or ER. When a scheduled event for a patient name or ID that begins with the information entered comes across the DICOM Modality Worklist interface it will be ignored and not added to the AcuoMed HIS/RIS database. Thus, if the name or ID presents to the AcuoMed system for reconciliation, the patient's images will be forced into the REM for reconciliation. Once the patient's actual information has been entered into the RIS, thus populating the AcuoMed HIS/RIS database, the REM user can then reconcile the patient with the correct information.

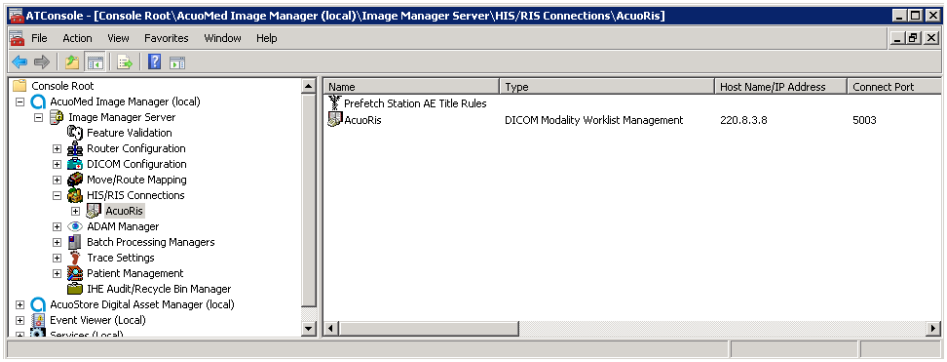
Please refer to Chapter 5 for more information on the REM.

6. Click **OK** to add the new HIS/RIS connection to the AcuoMed Server configuration.



7. Click **OK** to complete this procedure.

   The new HIS/RIS connection (AcuoRis) now appears in the console tree.



Now that the new HIS/RIS connection has been added, you can either update it or delete it (refer to the following procedures).

Update an Existing HIS/RIS Connection

To update the properties of an existing HIS/RIS connection, follow these steps:

1. Right-click the currently configured HIS/RIS connection and select **Update** from the pop-up menu.

   The HIS/RIS connection appears in both the right window pane and under HIS/RIS Connections in the console tree. You can right-click it in either of these locations to begin updating.

2. Use the HIS/RIS Connection Properties dialog to modify the current HIS/RIS connection as needed.

   Refer to the previous procedure *Set up a New HIS/RIS Connection* on page 282 for details about the various parameters you can specify for the HIS/RIS connection.

3. When you are done updating, click **OK** to save the changes and return to the AcuoMed console.

Temporarily Disable a HIS/RIS Connection

After a HIS/RIS connection is set up, it may be necessary (for troubleshooting purposes) to disable the connection temporarily. You can disable a HIS/RIS connection without losing configuration data by doing the following:

1. Use the *Update an Existing HIS/RIS Connection* procedure above to edit the HIS/RIS connection.
2. Change the HIS/RIS Listening Port to an invalid port number.
3. Restart AcuoMed.

The AcuoMed HIS/RIS connection (AcuoRis) will attempt to connect to the HIS/RIS system (Broker), the connection will fail, and AcuoRis will queue itself into a sleep mode.

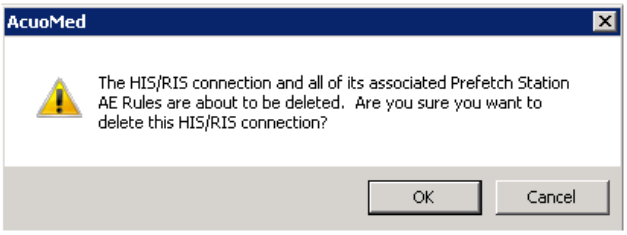
Delete an Existing HIS/RIS Connection

To delete an existing HIS/RIS connection, follow these steps:

1. Right-click the currently configured HIS/RIS connection and select **Delete** from the pop-up menu.

   The HIS/RIS connection appears in both the right window pane and under HIS/RIS Connections in the console tree. You can right-click it in either of these locations to perform the delete.

   You are warned that the HIS/RIS connection along with all of its associated Prefetch rules will be deleted.



2. Click **OK** to continue with the delete operation.

   The HIS/RIS connection is removed from the AcuoMed Server configuration.

Prefetch Procedures

AcuoMed Prefetch procedures include the processes that are needed to create and maintain the Prefetch Station AE Title Rules used by AcuoMed's prefetch facility:

- Add a New Prefetch Station AE Title Rule (next topic)
- Update an Existing Prefetch Station AE Title Rule (page 293)
- Delete a Prefetch Station AE Title Rule (page 293)

Add a New Prefetch Station AE Title Rule

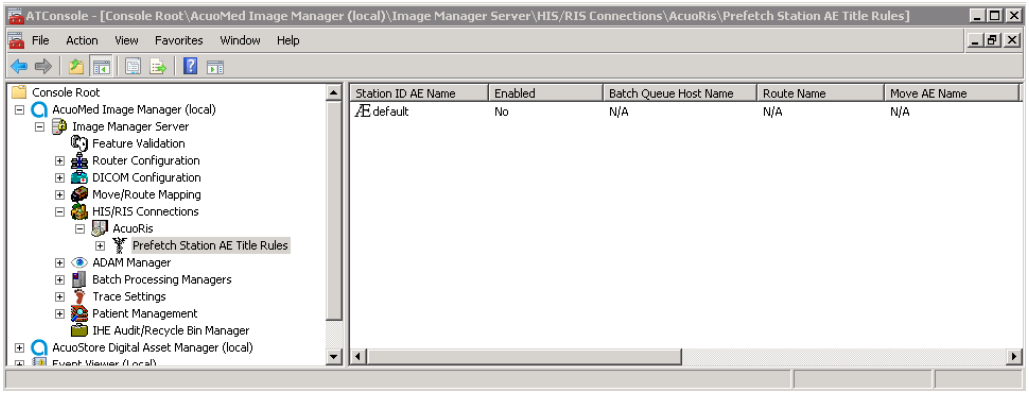
Use this procedure to register each resource for which prefetching will be done. A Station AE Title Rule must be defined for every prefetch location associated with a HIS/RIS connection. Each rule specifies several control items:

- The Station AE Title (patient/study location) for which prior patient studies will be prefetched
- The batch queue information that specifies the AcuoMed Server and associated routes which will be used to control the move
- The sources and destinations for the prior studies being prefetched
- The move criteria to specify the age of prior studies to retrieve

NOTE: Prior to configuring Station AE Title Rules, be sure that all prefetch routes have been defined on all AcuoMed Servers where a batch move may be scheduled to run. All required prefetch routes must already be defined to enable you to select them when specifying Routing Information in the following procedure.

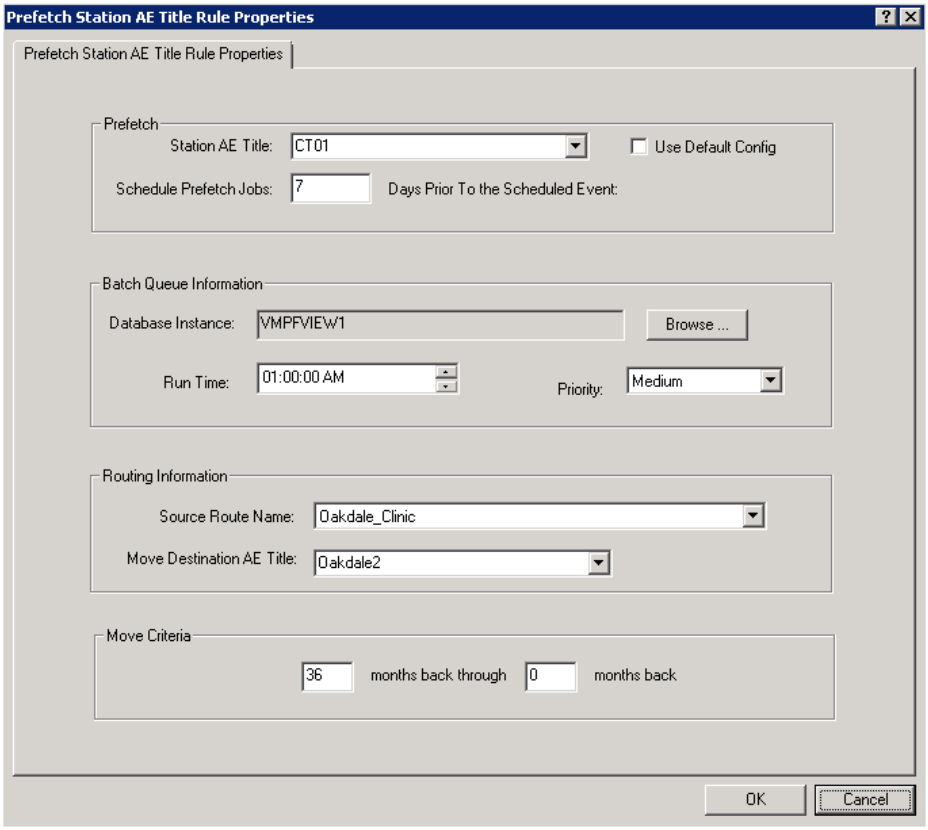
To add a new Station AE Title Rule, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager→AcuoMed Server→HIS/RIS Connections→connection name (AcuoRis in our example).



2. Right-click **Prefetch Station AE Title Rules** and select **New→New Prefetch Station AE Title Rule**.

   The Prefetch Station AE Title Rule Properties dialog displays.



3. Enter the Prefetch criteria.

   - Station AE Title – type in a station AE title or select one from the drop-down list. This is the modality that will be doing the procedure for which we are prefetching patient data. In our example the modality Station AE Title is CT01.
   - Use Default Config – check this selection to specify that the default Prefetch Station AE Title Rule configuration should be used. If you check **Use Default Config** there is nothing more to do in this procedure – just click **OK** to finish setting up this Prefetch Station AE Title Rule. If you do not check this selection, you will need to complete this procedure to set up the remaining required information.

NOTE: You need to do this procedure once to set up the **default** Prefetch Station AE Title Rule configuration that will be used whenever Use Default Config is checked. To do this, right-click default under Prefetch Station AE Title Rules in the console tree and select Update from the pop-up menu.

   - Disable Prefetch (only available for the **default** Prefetch Station AE Title Rule) – check this selection to prevent prefetches for the default Prefetch Station AE Title Rule configuration, or uncheck the box to enable prefetching according to the defined properties. If Disable Prefetch is checked for the default rule, then prefetching will be disabled for all Prefetch Station AE Title Rules that specify Use Default Config.
   - Schedule Prefetch Jobs – the number of days prior to a scheduled event that prefetch jobs will be processed for the selected Station AE Title. The date of the scheduled exam minus this number will specify the date to start the batch move.

4. Enter the Batch Queue Information.

   - Server Name – displays the AcuoMed Server name for which routing information will be displayed (see the Routing Information criteria in the next step). To display routing information for a different server, click the **Browse** button and then locate and select a new server.
   - Run Time – specify the time at which the move operations controlled by this Prefetch Station AE Title Rule will be run each day.

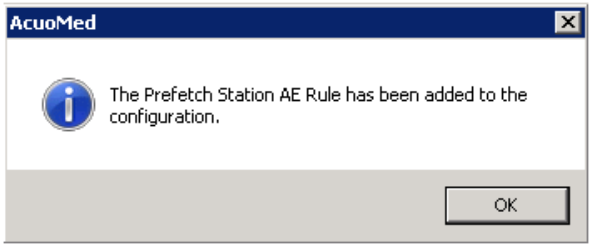
- Priority – select a batch job priority for move operations controlled by this Prefetch Station AE Title Rule.

NOTE: This priority may be overridden in the case of a "STAT" scheduled event from the worklist SCP. If AcuoMed receives an event with a status of "STAT" (normally for Emergency Room cases), AcuoMed inserts a job into the Batch Move Manager job queue with an "Expedited" priority so it will run immediately.

5. Enter the Routing Information.
   - Route Name – select an available route name from the drop-down list. This route name specifies the source locations to search for patient data.
   - Move Destination AE Title – select an available move destination from the drop-down list to control where the prior studies will be moved. This move destination is an AE name that will cause prior studies to be moved to one or more destinations (according to the configuration of the AE name's associated route).
6. Enter the Move Criteria.
   - months back through – type a number (in months) to specify the oldest prior studies to be moved. For example, enter 36 to retrieve patient priors starting three years ago.
   - months back – type a number (in months) to specify the most recent prior studies to be moved. For example, enter 12 to retrieve patient priors up to 1 year ago. If you enter 0, the scheduled procedure start date is used. If you enter any number other than 0, the scheduled procedure start date is overridden and a calculated value is used.

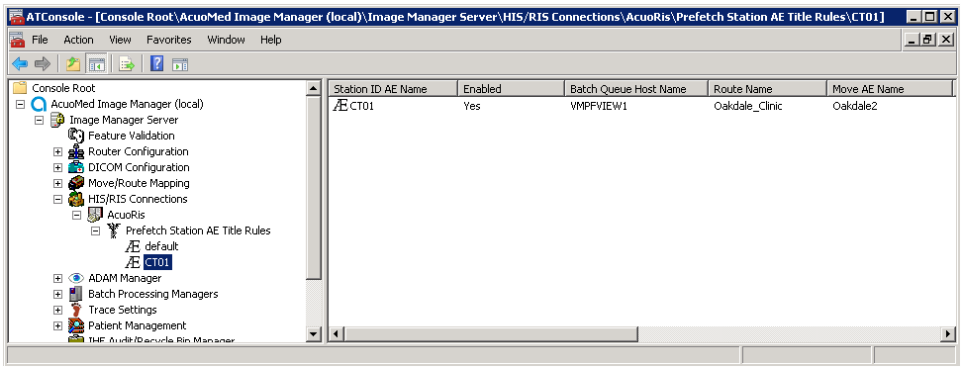
NOTE: The two Move Criteria fields work together. For example, to retrieve prior studies that are from three years old to one year old, you would enter "36 months back through 12 months back."

7. Click **OK** to add the new Prefetch Station AE Title Rule to the AcuoMed Server configuration.



8. Click **OK** to complete this procedure.

   The new Prefetch Station AE Title Rule (CT01) now appears in the console tree.



Now that the new Prefetch Station AE Title Rule has been added, you can either update it or delete it (refer to the following procedures).

Update an Existing Prefetch Station AE Title Rule

To update the properties of an existing Prefetch Station AE Title Rule, follow these steps:

1. Right-click the currently configured Prefetch Station AE Title Rule and select **Update**.

   The Prefetch Station AE Title Rule appears in both the right window pane and under Prefetch Station AE Title Rules in the console tree. You can right-click it in either of these locations to begin updating.

2. Use the Prefetch Station AE Title Rule Properties dialog to modify the current Prefetch Station AE Title Rule as needed.

   Refer to the previous procedure *Add a New Prefetch Station AE Title* Rule on page 290 for details about the various parameters you can specify for the station AE title.

3. When you are done updating, click **OK** to save the changes and return to the AcuoMed console.

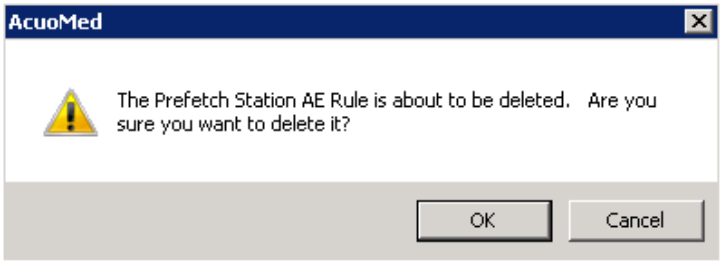
Delete a Prefetch Station AE Title Rule

To delete an existing Prefetch Station AE Title Rule, follow these steps:

1. Right-click the currently configured Prefetch Station AE Title Rule and select **Delete**.

   The Prefetch Station AE Title Rule appears in both the right window pane and under Prefetch Station AE Title Rules in the console tree. You can right-click it in either of these locations to perform the delete.

   You are warned that the Prefetch Station AE Title Rule will be deleted.



2. Click **OK** to continue with the delete operation.

   The Prefetch Station AE Title Rule is removed from the AcuoMed Server configuration.

Chapter 7 – Acuo Batch Processing Managers

In this chapter:

Overview

Batch Store Manager

Batch Reprocessing Manager

Overview

The Acuo Batch Processing Managers provide four key batch management capabilities. The Batch Store Manager and Batch Move Manager provide batch storing and moving of images that need to be delivered to one or more local route destinations. The Batch Reprocessing Manager works in coordination with Acuo Technologies' Reconciliation functionality to provide batch reprocessing of patient data with a connected HIS/RIS system. The Batch Patient Update Manager works in coordination with propagation routes when modifications are made manually with the use of Patient Management or automatically with the use of Reconciliation or HIS/RIS integration in an effort to keep you entire enterprise in synch.

For details about the capabilities provided by the Acuo Batch Processing Managers, refer to these topics:

Batch Store Manager on page 295

Batch Reprocessing Manager on page 319

Batch Patient Update Manager on page 323

Batch Store Manager

AcuoMed provides batch store management capability for handling images that need to be delivered to one or more route destinations. AcuoMed is able to receive images and then queue them for delivery to multiple destinations. This provides important advantages when a destination is not currently available (for example, a destination network is down) or when an image needs to be delivered to more than one destination. When a destination is configured to be batched, images sent to this destination do not need to go there immediately. AcuoMed will try to deliver images immediately, but if the destination is currently not available, then AcuoMed will queue images to the destination and retry delivery at a later time. If images need to be rerouted, for example if a destination is not available, a user can pause the job(s) and change the destination for those images. The Batch Store Manager's task is to monitor and manage the batch queue, and to provide a means for an administrator, or other user, to view batch job status.

Through its batch store capability, AcuoMed is able to deliver an image to different destinations at different times. For example, let's say an image is destined for two view stations and a dial-up connection to an on-call doctor's house. The image can be stored to one of the view stations immediately and to the other view station within minutes. However, the dial-up connection is not currently available and will need to be retried periodically until the doctor is online from home. AcuoMed can handle this scenario and can deliver the image to each destination in the timeliest manner. Therefore, AcuoMed can support different delivery times to multiple non-direct destinations within the same route through batch jobs.

Additionally, Batch Store Manager allows for scheduled delivery (such as delay delivery until tonight), delivery priorities (Low, Medium, High and Expedite). The Batch Store Manager monitors the queue and allows you to examine and manage pending batch jobs. You can sort jobs based on a variety of fields such as job Number, Patient Name, Patient ID, Status, Next Run Time, Last Run Time, Completed Time, Priority, Run Count, Last Run Error Status, Route Destination, Time on the Queue, etc. Figure 56 shows a sample Batch Store Manager jobs summary that displays a number of different job statuses.

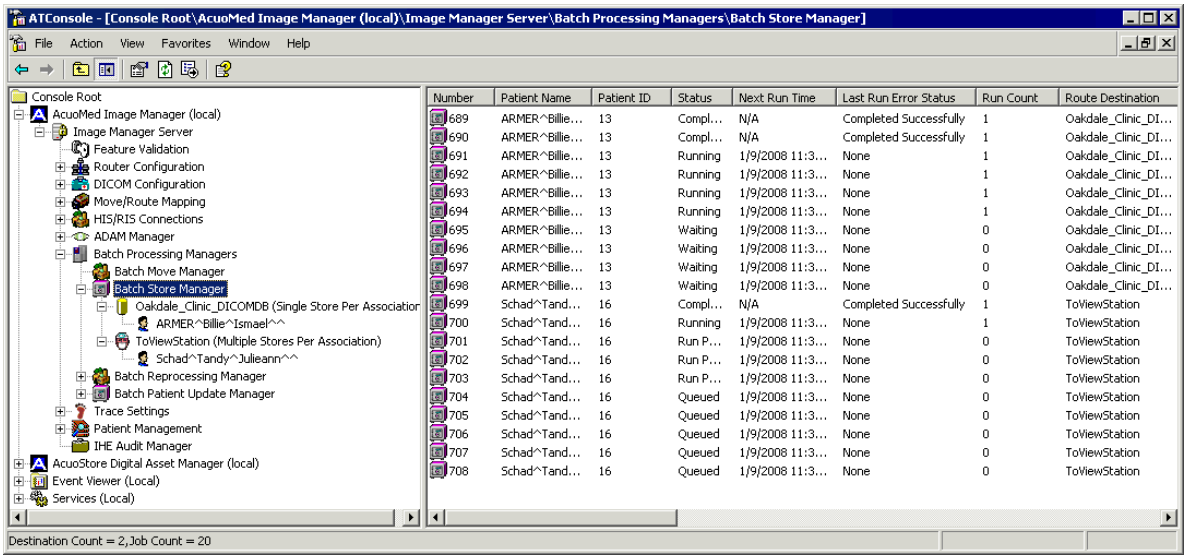


Figure 56: Batch Store Manager – Jobs Summary

Figure 45 shows just a few statuses that you most likely will see in the Batch Store Manager. However, below is a complete list of the job statuses (sorted) and their descriptions that can be reflected in the Batch Store Manager.

Running	Job is running
Run Pending	Job changing from Queued to Running
Queued/Retry	Run Count > 0, job is waiting to run
Queued *	Run Count = 0, job is ready to run
Waiting/Retry	Run Count > 0, job is waiting to be Queued

Waiting	Run Count = 0, job is waiting to be Queued
Paused	Job is paused
Cancel Pending	Job changing from paused to cancelled
Cancelled	Job is cancelled
On Hold	Paused jobs may be placed in a "On Hold" status.
Completed with Warning	Job has completed with accompanying warning message.
Completed	Job has completed

** Jobs for an external destination marked Multiple Stores Per Association will always be marked Queued, rather than Waiting because no more than one job will run at one time.*

NOTE: You can sort the Jobs Summary contents by any of the column headers. Just click the column header to sort by that column in ascending order. Click the column header again to toggle to a descending sort order.

Batch store destinations and patients display under the Batch Store Manager tree node. You can display jobs summary information and perform operations at three different levels:

- Click the Batch Store Manager tree node to display a comprehensive jobs summary for all destinations.
- Click a particular destination to display the jobs summary for just that destination.
- Click a particular patient name under one of the destinations to display a jobs summary for that patient only.

Also notice in the figure above that for each destination the C-STORE/Association relationship is shown in parenthesis. A destination can be configured in one of these ways:

Multiple Stores Per Association — This is the default mode of operation for performing Batch Store Processing with an External DICOM Device. The Acuo system will open a single association/connection to the destination device and route all the images destined for that device through this association. The association will remain open until all images are sent and the wait time expires (configured in the Image Manager Server Properties, Batch Processing tab). There is an option available via the registry that will cause the association to be cycled periodically (for example every 2 minutes). This may be useful in cases where we are sending to devices that need the association to stop/start in order for them to recover resources or show the studies on their worklist. Please contact Acuo Technologies Support for further information on this option..

One Store Per Association – Acuo will open up multiple concurrent associations in parallel, sending 1 image for each association and closing it when complete. The number of concurrent associations can be set with a minimum and maximum value. This mode is most common when sending between multiple Acuo systems. It may be considered the highest performance option, since the configuration can be set to open N associations to the destination, and as long as bandwidth is available data can be transmitted very rapidly. However, some receiving devices may not operate efficiently under this mode for various reasons (images for studies in different associations, too many associations, too fast). In addition, the sending Acuo system will consume a lot of resources (memory/CPU) in managing this type of transmission. Use this mode with caution and only after the other modes prove to not be sufficient.

Group By Study UID – This mode sends images through multiple concurrent associations/connections; however images for each Study (based on Study UID) are grouped into 1 association. Each connection is first opened after a configurable wait time, and closed when no new images are queued for the same Study UID (and a configurable wait time expires). It may allow a higher level of interoperability with certain receiving devices that expect each study to come in its own association (much like a modality transmits). This option offers a balance of the previous 2 options (single/multiple), allowing a friendlier transmission of images using multiple concurrent associations.

Group by Series UID – This mode sends images through multiple concurrent associations/connections; however images for each Study (based on Study UID) are grouped into 1 association.

These options are configured under External DICOM Device Properties. Expand the console tree as follows: AcuoMed Server→Router Configuration→External DICOM Devices. Right-click the destination device and select **Update** from the pop-up menu. In the External DICOM Device Properties dialog click the **Options** tab and, under Batch Store Processing, select either **Multiple Stores Per Association**, **One Store Per Association, Group By Study UID, or Group by Series UID**.

The following topics describe Batch Store Manager Operations.

Viewing and Changing Batch Store Manager Job Properties

You can select a job from the Batch Store Manager Jobs summary to view its properties or to make changes to how the job will be handled. (Right-click the job to view/change and select **Properties** from the pop-up menu.) For example in the jobs summary shown in Figure 56, you might want to select job number 315 that is in Never Started status to view its current properties and/or change how it is being processed. **Figure 57** below displays the Batch Store Properties for job number 315. Notice that the Batch Store Job Properties tab allows you to change the job's Priority.

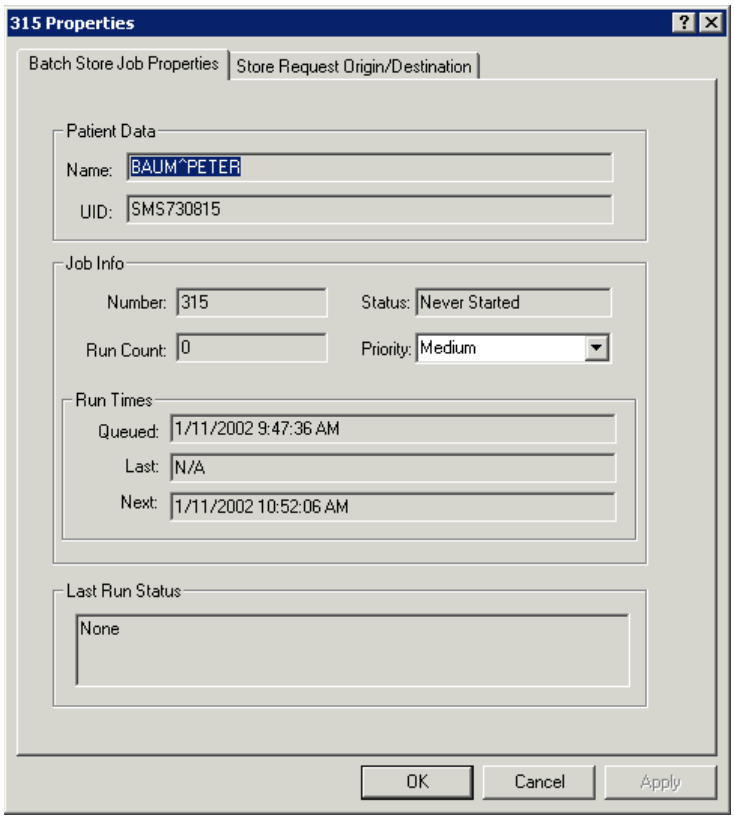


Figure 57: Batch Store Manager – Batch Store Job Properties

Viewing Batch Store Request Origin/Destination

In addition to viewing its properties, you can examine a job's store request origin to determine what device sent the store. You can also view the current route destination. It is possible to change the batch store destination for a destination node, and all jobs within that node (see the next topic).

Figure 58 below displays the store request origin/destination information for a job.

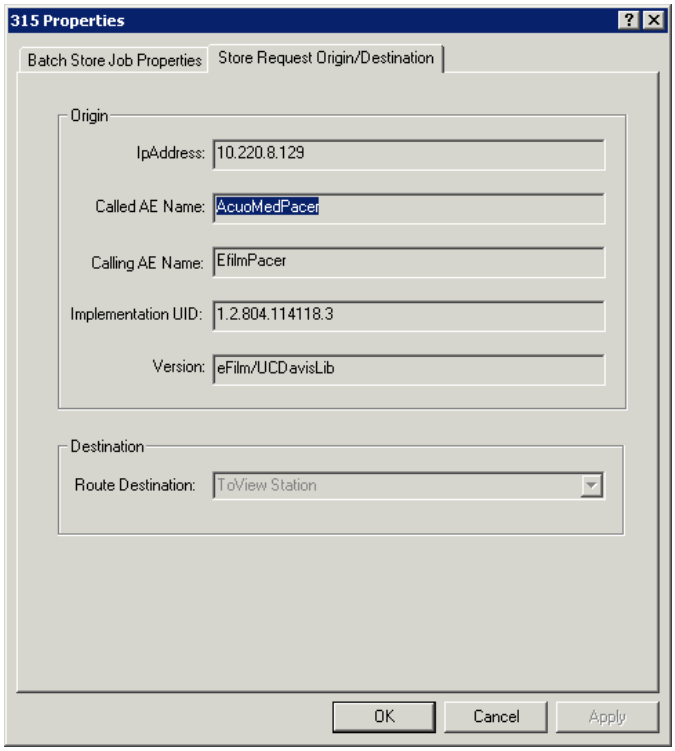
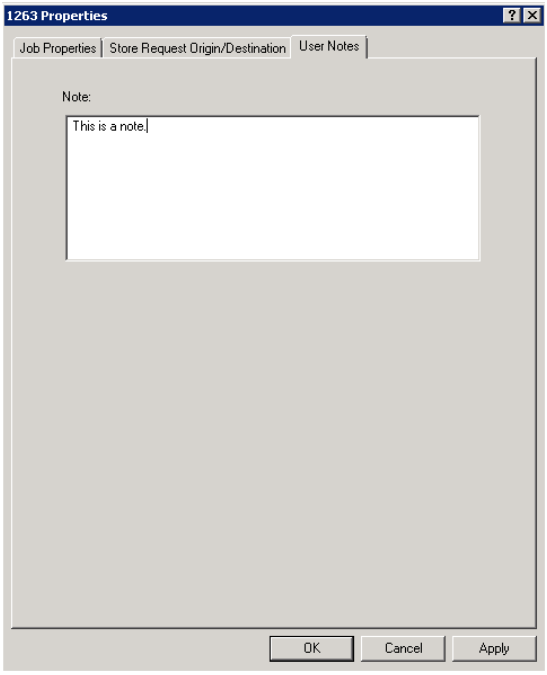


Figure 58: Batch Store Manager – Store Request Origin/Destination

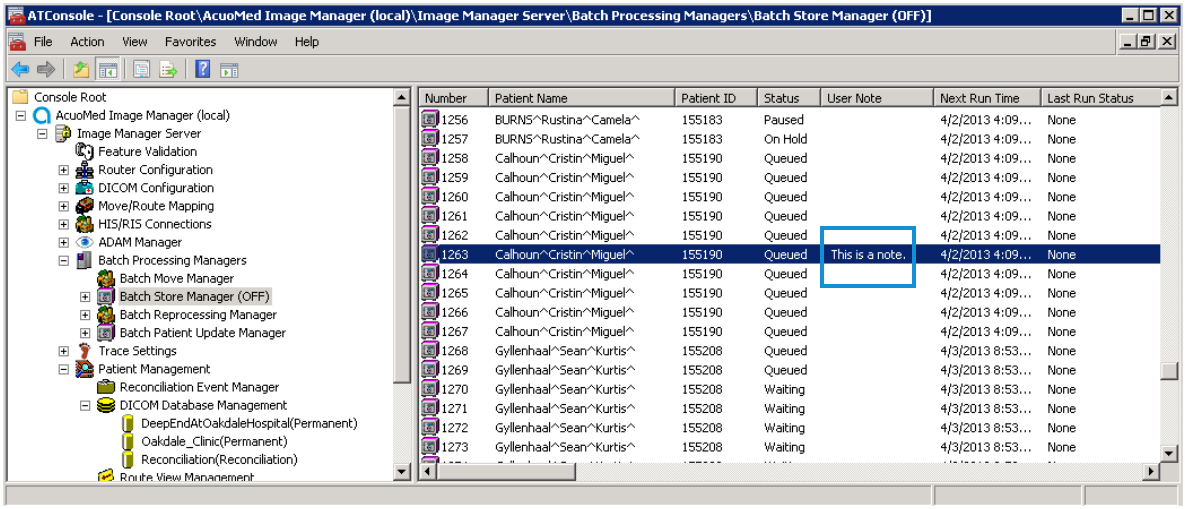
Adding a User Note

Users may add notes to Batch Store jobs that have not completed. Notes can be entered to assist with explaining why that particular job may be Paused, On Hold, or queued. To add a user note to a Batch Store Job, follow these steps:

Right-click on a non-completed Batch Store Job and select **Properties.** Select the **User Notes** tab. Enter the note and click "OK" when complete.



The user note is now available in the Batch Store Manager when viewing the job.



Manually Changing Batch Store Destination

You can reroute store requests from one destination to another destination. Store destinations can be changed for the destination node, Patient node and Job node, which will change the destination for all jobs currently being sent to that node. Jobs must be in a Paused or On Hold state to rerun to the new destination. Completed jobs in the queue are not rerun to the new destination.

To manually change a batch store destination, simply right-click a destination, patient, or job node under Batch Store Manager in the console tree. From the pop-up menu, select **Change Destination**. The Change Current Destination Properties dialog displays. Click the **New Route** list and select a new destination.

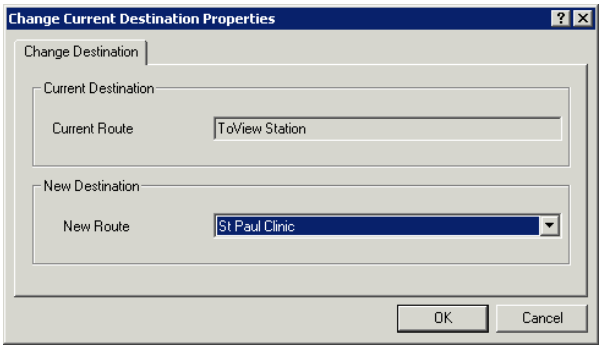


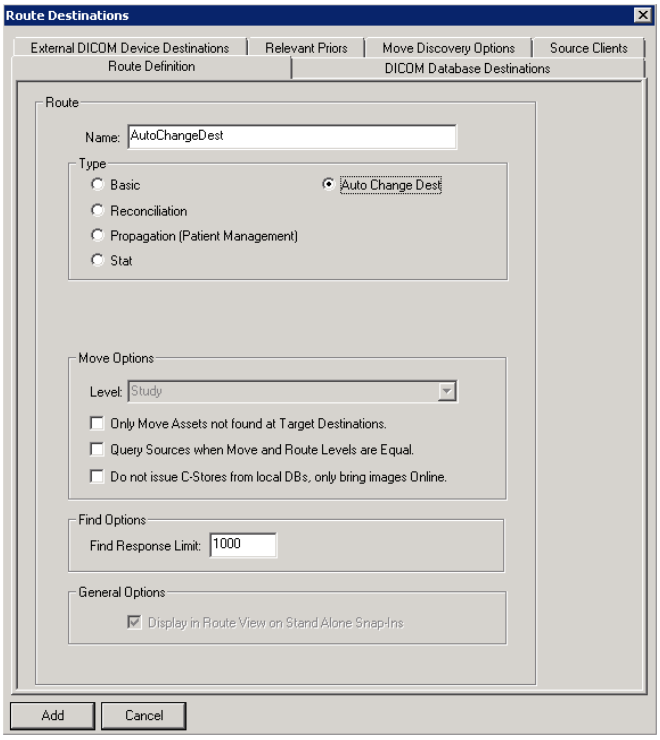
Figure 59: Change batch store destination

Automatically Changing Batch Store Destination

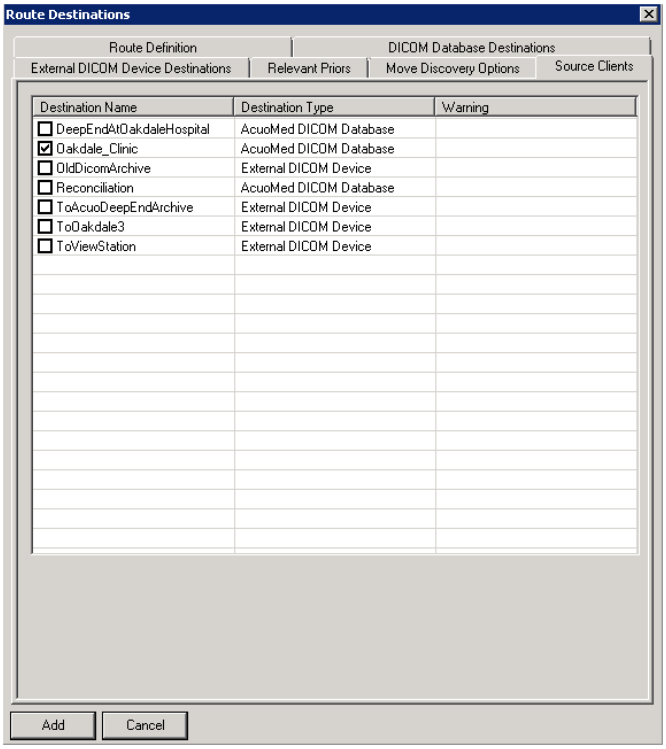
This functionality is meant to streamline the change destination workflow for handling UID conflicts by performing the identification and the destination changing automatically for the user.

Follow the steps below to configure Automatic Change Destination functionality:

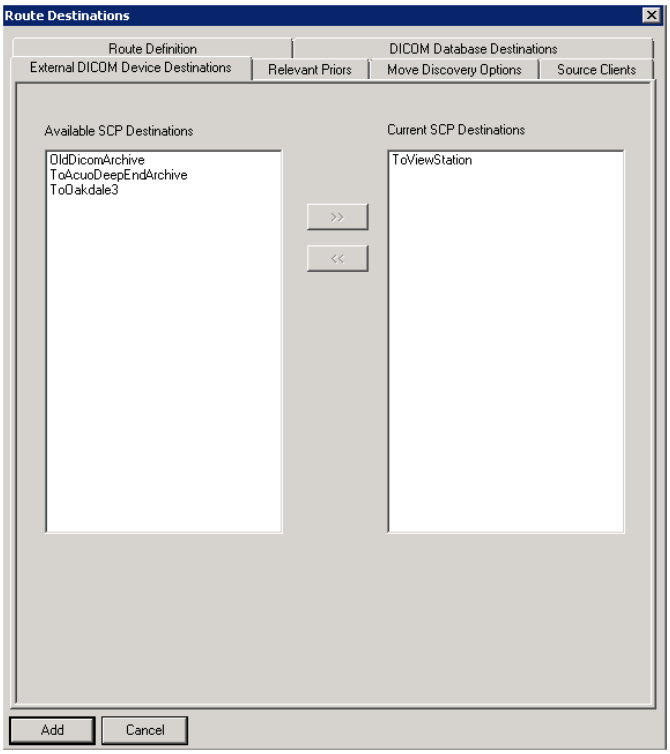
1. Create a new route of type “Auto Change Dest”



2. Click the “Source Clients” tab to select which “AcuoMed DICOM Databases” and “External DICOM Devices” will have their stores re-routed in the case of a UID failure. Multiple “Source Clients” may be selected.



3. Click the DICOM Database or External DICOM Device to serve as the destination for any conflicts encountered on the Source Clients selected in the previous step. Routes of this type support only one destination (either 1 External DICOM Device or 1 Local DICOM database.) In our example below the one selected destination is ToViewStation.



4. Click Add to complete the Auto Change Dest Route setup.

Auto Change Destination - Queue Management

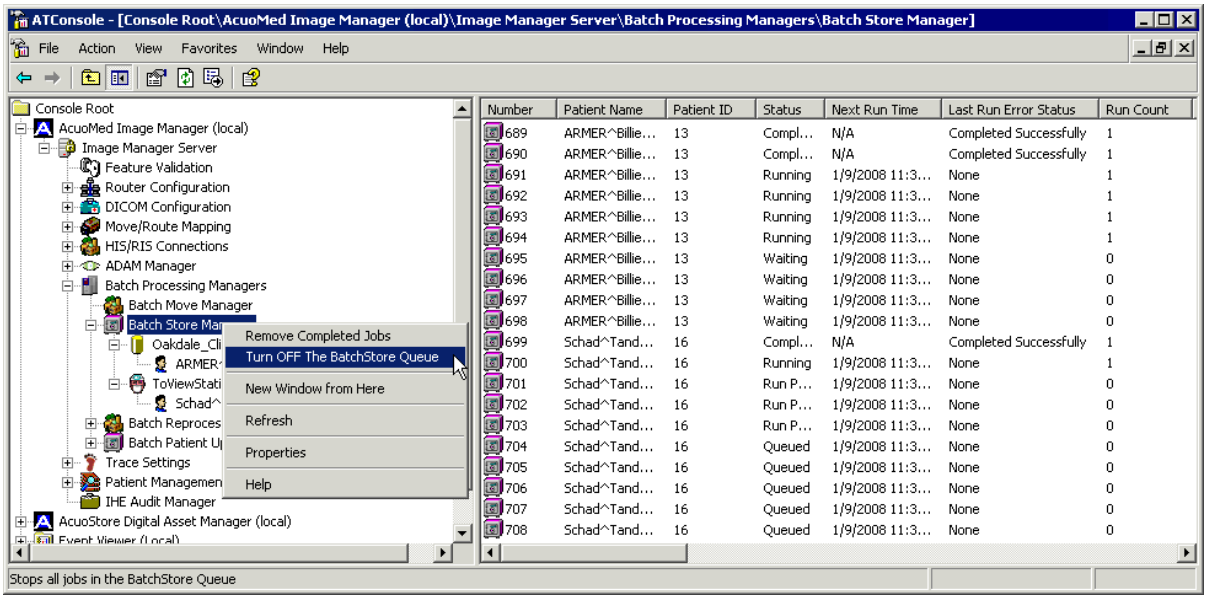
When a job has its destination automatically changed, the error text in the job is appended with one of the below strings, depending on whether the destination was an external device or DICOM database.

- "—Original DICOM Database Destination = [DestName]"
- "—Original External DICOM Device Destination=[DestName]"

When a UID conflict is encountered on a database/device configured as a source client, the job will be placed in an "On Hold" status and the destination will be automatically changed to the destination specified on the Auto Change Dest route. Once that job is resumed, the C-Store will complete to the new destination.

Turning Off/On the Batch Store Queue

The Batch Store Queue can be turned Off or On which stops or starts the processing of all jobs to both the local DICOM databases and External Devices. Turning the Batch Store Queue Off does not stop incoming data from being received and queued, it only stops it from being processed to external destinations or local DICOM databases. To execute, right-click the Batch Store Manager and select either **Turn OFF the Batch Store Queue** or **Turn On the Batch Store Queue**. When turning off the Batch Store Queue, jobs that are currently in a running state will complete.

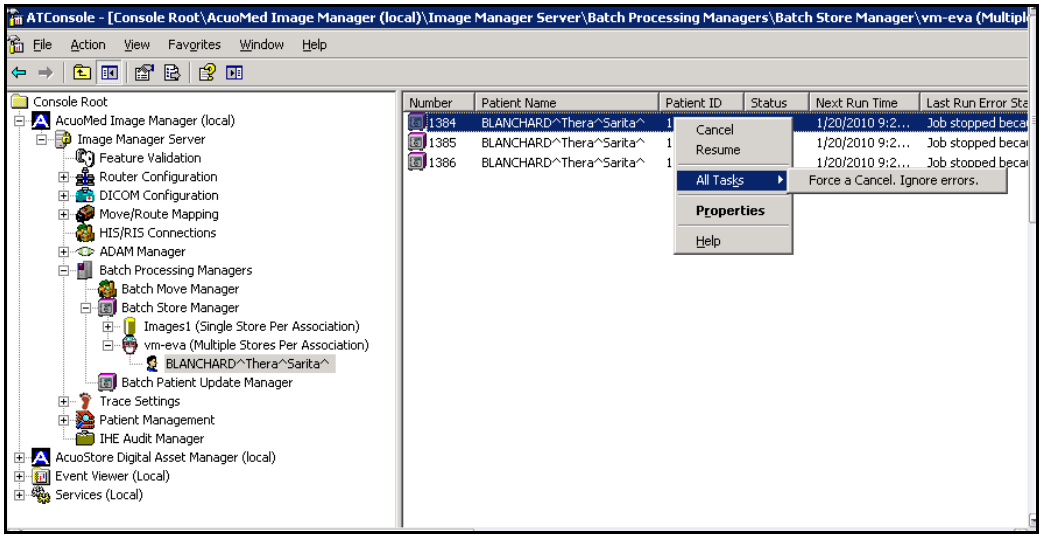


Canceling a Batch Store Job

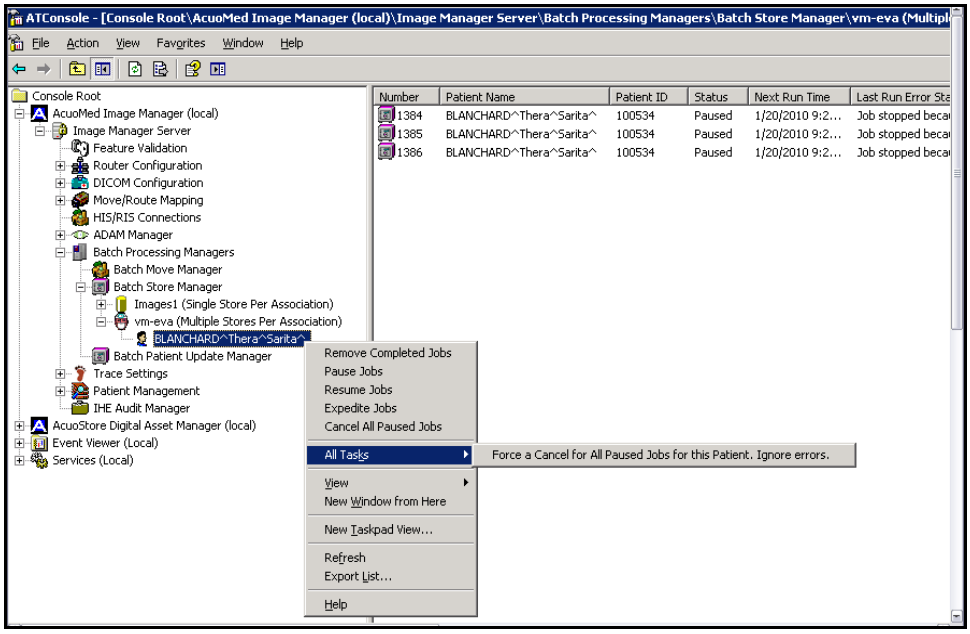
It is also possible to cancel a job that is pending in Batch Store Manager. An example of when you might need to cancel a job would be if a DICOM device has been eliminated from the workflow, but the AcuoMed Server still has a route to the device. To cancel a job, right-click the job in the jobs summary list (Figure 56) and select **Cancel** from the pop-up menu. If the job is not already paused, pause the job first and then use the cancel function. You can also **Cancel all Paused Jobs** from a destination node.

There is also a way to force the cancellation of batch store jobs that would otherwise be unable to be cancelled due to various read/parse errors. To force cancelation of a job, right-click the job in the jobs summary list and select All Tasks, **Force a Cancel. Ignore Errors.** This can be done at the job level and patient level. See the two figures below for more detail.

Job Level – Used to force a cancel for a particular paused job.



Patient Level – Used to force a cancel of all jobs for a particular patient.



Expedite a Batch Store Job

Changing the status of jobs, such as expediting, can easily be done at three different levels. Jobs can be expedited at the destination level, patient level or at the individual job level. To execute, right-click on any of these levels and select **Expedite Job(s)**. The jobs summary list will then display the expedite status and the job or jobs will run at a priority of expedite.

Direct Mode Batch Store Jobs

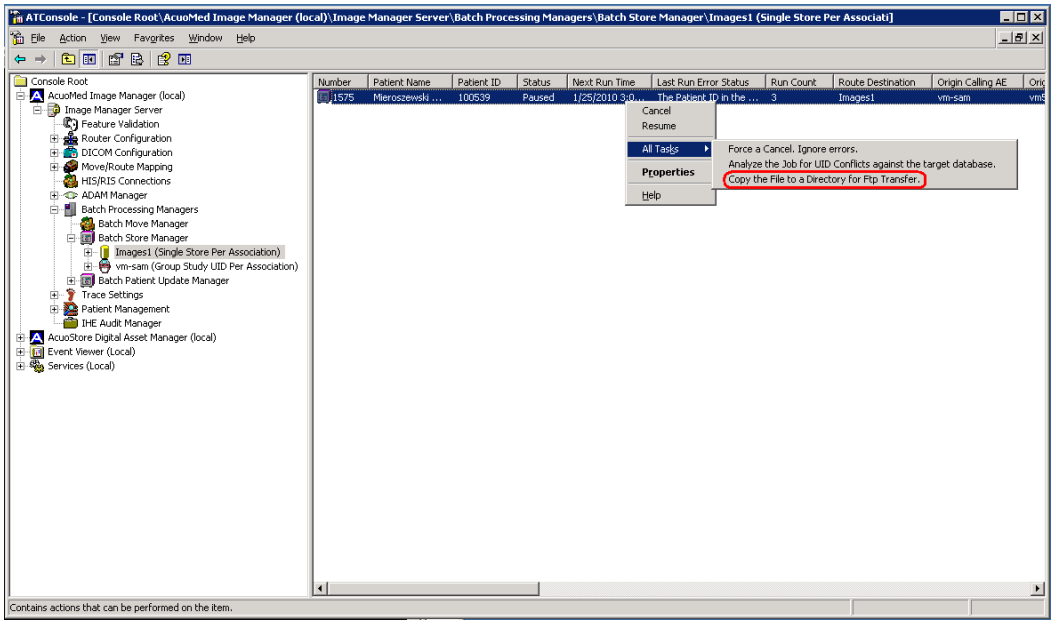
A Batch Store Job in the Batch Store Manager is populated for **Direct mode C-Stores**. The job is logged with a Number of 0 and the Priority column indicates it was stored via a route in direct mode. Inbound and/or outbound Direct Mode C-Stores that fail for any reason will display in the Batch Store Manager with a status of “Completed with Warning”. The Last Run Error Status then reports the error received. The screenshot below provides an example of a Direct-Mode C-Store that has completed successfully.

Other Batch Store Manager Job Controls

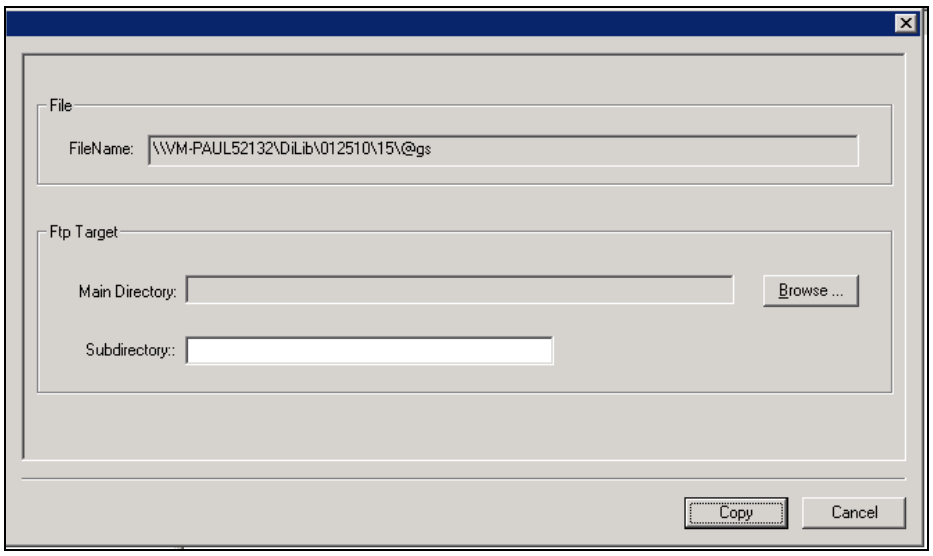
Batch Store Manager provides controls to pause, resume paused jobs, and remove completed jobs. You access these functions from different levels within the Batch Store Manager node in the MMC console tree and the job summary list:

- To pause jobs – expand **Batch Store Manager** in the console tree and right-click the destination node, the patient node, or a particular job from the jobs summary list, and select **Pause** from the pop-up menu**.**
- To resume paused jobs – right-click **Batch Store Manager** in the console tree and right-click on the paused destination node or a patient node, and select **Resume Jobs** from the pop-up menu. In the job summary list, right-click a selected paused job and select **Resume**.
- To remove completed jobs – Right-Click **Batch Store Manager** in the console tree and then select **Remove Completed Jobs** from the pop-up menu. This control can also be used at the destination node and patient node. All jobs with a status of **Cancelled** will also be removed with this control.
- Hold Paused Jobs – To place all paused jobs for a destination or Patient into an "On Hold" status, right-click the appropriate node and select "Hold All Paused Jobs". To place a single paused job on hold, right-click the job and select "Hold Job".
- Resume On Hold jobs – To resume all On Hold jobs for a destination or patient, right-click the appropriate node and select "Resume On Hold Jobs". To resume a single On Hold job, right-click on the job and select "Resume Job"

To place a copy of an asset in a local directory for jobs that are in a Paused state – Right-click on a job in the Batch Store Manager, select **All Tasks**, then **Copy the file to a Directory for Ftp Transfer**.



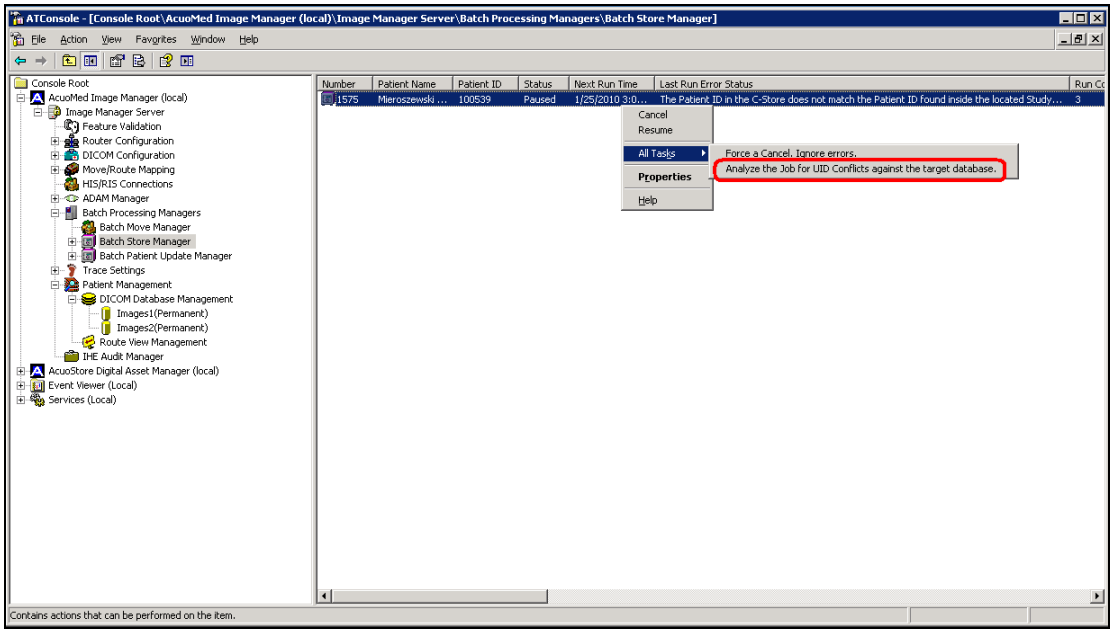
On the following screen, use the Browse button to specify a Main Directory for the file to be copied to. If desired, add a subdirectory (this will create a new folder within the Main Directory chosen). Once the destination has been specified, click Copy. The copied file will be found in the Main Directory\Subdirectory specified)..



Analyzing UID Conflicts

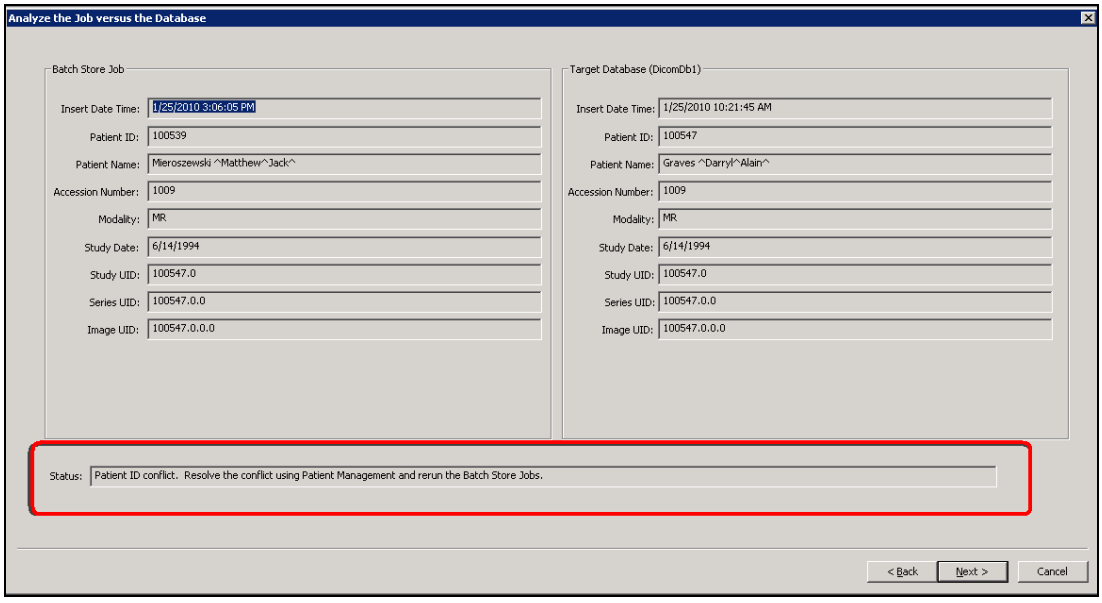
To analyze Patient\Study\Series\Image UID conflicts, Right-click on a job in the **Batch Store Manager**, **select All Tasks**, then **Analyze the Job for UID Conflicts against the target database**.

The patient ID in the figure below does not match the patient ID found inside the study within the Dicom database.



View the Batch Store Job information on the Analyze the Job versus the Database screen.

The Analyze the job versus the Database screen is displayed presenting both Store information and information from the target destination. This information can be used to assist with the identification and resolution of the UID conflict.



Setting Properties for Batch Store Manager

It is possible to set up Queue Management properties for Batch Store Manager. To do this, right-click the **Image Manager Server** node in the MMC console tree and select **Properties** from the pop-up menu. The AcuoMed Server Properties dialog displays with the AcuoStore DILIB Connection tab selected. Click the **Batch Processing** tab.

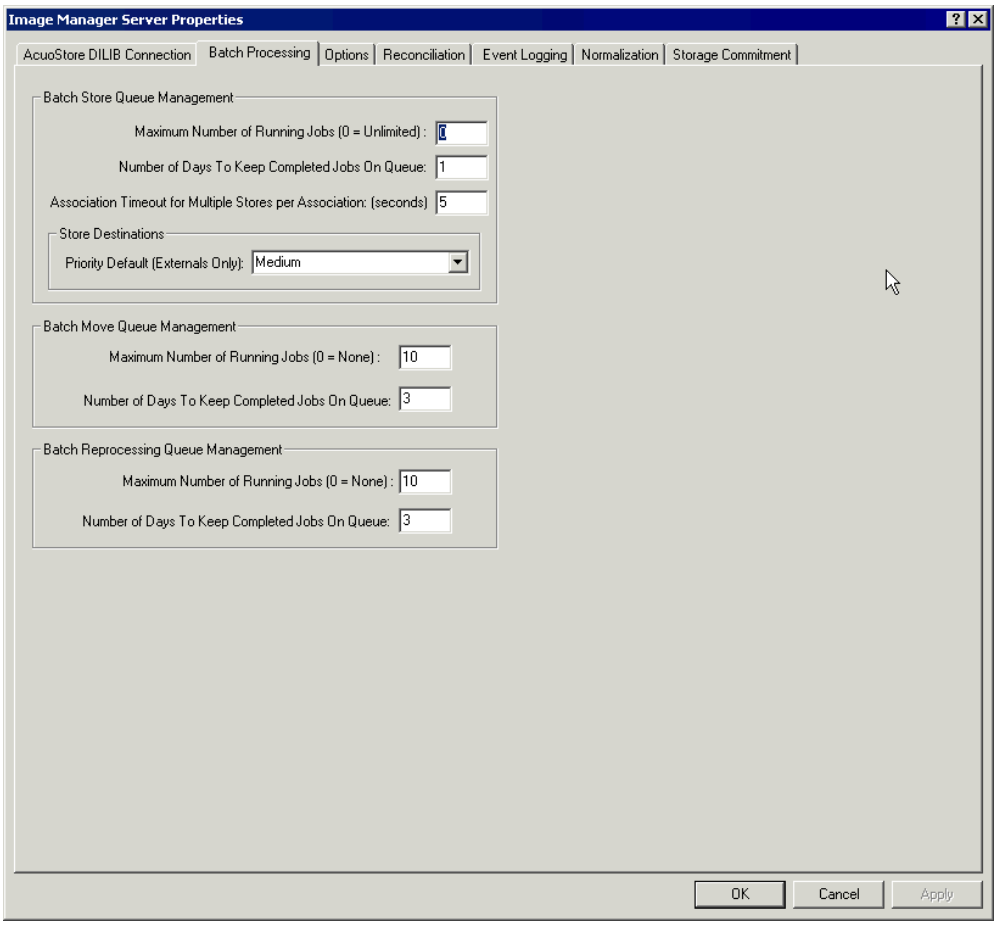


Figure 60: Batch Store Queue Management properties

Listed below are the configurable Batch Store properties:

Maximum Number of Running Stores (also configurable for Batch Move and Batch Reprocessing) – controls how many batch store jobs can be running at one time. The default value is 0 jobs (unlimited). Change this value for a failsafe mechanism against resource consumption by increasing this number as you see fit. When a limit is set, Batch Store will prioritize jobs by Job Priority and Next Run Time.

