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Technical
Publications

Direction 2223704
Revision 1.0

Advantage U-Server 1.0
CONFORMANCE STATEMENT
for DICOM V3.0

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REVISION

REV	DATE	REASON FOR CHANGE
1.0	Nov 24 1998	Initial Release

LIST OF EFFECTIVE PAGES

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1. INTRODUCTION

1.1 OVERVIEW

This DICOM Conformance Statement is divided into Sections as described below:

Section 1 (Introduction), which describes the overall structure, intent, and references for this Conformance Statement

Section 2 (Network Conformance Statement), which specifies the GEMS equipment compliance to the DICOM requirements for the implementation of Networking features.

Section 3 (Media Storage Conformance Statement), which specifies the GEMS equipment compliance to the DICOM requirements for the implementation of Media Storage features.

Section 4 (Patient Root Query/Retrieve information Model), which specifies the information required to intend using the DICOM Query/Retrieve models.

Section 5 (Study Root Query/Retrieve information Model), which specifies the information required to intend using the DICOM Query/Retrieve models.

Section 6 (Patient/Study only Query/Retrieve information Model), which specifies the information required to intend using the DICOM Query/Retrieve models.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the GEMS Conformance Statements and their relationship with the DICOM v3.0 Conformance Statements is shown in the Illustration below.

ID/Net v3.0

Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement
Direction: 2118780

APPLICATION ENTITY SPECIFICATION
(SERVICE CLASSES, INFORMATION OBJECTS, MESSAGE EXCHANGES, ETC.)

Product Implementation:

CT Advantage

MR Advantage

Advantage U-Server Conformance Statement
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Conformance Statement
Direction:
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DICOM STANDARD

Standard Specification:

DICOM V 3.0

Part 1

V 3.0

2

V 3.0

3

V 3.0

4

DICOM V 3.0

Part 13

This document specifies the DICOM v3.0 implementation. It is entitled:

> ***Advantage U-Server 1.0***
> *Conformance Statement for DICOM v3.0*
> *Direction **2223704***

This DICOM Conformance Statement documents the DICOM v3.0 Conformance Statement and Technical Specification required to interoperate with the GEMS network interface. Introductory information, which is applicable to all GEMS Conformance Statements, is described in the document:

> *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)*
> *Conformance Statement*
> *Direction: 2118780.*

This Introduction familiarizes the reader with DICOM terminology and general concepts. It should be read prior to reading the individual products' GEMS Conformance Statements.

The GEMS Conformance Statement, contained in this document, also specifies the Lower Layer communications which it supports (e.g., TCP/IP). However, the Technical Specifications are defined in the DICOM v3.0 Part 8 standard.

For more information including Network Architecture and basic DICOM concepts, please refer to the Introduction.

For the convenience of software developers, there is "collector" Direction available. By ordering the collector, the Introduction described above and all of the currently published GEMS Product Conformance Statements will be received. The collector Direction is:

> *ID/Net v3.0 Conformance Statements*
> *Direction: 2117016*

For more information regarding DICOM v3.0, copies of the Standard may be obtained by written request or phone by contacting:

> NEMA Publication
> 1300 North 17th Street
> Suite 1847
> Rosslyn, VA 22209
> USA
> Phone: (703) 841-3200

1.3 INTENDED AUDIENCE

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM v3.0 Standards and with the terminology and concepts which are used in those Standards.

If readers are unfamiliar with DICOM v3.0 terminology they should first refer to the document listed below, then read the DICOM v3.0 Standard itself, prior to reading this DICOM Conformance Statement document.

> *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)*
> *Conformance Statement*

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1.4 SCOPE AND FIELD OF APPLICATION

It is the intent of this document, in conjunction with the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*, to provide an unambiguous specification for GEMS implementations. This specification, called a Conformance Statement, includes a DICOM v3.0 Conformance Statement and is necessary to ensure proper processing and interpretation of GEMS medical data exchanged using DICOM v3.0. The GEMS Conformance Statements are available to the public.

The reader of this DICOM Conformance Statement should be aware that different GEMS devices are capable of using different Information Object Definitions. For example, a GEMS CT Scanner may send images using the CT Information Object, MR Information Object, Secondary Capture Object, etc.

Included in this DICOM Conformance Statement are the Module Definitions which define all data elements used by this GEMS implementation. If the user encounters unspecified private data elements while parsing a GEMS Data Set, the user is well advised to ignore those data elements (per the DICOM v3.0 standard). Unspecified private data element information is subject to change without notice. If, however, the device is acting as a "full fidelity storage device", it should retain and re-transmit all of the private data elements which are sent by GEMS devices.

1.5 IMPORTANT REMARKS

The use of these DICOM Conformance Statements, in conjunction with the DICOM v3.0 Standards, is intended to facilitate communication with GE imaging equipment. However, **by itself, it is not sufficient to ensure that inter-operation will be successful**. The **user (or user's agent)** needs to proceed with caution and address at least four issues:

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non–GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.

- **Validation** - Testing the complete range of possible interactions between any GE device and non–GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non–GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non–GE device and the stability of the image data for the intended applications.

  Such a validation is required before any clinical use (diagnosis and/or treatment) is performed. It applies when images acquired on GE imaging equipment are processed/displayed on a non-GE device, as well as when images acquired on non-GE equipment is processed/displayed on a GE console or workstation.

- **Future Evolution** - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM v3.0 Standard. DICOM v3.0 will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEMS protocol is based on DICOM v3.0 as specified in each DICOM Conformance Statement. Evolution of the

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Standard may require changes to devices which have implemented DICOM v3.0. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these DICOM Conformance Statements**. The **user** should ensure that any non–GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.

- **To be informed of the evolution of the implementation described in this document, the User is advised to regularly check the GE Internet Server, accessible via anonymous ftp (GE Internet Server Address: ftp.med.ge.com, 192.88.230.11).**

- **Interaction** - It is the sole responsibility of the **non–GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1.6 REFERENCES

A list of references which is applicable to all GEMS Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.*

1.7 DEFINITIONS

A set of definitions which is applicable to all GEMS Conformance Statements is included in *the Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.*

1.8 SYMBOLS AND ABBREVIATIONS

A list of symbols and abbreviations which is applicable to all GEMS Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.*

2. NETWORK CONFORMANCE STATEMENT

2.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the compliance to DICOM conformance requirements for the relevant **Networking** features on this GEMS product. Note that the format of this section strictly follows the format defined in DICOM Standard PS 3.2 (Conformance). Please refer to that part of the standard while reading this section.

2.2 IMPLEMENTATION MODEL

2.2.1 Application Data Flow Diagram

There are kinds of two Application Entities in Advantage U-Server. The one is for Hard Disk which name is Advantage U-Server Hard Disk Application Entity (AUSHD AE), the other is for reading CD which name is Advantage U-Server CDROM Application Entity (AUSCD AE). All DICOM functionality on the Advantage U-Server System is handled by the these AEs.

