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Technical Publications

Direction 2001017-007
Revision 1

GEMnet Image Vault 1.0 CONFORMANCE STATEMENT for DICOM V3.0

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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 (Patient Root Query/Retrieve Information Model Definition), which specifies the GEMS equipment compliance to DICOM requirements for the implementation of the Patient Root Query/Retrieve service.

Section 4 (Study Root Query/Retrieve Information Model Definition), which specifies the GEMS equipment compliance to DICOM requirements for the implementation of the Study Root Query/Retrieve service.

Section 5 (Patient/Study Only Query/Retrieve Information Model Definition), which specifies the GEMS equipment compliance to DICOM requirements for the implementation of the Patient/Study only Query/Retrieve service.

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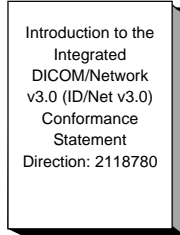
APPLICATION ENTITY SPECIFICATION
(SERVICE CLASSES, INFORMATION OBJECTS, MESSAGE EXCHANGES, ETC.)

**Product
Implementation:**

CT Advantage

MR Advantage

GEMnet Image
Vault
Conformance
Statement
Direction:
2001017-007

......
Conformance
Statement
Direction:
......
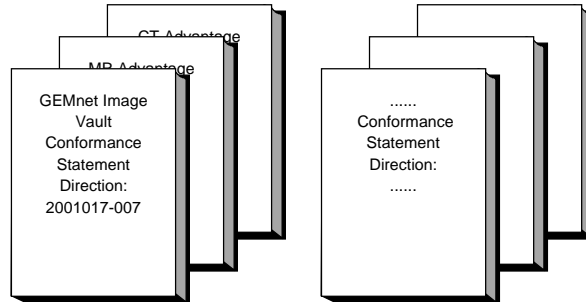
DICOM STANDARD

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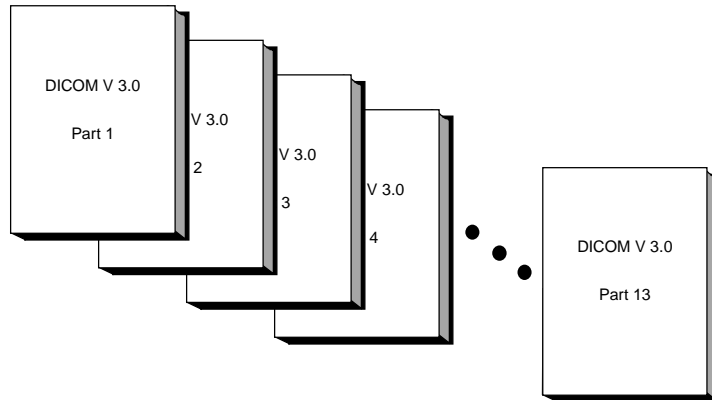
This document specifies the DICOM v3.0 implementation. It is entitled:

GEMnet Image Vault 1.0

Conformance Statement for DICOM v3.0
*Direction **2001017-007***

This DICOM Conformance Statement documents the DICOM v3.0 Conformance Statement and Technical Specification required to inter-operate 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*
> *Direction: 2118780*

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

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*.

The information object implementation refers to DICOM PS 3.3 (Information Object Definition).

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.

The GEMnet Image Vault is a combined hardware and software platform which provides high performance short term and archival storage for digital medical images. It provides immediate access to images in active review (recently stored or retrieved), and automatic long term archival mass storage for permanent image retention. The GEMnet Image Vault provides associated services for managing and retrieving the stored images, including automatic retrieval from mass storage libraries.

The GEMnet Image Vault is designed for the high performance requirements of X-ray modalities, specifically X-ray angiography, with real-time data rates of 7.5 MB/s and uncompressed data volumes of up to 1500 MB per study.

The GEMnet Image Vault is an open system, with all of its interfaces defined by international and industry standards. DICOM is the fundamental standard through which the GEMnet Image Vault communicates with other devices. DICOM protocols are used for sending image data to the GEMnet Image Vault for storage and archiving, for querying the image database, and for retrieving images.