Number of Days To Keep Completed Jobs On Queue (also configurable for Batch Move and Batch Reprocessing) – controls how many days jobs will continue to appear in the Batch Store Manager job summary (see Figure 56). The default value is 1 day. Set this value according to how many days you want to be able to review job status by looking at the jobs summary information. It is recommended that this value be left at its default value

Association Timeout for Multiple Stores per Association – controls how long an association with an external DICOM device will stay open after the transmission of an image is complete. The default setting is 5 seconds.

Priority Default – Any new Store Destinations you configure will be batched at the selected priority by default. After a new store destination is set up, you can change its Priority value. Expand the console tree as follows: AcuoMed Server→Router Configuration→Routes→[route name]. Right-click the Destination Name in the right window pane and select **Properties** from the pop-up menu and change the value in the C-STORE Job Priority field.

Setting Batch Store Queues for Destinations

The BatchStore's anti-starvation logic ensures Batch Store Destinations (databases and external devices) are not starved out of running queued jobs under normal operations. Each destination is its own queue and can be configured for maximum and minimum number of running Batch Store jobs. Figure 61 shows the default settings for jobs storing to an AcuoMed Database and Figure 64 shows the default settings for jobs storing to an External Device. Before changing the default settings, please contact Acuo Technologies for more information.

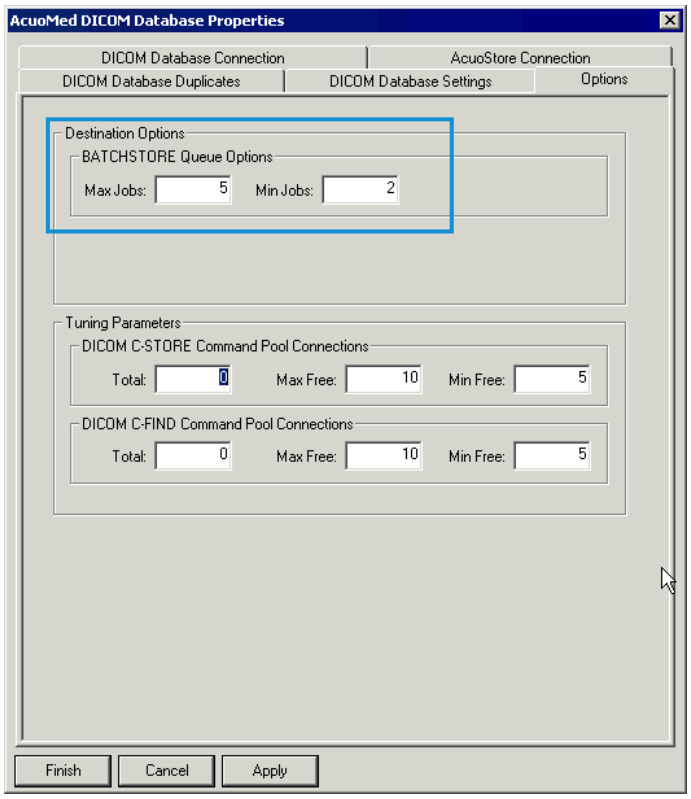


Figure 61: DICOM Database BatchStore Queue Options

Each AcuoMed Dicom Database destination has customizable BATCHSTORE Queue Options to Maximum and Minimum running Batch Store jobs.

- **Maximum** – is the total number of jobs with a status of 'Running' 'Run Pending', or 'Queued'.
- **Minimum** – is the point at which jobs change from a status of 'Waiting' to 'Queued'.

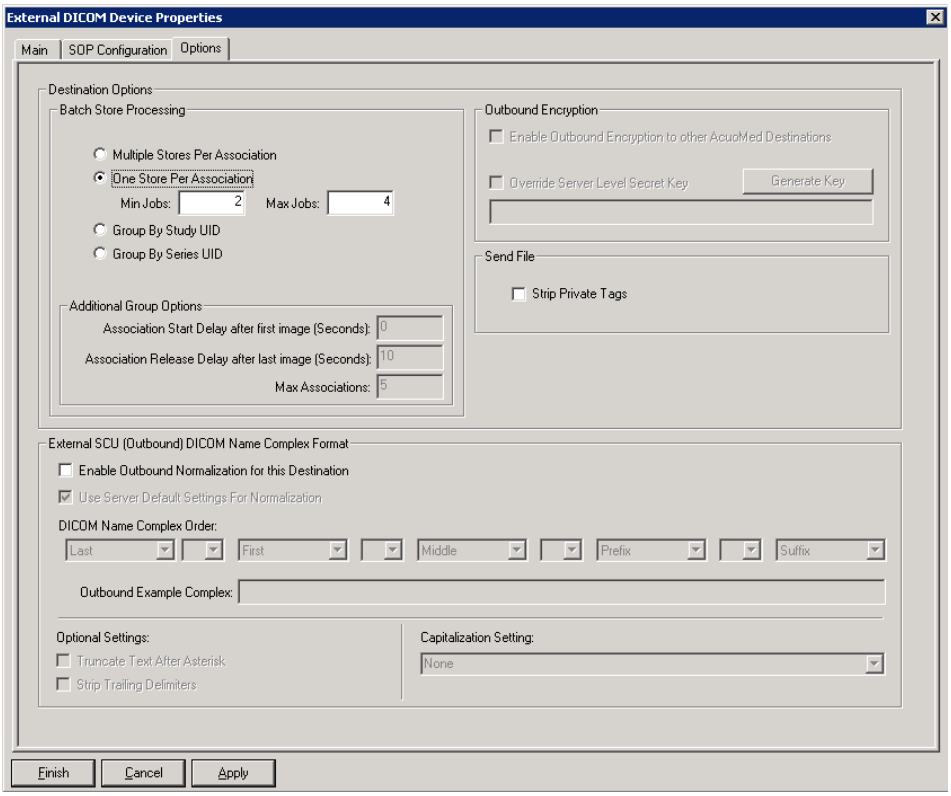


Figure 62: External DICOM Device BatchStore Queue Options

Each External DICOM device destination has customizable BATCHSTORE Queue Options to Maximum and Minimum running Batch Store jobs if running in One Store Per Association Mode.

- **Maximum** – is the total number of jobs with a status of 'Running' 'Run Pending', or 'Queued'.
- **Minimum** – is the point at which jobs change from a status of 'Waiting' to 'Queued'.

NOTE:	External Destinations set to 'Multiple Stores Per Association' have only one (1) running job thus they do not use these settings.

Batch Move Manager

AcuoMed provides batch move management capability for handling patient data and images that need to be delivered to one or more local route destinations. AcuoMed is able to queue batch jobs to search for and locate images at one or more sources and then deliver these images to one or more destinations. The Batch Move Manager's task is to monitor and manage the batch move jobs queue, and to provide a means for an administrator, or other user, to view batch job statuses.

Refer to the topic *Batch Store Manager* on page 295 for additional information about the ability of an Acuo Batch Processing Manager to support different delivery times with multiple destinations. In this regard, the Batch Move Manager has the same capabilities as the Batch Store Manager.

The Batch Move Manager is integrated with AcuoMed's HIS/RIS connectivity and patient data Prefetch functionality. Batch Move Manager seamlessly interacts with Prefetch with no need for Acuo user intervention. AcuoMed receives modality worklist management data from a client HIS/RIS system via an AcuoMed HIS/RIS connection. Prefetch Station AE Title Rules govern the sources and destinations for patient data for any given modality. This allows AcuoMed's Prefetch functionality to automatically queue batch move jobs in order to schedule the movement of patient images between multiple sources and destinations.

The Batch Move Manager monitors the jobs queue and allows you to examine and manage pending batch jobs. It will also recognize duplicate jobs as they are queued up and warn the user with a dialogue box to either rerun the job or not to rerun the job. Inbound C-Moves are also represented in the Batch Move Manager. All jobs can also be sorted based on a variety of fields such as job Number, Patient Family Name, Patient UID, Status, Priority, Run Count, Last Run Error Status, Route Destination, Move Destination AE, etc. Figure 63 shows a sample Batch Move Manager jobs summary.

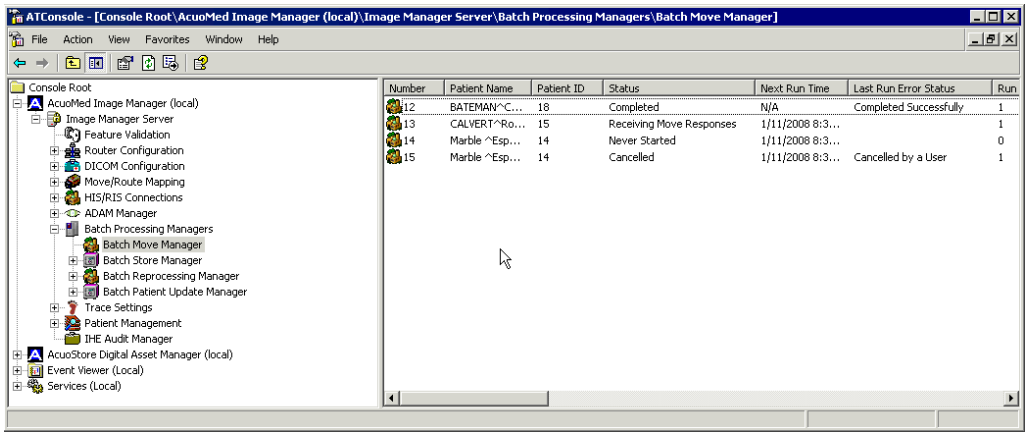


Figure 63: Batch Move Manager – Jobs Summary

NOTE: You can sort the Jobs Summary contents by any of the column headers. Just click the column header to sort by that column in ascending order. Click the column header again to toggle to a descending sort order.

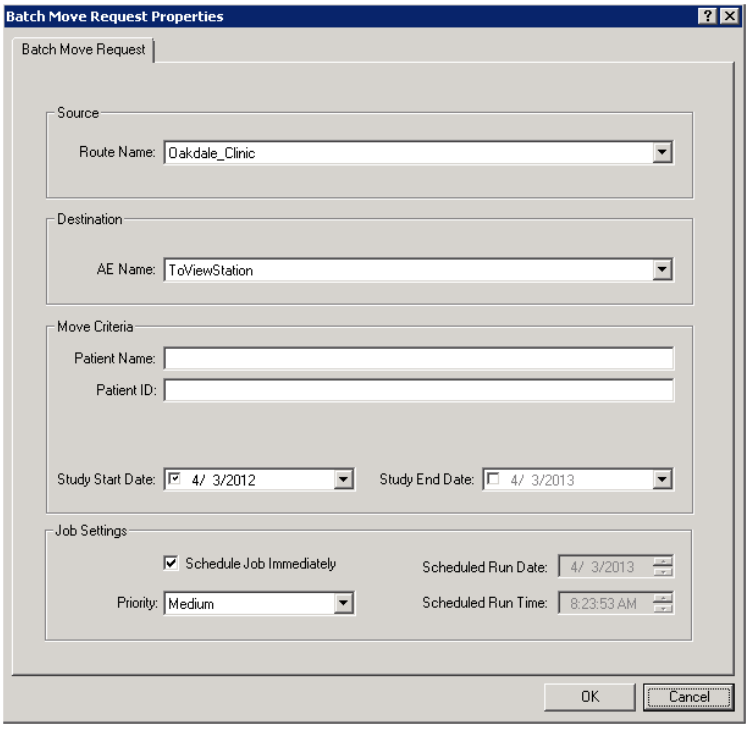
Scheduling a Batch Move Request from Batch Move Manager

You can schedule a new batch move request from Batch Move Manager. The moves that you schedule by this method are patient-level moves. This means that the patient/study/series/images for the patient are moved. It is possible to select a move level from the patient down to the image level when you schedule a batch move request from within DICOM Database Management. Refer to *Move Patients* on page 202 for more information.

To schedule a batch move request from Batch Move Manager, follow these steps:

1. In the console tree under Acuo Batch Processing Managers, right-click **Batch Move Manager** and select **New Batch Move Request** from the pop-up menu.

The New Batch Move Request Properties dialog displays.

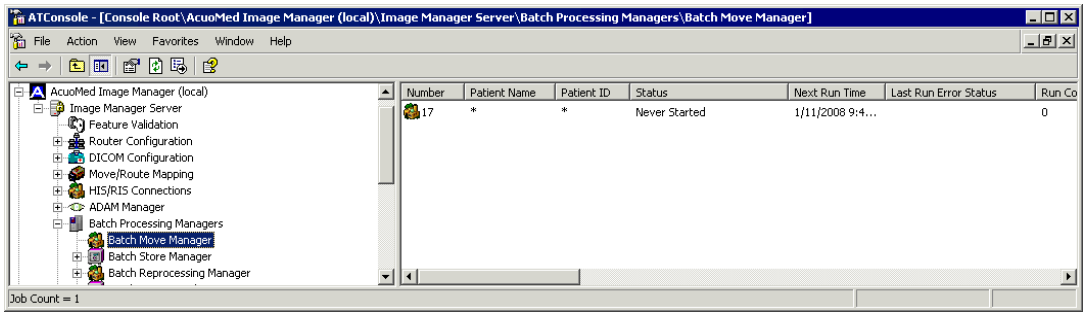


2. Enter the batch move properties required to schedule the new batch move job.

   - **Source -** From the dropdown select the route that identifies the source of the data you want to locate.
   - **Destination -** From the dropdown, select the route that identifies where you want to send the data that is located.
   - **Move Criteria -** Enter the Patient's Name and ID. An asterisk (*) can be used to specify more than one patient and/or ID.
   - **Study Date Range -** Enter a study date range. This is helpful if you want to move a block of patient studies between a study date range.
   - **Job Settings -** Either run the job immediately or schedule a run date and time.

3. Click **OK** to schedule the batch move request.

   The new batch move request is added to the batch move queue and Batch Move Manager jobs summary displayed in the right window pane. In the above example, a Move job will be queued for all data for a date range of one year, it has been scheduled to run later in the day.



Viewing and Changing Batch Move Manager Job Properties

You can select a job from the Batch Move Manager jobs summary to view its properties or to make changes to how the job will be handled. (Right-click the job to view/change and select **Properties** from the pop-up menu.) For example in the jobs summary shown in Figure 63, you might want to select the job that is in Retry status to view its current properties and/or change how it is being processed. Figure 64 below displays the batch move job Properties dialog. Notice that, by using its different tabs, this dialog allows you to change the job's Priority, run time, and view other information.

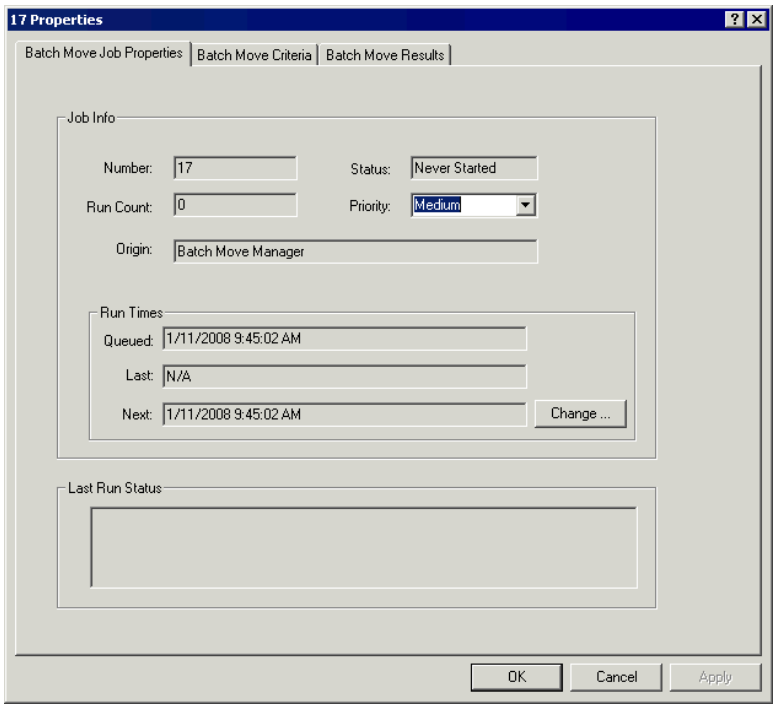


Figure 64: Batch Move Manager – Batch Move Job Properties

Canceling a Batch Move Job

In addition to viewing a batch move job's properties, you can also cancel a job that is pending in Batch Move Manager. An example of when you might need to cancel a job would be if a DICOM device has been eliminated from the workflow, but the AcuoMed Server still has a route to the device. To cancel a job, right-click the job in the jobs summary list (Figure 63) and select **Cancel** from the pop-up menu.

Rescheduling a Batch Move Job

Once a Batch Move job has been cancelled, you can reschedule the job to run again. To reschedule a job, right-click a cancelled job in the jobs summary list (Figure 63) and select **Re-schedule** from the pop-up menu. Notice the job status changes from cancelled to never started and a new Next Run Time is set. You can also change the Priority level and the Next Run Time to a later time.

Other Batch Move Manager Job Controls

Batch Move Manager provides controls to pause, resume paused jobs, and remove completed jobs. You access these functions from different levels within the Batch Move Manager node in the MMC console tree and the job summary list:

To pause a job – right-click a job from the job summary list and then select **Pause**.

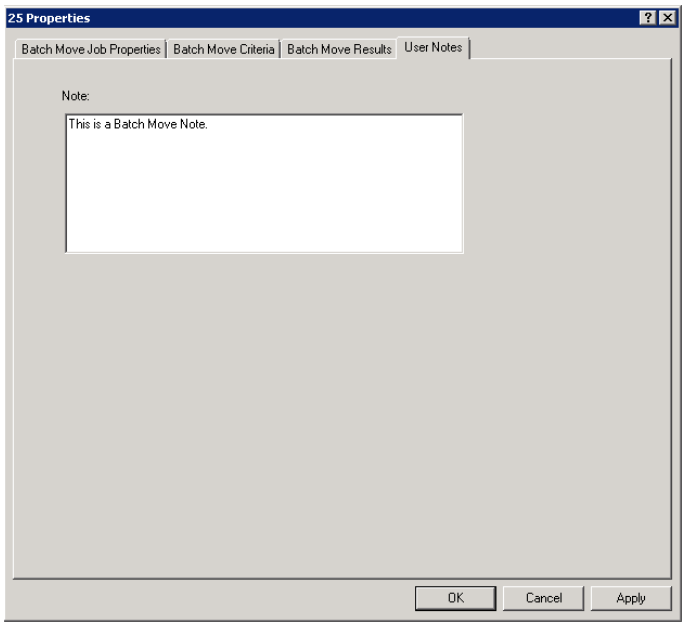
To resume all paused jobs – right-click **Batch Move Manager** in the console tree and then select **Resume All Paused Jobs** from the pop-up menu. To resume a selected job from the job summary list, right-click a job and select **Resume**.

To remove completed jobs – right-click **Batch Move Manager** in the console tree and then select **Remove Completed Jobs** from the pop-up menu.

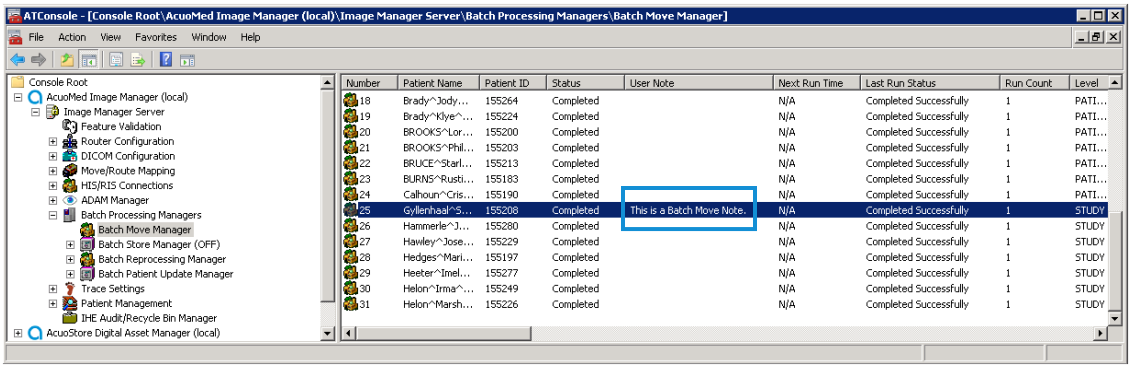
Adding a User Note to a Batch Move Job

Users may add notes to Batch Move jobs. Notes can be entered to assist with explaining why that particular job may be Paused, On Hold, or queued. To add a user note to a Batch Move Job, follow these steps:

Right-click on a Batch Move Job and select **Properties.** Select the **User Notes** tab. Enter the note and click "OK" when complete.

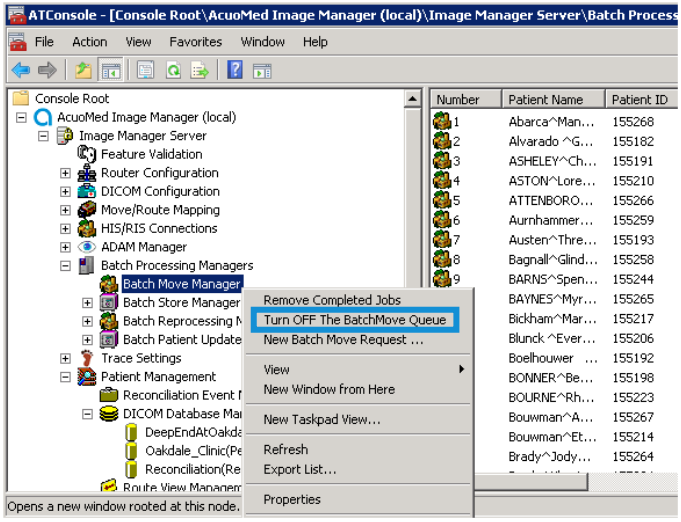


The user note appears in the Batch Move Manager when viewing the job.



Disabling the Batch Move Queue

To disable the Batch Move Queue – right-click **Batch Move Manager** in the console tree and select **Turn OFF the BatchMove Queue.**



Setting Properties for Batch Move Manager

It is possible to set up Queue Management properties for Batch Move Manager. To do this, right-click the **Image Manager Server** node in the MMC console tree and select **Properties** from the pop-up menu. The AcuoMed Server Properties dialog displays with the AcuoStore Dilib Connection tab selected. Click the **Batch Processing** tab.

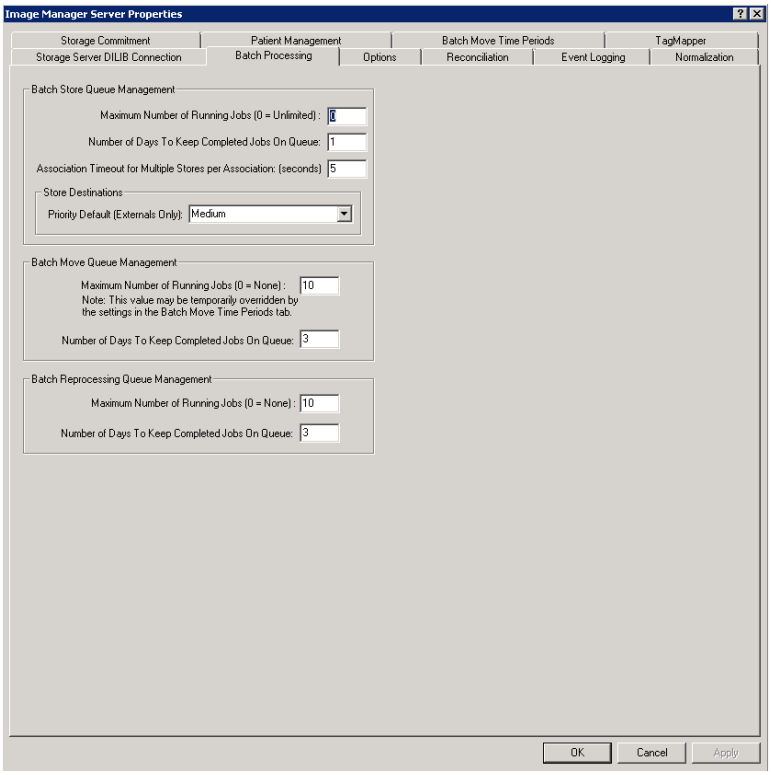


Figure 65: Batch Move Queue Management properties

These are the Batch Move properties you can configure:

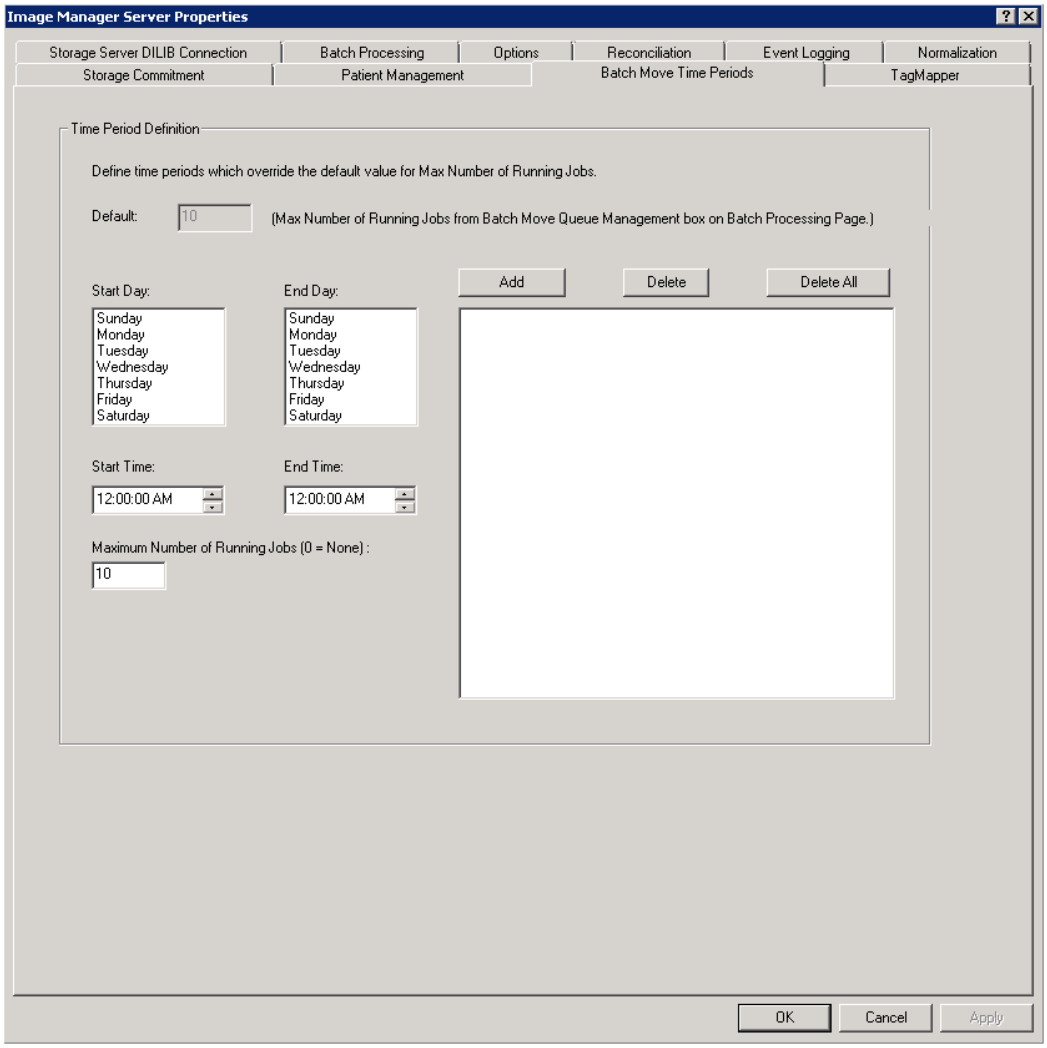
Maximum Number of Running Moves – controls how many batch move jobs can be running at one time across multiple destinations. For example, if there is one destination, and the default setting of 10 is configured, only one job will run. If there are 10 different destinations, then 10 move jobs will run concurrently. The default value is to run 10 concurrent move jobs. This number does not limit the total number of batch move jobs, it just limits how many can be running at any one time (to avoid system performance degradation).

Number of Days To Keep Completed Jobs On Queue – controls how many days jobs will continue to appear in the Batch Move Manager job(s) summary (see Figure 63). The default value is 3 days. Set this value according to how many days you want to be able to review job status by looking at the jobs summary information.

Batch Move Time Periods

Batch Move Time Periods allows the maximum number of running jobs to be dynamically adjusted based on day of the week and time of day. To configure Batch Move Time Periods, follow these steps:

To do this, right-click the **Image Manager Server** node in the MMC console tree and select **Properties** from the pop-up menu. The AcuoMed Server Properties dialog displays with the AcuoStore Dilib Connection tab selected. Click the **Batch Move Time Periods** tab.



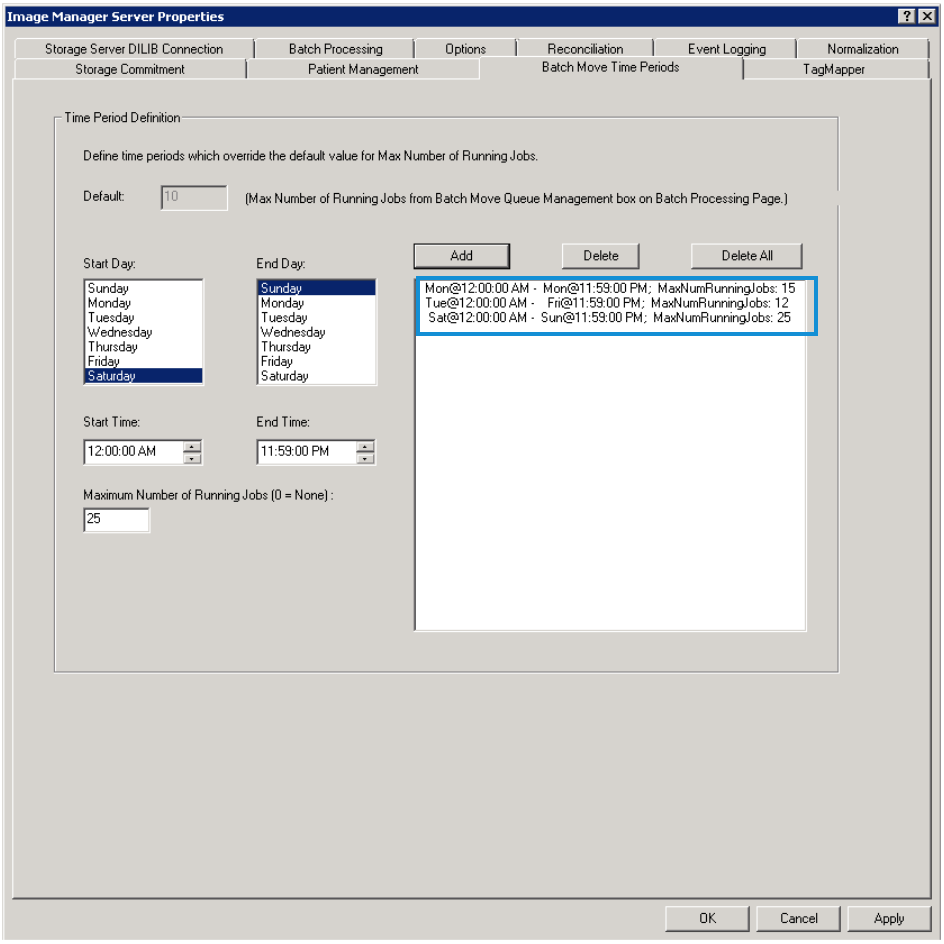
This page allows the user to define specific time period in which the default value for Maximum Number of Running Jobs will be overwritten with the value assigned to that time period. The steps to create a time period are as follows:

1. Set start and end day
2. Set start and end time
3. Set Maximum Number of Running jobs to be configured during this the time period.
4. Click Add button to add the time period
5. Click Ok when all time periods have been configured.

In the example below, the table shows the time periods in which we want to override the default setting of 10 running jobs. The screenshot displays how this would be configured on the Batch Move Time Periods configuration page.

Example Time Periods

Start Day	End Day	Start Time	End Time	Max # of Running Jobs
Monday	Monday	12:00 AM	11:59 PM	15
Tuesday	Friday	12:00 AM	11:59 PM	12
Saturday	Sunday	12:00 AM	11:59 PM	25



NOTE: A Time period will not be allowed if it overlaps with another time period that has already been added.

Batch Reprocessing Manager

The Batch Reprocessing Manager controls the queuing and control of jobs for edited reconciliation event assets that must be resubmitted to AcuoMed for Reconciliation reprocessing. The Batch Reprocessing Manager is part of AcuoMed's overall Reconciliation functionality. If you have not licensed the Reconciliation feature, the Batch Reprocessing Manager does appear in the console tree under the Acuo Batch Processing Managers node.

Figure 66 below shows a sample Batch Reprocessing Manager jobs summary.

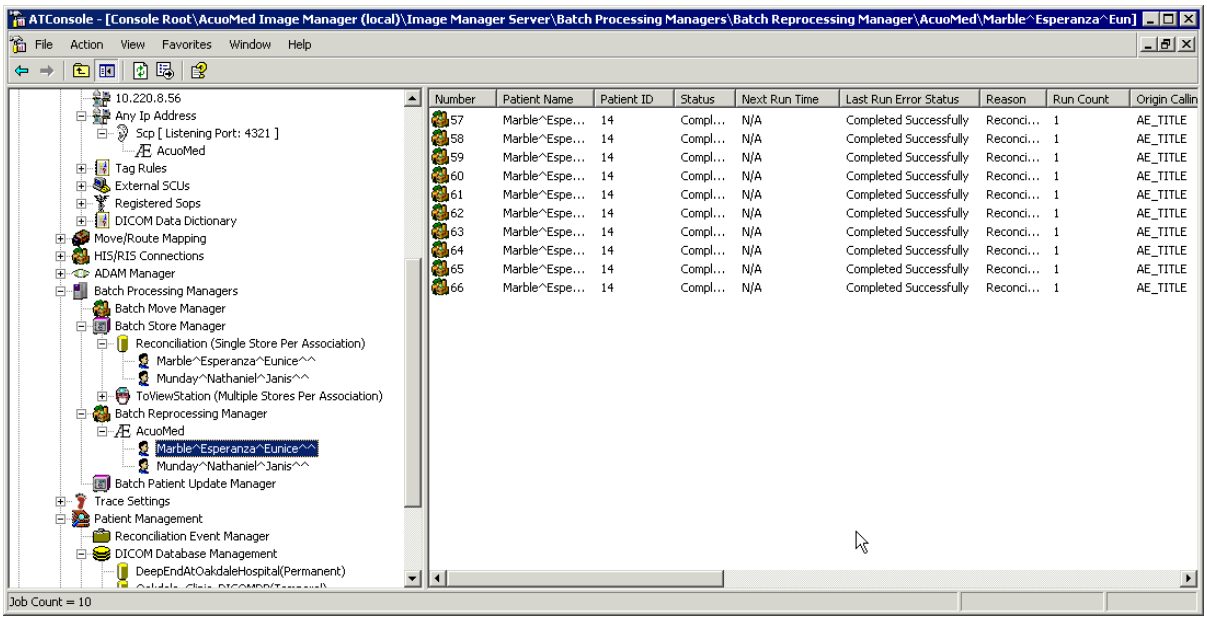


Figure 66: Batch Reprocessing Manager – Jobs Summary

NOTE: You can sort the Jobs Summary contents by any of the column headers. Just click the column header to sort by that column in ascending order. Click the column header again to toggle to a descending sort order.

As shown in the figure above, batch reprocessing AE nodes (one node in our example) display under the Batch Reprocessing Manager tree node. You can display jobs summary information and perform operations at three different levels:

- Click the **Batch Reprocessing Manager** tree node to display a comprehensive jobs summary for all destinations.
- Click a particular AE node to display the jobs summary for just that called AE.
- Click a particular patient name under one of the called AEs to display a jobs summary for that patient only.

The following topics discuss how you can view Batch Reprocessing Manager job properties, pause jobs, resume paused jobs, remove completed jobs, and set properties for the Batch Reprocessing Manager itself.

Viewing and Changing Batch Reprocessing Manager Job Properties

You can select a job from the Batch Reprocessing Manager jobs summary to view its properties.

To view Repro Job properties, right-click the job to view in the Jobs Summary (right window pane) and select **Properties** from the pop-up menu. The job Properties dialog displays with the Batch Store Job Properties tab selected as shown in Figure 67 below. This tab displays patient and job information, run time information, and last run status.

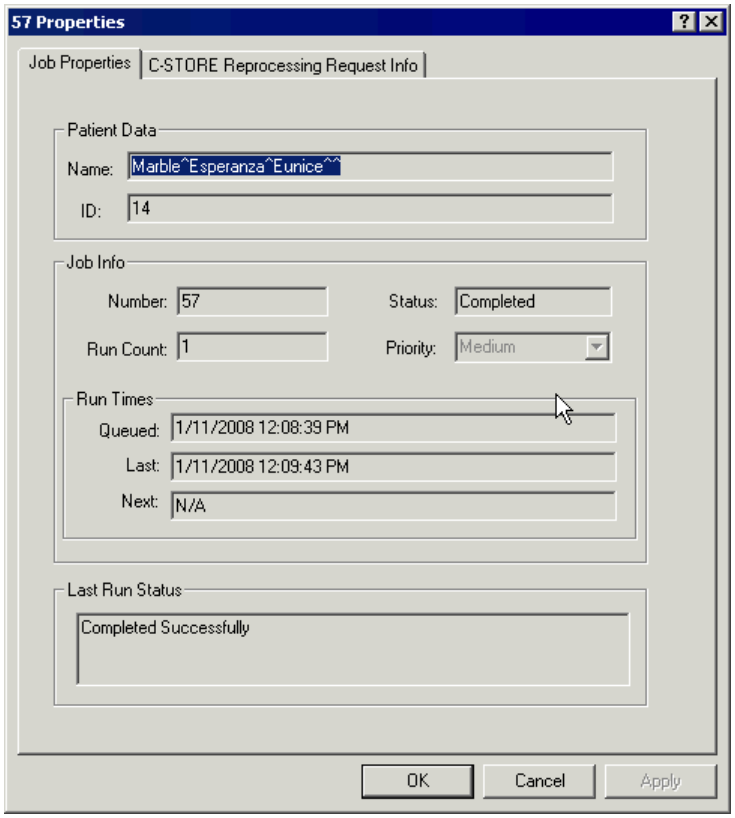


Figure 67: Batch Reprocessing Job Properties – Batch Store Job Properties tab

Click the C-**STORE Reprocessing Request Info** tab to view Origin and Destination information and to review Reconciliation Status (as shown in Figure 68 below).

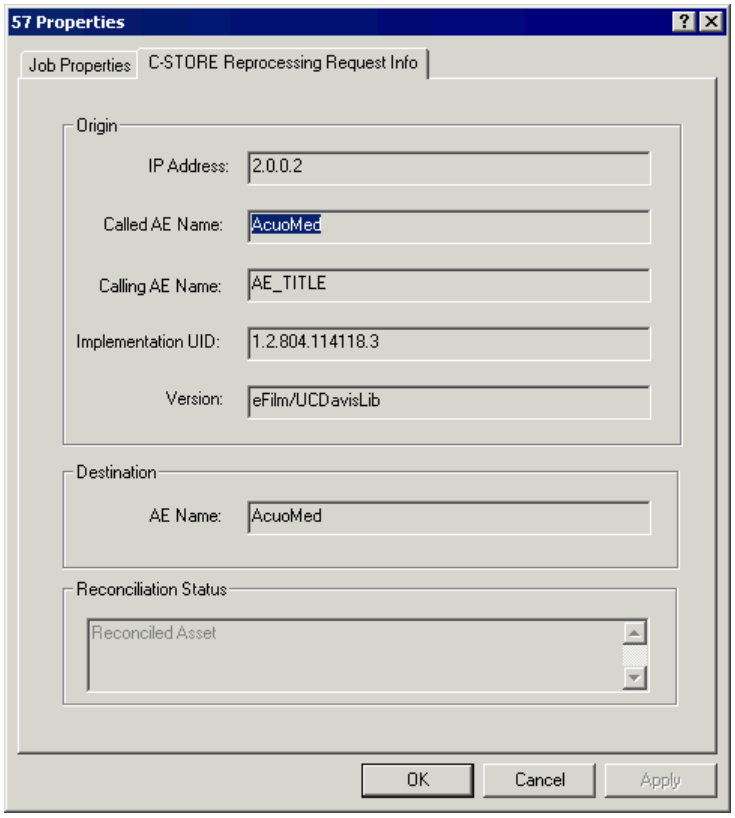


Figure 68: Batch Reprocessing Job Properties – Batch Reprocessing Request Info tab

Other Batch Reprocessing Manager Job Controls

Batch Reprocessing Manager provides controls to pause jobs, resume paused jobs and to remove completed jobs. You access both of these functions from the Batch Reprocessing Manager node in the MMC console tree:

- To pause a destination – right-click the AE destination from the **Batch Reprocessing Manager** in the console tree and then select **Pause Jobs** from the pop-up menu. You can also pause jobs at the patient node.
- To resume paused jobs – right-click the AE destination from the **Batch Reprocessing Manager** in the console tree and then select **Resume Paused Jobs** from the pop-up menu. You can also Resume jobs at the patient node.
- To expedite a queued job – right-click the patient node from the **Batch Reprocessing Manager** in the console tree and then select **Expedite Job(s)** from the pop-up menu.
- To remove completed jobs – right-click **Batch Reprocessing Manager** in the console tree and then select **Remove Completed Jobs** from the pop-up menu.

Adding a User Note to a Batch Reprocessing Job

Users may add notes to Batch Reprocessing jobs. Notes can be entered to assist with explaining why that particular job may be Paused, On Hold, or queued, etc. To add a user note to a Batch Reprocessing Job, follow these steps:

Right-click on a Batch Reprocessing Job and select **Properties.** Select the **User Notes** tab. Enter the note and click "OK" when complete.

The user note appears in the Batch Reprocessing Manager when viewing the job.

Setting Properties for Batch Reprocessing Manager

It is possible to set up Queue Management properties for Batch Reprocessing Manager. To do this, right-click the **Image Manager Server Node** in the MMC console tree and select **Properties** from the pop-up menu. The AcuoMed Server Properties dialog displays with the AcuoStore Dilib Connection tab selected. Click the **Batch Processing** tab.

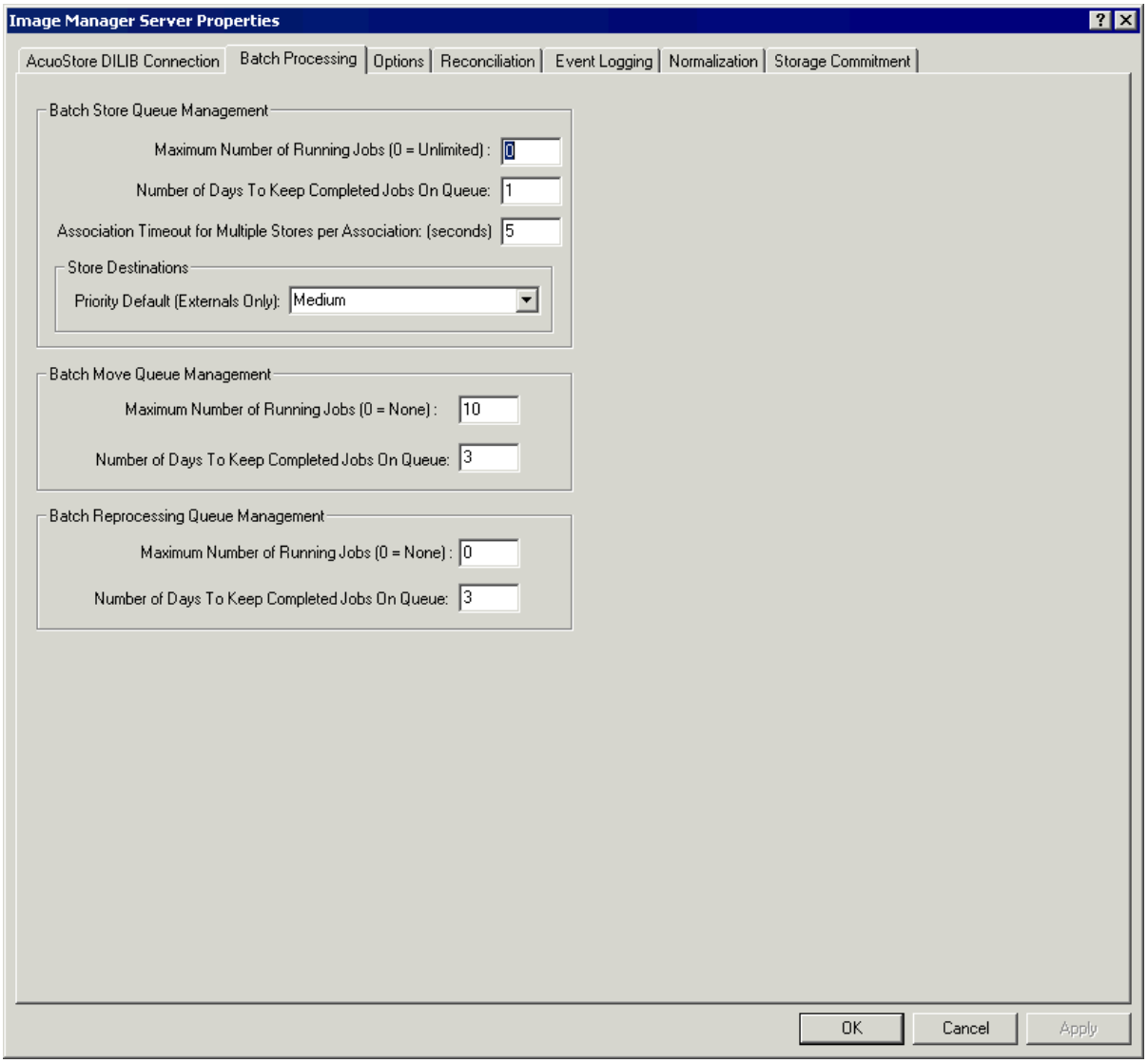


Figure 69: Batch Reprocessing Queue Management properties

These are the Batch Reprocessing properties you can configure:

- **Maximum Number of Running Jobs** – controls how many batch reprocessing jobs can be running at one time. The default value is 10. Change this value for a failsafe mechanism against resource consumption by increasing this number as you see fit. Change this value to 0 to process no jobs. When a limit is set, Batch Reprocessing will prioritize jobs by Job Priority and Next Run Time. This number does not limit the total number of batch reprocessing jobs, it just limits how many can be running at any one time (to avoid system performance degradation).
- **Number of Days To Keep Completed Jobs On Queue** – controls how many days jobs will continue to appear in the Batch Reprocessing Manager jobs summary (see Figure 66). The default value is 3 days. Set this value according to how many days you want to be able to review job statuses by looking at the jobs summary information.

Batch Router Manager

AcuoMed provides batch router management capability for managing jobs in a queue. Enabling Batch Router reduces AcuoMed's response time to a DICOM C-Store after all data has been received.

Note You can sort the Jobs Summary contents by any of the column headers. Click the column header to sort by that column in ascending order. Click the column header again to switch to a descending sort order.

Batch Router AE nodes display under the Batch Router Manager tree node. You can display jobs summary information and perform operations at three different levels.

Batch Router Manager: Select the Batch Router Manager tree node to display a comprehensive jobs summary for all destinations.

AE Node: Select an AE node to display the jobs summary for only that called AE.

Patient Name: Under a called AE, select a patient name to display a jobs summary for that patient only.

Enabling Batch Router

To enable Batch Router, in AcuoMed Management Console, complete the following steps.

1. Select **AcuoMed Image Manager** > **AcuoMed Server** > **DICOM Configuration** > [**IP Address**]
2. Right-click the called AE name and select **Update**.
3. Optional. If you are creating a new AE, under the IP Address, right-click the SCP/Port name and select **New** > **Called AE**.
4. In the **Called AE Properties** box, select the **Options** tab.
5. Under **C-STORE Response**, select **Enable Batch Router for quicker response**.

Turning Off/On the Batch Router Queue

You can enable or disable the Batch Router Queue to stop or start the processing of all jobs to both the local DICOM databases and External Devices.

To enable or disable the Batch Router Queue, right-click **Batch Router Manager** and select either **Turn Off the Batch Router Queue** or **Turn On the Batch Router Queue**.

Note Turning off the Batch Router Queue completes any jobs that are currently in a running state and stops incoming data from being processed to external destinations or local DICOM databases. It does not stop incoming data from being received and queued.

Cancelling a Batch Router Job

You can cancel a pending job in Batch Router Manager. For example, you might need to cancel a job if a DICOM device has been eliminated from the workflow but the AcuoMed Server still has a route to the device.

To cancel a job, complete the following steps.

1. Optional. If the job is not already paused, in the jobs summary list, right-click the job and select **Pause**.

2. In the jobs summary list, right-click the job and select **Cancel**.

3. To cancel all paused jobs, from a destination node, select **Cancel all Paused Jobs**.

Expediting a Batch Router Job

You can expedite a Batch Router job from three different levels.

- Destination Level
- Patient Level
- Individual Job Level

To expedite a job, right-click the level and select **Expedite Job(s)**. The jobs summary list displays the expedite status and the job runs at a priority of expedite.

Configuration Restrictions

Called AE Name contains a route, which can contain one or more external DICOM devices. Default mode is Batch Mode. The other option is Direct mode.

- You cannot save a CalledAE name with a route that contains a device that is in Direct mode.
- The feature cannot be enabled on a called AE name where reconciliation is also enabled.
- Fixit messages always show up in Batch Patient Update queue. All Acuo fixits and IOCM (Imaging Object Change Management) key object, a type of SOP, will bypass the Batch Router queue regardless of configuration.

Other Batch Router Manager Job Controls

From Batch Router Manager, you can pause jobs, resume paused jobs, and remove completed jobs. You access these functions in the Batch Router Manager node at the AE level and patient level and in the job summary list.

Pause jobs – In the console tree, expand **Batch Router Manager**. From the jobs summary list, right-click the destination node, the patient node, or a particular job, and select **Pause.**

Resume paused jobs – In the console tree, right-click **Batch Router Manager**. Right-click the paused destination node or a patient node, and then select **Resume Jobs**. In the job summary list, right-click a selected paused job and select **Resume**.

Remove completed jobs – In the console tree, right-click **Batch Router Manager** and select **Remove Completed Jobs**.

Note This control can also be used at the destination node and patient node. All jobs with a status of **Cancelled** will also be removed with this control.

Setting Properties for Batch Router Manager

To modify the Queue Management properties for Batch Router Manager, complete the following steps.

1. In the MMC console tree, right-click the **Image Manager Server Node** and select **Properties**.

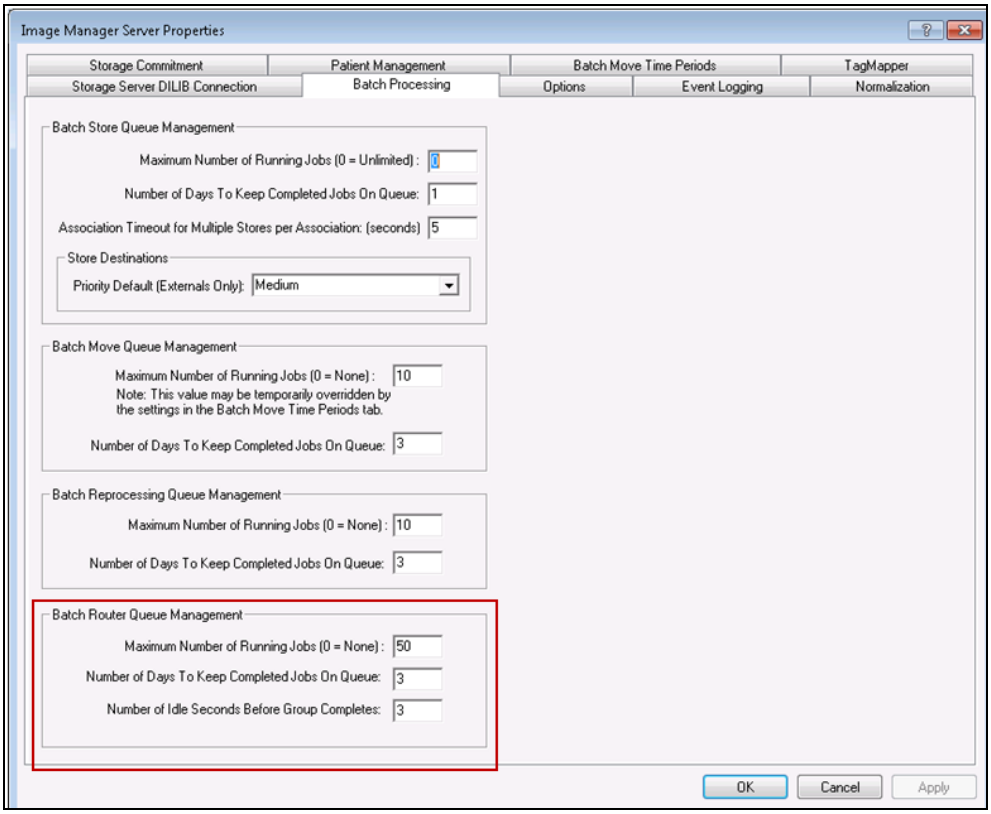
2. In the **Image Manager Server Properties** dialog box, click the **Batch Processing** tab.

3. Under **Batch Router Queue Management**, enter the desired settings. Below are the properties you can configure.

Maximum Number of Running Jobs – Controls how many batch reprocessing jobs can be running at one time. The default value is 10. Change this value for a failsafe mechanism against resource consumption by increasing this number as you see fit. Change this value to zero to process no jobs. When a limit is set, Batch Reprocessing will prioritize jobs by Job Priority and Next Run Time. This number does not limit the total number of batch reprocessing jobs, it just limits how many can be running at any one time to avoid system performance degradation.

Number of Days To Keep Completed Jobs On Queue – Controls how many days jobs will continue to appear in the Batch Reprocessing Manager jobs summary (see Figure 66). The default value is three days. Set this value according to how many days you want to be able to review job statuses by looking at the jobs summary information.

Number of Idle Seconds Before Group Completes - The number of seconds the queue is idle before the next group starts.



Viewing Batch Router Request Origin/Destination

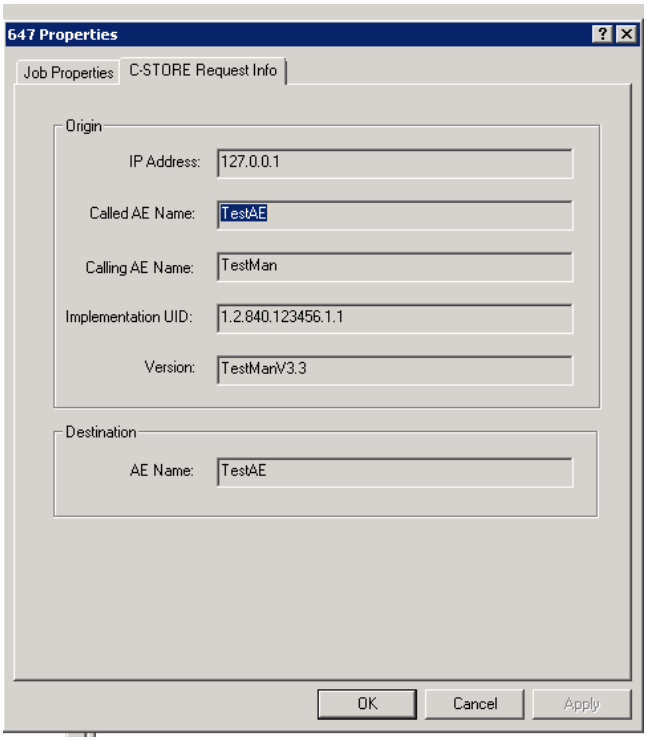
In addition to viewing job properties, you can examine a job's request origin to determine which device sent the request. You can also view the current route destination and change the batch router destination for a destination node and all jobs within that node.

To view the Batch Router request origin and destination properties, complete the following steps.

1. Under the **Batch Router Manager** node, select the CalledAE name.

2. In the right pane, right-click the job for which you want to view properties and select **Properties**.

3. In the **Properties** dialog box, select the **C-STORE Request Info** tab.



Upgrade Notes

When upgrading from versions that do not include the Batch Router Manager feature, any existing AE name will not have Batch Router queue enabled.

Batch Patient Update Manager

The Batch Patient Update Manager controls the processing of jobs for Data Synchronization Events. These events are generated when edits are made to locally stored data, or when HIS/RIS connections transmit updates, and a propagation route is configured for the database. The edit is immediately applied to the local database and Image (noted by the history of the Image) and then queued to the Batch Patient Update Manager to process the edit to all other destinations on the propagation route. The jobs remain in the queue in order, so if the same patient is edited twice, both edits will be propagated in the correct order the edit was made. The jobs are restricted from being deleted in order to retain synchronization. Once jobs are completed, they will remain in the queue for 30 days before they are automatically pruned. The end result is a synchronization of all modified data across an enterprise solution. Figure 66 below shows a sample Batch Patient Update Manager jobs summary.

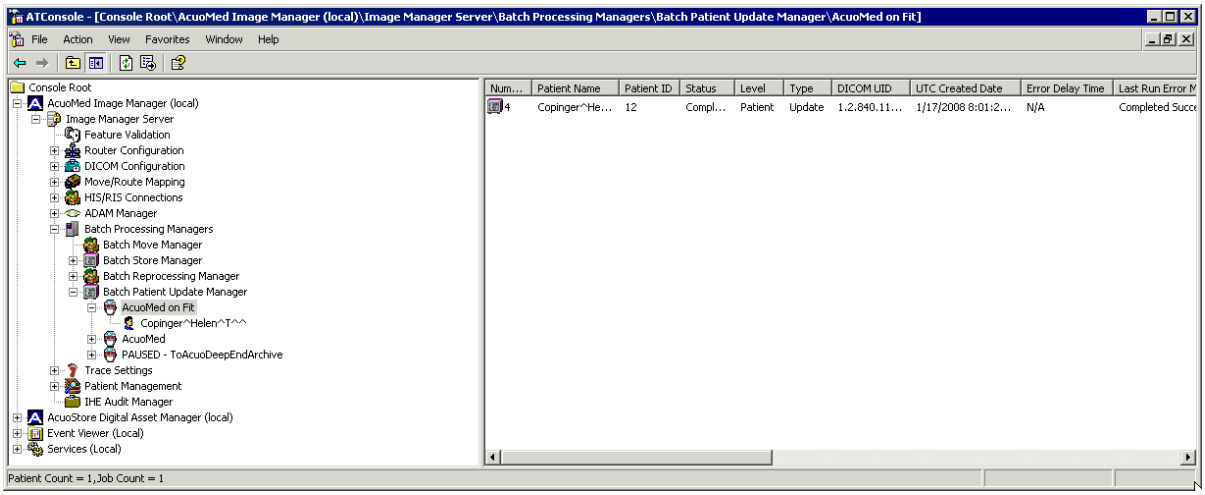


Figure 70: Batch Patient Update Manager – Jobs Summary

NOTE: You can sort the Jobs Summary contents by any of the column headers. Click the column header to sort by that column in ascending order. Click the column header again to toggle to a descending sort order.

As shown in the figure above, Batch Patient Update destinations display under the Batch Patient Update Manager tree node. You can display job summary information and perform operations at three different levels:

- Click the **Batch Patient Update Manager** tree node to display a comprehensive job summary for all destinations.
- Click a particular destination node to display the job summary for just that specific destination.
- Click a particular patient name under one of the destination nodes to display a job summary for that patient only.

The following topics discuss how you can view Batch Patient Update Manager job properties, pause jobs, and resume paused jobs.

Viewing Batch Patient Update Manager Job Properties

You can select a job from the Batch Patient Update Manager job summary to view its properties.

To view properties, right-click the job to view in the Job Summary (right window pane) and select **Properties** from the pop-up menu. The job Properties dialog displays with the Batch Store Job Properties tab selected as shown in Figure 67 below. For example, this tab displays patient update information.