The Basic and Specific Application models for this device are shown in the following Illustration:

IMPLEMENTATION MODEL DATA FLOW DIAGRAM
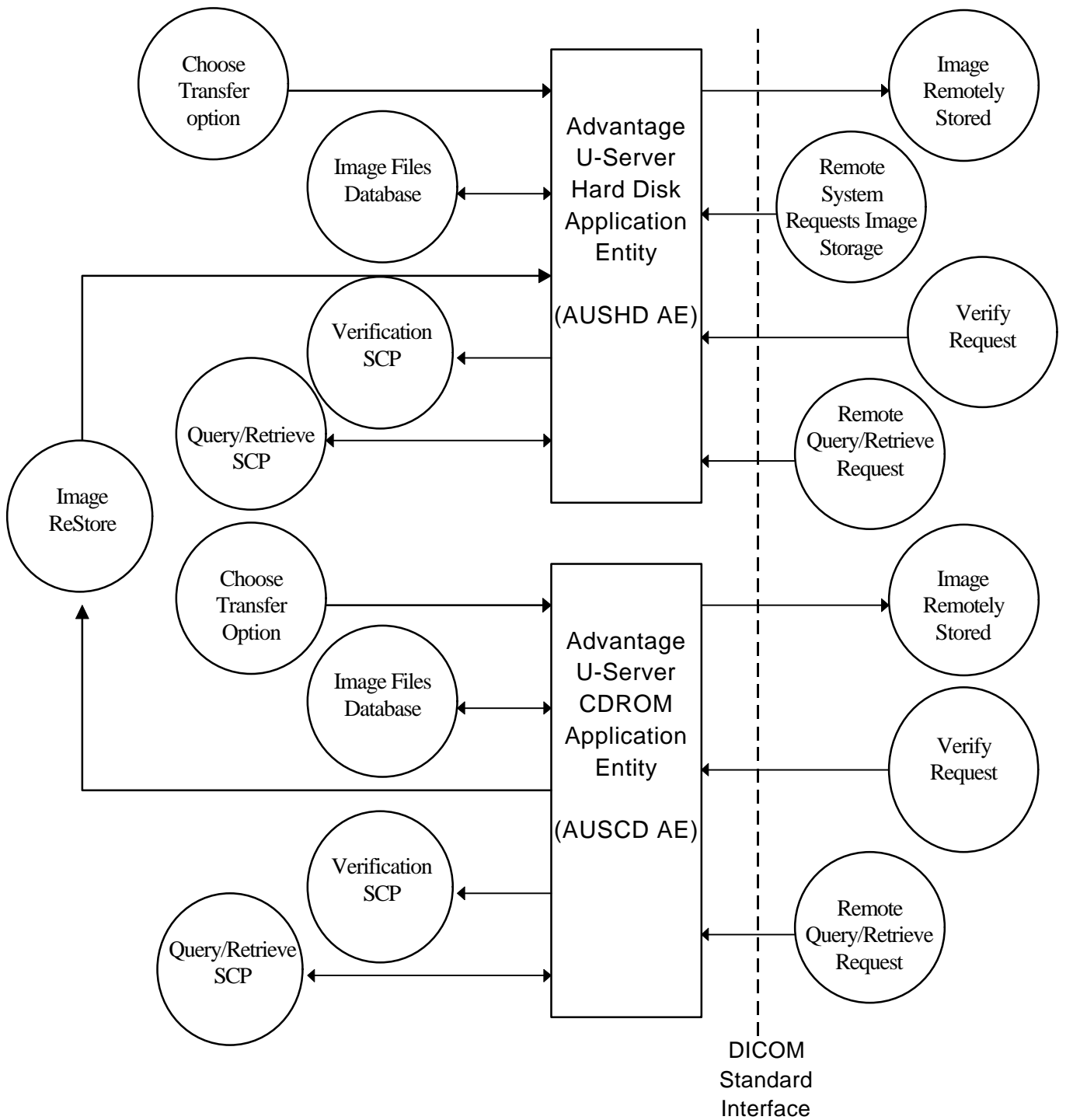
There is only one Real-World Activity that will cause the AUSHD AE and the AUSCD AE to initiate a DICOM association to remote DICOM Application Entity.

The *Image Restore* Real-World activity consists of an operator selecting one or more study, series or image in the Archive Management and choosing either Study Copy Button, Series Copy Button or Image Copy Button on the Archive Management to send the image(s) to Advantage U-Server Hard Disk(local database).

The *Choose "Transfer" Option* Real-World activity consists of an operator selecting one or more study, series or image in the Transfer Management and choosing either Study Transfer Button, Series Transfer Button or Image Transfer Button on the Transfer Management to send the image(s) to a selected destination which is a Remote DICOM AE.

There is no Real-World activity required for the AUSHD AE to respond to an incoming DICOM Store, Query, Retrieve or Verify. The AUSHD AE is always prepared to respond to a DICOM Store, Query, Retrieve and Verify by any Remote DICOM AE.

There is no Real-World activity required for the AUSCD AE to respond to an incoming DICOM Query, Retrieve or Verify. The AUSCD AE are always prepared to respond to a DICOM Query, Retrieve or Verify by any Remote DICOM AE.

The AUSHD AE will perform the Real-World activity and Image Installation, after the remote AE sends an image to the Advantage U-Server product.

Once a Query request is received, either the AUSHD AE or the AUSCD AE will search the local database for all entries that match the key requested by the Remote AE and send back the list of matches. The AE will also respond to an incoming retrieval request from a Remote AE by sending the image(s) to the Destination AE.

2.2.2 Functional Definition of AE's

The AUSHD AE and the AUSCD AE initiate the following operation:

- Initiate an association to a Remote AE to send image(s). If the Remote AE accepts the presentation context applicable to the image(s) being sent, the AUSHD AE and the AUSCD AE will send the image(s) by invoking C-STORE-RQ operation for each image on the same association.

The AUSHD AE and the AUSCD AE wait for association requests from Remote AEs that wish to perform the following operations:

- **Verification:** If a C-ECHO-RQ message is received, either AUSHD AE or AUSCD AE will send back a C-ECHO-RSP message with a status of "success".

- **Query:** If a C-FIND-RQ message is received, either AUSHD AE or AUSCD AE will search the local database for the requested attributes and send back a C-FIND-RSP message containing a match and status of "pending". After all matching records have been sent, a status of "success" will be returned in a C-FIND-RSP message. The Remote AE can terminate the query by sending a C-CANCEL-FIND-RQ message.

- **Retrieve:** If a C-MOVE-RQ message is received, either AUSHD AE or AUSCD AE will lookup its list of configured Remote AEs for the Destination AE. If the Destination AE is configured, The AE will open a new association to the Destination AE and use C-STORE-RQ to send the image(s). The AE will send a C-MOVE-RSP message with a status of "pending" after each image is sent. When all images are sent or if The AE receives a C-CANCEL-MOVE-RQ a final C-STORE-RSP will be sent back with an appropriate status.

2.2.3 Sequencing of Real-World Activities

Non Applicable.