2.2 IMPLEMENTATION MODEL

2.2.1 Application Data Flow Diagram

There is one Application Entity in the GEMnet Image Vault that is used for all DICOM functionality.   The default Application Entity Title for this application is "ImageServer_1". Illustration 2 is a graphical depiction of the relationships between the GEMnet Image Vault Application Entity (AE) and various Real-World Activities, as interrelated by DICOM.
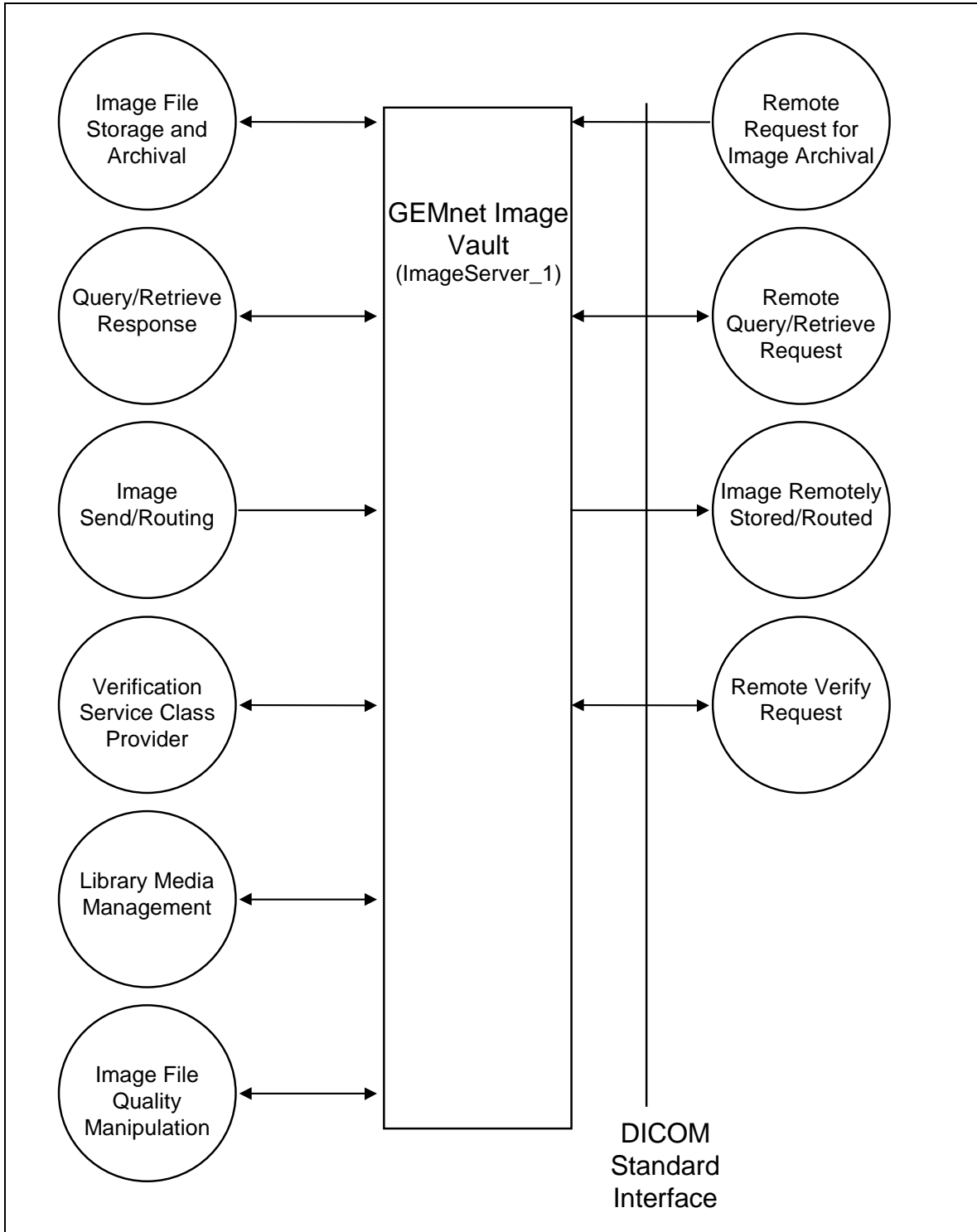
ILLUSTRATION 2: GEMNET IMAGE VAULT IMPLEMENTATION MODEL DATA FLOW DIAGRAM

Remote Request for Image Archival is an activity which sends one or more images to the GEMnet Image Vault to be archived. Image File Storage and Archival and Image Routing are local automatic activities triggered by the DICOM transfer of images to the

GEMnet Image Vault for archive. If the GEMnet Image Vault is configured for Image Routing, images meeting the routing criteria will be routed to remote systems. Library Media Management is a local automatic activity which manages migration of image file data to archival media and management of the library containing archival media.

Remote Query/Retrieve Request and Image Remotely Stored are activities by which an external user can identify images stored by the GEMnet Image Vault and retrieve specific images or sets of images. The GEMnet Image Vault Query/Retrieve Response activity provides information about images managed by the GEMnet Image Vault and initiates the return DICOM Association to the external Remote Retrieve activity or the Remote Image Stored activity for the transfer of the requested images. A user may also initiate the Image Remotely Stored activity directly from the GEMnet Image Vault. These activities are also supported by the Library Media Management activity.