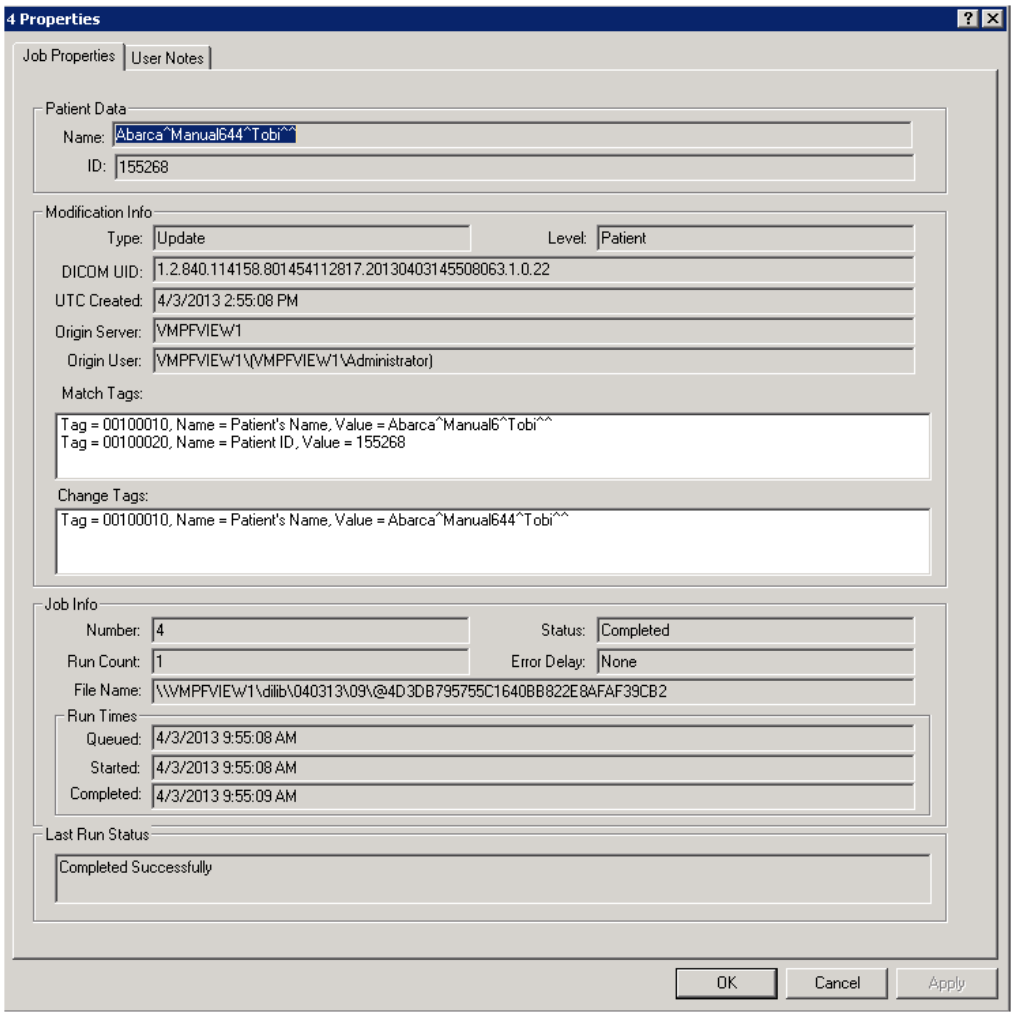


Figure 71: Batch Patient Update Job Properties – Job Properties tab

Other Batch Patient Update Manager Job Controls

Batch Patient Update Manager provides controls to pause jobs and resume paused jobs. You can access both of these functions from the Batch Patient Update Manager node in the MMC console tree:

- To pause a destination – right-click the destination from the **Batch Patient Update Manager** in the console tree and then select **Pause Jobs** from the pop-up menu.
- To resume paused jobs – right-click the destination from the **Batch Patient Update Manager** in the console tree and then select **Resume Paused Jobs** from the pop-up menu.

Adding a User Note to a Batch Patient Update Job

Users may add notes to Batch Patient Update jobs. Notes can be entered to assist with explaining why that particular job may be Paused, On Hold, or queued, etc. To add a user note to a Batch Patient Update Job, follow these steps:

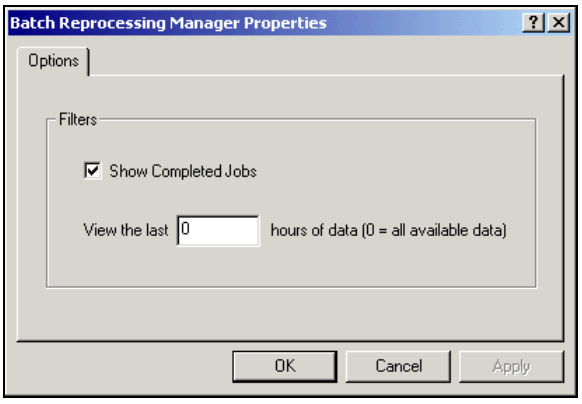
Right-click on a Batch Patient Update Job and select **Properties.** Select the **User Notes** tab. Enter the note and click "OK" when complete.

The user note appears in the Batch Patient Update Manager when viewing the job.

Batch Processing Managers Saved Settings

The following settings can be configured within the properties of the Batch Patient Update Manager node, however they are NOT saved with the MMC file (settings return to the defaults if the current MMC session is closed.)

- Show completed Jobs: By default this option is checked, but if a user decides that it is not necessary to see the completed jobs, this can be unchecked by the MMC user and all completed jobs and cancelled jobs will be filtered from view only on the system which this setting is applied.
- View the last (0) hours of data (0 = all available data): A user can decide how many hours of data he/she will filter from view on the system which this setting was saved.

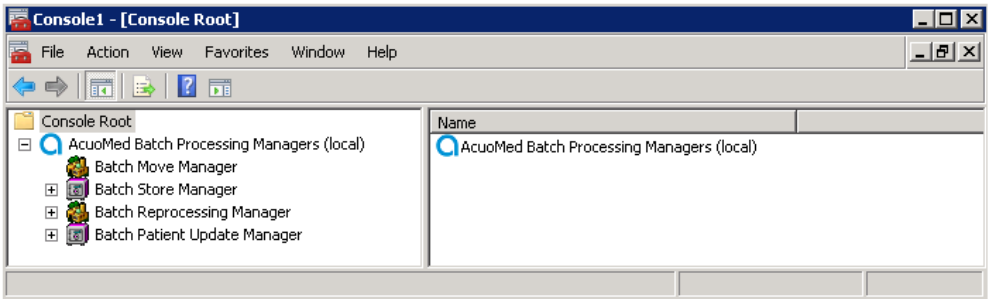


Acuo Batch Processing Managers Snap-In

Similarly to the Patient Management Snap-In, the Acuo Batch Processing Managers can also be snapped into an MMC. This allows users to view the Batch Move Manager, Batch Store Manager and if applicable, the Batch Reprocessing Manager. Also, like Patient Management, the first time the Acuo Batch Processing Managers are snapped into a new or saved MMC, it will need to be connected or reconnected to the Target Acuo Server.

For more information on the Batch Processing Managers refer to Chapter 2 - **Acuo Batch Processing Managers** on page 59.

The following figure shows the Acuo Batch Processing Managers snapped into the MMC along with the Patient Management Snap-In.



Chapter 8 - IHE Audit Log/Recycle Bin Manager

In this chapter:

Overview

IHE Audit Log Manager Service and Database Installation

IHE Audit Log Manager Configuration and Search Capabilities

Event Log,

Recycle Bin manager

Overview

The IHE Audit Log Manager is a stand-alone application. It's function is to establish measures which, together with the Security Policy and Procedures of an enterprise, provide patient information confidentiality, data integrity and user accountability.

This chapter will discuss the installation process, configuration, search functionality and audit pruning of the IHE Audit Lot Manager.

IHE Audit Log Manager Service and Database Installation

The IHE Audit log service is automatically installed when the AcuoMed service is installed. An IHE Audit Log database has a one-to-one relationship with an AcuoMed Database. For example if you have an AcuoMed database named AcuoMedTemp, then the IHE database will automatically be created and named AcuoMedTempIHEAudit.

IHE Audit Log Manager Configuration and Search Capabilities

From the **Image Manager Server** node**,** right-click on the **IHE Audit Manager** to launch the **IHE Audit Log Configuration and Search** stand-alone application.

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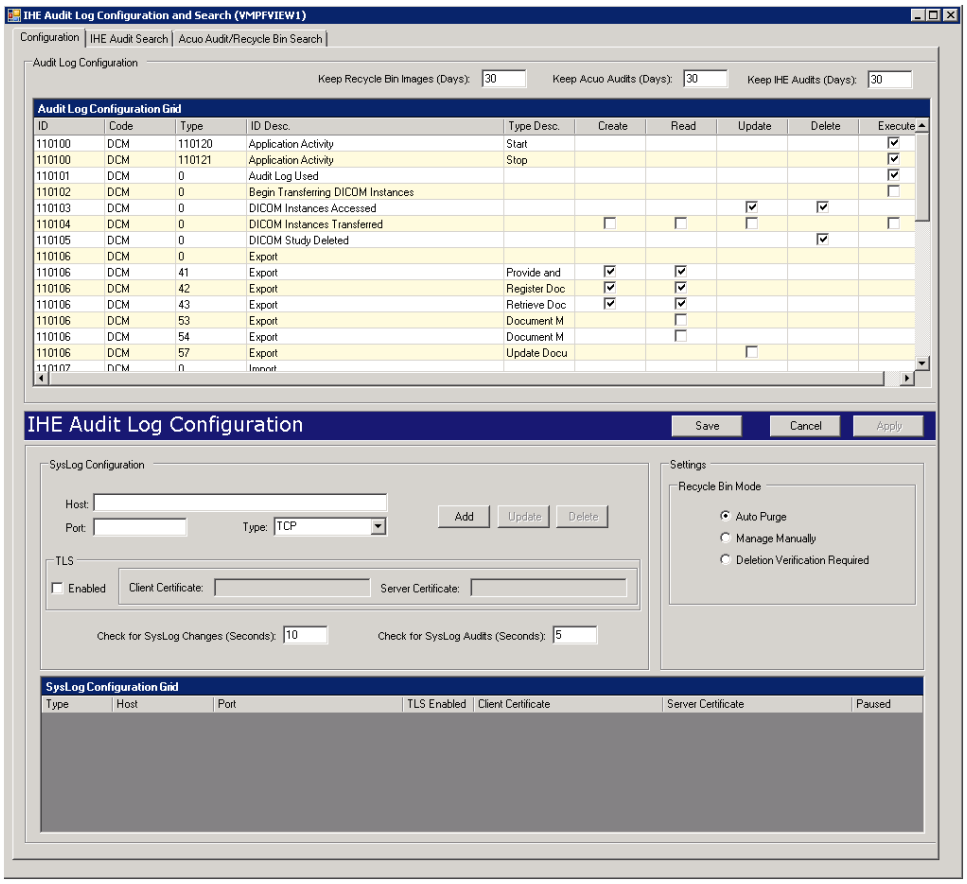

Figure 73b: IHE Audit Log Configuration and Search

Configuration

- Keep Recycle Bin (Days) – The number of days deleted assets are retained in the Recycle Bin. The default setting is 30 days as noted in Figure 73b.
- **Keep Acuo Audit (Days) –** The number of days Acuo audits are retained. The default setting is 30 days as noted in Figure 73b. The audit pruner will only run if the Acuo IHE Audit service is actively running.
- **Keep IHE Audit (Days) –** The number of days IHE audits are retained. The default setting is 30 days as noted in Figure 73b. The audit pruner will only run if the Acuo IHE Audit service is actively running.
- **Audit Log Configuration Grid** - At a minimum, Updates (edits/merges) and Deletes are always audited by default and cannot be turned off.

The following table further describes the auditing profiles and how they are supported as shown in the GUI above. To enable an audit simply click the checkbox for the type of auditing to be done and click **Apply**. Click **Save** to save your changes and close the application. If **Cancel** is selected, changes will not get applied and the application will close.

The Supported Types Key:
C = Create E = Execute
R = Read
U = Update
D = Delete

The Use Types Key:
O = Optional
M = Mandatory
N = Not Supported in this release

ID Description	Type Description	Use Type	Supported Type	Initial Status	AcuoMed Processing
Application Activity	Start	O	E	on	When the service is started.
Application Activity	Stop	O	E	on	When the Service is stopped.
Audit Log Used	Null	O	E	on	When the Audit GUI is entered and exited.
Begin Transferring DICOM instances	Null	O	E	off	The images of a C-MOVE request are about to be processed for a destination. Only the images that are to be moved out of an Acuo DICOM database are recorded, not images that are being moved as a result of federation to a remote system.
DICOM Instances Accessed	Null	C (N) R(N) U(M) D(M)	U D	U(on) D(on)	Updates to meta-data are audited in Patient Management or Reconciliation or the result of a Fix-It or HIS/RIS interface. (The audit references an update was performed. It does not audit the changes made) Deletes are audited for deletions from patient management, the source of a merge, Batch Store cancellations, Batch Repro event deletions, and Deletions from temporal databases.
DICOM Instances Transferred	Null	O	C R U E	off	An **E** (Execute) is logged on the start of a C-STORE out of a local DICOM database. On a successful completion of a C-STORE, a **C** is audited if the asset is created, an **R** if it is a duplicate, or a **U** if the asset has been modified or replaced.
DICOM Study Deleted	Null	M	D	on	n/a
Export	Null	N	n/a	n/a	n/a
Import	Null	N	n/a	n/a	n/a
Network Entry	Null	N	n/a	n/a	n/a
Order Entry	Null	N	n/a	n/a	n/a
Patient Record	Null	M	D	on	An audit is recorded when the database is updated. This states that the Patients Records have been logically altered, but the assets have not been modified. This can happen in cases where a database update is successful, but an update to the

					actual image fails, for example if they are offline. The audit references an update was performed. It does not audit the changes made
Procedure Record	Null	M	D	On	Need Info?
Query	Null	O	E	off	An audit is recorded when receiving a C-FIND query request.
Security	Null	N	n/a	n/a	n/a
User Authenticated	Null	N	n/a	n/a	n/a

Syslog Configuration

Syslog can be used for auditing and is easily configurable. To configure a syslog connection, enter the following parameters:

- Host – The server name or IP Address.
- Port – The port configured for syslog.
- Type – Choose between TCP and UDP.
- TLS – To enable TLS encryption on the connection to the configured syslog server, click Enabled and enter the following parameters:
    - Client Certificate
    - Server Certificate

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IHE Audit Search

The IHE Audit Search GUI, as shown below, provides the user with a mechanism to search all criteria available by clicking the **Check All** button or by filtering out the data by checking on specific criteria to be displayed in the GUI. Search criteria can consist of one, or a combination of, Audit Types and Star and End Date/Time.

Search results will be displayed in the **Search Results** section and when an entry is selected, an XML schema with the detailed audit information will display to the right, if available.

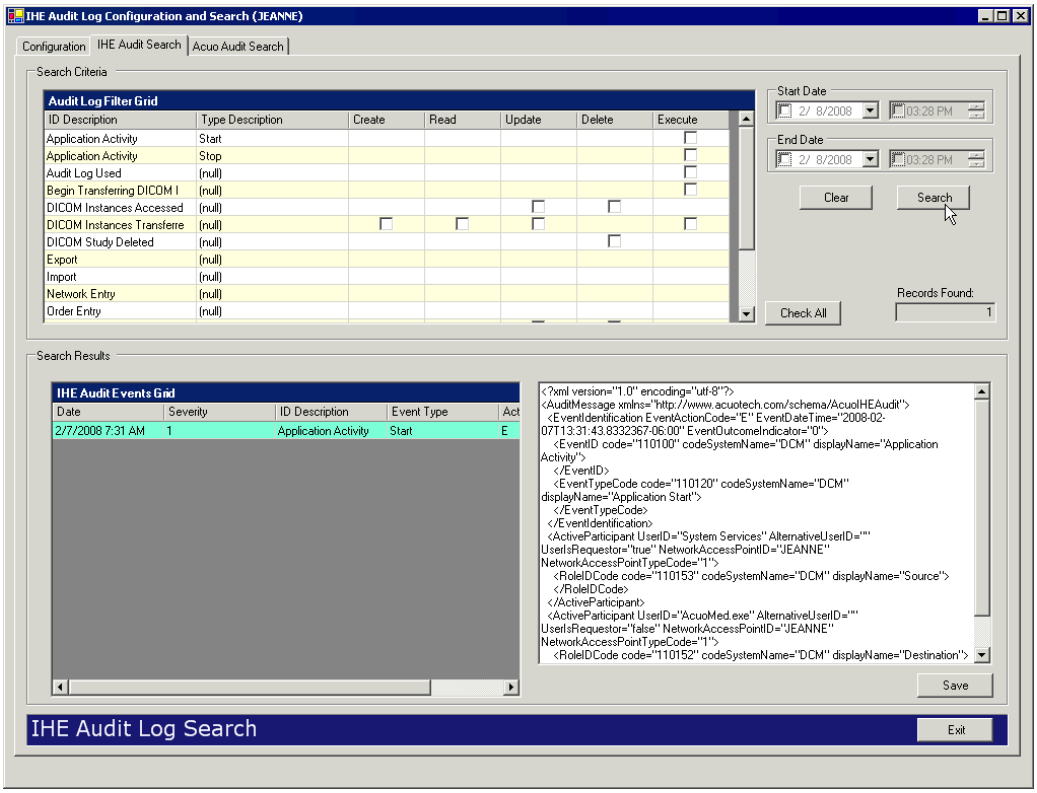


Figure 73c: IHE Audit Search Grid and Results Pane

Acuo Audit Search

The Acuo Audit Search GUI as shown below provides the user a mechanism to search by one or a combination of Demographics, Audit Source, Event Types, and/or Date/Time criteria.

Search results will display in the **Search Results** section, when an entry is selected an XML with the detailed audit information schema will display to the right, if available.

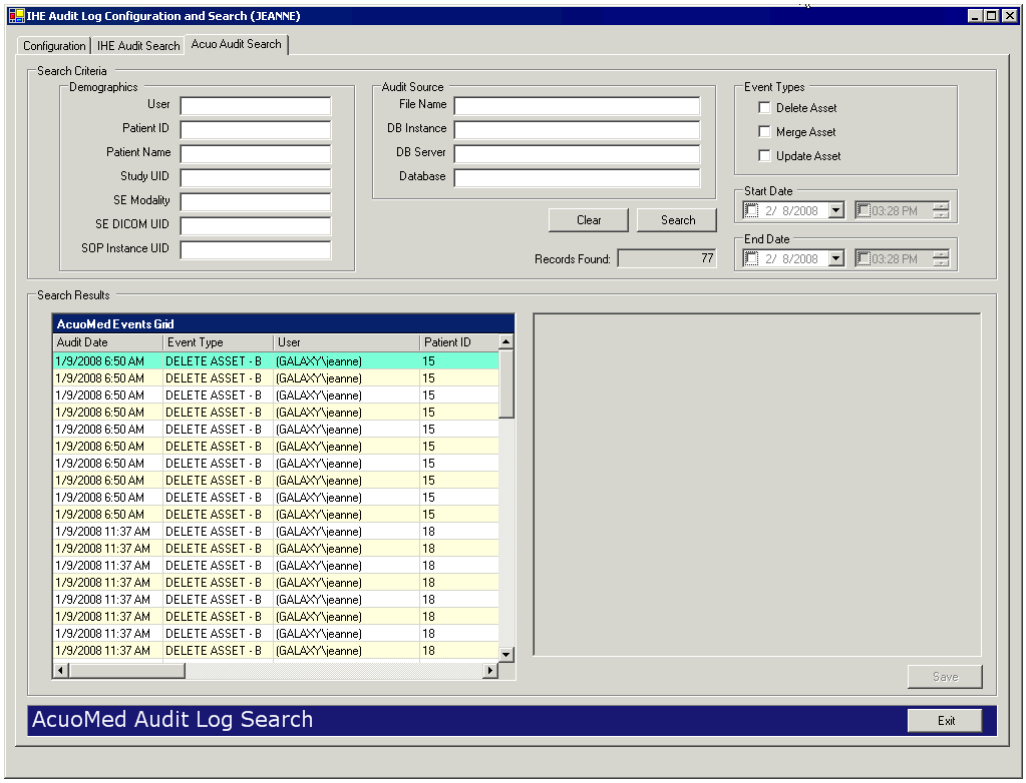
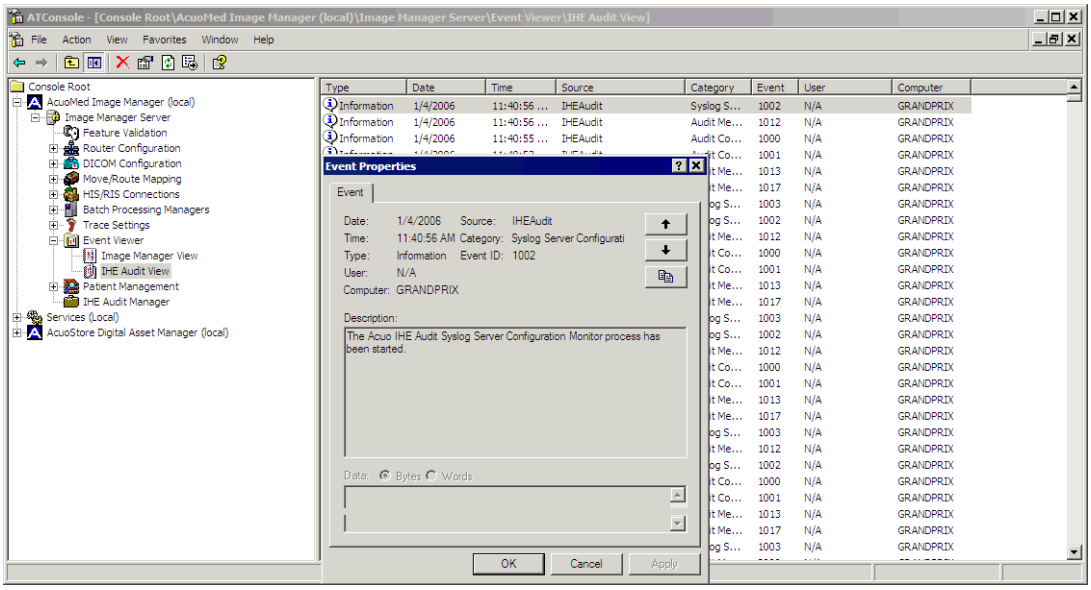
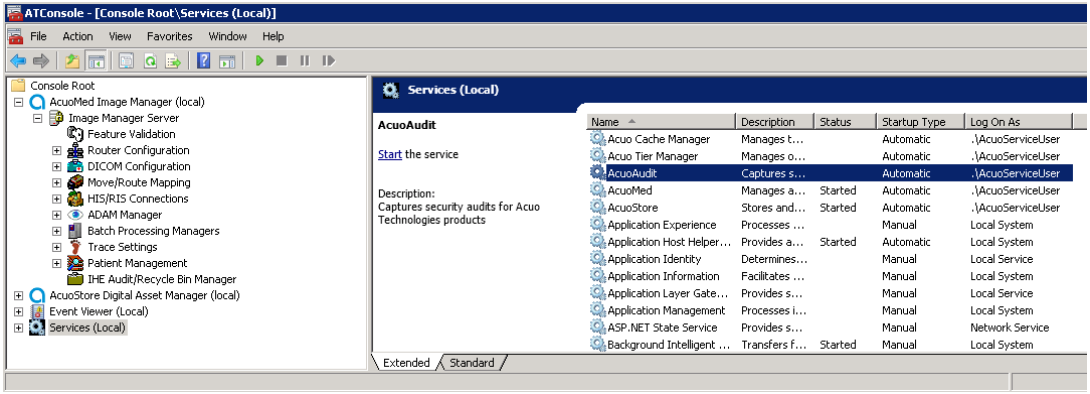


Figure 73d: Acuo Audit Search Grid and Results Pane

Event Log, Acuo IHEAudit Service and Pruning



- **Event Log -** The event log will display messages for each day to give the user an indication that the audit log has pruned. Audits are meant to be kept forever and a database maintenance plan should be established to assure the database is backed up routinely. The backup therefore can then be used to search for audit entries that have already been pruned.



- **Acuo IHEAudit Service -** The Acuo IHEAudit **service** must be running and set to Automatic in order for the system to prune the Audit entries from the database when the value in the setting **Keep Audits (Days)** is met.

Recycle Bin

The Acuo Recycle Bin functionality has been introduced in 6.0 to provide a data recovery option when deleting patient data. When a patient record (e.g., image, series, study, patient) is deleted from Patient Management or via HL7 feeds it is now placed in the Recycle Bin. The deleted data can then be reviewed and/or restored from the Recycle Bin. This functionality is enabled by default.

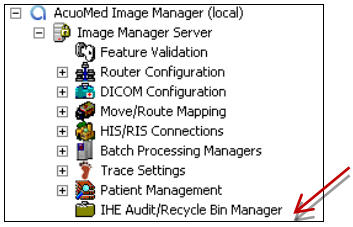
Images are retained and placed into the Recycle Bin for the following functional areas:

- Images deleted from Patient Management
- Images deleted from the Reconciliation Event Manager (REM)
- Images cancelled from Batch Store
- Images deleted via HL7 delete functionality on DICOM Database and Publisher DICOM Database
- Images deleted via Fixit delete functionality on DICOM Database and Publisher DICOM Database

Images are NOT retained (not placed into the Recycle Bin) for the following functional areas:

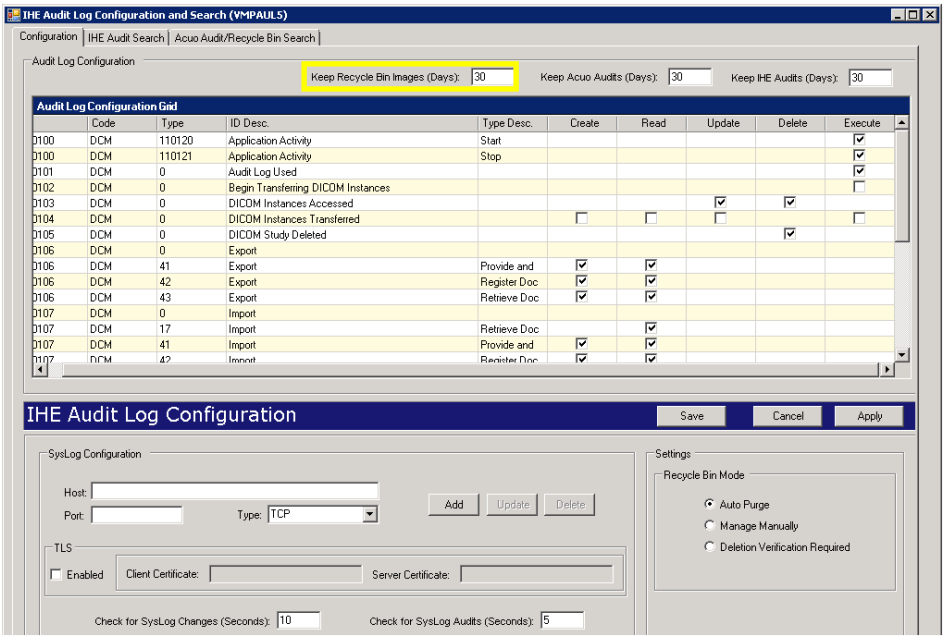
- Images deleted via Retention/Purge Policies (pruner)
- Images deleted automatically via Duplicates Processing (Keep Last, Keep First)
- Images removed from the REM/Reconciliation Database during normal reconciliation processing (when an asset is reconciled from the REM)
- Images received inbound that are not rejected or not accepted
- Images deleted via HL7\Fixit delete functionality on Subscriber DICOM Database

Acuo's Recycle Bin feature is built into the existing IHE Audit Manager, the label in the mmc now reflects the added functionality.



Configuration

Clicking on the "IHE Audit/Recycle Bin Manager" node displays the IHE Audit Log Configuration and Search screen.



The Setting section contains three options for Recycle Bin Mode.

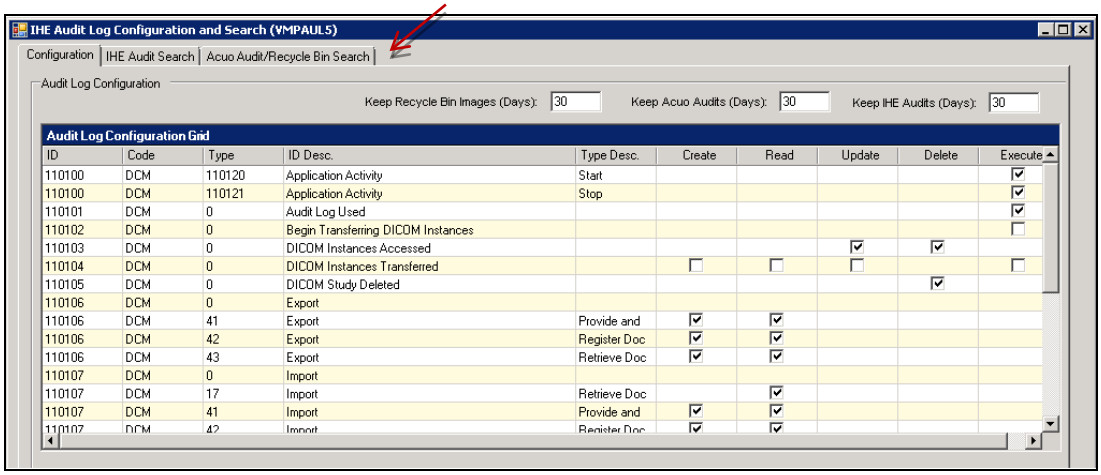
Auto Purge – This mode uses the "Keep Recycle Bin (Days)" configuration parameter (see highlight in screenshot above) to automatically delete images after remaining in the recycle bin for the number of days configured.

Manage Manually – This mode disables the Auto Purge functionality - the Recycle Bin image (as well as the audit for that image) can only be deleted manually.

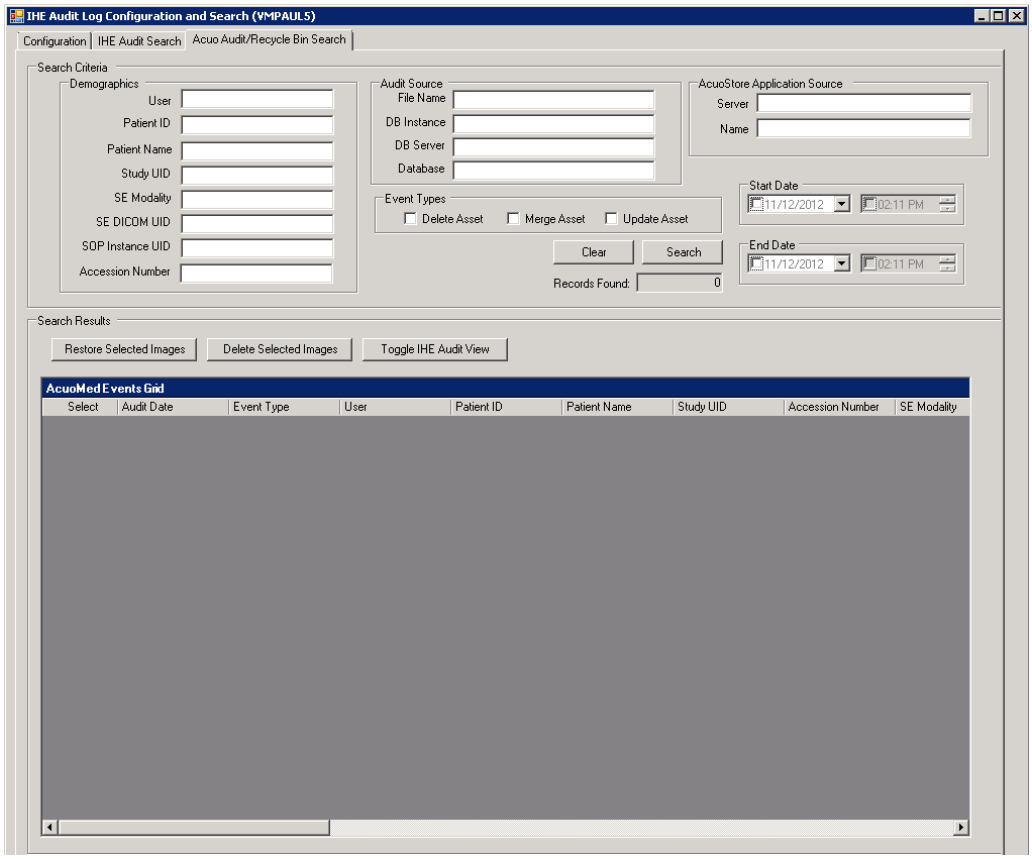
Deletion Verification Required – This mode is similar to "Manage Manually" however it adds an additional step before assets can be deleted manually from the Recycle Bin. Enabling this mode limits deletion to records that have been marked in the database as "Verified for Deletion". This may be used when exporting an audit log for review, then marking only certain assets for deletion.

Recycle Bin Search

Clicking on the "IHE Audit/Recycle Bin Manager" node displays the IHE Audit Log Configuration and Search screen. Select the "Acuo Audit/Recycle Bin Search" tab as highlighted in the screenshot below.



The "Acuo Audit/Recycle Bin Search" tab (as shown above) displays the following screenshot:



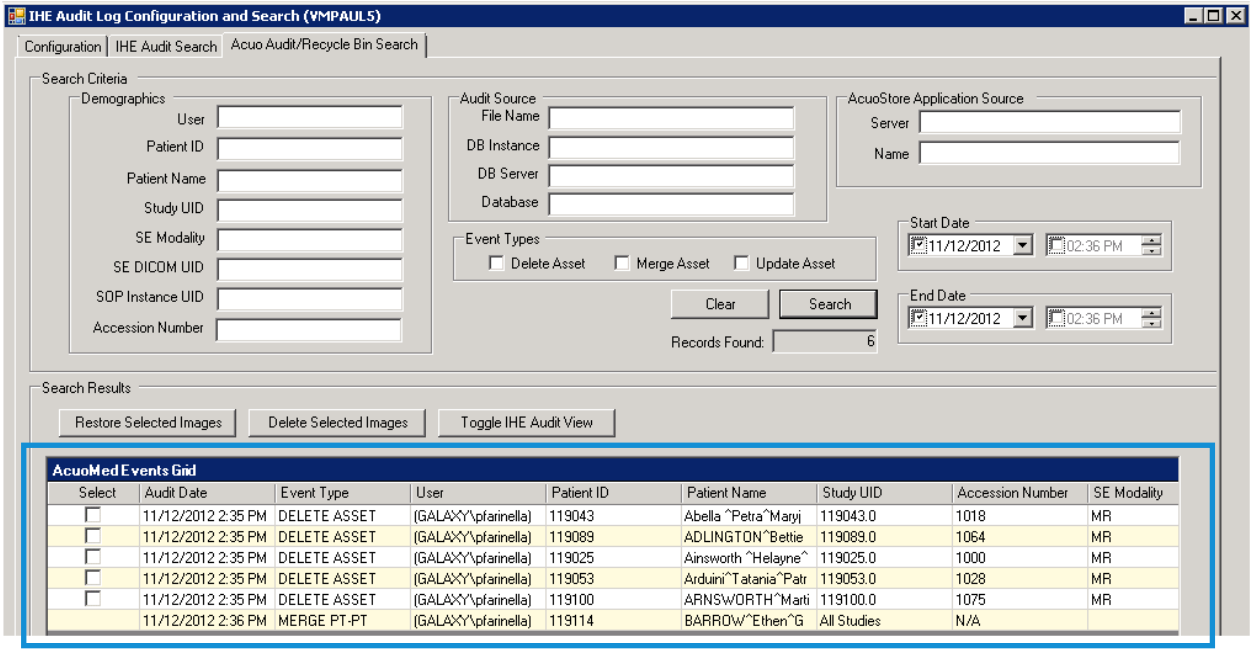
Search Criteria

The table below shows the search criteria options when filtering Acuo Audits and/or deleted patient records.

Demographics	Audit Source	AcuoStore Application Source	Event Types
• User • Patient ID • Patient Name • Study UID • SE Modality • SE DICOM UID • SOP Instance UID • Accession Number	• SE Modality • SE DICOM UID • SOP Instance UID • Accession Number	• Server • Name	• Delete Asset • Merge Asset • Update Asset **Start Date/End Date**

Search Results

Clicking Search will display the events that match the given criteria. The screenshot below shows an example of the results returned from the query.



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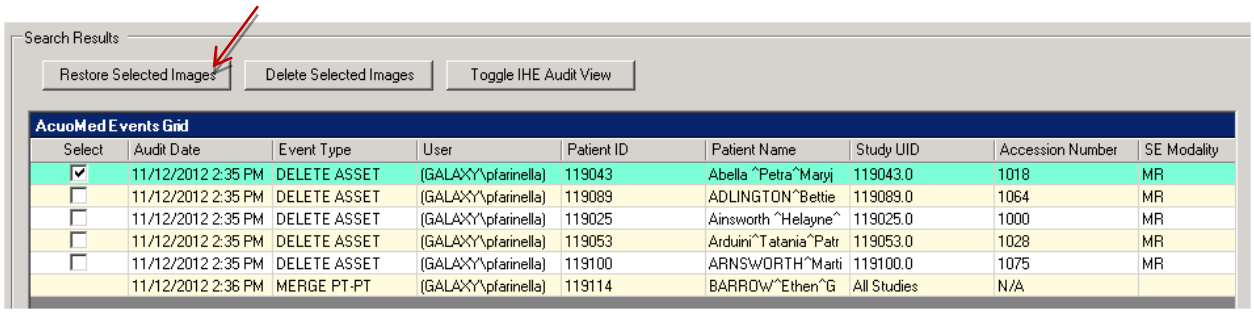
Recycle Bin Actions

When the query results are returned, assets that have been deleted display with a checkbox under the "Select" column. There are three actions that can be performed while one or more events are selected. The ability to Restore Selected Images, Delete Selected Images, and Toggle IHE Audit View are described below.

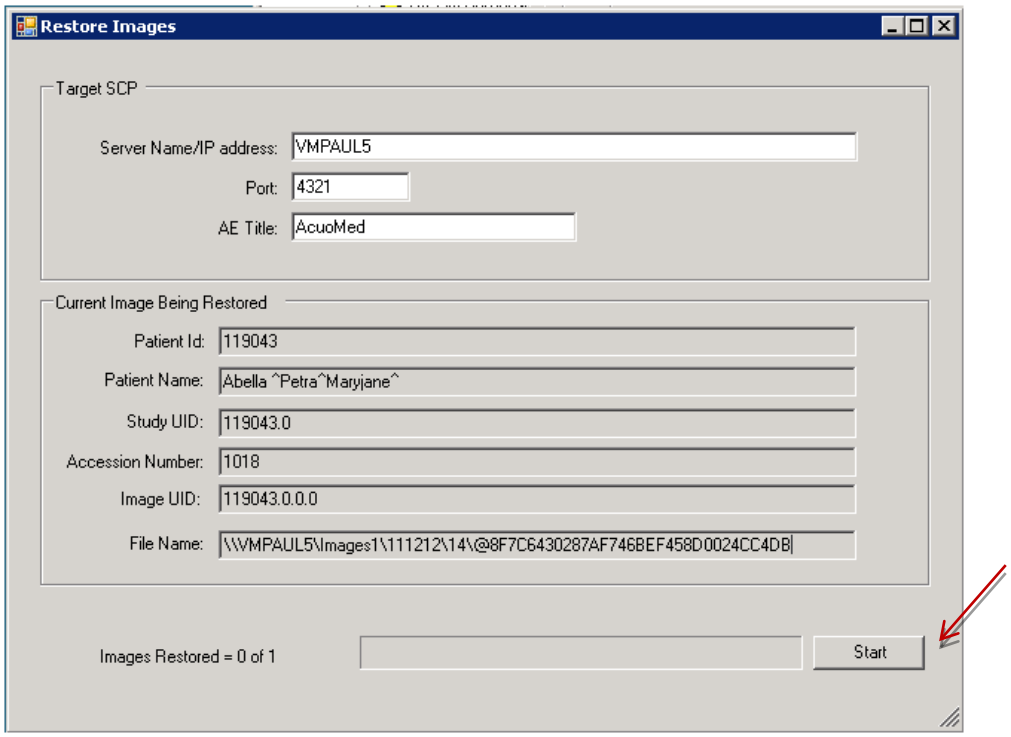
Restore Selected Images

Previously deleted images can be restored to a specified destination by selecting an event of type "DELETE ASSET" and clicking on the "Restore Selected Images" button.



Enter the Target SCP information (Server Name/IP, Port and AE Title) and review the Image information on the Restore Images screen, then click "Start" to restore.

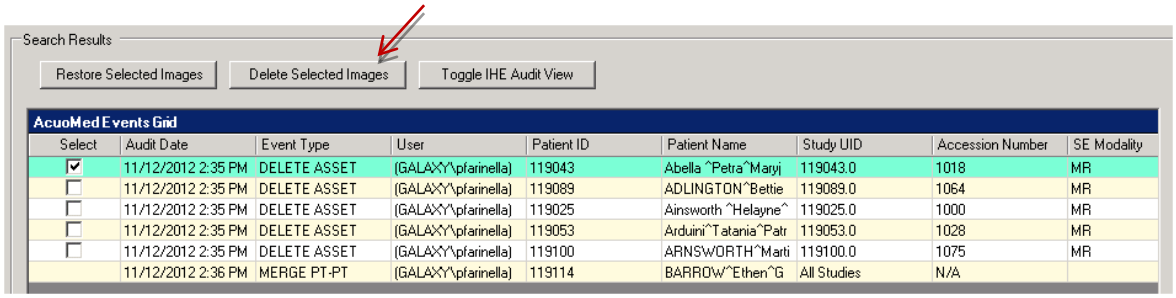
NOTE: Restored images will not have precedence over existing images in the DICOM database. If a restored image is received for an image that already exists it will be rejected.



The image will then be restored to the specified Target SCP.

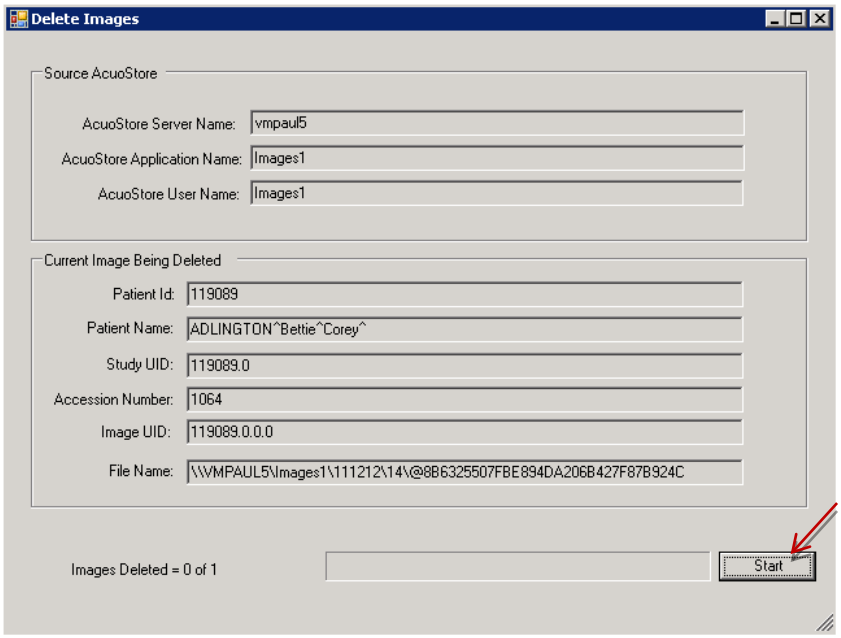
Deleted Selected Images

Previously deleted images can be deleted from the Recycle Bin by selecting an event of type "DELETE ASSET" and clicking on the "Delete Selected Images" button. The delete process removes the association between the AcuoStore database and the Recycle Bin.



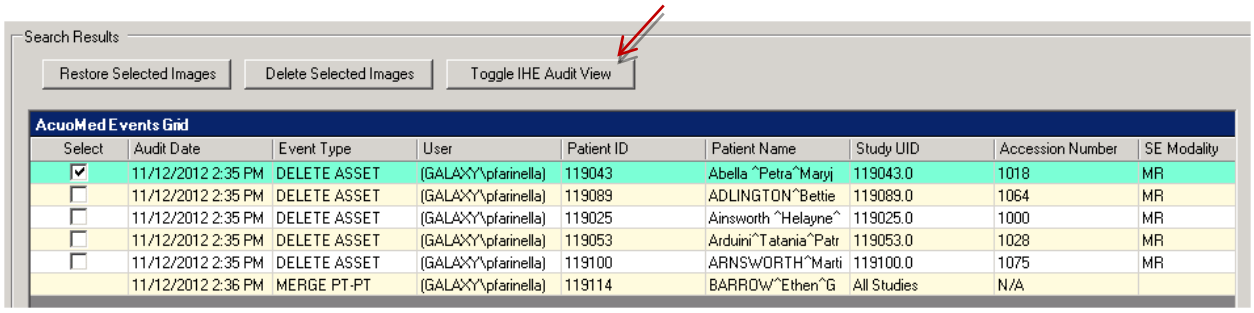
Verify the Source of the data and the "Current Image Being Deleted" then click "Start" to continue with the delete.

NOTE: If the only remaining record for the image to be deleted is in the Recycle Bin – the image will be permanently deleted when applying "Delete Selected Images".

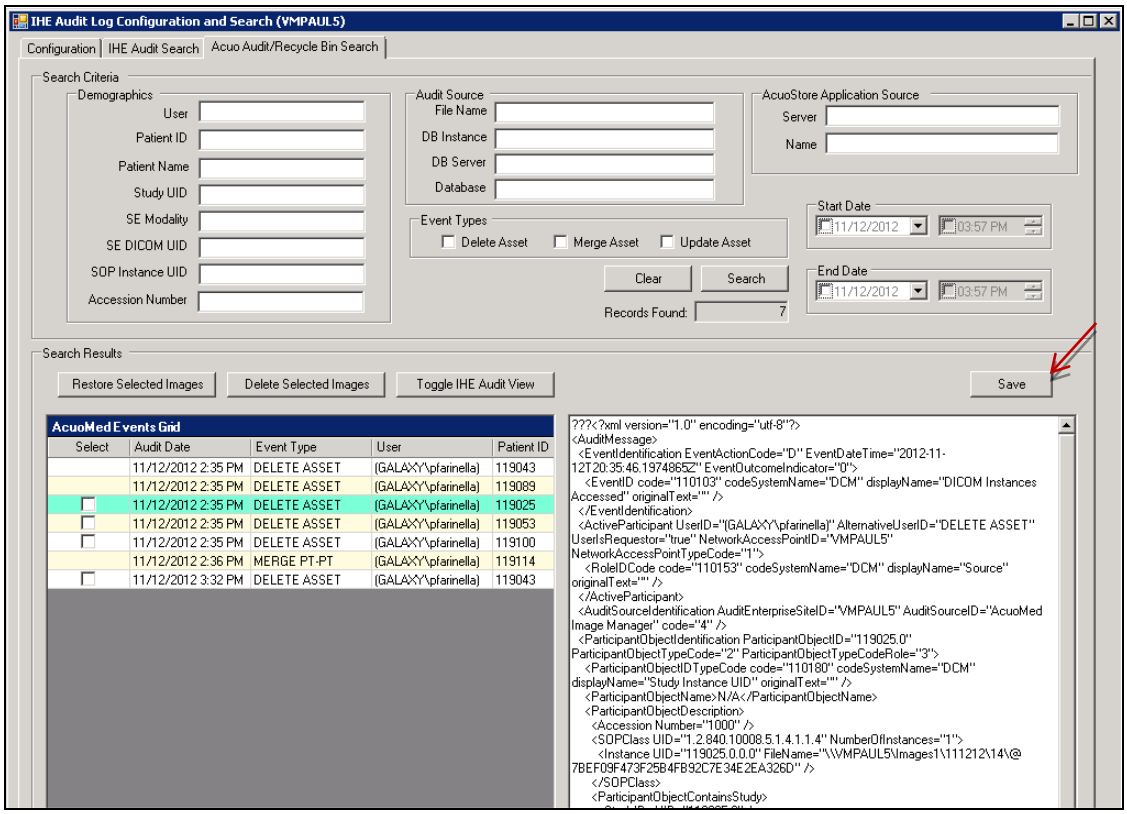


Toggle IHE Audit View

The Toggle IHE Audit View button activates a side panel that displays the IHE Audit Log information for the selected Event.



In the screenshot below, the DELETE ASSET event is highlighted and the IHE Audit View is displayed on the right side of the screen.



Save IHE Audit

When the IHE Audit View is enabled an option becomes available to “Save” the IHE Audit View. Clicking on the “Save” open a browse window where a location can be chosen to save the XML file for that audit.

Chapter 9 – Remote Management

In this chapter:

Overview

Management via MMC Console

Management via Terminal Services Client

Overview

Remote management refers to the practice of managing a computer at a different physical (remote) location from a local computer. Practically speaking, remote management lets you manage an Acuo server at one or more remote locations (for example, at several clinics or imaging centers) from another remote location (such as a central hospital). For example, you might implement centralized management from a central hospital where are image reads are done; from this location you could remotely manage several other clinics or hospitals (for example in a large metropolitan area) where scans/studies are done.

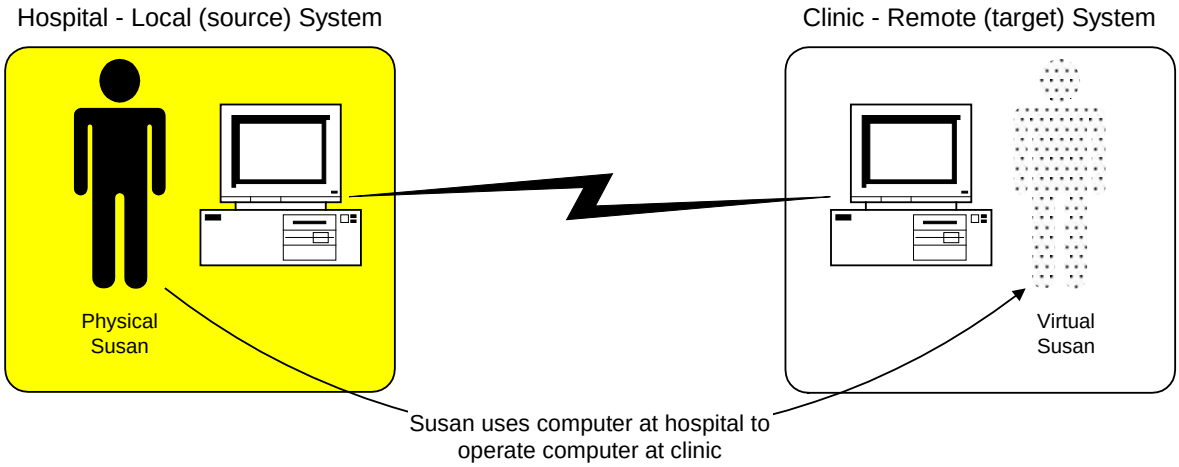


Figure 72: The remote management concept

NOTE: In the topics that follow, the term *source system* refers to the local system being used to manage a remote system. The remote system being managed is referred to as the *target system*.

There are two methods of administering remote management that essentially perform the same functions. However, each method has certain characteristics that make it distinct from the other. These methods, and their differences, are described under the following two topics:

- Management via MMC Console
- Management via Terminal Services Client (Terminal Server)

Management via MMC Console

Setting up an MMC console on a local server to manage a remote server eliminates the need to physically be where the remote server is located in order to perform certain tasks on it. Instead, you can manage other MMC console services and perform certain tasks through those services on remote servers from virtually any local server. Typically, these tasks include:

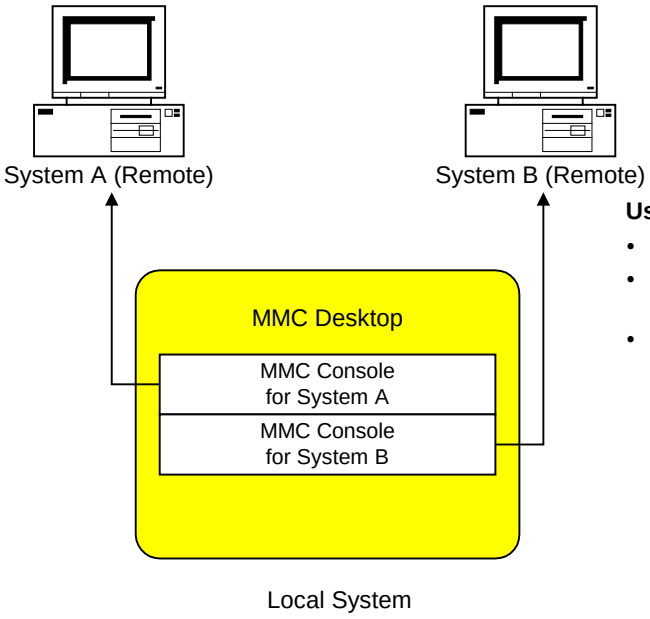
- Changing the configuration on the remote servers
- Stopping and restarting services on the remote servers
- Setting up a group of snap-ins that you want to routinely manage on the remote servers

NOTE: Management via MMC Console requires that the local server have a high-speed, highly available connection to the remote server. If this is not the case, Management Via Terminal Services Client is the better choice (refer to the discussion of this topic on page 352).

MMC Operational Considerations

The MMC console method of managing systems remotely is the preferred method if you have Windows 2000/2003 running on both the local and remote systems, and if you can access the local system from a remote system through a secure Intranet. If you can access the Intranet via a Virtual Private Network (VPN) using the Internet, this is also acceptable. Conversely, the MMC console method is not a viable method if at least one of your systems is not running Windows or if you have to go through a firewall without the benefit of a VPN.

To help determine whether using MMC console is an appropriate method for you to remotely manage other systems, review Figure 73 and the explanations that accompany it.



Using MMC Console:

- Windows 2000 required
- Log into Local System using its login ID and password
- After initial login, if System A and System B are physically on the same Intranet as the Local System, log directly into them via the MMC consoles for System A or System B
  -OR-
  After initial login, if the Local System is NOT Intranet-connected to Systems A and B (they are on the Internet instead), first log into System A or B via a VPN connection and then log in via the MMC Console for System A or B

Figure 73: Remote management using MMC console

Figure 73 shows that to manage a system remotely via an MMC console you must first log into the local system with its login ID and password. Once you are logged into the local server, you can create one or more MMC consoles to manage one or more corresponding remote servers.

In addition, Figure 73 notes that there are two access scenarios for using the MMC console approach to remote management — from INSIDE and from OUTSIDE your organization's Intranet. To summarize the difference, if both the local server and remote server are on the same Intranet, you can log directly into the remote server inside the Intranet with an MMC console application created for that purpose on the local server. Or, if the remote server is on the Internet, you must first access the remote server via a VPN across the Internet; you can then log into the remote server via an MMC console application created for that purpose on the local server. For an example of this, see the instructions with Figure 73.

MMC Configuration

The following procedure describes how to set up a local server to manage Acuo services running on a remote server.

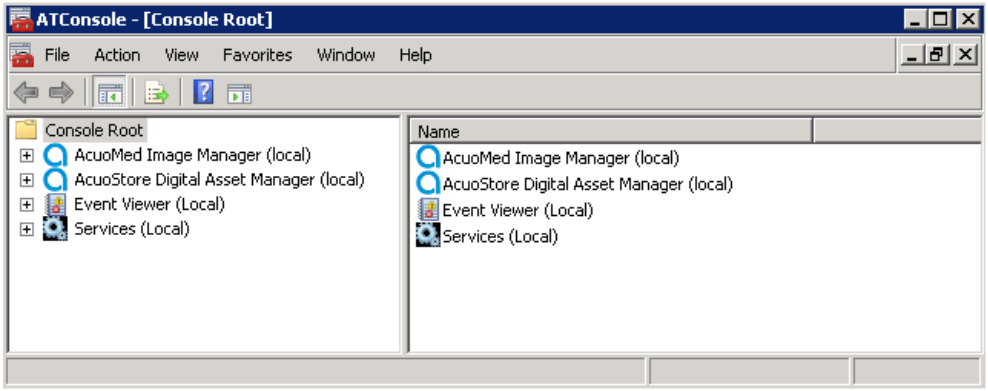
NOTE: The following procedure assumes that you have already set up an MMC console on your local server and that it is currently managing AcuoMed and AcuoStore services. If this is not the case, complete the steps in the topic *MMC Console Creation* on page 79, before starting this procedure.

IMPORTANT: This procedure also assumes that the remote server (the target server you want to manage) is either on the same Intranet as the local server or that, if you are accessing the remote server via an Internet VPN, you have already connected to the remote server via that method.

To set up a local server that will manage services on a remote server, follow these steps:

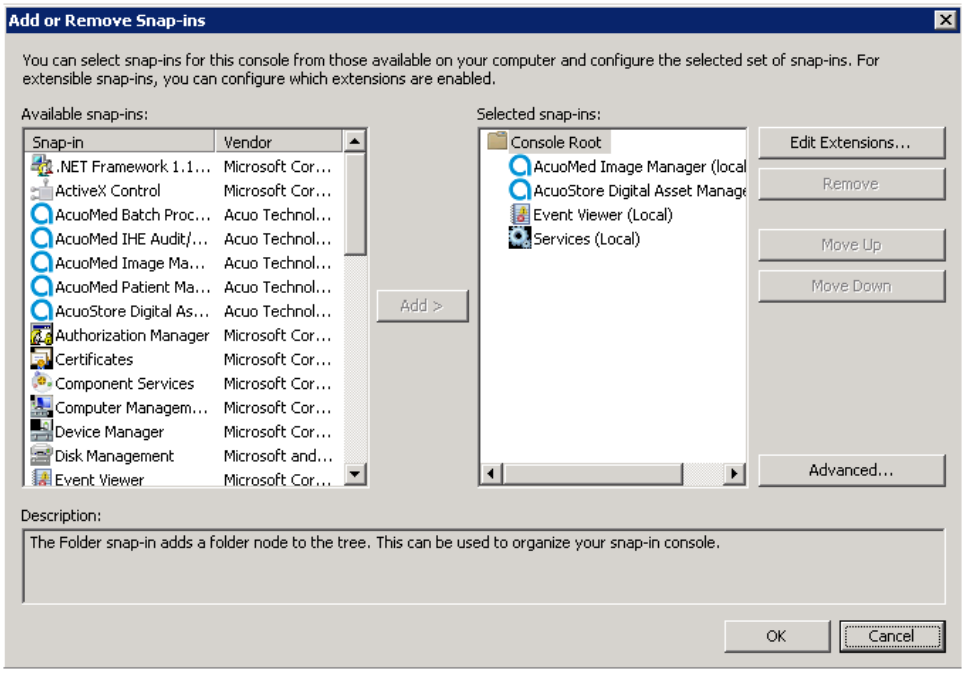
1. On the local server, open your MMC console.

   The Console Root screen displays.



2. From the Console menu, select **Add/Remove Snap-in**.

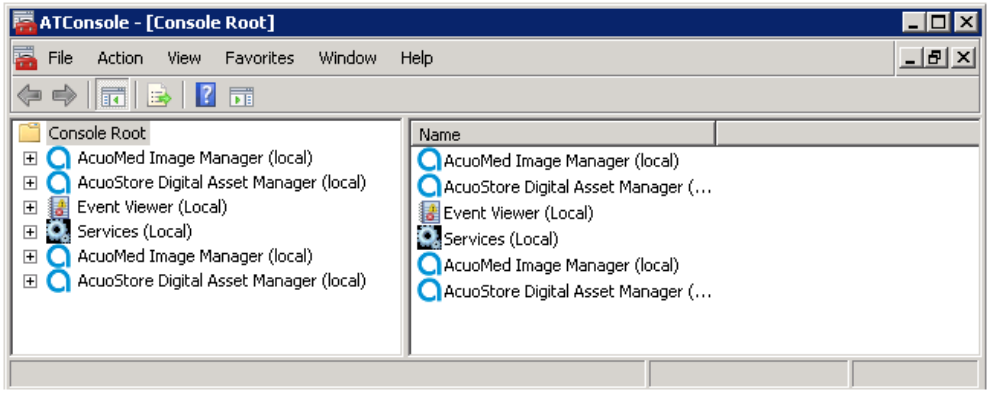
   The Add/Remove Snap-in dialog displays, which shows all the snap-ins currently selected.



4. Using the Add Standalone Snap-in dialog, add additional AcuoStore and AcuoMed snap-ins by highlighting each snap-in and then clicking **Add**.

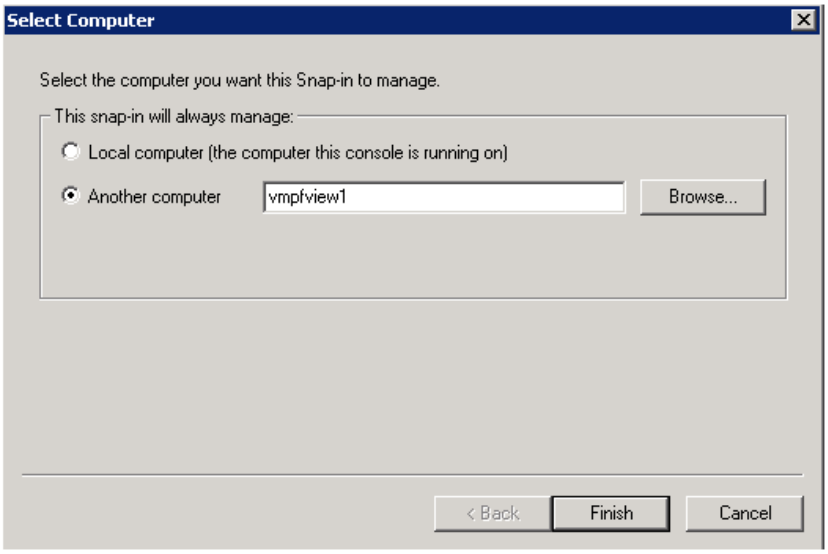
3. Click **OK** to continue.