2.3 AE SPECIFICATIONS

2.3.1 The AUSHD AE and the AUSCD AE Specification

The AUSHD and the AUSCD Application Entities provide Standard Conformance to the following DICOM V3.0 SOP Classes as an **SCU**:

SOP Class Name	SOP Class UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
X-Ray Angiographic Bi-Plane Image Storage	1.2.840.10008.5.1.4.1.1.12.3
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20

The AUSHD Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as an **SCP** :

SOP Class Name	SOP Class UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4

Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
X-Ray Angiographic Bi-Plane Image Storage	1.2.840.10008.5.1.4.1.1.12.3
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Patient/Study Only Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2
Verification SOP Class	1.2.840.10008.1.1

The AUSCD Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as an **SCP** :

SOP Class Name	SOP Class UID
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Patient/Study Only Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2
Verification SOP Class	1.2.840.10008.1.1

2.3.1.1 Association Establishment Policies

2.3.1.1.1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

Application Context Name	1.2.840.10008.3.1.1.1

The Maximum Length PDU negotiation is included in all association establishment requests.

The maximum length PDU for an association initiated by the AUSHD AE and the AUSCD AE are:

Maximum Length PDU	16 kbytes

The SOP Class Extended Negotiation is not supported.

2.3.1.1.2 Number of Associations

The AUSHD AE and the AUSCD AE can have associations as many as Remote AE initiated. But the number of associations are limited by hardware resources of Advantage U-Server.

2.3.1.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2.3.1.1.4 Implementation Identifying Information

The Implementation UID for this DICOM v3.0 Implementation is:

Advantage U-Server Implementation UID	1.2.840.113619.6.40

2.3.1.2 Association Initiation Policy

These AEs attempt to initiate an association due to the transfer operation initiated by the operator.

2.3.1.2.1 Real-World Activity <Push Image(s) to Remote AE>

2.3.1.2.1.1 Associated Real-World Activity

The operator must first select a destination(Remote AE),which the operator has registered in the local database, from the transfer management on the ImageManagement.

The Transfer operation will cause the AUSHD AE or the AUSCD AE to initiate an Association when the operator selects one or more study, series, or images in the local database and chooses either Transfer(Study), Transfer(Series), or Transfer(Image) from the Transfer Management on the Image Management.

2.3.1.2.1.2 Proposed Presentation Context Table

Presentation Context Table - Proposed			
Abstract Syntax	Transfer Syntax	Role	Extended

Name	UID	Name List	UID List		Negotiation
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
X-Ray Angiographic Bi-Plane Image Storage	1.2.840.10008.5.1.4.1.1.12.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.3.1.2.1.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

This implementation can perform multiple C-STORE operations over a single association.

Upon receiving a C-STORE confirmation containing a Refused status , an Error status or a Warning status (In short, except a Successful status), the status is logged and this implementation will continue to send the next image in the request on the same association.

Upon receiving a C-STORE confirmation containing a Successful status, this implementation will perform the next C-SORE operation. The association will be maintained possible.

Each Packet from C-STORE SCU is transferred within 60 seconds in the session layer of the TCP/IP. This implementation will close the association of the TCP/IP when the time is over 60 seconds.

2.3.1.3 Association Acceptance Policy

Any operation of the AUSHD AE and the AUSCD AE are worked by the request of Remote AE which must be configured in the local database to be able to establish an association.

When the AUSHD AE accepts an association for image storage, it will receive any images transmitted on that association and the store images on the disk.

It will also respond to query from Remote AEs by sending matching entries. Any Remote AE can request and receive a list of images in the local database. The Remote AE must be

configured in the local database to be able to retrieve images from the AUSHD AE or the AUSCD AE.

Any Remote AE can open an association to the AUSHD AE and the AUSCD AE for the purpose of verification.

2.3.1.3.1 Real-World Activity <Verification Request from Remote AE >

These AEs are indefinitely listening for association. No operator action is required to respond to a verification message.

2.3.1.3.1.1 Associated Real-World Activity

The Real-World Activities association with the verification request is to send a C-ECHO response message with a status of "success" to the requesting AE.

2.3.1.3.1.2 Accepted Presentation Context Table

Presentation Context Table - Accepted					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

2.3.1.3.1.2.1 SOP Specific DICOM Conformance Statement for Verification SOP Class

The AUSHD AE and the AUSCD AE provide standard conformance to the DICOM verification Service Class.

Each Packet from C-ECHO is transferred within 60 seconds in the session layer of the TCP/IP. This implementation will close the association of the TCP/IP when the time is over 60 seconds.

2.3.1.3.1.3 Presentation Context Acceptance Criterion

The AUSHD AE and the AUSCD AE accept any number of Presentation Contexts listed in the Accepted Presented Context Table. It rejects requests from remote AE not listed in the local database.

2.3.1.3.1.4 Transfer Syntax Selection Policies

The AUSHD AE and the AUSCD AE only support Implicit VR Little Endian.

2.3.1.3.2 Real-World Activity<Receive Image(s)>

The AUSHD AE is indefinitely listening for associations. No operator action is required to receive an image.

2.3.1.3.2.1 Associated Real-World Activity

The Real-World Activity associated with the Receive Image(s) operation are the storage of the image on the disk drive and the registration to the local database of the Advantage U-Server System.

2.3.1.3.2.2 Accepted Presentation Context Table

Presentation Context Table - Accepted					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
X-Ray Angiographic Bi-Plane Image Storage	1.2.840.10008.5.1.4.1.1.12.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

2.3.1.3.2.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

The AUSHD AE conforms to the SOPs of the Storage Service Class at level 2(full).

Following are the status codes the Application may send back to the SCU Equipment after performing the requested **Storage** :

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received

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Refused	A700	Out of resources	indicates that there was not enough system resources (such as memory and disk) to store the received image.	None
Error	C000	Cannot Understand	indicates that other reasons caused the failure to store the image.	None
Success	0000	Receiving is complete	No final identifier is supplied	None

In the event of a successful C-STORE operation, the image has been successfully been written to the disk. The image will then be accessed in the same manner as any other image by the applications on the Advantage U-Server.

Each Packet from C-STORE SCP is transferred within 60 seconds in the session layer of the TCP/IP. This implementation will close the association of the TCP/IP when the time is over 60 seconds.

2.3.1.3.2.3 Presentation Context Acceptance Criterion

The AUSHD AE accepts any number of Presentation Contexts listed in the Accepted Presented Context Table. It rejects requests from remote AE not listed in the local database.

2.3.1.3.2.4 Transfer Syntax Selection Policies

The AUSHD AE only supports Implicit VR Little Endian.

2.3.1.3.3 Real-World Activity<Query Request from Remote AE>

The AUSHD AE and the AUSCD AE are indefinitely listening for associations. No operator action is required to respond to a query request.

2.3.1.3.3.1 Associated Real-World Activity

The Real-World Activity associated with the Query request is to search the local database for entries that match the request and send a C-FIND response message with a status of "pending" for each matching entry.

2.3.1.3.3.2 Accepted Presentation Context Table

Presentation Context Table - Accepted					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Patient/Study Only Root Query/Retrieve	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

Information Model - FIND					

2.3.1.3.3.2.1 SOP Specific DICOM Conformance Statement for all FIND SOP Classes

All Request(R) and Unique(U) patient, study, series and image level key for the Patient Root Query/Retrieve Information Model, Study Root Query/Retrieve Information Model and Patient/Study Only Root Query/Retrieve Information Model are supported. (Refer to each **INFORMATION MODEL KEYS**).