The internal Image File Quality Manipulation activity allows a user to perform image quality management using the GEMnet Image Vault. A user may perform editing of patient demographics in order to ensure proper identifiers are maintained.

An external Verify Request activity may use a DICOM Association to verify the ability of the GEMnet Image Vault to respond to DICOM messages.

2.2.2 Functional Definition of AE's

The GEMnet Image Vault contains one Application Entity. It provides a general archival storage service for medial images, in particular X-ray angiographic images and related secondary capture images, and associated services for managing and retrieving those images.

Standard DICOM network communications is used to send images to the GEMnet Image Vault for storage (Storage Service), to query the GEMnet Image Vault for information about stored images (Query Service), and to retrieve stored images (Retrieve and Storage Services). The GEMnet Image Vault initiates and responds to DICOM echo requests (Verification Service).

The GEMnet Image Vault uses extensions to standard DICOM services (in conformance with the DICOM Standard) to provide additional system functionality. The GEMnet Image Vault supports retrieval of image storage related attributes as part of the query response (Standard Extended Query Service).

2.2.3 Sequencing of Real-World Activities

The only sequencing constraints are those which arise from the required existence of data prior to its access (e.g., images must be archived prior to their access through the Remote Query/Retrieve Request activity).

2.3 AE SPECIFICATIONS

2.3.1 ImageServer_1 AE Specification

This Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as an **SCU**:

SOP Class Name	SOP Class UID
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
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

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

SOP Class Name	SOP Class UID
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
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
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
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 GEMnet Image Vault is:

Maximum Length PDU	65 536 bytes

SOP Class Extended Negotiation is not supported.

The maximum number of Presentation Context Items that will be proposed is 8.

The user information Items sent by this product are:

- Maximum PDU Length

- Implementation UID

- Implementation Version Name

2.3.1.1.2 Number of Associations

The GEMnet Image Vault supports up to 32 simultaneous associations for acceptance and up to 32 simultaneous associations initiated.

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:

GEMnet Image Vault Implementation UID	1.2.840.113750.98201164.1.6.1.0.1

The Implementation Version Name for this DICOM v3.0 Implementation is:

GEMnet Image Vault Implementation Version Name	GEMnet IV 2.0B

2.3.1.2 Association Initiation Policy

The GEMnet Image Vault Application Entity attempts to initiate an association to support the C-MOVE sub-operation and to support C-STORE requests during the Image Remotely Stored and Image Remotely Routed activities. In other words, the three cases of real-world activity which cause the GEMnet Image Vault Application Entity to initiate the establishment of an association include:

- to handle the storage sub-operations in response to a retrieval request,

- to handle the storage operation of an image routing activity, and

- to handle the storage operation of an image send activity.

2.3.1.2.1 Real-World Activity: Remote Image Storage

2.3.1.2.1.1 Associated Real-World Activity

The Remote Image Storage activity includes Image Routing, user initiated Image Storage, and Image Retrieval. The GEMnet Image Vault Application Entity will establish an association in response to a Retrieve SOP Class (MOVE) request received from the Query/Retrieve Request Real-World Activity, or in response to a directive from the Image Routing Real-World Activity, or in response to a manually initiated directive from the Image Send Real-World Activity. The target Real-World Activity is an external Image Receive.

2.3.1.2.1.2 Proposed Presentation Context Table

The GEMnet Image Vault Application Entity will propose Presentation Contexts for each Transfer Syntax/Abstract Syntax combination listed in Table 1. All combinations will be proposed on each association, regardless of the specific Abstract Syntax of the SOP Instances which are to be transmitted.

TABLE 1: PROPOSED PRESENTATION CONTEXTS FOR GEMNET IMAGE VAULT IMAGE STORAGE

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
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
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
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
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
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
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		

2.3.1.2.1.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

The GEMnet Image Vault, as an SCU of the Storage SOP Classes, records any unsuccessful C-STORE operations in an error log and for Image Remotely Stored/Routed, the GEMnet Image Vault places the SOP Instance in a retry list for retry of the C_STORE. The GEMnet Image Vault takes no action upon successful or warning response statuses.

The GEMnet Image Vault does not support Storage SOP Class Extended Negotiation.

Image objects transferred under the Storage SOP Classes may have optional Type 3 data elements as implemented by the sources of those images, and included in the image objects archived in the GEMnet Image Vault.

2.3.1.3 Association Acceptance Policy

The GEMnet Image Vault Application Entity will accept an association at any time, consistent with the maximum number of simultaneous associations as described in Section 1.2.1.1.2.