   The Console Root screen displays, which should now show duplicate AcuoStore and AcuoMed snap-ins.



4. To select a different computer for a duplicated snap-in to manage, right-click the **AcuoStore Server** or the **AcuoMed Server** and select **Connect to Another Computer**.

   The Select Computer dialog displays.



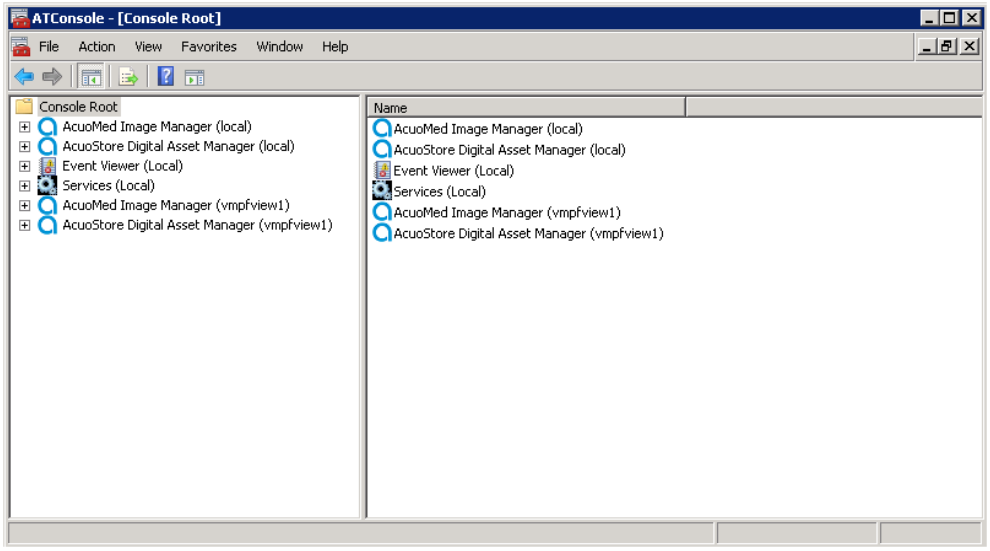
5. Click **Another Computer** to select it, click **Browse** to browse for another server, and, when you have selected the target server you want to manage, click **Finish**.

   Note: When you click **Browse**, the Browse for Computer dialog displays, which is a standard Windows browsing window that lets you attach to any server on your Intranet or VPN connection. Alternatively, if you know the name of the server that you want to connect to, type the name in the field provided, and then click **Finish**.

   The Console Root screen displays (see sample for Step 8).

6. Repeat Steps 6 and 7 for the second duplicated snap-in.

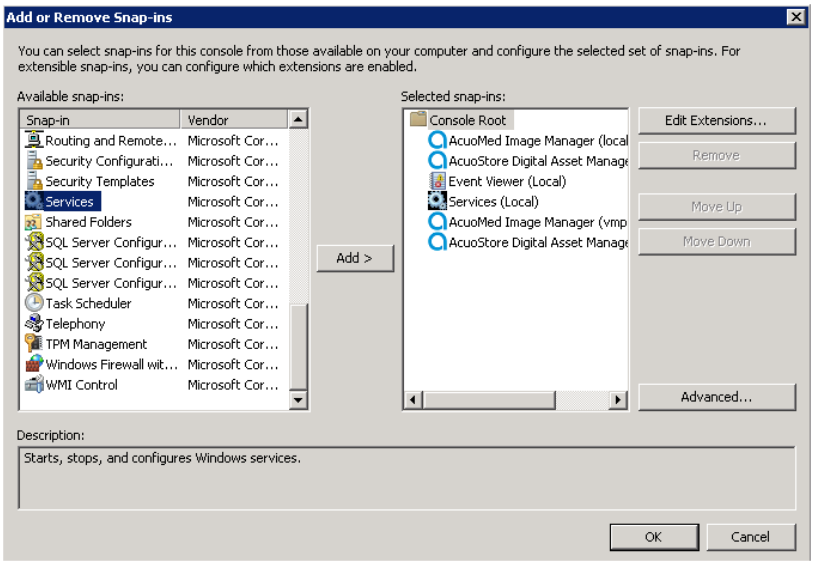
   The Console Root screen should show that the duplicate AcuoStore and AcuoMed snap-ins are now managing a different server, in this case vmpfview1.



7. To add an additional snap-in, for example the Services snap-in, repeat Steps 2 and 3 of this procedure and highlight the **Services** snap-in (as shown below).

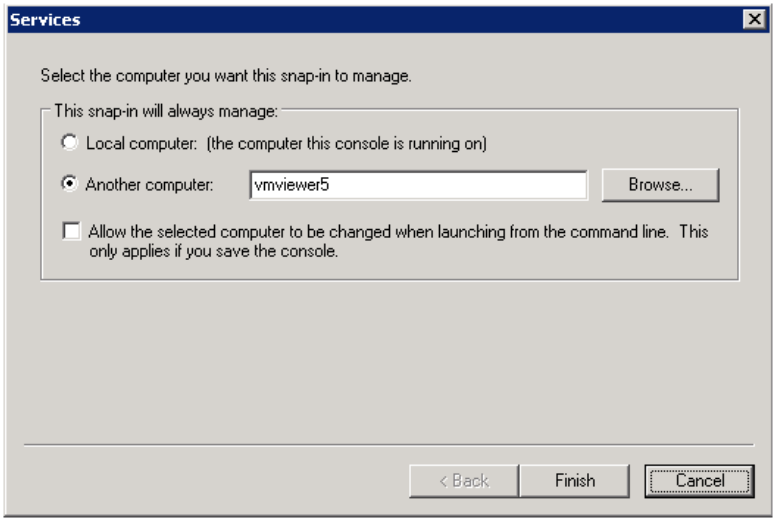
NOTE: Using the Add Standalone Snap-ins dialog, you can add the additional snap-ins that you want. Generally speaking, adding snap-ins expands functionality, which means in this context that you can increase the number of tasks you can complete on a remote (target) server. Note that all snap-ins are not added in the same manner and that a description for how to add each of them is not included in this manual. However, a description for how to add the Services snap-in is included below since it is recommended that you add this snap-in for most remote management implementations.

The Add Standalone Snap-in dialog displays.



8. Click **Add** to continue.

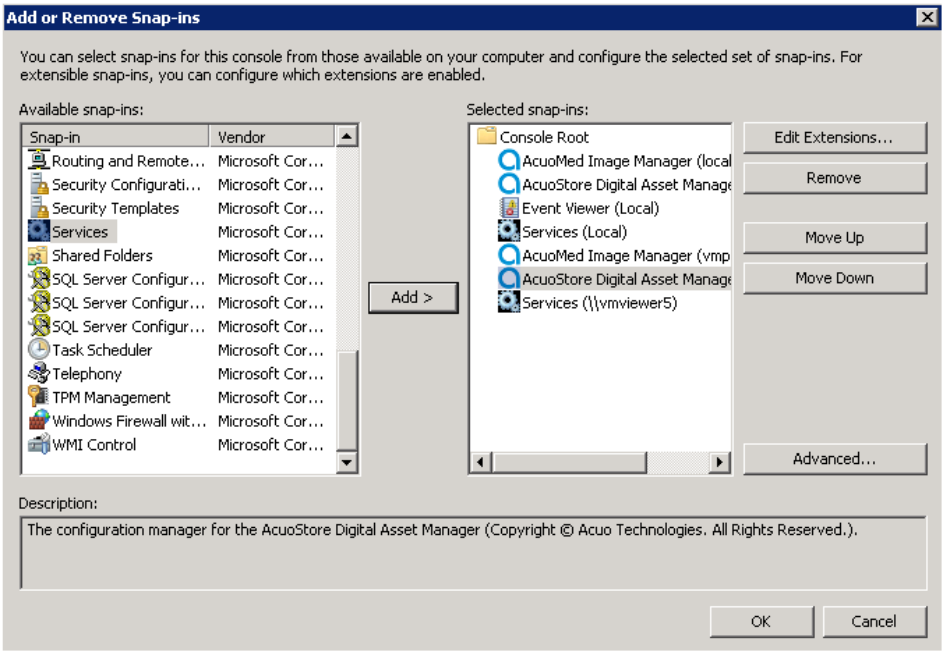
The Services dialog displays.



9. Click **Another Computer** to select it, click **Browse** to browse for another server, and, when you have selected the local server you want to manage, click **Finish**.

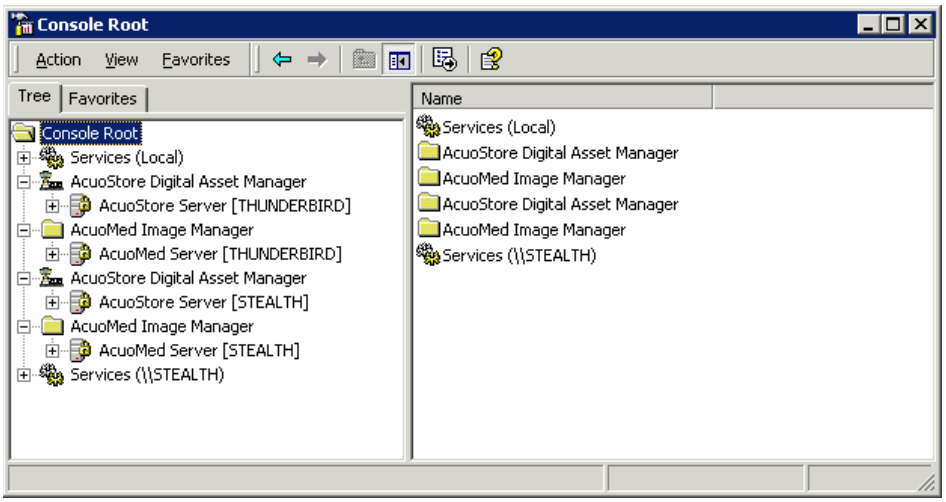
Note: When you click **Browse**, the Select Computer dialog displays, which is a standard Windows browsing window that lets you attach to any server on your Intranet or VPN connection. Alternatively, if you know the name of the server that you want to connect to type the name in the field provided, and then click **Finish**.

The Add/Remove Snap-in dialog displays.



10. Click **OK** to continue.

The Console Root screen displays.



11. From the Console menu, select **Save As** and save the new MMC console.

In our example above, the local server THUNDERBIRD is now ready to manage the remote server STEALTH from the local server's MMC console.

Important Note on Software Functionality – Remote Patient Management

The bandwidth connection from a client utilizing Remote Patient Management will directly impact the speed of processing updates (Edits, Merges, Deletes, and REM processing). For this reason we recommend that these functions be processed on the Application Server(s) in the data center via RDP or that the client workstations performing these functions have high speed/dedicated bandwidth to the data center/storage location of the image shares.

The same constraint will also affect any remote management of the full AcuoMed/AcuoStore configuration GUI. For example, the time to load the configuration information from the database is not optimized for low bandwidth.

Please contact Acuo Technologies for more information.

MMC Maintenance

With ongoing remote operations, there may be a time when you want to do certain tasks from a local server that has Windows on it but does not have AcuoMed or AcuoStore. If this is the case, one option is to only install the MMC console. Once this is done and you have set up the MMC console on the local server, you can manage MMC console services on remote (target) servers running Acuo products, provided you can gain secure access to the remote server via an Intranet or Internet VPN connection. Also refer to the topic *MMC Console Creation* on page 79.

Once you have set up a local system to manage MMC console applications on a remote system, there is little to do from a maintenance standpoint other than to carry out the tasks that are required to fulfill your business needs. However, the tasks you may perform are limited to those tasks that the MMC console applications manage on the remote system. By contrast, you can perform many more tasks via the Terminal Services Client (see the next topic).

Management via Terminal Services Client

The Terminal Services Client lets you convert the terminal of a local server (local PC) into a terminal that can be used to manage a remote server. This is achieved from the local server by entering the remote server's login ID and password into a Terminal Services Client interface that creates a link to the remote server. By doing this, you log into the remote server from a local location. Using Terminal Services Client on a local server to manage a remote server eliminates the need to physically be where the remote server is located in order to perform management tasks on it. (This is the same as management via MMC console discussing in the previous topics). However, unlike MMC console, a Terminal Services Client lets you perform many more tasks on the remote server from the local server because you are actually logged into the remote server.

With Terminal Services Client, since you are logged into the remote server, you can perform any task (including managing MMC console applications) that you could do if you were physically sitting at the remote server. Typically, these tasks include (but are not limited to):

- Changing the configuration on the remote server
- Stopping and restarting services on the remote server
- Building a set of management entities that you want to routinely manage on the remote server
- Checking and/or changing remote server settings including communications and storage options

Terminal Services Operational Considerations

The Terminal Services Client method of remotely managing systems is the only method if you are running Win95, Win 98, WinNT, or Unix on the local server. The Terminal Services Client also allows you to manage remote server MMC Console applications. Terminal Services Client is strongly recommended if you need to access the remote server through an Internet firewall. From an operational standpoint, Terminal Services Client is flexible and effective; it provides a variety of options so that it can meet the requirements of many different configurations.

To help determine whether using Terminal Services Client is an appropriate method for you to remotely manage other systems, review Figure 74 and the explanations that accompany it.

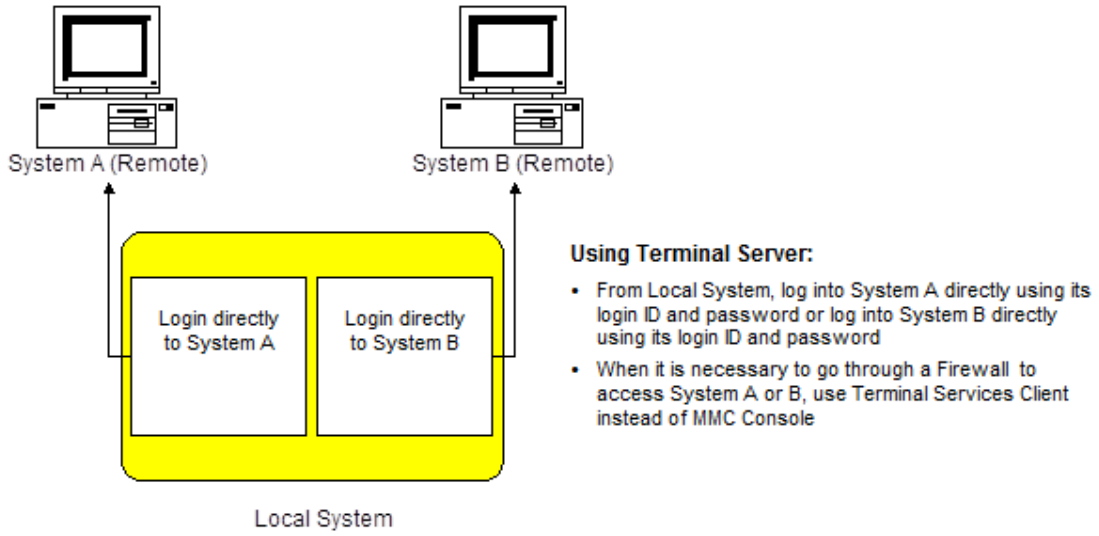


Figure 74: Remote management using Terminal Services Client

Figure 74 shows that from a local system that has a Terminal Services Client interface, you can log directly into a remote server by using its login ID and password. This is referred to as opening up a Terminal Services Client session. You may open up as many sessions as is practical.

In addition, Figure 74 notes that the Terminal Services Client method should be used if it is necessary to go through a firewall. This is because the Terminal Services Client uses a single TCP/IP port to gain access to the remote server.

Remote Desktop Configuration

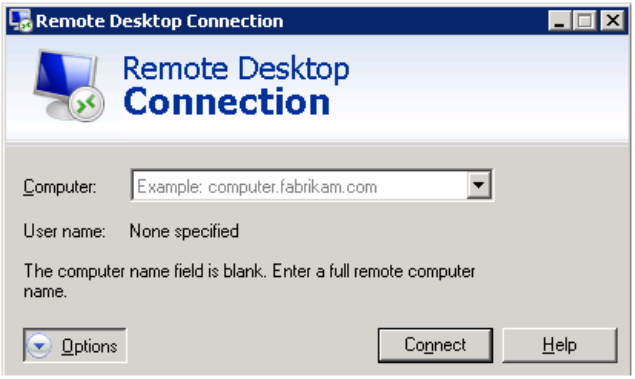
The following procedure describes how to set up a local server to manage Acuo services on a remote server using the Remote Desktop.

NOTE: The following procedure assumes that the Terminal Services Client is running on your local server and that a Terminal Services Service is running on the remote server.

Furthermore, in order to complete this procedure, you must know the username and password of the remote server that you want to log into and manage.

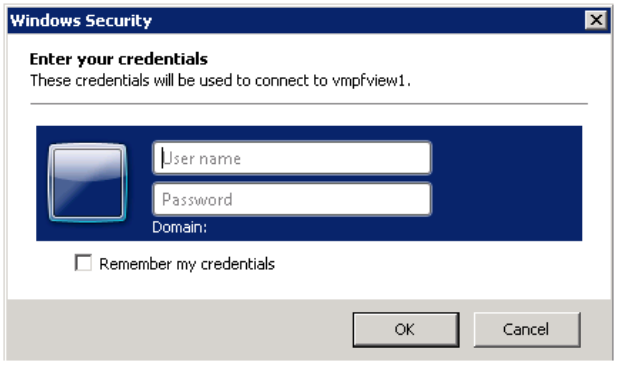
1. Open a Remote Desktop connection on your local server (via Run → MSTSC).

   The Remote Desktop Connection dialog displays:



2. Enter the name of the remote server to connect to and click **Connect**.

   The Log On to Windows dialog displays.



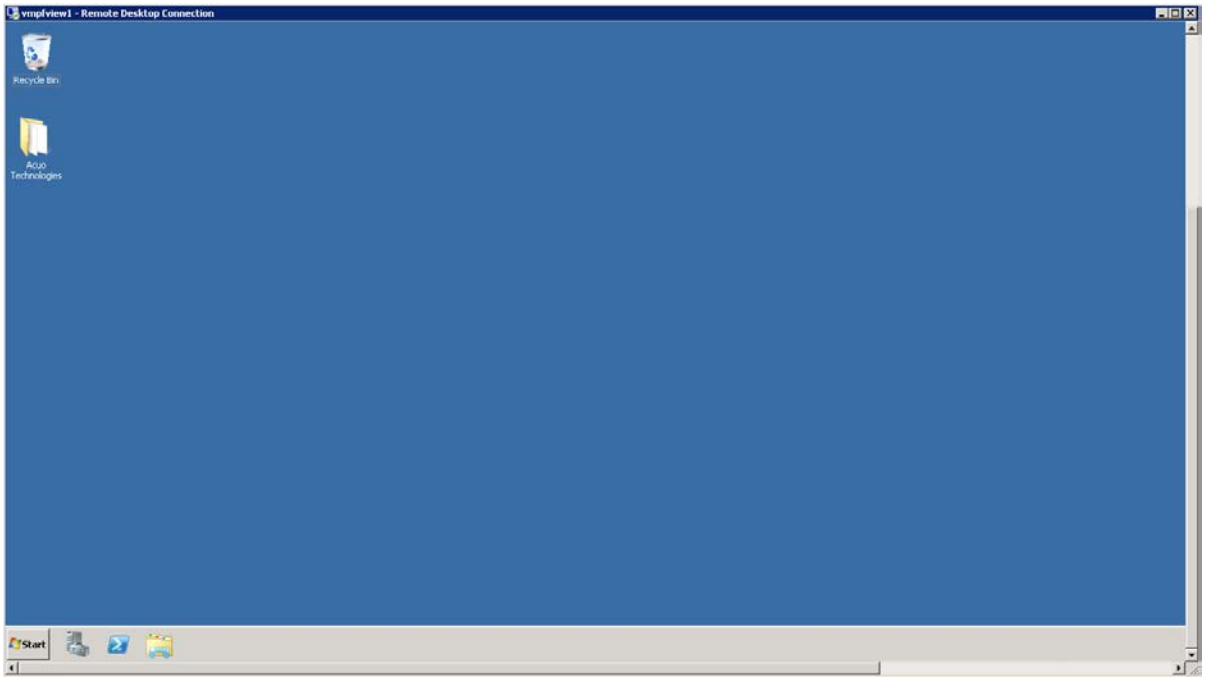
3. Enter the parameters for the server you want to manage.

   - Type the User name
   - Type the Password

   You are now ready to manage the remote (target) server.

4. On the target server you are remotely managing, open and use the applications needed to fulfill your business needs.

   The application interface of your choice displays.



Terminal Services Maintenance

Once you have set up a Terminal Services Client on a local server to manage a remote server there is little to do from a maintenance standpoint other than to carry out the tasks that are required to fulfill your business needs. Again, since you are actually logged into the remote server, you can perform any task on the remote server that you could do if you were physically sitting at the remote server.

Chapter 10 – System Backup and Recovery

In this chapter:

Overview

Backing up System Files and Databases

Disaster Recovery Planning and Practice

Overview

This chapter discusses the system backup and recovery considerations that users of Acuo Technologies' products should observe when making backup and recovery plans. The chapter is divided into two main topics:

- Backing up System Files and Databases
- Disaster Recovery Planning and Practice

The main goal of these topics is to help you, the Information Services Professional, integrate Acuo Technologies' products, and the images they are responsible for handling, into the system backup and recovery strategies and procedures you are already using for other mission-critical systems at your site. In other words, what is described below will give you the information necessary to handle Acuo Technologies' products safely and effectively, but it will not describe in a step-by-step manner how to perform the specific system backup and recovery procedures applicable at your site.

It is important not only that you have database maintenance processes and disaster recovery plans in place, but that you perform/practice these procedures on a regular basis.

However, while it does not describe how to perform system backups step-by-step, Acuo Technologies does recommend that when possible, you adopt the system backup principles outlined in at least one of the two configurations shown in Figure 75 and Figure 76.

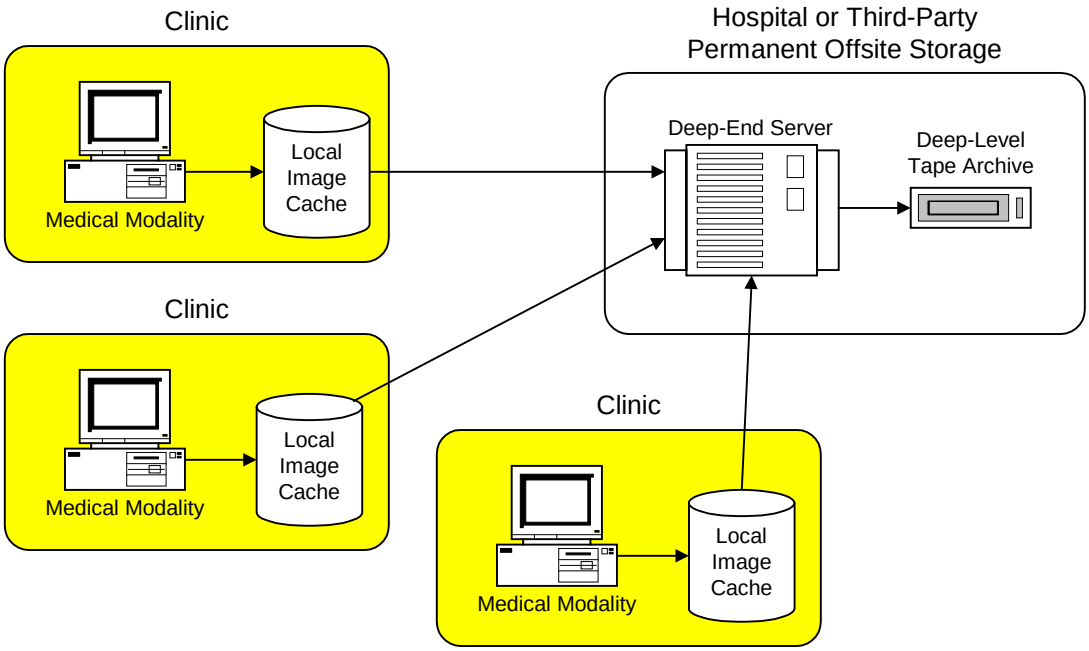


Figure 75: Temporal Server Model and Backups

Figure 75 shows a topology in which three clinics each have medical modalities and local image caches, but no deep-level tape archives. Instead, deep-level tape archive services are handled offsite at the centrally located, deep-end server. At the clinics, medical modalities save images to both the local image caches and the deep-end server at the same time. Later, in accordance with their temporal status, the local image caches prune (delete) images/studies after they have been stored for a preset amount of time. Finally, at the deep-end server, a complete set of all patients/studies/series/images is stored and incremental tape back-ups are conducted regularly.

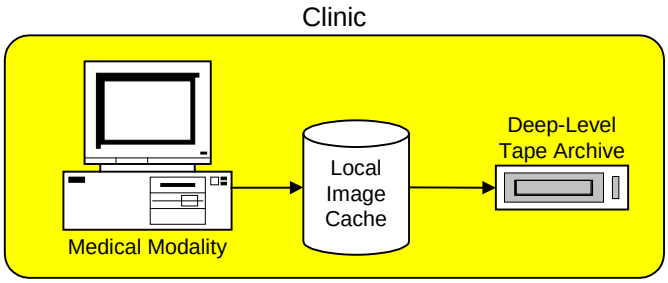


Figure 76: The Local Backup Archive

Figure 76, unlike Figure 75, shows that deep-level tape archive services can be handled onsite, or locally. In this scenario, care must be taken to ensure that incremental backups are conducted regularly as it is generally unlikely that this function will be handled automatically. In addition, it is often advisable to transport the tape backups to a secure, offsite location.

Lastly, note that the scenarios shown in Figure 75 and Figure 76 are only recommendations, and that in no way do they depict the only ways to handle system backups. On the contrary, your system and how you conduct backups will most likely vary. However, the common thread between both these scenarios is that for maximum security, Acuo Technologies recommends that you back up your images with a deep-level tape archive.

Backing up System Files and Databases

It is necessary to back up system files, databases, and assets:

- Windows and its system files including the Windows Registry file
- SQL databases and system log files
- HSM database (if using removable media through a third party HSM)
- AcuoMed DICOM database(s)
- AcuoMed Database
- AcuoStore Database
- Image (digital asset) files – backup all managed shares within AcuoStore

IMPORTANT: From the standpoint of Acuo Technologies' products, the key consideration to observe when backing up system files, databases, and image/digital asset files is the order in which you perform the backups. Refer to the procedure below for more information.

Backup order is critical to maintaining database integrity. To explain, when images come into the AcuoMed DICOM Database, the AcuoMed DICOM Database puts references to these assets into the AcuoStore Database automatically. So if the AcuoStore Database was being backed up before the AcuoMed DICOM Database, and items arriving in the AcuoMed DICOM Database while the AcuoStore Database was being backed up, there could be references in the AcuoMed DICOM Database to assets that were not in the backed up version of the AcuoStore Database.

NOTE: The topic following this one, *Disaster Recovery Planning* and Practice describes how to plan for a disaster such as a fire or other type of catastrophic event. In that topic, you will find references indicating that part of planning for a disaster is to carry out, on a scheduled basis, the numbered steps that follow in this procedure, *Backing up System Files and* Databases.

When backing up Acuo Technologies' system and database-related files, do so in the following order:

1. Backup Windows and its system files, including the Windows Registry file.

   To do this, follow the procedures found in Microsoft documentation for backing up these files.

2. If you are using removable media technology, back up the HSM database.

   Refer to the HSM documentation for specific procedures.

3. Backup the SQL databases and system log files.

   To do this, refer to the separate topic

Recommended *Acuo Maintenance* Plan.

4. Do an incremental backup of the image files.

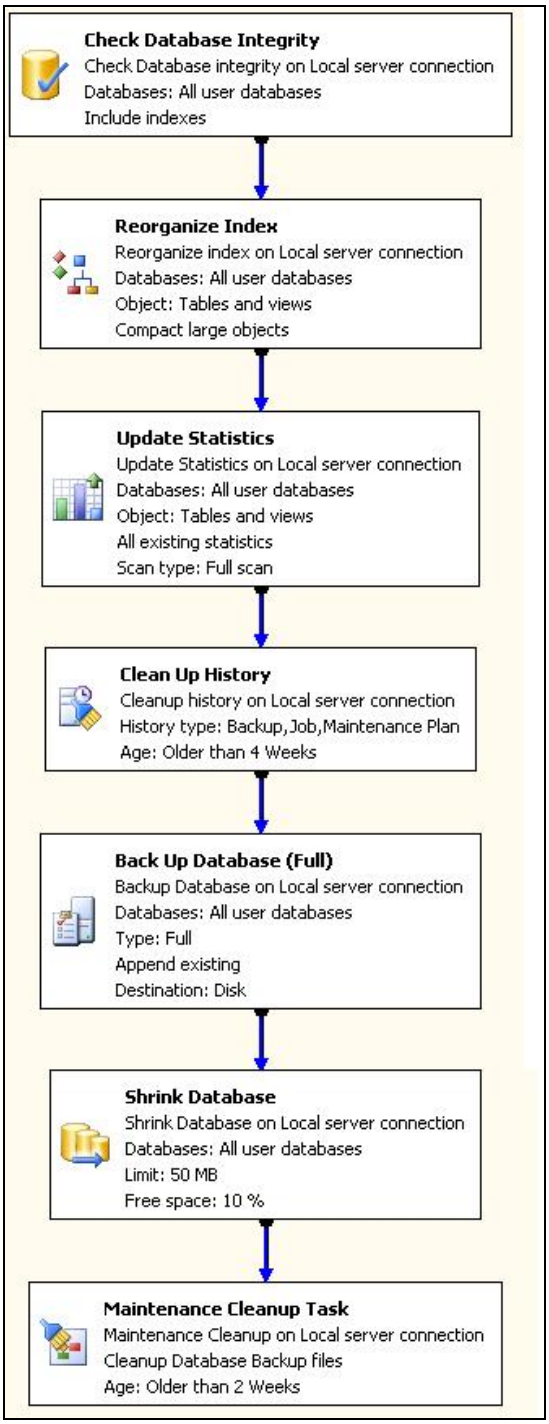
   To do this, use standard backup procedures. An incremental backup of image files lets you only backup new image files rather than backing up all your image files each time you make a tape backup.

5. Backup the Acuo Technologies installation directory.

   This is the directory where you installed your Acuo software. To do the backup, use standard backup procedures.

Recommended Acuo Maintenance Plan

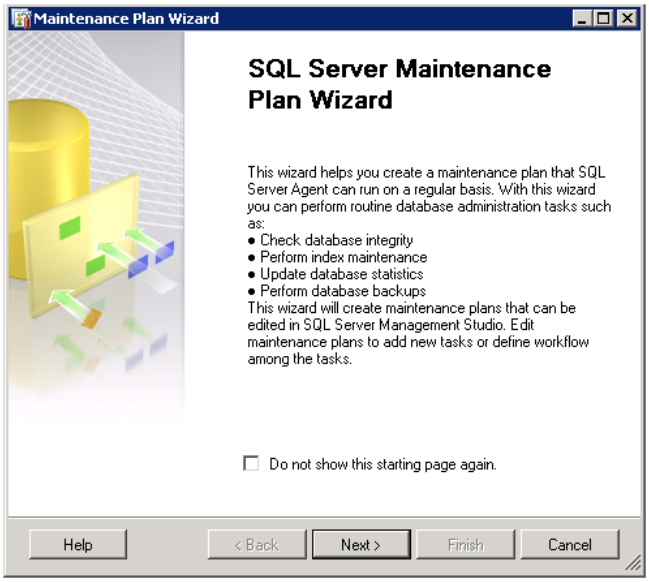
The following maintenance plan setup is recommended for a Microsoft SQL Server environment. Figure 79 is an overview of the Current Acuo Database Backup Plan.



AcuoMed and AcuoStore Database Backup Plans

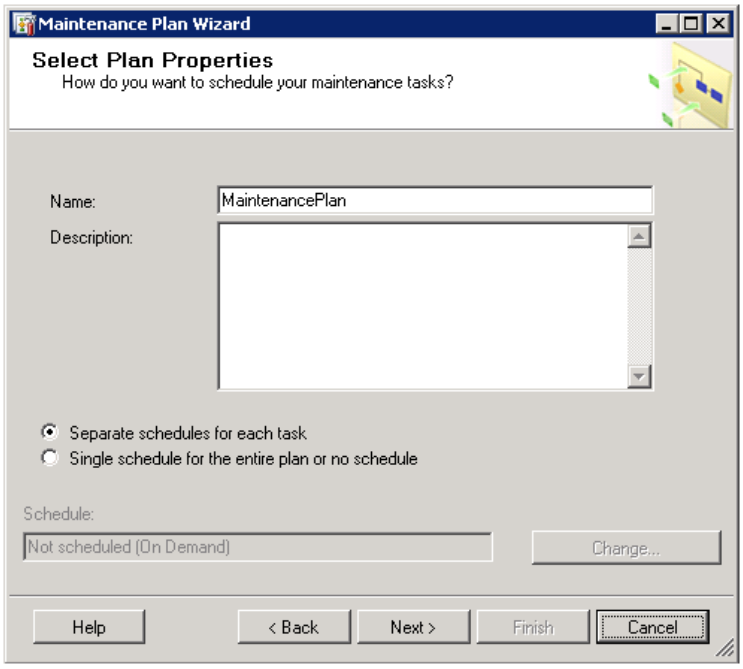
1. **Open "Enterprise Manager"**
   - Select <Start> <Programs> <Microsoft SQL Server> <SQL Server Management Studio>

2. **Create Acuo Database Maintenance Plan**
   - Select <Management> and <Maintenance Plan>
   - Right-click on <Maintenance Plans> and select <New Maintenance Plan…>
   - The "Welcome to the Database Maintenance Plan Wizard" window appears



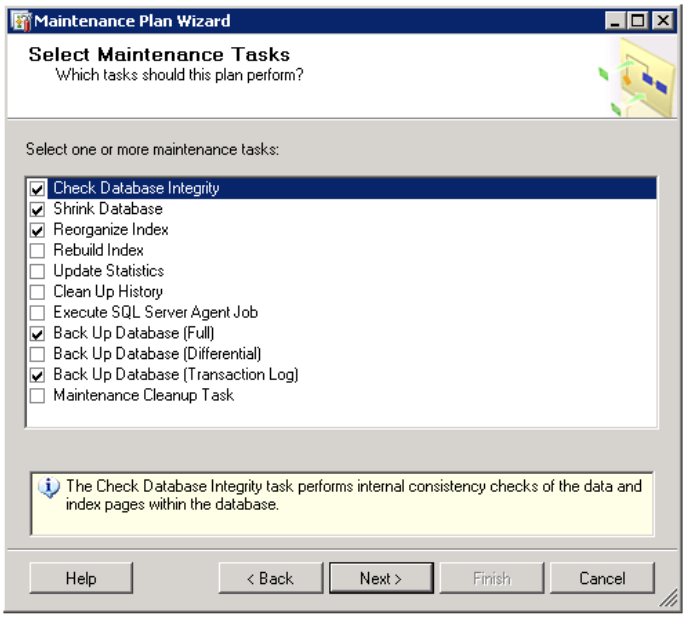
   - o Select <Next>

- The "Select Plan Properties" window appears



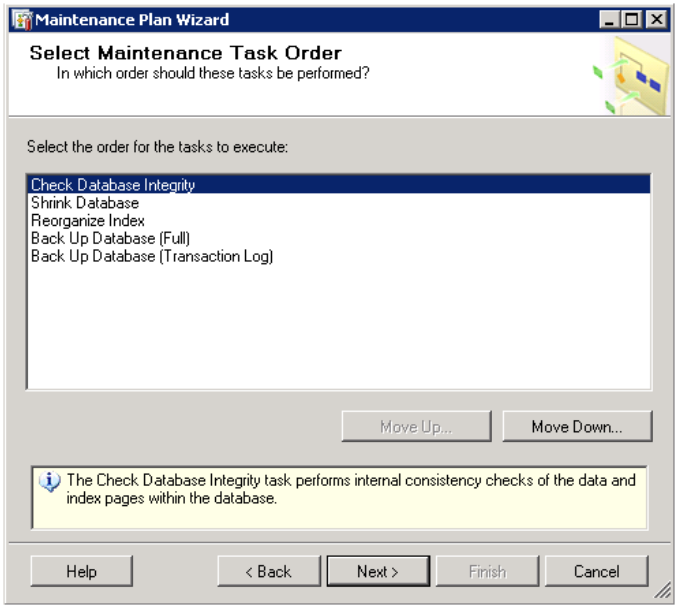
  - Provide Name and Description for Maintenance plan
  - Choose separate schedules for each task in the plan.
  - Select <Next>

- The "Select Maintenance Tasks" window appears



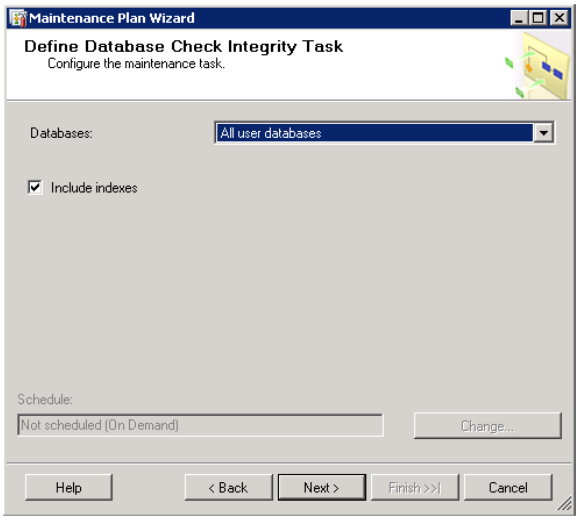
  - Select Shrink Database and Reorganize Database
  - Select <Next>

- The "Select Maintenance Task Order" window appears



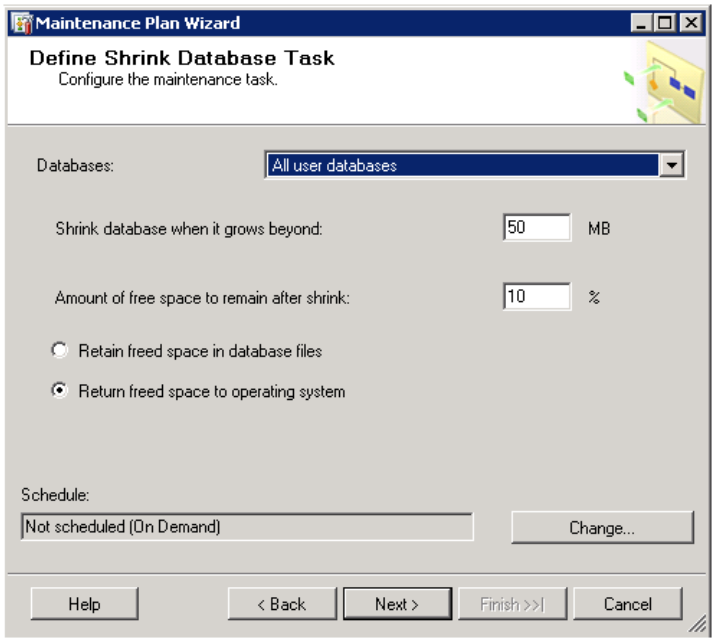
- Select <Next>

- The "Define Database Integrity Task" window appears

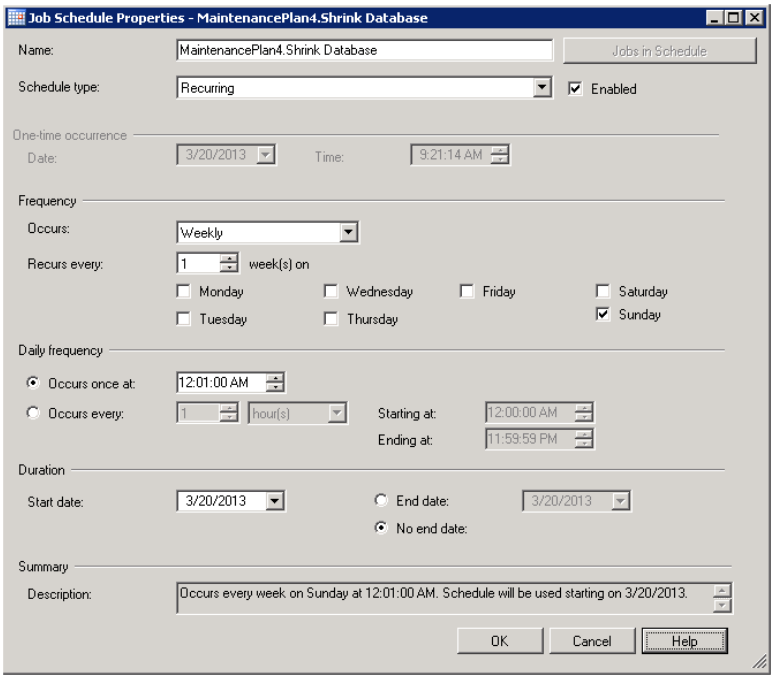


- Select All user databases
- Select <Next>

- The "Define Shrink Database Task" window appears

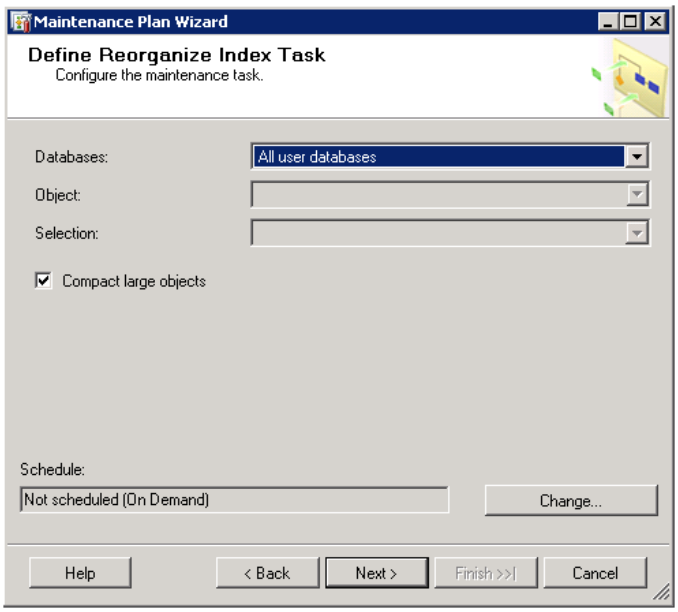


- Select All user databases
- "When it grows beyond" <50 MB>
- "Amount of free space to remain after shrink" <10%>
- Select <Change>

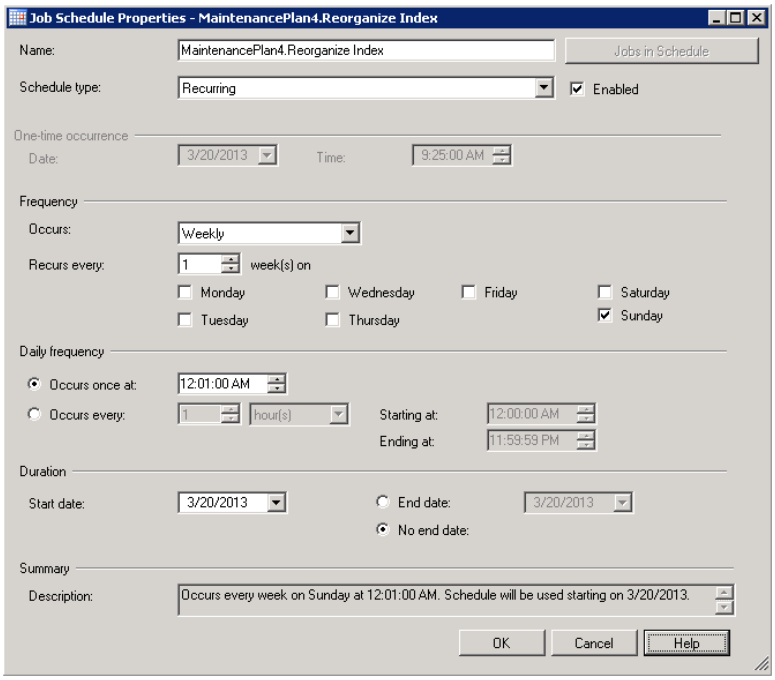


- Set Job Schedule Properties
- Select <OK>
- Select <Next>

- The "Define Reorganize Database Task" window appears.

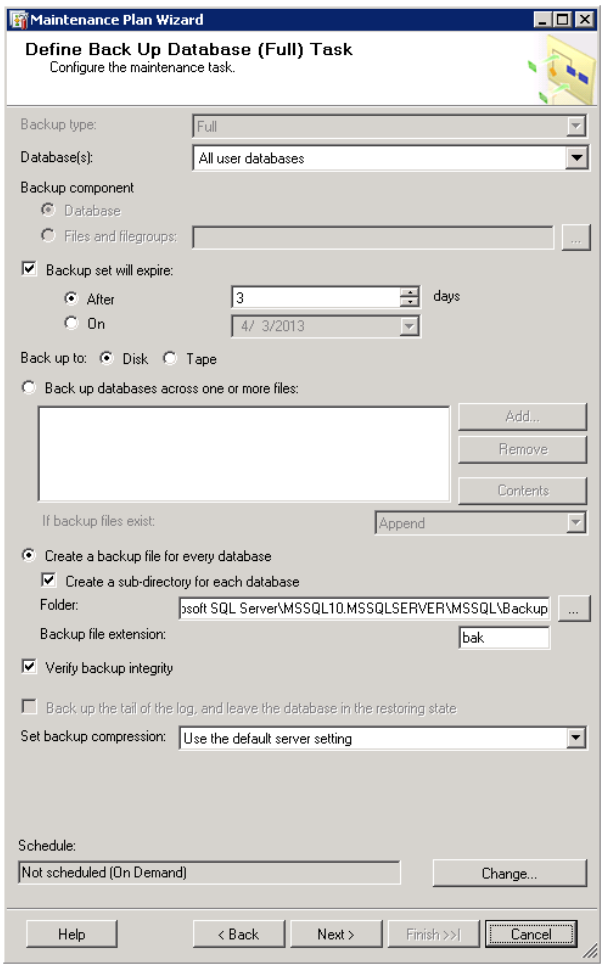


- Select All user databases
- Select <Change>



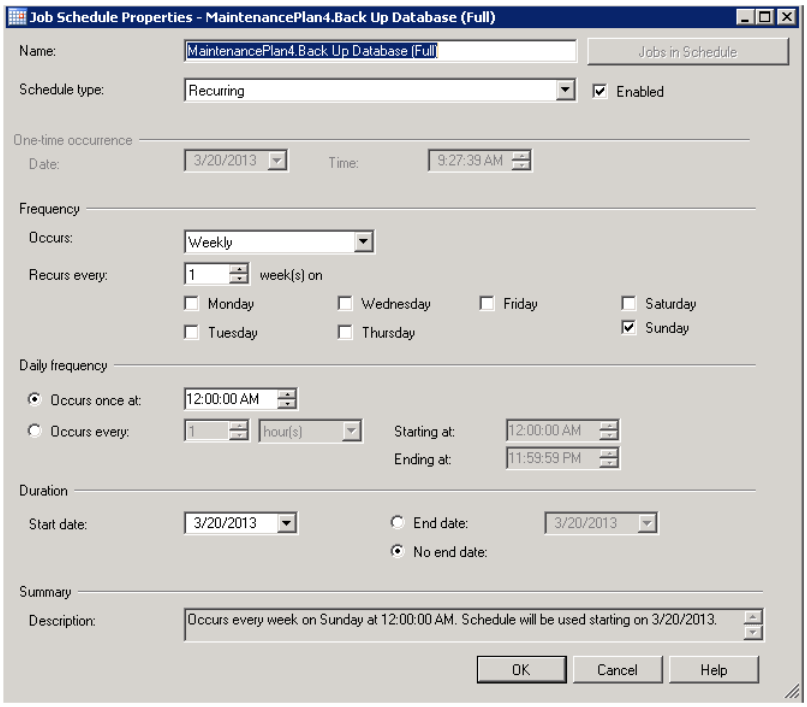
- Set Job Schedule Properties
- Select <OK>
- Select <Next>

- The “Define Back Up Database (Full) Task” window appears.



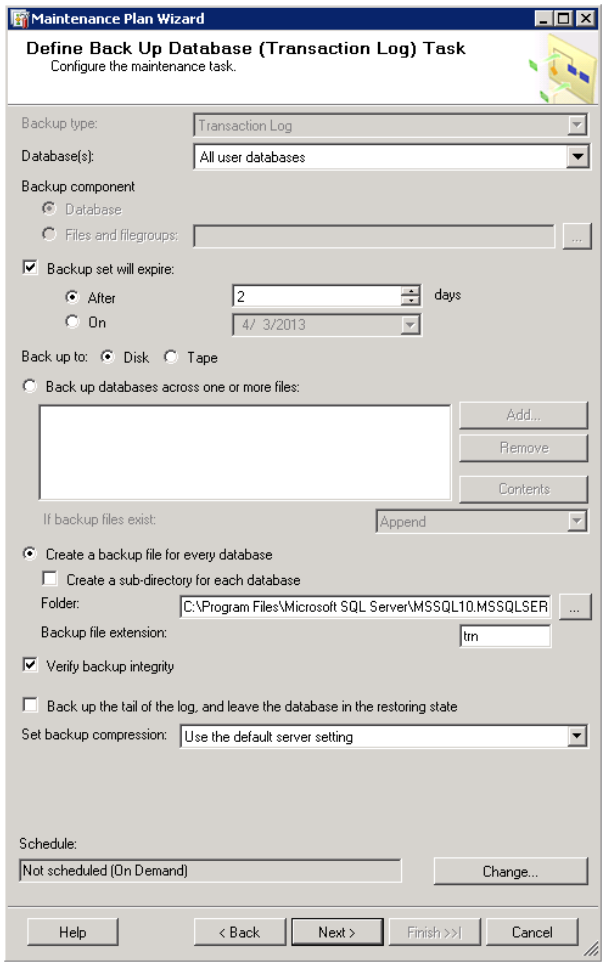
- Select All user databases
- Select Back up to "Disk" or "Tape"
- Choose location for backup files to be placed for each database.
  - Should be on different disk than OS
  - Should be on different disk than Databases and Transaction Logs
  - Should have 50 GB free space
- Check "Verify backup Integrity" (optional)
  - Positive – Increase the probability of a good database backup
  - Negative – Database backup time is doubled

- Select <Change>

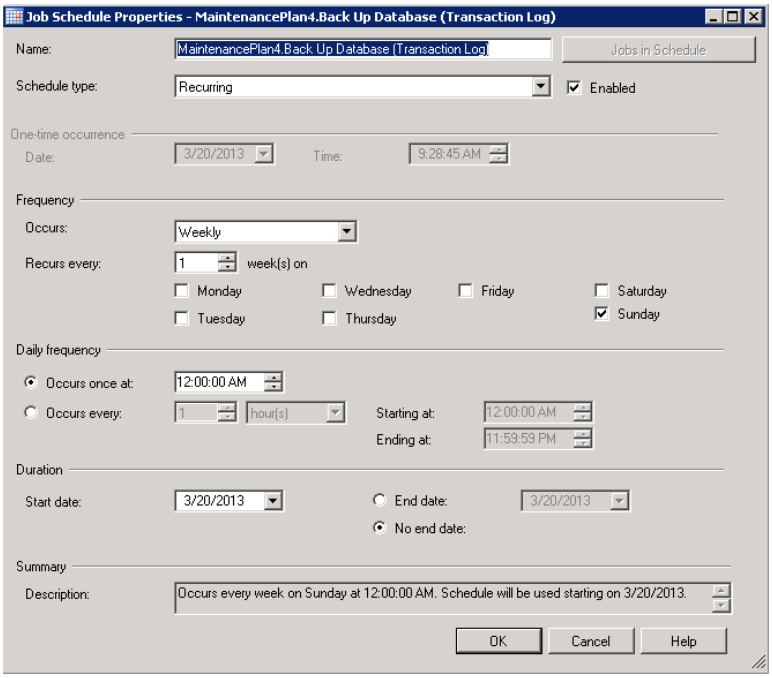


- Set Job Schedule Properties
- Select <OK>
- Select <Next>

- The "Define Back Up Database (Transaction Log) Task" window appears.

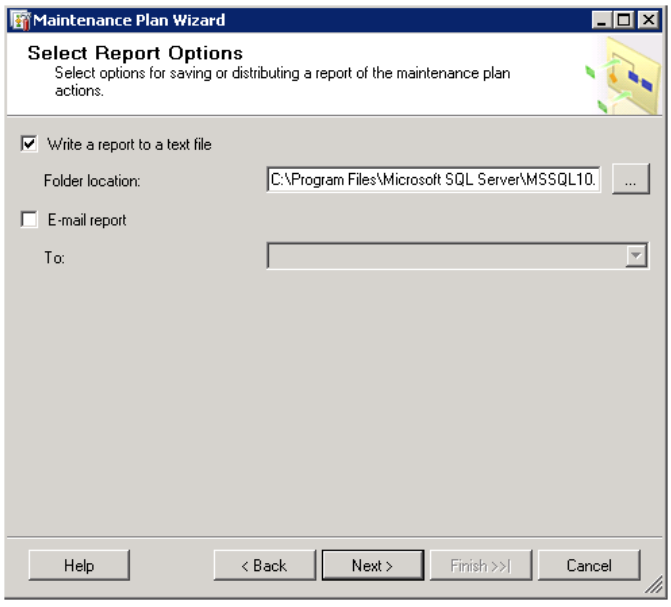


  - Select All user databases
  - Select Back up to "Disk" or "Tape"
  - Choose location for backup files to be placed for each database.
    - Select a location for the backup files
    - Should be on different disk than OS
    - Should be on different disk than Databases and Transaction Logs
    - Should have 50 GB free space
  - Select <Create a subdirectory for each database>
  - Check "Verify backup Integrity" (optional)
    - Positive – Increase the probability of a good database backup
    - Negative – Database backup time is doubled
  - Select <Change>



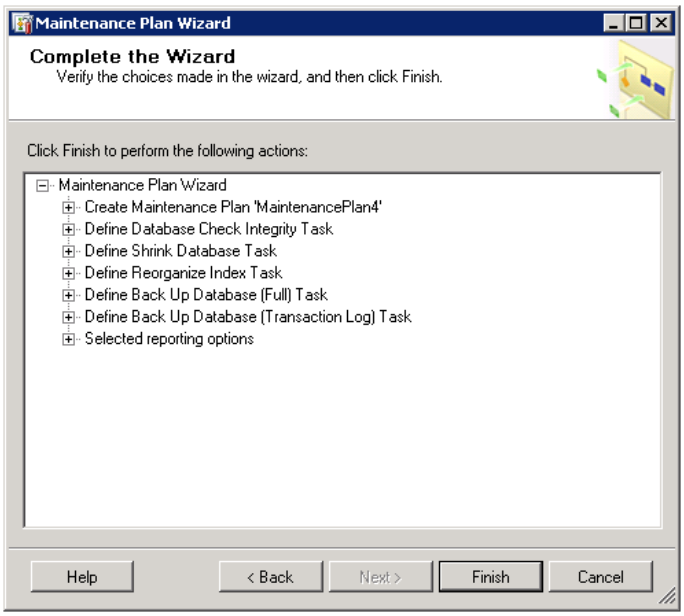
- Set Job Schedule Properties
- Select <OK>
- Select <Next>

- The "Select Report Options" window appears.



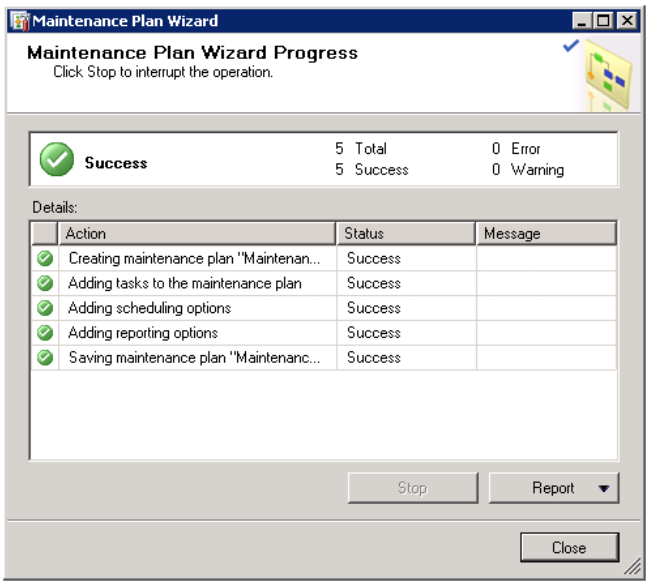
- Choose Folder Location
  - Should be on different disk than OS
  - Should be on different disk than Databases and Transaction Logs
  - Should have 50 GB free space
- Select <Next>

- The "Complete the Wizard" window appears



- Select <Finish>

- The "Maintenance Plan Wizard Progress" window appears



- Select <Close>

It is important not only that you have database maintenance processes and disaster recovery plans in place, but that you perform/practice these procedures on a regular basis.

Acuo Technologies recommends that you adopt system backup principles outlined by Microsoft:

http://msdn.microsoft.com/en-us/library/ms187048(v=sql.105).aspx

HSM Operations

It is recommended that you use the copying facilities of HSM to create onsite and offsite backups of your digital assets. You can set up a job that automatically makes up to three copies of a tape:

- One copy remains in the tape jukebox
- One copy is ejected for onsite backup
- One copy is ejected for offsite backup

Refer to appropriate HSM information for backup and recovery procedures.

Disaster Recovery Planning and Practice

If some type of catastrophic event should happen in which you lose data, you should have a Disaster Recovery Plan in place that lets you recover your mission-critical business data and resume operations as quickly as possible. Therefore, drafting such a plan should be a priority if you do not already have a plan in place. Otherwise, if you have already implemented a plan, you should now consider updating it to reflect the addition of your Acuo Technologies implementation.

IMPORTANT: It is critical that you not only have a disaster recovery plan, but that you practice it to ensure that all people involved knows their roles and that the plan is thoroughly tested and provides the required results.

First off, other than the order in which you should conduct backups as described in the previous topic, there are no particular things that you should consider with regard to disaster recovery planning that do not already apply to all Windows Server and most database applications. Therefore, Microsoft documentation on this subject, particularly topics in online help under *disaster recovery*, are applicable to your needs in this area.

However, so that you may have immediate access to disaster planning-related information, some key points for consideration are discussed below. These points should let you consider some of the more critical areas relative to Acuo Technologies' products. However, remember that these are just sample points. You must consider them on the basis of your own environment or in the context of your own recovery plans, and decide how to integrate them into your plans by modifying them accordingly.

Caution

The procedures that follow in this chapter are guidelines for implementing disaster recovery. Use these general guidelines as a starting point for drafting a detailed and comprehensive disaster recovery plan that applies to your site and overall business requirements.

General Planning Considerations

Generally, a Disaster Recovery Plan should include the following:

- How long will it take to recover data and, once this is done, what state can users expect data to be in? For example, the plan might state that recovery will take 24 hours and that users can expect no more than five days' worth of data to be recovered and guaranteed.
- Who should be contacted in the event of a failure, and how should they be contacted (by phone, e-mail, pager, etc.)?
- Where should new hardware be obtained, if needed?
- Who is responsible for the plan?
- When was the plan last tested and how well did it perform? If there were failures during regular testing, or stress testing, were those failures addressed and, if so, were they re-tested? What were the results of those tests?
- Is management informed about the Disaster Recovery Plan and its specifications? Can stress and other kinds of testing substantiate the specifications?

Systems That Can Be Shut Down

To be prepared for a disaster, the following plan could apply to systems that you can shut down — that is, systems which do not need to operate continuously (24 hours a day).

1. Shut down your server, and complete all the steps noted in the previous topic, *Backing up System Files and* Databases.
2. Determine if there are functionality scripts that can be run to quickly find out if the system is functioning at minimal levels.
3. Consider performing database and transaction log backups during the day to minimize the amount of data you could lose during a day.

To recover data after some kind of disaster has happened, follow these steps:

1. Obtain suitable replacement hardware (if required).
2. Install your Windows operating system with appropriate service packs.
3. Install your server software and its appropriate service packs.
4. Confirm that Windows and your server are operating properly.
5. Halt your server's operation.
6. Install your AcuoStore and AcuoMed systems in the same place you were originally running them.
7. Restore all Acuo databases to their original locations.
8. Start server operation.
9. Load any available transaction or database logs.
10. If you have a functionality script, run it to ensure that the system is running properly.
11. If all systems check out okay, allow users back onto the system.

Systems That Cannot Be Shut Down

To be prepared for a disaster, the following plan could apply to systems that you cannot shut down — that is, systems which operate continuously (7 days a week, 24 hours a day).

1. When you can, back up all transaction and system logs and databases to another computer and to a deep-level tape archive.
2. Keep a record of where all your server and system files are located, as well as the service packs installed and any special database options.
3. If possible, create functionality scripts that let you quickly determine whether your databases are functioning properly without having to seek end-user verification.