Following are the status codes the Application may send back to the SCU Equipment after performing the requested **FIND** :

Service Status	Status Codes	Further Meaning	Status Code sending explanation	Related Fields sent back to the SCU
Error	C000	Unable to process	indicates that an internal system call has failed while processing the image	None
Success	0000	Matching is complete	No final identifier is supplied	None
Pending	FF00	Matches are continuing	Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	Identifier
	FF01	Matches are continuing	Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	Identifier

Each Packet from C-C-FIND SCP is transferred within 60 seconds in the session layer of the TCP/IP. This implementation will close the association of the TCP/IP when the time is over 60 seconds.

2.3.1.3.3.3 Presentation Context Acceptance Criterion

The AUSHD AE and the AUSCD AE accept any number of Presentation Contexts listed in the Accepted Presented Context Table.

2.3.1.3.3.4 Transfer Syntax Selection Policies

The AUSHD AE and the AUSCD AE only support Implicit VR Little Endian.

2.3.1.3.4 Real-World Activity<Retrieve Request from Remote AE>

The AUSHD AE and the AUSCD AE are indefinitely listening for associations. No operator action is required to respond to a retrieve request.

2.3.1.3.4.1 Associated Real-World Activity

The Real-World Activity associated with the Retrieve request is to send all images corresponding to the C-MOVE request to the destination AE through a separate association.

2.3.1.3.4.2 Accepted Presentation Context Table

Presentation Context Table - Accepted					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Patient/Study Only Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

2.3.1.3.4.2.1 SOP Specific DICOM Conformance Statement for all Move SOP Classes

All images requested in a C-MOVE-RQ will be sent over a single separate association. A C-MOVE-RSP with a "pending" status will be returned to the requester every image.

Following are the status codes the Application may send back to the SCU Equipment after performing the requested **MOVE** :

Service Status	Status Codes	Further Meaning	Status Code sending explanation	Related Fields sent back to the SCU
Failed	C000	Unable to Process	indicates that an internal system call has failed while processing the image	(0000,0901)
Success	0000	Sub-operations Complete - No Failures	No final identifier is supplied	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	B000	Sub-operations Complete - One or more Failures		(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	FF00	Sub operation are continuing		(0000,1020) (0000,1021) (0000,1022)

				(0000,1023)

Each Packet from C-MOVE SCP is transferred within 60 seconds in the session layer of the TCP/IP. This implementation will close the association of the TCP/IP when the time is over 60 seconds.

2.3.1.3.4.3 Presentation Context Acceptance Criterion

The AUSHD AE and the AUSCD AE accept any number of Presentation Contexts listed in the Accepted Presented Context Table. It rejects requests from remote AE not listed in the local database.

2.3.1.3.4.4 Transfer Syntax Selection Policies

The AUSHD AE and the AUSCD AE only support Implicit VR Little Endian.

2.4 COMMUNICATION PROFILES

2.4.1 Supported Communication Stacks (PS 3.8, PS 3.9)

DICOM Upper Layer (PS 3.8) is supported using TCP/IP.

2.4.2 OSI Stack

OSI stack not supported

2.4.3 TCP/IP Stack

The TCP/IP stack is inherited from a Windows NT Operating System.

2.4.3.1 API

Not applicable to this product.

2.4.3.2 Physical Media Support

Ethernet V2.0,IEEE 802.3

2.4.4 Point-to-Point Stack

A 50-pin ACR-NEMA connection is not applicable to this product.

2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

2.5.1 Standard Extended /Specialized/Private SOPs

Not applicable.

2.6 CONFIGURATION

2.6.1 AE Title/Presentation Address Mapping

The Advantage U-Server system allows the operator to "Add", "Delete" or "Update" the mapping of remote AE Title to IP Address and Port. These options can be selected from "Remote" menu display by choosing "System Configuration " of Advantage U-Server System.

The operator can configure Local IP Address and Local IP Netmask in Control Panel of Windows NT Operating System.

The operator can configure Port Number as environment variable in Control Panel of Windows NT Operating System.

The operator can configure default router IP address in Control Panel of Windows NT Operating System.

2.6.2 Configurable Parameters

The following fields are configurable for the AUS AEs (local):

- Local AE Title

- Local IP Address

- Local Port Number

- Local IP Netmask

The following fields are configurable for every remote DICOM AE:

- Remote AE Title

- Remote IP Address

- Listening TCP/IP Port Number

Note: All configurations must be performed by a operator.

2.7 SUPPORT OF EXTENDED CHARACTER SETS

No extended character sets is supported. The Advantage U-Server supports only the ISO_IR 6 (default) .

3. MEDIA STORAGE CONFORMANCE STATEMENT

3.1 INTRODUCTION

This section of the conformance statement (CS) specifies the Advantage U-Server compliance to DICOM Media Interchange. It details the DICOM Media Storage Application Profiles and roles which are supported by this product.

This System provides capabilities to DICOM interchange on CD-R (Compact Disc-Recordable) and on CD-ROM(Compact Disc Read Only Memory) with application profile supported for each media. Basically, the Advantage U-Server system works with Ultrasound(US),Ultrasound Multi-frame(USM), Computed Tomography(CT),Magnetic Resonance(MR),Secondary Captures(SC),Computed Radiography(CR),Nuclear Medicine (NM),XRay Angiographic(XA), XRay Angiographic Bi-Plane(XAB), XRay Radio Fluoroscopic(RF) Image Storage and Standalone Overlay Storage.

Note that the format of this section strictly follows the format defined in DICOM Standard PS 3.2 (Conformance). Please refer to that part of the standard while reading this section.

3.2 IMPLEMENTATION MODEL

3.2.1 Application Data Flow Diagram

The Basic and Specific Application models for CDROM device and CD-R device are shown in the following Illustration :

● Description of the data Flow Diagram for the CDROM device

The DICOM ARCHIVE/RESTORE functionality for the CDROM device is handled by the DICOM MEDIA READER Application Entity(DMR AE).The DMR AE is commanded by the operator to perform DICOM services operation on the DICOM media through the use of buttons and menu selections on the graphical user interface of the system.

The operator can request the reading of a DICOM file set written on a CDROM by selecting the CDROM drive, and clicking on "Query" Item button which is on the ImageManagement of Advantage U-Server System.

The Application models for the CDROM device are shown in Illustration 3.2.1 - 1

Illustration 3.2.1 - 1

SPECIFIC AE APPLICATION MODEL FOR CDROM DEVICE

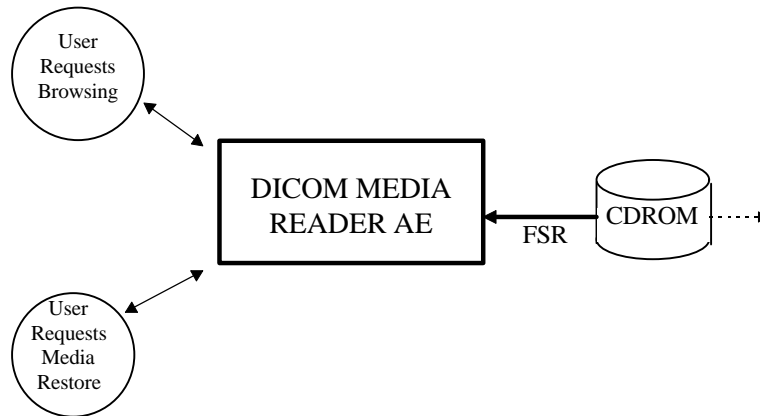- Description of the data Flow Diagram for the CD-R device

The DICOM ARCHIVE/RESTORE functionality for the CD-R device is handled by the DICOM MEDIA CREATOR Application Entity(DMC AE) .The DMC AE is commanded by the operator to perform DICOM services operation on the DICOM media through the use of buttons and menu selections on the graphical user interface of the system.