The GEMnet Image Vault Application Entity accepts the establishment of an association in these cases of Real-World Activity:

- to support a remote Application Entity verifying the connectivity and responsiveness of the GEMnet Image Vault Application Entity,

- to receive images for archive from a remote Application Entity,

- to support query/retrieve requests from a remote Application Entity.

The GEMnet Image Vault may terminate an association (A_ABORT) if there is no activity for a parameterized length of time.

2.3.1.3.1 Real-World Activity: Verification

2.3.1.3.1.1 Associated Real-World Activity

The GEMnet Image Vault Application Entity will accept an association from a remote Application Entity to verify the ability of the GEMnet Image Vault to respond to DICOM messages (Verification Real-World Activity).

2.3.1.3.1.2 Accepted Presentation Context Table

The GEMnet Image Vault will accept the Presentation Contexts for the Verification activity as shown in Table 2. A single association may be used both for this activity and for any of the other activities for which the GEMnet Image Vault is the association acceptor.

TABLE 2: ACCEPTABLE PRESENTATION CONTEXTS FOR GEMENT IMAGE VAULT APPLICATION ENTITY VERIFICATION

Presentation Context Table - Accepted

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification SOP Class	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 the Verification SOP Class

The GEMnet Image Vault Application Entity conforms to the definition of an SCP of the Verification SOP Class in accordance with the DICOM standard.

2.3.1.3.1.3 Presentation Context Acceptance Criterion

The GEMnet Image Vault Application Entity will unconditionally accept a Presentation Context for the Verification association.

2.3.1.3.2 Real-World Activity: Image File Storage and Archival

2.3.1.3.2.1 Associated Real-World Activity

The GEMnet Image Vault Application Entity will accept an association from a remote Application Entity to transfer images to the GEMnet Image Vault Application Entity for image archival storage. This association supports the Real-World Activity Remote Request for Image Archival.

2.3.1.3.2.2 Accepted Presentation Context Table

The GEMnet Image Vault Application Entity will accept multiple Presentation Contexts for the Remote Request for Image Archival activity as shown in Table 3. A single association may be used both for this activity and for any of the other activities for which the GEMnet Image Vault is the association acceptor.

TABLE 3: ACCEPTABLE PRESENTATION CONTEXTS FOR GEMNET IMAGE VAULT APPLICATION ENTITY STORAGE

Presentation Context Table - Accepted					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2 1.2.840.10008.1.2.4.70	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2 1.2.840.10008.1.2.4.70	SCP	None
X-Ray Radiofluoroscopic	1.2.840.10008.5.1.4.1.1.12.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

Image Storage		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		

2.3.1.3.2.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

The GEMnet Image Vault provides Level 2 (Full) conformance as an SCP of the Storage SOP Classes. All received attributes are stored and may be subsequently accessed, included private and other type 3 attributes included in the Standard Extended SOP Instances.

Stored SOP Instances may be accessed using the DICOM standard Query/Retrieve SOP Classes. Store SOP Instances may be accessed from the local user interface for transmission to another network node.

Stored SOP Instances are permanently accessible (long-term archive).

The GEMnet Image Vault Application Entity will return an unsuccessful or warning C-STORE response in accordance with Table 4. In all error cases, the SOP Instance is not stored, and the source system must re-transmit the image.

TABLE 4: GEMNET IMAGE VAULT APPLICATION ENTITY STORAGE RESPONSE CODES

Service Status	Status Codes	Further Meaning	Status Code sending explanation	Related Fields sent back to the SCU
Refused	A700	Out of resources	Disk Full Disk File System Error	None
Error	C000	Cannot Understand	Affected SOP Instance UID (0000,1000) is not the same as the IOD SOP Instance UID (0008,0018)	None
	A900	Data Set does not match SOP Class	Affected SOP Class UID (0000,0002) is not the same as the IOD SOP Class UID (0008,0016)	None
Success	0000			None

The GEMnet Image Vault performs no automatic coercion of data element (attribute) values within the stored SOP Instances. However, the GEMnet Image Vault user may manually edit and update patient and study attribute values in the stored SOP Instances.

2.3.1.3.2.3 Presentation Context Acceptance Criterion

The GEMnet Image Vault Application Entity will accept the Presentation Contexts for the SOP Classes associated with Image File Storage and Archival only if a minimum amount

of storage space is available on the online disk. If such space is not available, the GEMnet Image Vault Application Entity will return a Result/Reason "No-reason (provider rejection)" for all Presentation Contexts proposed for Storage SOP Classes.