To recover data after some kind of disaster has happened, follow these steps:

1. Obtain suitable replacement hardware (if required).
2. Install your Windows operating system with appropriate service packs.
3. Install your server software and its appropriate service packs.
4. Confirm that Windows and your server are operating properly.
5. Halt your server's operation.
6. Install your AcuoStore and AcuoMed systems in the same place you were originally running them.
7. Restore all Acuo databases and transaction logs from dumped files as appropriate.
8. Start server operation.
9. Load any other available transaction or database logs.
10. If you have a functionality script, run it to ensure that the system is running properly.
11. If all systems check out okay, allow users back onto the system.

Chapter 11 – Advanced Functionality

In this chapter:

XDS-I

C-Moves and Routes

Filter Moves by Target

Postfetch Functionality

Relevancy Filtering

Database Retention/Purge Policies

Soundex Support

XDS-I

Introduction

XDS-I, Cross-Enterprise Document Sharing for Imaging, extends XDS to share images, diagnostic reports and related information across an enterprise of care sites. It provides a solution for publishing, querying and retrieving image assets across a group of affiliated enterprises.

Acuo XDS-I Actor Configuration

This section will guide you through the configuration options added in 6.0 used to setup XDS-I sources and consumers within the Acuo VNA.

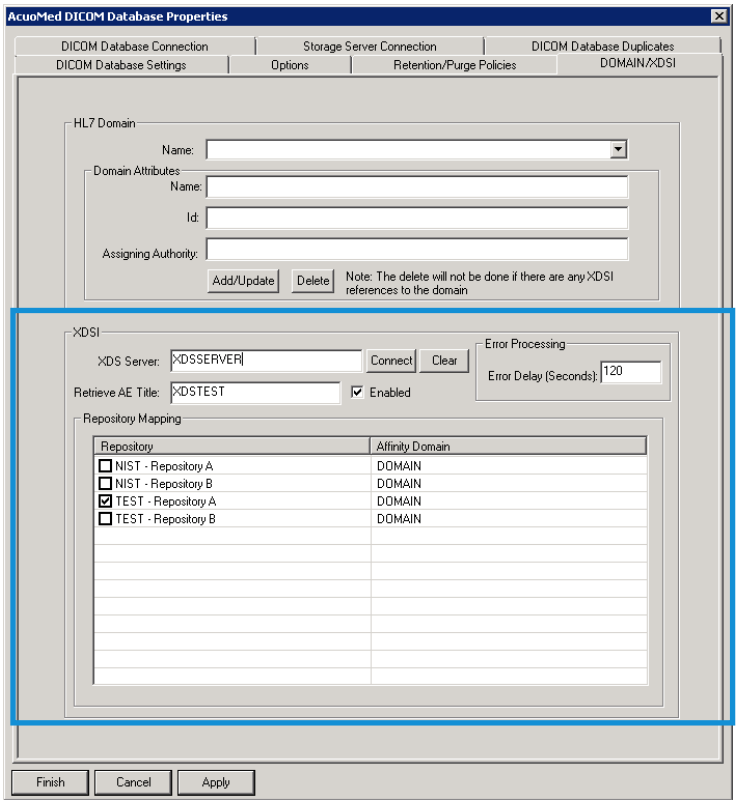
Acuo XDS-I Sources

The responsibility of the Acuo XDS-I Document Source is to submit Full Study DICOM manifest submission sets to the Affinity Domain. The source is also responsible for providing the mechanisms for retrieving DICOM images from requesting XDS-I Document Consumers. The two retrieval mechanisms are WADO and DICOM retrieve.

In the Acuo VNA there are three triggering mechanisms in place that initiate the submission of a Study Level Manifest to XDS. The three areas where triggering mechanisms can be configured are DICOM Database, Called AE and/or Patient Management. Each will be discussed in more detail below.

AcuoMed DICOM Database

A new property page has been created to configure XDS-I for a DICOM database. This tab now appears on the AcuoMed DICOM Database Properties page as shown in the screenshot below.



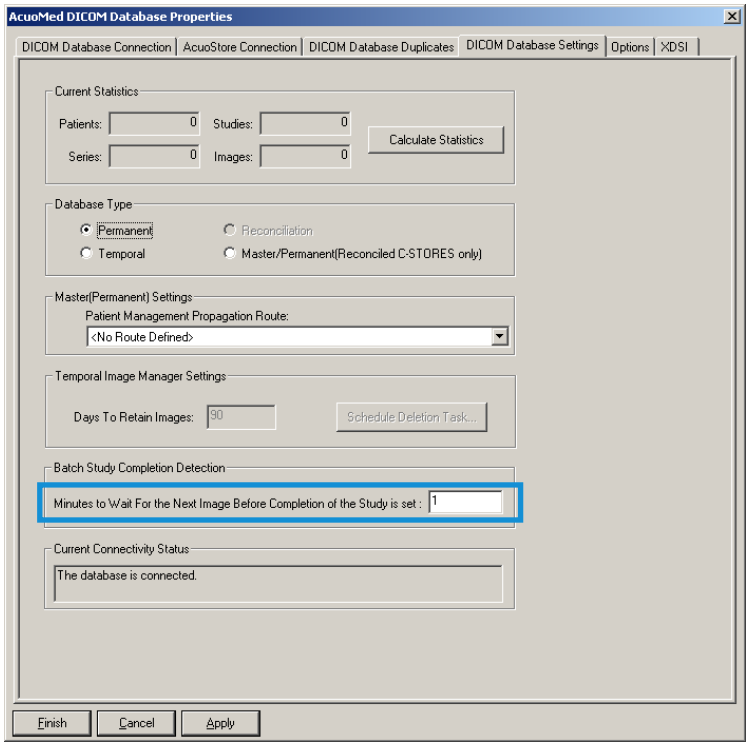
DICOM Database – XDS-I Configuration Settings

Domain/XDS-I Tab

- **XDS Server** – The XDS Server is the Server where the XDS Service is running. The connect button connects the user to the XDS Server. If the XDS Server is not available all fields will be disabled. The clear button will clear the XDS-I support for this DB.
- **Retrieve AE Title** – The Retrieve AE Title is set in the manifest for every study submitted to this resource. An XDS-I image document source uses this to map back to the images with either a WADO or DICOM retrieve.
- **Enabled** – The enabled button enables/disables manifest submissions to the repository.
- **Error Delay** – The Error Delay is used to tell the Batch Study Manager the duration to wait for retries when errors are detected submitting request to the XDS-I processor. The valid range for the time is 120 to 216000 seconds).
- **HL7 Domain** – The HL7 Domain identification fields attach this resource to a specific HL7 domain. The ID is the HL7 identification within the HL7 domain. The Assigning Authority is the Authority that is used to assign the ID. Within XDS, the assigning authority is ISO.
- **Repository Mapping** - The Repository Mapping is used to select repositories that a Manifest will be submitted to for this specific resource. For example, if a study arrives for this database then the XDS-I manifest will be submitted to all the selected repositories. (in the example above, the repository labeled "TEST – Repository A" is enabled.)

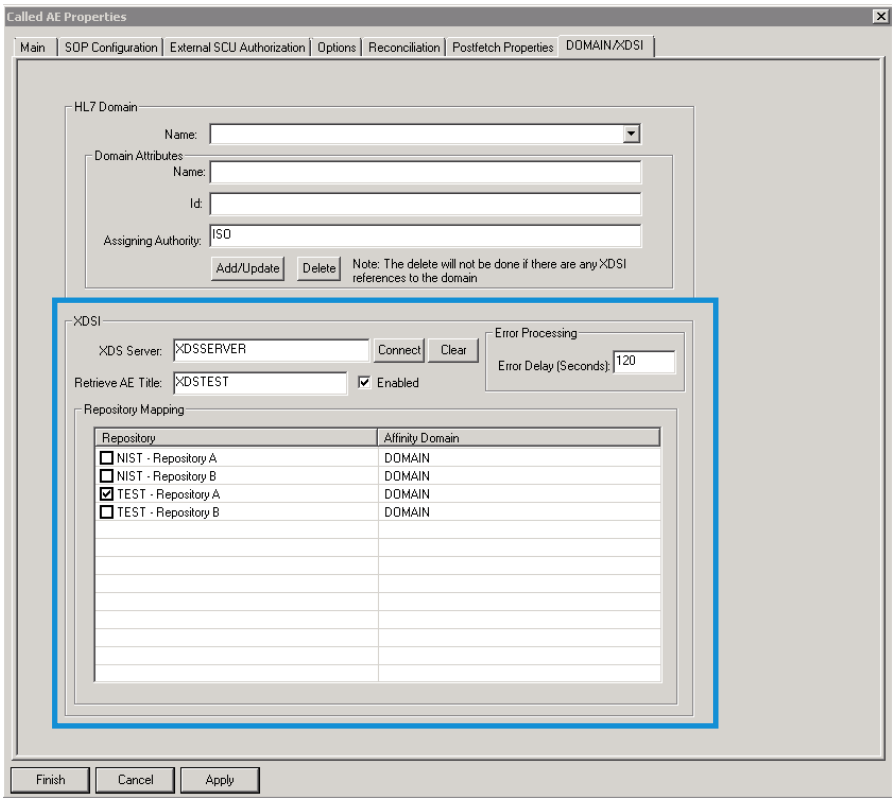
DICOM Database Settings Tab

Within the DICOM Database Settings tab, the "Minutes to Wait for the Next Image Before Completion of the Study is set" option can be configured. The use of this setting is not limited to XDS-I implementations therefore has been segregated from the DOMAIN/XDS-I tab.



Called AE

A new property page has been created to configure XDS-I for a Called AE. This tab now appears on the Called AE Properties page as shown in the screenshot below.



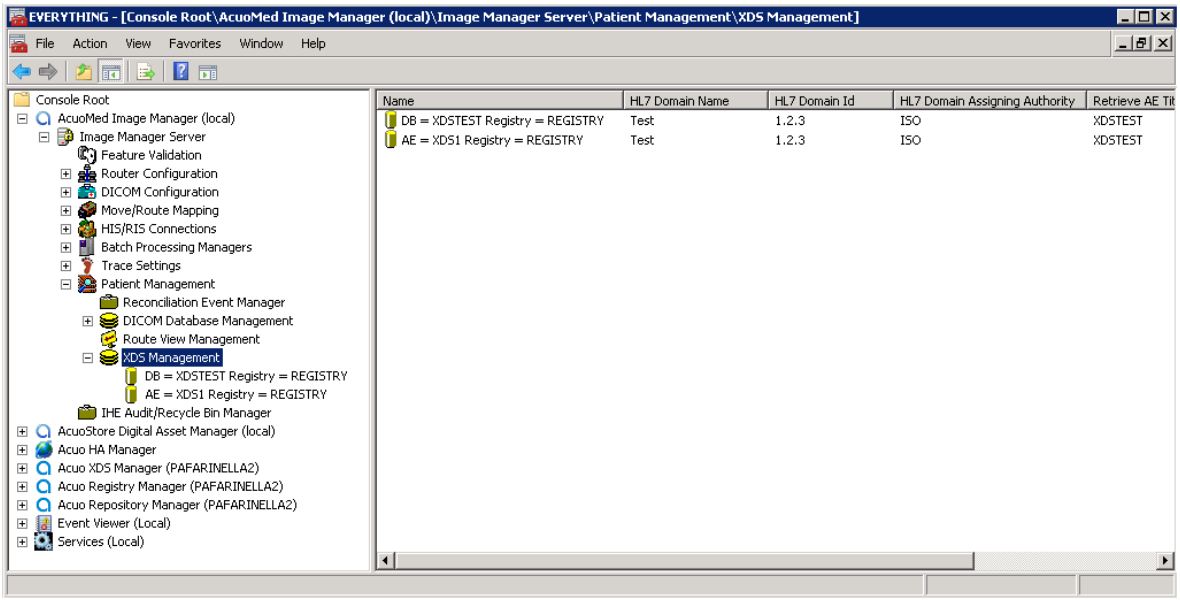
Called AE – XDS-I Configuration Settings

Domain/XDS-I Tab

- **XDS Server** – The XDS Server is the Server where the XSD Service is running. The connect button connects the user to the XDS Server. If the XDS Server is not available all fields will be disabled. The clear button will clear the XDS-I support for this DB.
- **Retrieve AE Title** – The Retrieve AE Title is set in the manifest for every study submitted to this resource. An XDS-I image document source uses this to map back to the images with either a WADO or DICOM retrieve.
- **Enabled** – The enabled button enables/disables manifest submissions to the repository.
- **Error Delay** – The Error Delay is used to tell the Batch Study Manager the duration to wait for retries when errors are detected submitting request to the XDS-I processor. The valid range for the time is 120 to 216000 seconds).
- **HL7 Domain** – The HL7 Domain identification fields attach this resource to a specific HL7 domain. The ID is the HL7 identification within the HL7 domain. The Assigning Authority is the Authority that is used to assign the ID. Within XDS, the assigning authority is ISO.
- **Repository Mapping** - The Repository Mapping is used to select repositories that a Manifest will be submitted to for this specific resource. For example, if a study arrives for this database then the XDS-I manifest will be submitted to all the selected repositories. (the repository labeled "TEST – Repository A" is enabled.)

Patient Management – XDS Management GUI

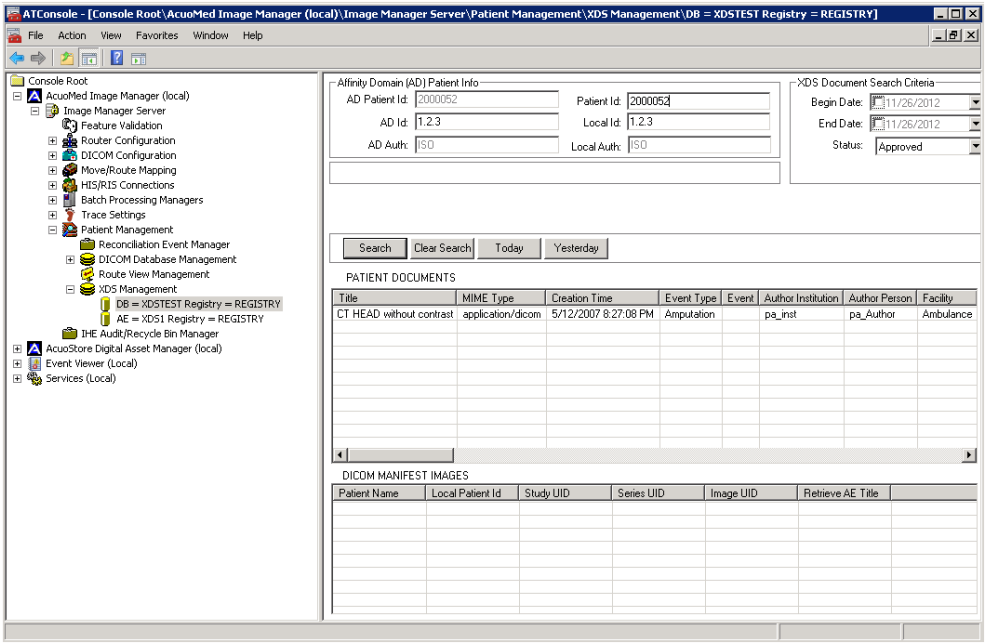
The XDS Management Node in Patient Management is an XDS-I consumer. Each configured Acuo resource (DICOM DB or Called AE) will be managed separately. The XDS Manager will display a list of all the AcuoMed resources defined to a particular XDS Affinity Domain Registry.



The screenshot above shows two Acuo resources attached to XDS Affinity Domains Registries. One is an AE configured to the XDS1 Registry. The other is a DICOM database configured to the XDSTEST Registry.

Registry Queries

All registry queries require the Global Patient ID for the Query. The Global Patient ID can be obtained by querying the MPI with a Patient Identity Query (PIX Query) or by using PDQ (Patient Demographics Query). The methods are described below.



The above screen shows the results of a search of the XDSTEST Registry for the global Patient Id "2000052" in the global affinity domain "1.2.3". In this example the global affinity domain Id is the same as the local Patient domain, so there is no need for an MPI (Master Patient Index) to do the global Patient Id lookup.

The Patient Information list box shows all the documents found in the registry for Patient Id "2000052". It shows 1 manifest document submitted for this patient.

The following steps describe the normal use of this screen.

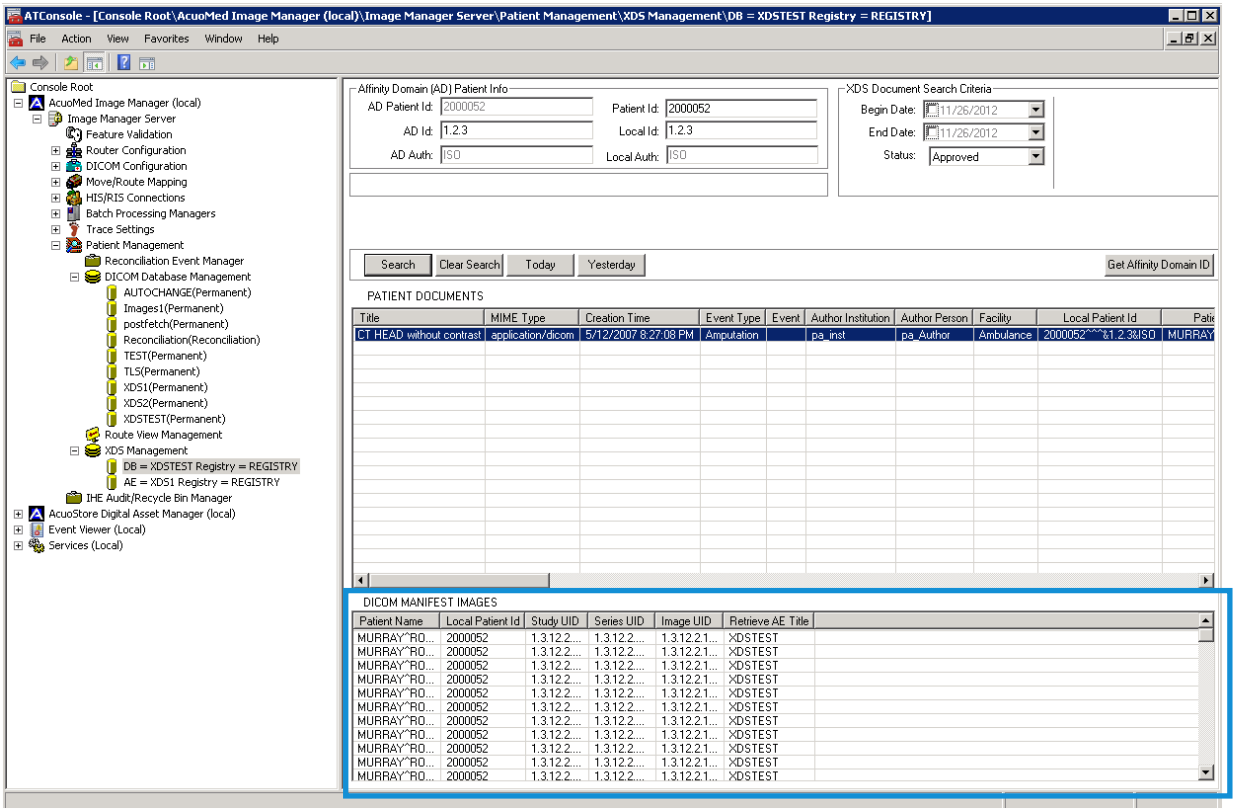
- Type in the local Patient Id.
- Select the "Get Affinity Domain ID" button to do the MPI lookup to obtain the global Patient Id within the Affinity domain.
- Select the "Search" button to search the registry for the documents associated with this patient.

Listed below are other querying options that can be used:

- PDQ Query – This option will appear if the Affinity Domain supports the PDQ (Patient Demographic Query) transaction. The button (not shown in screenshot above) will open a dialog to type in Patient Demographic information to find both the local Patient ID and the Global Patient ID for the desired patient. The dialog is described in the PDQ Support section of this document.
- XDS Document Search Criteria
    - End/Begin Date can be used to limit the scope of the search.
    - Status can be used to search for Approved/Deprecated/All Document.
- Clear Search – clears all the search data
- Today – sets the Begin/End date range to today's date.
- Yesterday – sets the Being/End date range to Yesterday's date.

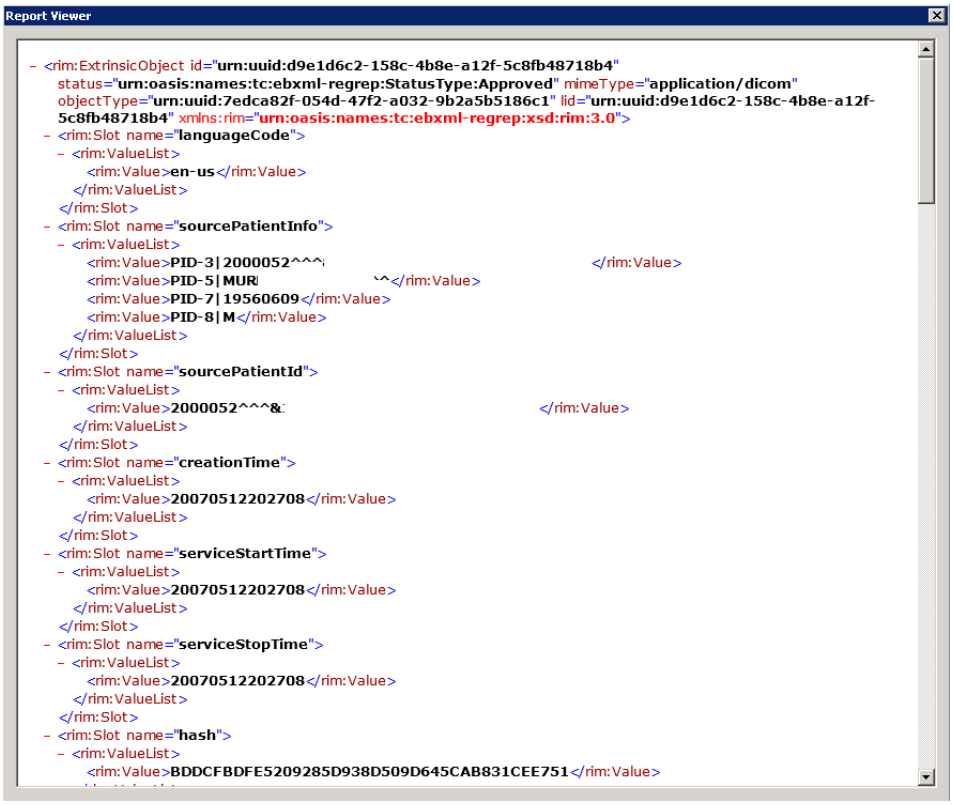
Retrieve DICOM Manifests

The DICOM manifest images show the images defined within the manifest selected from the Patient Information screen. Right-click on a manifest and select “Get DICOM Manifest” to retrieve. The retrieved DICOM Manifest images will be displayed in the DICOM MANIFEST IMAGES section highlighted below.



View Document Query Response

The Document Query Response can be viewed by Right-Clicking on a manifest and selecting “View the Document Query Response”

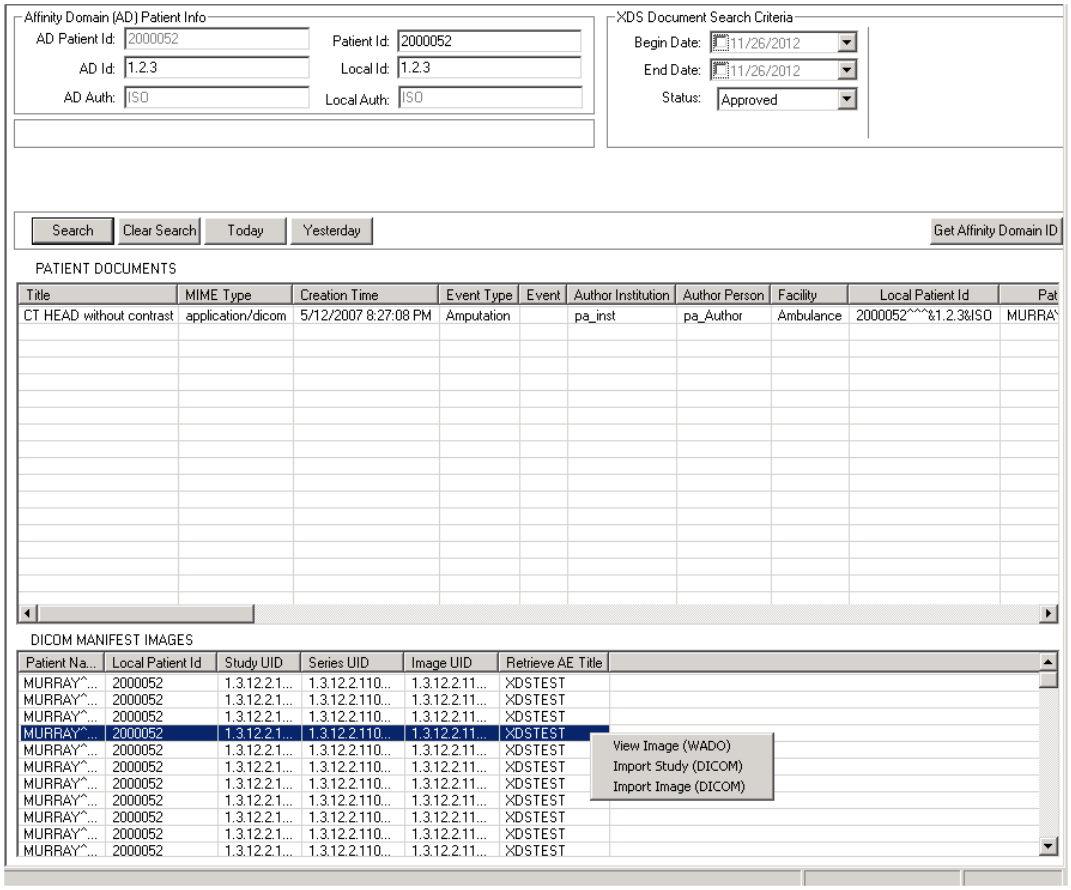


A browser view of the query response for the selected document is shown. This would be used for debugging purposes.

Retrieve Images

To retrieve images, select an image from the DICOM MANIFEST IMAGES list box and right-click the image. This will present the following menu options based on the "Retrieve AE Title' XDS configuration. Please see the section below on AE Title Mappings for more information on how and where these are configured.

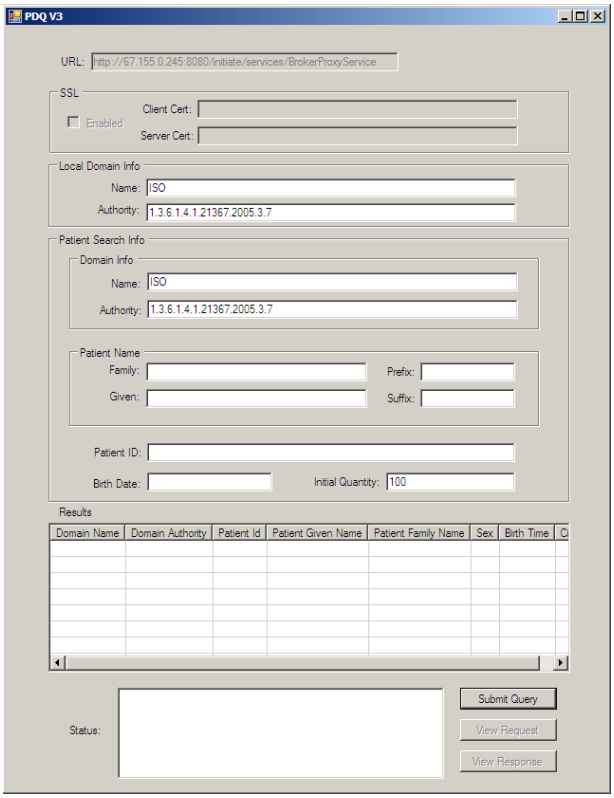
- **View Image (WADO)** - Selecting the View Image (WADO) menu item will present a JPEG view of the image in a browser if it can be rendered as JPEG.
- **Import Study (DICOM)** - Selecting DICOM Import Study option will generate a Batch Move job based on the XDS configuration for this AE Title Mapping.
- **Import Image (DICOM)** - Selecting DICOM Import Study option will generate a Batch Move job based on the XDS configuration for this AE Title Mapping.



NOTE - If no Retrieve AE Title configuration is available the following message will appear: *The Retrieve AE Title (XDSTEST) is not mapped to a target AE. Check the AE Title Mapping Configuration.*

PDQ (Patient Demographic Query) Support

If the Affinity Domain is configured for PDQ support then the "PDQ Query" button will become visible on the XDS Management screen. Use this feature to obtain the Patient's local and global Ids.



The PDQ query screen allows searching for the Patient Ids by name, local Id, or birth date.

Once the results are obtained highlight the desired Patient Id and "X" out of the screen to pass the Ids back to the XDS Patient Management Search screen.

The "View Request" and "View Response" buttons are present for debugging purposes. The status screen will show any problems with the query on failure. If it is successful it will tell you the number of results received.

C-Moves and Routes

This section describes the operation of the Move process as of the 5.3.1 Release. It gives a detailed overview of the C-Move operation in AcuoMed, and also covers details regarding configuration and functionality of Routes.

Dicom C-Move

- Sent to an AE capable of performing the move operation.
- Identifies the Query/Retrieve level (i.e. move level) of the move object.
- Identifies one or more objects which are the subjects of the move:
    - Patient ID
    - Study UID
    - Series UID
    - Image UID (i.e. SOP Instance UID)
- Identifies the Target AE (i.e. where to send the data).

The Syntax of a Move operation can be viewed as follows:

Move <Move_Subject> from <Source_Route> to <Target_AEName>

➔ Move_Subject is the object to be moved; i.e. a Patient, Study, Series, or Image.
➔ Source_Route is the set of AEs to be searched for the objects to be moved.
➔ TargetAEName is the identifier of the route (via Move/Route Mapping) that identifies a set of destinations to receive the images being moved.

Routes

The DICOM model has no concept of, nor term for, a route. The route is an Acuo construct which is used to aggregate multiple AEs (i.e. destinations, or dests for short) providing for movement of data between the following AE relationships from a single C-Move command:

- One to one
- One to N
- N to One
- N to N

Acuo associates AEs with routes in two ways:

- The AE which receives the incoming DICOM C-Move command is configured with a default route. This route serves as the source route of the Move.
- The Move Route Mapping Table also associates AE names with Routes. These routes are used as target routes as they are associated with Move Target AE names.

NOTE: The same route can be configured as a source route (associated with a Dicom AE name) and a target route (associated with a move target AE Name in the Move Route Mapping Table) although not for the same move instance.

Route Destinations

Each route has one or more destinations (or Dests) which can be:

- All local DBs
- All External AE Names
- A mix of both local DBs and External AE Names

Each destination on a route is configured to support the following DICOM Commands:

- C-Find
- C-Move
- C-Store

Note that C-Move has a dependency on C-Find so it is automatically disabled when C-Find is disabled.

When a route has multiple destinations the first destination is considered the primary destination while all others are secondary. This difference matters during error processing where failures from a primary destination will result in the batch move job being paused while failures from a secondary will complete with warnings.

Route Roles

A route has one of the following roles during a Move:

- Source (i.e. a Source Route)
- Target (i.e. a Target Route)

The same route may be used as a Source Route for one move and the Target Route for another.

When a Source Route has a mix of local and external destinations:

- The transfer phase begins once the first local destination completes its discovery. Note: The transfer phase (i.e. issuance of C-Stores & C-Moves) will not start until all target destinations complete their discovery (i.e. C-Finds) when Filter by Target is used.
- Preference is given to move from local destinations over moving from externals.
- C-Moves are issued to externals only when an external has elements not found in any local DB for that source route.

Route Levels

A route has a configured Level which sets the depth limit for the discovery:

- Patient – only Patient level Query/Retrieves are permitted.
- Study - only Patient and Study level Query/Retrieves are permitted.
- Series – Patient, Study and Series level Query/Retrieves are permitted.
- Image – Patient, Study, Series and Image level Query/Retrieves are permitted.

When all destinations for a route are local – the effective route level is Image, regardless of the configured level.

Route Priorities

Each route has a defined priority:

- Direct
- Low
- Medium
- Expedited

A route with direct priority will have its action handled immediately with no process scheduling delays.

Routes with non-direct priority will schedule the processing of the Move and Store actions via the Batch Queues (Finds are not batched).

Note: A received DICOM C-Move is never batched regardless of the priority of the route associated with the AE receiving the C-Move command (although it is now logged in the Batch Move Table).

Move Process Overview

AcuoMed Move processing may be initiated by:

- Dicom C-Move command
- Acuo MMC
    - Batch Move Manager
    - Patient Management
    - RouteView
- Acuo Prefetch feature
    - Modality Work List
    - AcuoSemantix
- Acuo Postfetch feature
- ADAM
- Acuo Web Services
- Acuo User via the BATCHMOVE_USER_INSERT stored procedure.

The move operation has 2 phases:

- Discovery - find phase of the move
- Transfer - store phase of the move

Discovery Phase

This phase identifies all elements in the source route which are associated with the object of the move.

During this phase:

- Each local destination of the source route is queried for all images which are associated with the object of the move (i.e. patient, study, series, or image).
- One or more DICOM C-Find commands are issued to each destination of the Source Route.
- A hierarchical list (i.e. a movetree) is constructed for each destination of the Source Route. The movetree holds the UIDs and relationships of each element that is found.

The discovery phase may be skipped when:

- The move originator is Adam (Adam has already done the discovery).
- The Query/Retrieve level is the same as the level of the source route (note: This can be overridden in the route configuration).

Transfer Phase

The Transfer phase delivers a single instance of each element discovered to each destination in the Target Route. Delivery takes the form of:

- C-Store from local DBs
- C-Move issued to external SCUs

During this phase:

- A DICOM C-Move command is issued to each external destination of the source route for each unique item found at that destination.
- A DICOM C-Store is initiated to each destination in the target route for each unique image found in the local destinations of the source route.

Move Filtering

An unfiltered move will move all items found, during the source route discovery, to all target destinations. Move filtering will reduced the number of images actually moved. Filtering options are:

- Filter for Relevant Priors
- Filter Moves by Target

These filters are mutually exclusive of each other. Either one, or both, may be used for a given Move.

Reference the sections below for details on the filtering options (Filter Moves By Target , Relevancy Filtering – Prefetch/Postfetch).

Logging

The RouterMove Log summarizes the details of the move. This log is found in the Windows tracing directory, with other Acuo traces, and is managed via the Acuo MMC Trace Settings. Information reported in this log includes:

- Move parameters: level, Source Route, AE Name
- Filtering use and parameters used.
- Discovery results for each destination prior to any Moves or Stores
- Entry for each C-Move issued
- Entry for each C-Store issued
- Filtering results:
    - Items selected when Filtering for Relevant Priors
    - Items not sent when Filtering By Target

Filter Moves by Target

Filter by Target performs a discovery on each target route destination to determine which objects are already present at each target destination. Filter by Target is done during the transfer phase. Each image to be moved is compared against the discovery done on the target destinations and only sent to those destinations which did not report having that image.

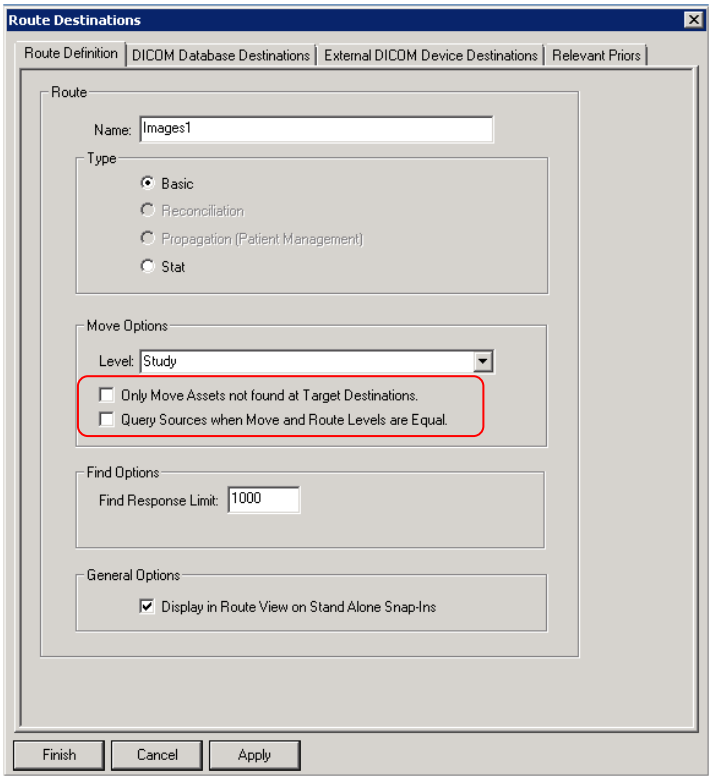
While Filter by Target operates on the route associated with the destination AE name, the source route configuration affects the filtering behavior. When the source route contains external destinations it is not possible to filter the move to them, here's why.

Preference is always given to moving from local destinations (Dicom DBs) than externals. Moves are only issued to externals when they have unique data, (i.e. not present in local Dicom Databases). If an external has unique data the Move is forwarded to that destination. The route associated with the target AE may be defined locally as having multiple destinations. Some may have the data, some may not.

- If the move is forwarded to the external, and it also associates that AE Name with multiple destinations (e.g. another ACUO device), it may deliver data to destinations which already have the data; not ideal but not a serious issue.
- If the move is not forwarded to the external then some destinations may not get the data they need; a serious issue.

Therefore, the move is always forwarded to external destinations of the source route (i.e. Filtering not done). If the external destination is another Acuo device it should also have Filter by Target enabled; thus the effect of the move and the filter will be realized. Since Filter by Target does not filter C-Moves to external destinations, it is effectively disabled for C-Moves where the source route consists of only external destinations.

The screenshot below displays the Filter Move by Target options and how they are configured.



Only Move Assets not found at Target Destinations. – Enabling will prevent assets from being moved when they already exist at the Move Target.

Query Sources when Move and Route Levels are Equal. – Enabling will issue a C-Find before the move is forwarded to the destination(s) when the Move Level is equal to the level of the source route

Do not issue C-Stores from local DBs, only bring images Online. – When enabled, no C-Stores will be initiated and any images affected by the move that were offline will be brought online. This feature might be used when an archive device is present and data needs to be staged for more rapid retrieval by another application.

Filter by Target may be configured to use **Instance Availability** when assessing whether a destination has the queried on. The status values returned for this tag are:

- ONLINE
- NEARLINE
- OFFLINE
- UNAVAILABLE

Effects of Filtering on Route Levels

Filter by Relevancy sets the effective route level, of the source route, to Study since only Study Level information is used as selection criteria.

Filter by Target compares destination information gathered from both source and target routes. Each route is independent of the other and may therefore have different levels configured. An Effective Route Level is used on both routes so that the same level of information is gathered from all destinations. This Effective Route Level is determined by comparing the Route Composition of the Source and Target Route as shown in the following table. Any route that is comprised on only local DBs (i.e. destinations) is processed as if the route level were configured to Image.

Source Route Composition	Target Route Composition	Effective Route Level
Local DBs only	Local DBs only	Image Level
Local DBs only	NOT Local DBs only	Target Route Level
NOT Local DBs only	Local DBs only	Source Route Level
NOT Local DBs only	NOT Local DBs only	The higher of the two Route Levels

The net effect is that one route may have its level raised to that of the other. The same effective route level is used on both routes as doing a discovery to a lower level on either route would only take more time and resources while the additional detail is not used by the filtering process.

Note: when both Filter by Target and Filter for Relevant Priors are used the Filter by Target Effective Route Level will apply (i.e. the route level will not be forced to Study by the Relevancy Filtering process).

Postfetch Overview

Postfetch functionality allows the automatic retrieval of prior studies triggered by an incoming DICOM C-Store. Postfetch Properties are configured in the Called AE Name Properties. The incoming C-Store initiates a Batch Move Job which sends all prior studies for that patient to the configured Move Destination AE. The Postfetch job can be delayed for a period of time to allow the processing of the inbound C-Store to complete. The steps below describe the process of creating a Called AE Name with Postfetch enabled.

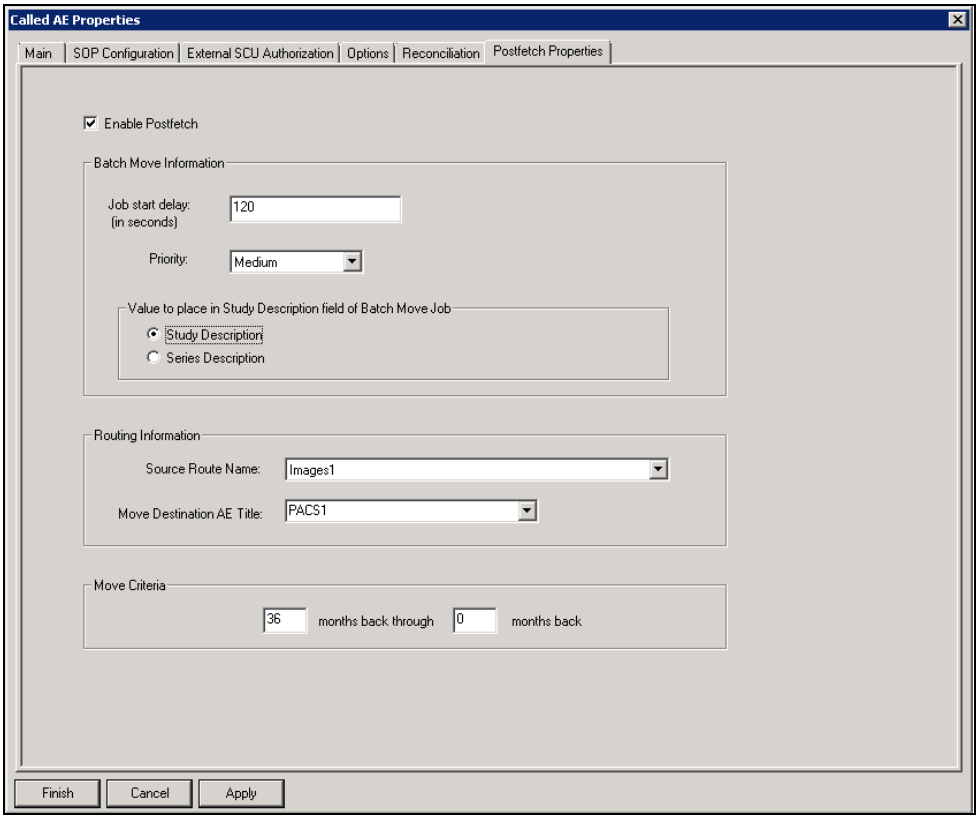
To setup a new Called AE with Postfetch enabled, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager → AcuoMed Server → DICOM Configuration

2. Right-click SCP and select **New → Called AE.**

3. Click the Postfetch Properties tab.

The Called AE Properties dialog displays with the Postfetch Properties tab selected.



4. On the Postfetch Properties tab, select the desired properties for each category as described below.

- **Postfetch**
  - Click the "Enable Postfetch" checkbox to enable Postfetch functionality and activate all configuration fields.

NOTE: The Relevancy Filtering Attributes described below apply ONLY to configurations where Body Part Filtering is enabled on the source route and "Study Description" is selected as the Body Part Source Option. Please reference the "Relevancy Filtering – Prefetch/Postfetch" section below (chapter 11) for details.

  - **Relevancy Filtering Attributes –** Identifies the value to be placed in the Study Description field of the Batch Move Job (this will be used as criteria for Body Part Filtering)

- **Study Description –** Select to set the incoming Study Description as the criteria to be used when filtering by body part and "Study Description" is selected as the Body Part Source Option on the source route.

- **Series Description –** Select to set the incoming Series Description as the criteria to be used when filtering by Body part and "Study Description" is selected as the Body Part Source Option on the source route.

- **Batch Move Information**
  - **Job Start Delay** – Set a delay in seconds for processing the Batch Move Job.
  - **Priority** – Select a batch job priority for move operations controlled by this AE.

- **Routing Information**
  - **Source Route Name** – Select the Route to be used as the Source Route.
  - **Move Destination AE Title –** Select an available move destination from the drop-down list to control where the prior studies will be moved. This move destination is an AE name defined by Move/Route Mapping that will cause prior studies to be moved to one or more destinations.

- **Move Criteria (Study Date Range)**
  - **Months back through** – type a number (in months) to specify the oldest prior studies to be moved. For example, enter 36 to retrieve patient priors starting three years ago.
  - **Months back** – type a number (in months) to specify the most recent prior studies to be moved. For example, enter 12 to retrieve patient priors up to 1 year ago. For prefetch configurations, If you enter 0 the scheduled procedure start date is used. Entering any number other than 0 causes the scheduled procedure start date to be overridden and a calculated value is used.

NOTE: The two Move Criteria fields work together. For example, to retrieve prior studies that are from three years old to one year old, you would enter "36 months back through 12 months back."

5. Click **OK** to add the new AE Name to the AcuoMed Server configuration.

Relevancy Filtering – Prefetch/Postfetch

Relevancy Filtering allows the ability to filter the studies moved when pre-fetching or post-fetching. Study filtering is needed to provide a recent set of relevant studies rather than a complete set of studies. Filtering for Relevant Priors is applied against the Source Route of the move. Configured filtering criteria are used to select only those studies which are most relevant. Only those studies which are chosen will be moved.

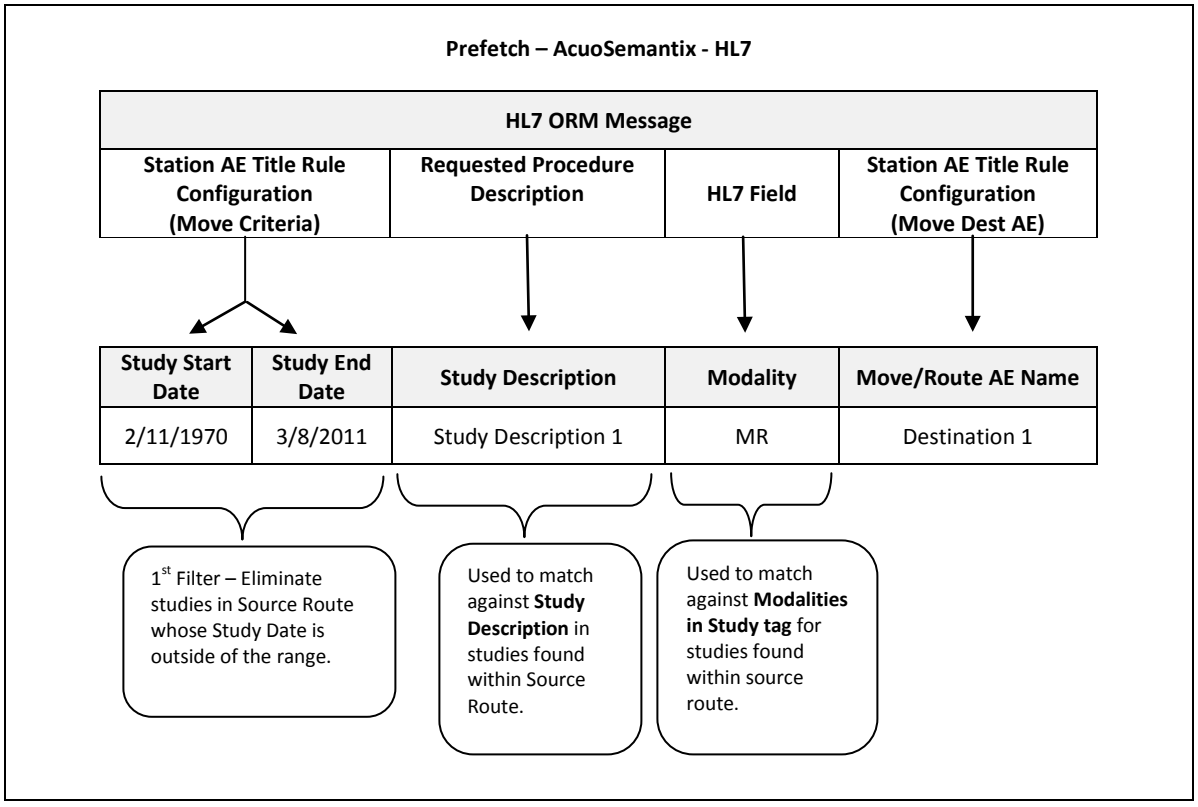
In 5.3.1 the settings allow the ability to filter a configurable number of studies for a specific date range. Relevancy filtering is configured in the route properties for the source route and selected studies can be based on Body Part, Modality and/or Unconstrained criteria. The criteria used to select studies for move is generated by either an incoming HL7 ORM message (Prefetch) or an incoming C-Store (Postfetch).

Filtering for Relevancy is accomplished by selecting only those studies which match the selection criteria, all others are thusly 'filtered'. The process is:

1. Sort all studies found during the source route discovery by Study Date; newest to oldest.
2. Select all studies which meet the body part criteria (up to the configured limit).
3. Select all studies, not already selected, which meet the modality criteria (up to the configured limit).
4. Select all other studies, i.e. unconstrained, not already selected (up to the configured limit).

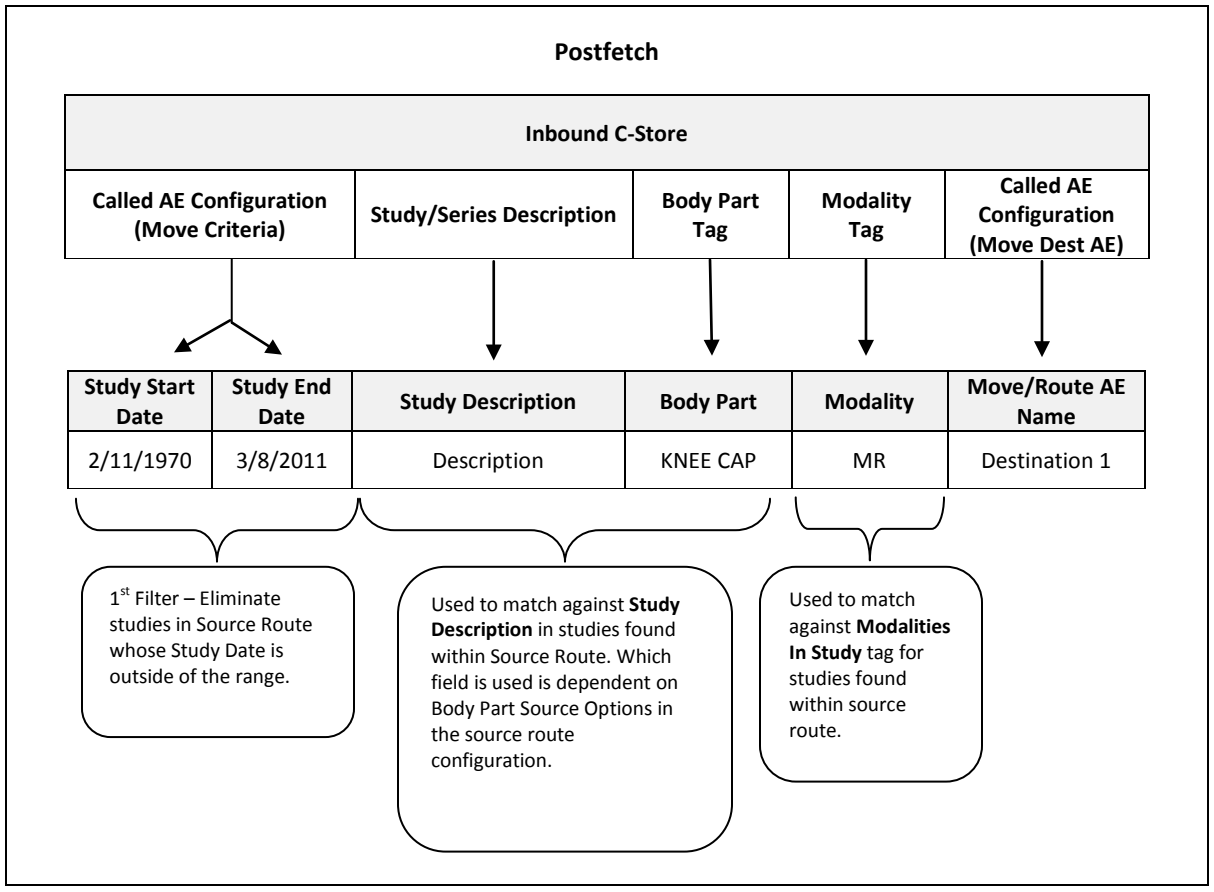
Prefetch Relevant Priors

AcuoSemantix processes an HL7 ORM message by scheduling a batch move for the Patient ID or Patient Name identified in the ORM. **The diagram below illustrates how the Batch Move Job fields correspond to incoming HL7 ORM messages processed by AcuoSemantix and which of these fields are used when filtering relevant studies.**



Postfetch Relevant Priors

Postfetch is initiated when a DICOM C-Store is received by AcuoMed from an SCU. **The diagram below illustrates how the Batch Move Job fields correspond to incoming C-Stores processed by AcuoMed and which of these fields are used when filtering relevant studies.**



Configure a Route with Relevant Priors

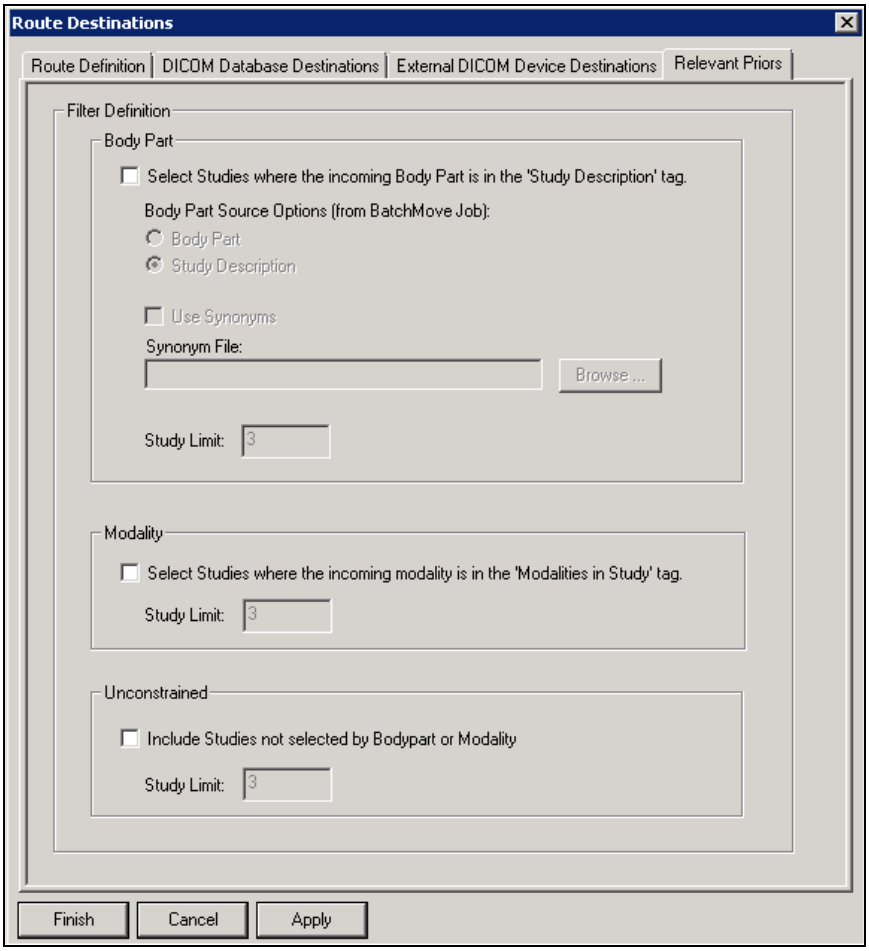
To set up a Route with Filtering enabled, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager → AcuoMed Server → Router Configuration → Local Route Definitions.

2. Right-click **Route** and select **New → New Route Name**

3. Click the Relevant Priors tab.

The Route Destinations dialog displays with the Relevant Priors Tab selected.



4. On the Relevant Priors tab, select the filters you would like to apply. These filters are used in conjunction with date provided by the Prefetch and/or Postfetch properties.

Body Part – Enable Body Part Filtering to select studies found on this route where the incoming Body Part is included in the "Study Description" Tag. When body part filtering is used, the body part value source is compared to the study description for each study found in the source route. If a match is found, that study is selected to move, unless the body part study limit has already been reached.

- **Body Part Source Options**
  - **Body Part (Postfetch Only)** – Filter prior studies by body part using the Body Part field of the Batch Move Job as the criteria. The source of this data is one of the following:

- From the body part tag of an inbound C-Store (via Postfetch)
- From an HL7 message (via Prefetch)

- **Study Description** – Filter prior studies by body part using the Study Description field of the Batch Move Job as the criteria. The source of this data is one of the following:
  - Either the Study Description or Series Description of an inbound C-Store (via Postfetch)
  - From an HL7 message (via Prefetch)

- **Use Synonyms**
  - Check the "Use Synonyms" checkbox to enable the Synonym File selector.
  - Click Browse to select a valid Synonym File (.xml)

- **Study Limit**
  - Set a Study Limit to limit the amount of Relevant prior studies to be moved when body part criteria is met.

- **Modality** – Enable Modality filtering to select studies found on this route where the Modality field of the batch move matches the Modalities in Studies tag.
  - **Study Limit**
    - Set a Study Limit to limit the amount of Relevant prior studies to be moved when modality criteria is met.

- **Unconstrained** – Enable Unconstrained filtering to limit studies found on this route to a certain amount with or without additional filtering options configured (i.e., body part, Modality).
  - **Study Limit**
    - Set a Study Limit to limit the amount of Relevant prior studies to be moved when unconstrained criteria is met.

5. Click Add to complete set up of the Route and add it to the configuration.

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Using a Synonym file with Prefetching/Postfetching of Relevant Priors – Body Part

A Synonym file consists of a list or multiple lists of words that can be used as the criteria when filtering prior studies via Prefetch or Postfetch by Body Part/Study Description. When a synonym file is attached to the source route being filtered, any words identified in the list are used as criteria for selecting relevant prior studies.

Synonyms may be used when evaluating the Batch Move entry study description value & study description of the discovered studies. The synonyms are defined in an XML file. The XML file to be used is defined in the configuration of the route. Details of the synonym functionality are as follows:

- The Synonym selection process locates all lists in the synonym file which have words that are found in the study description value from the batch move entry.
- The study description of each discovered study is then compared against the collective set of words from the synonym lists that matched. If the study description of the discovered study has any of the words in the collective set of words it is considered a match and is selected.
- All comparisons are case insensitive.
- When modality filtering is also configured, the modality value provided is compared against the Modalities in Study tag for each study found in the source route that had not already been selected by body part filtering. If a match is found, that study is selected to move, unless the modality study limit has already been reached.
- When the Unconstrained option is also enabled, each study that was not selected by body part or modality will be selected until the unconstrained study limit is reached.
- All selected studies will then be moved (all studies not selected will not be moved).

File Structure (xml) Example

```
<?xml version="1.0" encoding="utf-8"?>
 <synonyms>
  <group>
   <groupname>bodypart</groupname>
    <list>
     <listname>Synonyms_for_ABDOMEN</listname>
       <word>ABDOMEN</word>
       <word>STOMACH</word>
       <word>MID</word>
       <word>Add additional synonyms for ABDOMEN here</word>
    </list>
    <list>
     <listname>Synonyms_for_ANKLE</listname>
       <word>ANKLE</word>
       <word>Add additional synonyms for ANSLE here</word>
       <word>Add additional synonyms for ANSLE here</word>
    </list>
  </group>
 </synonyms>
```

Using the basic sample above:

<groupname> = label for the entire group of lists. **Must be labeled "bodypart" for relevancy filtering.**

<listname> = label for the list (user defined) – there can be multiple lists within a group.

<word> = word is included as an acceptable filtering criteria in addition to source Body Part, Study Description, or Series Description.

Example 1

Configuration	Existing Studies (Study Description)	Studies Filtered (reason)
SYNONYM FILE = Example (above) INBOUND BODY PART TAG = ABDOMEN STUDY LIMIT = 5	1. STOMACH 2. MIDSECTION 4. SKULL 5. stomach scan	1. STOMACH (matches word contained in Synonym file) 2. MIDSECTION (portion of word contained in synonym file) 3. stomach scan (portion of word contained in synonym file)

Database Retention/Purge Policy Overview

Prior to the 5.3.1 Release the ability to have images purged was limited to temporal databases. The addition of the Retention/Purge Policy functionality included in 5.3.1 allows assets to be purged from Master, Temporal and/or Permanent databases.

Retention/Purge Policies provide an enhanced pruner capability that allows for Policies to be assigned to individual DICOM Databases. These policies are responsible for the purging of data based on specified criteria. Policies are created/updated within the Local DICOM Database Properties configuration.

The following criteria can be set:

Standard Policy Criteria

- Patient Birth Date– Purge/Retain images based on age.
- Study Date – Purge/Retain images based on Study Date.
- Insert Date – Purge/Retain images based on Insert Date.
- Institution Name – Purge/Retain images based on Institution Name.
- Modality – Purge/Retain images based on Modality Type.

Advanced Policy Criteria

- Allows for user to assign a policy based on a custom query.

Database Purge/Retention Policies can be assigned to a single database, or to multiple databases (global). The time of the purge on each database is configured in the Image Deletion Manager Task within the AcuoMed DICOM Database Properties>Retention/Purge Policies tab.