The operator requests the creation of DICOM file set and the writing of this DICOM File Set on a blank CD-R by selecting images in the local database. These Images are saved on mono-session disk in a one shot operation.

The DMC AE will create and write DICOM File Set on a blank CD-R by defining "a condition order" which the Advantage U-Server archives them to the CD-R automatically.

The Application model for the CD-R device is shown in Illustration 3.2.1 - 2

Illustration 3.2.1 - 2

SPECIFIC AE APPLICATION MODEL FOR CD-R DEVICE

3.2.2 Functional Definition of AE's

The Advantage U-Server has the DICOM MEDIA READER(DMR) and the DICOM MEDIA CREATOR(DMC) Application Entities.

The DMC AE can create and write DICOM File Set onto the media(Archive CD).

The DMR AE can display directory listing of the DICOM File Set on a piece of media(Browse CD).

The DMR AE can copy the SOP Instances from the CDROM onto the disk(Restore CD).

3.2.3 Sequencing Requirements

Non Applicable

3.2.4 File Meta Information Options (See PS3.10)

The File Meta-Information for this implementation is :

File Meta-Information Version	1
Advantage U-Server Implementation UID	1.2.840.113619.6.40
Implementation Version Name	GEYMS 02.01

3.3 AE SPECIFICATIONS

3.3.1 The DICOM MEDIA READER and DICOM MEDIA CREATOR AE Specification

The DICOM MEDIA READER and DICOM MEDIA CREATOR Application Entity provides standard conformance to DICOM Interchange Option of the Media Storage Service Class. The application Profiles and roles are listed below.

Table 3.3.1

Supported Application Profile	Real World Activity	Role	Description
PRI-AUS-CD	Browse CD	FSR	Interchange
PRI-AUS-CD	Restore CD	FSR	Interchange
PRI-AUS-CD	Archive CD	FSC	Interchange

3.3.1.1 File Meta Information for the DICOM MEDIA READER and DICOM MEDIA CREATOR Application Entities

This File Meta Information does not include "Source Application Entity Title" , "Private Information Creator UID" and "Private Information".

3.3.1.2 Real-World Activities for the DICOM MEDIA READER and DICOM MEDIA CREATOR Application Entities

3.3.1.2.1 Real-World Activity "Browse CD"

The DICOM MEDIA READER AE acts as an FSR using the interchange option when requested to browse the CD.

When the DICOM MEDIA READER AE is requested to provide a directory listing, it reads the File-set and displays the DICOMDIR directory entries according to the PATIENT,STUDY,SERIES,IMAGE paradigm.

3.3.1.2.1.1 Media Storage Application Profile for the RWA "Browse CD":

For the list of Application Profiles that invoke this AE for the Browse CD RWA, see the Table in 3.3.1

3.3.1.2.1.2 Options:

None applicable.

3.3.1.2.2 Real-World Activity "Restore CD"

The DICOM MEDIA READER AE acts as an FSR using the interchange option when requested to copy the SOP Instances from the CDROM to the disk.

3.3.1.2.2.1 Media Storage Application Profile for the RWA "Restore CD":

For the list of Application Profiles that invoke this AE for the Restore CD RWA, see the Table in 3.3.1

3.3.1.2.2.2 Options:

None Applicable.

3.3.1.2.3 Real-World Activity "Archive CD"

The DICOM MEDIA CREATER AE acts as an FSC using the interchange option when requested to write the SOP Instances from the disk to the CD-R.

3.3.1.2.3.1 Media Storage Application Profile for the RWA "Archive CD":

For the list of Application Profiles that invoke this AE for the Archive CD RWA, see the Table in 3.3.1

3.3.1.2.3.2 Options:

None applicable.

3.4 AUGMENTED AND PRIVATE APPLICATION PROFILES

3.4.1 Augmented Application Profiles

No augmented

3.4.2 Private Application Profiles

3.4.2.1 Private Application Profile PRI-AUS-CD

The specific Application Profile in this class is shown as follows:

Application Profile	Identifier	Description
Image onto CD-R Image Archive in the Advantage U-Server System	PRI-AUS-CD	It handles uncompressed images stored in Implicit VR Little Endian.

3.4.2.1.1 Clinical Context

This Application Profile facilitates the interchange of images and related data on CD-R media.

This Application Profile facilitates the creation of multi-modality medium, useful for clinical, patient record, teaching and research applications.

3.4.2.1.1.1 Role and Service Class Option

This Application Profile uses the Media Storage Class defined in PS 3.4

The Application Entity shall support one or more of roles of File Set Reader(FSR) , File Set Creator(FSC) defined PS3.10.

3.4.2.1.1.1.1 File Set Reader

The role of File Set Reader is used by the DICOM MEDIA READER Application Entity which receive a transferred File Set. Typical entity using this role would include display servers and archive systems which receive a patient record transferred from another institution. File Set Reader shall be able to read all the SOP Classes defined for the specific Application Profile for which a Conformance Statement is made using all the defined Transfer Syntaxes.

3.4.2.1.1.1.2 File Set Creator

The role File Set Creator shall be used by the DICOM MEDIA CREATOR Application Entity which generates a File Set under the PRI-AUS-CD Application Profile Class. File Set Creator shall be able to generate the Media Storage Directory Storage SOP Class in the DICOMDIR file with all types of records related the SOP Classes stored in the File-set.

3.4.2.1.1.1.3 File Set Updater

None.

3.4.2.1.1.2 PRI-AUS-CD Class Profile

3.4.2.1.1.2.1 SOP Class and Transfer Syntaxes

Following are the SOP Classes supported by RWA "PRI-AUS-CD"

Information Object Definition	SOP Class UID	Transfer Syntax and UID	FSC Req-	FSR Req-
Media Storage Directory Storage	1.2.840.10008.1.3.10	Explicit VR Little Endian uncompressed 1.2.840.10008.1.2.1	M	M
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian uncompressed 1.2.840.10008.1.2	O	M
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian uncompressed 1.2.840.10008.1.2	O	M
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian uncompressed 1.2.840.10008.1.2	O	M
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian uncompressed 1.2.840.10008.1.2	O	M
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian uncompressed 1.2.840.10008.1.2	O	M
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian uncompressed 1.2.840.10008.1.2	O	M
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	Implicit VR Little Endian uncompressed 1.2.840.10008.1.2	O	M
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian uncompressed 1.2.840.10008.1.2	O	M
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Implicit VR Little Endian uncompressed 1.2.840.10008.1.2	O	M

X-Ray Angiographic Bi-Plane Image Storage	1.2.840.10008.5.1.4.1.1.12.3	Implicit VR Little Endian uncompressed 1.2.840.10008.1.2	O	M
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian uncompressed 1.2.840.10008.1.2	O	M

M : Mandatory   O : Option

3.4.2.1.1.2.2 Physical Medium and Medium Format

The PRI-AUS-CD application profile required the 120mm CD-R physical medium with the ISO/IEC 9660 Media Format, as defined in PS 3.12.