2.3.1.3.2.4 Transfer Syntax Selection Policies

Within each Presentation Context, the GEMnet Image Vault Application Entity will accept the first proposed transfer syntax that is supported.

2.3.1.3.3 Real-World Activity: Query/Retrieve

2.3.1.3.3.1 Associated Real-World Activity

The GEMnet Image Vault Application Entity will accept an association from a remote Application Entity to query the GEMnet Image Vault Application Entity for information about stored images and/or to retrieve images from the GEMnet Image Vault Application Entity. This association supports the Real-World Activity Remote Query Retrieve Request.

2.3.1.3.3.2 Accepted Presentation Context Table

TABLE 5: ACCEPTABLE PRESENTATION CONTEXTS FOR GEMNET IMAGE VAULT APPLICATION ENTITY QUERY/RETRIEVE

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

2.3.1.3.3.2.1 SOP Specific DICOM Conformance Statement for the Patient Root Query/Retrieve Information Model - FIND , Study Root Query/Retrieve Information Model - FIND and Patient/Study Only Query/Retrieve Information Model - FIND SOP Classes

The GEMnet Image Vault conforms to the definition of an SCP of the Query (C-FIND) Service in accordance with the DICOM standard.

The GEMnet Image Vault does not support priority processing or relational queries.

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

TABLE 6: GEMNET IMAGE VAULT APPLICATION ENTITY QUERY RESPONSE CODES

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Failed	C000	Unable to process	Database Access Error Cannot Understand Request Cannot Build Response	None
Cancel	FE00	Matching terminated due to cancel	Cancel Response	None
Success	0000	Matching is complete - No final identifier is supplied	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.	Current match is supplied and any optional keys were supported in the same manner as required keys	Identifier

2.3.1.3.3.2.2 SOP Specific DICOM Conformance Statement for the Patient Root Query/Retrieve Information Model - MOVE , Study Root Query/Retrieve Information Model - MOVE and Patient/Study Only Query/Retrieve Information Model - MOVE SOP Classes

The GEMnet Image Vault conforms to the definition of an SCP of the Retrieve (C-MOVE) Service in accordance with the DICOM standard.

The GEMnet Image Vault does not support priority processing or relational retrieves.

The GEMnet Image Vault uses the Storage SOP Classes defined in Section 2.3.1.2 to support the C-STORE sub-operations of the retrieve SOP Classes.

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

TABLE 7: GEMNET IMAGE VAULT APPLICATION ENTITY MOVE RESPONSE CODES

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Refused	A701	Out of resources - Unable to calculate number of matches	System Error	None
	A801	Move Destination Unknown	Unknown Remote Host	None
Failed	C000	Unable to process	System Error	None
Cancel	FE00	Sub-operations terminated due to a Cancel indication	Cancel Response	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	B000	Sub-operations Complete - One or more Failures.	One or more sub-operations failed	(0000,1021) (0000,1022) (0000,1023)
Success	0000	Sub-operations Complete - No Failure.	No Failure	(0000,1021) (0000,1022) (0000,1023)
Pending	FF00	Sub-operations are continuing -	More sub-operations to be returned	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

2.3.1.3.3.3 Presentation Context Acceptance Criterion

There are no special criteria for accepting Query/Retrieve Presentation Contexts.

2.3.1.3.3.4 Transfer Syntax Selection Policies

Within each Presentation Context, the GEMnet Image Vault Application Entity will accept the first proposed transfer syntax that is supported.

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 the Windows NT Server Operating System.

2.4.3.1 API

Not applicable to this product.

2.4.3.2 Physical Media Support

DICOM is indifferent to the Physical medium over which TCP/IP executes (e.g. Ethernet V2.0,IEEE 802.3, ATM, FDDI)

Note: For more information about the Physical Media available on GEMnet Image Vault, please refer to the Product Data Sheet.

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

2.5.1.1 Standard Extended Query SOP Class

The GEMnet Image Vault Application Entity provides Standard Extended Conformance to the supported DICOM Query SOP Classes as an SCP. The extension occurs as a result of supporting private query attributes (see Section 3.5).

2.6 CONFIGURATION

2.6.1 AE Title/Presentation Address Mapping

The GEMnet Image Vault Application Entity resolves addresses of other applications and entities using a configurable look-up table. This table is maintained by the system administrator using the GEMnet Image Vault Configuration user interface.

2.6.2 Auto-Routing

The GEMnet Image Vault Application Entity routes received images to other applications based on an Auto-Routing Table and criteria. This table is maintained by the system administrator using the GEMnet Image Vault Configuration user interface.