NOTE: If the database to be purged includes an assigned propagation route it is important to note that the deletes performed will **NOT** be propagated.

The following pages describe how to create and assign various types of policies.

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Create and Assign a Standard Policy

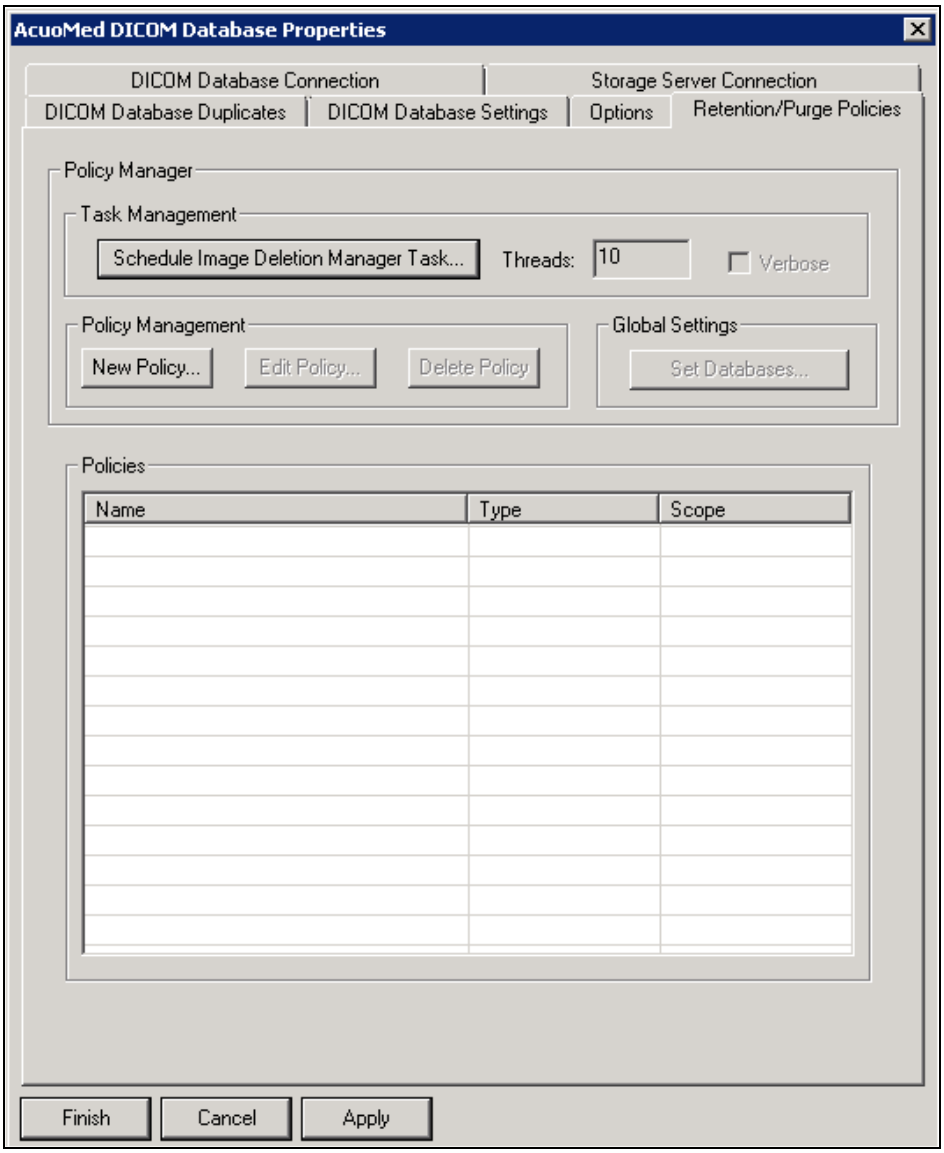
To assign a new Standard policy to a single DICOM database, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager → Image Manager Server → Router Configuration → Destinations → AcuoMed DICOM Databases

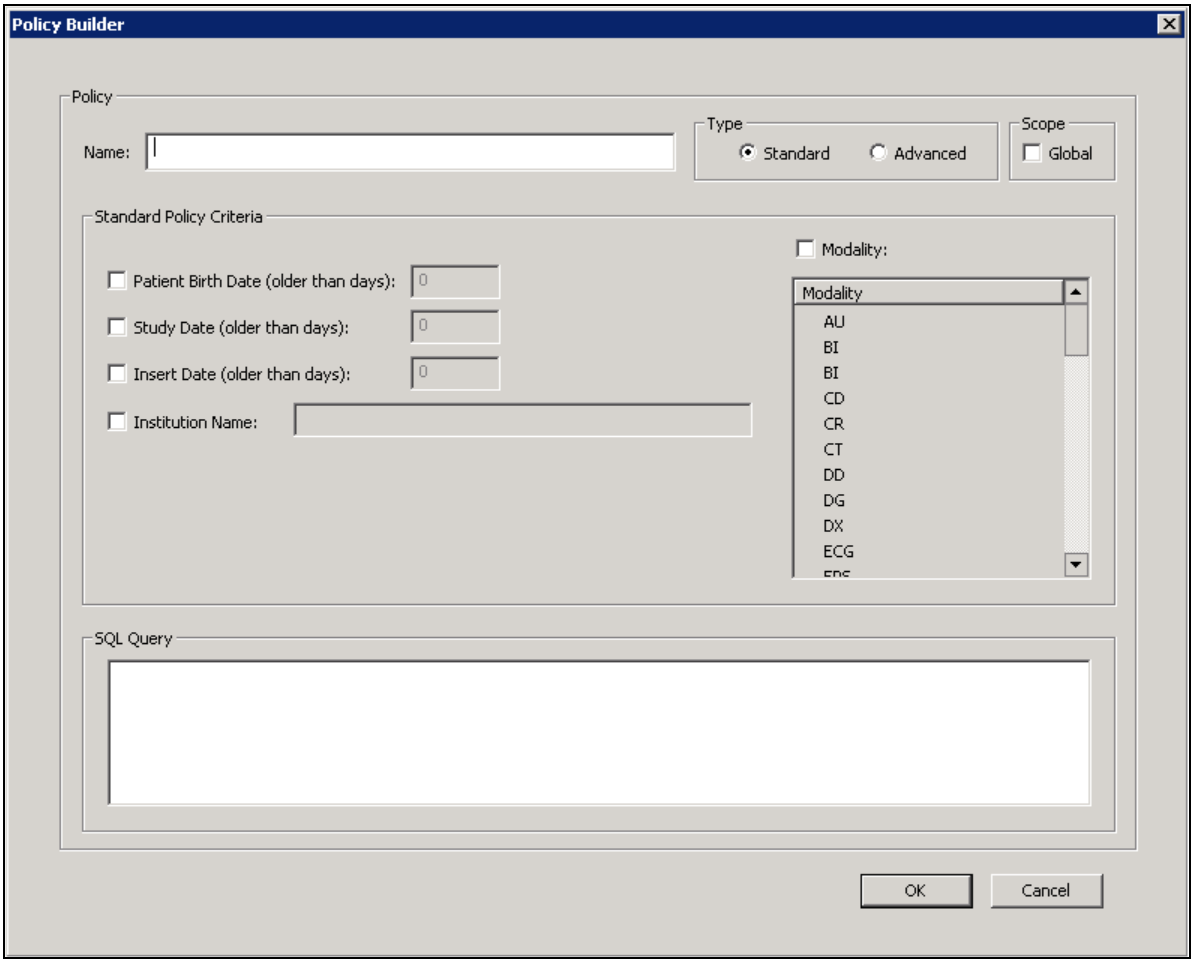
2. Right-click a DICOM Database and select **Update.**

3. Click the retention/Purge Policies tab.

The AcuoMed DICOM Database Properties dialog displays with the Retention/Purge Policy tab selected.



4. On the Retention/Purge Policies tab, select New **Policy**. The Policy Builder is displayed.



Enter the Policy settings as described below:

5. Select a name for the policy.

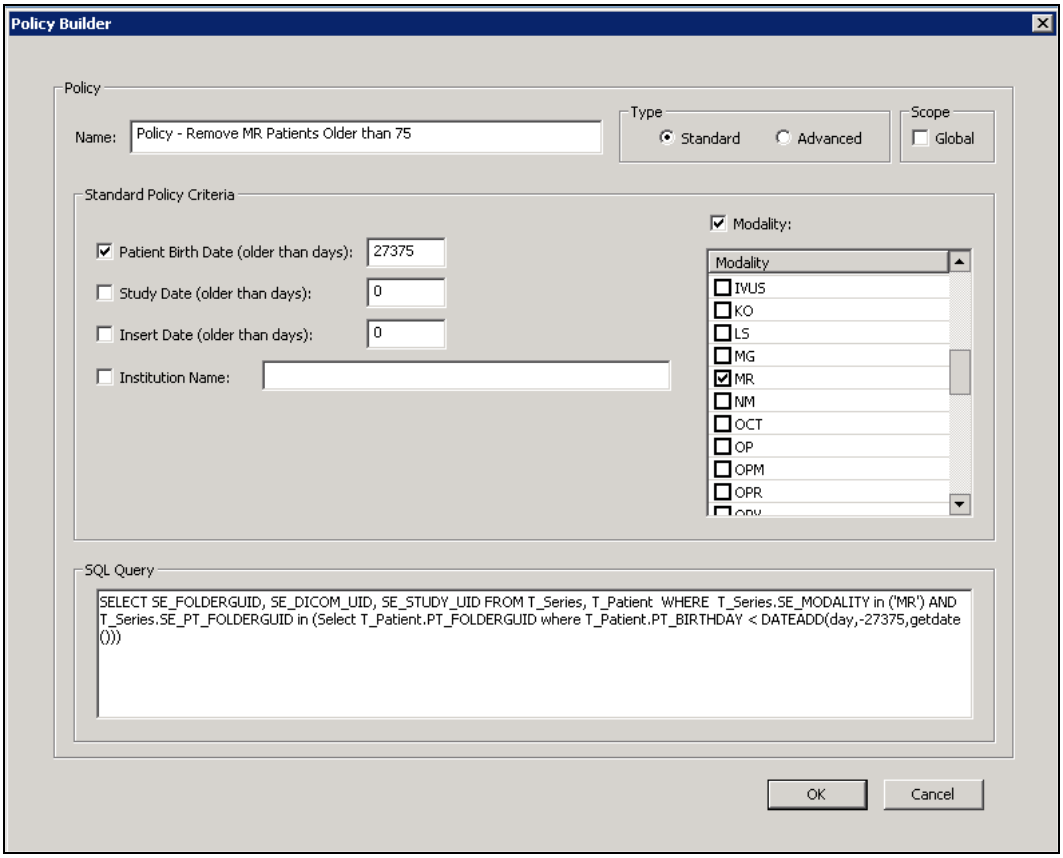
6. Choose standard policy type.

7. Select Scope of the policy. If the Global setting is left unchecked, the policy criteria selected will only apply to the single DICOM database being configured. If Global is checked, the option to Set Databases will be activated on the AcuoMed DICOM Database Properties screen. The Set Databases option allows for the policy to be applied to multiple DICOM databases. For this example we will leave the Global setting unchecked.

8. Choose Standard Criteria to be used when filtering assets to be purged.

    - Patient Birth Data – Purge/Retain images based on age.
    - Study Date – Purge/Retain images based on Study Date.
    - Insert Date – Purge/Retain images based on Insert Date.
    - Institution Name – Purge/Retain images based on Institution Name.
    - Modality – Purge/Retain images based on Modality Type.

For this example, we have chosen to purge all **MR** assets with **Study Dates older than 75 years.**



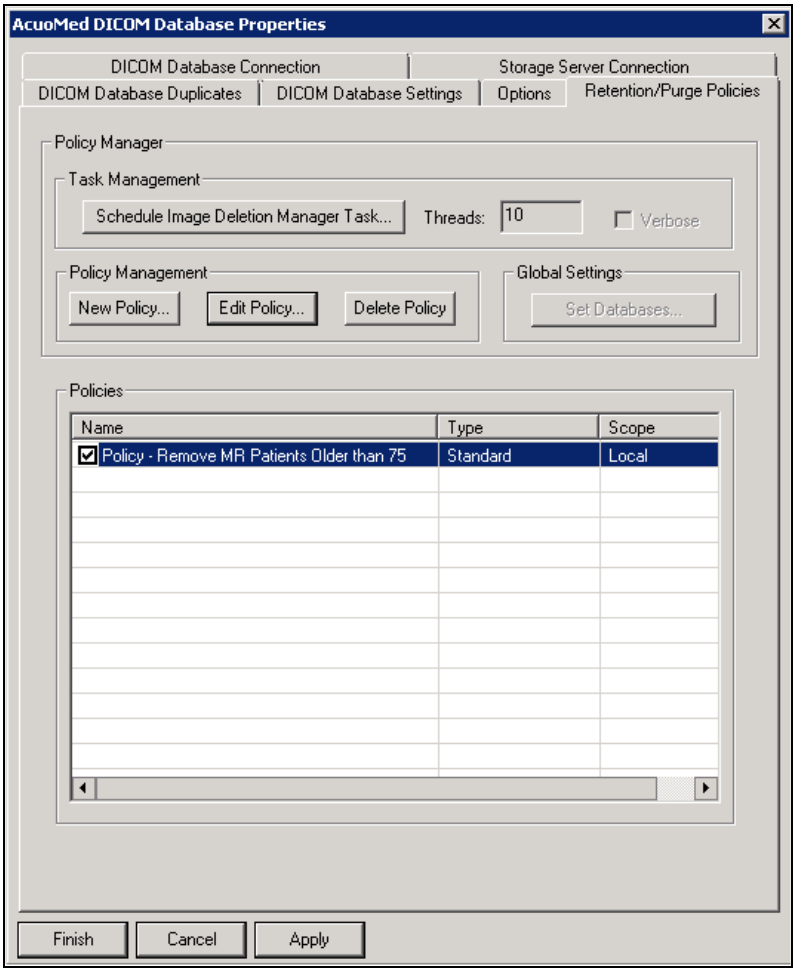
9. Select the Patient Birth Date criteria option and enter the amount of days to retain images. (27375 days = 75 years)

10. Select the Modality criteria option and select the checkbox for the MR modality.

11. Click the OK button to save the criteria option selected.

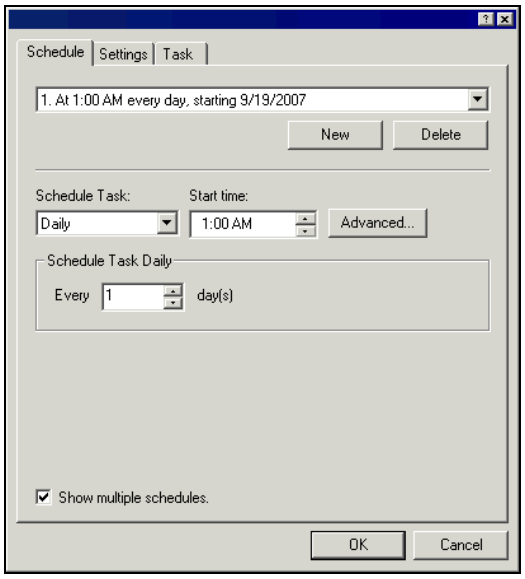
NOTE: The SQL Query window builds the query to be used as criteria options are selected. Running the generated query against the applied database(s) will yield the assets to be purged when the purge task is run.

Now that the policy has been successfully created a Scheduled Task must be created to configure when the policy should run.



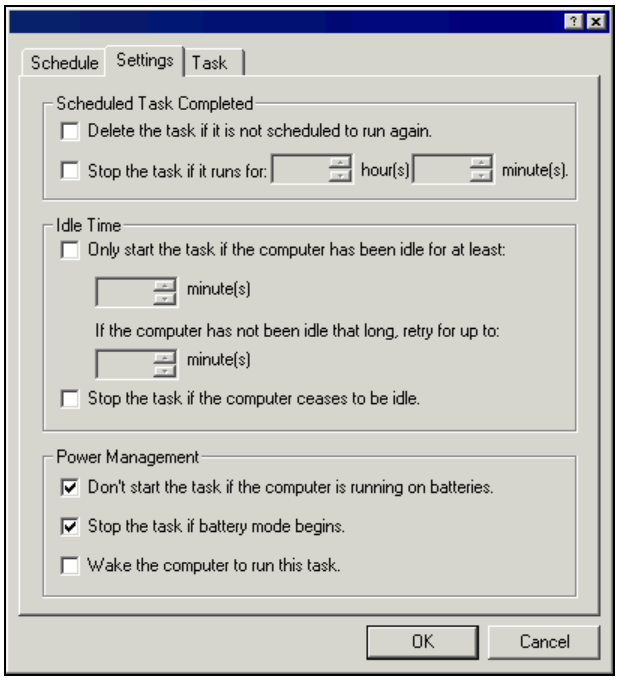
- Click the Schedule Image Deletion Manager Task button.

The following is an example of a daily deletion task that is set up to run every day at 1:00 AM.

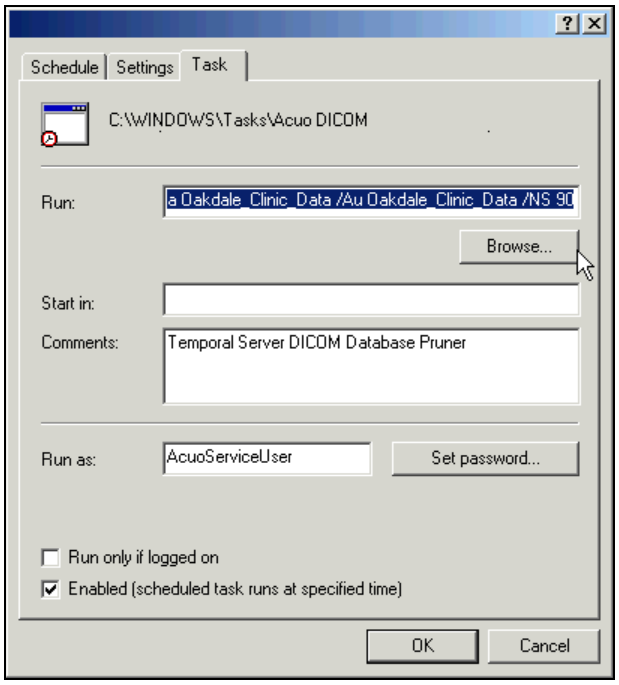


It is recommended that deletion tasks be scheduled to run at a time when workflow volume is low.

Click the **Settings** tab to set up additional task scheduling control (access Windows online Help for more details about the Settings tab).



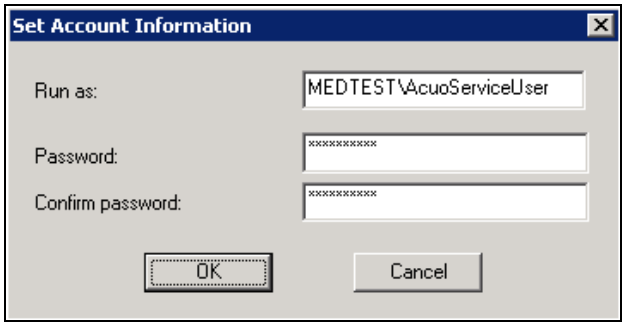
- Click on **the Task tab. It shows that the task is enabled.**

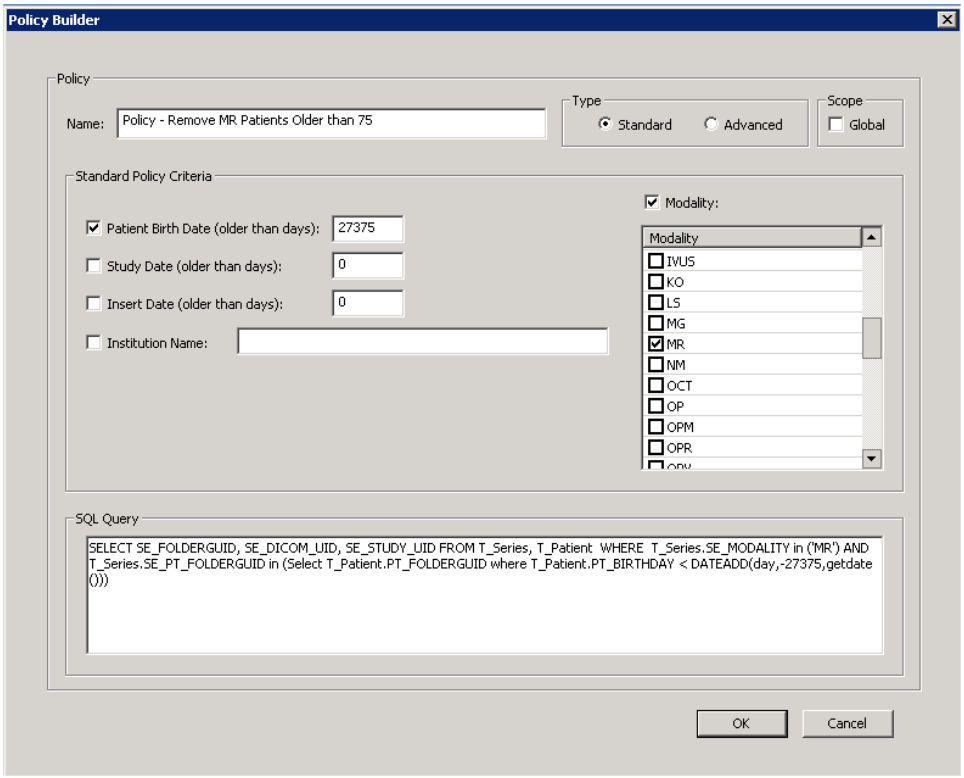


- Click **OK** to add the new deletion task.

NOTE: After you schedule one or more deletion tasks, the DICOM Database Pruner will appear in Scheduled Tasks (accessed via the Windows Control Panel). The pruner job can be run manually or deleted from Windows Control Panel → Scheduled Tasks.

If requested for Account information, enter the password for the service account running the task.





NOTE:	The Global Settings section and Set Databases button are only active when policies are of type Global. In this example we are only applying the policy to the current database being configured. When active, the Set Databases button allows the user to choose which DICOM databases for which the policy applies.

11. Click **Finish** to complete set up and add the Policy to the database configuration.

Create and Assign a Standard Policy – Multiple Databases (Global)

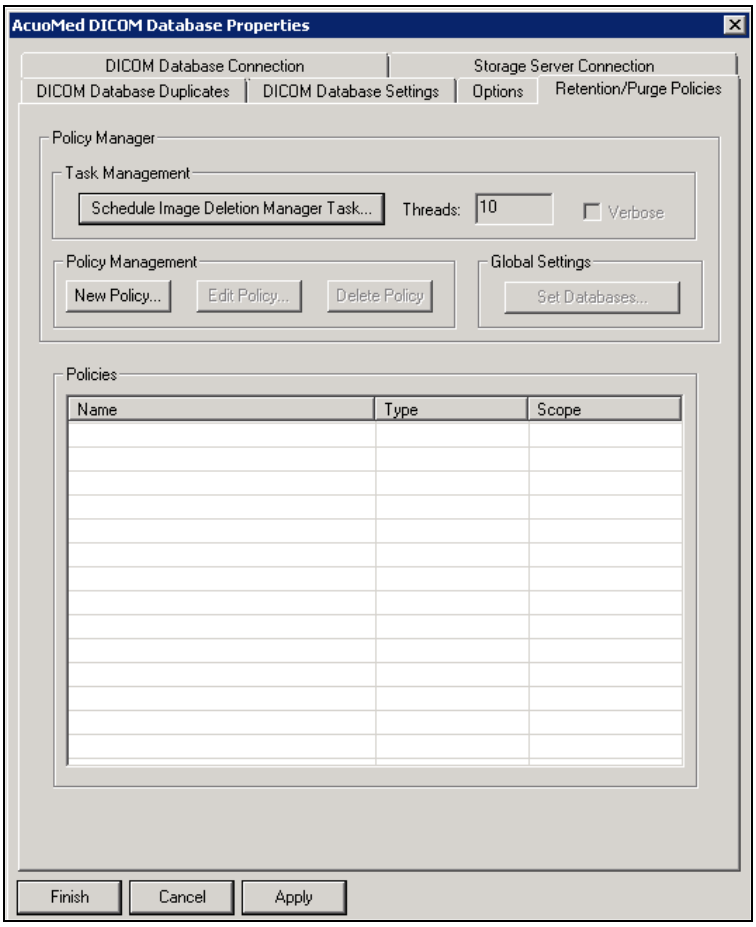
To assign a new Standard policy to a single DICOM database, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager → Image Manager Server → Router Configuration → Destinations → AcuoMed DICOM Databases

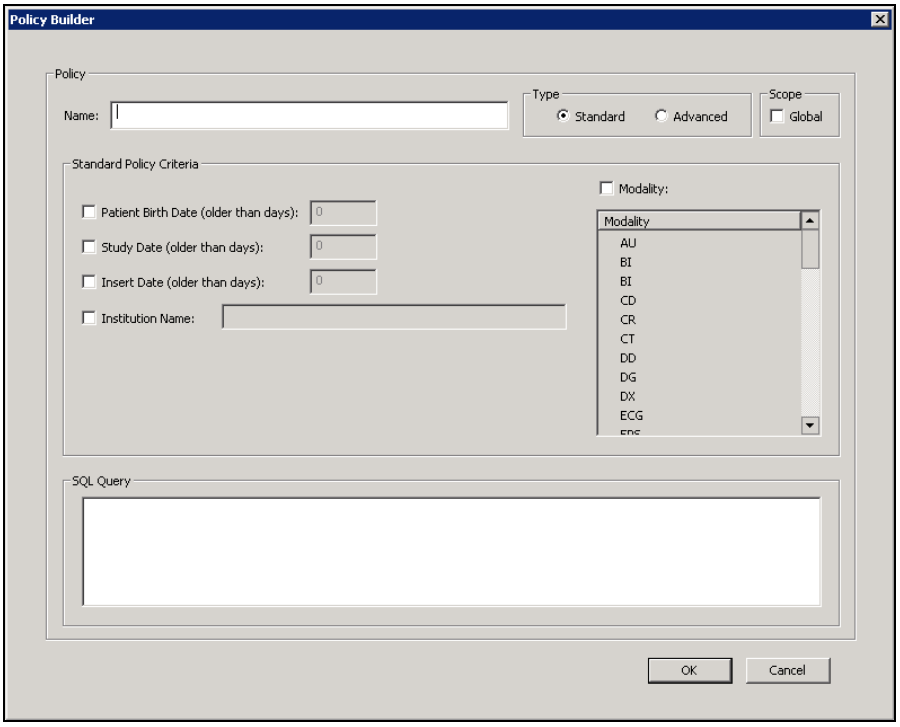
2. Right-click a DICOM Database and select **Update.**

3. Click the retention/Purge Policies tab.

The AcuoMed DICOM Database Properties dialog displays with the Retention/Purge Policy tab selected.



4. On the Retention/Purge Policies tab, select New **Policy**. The Policy Builder is displayed.



Enter the Policy settings as described below:

5. Select a name for the policy.

6. Choose standard policy type.

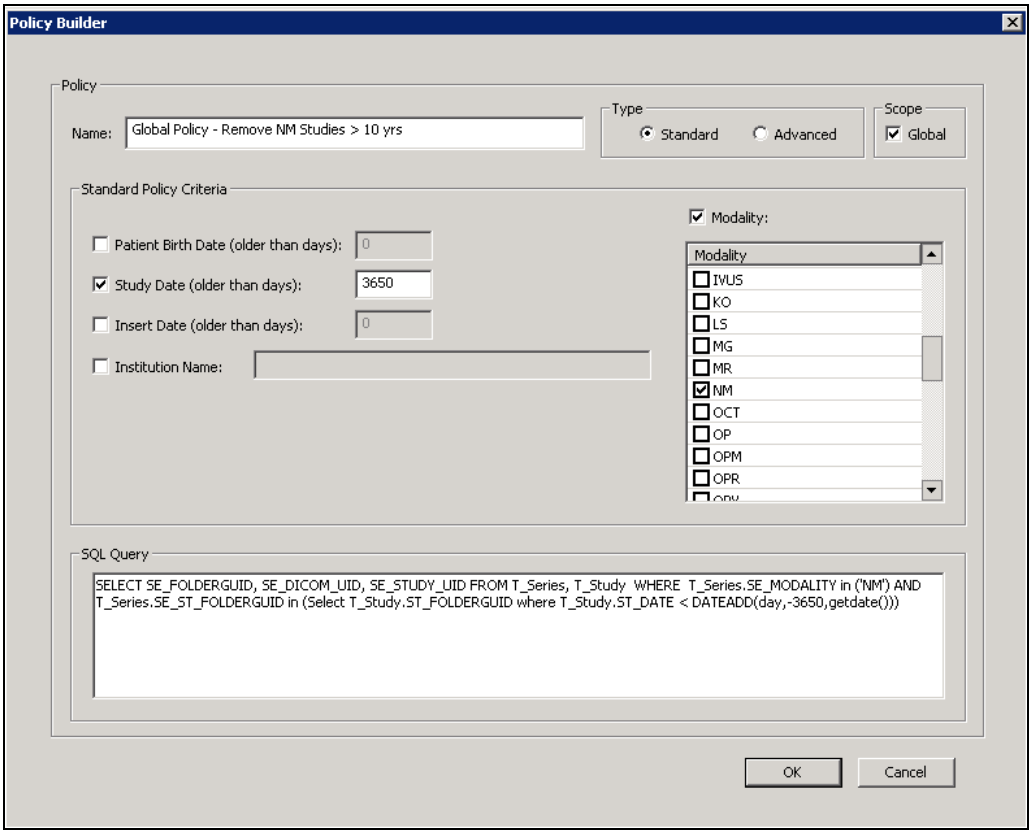
7. Select Scope of the policy. If the Global setting is left unchecked, the policy criteria selected will only apply to the single DICOM database being configured. If Global is checked, the option to Set Databases will be activated on the AcuoMed DICOM Database Properties screen. The Set Databases option allows for the policy to be applied to multiple DICOM databases. For this example we will enable the Global setting.

NOTE: Once a policy has been set as Global it cannot be changed to a local policy.

8. Choose Standard Criteria to be used when filtering assets to be purged.

- Patient Birth Data – Purge/Retain images based on age.
- Study Date – Purge/Retain images based on Study Date.
- Insert Date – Purge/Retain images based on Insert Date.
- Institution Name – Purge/Retain images based on Institution Name.
- Modality – Purge/Retain images based on Modality Type.

For this example, we have chosen to purge all **NM** assets with Study Date > **10 years old.**

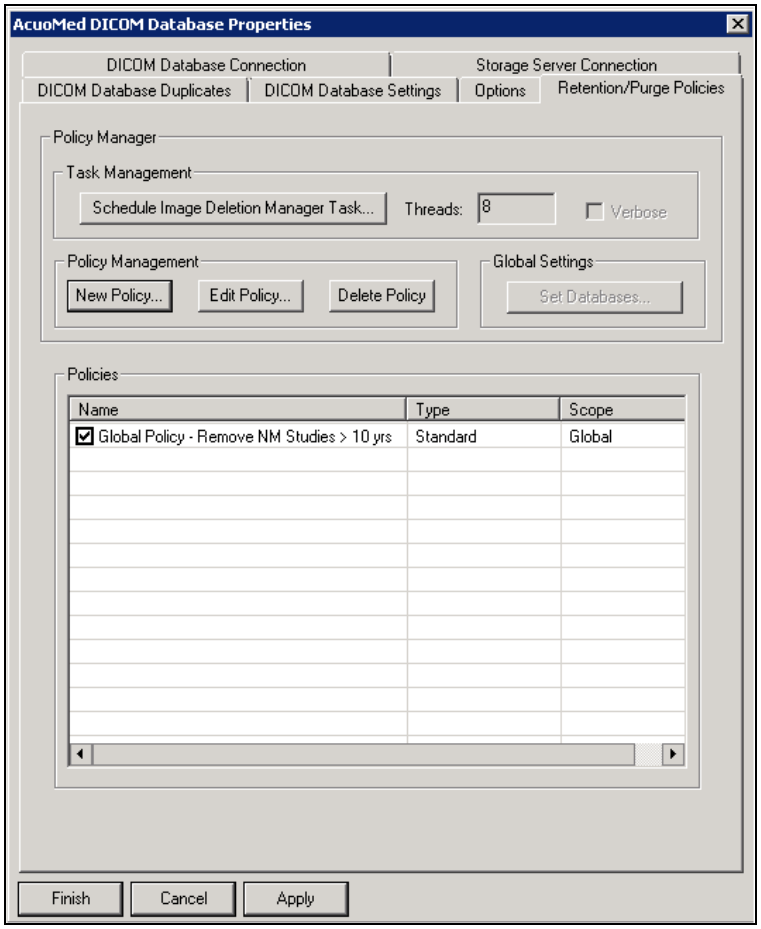


9. Select the Patient Birth Date criteria option and enter the amount of days to retain images. (3650 days = 10 years)

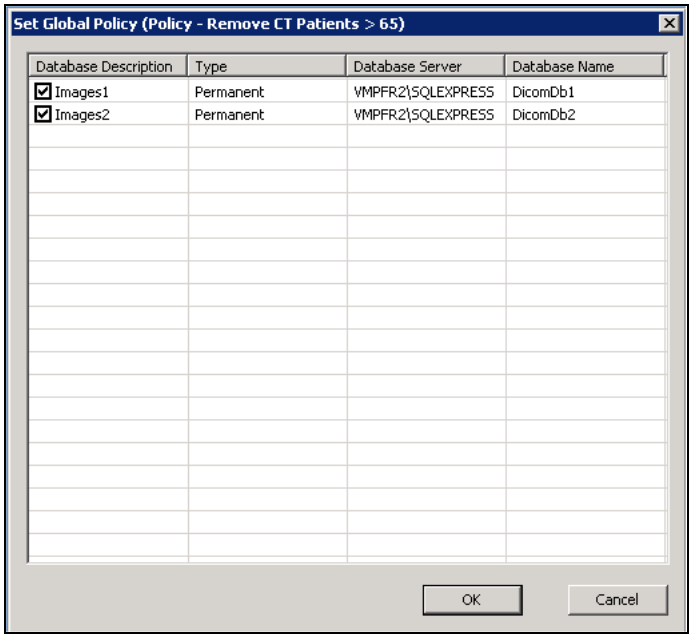
10. Select the Modality criteria option and select the checkbox for the **NM** modality.

11. Click the OK button to save the criteria option selected.

NOTE: The SQL Query window builds the query to be used as criteria options are selected. Running the generated query against the applied database(s) will yield the assets to be purged when the purge task is run.



12. Click on the Policy in the Policies window, and then select "**Set Databases**" within the Global Settings section. The Set Global Policy window is displayed.



13. Select the DICOM databases to assign the policy to and click “OK”.

14. Follow the steps listed in the previous example above to set a Scheduled Task.

NOTE: When assigning a global policy to multiple databases a separate scheduled task will need to be configured for each database that the policy is to be run.

15. Click **Finish** to complete set up and add the Policy to the database configuration.

Create and Assign an Advanced Policy

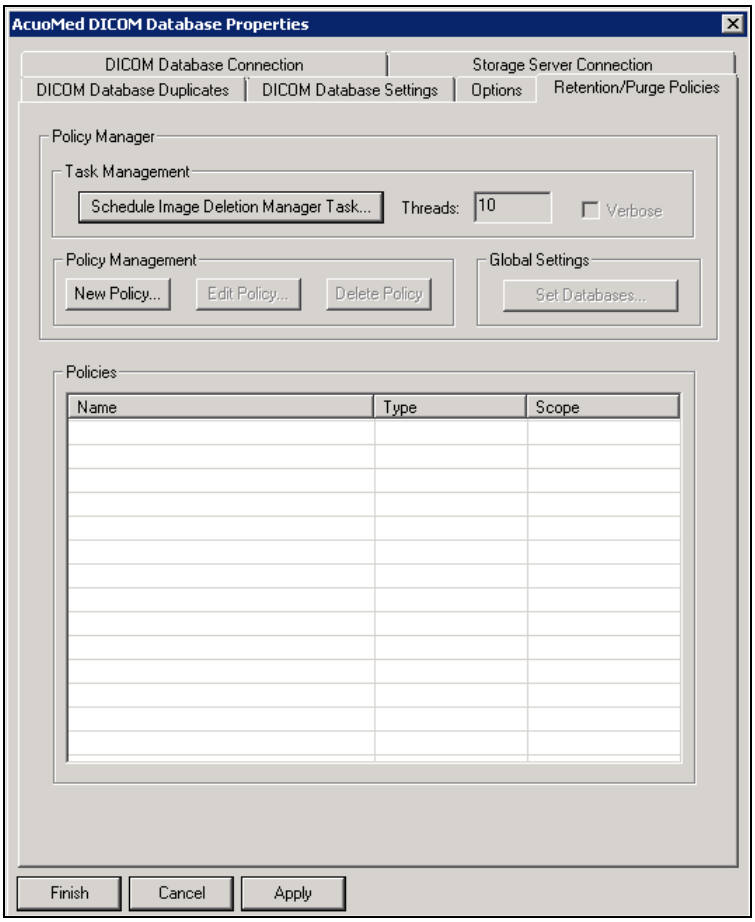
To assign a new Advanced policy to a single DICOM database, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager → Image Manager Server → Router Configuration → Destinations → AcuoMed DICOM Databases

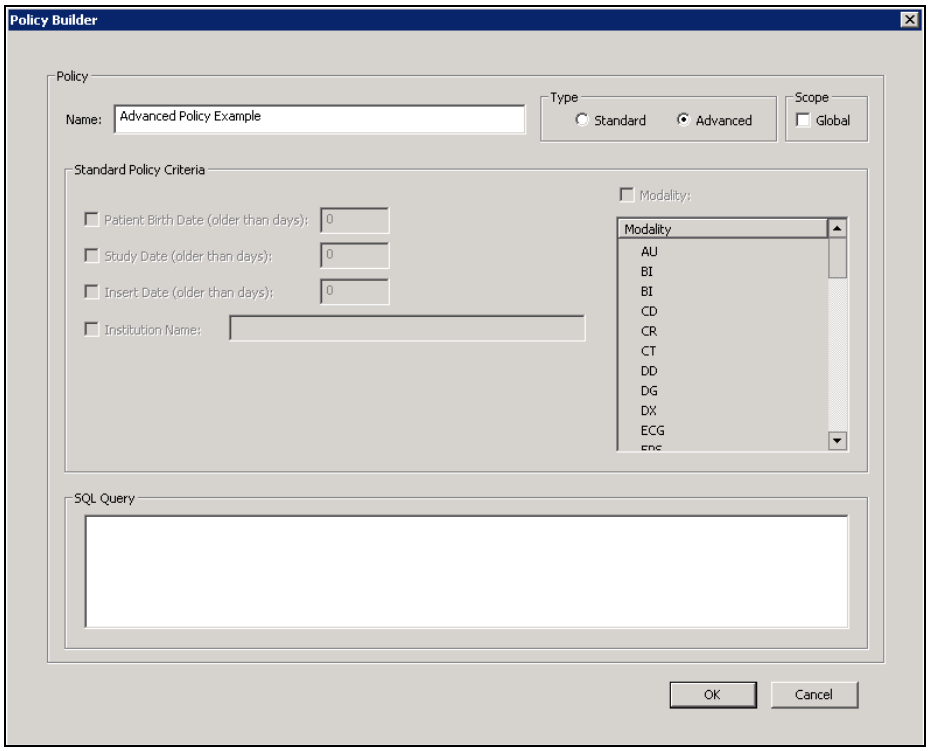
2. Right-click a DICOM Database and select **Update.**

3. Click the retention/Purge Policies tab.

The AcuoMed DICOM Database Properties dialog displays with the Retention/Purge Policy tab selected.



4. On the Retention/Purge Policies tab, select New **Policy**. The Policy Builder is displayed.



Enter the Policy settings as described below:

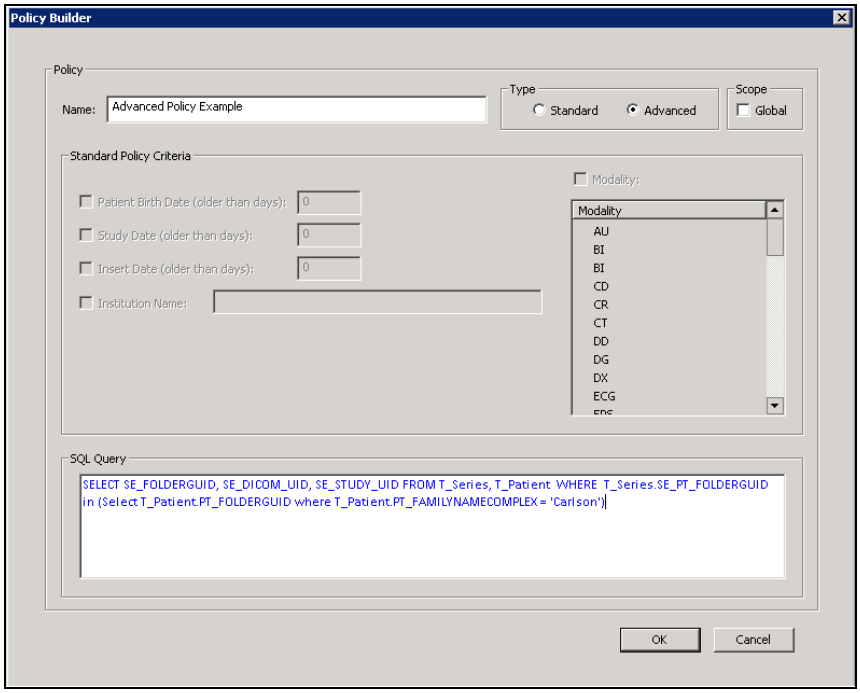
5. Select a name for the policy.

6. Choose **Advanced** policy type.

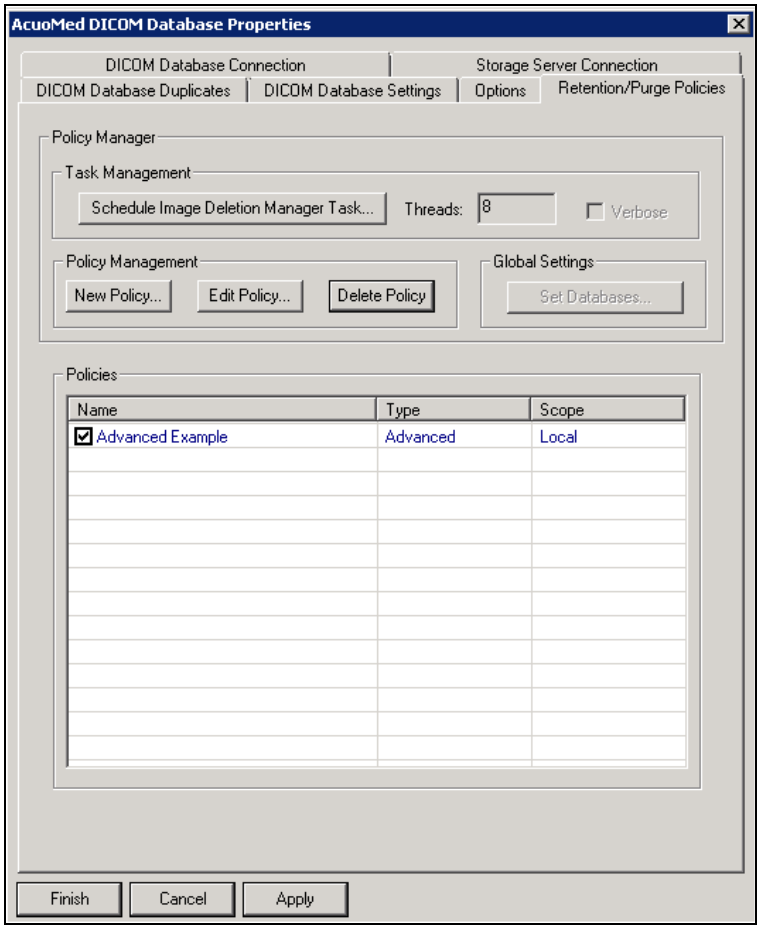
7. Select Scope of the policy. If the Global setting is left unchecked, the policy criteria selected will only apply to the single DICOM database being configured. If Global is checked, the option to Set Databases will be activated on the AcuoMed DICOM Database Properties screen. The Set Databases option allows for the policy to be applied to multiple DICOM databases. For this example we will disable the Global setting.

NOTE: Once a policy has been set as Global it cannot be changed to a local policy.

8. Enter the desired advanced query in the SQL Query field. The example below is a simple query that selects all images for Patient's with last name of Carlson.



NOTE: When developing a custom SQL Query for use with an advanced purge policy, a requirement enforced by the Policy Builder is that all queries must begin with the following prefix: (SELECT SE_FOLDERGUID, SE_DICOM_UID, SE_STUDY_UID FROM T_Series, T_Patient)



9. Follow the steps listed in the previous example above to set a Scheduled Task.

NOTE: When assigning a global policy to multiple databases a separate scheduled task will need to be configured for each database that the policy is to be run.

10. Click **Finish** to complete set up and add the Policy to the database configuration.

Example 1 – Standard Policy assigned to single DICOM Database.

This example contains a data set of 10 patients and 20 studies stored to 1 DICOM databases. The criteria for example 1 are MR studies with Patient Birth Date over 75 years old.

Pati...	Patient Name	Study Date	Birth Date	St...	Ac...	Study Description	Modalities in Study
118725	BELFORD^Kelle^Caroline^	3/27/1995	5/9/1917	3004	1004	This is a description of study # 118725.0	\MR\
118725	BELFORD^Kelle^Caroline^	9/6/2000	5/9/1917	3005	1005	This is a description of study # 118725.1	\NM\
118730	BRIDGES^Jung^Ram^	10/8/1998	9/18/1939	3014	1014	This is a description of study # 118730.0	\MR\
118730	BRIDGES^Jung^Ram^	10/18/2000	9/18/1939	3015	1015	This is a description of study # 118730.1	\NM\
118727	BROWNELL^Kristen^Cornelia^	3/6/1995	9/7/1926	3008	1008	This is a description of study # 118727.0	\MR\
118727	BROWNELL^Kristen^Cornelia^	1/14/1998	9/7/1926	3009	1009	This is a description of study # 118727.1	\NM\
118724	CALVERT^Raphael^Dale^	8/8/2001	4/23/1922	3002	1002	This is a description of study # 118724.0	\MR\
118724	CALVERT^Raphael^Dale^	8/19/2001	4/23/1922	3003	1003	This is a description of study # 118724.1	\NM\
118731	CAMPION^Jackolyn^Rina^	4/7/1997	4/18/1970	3016	1016	This is a description of study # 118731.0	\MR\
118731	CAMPION^Jackolyn^Rina^	6/15/1997	4/18/1970	3017	1017	This is a description of study # 118731.1	\NM\
118723	Carlson^Gabriel^Katelynn^	7/20/1996	12/10/2001	3000	1000	This is a description of study # 118723.0	\MR\
118723	Carlson^Gabriel^Katelynn^	2/15/1994	12/10/2001	3001	1001	This is a description of study # 118723.1	\NM\
118732	Christopher^Brenden^Gaven^	12/27/1994	6/16/1945	3018	1018	This is a description of study # 118732.0	\MR\
118732	Christopher^Brenden^Gaven^	7/3/2000	6/16/1945	3019	1019	This is a description of study # 118732.1	\NM\
118726	Trumpy^Lloyd^Clive^	6/1/1996	9/8/1926	3006	1006	This is a description of study # 118726.0	\MR\
118726	Trumpy^Lloyd^Clive^	9/12/1998	9/8/1926	3007	1007	This is a description of study # 118726.1	\NM\
118729	Warner^Lael^Toni^	7/26/1999	7/9/1978	3012	1012	This is a description of study # 118729.0	\MR\
118729	Warner^Lael^Toni^	3/20/1997	7/9/1978	3013	1013	This is a description of study # 118729.1	\NM\
118728	Wooten ^Colin^Burton^	8/13/2000	12/8/1971	3010	1010	This is a description of study # 118728.0	\MR\
118728	Wooten ^Colin^Burton^	7/19/2000	12/8/1971	3011	1011	This is a description of study # 118728.1	\NM\

Run the query to verify what we should expect to be deleted by the policy when executed.

```
SELECT SE_FOLDERGUID, SE_DICOM_UID, SE_STUDY_UID FROM T_Series, T_Patient  WHERE  T_Series.SE_MODALITY in ('MR')
AND T_Series.SE_PT_FOLDERGUID in (Select T_Patient.PT_FOLDERGUID where T_Patient.PT_BIRTHDAY < DATEADD(day,-
25550,getdate()))
```

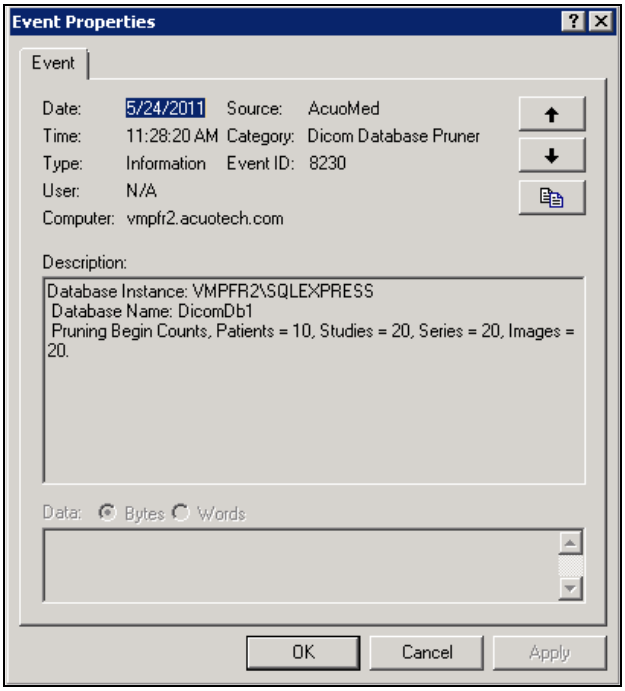
Results | Messages

	SE_FOLDERGUID	SE_DICOM_UID	SE_STUDY_UID
1	0x44624867093F4A49838AD83C41484B3E	118724.0.0	118724.0
2	0xF472D1F40229304485D251873BE395CF	118725.0.0	118725.0
3	0xB3601F2C4E6CBE4FAA7E8713DFAF65F2	118726.0.0	118726.0
4	0xC2E453017A07D740803B42E96FF07A99	118727.0.0	118727.0
5	0xBCEBFF4D8DF5384FB9BAC2205C74D649	118730.0.0	118730.0

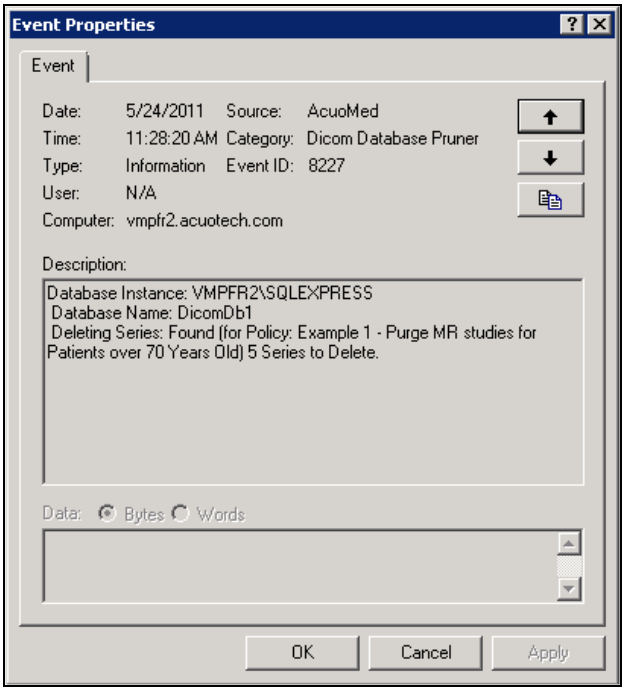
The SQL Query returns 5 series to be purged (as indicated by the screenshot below). We can expect these studies to be deleted when the policy task is run.

Pati...	Patient Name	Study Date	Birth Date	St...	Ac...	Study Description	Modalities in Study
118725	BELFORD^Kelle^Caroline^	3/27/1995	5/9/1917	3004	1004	This is a description of study # 118725.0	\MR\
118725	BELFORD^Kelle^Caroline^	9/6/2000	5/9/1917	3005	1005	This is a description of study # 118725.1	\NM\
118724	CALVERT^Raphael^Dale^	8/8/2001	4/23/1922	3002	1002	This is a description of study # 118724.0	\MR\
118724	CALVERT^Raphael^Dale^	8/19/2001	4/23/1922	3003	1003	This is a description of study # 118724.1	\NM\
118727	BROWNELL^Kristen^Cornelia^	3/6/1995	9/7/1926	3008	1008	This is a description of study # 118727.0	\MR\
118727	BROWNELL^Kristen^Cornelia^	1/14/1998	9/7/1926	3009	1009	This is a description of study # 118727.1	\NM\
118726	Trumpy^Lloyd^Clive^	6/1/1996	9/8/1926	3006	1006	This is a description of study # 118726.0	\MR\
118726	Trumpy^Lloyd^Clive^	9/12/1998	9/8/1926	3007	1007	This is a description of study # 118726.1	\NM\
118730	BRIDGES^Jung^Ram^	10/8/1998	9/18/1939	3014	1014	This is a description of study # 118730.0	\MR\
118730	BRIDGES^Jung^Ram^	10/18/2000	9/18/1939	3015	1015	This is a description of study # 118730.1	\NM\
118732	Christopher^Brenden^Gaven^	12/27/1994	6/16/1945	3018	1018	This is a description of study # 118732.0	\MR\
118732	Christopher^Brenden^Gaven^	7/3/2000	6/16/1945	3019	1019	This is a description of study # 118732.1	\NM\
118731	CAMPION^Jackolyn^Rina^	4/7/1997	4/18/1970	3016	1016	This is a description of study # 118731.0	\MR\
118731	CAMPION^Jackolyn^Rina^	6/15/1997	4/18/1970	3017	1017	This is a description of study # 118731.1	\NM\
118728	Wooten ^Colin^Burton^	8/13/2000	12/8/1971	3010	1010	This is a description of study # 118728.0	\MR\
118728	Wooten ^Colin^Burton^	7/19/2000	12/8/1971	3011	1011	This is a description of study # 118728.1	\NM\
118729	Warner^Lael^Toni^	7/26/1999	7/9/1978	3012	1012	This is a description of study # 118729.0	\MR\
118729	Warner^Lael^Toni^	3/20/1997	7/9/1978	3013	1013	This is a description of study # 118729.1	\NM\
118723	Carlson^Gabriel^Katelynn^	7/20/1996	12/10/2001	3000	1000	This is a description of study # 118723.0	\MR\
118723	Carlson^Gabriel^Katelynn^	2/15/1994	12/10/2001	3001	1001	This is a description of study # 118723.1	\NM\

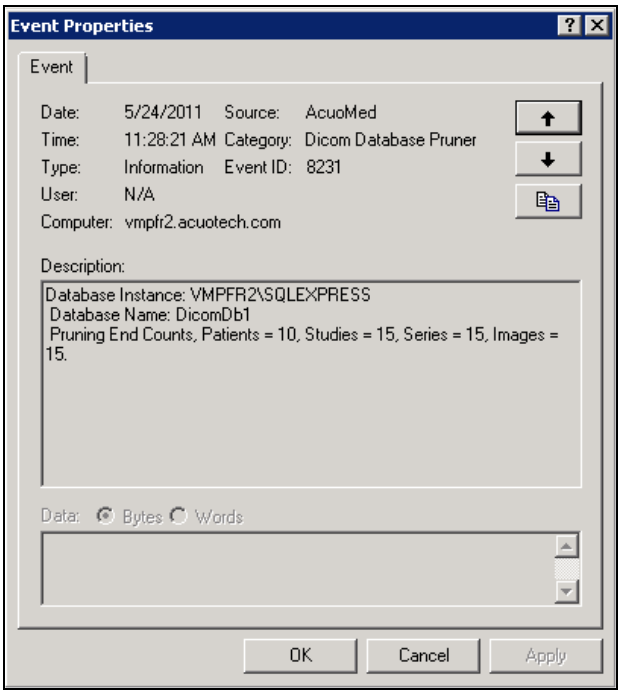
View the Acuo Event Viewer:



This event displays the beginning counts.



This event displays the number of studies to be deleted (5).



This event displays the Database counts when the policy is complete.

Pati...	Patient Name	Study Date	Birth Date	St...	Ac...	Study Description	Modalities in Study
118725	BELFORD^Kelle^Caroline^	9/6/2000	5/9/1917	3005	1005	This is a description of study # 118725.1	\NM\
118724	CALVERT^Raphael^Dale^	8/19/2001	4/23/1922	3003	1003	This is a description of study # 118724.1	\NM\
118727	BROWNELL^Kristen^Cornelia^	1/14/1998	9/7/1926	3009	1009	This is a description of study # 118727.1	\NM\
118726	Trumpy^Lloyd^Clive^	9/12/1998	9/8/1926	3007	1007	This is a description of study # 118726.1	\NM\
118730	BRIDGES^Jung^Ram^	10/18/2000	9/18/1939	3015	1015	This is a description of study # 118730.1	\NM\
118732	Christopher^Brenden^Gaven^	12/27/1994	6/16/1945	3018	1018	This is a description of study # 118732.0	\MR\
118732	Christopher^Brenden^Gaven^	7/3/2000	6/16/1945	3019	1019	This is a description of study # 118732.1	\NM\
118731	CAMPION^Jackolyn^Rina^	4/7/1997	4/18/1970	3016	1016	This is a description of study # 118731.0	\MR\
118731	CAMPION^Jackolyn^Rina^	6/15/1997	4/18/1970	3017	1017	This is a description of study # 118731.1	\NM\
118728	Wooten ^Colin^Burton^	8/13/2000	12/8/1971	3010	1010	This is a description of study # 118728.0	\MR\
118728	Wooten ^Colin^Burton^	7/19/2000	12/8/1971	3011	1011	This is a description of study # 118728.1	\NM\
118729	Warner^Lael^Toni^	7/26/1999	7/9/1978	3012	1012	This is a description of study # 118729.0	\MR\
118729	Warner^Lael^Toni^	3/20/1997	7/9/1978	3013	1013	This is a description of study # 118729.1	\NM\
118723	Carlson^Gabriel^Katelynn^	7/20/1996	12/10/2001	3000	1000	This is a description of study # 118723.0	\MR\
118723	Carlson^Gabriel^Katelynn^	2/15/1994	12/10/2001	3001	1001	This is a description of study # 118723.1	\NM\

The resulting studies are displayed after the policy has been executed.

Example 2 – Standard Policy assigned to Multiple DICOM Databases.

To make this example as simple as possible, I've duplicated the same data set and stored to 2 DICOM databases. The criteria for example 2 are NM studies with Study Date over 10 years old.