3.4.2.1.1.2.3 Directory information in DICOMDIR

Conformant Application Entity shall include in the DICOM File a Media Storage Directory IOD containing Directory Records at Patient and subsidiary levels appropriate to the SOP Classes in the File-Set. All DICOM file in the File-Set incorporating SOP instance Application Profile shall be referenced by Directory Records.

3.4.2.1.1.2.3.1 Additional Keys

The following keys are added as Type3 data elements in the Basic Directory IOD:

Key Attribute	Tag	Directory Record Type
Patient's Birth Date	(0010,0030)	PATIENT
Patient's Sex	(0010,0040)	PATIENT
Study Description	(0008,1030)	STUDY
Patient's Age	(0010,1010)	STUDY
Referring Physical Name	(0008,0090)	STUDY
Admitting Diagnoses Description	(0008,1080)	STUDY
Protocol Name	(0018,1030)	SERIES
Series Part Examined	(0018,0015)	SERIES
Manufacturer's Model Name	(0008,1090)	SERIES
Image Type	(0008,0008)	IMAGE
Contract/Bolus Agent	(0018,0010)	IMAGE
Slice Location	(0020,1041)	IMAGE

**3.5 EXTENSIONS, SPECIALIZATIONS, PRIVATIZATIONS OF SOP CLASSES
AND TRANSFER SYNTAXES**

3.5.1 Extensions, Specializations, and Privatizations of SOP Classes

 Not Applicable.

3.5.2 Private Transfer Syntax Specification

No private Transfer Syntax.

3.6 CONFIGURATION

The CD-R Archive Application will have only 640MB drive installed.

3.7 SUPPORT OF EXTENDED CHARACTER SETS

No extended character sets is supported. The Advantage U-Server supports only the
IOS_IR6(default).

4. PATIENT ROOT QUERY/RETRIEVE INFORMATION MODEL DEFINITION

4.1 INTRODUCTION

This section specifies the use of the DICOM Patient Root Query/Retrieve Model used to organize data and against which a Query/Retrieve will be performed. The contents of this section are:

4.2 - Information Model Description

4.3 - Information Model Entity-Relationship Model

4.4 - Information Model Keys

4.2 PATIENT ROOT INFORMATION MODEL DESCRIPTION

The Patient Root Query/Retrieve Information Model is based upon a four level hierarchy:

- ■   Patient

- ■   Study

- ■   Series

- ■   Image

The Patient level is top level and contain Attributes association with the Patient Information Entity(IE) of Image IODs. Patient are modality independent.

The Study level is below the patient level and contain Attributes association with the Study IE of Image IODs. A study belongs to a single patient . A single patient may have multiple study . Study IEs are modality dependent.

The Series level is below the study level and contains Attributes association with the Series IE of Image IODs. A series belong to a single study. A single study may have multiple series. Series IEs are modality dependent.

The lowest level is the image level and contains Attributes associated with the Image IE of Image IODs. An image belong to a single series. A single series may have multiple images. Image are modality dependent.

4.3 PATIENT ROOT INFORMATION MODEL ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Patient Root Information Model schema is shown in Illustration 4.3-1**.** In this figure, the following diagrammatic convention is established to represent the information organization :

- each entity is represented by a rectangular box

- each relationship is represented by a diamond shaped box.

- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to n Images per Series, but the Patient to Study relationship has 1 Study for each Patient (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 4.3-1
PATIENT ROOT QUERY/RETRIEVE INFORMATION MODEL E/R DIAGRAM
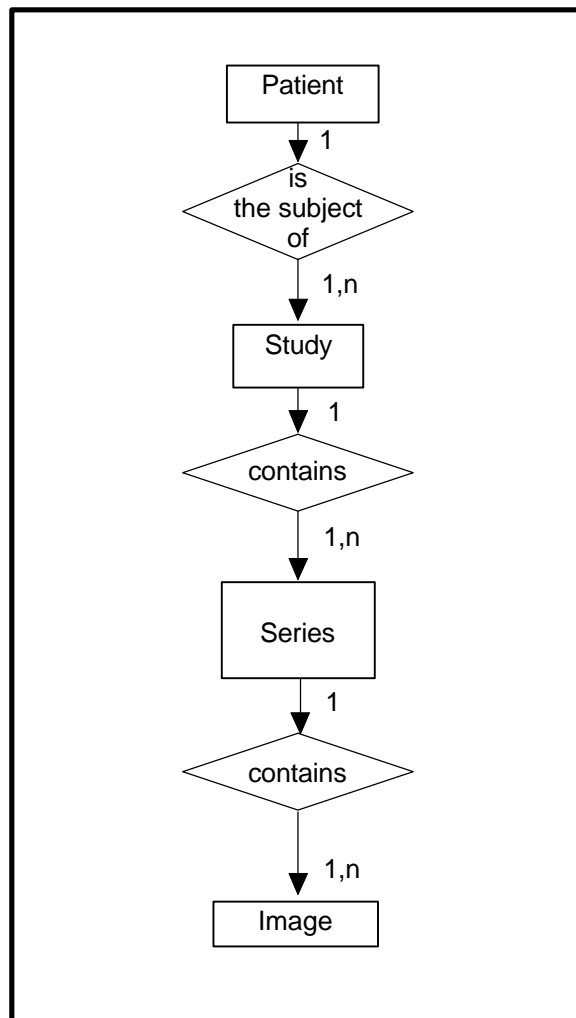
4.3.1 ENTITY DESCRIPTIONS

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Patient Root Query/Retrieve Information Model.

4.3.1.1 Patient Entity Description

The patient Entity defines the characteristics of a patient who is the subject of one or more medical studies which produce medical images.

4.3.1.2 Study Entity Description

The Study Entity defines the characteristics of a medical study performed on patient. A study is collection of one or more series of medical images which are logically related for the purpose of diagnosing a patient. Each study is associated with exactly one patient.

4.3.1.3 Series Entity Description

The Series Entity defines the attributes which are used to group images into distinct logical sets. Each series is associated with exactly one study.

4.3.1.4 Image Entity Description

The Image Entity defines the attributes which describe the pixel of an image. The pixel data is generated as a direct result of patient scanning(an Original image). An image is defined by its image plan, pixel data characteristics gray scale and color mapping characteristics and modality specific characteristics(acquisition parameters and image creation information).

4.3.2 Advantage U-Server Mapping of DICOM entities

TABLE 4.3-1

MAPPING OF DICOM ENTITIES TO ADVANTAGE U-SERVER ENTITIES

DICOM	Advantage U-Server Entity
Patient	Patient
Study	Study
Series	Series
Image	Image

4.4 INFORMATION MODEL KEYS

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Patient Root Query/Retrieve Information Model.

The following Level descriptions are included to specify what data elements are supported and what type of matching can be applied. It should be noted that they are the same ones as defined in the DICOM v3.0 Standard PS 3.4 (Service Class Specifications).

4.4.1 Supported Matching

Following are the types of matching that are supported by the implementation :

– Single Value matching

– Universal Matching

– Wild Card Matching

– Range of date, Range of Time

4.4.2 Patient Level

This section defines the keys at the Patient Level of the Patient Root Query/Retrieve Information Model that are supported by this implementation.