2.6.3 Configurable Parameters

The following fields are configurable for this AE (local):

- Local AE Title

- Local IP Address

- Local Listening Port Number

- Local IP Netmask

The following fields are configurable for every remote DICOM AE:

- Remote AE Title

- Remote IP Address or Host Name

- Listening TCP/IP Port Number

The following fields are configurable:

- Association Establishment Timer

- Store Timers

- Store Inactivity Timers

- Store Maximum Length PDU

Note: All configurations must be performed by a GE Field Engineer.

2.7 SUPPORT OF EXTENDED CHARACTER SETS

The GEMnet Image Vault will support only the ISO_IR 100 (ISO 8859-1:1987 Latin alphabet N 1. supplementary set) as extended character sets. Any incoming SOP instance that is encoded using another extended character set will not be installed in the local database.

3. PATIENT ROOT QUERY/RETRIEVE INFORMATION MODEL DEFINITION

3.1 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:

3.2 - Information Model Description

3.3 - Information Model Entity-Relationship Model

3.4 - Information Model Keys

3.5 - Private Data Dictionary

3.2 PATIENT ROOT INFORMATION MODEL DESCRIPTION

3.3 PATIENT ROOT INFORMATION MODEL ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Patient Root Information Model schema is shown in Illustration 3.3-1. 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 3.3-1
PATIENT ROOT QUERY/RETRIEVE INFORMATION MODEL E/R DIAGRAM
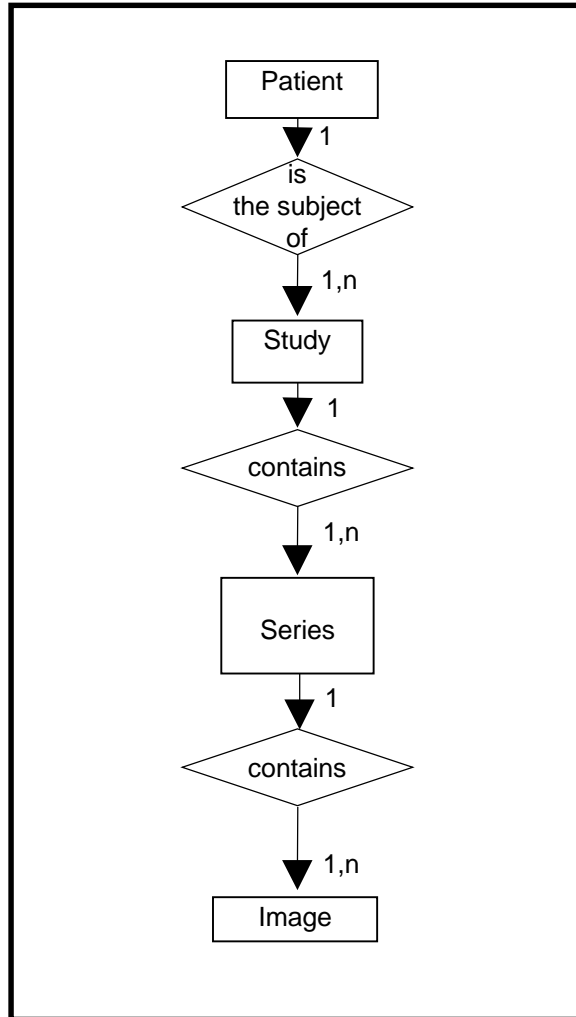
3.3.1 ENTITY DESCRIPTIONS

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.

3.3.2 GEMnet Image Vault Mapping of DICOM entities

TABLE 3.3-1
MAPPING OF DICOM ENTITIES TO GEMNET IMAGE VAULT ENTITIES

DICOM	GEMnet Image Vault Entity
Patient	Patient
Study	Exam or Case
Series	Series
Image	Run or Loop

3.4 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).

3.4.1 Supported Matching

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

- Single Value Matching
- List of UID Matching
- Universal Matching
- Wild Card Matching
- Range of Date, Range of Time Matching

3.4.2 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 3.4-1
PATIENT LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Note
Patient's Name	(0010,0010)	R	Single Value Matching, Universal Matching, Wild Card Matching
Patient ID	(0010,0020)	U	Single Value Matching, Universal Matching, Wild Card Matching
Patient's Birth Date	(0010,0030)	O	Single Value Matching, Universal Matching, Wild Card Matching, Range of Date Matching