DicomDB1

Pati...	Patient Name	Study Date	Birth Date	St...	Ac...	Study Description	Modalities in Study
118725	BELFORD^Kelle^Caroline^	3/27/1995	5/9/1917	3004	1004	This is a description of study # 118725.0	\MR\
118725	BELFORD^Kelle^Caroline^	9/6/2000	5/9/1917	3005	1005	This is a description of study # 118725.1	\NM\
118730	BRIDGES^Jung^Ram^	10/8/1998	9/18/1939	3014	1014	This is a description of study # 118730.0	\MR\
118730	BRIDGES^Jung^Ram^	10/18/2000	9/18/1939	3015	1015	This is a description of study # 118730.1	\NM\
118727	BROWNELL^Kristen^Cornelia^	3/6/1995	9/7/1926	3008	1008	This is a description of study # 118727.0	\MR\
118727	BROWNELL^Kristen^Cornelia^	1/14/1998	9/7/1926	3009	1009	This is a description of study # 118727.1	\NM\
118724	CALVERT^Raphael^Dale^	8/8/2001	4/23/1922	3002	1002	This is a description of study # 118724.0	\MR\
118724	CALVERT^Raphael^Dale^	8/19/2001	4/23/1922	3003	1003	This is a description of study # 118724.1	\NM\
118731	CAMPION^Jackolyn^Rina^	4/7/1997	4/18/1970	3016	1016	This is a description of study # 118731.0	\MR\
118731	CAMPION^Jackolyn^Rina^	6/15/1997	4/18/1970	3017	1017	This is a description of study # 118731.1	\NM\
118723	Carlson^Gabriel^Katelynn^	7/20/1996	12/10/2001	3000	1000	This is a description of study # 118723.0	\MR\
118723	Carlson^Gabriel^Katelynn^	2/15/1994	12/10/2001	3001	1001	This is a description of study # 118723.1	\NM\
118732	Christopher^Brenden^Gaven^	12/27/1994	6/16/1945	3018	1018	This is a description of study # 118732.0	\MR\
118732	Christopher^Brenden^Gaven^	7/3/2000	6/16/1945	3019	1019	This is a description of study # 118732.1	\NM\
118726	Trumpy^Lloyd^Clive^	6/1/1996	9/8/1926	3006	1006	This is a description of study # 118726.0	\MR\
118726	Trumpy^Lloyd^Clive^	9/12/1998	9/8/1926	3007	1007	This is a description of study # 118726.1	\NM\
118729	Warner^Lael^Toni^	7/26/1999	7/9/1978	3012	1012	This is a description of study # 118729.0	\MR\
118729	Warner^Lael^Toni^	3/20/1997	7/9/1978	3013	1013	This is a description of study # 118729.1	\NM\
118728	Wooten ^Colin^Burton^	8/13/2000	12/8/1971	3010	1010	This is a description of study # 118728.0	\MR\
118728	Wooten ^Colin^Burton^	7/19/2000	12/8/1971	3011	1011	This is a description of study # 118728.1	\NM\

DicomDB2

Pati...	Patient Name	Study Date	Birth Date	St...	Ac...	Study Description	Modalities in Study
118725	BELFORD^Kelle^Caroline^	3/27/1995	5/9/1917	3004	1004	This is a description of study # 118725.0	\MR\
118725	BELFORD^Kelle^Caroline^	9/6/2000	5/9/1917	3005	1005	This is a description of study # 118725.1	\NM\
118730	BRIDGES^Jung^Ram^	10/8/1998	9/18/1939	3014	1014	This is a description of study # 118730.0	\MR\
118730	BRIDGES^Jung^Ram^	10/18/2000	9/18/1939	3015	1015	This is a description of study # 118730.1	\NM\
118727	BROWNELL^Kristen^Cornelia^	3/6/1995	9/7/1926	3008	1008	This is a description of study # 118727.0	\MR\
118727	BROWNELL^Kristen^Cornelia^	1/14/1998	9/7/1926	3009	1009	This is a description of study # 118727.1	\NM\
118724	CALVERT^Raphael^Dale^	8/8/2001	4/23/1922	3002	1002	This is a description of study # 118724.0	\MR\
118724	CALVERT^Raphael^Dale^	8/19/2001	4/23/1922	3003	1003	This is a description of study # 118724.1	\NM\
118731	CAMPION^Jackolyn^Rina^	4/7/1997	4/18/1970	3016	1016	This is a description of study # 118731.0	\MR\
118731	CAMPION^Jackolyn^Rina^	6/15/1997	4/18/1970	3017	1017	This is a description of study # 118731.1	\NM\
118723	Carlson^Gabriel^Katelynn^	7/20/1996	12/10/2001	3000	1000	This is a description of study # 118723.0	\MR\
118723	Carlson^Gabriel^Katelynn^	2/15/1994	12/10/2001	3001	1001	This is a description of study # 118723.1	\NM\
118732	Christopher^Brenden^Gaven^	12/27/1994	6/16/1945	3018	1018	This is a description of study # 118732.0	\MR\
118732	Christopher^Brenden^Gaven^	7/3/2000	6/16/1945	3019	1019	This is a description of study # 118732.1	\NM\
118726	Trumpy^Lloyd^Clive^	6/1/1996	9/8/1926	3006	1006	This is a description of study # 118726.0	\MR\
118726	Trumpy^Lloyd^Clive^	9/12/1998	9/8/1926	3007	1007	This is a description of study # 118726.1	\NM\
118729	Warner^Lael^Toni^	7/26/1999	7/9/1978	3012	1012	This is a description of study # 118729.0	\MR\
118729	Warner^Lael^Toni^	3/20/1997	7/9/1978	3013	1013	This is a description of study # 118729.1	\NM\
118728	Wooten ^Colin^Burton^	8/13/2000	12/8/1971	3010	1010	This is a description of study # 118728.0	\MR\
118728	Wooten ^Colin^Burton^	7/19/2000	12/8/1971	3011	1011	This is a description of study # 118728.1	\NM\

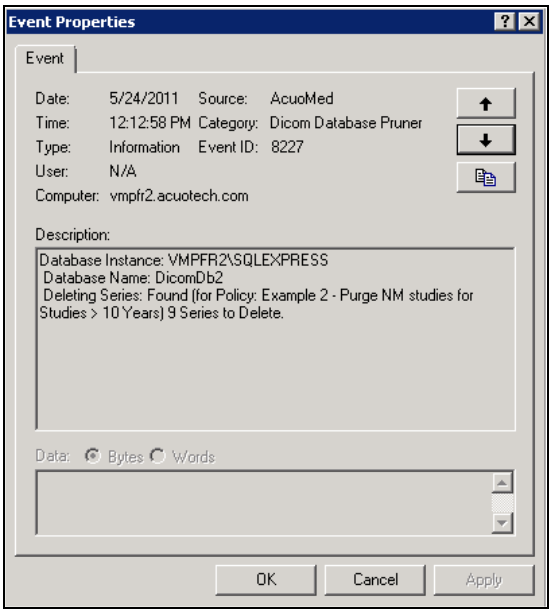
```
SELECT SE_FOLDERGUID, SE_DICOM_UID, SE_STUDY_UID FROM T_Series, T_Study  WHERE  T_Series.SE_MODALITY in ('NM')
AND T_Series.SE_ST_FOLDERGUID in (Select T_Study.ST_FOLDERGUID where T_Study.ST_DATE < DATEADD(day,-
3650,getdate()))
```

	SE_FOLDERGUID	SE_DICOM_UID	SE_STUDY_UID
1	0x0C1D45ADFCB05D498AB89CAAC4218243	118723.1.0	118723.1
2	0x52B8E4023AB8694BBC63D5DBADD1B5E3	118725.1.0	118725.1
3	0x6756F02998A96A42AC01830BA1B6E526	118726.1.0	118726.1
4	0x33B23F190DBF044BB5D64057487F21DC	118727.1.0	118727.1
5	0x181E0BF4616ED5499F53466AB5249476	118728.1.0	118728.1
6	0xC138F71614908F478544B882B9976E5D	118729.1.0	118729.1
7	0xC596A2F460D6BE4491A1BFB394261172	118730.1.0	118730.1
8	0x5151981ADF537549BE7DE35FE36F0A85	118731.1.0	118731.1
9	0x985C2B324D7729418F7F2AA0BAF0065D	118732.1.0	118732.1

The SQL Query returns 9 studies to be purged (as indicated by the screenshot below). We can expect these studies to be deleted (from DicomDb1 AND DicomDb2) when each policy task is executed.

Pati...	Patient Name	Study Date	Birth Date	St...	Ac...	Study Description	Modalities in Study
118723	Carlson^Gabriel^Katelynn^	2/15/1994	12/10/2001	3001	1001	This is a description of study # 118723.1	\NM\
118732	Christopher^Brenden^Gaven^	12/27/1994	6/16/1945	3018	1018	This is a description of study # 118732.0	\MR\
118727	BROWNELL^Kristen^Cornelia^	3/6/1995	9/7/1926	3008	1008	This is a description of study # 118727.0	\MR\
118725	BELFORD^Kelle^Caroline^	3/27/1995	5/9/1917	3004	1004	This is a description of study # 118725.0	\MR\
118726	Trumpy^Lloyd^Clive^	6/1/1996	9/8/1926	3006	1006	This is a description of study # 118726.0	\MR\
118723	Carlson^Gabriel^Katelynn^	7/20/1996	12/10/2001	3000	1000	This is a description of study # 118723.0	\MR\
118729	Warner^Lael^Toni^	3/20/1997	7/9/1978	3013	1013	This is a description of study # 118729.1	\NM\
118731	CAMPION^Jackolyn^Rina^	4/7/1997	4/18/1970	3016	1016	This is a description of study # 118731.0	\MR\
118731	CAMPION^Jackolyn^Rina^	6/15/1997	4/18/1970	3017	1017	This is a description of study # 118731.1	\NM\
118727	BROWNELL^Kristen^Cornelia^	1/14/1998	9/7/1926	3009	1009	This is a description of study # 118727.1	\NM\
118726	Trumpy^Lloyd^Clive^	9/12/1998	9/8/1926	3007	1007	This is a description of study # 118726.1	\NM\
118730	BRIDGES^Jung^Ram^	10/8/1998	9/18/1939	3014	1014	This is a description of study # 118730.0	\MR\
118729	Warner^Lael^Toni^	7/26/1999	7/9/1978	3012	1012	This is a description of study # 118729.0	\MR\
118732	Christopher^Brenden^Gaven^	7/3/2000	6/16/1945	3019	1019	This is a description of study # 118732.1	\NM\
118728	Wooten ^Colin^Burton^	7/19/2000	12/8/1971	3011	1011	This is a description of study # 118728.1	\NM\
118728	Wooten ^Colin^Burton^	8/13/2000	12/8/1971	3010	1010	This is a description of study # 118728.0	\MR\
118725	BELFORD^Kelle^Caroline^	9/6/2000	5/9/1917	3005	1005	This is a description of study # 118725.1	\NM\
118730	BRIDGES^Jung^Ram^	10/18/2000	9/18/1939	3015	1015	This is a description of study # 118730.1	\NM\
118724	CALVERT^Raphael^Dale^	8/8/2001	4/23/1922	3002	1002	This is a description of study # 118724.0	\MR\
118724	CALVERT^Raphael^Dale^	8/19/2001	4/23/1922	3003	1003	This is a description of study # 118724.1	\NM\

View the Acuo Event Viewer:

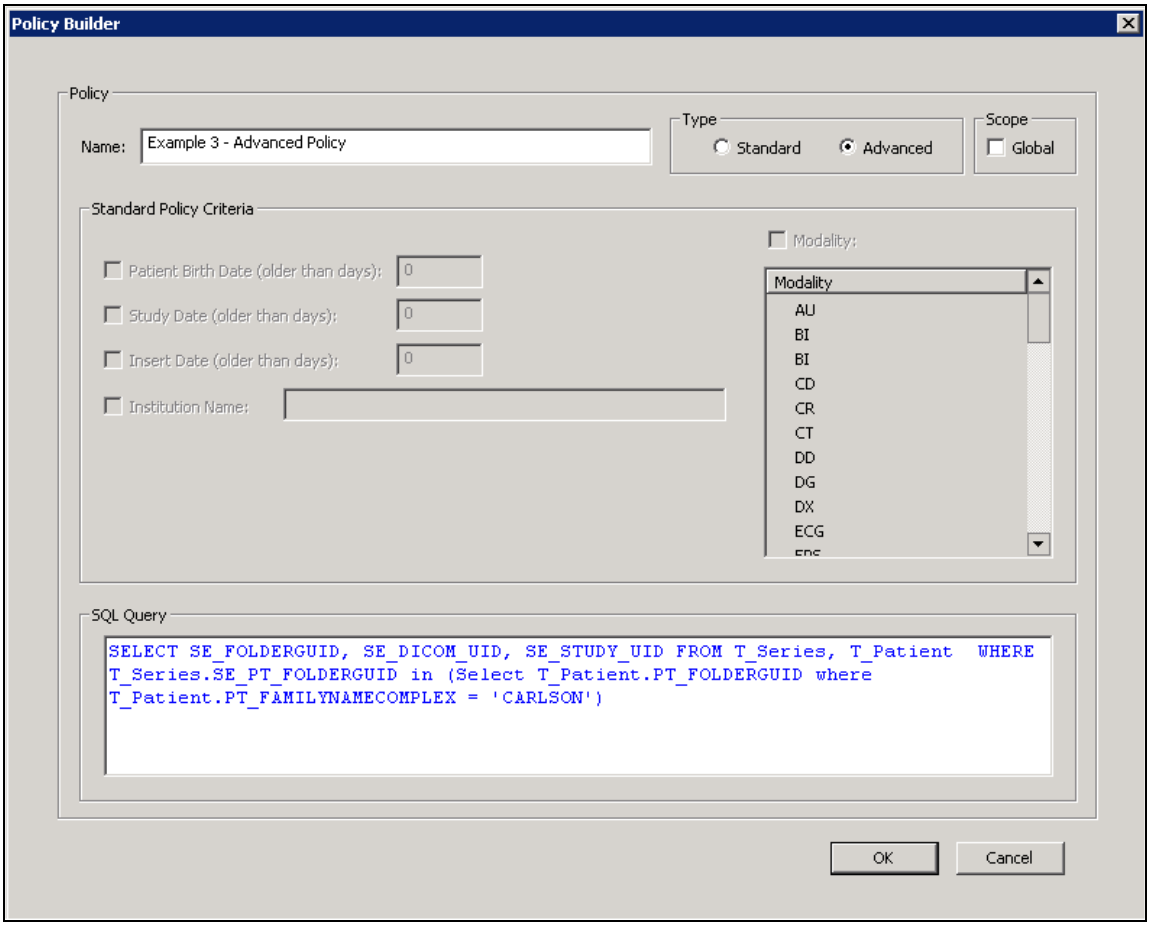


Pati...	Patient Name	Study Date	Birth Date	St...	Ac...	Study Description	Modalities in Study
118732	Christopher^Brenden^Gaven^	12/27/1994	6/16/1945	3018	1018	This is a description of study # 118732.0	\MR\
118727	BROWNELL^Kristen^Cornelia^	3/6/1995	9/7/1926	3008	1008	This is a description of study # 118727.0	\MR\
118725	BELFORD^Kelle^Caroline^	3/27/1995	5/9/1917	3004	1004	This is a description of study # 118725.0	\MR\
118726	Trumpy^Lloyd^Clive^	6/1/1996	9/8/1926	3006	1006	This is a description of study # 118726.0	\MR\
118723	Carlson^Gabriel^Katelynn^	7/20/1996	12/10/2001	3000	1000	This is a description of study # 118723.0	\MR\
118731	CAMPION^Jackolyn^Rina^	4/7/1997	4/18/1970	3016	1016	This is a description of study # 118731.0	\MR\
118730	BRIDGES^Jung^Ram^	10/8/1998	9/18/1939	3014	1014	This is a description of study # 118730.0	\MR\
118729	Warner^Lael^Toni^	7/26/1999	7/9/1978	3012	1012	This is a description of study # 118729.0	\MR\
118728	Wooten ^Colin^Burton^	8/13/2000	12/8/1971	3010	1010	This is a description of study # 118728.0	\MR\
118724	CALVERT^Raphael^Dale^	8/8/2001	4/23/1922	3002	1002	This is a description of study # 118724.0	\MR\
118724	CALVERT^Raphael^Dale^	8/19/2001	4/23/1922	3003	1003	This is a description of study # 118724.1	\NM\

The resulting studies are displayed after the policy has been executed.

Example 3 – Advanced Policy assigned to single DB.

This example contains a data set of 10 patients and 20 studies stored to 1 DICOM database. The criteria for example 3 are all images for Patient's with last name of Carlson.



On the Policy Builder screen, select "Advanced" for Policy Type. Selecting "Advanced" opens the SQL Query window and allows the user to input a custom query. The query used in this example is listed below:

SELECT SE_FOLDERGUID, SE_DICOM_UID, SE_STUDY_UID FROM T_Series, T_Patient WHERE T_Series.SE_PT_FOLDERGUID in (Select T_Patient.PT_FOLDERGUID where T_Patient.PT_FAMILYNAMECOMPLEX = 'Carlson')

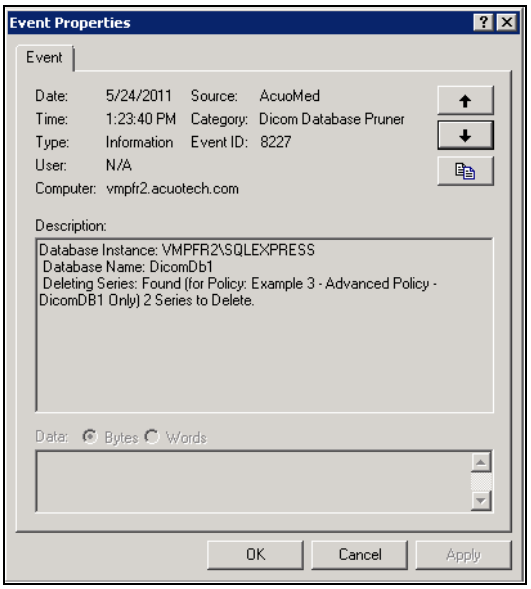
This query selects series for patients with the Given Name of "CARLSON"

NOTE: When developing a custom SQL Query for use with an advanced purge policy, a requirement enforced by the Policy Builder is that all queries must begin with the following prefix: (SELECT SE_FOLDERGUID, SE_DICOM_UID, SE_STUDY_UID FROM T_Series, T_Patient)

The SQL Query returns 2 studies to be purged (as indicated by the screenshot below). We can expect these studies to be deleted (from DicomDb1) when the policy task is executed.

Pati...	Patient Name	Study Date	Birth Date	St...	Ac...	Study Description	Modalities in Study
118725	BELFORD^Kelle^Caroline^	3/27/1995	5/9/1917	3004	1004	This is a description of study # 118725.0	\MR\
118725	BELFORD^Kelle^Caroline^	9/6/2000	5/9/1917	3005	1005	This is a description of study # 118725.1	\NM\
118730	BRIDGES^Jung^Ram^	10/8/1998	9/18/1939	3014	1014	This is a description of study # 118730.0	\MR\
118730	BRIDGES^Jung^Ram^	10/18/2000	9/18/1939	3015	1015	This is a description of study # 118730.1	\NM\
118727	BROWNELL^Kristen^Cornelia^	3/6/1995	9/7/1926	3008	1008	This is a description of study # 118727.0	\MR\
118727	BROWNELL^Kristen^Cornelia^	1/14/1998	9/7/1926	3009	1009	This is a description of study # 118727.1	\NM\
118724	CALVERT^Raphael^Dale^	8/8/2001	4/23/1922	3002	1002	This is a description of study # 118724.0	\MR\
118724	CALVERT^Raphael^Dale^	8/19/2001	4/23/1922	3003	1003	This is a description of study # 118724.1	\NM\
118731	CAMPION^Jackolyn^Rina^	4/7/1997	4/18/1970	3016	1016	This is a description of study # 118731.0	\MR\
118731	CAMPION^Jackolyn^Rina^	6/15/1997	4/18/1970	3017	1017	This is a description of study # 118731.1	\NM\
118723	Carlson^Gabriel^Katelynn^	7/20/1996	12/10/2001	3000	1000	This is a description of study # 118723.0	\MR\
118723	Carlson^Gabriel^Katelynn^	2/15/1994	12/10/2001	3001	1001	This is a description of study # 118723.1	\NM\
118732	Christopher^Brenden^Gaven^	12/27/1994	6/16/1945	3018	1018	This is a description of study # 118732.0	\MR\
118732	Christopher^Brenden^Gaven^	7/3/2000	6/16/1945	3019	1019	This is a description of study # 118732.1	\NM\
118726	Trumpy^Lloyd^Clive^	6/1/1996	9/8/1926	3006	1006	This is a description of study # 118726.0	\MR\
118726	Trumpy^Lloyd^Clive^	9/12/1998	9/8/1926	3007	1007	This is a description of study # 118726.1	\NM\
118729	Warner^Lael^Toni^	7/26/1999	7/9/1978	3012	1012	This is a description of study # 118729.0	\MR\
118729	Warner^Lael^Toni^	3/20/1997	7/9/1978	3013	1013	This is a description of study # 118729.1	\NM\
118728	Wooten ^Colin^Burton^	8/13/2000	12/8/1971	3010	1010	This is a description of study # 118728.0	\MR\
118728	Wooten ^Colin^Burton^	7/19/2000	12/8/1971	3011	1011	This is a description of study # 118728.1	\NM\

The screenshots below show the identification of the 2 series to delete while executing the Advanced Policy.



Soundex Functionality

Soundex is a phonetic algorithm for indexing names by sound. In version 5.3.1 Soundex options have been added at the DICOM (patient) Database level to provide greater control on how patients are stored despite differences in spelling. In some cases the name of the patient changes after the original image is stored and the name change is deemed minor or non-significant (for example from Johnson to Johnsen). With Soundex, a level of sensitivity can be set for the storage of images such that the matching of patient names is loosened up or removed entirely.

The SQL Server Soundex algorithm is used to provide a phonetic match of the Patient First and Last Name. Soundex returns a four-character (SOUNDEX) code to evaluate the similarity of two strings. The difference in the SOUNDEX value of the Patient First/Last Name will be used to determine if this should be stored in the same Patient Folder or a new Patient Folder. If the lowest value on the differences is equal to or greater than the configured value the image will be store in the same Patient Folder, otherwise, the rules for a match failure will be applied.

For example:
SELECT SOUNDEX ('Smith'), SOUNDEX ('Smithe') = S530 S530

In this example all four SOUNDEX characters match.

The **DIFFERENCE** function compares the difference of the SOUNDEX pattern results. The integer returned is the number of characters in the SOUNDEX values that are the same. The return value ranges from 0 through 4: 0 indicates little or no similarity, and 4 indicates a strong similarity or identical values.

For Example:
SELECT DIFFERENCE('Smith', 'Smithe') = 4

The range of values allowed is 0-4, with 4 being the strictest and 0 being the least strict. For example the following Soundex settings would result in successful storage of the Matched Name to the Original Name:

Soundex Calculations			
Difference Value Allowed	**Original Name**	**Matched Name**	**SQL Statement**
4	Smith	Smithe	SELECT DIFFERENCE(‘Smith’, ‘Smithe)
3	Smith	Smithson	SELECT DIFFERENCE(‘Smith’, ‘Smithson’)
2	Smith	Swanson	SELECT DIFFERENCE(‘Smith’, ‘Swanson’)
1	Smith	Mauer	SELECT DIFFERENCE(‘Smith’, ‘Mauer’)
0	Smith	Caulfield	SELECT DIFFERENCE(‘Smith, ‘Caulfield’)

Comparing two names and assigning a value of difference using Soundex allows us to make the correct decision on whether to store the inbound patient to an already existing patient record, a new patient record, or to reject the c-store entirely.

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Match Failure Action
Two options are available if there is a Patient Name mismatch based on the configured parameters. The Images (C-STORE negative response) can be rejected or a new Patient Folder with the same Patient ID will be created.

- Rejecting the image will cause the image to be Paused in the Batch Store Queue if the Database Destination is configured for Batch processing. Patient Management will be needed to edit the Patient's First and Last Name in the database to match the incoming image. The image stored can then be Resumed in the Batch Store queue.

- Accepting the images will result in multiple Patient ID folders.

NOTES: If Soundex is configured and a patient is stored under the same patient folder, the original name will be transmitted if the patient is sent outbound. Therefore, if multiple Acuo systems are involved in an enterprise configuration, it may be advisable to configure the same Soundex settings on all Acuo systems for consistency.

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Assign Soundex values to DICOM Database

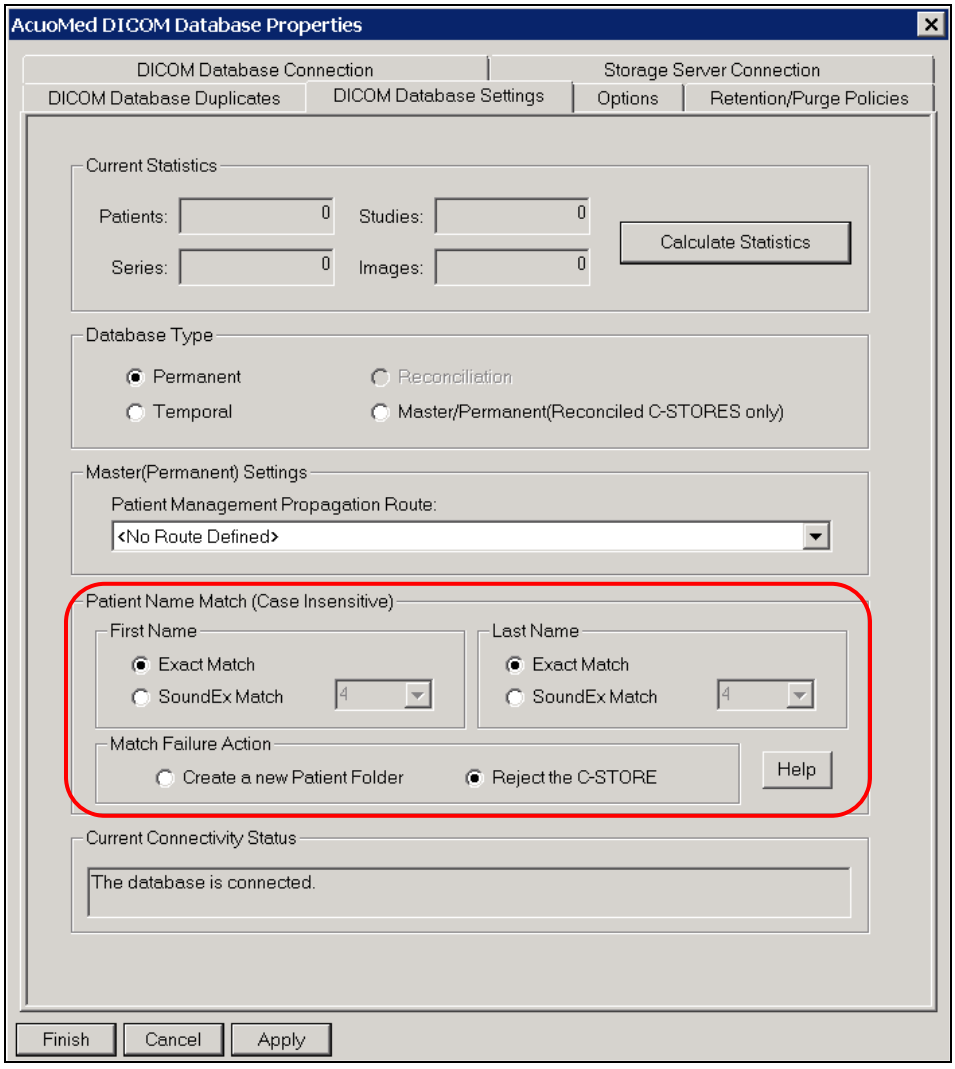
To assign Soundex Values to a DICOM database, follow these steps:

1. Expand the console tree as follows: AcuoMed Image Manager → Image Manager Server → Router Configuration → Destinations → AcuoMed DICOM Databases

2. Right-click a DICOM Database and select **Update.**

3. Click on the DICOM Database Settings tab.

The AcuoMed Dicom Database Properties dialog displays with the DICOM Database Settings tab selected.



4. Configure Soundex Match for First Name and Last Name. The options are as follows:

   a. Exact Match – Soundex Disabled, anything other than an exact match of the name will trigger the Match Failure Action selected.

b. Soundex Match – Soundex is enabled and the dropdown menu becomes available to assign an appropriate Soundex difference value (0-4).

5. Select a **Match Failure Action** in the case that at least one of the two names did not meet match qualifications. The options are as follows:

   a. Create a new Patient Folder – if either name fails to meet the matching settings the inbound C-store will be accepted and a new Patient Folder will be created with a duplicate Patient ID.

   b. Reject the C-Store – if either name fails to meet the matching settings, the inbound C-Store will be rejected. Rejected jobs will enter a Paused state in the Batch Store Manager. There will also be an event populated in the Acuo Event Viewer describing the reason for the failure.

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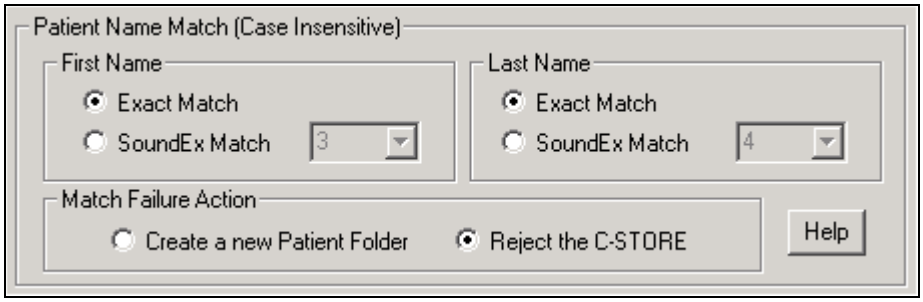
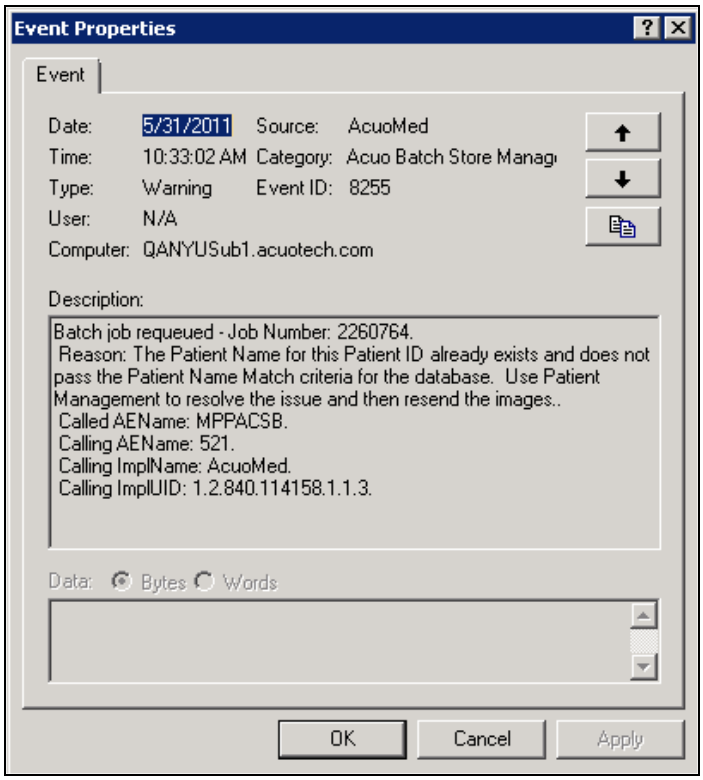
Example 1 – Default Settings

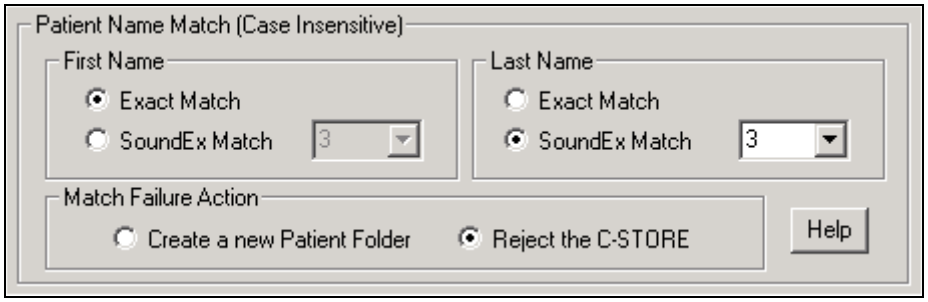


Inbound C-Store	Existing Patient Record	Result
Patient ID: 92513110 / Patient Name: Smith^Holden^^^	Patient ID: 92513110 / Patient Name: Smith^Holden^^^	Inbound C-Store is accepted and Merged with existing Patient Record.

Inbound C-Store	Existing Patient Record	Result
Patient ID: 92513110 / Patient Name: Smithson^Holden^^^	Patient ID: 92513110 / Patient Name: Smith^Holden^^^	Inbound C-Store is Rejected. See below for event.



Example 2 –Soundex Enabled with following settings



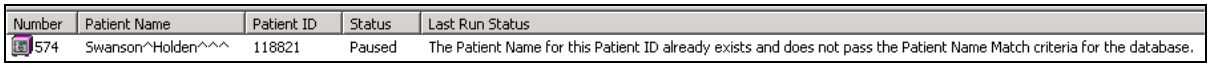
If the Last name of the incoming C-Store has a Soundex difference value of 3 or more, accept the C-store.

Inbound C-Store	Existing Patient Record	Result
Patient ID: 92513110 — Patient Name: Smithson^Holden^^^	Patient ID: 92513110 — Patient Name: Smith^Holden^^^	Inbound C-Store is accepted and Merged with existing Patient Record.

If the Last name of the incoming C-Store has a Soundex difference value of 2 or less, reject the C-store.

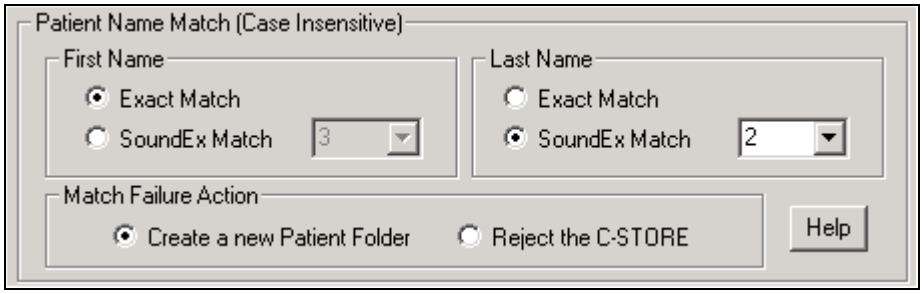
Inbound C-Store	Existing Patient Record	Result
Patient ID: 92513110 — Patient Name: Swanson^Holden^^^	Patient ID: 92513110 — Patient Name: Smith^Holden^^^	Inbound C-Store is rejected. See Batch Store Job below.

Below is an example of a rejected C-Store as displayed in the Batch Store Manager.



Number	Patient Name	Patient ID	Status	Last Run Status
574	Swanson^Holden^^^	118821	Paused	The Patient Name for this Patient ID already exists and does not pass the Patient Name Match criteria for the database.

Example 3 –Soundex Enabled with following settings



If the last name of the incoming C-Store has a Soundex difference value of 2 or more, accept the C-store.

Inbound C-Store	Existing Patient Record	Result
Patient ID: 92513110, Patient Name: Swanson^Holden^^^	Patient ID: 92513110, Patient Name: Smith^Holden^^^	Inbound C-Store is accepted and Merged with existing Patient Record.

If the Last name of the incoming C-Store has a Soundex difference value of 1 or less, reject the C-store.

Inbound C-Store	Existing Patient Record	Result
Patient ID: 92513110, Patient Name: Mauer^Holden^^^	Patient ID: 92513110, Patient Name: Smith^Holden^^^	Inbound C-Store is accepted and a new patient record is created. See screenshot below.

When "Create a new Patient Folder" is enabled, any match failures are accepted and a new Patient Folder is created with the same Patient ID. The screenshot below demonstrates this.

Patient ID	Patient Name	Birth Date	Study ID	Accession	Study Description
92513110	Mauer^Holden^^^	7/30/1934	9949	1925861	CT Chest W(Unpaired)
92513110	Smith^Holden^^^	7/30/1934	3000	1000	This is a description of study # 118756.0

Appendix A – Frequently Asked Questions

In this appendix:

General Questions

Installation Questions

Configuration Questions

Remote Management Questions

System Backup and Recovery Questions

General Questions

Here are a few frequently asked general questions about AcuoMed.

Is AcuoMed compatible with my existing PACS/DICOM equipment?

Yes. AcuoMed complies with the DICOM 3.0 Standard. If your current equipment is DICOM 3.0 compatible, AcuoMed can communicate and interoperate with these devices. AcuoMed allows you to continue to derive value from your legacy systems while providing a smooth migration path to open systems equipment and new technologies.

Am I limited in how much I can expand my AcuoMed Image Manager installation?

No. AcuoMed is extensible both within an individual Image Manager Server Node and across your entire enterprise. You can expand the physical archiving space of individual AcuoMed Servers, add new AcuoMed Servers, and share resources and manage assets across a large, geographically-distributed AcuoMed network.

How does AcuoMed accelerate the performance of my imaging network?

By controlling and filtering interfaces to HIS/RIS, AcuoMed improves modality worklist management and thus reduces network traffic. AcuoMed can also take receive inbound image traffic from a modality and distribute this data to multiple destinations in a single operation; which quickly frees up the modality for subsequent processing. Also, AcuoMed's Batch Processing Managers can deliver image traffic to multiple destinations even if one or more of those destinations are not currently available. This "store and forward" capability eliminates the need for time-consuming and performance-degrading retries of undelivered image traffic.

Installation Questions

Here are some common installation questions.

How do I know what hardware, software, and networking components I need for AcuoMed?

This information is provided in Chapter 3 – Getting Started.

How do I estimate how much storage capacity I will need?

Refer to *Appendix C – Storage Analysis* which discusses how to use the automated tools that Acuo Technologies provides to assist you with planning both your online (RAID) and offline (robotic tape library) storage requirements.

What is the DILIB application/managed share, and why is it required?

DILIB, the DICOM Library, is a subsystem of AcuoMed. A DILIB managed share and application within AcuoStore is required in order for Dilib to receive the DICOM data off the wire and write it to disk. Once the data has been written to the managed share (disk), the Dilib subsystem hands the data to the AcuoMed Router for further processing. Therefore, it is strongly recommended that the DILIB managed share be located on a highly available, locally attached disk, however, ultimately the configuration is at the users discretion.

Configuration Questions

Here are a few common questions relating to AcuoMed configuration. For each question, a general explanation is given of what you need to do. Also, a reference is given to one or more procedures that demonstrate how to perform the specific task. These procedures are part of the configuration example in Chapter 4. So, you can use them as a guide, but you will need to make changes (for example, IP addresses, route names, AE names, etc.) that are appropriate to your system configuration.

How do I configure the features that are licensed for an AcuoMed Server?

To change your feature licensing click the **Feature Validation** node in the MMC console tree (under AcuoMed Server). The right pane displays the current licensed features configuration. To change your licensed features, you will need to provide your Server Identification (at the top of the right pane) to Acuo Technologies. You will then receive a new feature key that you will type in the Feature Key field. When you click **Apply**, your new licensed features configuration will display.

Refer to **AcuoMed Feature Validation** on page 48 for more information.

I made a configuration change, why am I not seeing it?

After you make changes to the AcuoMed configuration, you must restart the AcuoMed service in order for the changes to take effect.

For the specific procedure to do this, reference the topic *Restarting the AcuoMed Service After Configuration* on page 185.

How do I add a modality?

You add a modality to the AcuoMed configuration as an SCP source under the DICOM Configuration node of the console tree. On the AcuoMed side, this involves setting up a new SCP for the AcuoMed Server IP address and port that the modality will be calling. On the modality side, the modality must be configured to call the proper IP address and port on the AcuoMed Server.

For specific information on how to do this, reference the topics New SCP on page 134 and *Set up SCP for 220.8.3.7* on page 135.

NOTE:	There is an alternative way to add a modality, which is to configure the new modality to connect to an existing SCP. This method requires configuration of the modality, but no special AcuoMed configuration. Refer to the appropriate modality configuration information.

How do I add a view station?

You add a view station to the AcuoMed configuration as a Local Route Destination of the type External DICOM Device under the Router Configuration node of the console tree. To do this, you need to add a New External DICOM Device and

then configure this device as needed for the view station you are adding (for example, the view station's AE Name, SOP configurations, etc.)

For specific information on how to do this, reference the topics *Set up Destinations*

on page 102, *External DICOM Device* on page 108, and *Continue with the next procedure to configure the View Station*

Configure the View Station on page 108.

How do I add a view station that can do a move?

By default, when you add a new Local Route Destination (see the previous question) this new destination is set up to support C-MOVE, C-STORE, and C-FIND operations. So you do not need to do anything special to allow a newly-added view station to do a move operation.

However, if you want to restrict a view station (or other device destination) you can reconfigure the route definition(s) for the device to add the filtering you want. And you can set up multiple route definitions with different filtering for the same device. For example, a view station on one route might support the default C-MOVE, C-STORE, and C-FIND operations. But the same view station on a different route might be reconfigured to only receive stores.

For specific information on how to do this, reference the topic *Reconfigure First Route* on page 119.

NOTE: Prior to reconfiguring a route definition, you must first set up the route definition (see the next question).

How do I define a route to a destination?

You define a route to a destination by setting up a Local Route Definition under the Router Configuration node of the console tree. To do this, you need to add a New Route Name and then set up the destinations for that route (such as AcuoMed DICOM Databases, AcuoRoute Remote Clients, and External DICOM Devices).

How do I auto forward?

AcuoMed supports routing to both single-point and multi-point destinations. So it is easy to configure AcuoMed to deliver (auto forward) DICOM image data to multiple destinations in a single operation. You do this by defining a multi-point route two or more destinations.

For specific information on how to do this, see the previous question

*How do I define a route to a destination***?**.

How do I add a route that stores to both a local image cache and to a deep-level archive?

You do this, as we have seen in the questions above, by first setting up the local image cache (AcuoMed DICOM Database) and the Deep-End Server with its deep-level archive as Local Route Destinations and then defining the route(s) to these destinations. Note that to be able to access the deep-level archive, you must add it to the Deep-End Server configuration as both a Local Route Destination (an AcuoMed DICOM Database configured as a deep-level archive, not a Temporal Server) and as a Local Route Definition.

How do I add a route that moves images stored on a deep-level archive to the local image cache and a viewing station?

As with the previous question, this involves configuration on both the local Department (local) AcuoMed Server and the Deep-End AcuoMed Server where the deep-level archive is located. On the local AcuoMed Server, you must set up the required Local Route Destinations for the local image cache and view station and define a route to these destinations. On the Deep-End AcuoMed Server, you must add a route definition to the move destinations and set up move/route mapping to allow images to be moved from the deep-end archive to the move destinations.

How Do I Collaborate with Another DICOM Device?

The Federation feature allows an AcuoMed Server to collaborate with an unlimited number of external Acuo and non-Acuo devices, and to populate Find and Move operations with these other devices. In addition, Federation allows AcuoMed to broker Move operations across multiple devices in an enterprise and to intelligently collect and return requested information as a consolidated result to the requesting device.

To implement Federation you need two things. First, you must be licensed for the Federation option (refer to **AcuoMed Feature Validation** on page 48). Second you need to have an external DICOM device configured and routes set up to populate Finds and Moves to external devices (refer to *External DICOM Device* on page 108 and *Set up Routes* on page 131).

Can I set up customized, rule-based routing for my DICOM network?

Yes. AcuoMed provides powerful rule-based routing controls via its Tag Rule Routing functionality. You can customize both tag values and the tags that are available for rule-based routing. And you can set up either simple or complex rules to control a wide variety of possible routing scenarios that fit your business needs.

For overview information on Tag Rule Routing, refer to the topic *Controlling Routing with Tag Rules* on page 42. For information on how to set up rule-based routing, refer to the topic *Set up Routing by Tag* on page 151.

If I'm using Tag Rule Routing, do I need to set up customized tags for each AcuoMed Server?

No. AcuoMed allows you to build a single database of customized tag values and then access this single source from every other AcuoMed Server in your network. This eliminates time consuming, redundant data entry on multiple servers and avoids the entry errors and inconsistencies associated with building and maintaining multiple sets of data.

For more information about setting up a single source for tag value data, refer to the topic **Centralizing Tag Value Data** on page 45.

When building a tag rule, can I specify a particular source as part of my rule?

Yes. When building a tag rule, you can choose Insert External SCU Rule. This allows you to select as a valid source one or more external SCUs currently defined in your AcuoMed configuration. In this case, only DICOM messages inbound from the selected external SCU(s) will be passed for additional rule processing or customized routing.

For an example of how to set up an external SCU rule, refer to the topic *Configure Tag Rule Routing* on page 156.

What if the tag I want to use to control routing is not currently available?

AcuoMed is shipped with a number of preset tags that Acuo Technologies feels are useful for many routing scenarios. But if the DICOM tag you want does not currently appear, you can add it to the set of available tags.

Refer to the topic *Add a Tag* on page 164 for an example of how to add a new tag to your AcuoMed configuration.

What about other configuration options?

AcuoMed is flexible and can be set up in a wide range of configurations. If none of the items above address your question, please review the information given in Chapter 4 – AcuoMed Configuration Example. If you still cannot locate the information you need, please contact Acuo Technologies for assistance.

Patient Management Questions

Here are some common patient management questions.

How will I know when I need to fix patient data?

If you are not using the Reconciliation feature, you normally find this out when there is some problem locating or processing patient information (for example, someone cannot locate a new study done for a certain patient because a Patient Name or Patient ID is incorrect).

If you are licensed for Reconciliation, an event (normally a group of like events) will be present on the reconciliation queue (within Reconciliation Event Manager). The event properties information available from the reconciliation queue will provide assistance with determining what the patient data problem is.

What are my options for fixing patient data?

If you are not using the Reconciliation feature, you can use AcuoMed's standard DICOM Database Management functionality to manually search for patients and to view and edit patient data as needed to fix any known problems. For more information, refer to the topic *DICOM Database Management* on page 189.

If you are licensed for Reconciliation, you use the Reconciliation Event Manager to edit patient assets to resolve reconciliation events. After editing patient data, the asset(s) are submitted for reprocessing. For more information, refer to the topic For more information, refer to the topic *Reconciliation Event Manager* on page 240.

I just licensed the Reconciliation feature – what do I do now?

There are several things you need to do, such as installing a reconciliation database, setting up routes, setting up reconciliation tag rules, and configuring called AE names. For more information, refer to the topic *Reconciliation Configuration Requirements* on page 232.

What is the reconciliation database and how do I install it?

A reconciliation database is required to support the Reconciliation feature. This database is used to temporarily hold assets that have not yet passed reconciliation. While assets are in the reconciliation database, they can be searched and moved as needed, which allows interim access to the assets until they are delivered to their route destinations.

Enabling the Reconciliation feature automatically launches the process to install a reconciliation database. For assistance with this process, refer to the topic *Install a Reconciliation Database* on page 233.

What can I do with reconciliation tag rules?

Reconciliation tag rules allow you to filter and auto-correct inbound data that would otherwise cause a reconciliation event. There are a few configuration steps you need to do to take advantage of these powerful features. For more information, refer to the topic *Reconciliation Tag Rules* on page 250.

HIS/RIS Connectivity Questions

Here are some common HIS/RIS connectivity questions.

What do I need to do to set up a HIS/RIS connection to AcuoMed?

To establish HIS/RIS connectivity, you must set up the HIS/RIS connection in the AcuoMed Server configuration. This involves defining a number of parameters such as the connection name, called AE name of the connected HIS/RIS system, required TCP/IP and listening port connectivity information, DICOM tag and DICOM search order information, and options that govern C-FIND request control. The procedure *Set up a New HIS/RIS Connection* on page 282 explains this process in detail.

How does the HIS/RIS connection interact with my tag data?

A HIS/RIS-connected AcuoMed Server is able to derive DICOM tag information from HIS/RIS events and save this information in an XML database maintained by AcuoMed. AcuoMed uses its HIS/RIS connection to "learn" information that then makes it possible to build, update, and populate DICOM tag information that is stored on and used by the AcuoMed Server.

For more information, refer to the topic *Automatic Building and Updating of Tag Data from HIS/RIS Events* on page 276.

What does Prefetch do and how do I set it up?

AcuoMed's Prefetch functionality uses HIS/RIS patient/study events information it receives from a connected HIS/RIS system to schedule batch move jobs for required patient images. You need to set up Prefetch Station AE Title Rule properties for all modalities that are connected to an AcuoMed Server. Once you have done this, prefetch is able to invoke the Acuo Batch Move Manager to perform the automated movement of required images from their source locations to their destinations.

For more information, refer to the topic *Prefetch* Overview on page 276.

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Acuo Batch Processing Questions

Here are some common batch processing questions.

How do the different batch processing managers differ?

The Acuo Batch Processing Managers provide four key batch management capabilities. The Batch Store Manager and Batch Move Manager provide batch storing and moving of images that need to be delivered to one or more local route destinations. The Batch Reprocessing Manager works in coordination with Acuo Technologies' Reconciliation functionality to provide batch reprocessing of patient data with a connected HIS/RIS system. The Batch Patient Update Manager works in coordination with propagation routes when modifications are made manually with the use of Patient Management or automatically with the use of Reconciliation or HIS/RIS integration in an effort to keep you entire enterprise in synch.

Why I don't see the Batch Reprocessing Manager in my AcuoMed console?

The Batch Reprocessing Manager is part of AcuoMed's overall Reconciliation functionality. If you have not licensed the Reconciliation feature, the Batch Reprocessing Manager does appear in the console tree under the Acuo Batch Processing Managers tree node.

Can I set global and default batch processing parameters?

Yes. This is done in the Image Manager Server Properties dialog on the Batch Processing tab. Access this dialog by right-clicking the **Image Manager Server Node** in the console tree and selecting **Properties** from the pop-up menu. On the Batch Processing tab, you can specify global queue management values for each of the batch managers. Certain values (Priority Default for example) can then be overridden for particular batch jobs as needed. For more information about making such changes, refer to the topics in *Chapter 7 – Acuo Batch Processing Managers* regarding viewing and changing batch manager job properties.

Remote Management Questions

Here are some common remote management questions.

What are my options for remotely managing AcuoMed?

You can remotely manage AcuoMed applications and AcuoMed Servers via either an MMC console interface or a terminal services client (terminal server) interface. Deciding which of these methods best fits your needs will depend on your system and network configurations and the extent of your remote management requirements.

For more information, refer to the topics *Management via MMC Console* on page 345 and *Management via Terminal Services Client* on page 352.

Can I manage multiple AcuoMed Servers and applications from a single MMC console?

Yes. You can add remote systems to a single local MMC console and manage an entire set of distributed AcuoMed resources from this single console. Or, if you find it more convenient, you can set up a separate MMC console on your local machine for each AcuoMed system you want to remotely manage.

For more information, refer to the topic *MMC Console Creation* on page 79.

Are my remote management sessions secure?

Yes. AcuoMed security is integrated with Windows logon security for MMC applications. And the terminal services client interface requires the same user authentication (user name and password logon) as is required to log on if you were actually at the remote system. It is recommended that if you are accessing remote systems across the Internet, that you do so across a virtual private network (VPN) connection that is secured by a reliable authentication means (such as SecureID token authentication).

System Backup and Recovery Questions

Here are some common backup/recovery questions.

Where can deep-level tape archives be located?

You are not restricted on the location of deep-level tape archives in your AcuoMed system network. A deep level archive can be at the same physical location (for example a clinic) as one or more department-level AcuoMed Servers for which it provides archiving services. Or, more typically, a deep-level archive can be located at a centralized location (for example a main hospital) and provide archiving services for department-level AcuoMed Servers at several locations (such as clinics and imaging centers).

What is the best way to create onsite and offsite backups?

It is recommended that you use the copying facilities of RSM to create onsite and offsite backups. You can set up a job that automatically makes up to three copies of a tape:

One copy remains in the tape jukebox.
One copy is ejected for onsite backup.
One copy is ejected for offsite backup.

Refer to appropriate Microsoft RSS/RSM information for backup and recovery procedures.

Appendix B – Troubleshooting

In this appendix:

Overview

Event Viewer (Event Log)

- Activity Log

Other Debug Aids

Trace Settings

Automated Error Event Notification

Third-Party Software

Overview

This appendix describes the various steps that you can take when you encounter problems using Acuo products. All Acuo products use log files in an attempt to output information about every possible type of problem that might occur. In the event that you encounter a problem, you should consult these logs first for possible causes.

This appendix describes the following troubleshooting aids:

Event Viewer (Event Log) – Lets you view three event logs to obtain problem information.

Activity Log – Lets you monitor command-related activities that are associated with connections to DICOM databases.

Other Debug Aids – These debug tools are used by Acuo Technical Support to troubleshoot DICOM communication problems.

Trace Settings – These monitors are part of the MMC console, and traces can be turned on at virtually every level of Acuo software to help determine a problem. Tracing can be configured to stop on any event ID appearing in the Acuo Event Log.

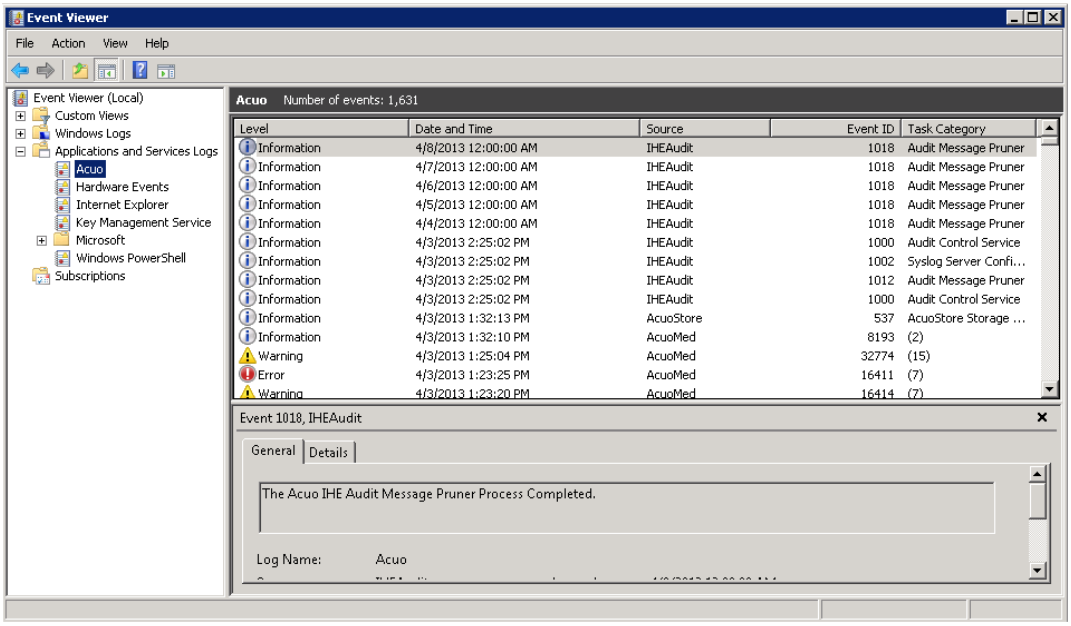
Automated Error Event Notification – This facility automates the delivery of error event trace information to the Acuo Support staff.

Third-Party Software – These are non-Acuo programs that add special capabilities.

Event Viewer (Event Log)

The Event Viewer within Windows lets you view four event logs. Each of these logs runs constantly and, when you encounter a problem, you can open the Event Viewer and select from one of the four event logs to obtain more information.

To open the Event Viewer, from the Windows Start menu, select **Programs→Administrative Tools→ Event Viewer**.



The Event Viewer contains the following three event logs:

Application Log (Windows Logs) – This log contains messages that describe events that are generated by Windows applications and services (including Acuo products). For information on how to view Acuo events only, see the next topic

Security Log (Windows Logs) – This log contains messages about any number of security-related events that you, as an administrator, can configure. For example, you may want to have an event message generated every time a particular file is accessed.

System Log (Windows Logs) – This log contains messages generated by operating system events. For example, if something were to go wrong with your network card, or if a connectivity problem occurred, you would find messages related to these problems in this log. Also, informational messages note that system services were either started or stopped.

Acuo Log (Applications and Services Logs) – This log contains messages generated by the Acuo application.

Each event log (when it is configured and in use) generates the following three message types:

Information – Information messages provide information about non-critical events.

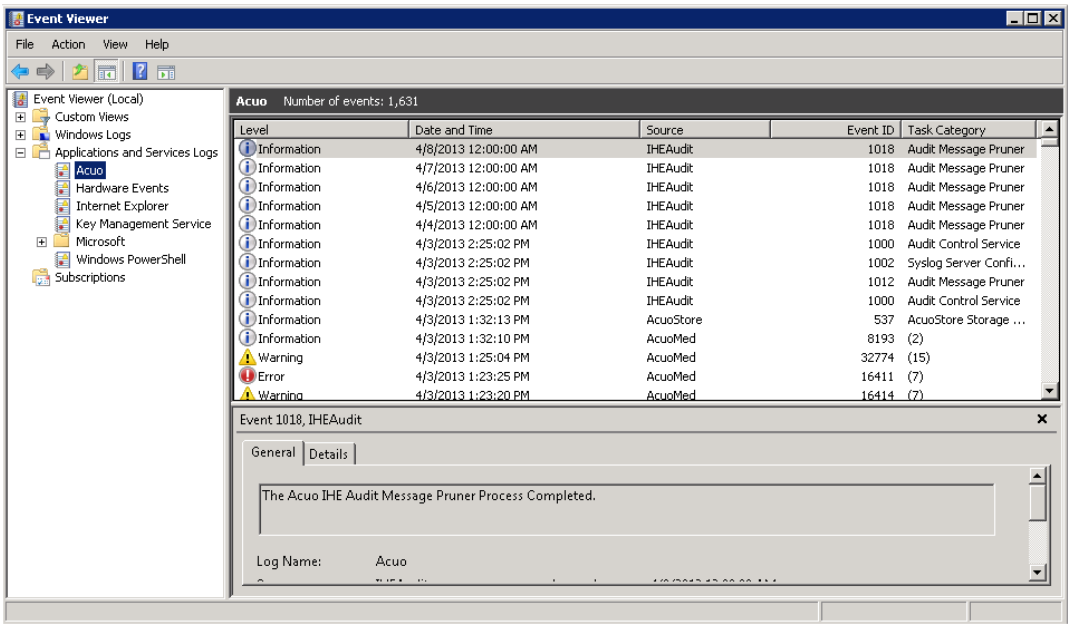
Warning – Warning messages usually indicate some kind of configuration error or network problem, or something that can be fixed by the administrator. Example warning messages include those indicating that the network or a database server is down or some type of configuration error is occurring.

Error – Error messages may require that you call Acuo Technologies to get assistance resolving the problem. First you can try stopping and restarting your services. If the problem persists after stopping and restarting your services, you should call Acuo Technologies for assistance.

NOTE:	When using the Information, Warning, and Error messages to diagnose a problem, you should review several messages around a particular timeframe to gain a more comprehensive picture of what is happening.

Event Viewer

All Acuo event can be viewed from the within the Acuo application's MMC console tree. The source column indicates the source application.

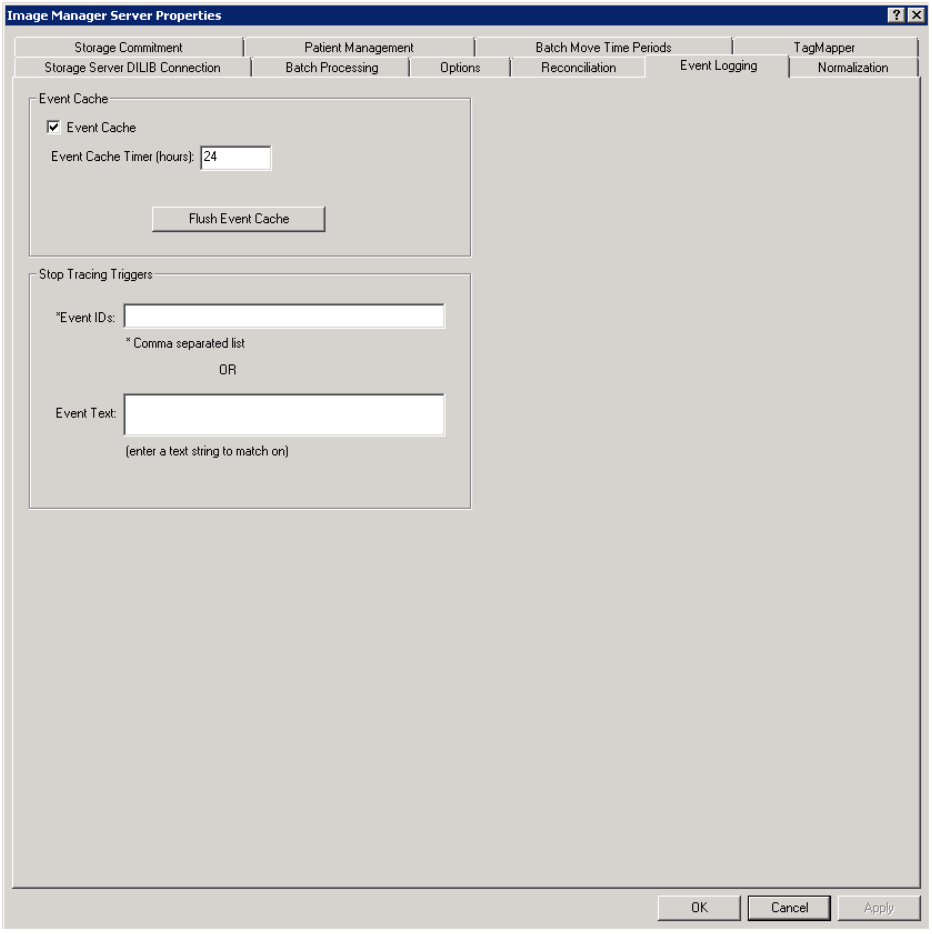


Event Cache

The Event Cache is a way to monitor events so when the event occurs again, the event with either 1) not post again, or 2) post again with a lower severity. This will help reduce the rate at which some events are output to the Event Log. The Event Cache is ON by default. To turn it off, simply right click the Image Manager Server node and select properties. Under the Event Logging tab, there is an option to turn the Event Cache On and Off as well as an Event Cache timer .

Event Cache Timer

The Global Timer can be configured to indicate a number (in hours) for entries to remain in the cache. The default setting is 24 hours.



Flush Event Cache

Users can reset/clear the event cache manually by navigating to and selecting 'Flush Event Cache', as noted below.

Stop Tracing Triggers

Stop Tracing Triggers are ways for Acuo to capture enabled traces when specific events are triggered. This allows for more effective and efficient troubleshooting of the product.

Event IDs

Enter one or more event ID's (comma separated) to stop tracing when the event(s) occur. The traces are then captured and then can be sent to Acuo Technologies for further review.

Event Text

Enter one or more text strings (comma separated) to stop tracing when the event text is encountered. The traces are then captured and then can be sent to Acuo Technologies for further review.