TABLE 4.4-1
PATIENT LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	R	
Patient ID	(0010,0020)	U	If no Patient ID, Study Instance UID is set.
Patient's Birth Date	(0010,0030)	O	
Patient's Sex	(0010,0040)	O	

TABLE 4.4-2
Q/R PATIENT LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = PATIENT
Retrieve AE Title	(0008,0054)	R	Value = Called AE Title

4.4.3 Study Level

This section defines the keys at the Study Level of the Patient Root Query/Retrieve Information Model that are supported by this implementation.

TABLE 4.4-3
STUDY LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Study Date	(0008,0020)	R	
Accession Number	(0008,0050)	R	
Study ID	(0020,0010)	R	
Study Instance UID	(0020,000D)	U	
Referring Physician's Name	(0008,0090)	O	
Study Description	(0008,1030)	O	
Admitting Diagnoses Description	(0008,1080)	O	

Patient's Age	(0010,1010)	O	

TABLE 4.4-4
Q/R STUDY LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = STUDY
Retrieve AE Title	(0008,0054)	R	Value = Called AE Title

4.4.4 Series Level

This section defines the keys at the Series Level of the Patient Root Query/Retrieve Information Model that are supported by this implementation.

TABLE 4.4-5
SERIES LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	R	
Series Number	(0020,0011)	R	
Series Instance UID	(0020,000E)	U	
Protocol Name	(0018,1030)	O	
Series Description	(0008,0015)	O	
Body Part Examined	(0018,0015)	O	
Manufacturer's Model Name	(0008,1090)	O	

TABLE 4.4-6
Q/R SERIES LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = SERIES
Retrieve AE Title	(0008,0054)	R	Value = Called AE Title

4.4.5 Image Level

This section defines the keys at the Image Level of the Patient Root Query/Retrieve Information Model that are supported by this implementation.

TABLE 4.4-7
IMAGE LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	R	

SOP Instance UID	(0008,0018)	U	
Image Type	(0008,0008)	O	
Contrast/Bolus Agent	(0018,0010)	O	
Slice Location	(0020,1041)	O	

TABLE 4.4-8
Q/R IMAGE LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = IMAGE
Retrieve AE Title	(0008,0054)	R	Value = Called AE Title

4.5 PRIVATE DATA DICTIONARY

There are no private query key attributes defined for this implementation.

5. STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL DEFINITION

5.1 INTRODUCTION

This section specifies the use of the DICOM Study Root Query/Retrieve Model used to organize data and against which a Query/Retrieve will be performed. The contents of this section are:

5.2 - Information Model Description

5.3 - Information Model Entity-Relationship Model

5.4 - Information Model Keys

5.2 STUDY ROOT INFORMATION MODEL DESCRIPTION

The Study Root Query/Retrieve Information Model is based upon a there level hierarchy:

- ■ Study

- ■ Series

- ■ Image

The Study level is top level and contain Attributes association with the Study IE of Image IODs. Attributes of patients are considered to be attributes of studies. Sturdy IEs are modality independent.

The Series level is below the study level and contains Attributes association with the Series IE of Image IODs. A series belong to a single study. A single study may have multiple series. Series IEs are modality dependent.

The Image level is the image level and contains Attributes associated with the Image IE of Image IODs. An image belong to a single series. A single series may have multiple images. Image are modality dependent.

5.3 STUDY ROOT INFORMATION MODEL ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Study Root Information Model schema is shown in Illustration 5.3-1. In this figure, the following diagrammatic convention is established to represent the information organization :

- • each entity is represented by a rectangular box

- • each relationship is represented by a diamond shaped box.

- • the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to n Images per Series.

ILLUSTRATION 5.3-1
STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL E/R DIAGRAM

```
                    ┌──────────────┐
                    │    Study     │
                    └──────┬───────┘
                           │ 1
                    ◇──────────────◇
                    │   contains   │
                    ◇──────────────◇
                           │ 1,n
                    ┌──────────────┐
                    │    Series    │
                    └──────┬───────┘
                           │ 1
                    ◇──────────────◇
                    │   contains   │
                    ◇──────────────◇
                           │ 1,n
                    ┌──────────────┐
                    │    Image     │
                    └──────────────┘
```
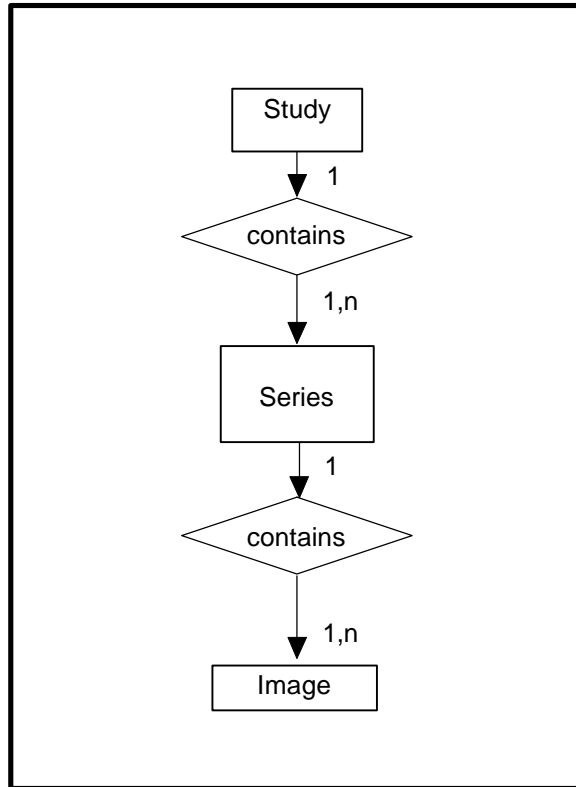
5.3.1 Entity Descriptions

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Study Root Query/Retrieve Information Model.

5.3.1.1 Study Entity Description

The Study Entity defines the characteristics of a medical study performed on a patient. A study is a collection of one or more series of medical images which are logically related for the purpose of diagnosing a patient Each study is associated with exactly one patient.

5.3.1.2 Series Entity Description

The Series Entity defines the attributes which are used to group images into distinct logical sets. Each series is associated with exactly one study

5.3.1.3 Image Entity Description

The Image Entity defines the attributes which describe the pixel of an image. The pixel data is generated as a direct result of patient scanning(an Original image). An image is defined by its image plan, pixel data characteristics gray scale and/or color mapping characteristics

and modality specific characteristics(acquisition parameters and image creation information)

5.3.2 Advantage U-Server Mapping of DICOM entities

TABLE 5.3-1
MAPPING OF DICOM ENTITIES TO ADVANTAGE U-SERVER ENTITIES

DICOM	Advantage U-Server Entity
Study	Study
Series	Series
Image	Image

5.4 INFORMATION MODEL KEYS

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Study Root Query/Retrieve Information Model.

The following Level descriptions are included to specify what data elements are supported and what type of matching can be applied. It should be noted that they are the same ones as defined in the DICOM v3.0 Standard PS 3.4 (Service Class Specifications).