TABLE 3.4-2
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)	-	None

3.4.3 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 3.4-3
STUDY LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Study Date	(0008,0020)	R	Single Value Matching, Universal Matching, Wild Card Matching, Range of Date Matching
Study Time	(0008,0030)	R	Single Value Matching, Universal Matching, Wild Card Matching, Range of Time Matching
Accession Number	(0008,0050)	R	Single Value Matching, Universal Matching, Wild Card Matching
Study ID	(0020,0010)	R	Single Value Matching, Universal Matching, Wild Card Matching
Study Instance UID	(0020,000D)	U	Single Value Matching, Universal Matching, Wild Card Matching
Referring Physician's Name	(0008,0090)	O	Single Value Matching, Universal Matching, Wild Card Matching
Study Description	(0008,1030)	O	Single Value Matching, Universal Matching, Wild Card Matching
Name of Physician(s) Reading Study	(0008,1060)	O	Single Value Matching, Universal Matching, Wild Card Matching
Admitting Diagnoses Description	(0008,1080)	O	Single Value Matching, Universal Matching, Wild Card Matching
Interpretation Author	(4008,010C)	O	Single Value Matching, Universal Matching, Wild Card Matching
Private Creator Code	(0087,00xx)	O	Single Value Matching (See Section 3.5)
Media Location	(0087,xx20)	O	Existence (See Section 3.5)
Size in MB	(0087,xx40)	O	Existence (See Section 3.5)
Estimated Retrieve Time	(0087,xx50)	O	Existence (See Section 3.5)

TABLE 3.4-4
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)	-	None

3.4.4 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 3.4-5
SERIES LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	R	Single Value Matching, Universal Matching, Wild Card Matching, Range of Date Matching
Series Number	(0020,0011)	R	Single Value Matching, Universal Matching, Wild Card Matching, Range of Time Matching
Series Instance UID	(0020,000E)	U	Single Value Matching, Universal Matching, Wild Card Matching
Performing Physician's Name	(0008,1050)	O	Single Value Matching, Universal Matching, Wild Card Matching
Institution Name	(0008,0080)	O	Single Value Matching, Universal Matching, Wild Card Matching
Institution Address	(0008,0081)	O	Single Value Matching, Universal Matching, Wild Card Matching

TABLE 3.4-6
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)	-	None

3.4.5 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 3.4-7
IMAGE LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	R	Single Value Matching, Universal Matching, Wild Card Matching
SOP Instance UID	(0008,0018)	U	Single Value Matching, Universal Matching, Wild Card Matching

SOP Class UID	(0008,0016)	O	Single Value Matching, Universal Matching, Wild Card Matching
Image Type	(0008,0008)	O	Single Value Matching, Universal Matching, Wild Card Matching
Private Creator Code	(0087,00xx)	O	Single Value Matching (See Section 3.5)
Media Type	(0087,xx10)	O	Existence (See Section 3.5)
Media Location	(0087,xx20)	O	Existence (See Section 3.5)
Storage File ID	(0087,xx30)	O	Existence (See Section 3.5)
Size in MB	(0087,xx40)	O	Existence (See Section 3.5)

TABLE 3.4-8
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)	-	None

3.5 PRIVATE DATA DICTIONARY

The GEMnet Image Vault Application Entity provides Standard Extended Conformance to the supported DICOM Patient Root Query SOP Class as an SCP by adding support for private attributes.

TABLE 3.5-1
PRIVATE QUERY KEY ATTRIBUTES

Attribute Name	Tag	VR	VM	Notes
Private Data Element Creator	(0087,00xx)	LO	1	Enumerated value: 1.2.840.113708.794.1.1.2.0
Media Type	(0087,xx10)	CS	1	Type of storage media. Supported at IMAGE query level only. Defined terms: DISK - image is on magnetic disk DLT - image is on DLT media
Media Location	(0087,xx20)	CS	1	Defined terms: ONLINE - media is first tier magnetic disk NEARLINE - media is in automatic disk or tape library (jukebox) OFFLINE - media must be manually loaded into system
Storage File ID	(0087,xx30)	ST	1	Full file pathname
Size in MB	(0087,xx40)	DS	1	Size of study or image (depending on query level)
Estimated Retrieve Time	(0087,xx50)	IS	1	Estimated Retrieve Time in seconds: -1 indicates item is OFFLINE and time cannot be estimated.

4. STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL DEFINITION

4.1 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:

4.2 - Information Model Description

4.3 - Information Model Entity-Relationship Model

4.4 - Information Model Keys

4.5 - Private Data Dictionary

4.2 STUDY ROOT INFORMATION MODEL DESCRIPTION

4.3 STUDY ROOT INFORMATION MODEL ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Study 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.