Activity Log

The activity log lets you monitor command-related activities that are associated with DICOM connections. This includes commands such as association (DICOM connection) C-FIND, C-MOVE, C-STORE, and C-ECHO. By monitoring these commands you can determine things like, for example, how many images were stored, how many were moved or which devices are sending and receiving messages to and from the Acuo System startup and tear down.

With compression enabled, you will also see activity like “compressing” and “decompressing” data along with original size and resulting size of the pixel data as it relates to the compression type being used.

The activity log itself, which is only available in AcuoMed, is a file named Acuo_Activity_Trace.LOG. You open the Activity Log via the AcuoMed Activity Log utility under AcuoMed Utilities (see *Opening the Activity Log* on page 445.)

Regardless of whether or not it is open, the activity log is always accumulating system activity-related information.

For a description of the fields in the Acuo_Activity_Trace.LOG file, review the sample activity log record shown below in Figure 77, and then see an explanation of each field in the table that follows.

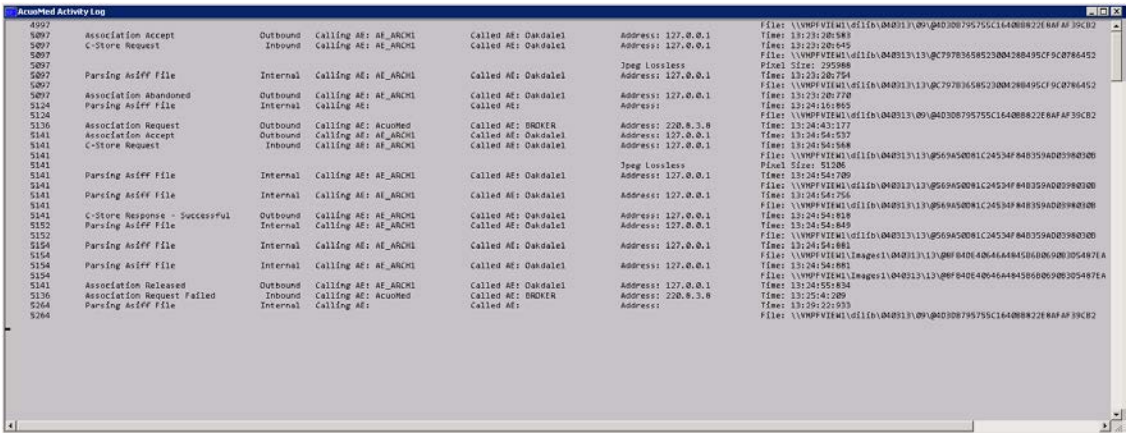


Figure 77: Sample Activity Log

Reading from left to right, the Activity Log columns display the following types of information:

- Connection Identifier
- DICOM Command
- Message Direction
- Calling AE Name
- Called AE Name
- Original and Resulting Size (pixel)
- Compression Technique
- IP Address of External Client
- Time Stamp/File Name

Opening the Activity Log

To open the Activity Log, follow these steps:

1. On the Windows desktop, double-click the **Acuo Technologies** folder to open it.
2. Within the Acuo Technologies folder, double-click the **AcuoMed Utilities** folder to open it.
3. In the AcuoMed Utilities folder, double-click **AcuoMed Activity Log**.

   The Activity Log contents display (as shown in Figure 77 above).

Other Debug Aids

Like all large standards, DICOM contains a level of ambiguity which can cause communication problems between clients and servers. Acuo Technologies has developed tools that are primarily used by Acuo personnel to capture and analyze DICOM traffic. These tools allow the Acuo Support staff to validate the Acuo DICOM interface against other DICOM-compliant devices. These debug tools can also be the last resort in cases where a difficult communications problem is evident.

Acuo Technologies has developed powerful debug tools to gather, analyze, and recreate specific DICOM sequences. These tools are used by Acuo Support to troubleshoot DICOM interaction between an AcuoMed Server and any DICOM-based client or server.

Acuo Technologies' debug aids include the following tools:

Acuo MMC Console – provides the ability to collect detailed communications data on DICOM connections.

Acuo "Decode DICOM" tool – analyzes DICOM communications data and translates this data into a more readable format.

Acuo "Replay DICOM" tool – allows Acuo Support staff to recreate exact DICOM sequences using the output from the "Decode DICOM" tool. The Replay tool is run via an EXE program and should only be used with assistance from the Acuo Support staff.

Please be sure to contact Acuo Technical Support for further information and assistance with any problems you encounter that require this level of analysis.

Trace Settings

The trace setting monitors are part of the MMC console. Traces can be turned on at virtually every level of Acuo software to help determine a problem.

Caution

Trace Settings should be used with the assistance of Acuo Support staff. Please call Acuo Technologies before using any of the trace setting monitors shown below. To assist with analysis of error events and trace data, Acuo Technologies provides an automated facility that makes it easy for you to send trace information to the Acuo Support staff – see the topic *Automated Error Event Notification* on page 448.

To access the trace setting monitors, follow these steps:

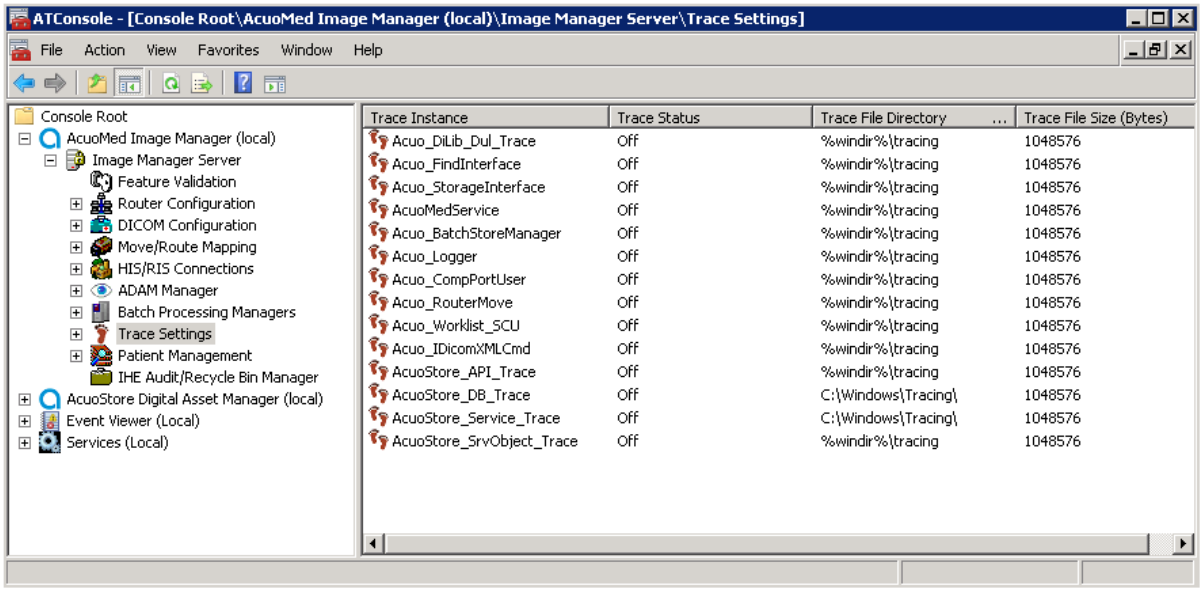
1. Start the Acuo MMC console, if it is not already running.

   Click the shortcut on the desktop, if there is one, or

   From the Windows Start menu, select Programs→Administrative Tools→ the AcuoMed Image Manager.

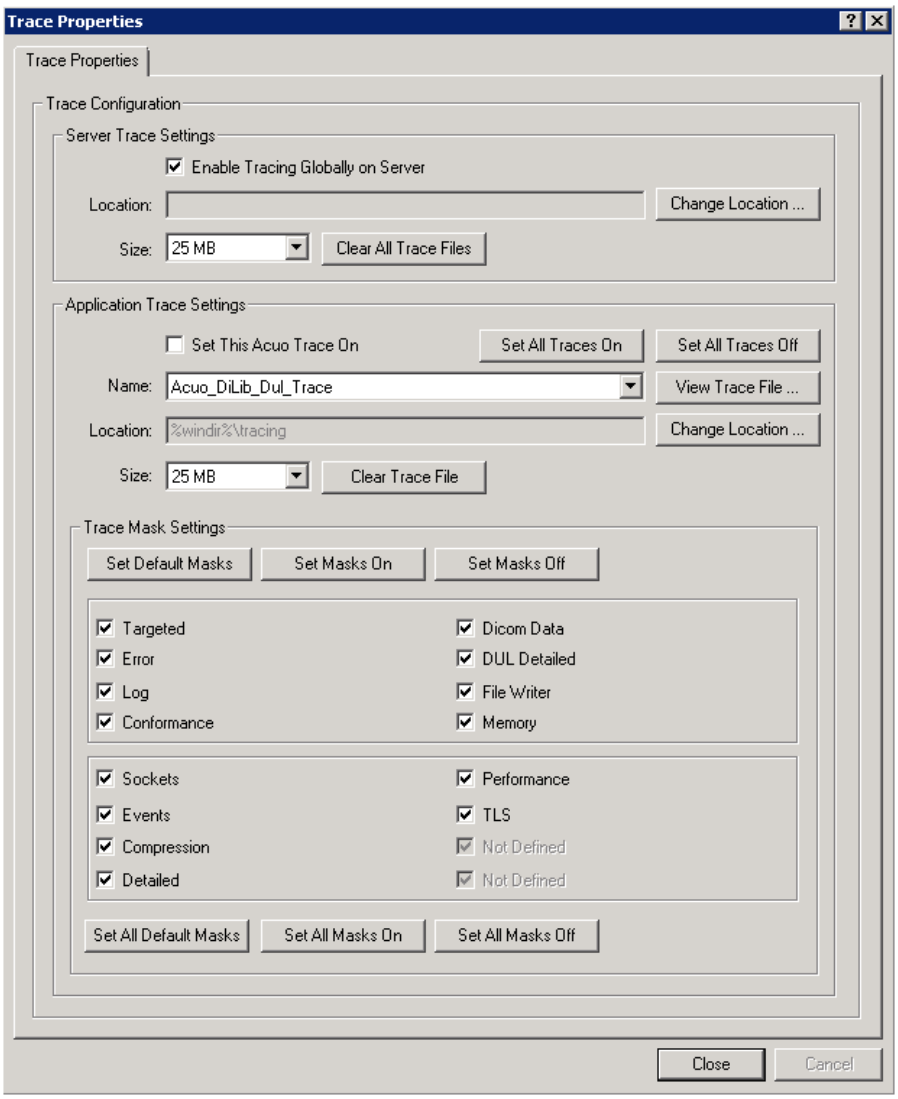
   The Acuo MMC console displays.
2. Expand the AcuoMed Image Manager until you can locate and open the **Trace Settings** folder as shown below.

   All the available AcuoMed trace monitors display.



3. To activate a particular trace, right-click the trace you want to turn on and select **Modify Trace Settings** from the pop-up menu.

   The Trace Properties dialog displays.



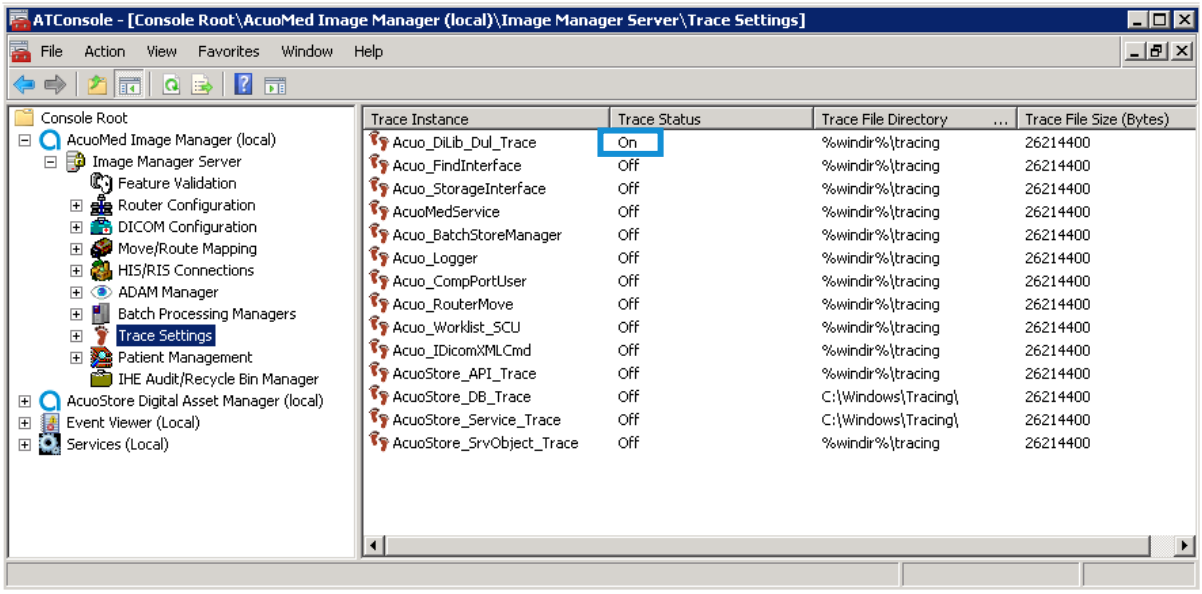
4. In the Trace Properties dialog set up the trace as needed. To activate the trace, be sure that the Individual Trace Setting **Trace On** checkbox is checked.

   This dialog gives you much control over how the trace will behave. Refer to additional information in online Help and, most importantly, be sure to contact the Acuo Support staff about how to set up your traces.

NOTE: The Global Trace is set ON by default and should be left ON unless otherwise specified by Acuo Technologies.

5. Click **Close** to save your trace settings and exit.

   The trace you just activated will now show a Trace Status of **On** in the right window pane.



Note: By clicking the **Trace Settings** node, you can see a summary of which traces are On or Off.

Automated Error Event Notification

The Automated Error Event Notification (AEEN) facility automates the delivery of error event trace information to the Acuo Support staff. AEEN can zip, encrypt, and move trace data to Acuo Technologies via FTP without user intervention. There are two options for how to trigger the AEEN packaging and delivery of trace data:

AEEN will automatically package and move trace data to Acuo Technologies whenever an error event is encountered.

Optionally, you can click the AEEN icon on the Windows desktop to send trace information immediately. A case where you might want to do this is if you are experiencing a system problem, but there are no errors associated with the problem to automatically trigger AEEN.

AEEN requires the use of an event log monitoring tool like the Event Log Manager (ELM) from TNT Software as well as PKZIP from PKWARE. Refer to *Third-Party Software* on page 451.

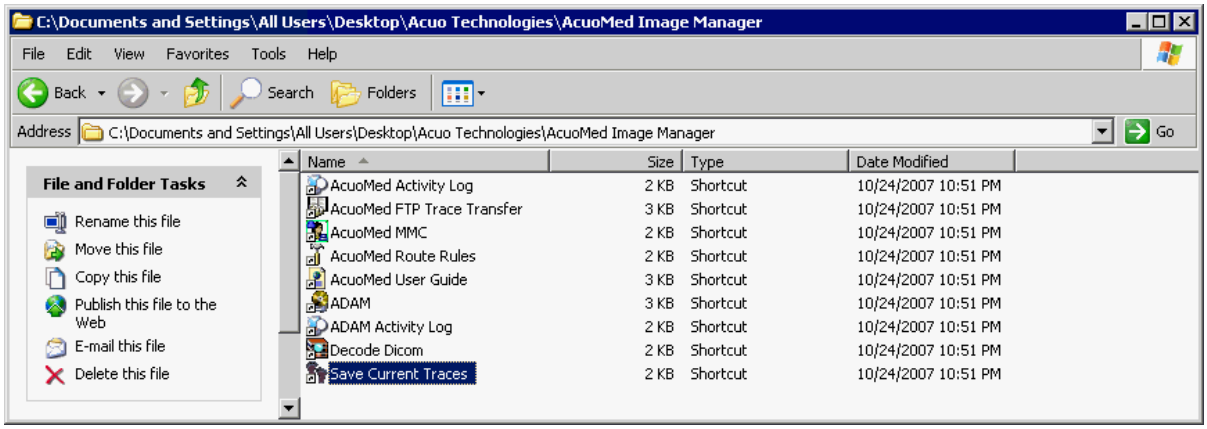
Please contact Acuo Technologies in order to configure AEEN with the appropriate username and password information for automated delivery of traces to Acuo Support.

In addition to the automated trace delivery process provided by AEEN, there may be cases when it is necessary to manually send error trace data to the Acuo Support staff (see the next topic).

Collection and Manual Delivery of Error Trace Data

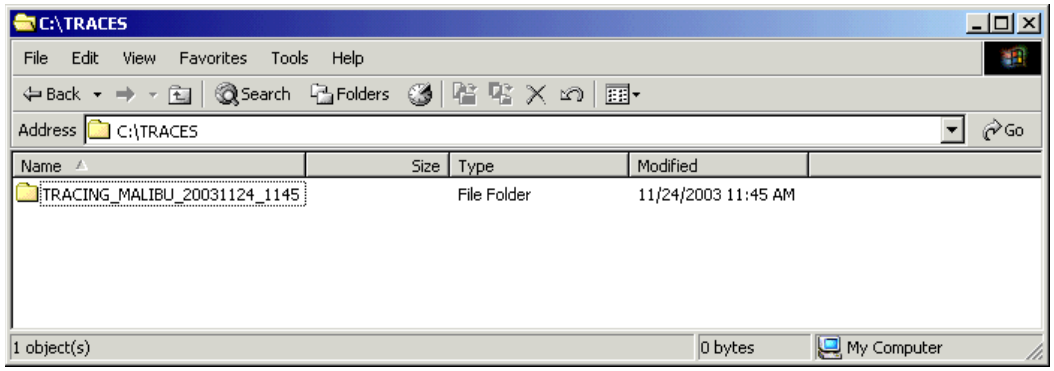
There may be cases when the Acuo Support staff will want you to manually collect and send trace information either via email or on a CD. You need to locate, zip, and send the contents of the AcuoMed trace folder. To do this, follow these steps:

1. To collect traces, double-click **Save Current Traces** from within the Acuo Technologies Folder => AcuoMed Utilities folder located on the desktop of your AcuoMed Server.



2. Select all the files intended to be sent from the AcuoMed trace folder located in C:\TRACES and add to a zip file.

   Select the folder containing all files (.LOG and .OLD) and add them to a .ZIP file.



2. Send the zip file to Acuo Technologies.

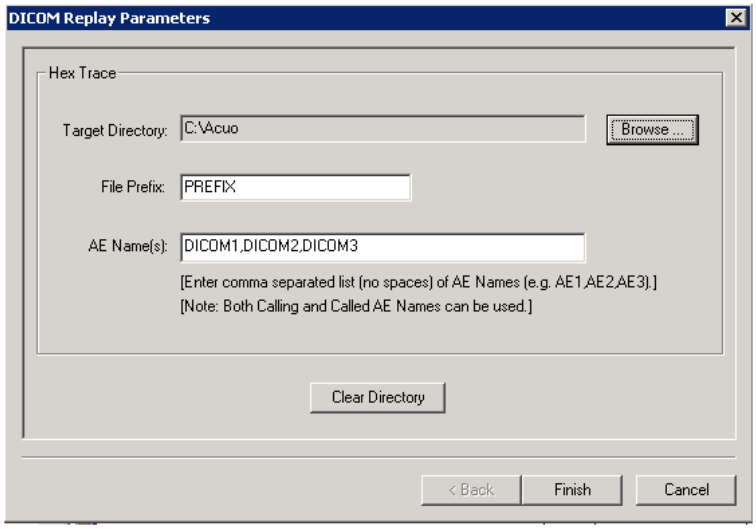
   Depending on the file size or on your firewall email permissions you will either email the zip file or write it to a CD and mail that CD to Acuo Technologies.

   Email address: support-escalation@acuotech.com
   Mailing address: Acuo Technologies
   Riverview Office Tower
   8009 34th avenue South
   Suite 900
   Bloomington, MN 55425 U.S.A.

DICOM Hex Tracing

AcuoMed comes with a rich set of tools to quickly obtain a high-level or detailed view of system activity and workflow. This advanced toolset helps to efficiently anticipate, isolate and resolve integration challenges – in many cases before they occur. Included in this toolset is the Hex Tracing (DICOM Sniffer) tool. The tool traces all data that is both written to and read from the network as the data appears on the network. A separate hex trace is generated for each DICOM association.

To Enable DICOM Hex Tracing, right-click on the **Image Manager Server Node** in the MMC console tree and select **Modify DICOM Replay Parameters** from the pop-up menu. The DICOM Replay Parameters dialog is presented as shown in the screenshot below.



The following parameters can be set within the DICOM Replay Parameters:

Target Directory - Click the Browse button to select a Target Directory where hex files will be generated.

File Prefix – Select the prefix to be used for each DICOM Hex Trace produced. (e.g., in the example above, all generated hex traces will begin with the prefix "PREFIX".

AE Names(s) - If left blank, Hex traces will be generated for any data that is both written to and read from the network as the data appears on the network. If one or more AE Name(s) are specified, hex traces will only be generated for data written to and read from the specified AE Name(s). Both Called AE and Calling AE names can be used.

Clear Directory – To disable Hex Tracing, select the "Clear Directory" button to remove the content from Target Directory field.

File Generation Details:

InProgress – When hex trace files are being generated and the connection/association is still open, files are placed into a subfolder titled "InProgress" (a subfolder within the base Hex Tracing target directory).

Complete – When the connection/association is closed, hex traces are moved to the base Hex Tracing Target Directory, and the Calling and Called AE Names are added to the file name as showing in the Format example below.

General Format - File Prefix – Hex Trace Process ID – (Calling AE-CalledAE).hex

Example – PREFIX-PID12600-3299(CallingAEName-CalledAEName).hex

Once the Hex Traces are complete, the Decode-DICOM debugging tool can be used that takes the hex trace as input and annotates the data with DICOM statements, making the trace readily understandable to the user.

Third-Party Software

Acuo recommends that you use some type of third-party, system-monitoring software to monitor the event log and other parts of your system. For example, certain third-party products can be set up to monitor the event log and page you or send an e-mail to you whenever a certain kind of event occurs.

The goal of using this type of software is to stay on top of your system and to minimize the possibility that data will be lost. Your system is made up of many very important components such as RAID storage devices, system drives, and databases. If any of these were to fail, you would want to know about it as soon as possible. It is practical to use third-party products to perform these monitoring tasks so that you can select the products that best fit your environment and system components. It is not possible for Acuo Technologies to anticipate every system configuration and all customer monitoring requirements. Therefore, using third-party software lets you supplement your Acuo systems environment with the tools that best suit your needs.

One such application is the Event Log Monitor (ELM) from TNT Software. For your convenience, Acuo Technologies has delivered a 90 day demo of ELM which is located on your Acuo Technologies software distribution CD. For questions related to ELM, please contact TNT Software at http://www.tntsoftware.com/.

In order to use Acuo Technologies' Automated Error Event Notification software you will need to acquire a license for PKZIP from PKWARE. You can find licensing information at http://www.pkware.com/.

Appendix C – Storage Analysis

In this appendix:

Overview of the Storage Analysis Spreadsheet

Sample Storage Analysis Spreadsheet

How to Use the Storage Analysis Spreadsheet

Understanding the Estimated Storage Requirements

Overview of the Storage Analysis Spreadsheet

This appendix describes Acuo Technologies' Storage Analysis spreadsheet tool that helps you accurately estimate storage sizing requirements for an AcuoMed Server according to the types of modalities that will be supported, the numbers of images that need to be stored, and the time periods over which images need to be stored. The goal is to size online (RAID) storage to accommodate one year's studies. Additional nearline (robotic tape library) storage is estimated according to the long-term storage requirements specified in the Storage Analysis Spreadsheet.

The Storage Analysis Spreadsheet is implemented as a Microsoft Excel spreadsheet with the filename **Acuo Image Vol-Analysis.xls**. You will find this file on the AcuoMed Web Page, http://www.acuotech.com, under resources.

NOTE: You can also run the most up-to-date version of the Storage Analysis Spreadsheet interactively at the Acuo Technologies Web site at http://www.acuotech.com.

The following topics provide a sample Storage Analysis Spreadsheet, describe how to use the spreadsheet, and discuss how to understand the estimated storage requirements.

Sample Storage Analysis Spreadsheet

The Storage Analysis spreadsheet comprises two worksheets:

Input worksheet

Analysis worksheet

The following topics describe these worksheets and provide samples.

Input Worksheet

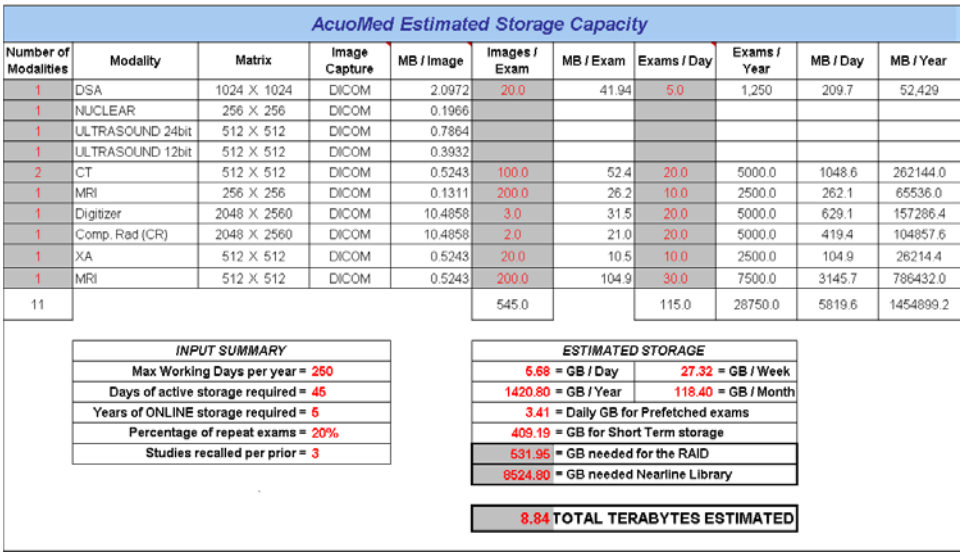
The Input worksheet (see Figure 78) is used to collect general storage and connectivity information that is needed to size the online (RAID) and nearline (robotic tape library) storage devices that are required to support the AcuoMed installation and its associated DICOM devices. This includes data such as how many days per week/year the hospital works, what is the workflow (number of patients, number of exams, number of repeat exams, number of priors), what are the short-term and long-term storage requirements, and how many source and destination devices are connected to the AcuoMed Server. This data can be gathered from the scheduling component of the hospital RIS system.

Storage Analysis by Acuo Technologies		
Storage information :		
#	How many **days** does the hospital work **per year**? or How many **days** does the hospital work **per week**?	**250** **or** **0**
#	How many **patients** are processed by Radiology **per year**?	**15,000**
#	How many days of **Short-Term** storage is needed? (This is a factor for how much **RAID** is needed)	**45**
#	How many years of **NEARLINE** storage is needed for **Long-Term** storage? (Before Shelf-Management or a HW upgrade is required, this affects the LIBRARY choice)	**5**
#	How many **exams** are done **per year**?	**15,000**
#	Of all the exams, how many **repeat visit exams** per year? (20.00% of exams)	**3,000**
#	When **priors** are recalled. How many **studies** on the average are **recalled** for each new study?	**3**
Connectivity information :		
#	How many **Modalities** are **connected** to the AcuoMed Server. Count all CT, MR, NM, US, Film Digitizers, Video Capture devices that are sending data directly to AcuoMed via DICOM C-Store RQ.	**11**
#	At peak time (on the average) how many **modalities** will be storing exams into AucoMed/AcuoStore	**6**
#	To how many **destinations/workstations** is the AcuoMed Server sending data?	**4**
#	At peak time (on average) how many workstations will be receiving studies or querying the AcuoMed Server?	**4**

Figure 78: Storage Analysis spreadsheet - Input worksheet

Analysis Worksheet

The Analysis worksheet (see Figure 79) is used to collect specific information regarding numbers of each type of modality, typical images per exam, and typical number of exams per day. This information is used as further detail to calculate and verify the total amounts of storage these modalities require in a year's time. Acuo Technologies recommends that you survey modality operators to get the most accurate and current information.



AcuoMed Estimated Storage Capacity

Number of Modalities	Modality	Matrix	Image Capture	MB / Image	Images / Exam	MB / Exam	Exams / Day	Exams / Year	MB / Day	MB / Year
1	DSA	1024 X 1024	DICOM	2.0972	20.0	41.94	5.0	1,250	209.7	52,429
1	NUCLEAR	256 X 256	DICOM	0.1966						
1	ULTRASOUND 24bit	512 X 512	DICOM	0.7864						
1	ULTRASOUND 12bit	512 X 512	DICOM	0.3932						
2	CT	512 X 512	DICOM	0.5243	100.0	52.4	20.0	5000.0	1048.6	262144.0
1	MRI	256 X 256	DICOM	0.1311	200.0	26.2	10.0	2500.0	262.1	65536.0
1	Digitizer	2048 X 2560	DICOM	10.4858	3.0	31.5	20.0	5000.0	629.1	157286.4
1	Comp. Rad (CR)	2048 X 2560	DICOM	10.4858	2.0	21.0	20.0	5000.0	419.4	104857.6
1	XA	512 X 512	DICOM	0.5243	20.0	10.5	10.0	2500.0	104.9	26214.4
1	MRI	512 X 512	DICOM	0.5243	200.0	104.9	30.0	7500.0	3145.7	786432.0
11					545.0		115.0	28750.0	5819.6	1454899.2

INPUT SUMMARY	
Max Working Days per year =	250
Days of active storage required =	45
Years of ONLINE storage required =	5
Percentage of repeat exams =	20%
Studies recalled per prior =	3

ESTIMATED STORAGE			
5.68	= GB / Day	27.32	= GB / Week
1420.80	= GB / Year	118.40	= GB / Month
3.41	= Daily GB for Prefetched exams		
409.19	= GB for Short Term storage		
531.95	= GB needed for the RAID		
8524.80	= GB needed Nearline Library		
8.84	TOTAL TERABYTES ESTIMATED		

Figure 79: Storage Analysis spreadsheet - Analysis worksheet

How to Use the Storage Analysis Spreadsheet

To properly use the storage analysis spreadsheet, you must complete the available user data entry items on both the Input and Analysis worksheets. These input items are described in the topics below.

Complete the Input Worksheet

The items on the Input worksheet provide the general information required to analyze workflow, connectivity, and storage requirements. You must complete both Storage Information and Connectivity Information for the Input worksheet.

Follow these steps to complete the Input worksheet Storage Information:

1. Enter either the number of days the hospital works per year or the number of days the hospital works per week.

   If you enter both numbers, the entry that yields the larger value for total days per year will be used.

2. Enter how many patients are processed by Radiology per year.

   This number should not include repeat patient visits.

3. Enter how many days of short-term storage in needed.

   This value affects the amount of RAID needed for day-to-day online storage of new studies and prefetched priors (if not known, use the default value of 35).

4. Enter how many years of long-term storage is needed.

   This value affects the amount of nearline (robotic tape library) storage needed for long-term storage of studies (if not known, use the default value of 5). This should be the period of years until the records can be moved to shelf-management (offline storage) or until a hardware upgrade is anticipated.

5. Enter how many exams are done per year.

   This statistic comes from Radiology administration and Radiology Information.

6. Enter how many repeat exams are done per year.

   This is the number of exams made for a patient on different visits. This is not the number of exams that had to be repeated because of errors or issues (if not known, use 20% of the total exams per year as the default).

7. Enter how many studies are recalled for each new study when priors are recalled.

   This is the typical number of prior exams recalled for a study. For example, for a Head study, the recall is for the last 2 CT Heads, the last 1 X ray, and the last 3 MRs = for a total of 6 priors. You need to determine an average number of priors for all types of procedures (if not known, enter 3 as a default).

Follow these steps to complete the Input worksheet Connectivity Information:

1. Enter how many modalities are connected to the AcuoMed Server.

   Be sure to include all types of devices that are sending data directly to AcuoMed via DICOM.

2. Enter the average peak-time value for how many modalities will be storing exams into AcuoMed/AcuoStore.

   This is the typical maximum value during a department's busiest period of a shift. Video Capture and Film Digitizers are active in bursts; therefore, only count the CT, MR, CR, and NM scanners that are active and sending to the AcuoMed Server at peak time.

3. Enter to how many destination/workstations the AcuoMed Server is sending data.

   This is the total number of external DICOM devices to which the AcuoMed Server must route outbound data.

4. Enter the average peak-time value for how many workstations will be receiving studies or querying the AcuoMed Server.

   This is the typical maximum value during a department's busiest period of a shift.

This completes data entry on the Input worksheet. Continue with the next topic to complete the Analysis worksheet.

Complete the Analysis Worksheet

The items on the Analysis worksheet provide the specific information required to analyze the total amount of scanner image data that must be stored during the period of one year.

Follow these steps to complete the Input worksheet:

1. In the "Numbers of Modalities" column, enter the number of each type of modality connected to the AcuoMed Server.

   The total number of modalities entered in this column must match the value entered on the Input worksheet for "How many Modalities are connected to the AcuoMed Server?" If these values do not match, you will see a WARNING message.

2. In the "Images / Exam" column, enter for each modality type the typical number of images required per exam.

   Survey modality operators to get accurate information.

3. In the "Exams / Day" column, enter for each modality type the typical number of exams performed per day.

   Survey modality operators to get accurate information.

Now that you have entered all required data, it is time to review the estimated storage requirements (see the next topic).

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Understanding the Estimated Storage Requirements

The Storage Analysis spreadsheet calculates estimated storage requirements based on the user-entered data on the Input worksheet and Analysis worksheet. Refer to the Estimated Storage information in the lower right portion of the Analysis worksheet (Figure 79). This estimated storage summary provides the following information:

Total gigabytes of storage required per day, per week, per month, and per year – this summary information is calculated from the MB/Image, Images/Exam, and Exams/Day data in the Analysis worksheet.

Daily GB for prefetched exams – this summary information is calculated from the "Percentage of repeat exams" and the "Studies recalled per prior" (refer to the Input Summary information in the lower left portion of the Analysis worksheet).

GB for Short-Term storage – this summary information is calculated from the daily amount of storage required for new exams and prefetched exams and the total number of days of short-term storage required.

GB needed for the RAID – this is the size recommendation for the AcuoMed Server's online (RAID) storage.

GB needed for Nearline Library – this is the size recommendation for the AcuoMed Server's nearline (robotic tape library) storage.

Total Terabytes Estimated – this is the total recommended storage capacity for the AcuoMed Server in terabytes. This total includes both online RAID and nearline tape library storage.

Appendix D – Optional Settings

In this appendix:

Overview of feature options which require Acuo Technologies Support assistance to configure.

Abort Association Time Limit for inbound activity.	Time in minutes an inbound association will be aborted if no activity occurs. *This is disabled on installation.*
Acuo UID Processing	**Study Level Check** – Acuo can only generate new Study UIDs. If an incoming Study UID already exists in the Database, and the Series UID for that Study does NOT exist, a new Study UID will be generated. **Study / Series Level Check** – Acuo can generate a new Study and Series UIDs. If the incoming Study UID or Series UID already exists in the Database, a new one will be generated. *This is disabled on installation.*
Auto Map Accession Number Override	The accession number will be ignored as a Matching tag criteria, and the Accession Number from the HIS/RIS should be mapped into the asset. The Study UID of the incoming asset MUST match the Study UID in the HIS/RIS for the Accession Number to be mapped. *This is disabled on installation.*
Blocking Time	This is the number of Seconds AcuoMed will wait IN THE MIDDLE of receiving data before it will issue an Abort. The following red error event will be generated in the Event Log: "A timeout (on a blocking request) of xx seconds was reached while receiving a DICOM message." Default setting is 15 minutes or 900 seconds. *This is enabled on installation.*
Concatenate Requested Procedure Description into incoming Image Study Description field	Acuo will concatenate the Requested Procedure Description from the HIS/RIS into the Study Description field of the incoming image, assuming the modality of the incoming asset matches one of the modalities configured. *This is disabled on installation.*
Connection Control Time Limit by UIDs	Time in minutes an outbound association will be recycled if the UID in the outbound association response matches one of the UIDs configured.
Deliver Part 10	Controls whether or not certain Part 10 tags are sent outbound (assuming AcuoMed received these Part 10 tags from another device). Use this configuration with CAUTION. The DICOM standard indicates these Part 10 tags should NOT be sent in a DICOM transmission and can cause (receiving) problems with other devices.
Exclude List for Batch Move	Tags excluded from a Move Request to an External destination. The following tags may be excluded:

	Study Date, Study Time, Accession Number, Modality, Study ID Additional configuration is needed when using with ADAM.
FTP options	Configure to use the AcuoMed FTP Trace Transfer Utility. This utility is used to save and send various traces to Acuo's FTP server.
Get Find Counts	All applicable instance count tags inside a C-FIND Request will be returned with computed values. This will fix a problem where the Find Response of incorrect instance counts for a set of supported tags.
Reconciliation Auto Pass By Modality	A list of modalities that should be marked as reconciled automatically. An image should not FAIL reconciliation if the incoming modality matches one configured.
Remap Study Description	The Scheduled Procedure Step Description, (0040,0007) tag, from the HIS/RIS table is mapped to the Study Description, (0008,1030) tag, in the incoming image. The mapping of the Scheduled Procedure Step. The Scheduled Procedure Step Description in the HIS/RIS will NO LONGER get mapped to the Scheduled Procedure Step Description in the incoming image.

Glossary

This Glossary defines terms specific to Acuo Technologies' products and operational environment. For the reader's convenience, some related general industry and computer terminology is also defined.

Acuo HIS/RIS Data

This data resides inside the AcuoMed database and contains a local copy of the "master" patient/study data that is used for reconciliation. This data is populated from either a Modality Worklist (MWL) connection, or from an HL7 feed through AcuoSemantix (it may also be imported into SQL from another source). If an HL7 feed is being used (AcuoSemantix), this data may also be used for certain options within AcuoSemantix (for example, to filter fixits messages if the data has already been received).

See also HIS/RIS Database and Reconciliation Target.

Acuo Tier Manager

The Acuo Tier Manger service is created at the time of install/upgrade and is disabled by default. The newly installed service is responsible for orchestrating the writing of assets to offline storage devices. The segregation from the AcuoStore service will allow for improved efficiency, flexibility and compatibility with an increasing number of Archive Devices.

AcuoMed Image Manager

AcuoMed Image Manager (AcuoMed for short) is Acuo Technologies' medical imaging product that provides an open-systems solution for transporting, storing, tracking, and retrieving digital medical images across an entire storage system network. When used generically, the term AcuoMed refers to the hardware and software system components that comprise Acuo Technologies' medical image and archive management product.

AcuoMed uses the AcuoStore Digital Asset Manager to manage physical storage and to store and retrieve digital medical images.

See also AcuoMed Server, AcuoMed Service, and AcuoStore Digital Asset Manager.

AcuoMed Database

Contains server configuration and image management information such as connections to modalities, local route definitions, and remote server configurations. There is one AcuoMed Database per AcuoMed Image Manager.

See also AcuoMed DICOM Database and AcuoStore Database.

AcuoMed DICOM Database

Contain patient, study, and series record information that describes the images that are physically present on the AcuoMed archive system. There can be multiple different AcuoMed DICOM Databases in use concurrently on an AcuoMed Image Manager. Each AcuoMed DICOM Database requires a separate AcuoStore Application.

See also AcuoMed Database and AcuoStore Application.

Acuo Tier Manager Service

The Acuo Tier Manager is responsible for writing assets to various archive storage devices. Please note that this does not apply for connections to EMC Centera CAS Devices. The writing of files to Centera devices is still handled by AcuoStore and in such cases the Acuo Tier Manager Service should be disabled.

AcuoMed Server

The AcuoMed Server is a DICOM3.0 compliant server that uses Microsoft Windows as a platform. An AcuoMed Server consists of a PC dedicated to AcuoMed that is running the Windows Server operating system and the AcuoMed application.

An AcuoMed system typically comprises more than one AcuoMed Server (for example two AcuoMed Department Servers networked with one AcuoMed Deep-End Server).

AcuoMed Service

AcuoMed runs as a service within Windows and can be managed the same as other Windows Services via the Administrative Tools menu.

See also Service.

AcuoStore Application

An AcuoStore application is used to configure which users(s) have access to which managed shares (according to username and password), and how much physical disk space will be allocated to each user. In this way AcuoStore applications make the linkage from client applications/users to logical and physical storage resources.

See also Managed Share.

AcuoStore Database

Contains information related to the bulk storage of digital images and related data including information about the shares and about the applications that use those shares.

AcuoStore Digital Asset Manager

The AcuoStore Digital Asset Manager is a general-purpose, digital asset retrieval service that lets you store, track, and retrieve virtually any type of digital asset routed to an AcuoStore archive from a client application such as AcuoMed.

See also AcuoStore Service and AcuoMed Image Manager.

AcuoStore Service

AcuoStore runs as a service within Windows and can be managed the same as other Windows Services via the Administrative Tools menu.

See also Service.

AE Name

Application Entity Name – this is the name that is used in an AcuoMed DICOM configuration to make a connection to a specific route. The route, in turn, may connect to one or more destinations. An AcuoMed Server (which is a DICOM-compliant device) can concurrently support multiple AE Names pointing to multiple routes.

See also AE Title and Route.

AE Title

Application Entity Title – AE Title is synonymous with AE Name. In most instances in the AcuoMed software and in this document, the term "AE Name" is used. However, there are some cases when "AE Title" is used due to a special context (for example, information relating to HIS/RIS connectivity).

See also AE Name and Route.

Application Entity (AE)

This is a DICOM-compliant logical end point in a DICOM network such as a modality, server, archive, or view station application. An application entity can be identified concurrently as several different application entity names (for example, where each AE name would be used to route information to different destinations or to perform different functions).

See also AE Name.

Association

See DICOM Association.

BLOB

Binary Large Object – an arbitrary set of bytes that may be an image, file, document or other object to be stored.

See also Digital Asset.

C-FIND

See Find.

Client application

An application, for example AcuoMed, that manages and routes digital assets to a storage archive such as AcuoStore. For users who want to access an archive managed by AcuoStore with their own client application, an API can be provided that allows them to access AcuoStore. Currently, AcuoMed is the *only* client application that accesses AcuoStore.

C-MOVE

See Move.

Federation

An AcuoMed feature that allows an AcuoMed Server to collaborate with an unlimited number of external Acuo and non-Acuo devices, and to populate Find and Move operations with these other devices. In addition, Federation allows AcuoMed to broker Move operations across multiple devices in an enterprise and to intelligently collect and return requested information as a consolidated result to the requesting device.

Console

A console is an administrative structure that can contain tools, folders, Web pages, and other administrative items. You can set up different consoles to manage different parts of your AcuoMed/AcuoStore network (for example, a local console and a remote console). Consoles are hosted within MMC.

See also MMC.

C-STORE

See Store.

Data Archive

For AcuoStore, this refers to a bulk storage facility for storing images and other data. This facility has no knowledge of DICOM; it keeps track of data BLOBs using globally unique IDs (GUIDs). The data archive has the ability to group data BLOBs into folders.

Data Storage Archive

The data storage archive stores and retrieves digital assets based on a GUID (Globally Unique ID).

Deep-End Server

A deep-end server is an AcuoMed Server that is configured to perform deep-level archiving operations. Therefore, it handles long-term storage or digital images for other devices such as department AcuoMed Servers. A deep-end server also typically includes AcuoMed DICOM router functionality for the purposes of moving archived images to other destinations and for extending AcuoMed routes to other AcuoMed Server modes.

See also Deep-Level Archive, Department Server, and Temporal Server.

Deep-Level Archive

A storage device such as a tape jukebox that is connected to a deep-end server to provide long-term archival storage of digital assets for one or more other network-connected devices. A deep-level archive is typically connected to a deep-end AcuoMed Server and is used to maintain a permanent DICOM archive.

See also Deep-End Server.

Department Server

A department server is an AcuoMed Server that contains temporary storage of DICOM images via a local image cache and an AcuoMed DICOM database used for managing and performing queries on DICOM image data. The department server also includes AcuoMed DICOM router functionality. Since a department server automatically removes images from its cache after a certain time period, it is referred to as a temporal server.

See also Deep-End Server and Temporal Server.

Destination AE Name

The AE name that is associated with an AcuoMed local route destination.

See also AE Name and Local Route Destination.

DFS

Distributed File System – refers to a file system that simplifies the steps needed to use files located at various places across a network. Files can be drawn seamlessly from different parts of a network making it possible to have storage resources on different servers appear to users as one storage resource.

See also Logical Share (DFS Share).

DICOM

Digital Imaging and Communications in Medicine – The DICOM standard is a detailed specification for transferring medical images and related information between computers. DICOM is an open-systems standard that allows connectivity and interoperation of equipment from multiple vendors.

AcuoMed supports the DICOM 3.0 2000 standard.

DICOM Archive

An AcuoMed system that has a DICOM database and some number of images stored on a local image cache. The database can be either permanent or temporal. A permanent database (such as a deep-level archive on a deep-end AcuoMed Server) tracks all exams indefinitely; a temporal archive (such as a local image cache) is pruned automatically to create space for new data as it comes in.

See also Deep-End Server and Temporal Server.

DICOM Association

In AcuoMed, a DICOM association links an AE name to a route.

See also AE Name and Route.

DICOM Data Dictionary

This is an AcuoMed function which provides a summary of all standard tags that are valid in DICOM. The DICOM Data Dictionary is accessed as a node in the console tree under DICOM Configuration.

DICOM Domain

A set of DICOM application entities (AEs) accessible via the DICOM router.

DICOM Router

An essential building block for all of the Acuo Technologies' products, DICOM router provides a gateway between different DICOM domains. DICOM router provides the capability to do collaborative study on images where professionals that need access to the same image might be in different facilities, or even across the country.

Digital Asset

A digital asset is an image, file, document or any other combination of bytes that needs to be stored. (Some documents refer to this as a Binary Large OBject, or BLOB).

See also BLOB.

External DICOM Device

This is basically a device that communicates as a DICOM 3.0 SCP. When connecting to such a device, the AcuoMed Server acts as an SCU.

See also External SCP.

External SCP

In an AcuoMed DICOM configuration, an external SCP refers to an external DICOM device that can be a local route destination for an AcuoMed route. View stations and non-Acuo archives are examples of external SCPs.

See also, SCP, Local Route Destination, and Route.

External SCU

This is a DICOM device that is inbound to the AcuoMed Server. There are two reasons to define an External SCU: 1.) To provide an added level of security, since only specified SCUs are allowed to communicate with the AcuoMed Server (the SCP). 2.) To allow a tag rule to be based on the External SCU in order to control routing.

Feature Validation

Feature validation allows Acuo Technologies' customers to match licensed features to the routing and archiving requirements of each AcuoMed Server in an AcuoMed network. So, feature validation allows customers to pay for an appropriate set of capabilities at each Image Manager Server Node.

Filter Move by Target

Filter Move by Target functionality provides a Move option which limits the assets moved to those that are not already stored at the Move Target.

Find

The ability to locate an image (digital asset) that is stored on the AcuoMed network. Find represents the query portion of a retrieve request.

See also Move and Store.

Folder

A grouping of data assets that can be treated as a unit.

GUID

Globally Unique ID – The GUID identifies each specific digital asset for tracking and future retrieval. AcuoStore uses GUIDs to locate digital assets and make them asset locally available to requesters.

HIPAA

Health Insurance Portability and Accountability Act of 1996 - Security regulations published on August 12, 1998.

HIS/RIS

Hospital Information System/Radiology Information System – Medical administration systems that are used to manage patient information, track patient records, and schedule studies to be performed on modalities.

HIS/RIS Data

A database that resides on a HIS/RIS Data system and that contains master patient data.

HL7

HL7, which is an abbreviation of Health Level Seven, is a standard for exchanging information between medical applications. This standard defines a format for the transmission of health-related information.

HSM

Hierarchical Storage Management – An application used for controlling and managing data storage across hierarchical layers of interoperating storage devices having different speeds and capacities. HSM enables data to be managed and stored on an appropriate medium according to its aging and anticipated retrieval requirements; this includes migrating data between storage devices when appropriate. HSM is a generic concept that includes many different vendors' storage system implementations (for example Microsoft's RSS and RSM products).

Local Image Cache

This is a DICOM temporal archive that is implemented on a temporal (department) server. The local image cache is typically a locally attached RAID that is used to store images that are associated with a DICOM database that is also located on the temporal server.

Local Route Definition

In an AcuoMed DICOM configuration, a local route definition associates an AE name to a route name and specifies one or more local route destinations that are on the route.

See also AE Name and Local Route Destination.

Local Route Destination

In an AcuoMed DICOM configuration, a local route destination is an entity that supports the exchange of DICOM images for queries, stores, and moves. Local route destinations include AcuoMed DICOM databases, AcuoRoute Remote Clients, and external DICOM devices.

See also Local Route Definition.

Local Server

1.) In an AcuoMed configuration context, a local server is the AcuoMed Server that you are configuring. This could be either a department server or a deep-end server.

2.) In a remote management context, the local server is the system that you are using to manage another target system at a remote location. For remote management discussions, the local server is also referred to as the "local system" or "source system."

See also Remote Server.

Logical Share (DFS Share)

A logical share, as opposed to a physical share on a local volume, makes it possible to extend a physical volume extensively by logically adding more physical volumes to the logically shared volume. For example, if you created a logical share to a 10-gigabyte physical volume and called that share Anderson_Images, the managed share, Anderson_Images, would have 10 gigabytes. However, since it is a logical share, you could attach another 10 gigabytes, or more, to the initial volume and the managed share Anderson_Images would grow to 20 gigabytes from 10 gigabytes.

See also DFS and Physical Share.

Managed Share

A managed share is a logical mapping to a physical storage space. Managed shares are configured in AcuoStore. Once configured, managed shares function as a route through which digital images travel. There can be single or multiple managed shares going to one storage device.

See also AcuoStore Application.

Master/Permanent Database

Effective in 5.3.1, images in any database type (Permanent, Temporal, Master) can be pruned through configuration of Retention/Purge Policies. Please reference the "Retention/Purge Policies" section in Chapter 11 for further details. See also Permanent Database, Temporal Database, and Reconciliation Database.

MMC

Microsoft Management Console – MMC is a framework for hosting administrative tools called consoles within the Windows environment. MMC provides the tools and commands that you need to build new consoles.

See also Console.

Modality

Refers to a wide range of medical imaging devices that AcuoMed is capable of communicating with and receiving digital images from. Modalities include such devices as MRIs, CT Scanners, X-Ray devices, Ultrasound devices, etc. Basically, AcuoMed can interface with any modality that is DICOM 3.0 compliant.

Move

The ability to move an image (digital asset) from one place to another on the AcuoMed network. This includes the ability to route a retrieve request to more than one destination.

See also Find and Store.

Namespace

A namespace is a reference to a logical storage location in which multiple physical storage devices may be defined and accessed. For example, imagine that you have two computers shared on a network as *Computer X* and *Computer Y*. The name *Computer X* and the name *Computer Y* each become namespaces that are logical storage locations within which you have a physical C:\ drive. When selecting the C:\ drive, you must ensure that you are in the correct namespace, *Computer X* or *Computer Y*, to be assured of finding the data for which you are looking. Lastly, remember that within a namespace, you may add virtually any number of physical devices, thus expanding almost indefinitely the amount of space a namespace may represent.

Non-Acuo Archive

An existing archive that is DICOM 3.0 compatible. A non-Acuo archive is typically an old DICOM archive from a third-party vendor other than Acuo Technologies. Even though this is a non-Acuo device, AcuoMed can interoperate with it as long as it is DICOM compatible. This allows AcuoMed customers to continue using existing equipment and provides a migration path to AcuoMed technology.

NTFS

NT File System – a file system that you can select when you set up a computer running Microsoft Windows. In contrast to the FAT or FAT32 file systems, an NT File System supports much larger volumes, and unlike the other file systems, and NTFS volume supports domains.

PACS

Picture Archiving Communication System – this type of medical imaging system is generally based on DICOM technology and provides a means to display, move, and store medical images.

Patient Prior

A study done at a modality during a previous patient visit that is available for prefetch. The study may have been done at an earlier time on the same modality that the prefetch is being processed for, or the study may have been done on a different modality.

See also Study.

Permanent Database

Effective in 5.3.1, images in any database type (Permanent, Temporal, Master) can be pruned through configuration of Retention/Purge Policies. Please reference the “Retention/Purge Policies” section in Chapter 11 for further details. See also Temporal Database, Reconciliation Database, and Master/Permanent Database.

Physical Share (Local Volume)

A physical share is analogous to the physical C:\ drive on your computer. That is, a physical share can only be as large as the local drive actually is (for example, 10 GB). Since a physical share by definition is not logical, it cannot be expanded seamlessly the way a logical share can.

See also Logical Share.

Postfetch

Postfetch functionality provides the automatic retrieval and transmission of prior studies triggered by an incoming DICOM C-Store.

Push

The ability to store images and associated data to a remote system either manually or based on the content of the DICOM data.

QRP

Query and Retrieve Provider – this is an application entity that receives requests from remote DICOM application entities (QRUs) to locate and retrieve images or to transfer those images to another DICOM application entity.

See also QRU.

QRU

Query and Retrieve User – this is an application entity that sends retrieve/transfer requests to remote DICOM application entities (QRPs).

See also QRP.

Query

The ability to query DICOM databases for data and/or images. This includes the ability to route query requests to multiple computers where DICOM databases exist.

RAID

Redundant Array of Independent Disks – A data storage method in which data is distributed between two or more hard disk drives in order to improve performance, reliability, and fault tolerance. Different levels of RAID (such as RAID3 and RAID5) offer tradeoffs regarding their access speed, reliability, and cost. For this reason, Acuo Technologies recommends different RAID levels for different system uses.

Reconciliation

An AcuoMed licensed feature that allows patient information to be controlled, compared, and corrected against data from a Modality Worklist Connection or date received via HL7.

Reconciliation Database

This DICOM database type holds assets that failed reconciliation and that will require editing and reprocessing before they can be routed to their destinations. An AcuoMed Server can only have one database of this type. In our examples in this document, this database has the name "Reconciliation" but it can have any user-defined name. For example, you could name it "Unreconciled Images" or some other useful name. Users can access the contents of this database like any other DICOM database. For example, if a physician has not received an expected image, he or she can search for it in the Reconciliation database. However, users cannot delete records from this database; AcuoMed automatically deletes records after they have been reconciled.

See also Permanent Database, Temporal Database, and Master/Permanent Database.

Reconciliation Target

Reconciliation target refers to the patient master data that AcuoMed's Reconciliation feature uses to verify patient information and to reconcile assets with incorrect patient data. The Reconciliation Target is generally considered to be the Acuo HIS/RIS data, however this data can be populated through a Modality Worklist connection or from an HL7 feed via AcuoSemantix.

Relevancy Filtering

This functionality allows the ability to filter the studies moved when pre-fetching or post-fetching. Study filtering is needed to provide a recent set of relevant studies rather than the complete set of known studies. Filtering can be performed by Body Part or Modality.

Remote Destination

In an AcuoMed DICOM configuration a remote destination is an AcuoRoute Remote Client that is connected to an AcuoMed Server across a wide-area network connection such as an Internet VPN or a private WAN service.

Remote Server

1.) In an AcuoMed configuration context, a remote server is an AcuoMed Server at another location. For example, you set up a remote server port on a local AcuoMed Server to allow the local server to listen for incoming traffic from a remote server.

2.) In a remote management context, the remote server is the system that you are remotely managing from another source system at a "local" location. For remote management discussions, the remote server is also referred to as the "remote system" or "target system."

See also Local Server.

Retention/Purge Policy

Retention/Purge Policies provide an enhanced pruner capability that allows for Policies to be assigned to individual DICOM Databases. These policies are responsible for the purging of data based on specified criteria.

Round Robin

Term used to describe AcuoStore's ability to distribute load evenly to multiple nodes and reference a set of secondary nodes (IPs) if primary nodes become unavailable.

Route

In an AcuoMed DICOM configuration each Route name has a 1-to-1 association with an AE name and a 1-to-many association to one or more Local Destinations.

See also Local Route Destination, Local Route Definition, and AE Name.

RSM

Removable Storage Manager – A service included with Microsoft Windows, RSM facilitates management of and communication among groups of libraries, disk drives, applications, and removable media. RSM enables multiple applications to share local robotic media libraries and tape or disk drives, and manages removable media within a single-server system. A group of libraries, drives, and media that are managed by RSM is called an RSM system. RSM also operates in conjunction with RSS to manage storage resources.

See also RSS.

RSS

Remote Storage Service – This Microsoft service monitors drives, and based on aging algorithms, moves files out to a tape. In addition, RSS also provides facilities for duplicating tapes for disaster recovery purposes. For RSS to manage a drive, the drive must be NTFS capable. RSS also operates in conjunction with RSM to manage storage resources.

See also RSM.

SCP

Service Class Provider – The SCP is basically a server module that the AcuoMed DICOM router uses in the propagation of commands and information. An SCP operates in conjunction with an SCU in a server to client relationship.

Whether a particular device is functioning as an SCP or an SCU at a given time is determined by the role negotiated at association establishment time.

See also SCU.

SCU

Service Class User – The SCU is basically a client module that the AcuoMed DICOM router uses in the propagation of commands and information. An SCU operates in conjunction with an SCP in a client to server relationship.

Whether a particular device is functioning as an SCU or an SCP at a given time is determined by the role negotiated at association establishment time.

Also see SCP.

Series

A series is a logical grouping of images that is assembled according to specific criteria. Each series is associated with exactly one study.

See also Study.

Service

A service is a program, routine, or process that supports other programs running in a Windows environment by performing a specific system function. AcuoMed and AcuoStore run as services within Windows and can be managed the same as other Windows Services via the Administrative Tools menu.

Snap-in

A snap-in is a type of tool that can be added to a console. Both the AcuoStore and AcuoMed applications are snap-ins that can be added to an MMC-supported console.

See also Console and MMC.

SOP

Service Object Pair – Application entities select SOP classes to establish an agreed upon set of capabilities that will support the interaction of the application entities.

Soundex

Soundex is a phonetic algorithm for indexing names by sound. In version 5.3.1 Soundex options have been added at the DICOM (patient) Database level to provide greater control on how patients are stored despite differences in spelling. With Soundex a level of sensitivity can be set for the storage of images such that the matching of patient names is loosened up or removed entirely.

SSCP

Storage Service Class Provider – this is an application entity that receives requests from remote DICOM application entities (SSCUs) to store images. The status of the Store operation, reflecting success or failure, is returned to the sender.

See also SSCU.

SSCU

Storage Service Class User – this is an application entity that sends storage requests to DICOM application entities (SSCPs).

See also SSCP.

Store

The ability to save an image (digital asset) received from a modality to another DICOM device on the AcuoMed network. This includes the ability to save an image to more than one destination in a single operation.

See also Find and Move.

Study

A study is a collection of one or more series of medical images that are logically related for the purpose of diagnosing a patient. Each study is associated with exactly one patient.

See also Series.

Subscriber

An individual medical professional, user, or remote clinic or hospital that has access to an AcuoStore-managed storage archive or device. Subscribers have a Subscriber ID that lets them access only their assets. Subscribers may have access to multiple archives or just one.

Tag

Tags are the control information carried along with a DICOM message that identify and delimit the types of information in the DICOM data stream. In other words, tags identify the image itself and all of its associated information (such as who the patient is, who the physician is, the institution, the modality, etc.).

See also DICOM Data Dictionary, Tag Rule, and Tag Rule Routing.

TagMapper

Acuo TagMapper is a feature that is used to modify tag data within incoming and outgoing DICOM messages. The TagMapper feature is executed while processing a DICOM C-STORE Message. TagMapper commands are read from a command file and executed using information from the Tag Data, TagMapper DB table (if used), and/or string data within the associated command file.

Tag Rule

A rule you create by means of AcuoMed's Tag Rule Routing that allows you to specify a wide variety of customized routing configurations by means of the tag control information that is embedded in DICOM messages.

See also Tag and Tag Rule Routing.

Tag Rule Routing

The AcuoMed functionality that allows you to customize DICOM tags and tag values for your site and to configure and control image routing through the use of tag rules.

See also Tag and Tag Rule.

Temporal Database

Effective in 5.3.1, images in any database type (Permanent, Temporal, and Master) can be pruned through configuration of Retention/Purge Policies. Please reference the “Retention/Purge Policies” section in Chapter 11 for further details. See also Permanent Database, Reconciliation Database, Master/Permanent Database, and Temporal Server.

Temporal Server

This refers to an AcuoMed Server with a temporal DICOM database that describes images that are physically present on an archive (usually a local image cache). This system is self-maintaining; when the allocated archive disk space starts to fill up, images and associated entries in the DICOM database are deleted on a least recently used (LRU) basis. If they are needed again, they can be retrieved from a DICOM permanent archive (permanent DICOM database). A temporal server is typically a department AcuoMed Server.

See also Department Server and DICOM archive.

Terminal Server

See Terminal Services Client.

Terminal Services Client

A software application that lets you log into another computer via a TCP/IP port. In contrast to an MMC console remote management configuration, which lets you "talk" only to MMC consoles on other computers, a terminal services client lets you manage any part of another computer because you are actually logged into the remote computer.

Transfer Syntax

Defines the format that DICOM data is transferred as from one device to another. *(example: compressed or uncompressed)*

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