5.4.1 Supported Matching

Following are the types of matching that are supported by the implementation :

  − Single Value matching
  − Universal Matching
  − Wild Card Matching
  − Range of date, Range of Time

5.4.2 Study Level

This section defines the keys at the Study Level of the Study Root Query/Retrieve Information Model that are supported by this implementation.

TABLE 5.4-1
STUDY LEVEL ATTRIBUTES FOR THE STUDY ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Study Date	(0008,0020)	R	
Study Time	(0008,0030)	R	
Accession Number	(0008,0050)	R	
Patient's Name	(0010,0010)	R	
Patient ID	(0010,0020)	R	If no Patient ID, Study Instance UID is set.
Study ID	(0020,0010)	R	
Study Instance UID	(0020,000D)	U	

Referring Physician's Name	(0008,0090)	O	
Study Description	(0008,1030)	O	
Patient's Birth Date	(0010,0030)	O	
Patient's Sex	(0010,0040)	O	
Patient's Age	(0010,1010)	O	
Admitting Diagnoses Description	(0008,1080)	O	

TABLE 5.4-2
Q/R STUDY LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = STUDY
Retrieve AE Title	(0008,0054)	R	Value = Called AE Title

5.4.3 Series Level

This section defines the keys at the Series Level of the Study Root Query/Retrieve Information Model that are supported by this implementation.

TABLE 5.4-3
SERIES LEVEL ATTRIBUTES FOR THE STUDY ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	R	
Series Number	(0020,0011)	R	
Series Instance UID	(0020,000E)	U	
Protocol Name	(0018,1030)	O	
Series Description	(0008,0015)	O	
Body Part Examined	(0018,0015)	O	
Manufacturer's Model Name	(0008,1090)	O	

TABLE 5.4-4
Q/R SERIES LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = SERIES
Retrieve AE Title	(0008,0054)	R	Value = Called AE Title

5.4.4 Image Level

This section defines the keys at the Image Level of the Study Root Query/Retrieve Information Model that are supported by this implementation.

TABLE 5.4-5
IMAGE LEVEL ATTRIBUTES FOR THE STUDY ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	R	
SOP Instance UID	(0008,0018)	U	
Image Type	(0008,0008)	O	
Contrast/Bolus Agent	(0018,0010)	O	
Slice Location	(0020,1041)	O	

TABLE 5.4-6
Q/R IMAGE LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = IMAGE
Retrieve AE Title	(0008,0054)	R	Value = Called AE Title

5.5 PRIVATE DATA DICTIONARY

There are no private query key attributes defined for this implementation.

6. PATIENT/STUDY ONLY QUERY/RETRIEVE INFORMATION MODEL DEFINITION

6.1 INTRODUCTION

This section specifies the use of the DICOM Patient/Study only Query/Retrieve Model used to organize data and against which a Query/Retrieve will be performed. The contents of this section are:

6.2 - Information Model Description

6.3 - Information Model Entity-Relationship Model

6.4 - Information Model Keys

6.2 PATIENT/STUDY ONLY INFORMATION MODEL DESCRIPTION

There are only two level in Patient/Study Only Q/R Model. The one is a patient level, the other is the study level.

The Patient level is top level and contain Attributes association with the Patient Information Entity(IE) of Image IODs. Patient are modality independent.

The Study level is below the patient level and contain Attributes association with the Study IE of Image IODs. A study belongs to a single patient . A single patient may have multiple study . Study IEs are modality dependent.
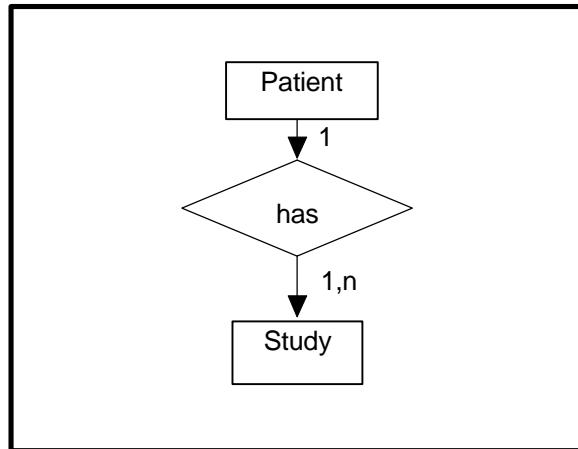
6.3 PATIENT/STUDY ONLY INFORMATION MODEL ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Patient/Study only Information Model schema is shown in Illustration 6.3-1**.** In this figure, the following diagrammatic convention is established to represent the information organization :

- each entity is represented by a rectangular box

- each relationship is represented by a diamond shaped box.

- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Patient and Study can have up to n Studies per Patient

ILLUSTRATION 6.3-1
PATIENT/STUDY ONLY QUERY/RETRIEVE INFORMATION MODEL E/R DIAGRAM

6.3.1   Entity Description

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Patient/Study only Query/Retrieve Information Model.

6.3.1.1   Patient Entity Description

The patient Entity defines the characteristics of a patient who is the subject of one or more medical studies which produce medical image.

6.3.1.2   Study Entity Description

The Study Entity defines the characteristics of a medical study performed on patient. Each study is associated with exactly one patient.

6.3.2   Advantage U-Server Mapping of DICOM entities

TABLE 6.3-1
MAPPING OF DICOM ENTITIES TO ADVANTAGE U-SERVER ENTITIES

DICOM	Advantage U-Server Entity
Patient	Patient
Study	Study

6.4   INFORMATION MODEL KEYS

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Patient/Study only Query/Retrieve Information Model.

The following Level descriptions are included to specify what data elements are supported and what type of matching can be applied. It should be noted that they are the same ones as defined in the DICOM v3.0 Standard PS 3.4 (Service Class Specifications).

6.4.1 Supported Matching

Following are the types of matching that are supported by the implementation :

- Single Value matching
- Universal Matching
- Wild Card Matching
- Range of date, Range of Time

6.4.2 Patient Level

This section defines the keys at the Patient Level of the Patient/Study only Query/Retrieve Information Model that are supported by this implementation.

TABLE 6.4-1
PATIENT LEVEL ATTRIBUTES FOR THE PATIENT/STUDY ONLY
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	R	
Patient ID	(0010,0020)	U	If no patient ID, Study instance UID is set.
Patient's Birth Date	(0010,0030)	O	
Patient's Sex	(0010,0040)	O	

TABLE 6.4-2
Q/R PATIENT LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = PATIENT
Retrieve AE Title	(0008,0054)	R	Value = Called AE Title

6.4.3 Study Level

This section defines the keys at the Study Level of the Patient/Study only Query/Retrieve Information Model that are supported by this implementation.

TABLE 6.4-3
STUDY LEVEL ATTRIBUTES FOR THE PATIENT/STUDY ONLY
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Study Date	(0008,0020)	R	
Accession Number	(0008,0050)	R	
Study ID	(0020,0010)	R	

Study Instance UID	(0020,000D)	U	
Referring Physician's Name	(0008,0090)	O	
Study Description	(0008,1030)	O	
Admitting Diagnoses Description	(0008,1080)	O	
Patient's Age	(0010,1010)	O	

TABLE 6.4-4
Q/R STUDY LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = STUDY
Retrieve AE Title	(0008,0054)	R	Value = Called AE Title

6.5 PRIVATE DATA DICTIONARY

There are no private query key attributes defined for this implementation.