ILLUSTRATION 4.3-1
STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL E/R DIAGRAM

```
                    ┌──────────┐
                    │  Study   │
                    └──────────┘
                         │ 1
                         ▼
                    ╱──────────╲
                    ⟨ contains  ⟩
                    ╲──────────╱
                         │ 1,n
                         ▼
                    ┌──────────┐
                    │  Series  │
                    └──────────┘
                         │ 1
                         ▼
                    ╱──────────╲
                    ⟨ contains  ⟩
                    ╲──────────╱
                         │ 1,n
                         ▼
                    ┌──────────┐
                    │  Image   │
                    └──────────┘
```
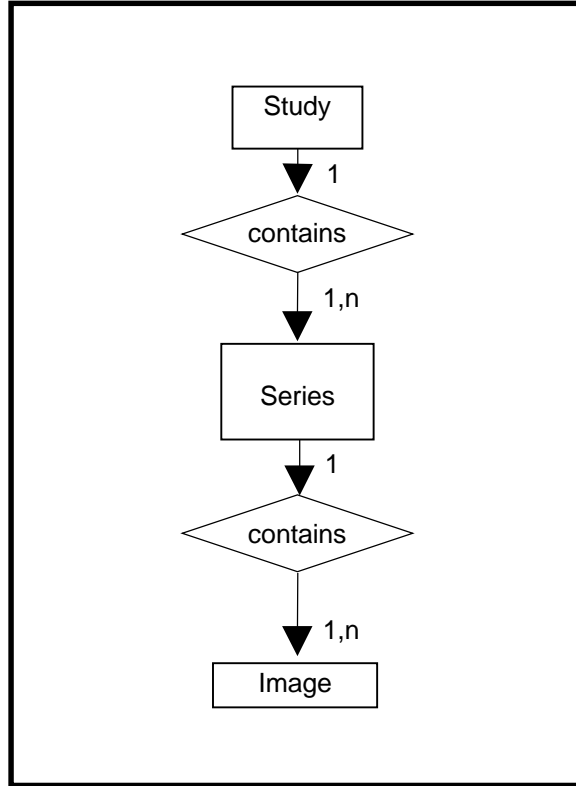
4.3.1 Entity Descriptions

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

4.3.2 GEMnet Image Vault Mapping of DICOM entities

TABLE 4.3-1
MAPPING OF DICOM ENTITIES TO GEMNET IMAGE VAULT ENTITIES

DICOM	GEMnet Image Vault Entity
Study	Exam or Case
Series	Series
Image	Run or Loop

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 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).

4.4.1 Supported Matching

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

– Single Value matching
– List of UID matching
– Universal Matching
– Wild Card Matching
– Range of date, Range of Time

4.4.2 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 4.4-2
STUDY LEVEL ATTRIBUTES FOR THE STUDY ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Study Date	(0008,0020)	R	Single Value Matching, Universal Matching, Wild Card Matching, Range of Date Matching
Study Time	(0008,0030)	R	Single Value Matching, Universal Matching, Wild Card Matching, Range of Time Matching
Accession Number	(0008,0050)	R	Single Value Matching, Universal Matching, Wild Card Matching
Patient's Name	(0010,0010)	R	Single Value Matching, Universal Matching, Wild Card Matching
Patient ID	(0010,0020)	U	Single Value Matching, Universal Matching, Wild Card Matching
Study ID	(0020,0010)	R	Single Value Matching, Universal Matching, Wild Card Matching
Study Instance UID	(0020,000D)	U	Single Value Matching, Universal Matching, Wild Card Matching
Referring Physician's Name	(0008,0090)	O	Single Value Matching, Universal Matching, Wild Card Matching

Study Description	(0008,1030)	O	Single Value Matching, Universal Matching, Wild Card Matching
Name of Physician(s) Reading Study	(0008,1060)	O	Single Value Matching, Universal Matching, Wild Card Matching
Admitting Diagnoses Description	(0008,1080)	O	Single Value Matching, Universal Matching, Wild Card Matching
Patient's Birth Date	(0010,0030)	O	Single Value Matching, Universal Matching, Wild Card Matching, Range of Date Matching
Interpretation Author	(4008,010C)	O	Single Value Matching, Universal Matching, Wild Card Matching
Private Creator Code	(0087,00xx)	O	Single Value Matching (See Section 4.5)
Media Location	(0087,xx20)	O	Existence (See Section 4.5)
Size in MB	(0087,xx40)	O	Existence (See Section 4.5)
Estimated Retrieve Time	(0087,xx50)	O	Existence (See Section 4.5)

TABLE 4.4-3
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)	-	None

4.4.3 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 4.4-4
SERIES LEVEL ATTRIBUTES FOR THE STUDY ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	R	Single Value Matching, Universal Matching, Wild Card Matching, Range of Date Matching
Series Number	(0020,0011)	R	Single Value Matching, Universal Matching, Wild Card Matching, Range of Time Matching
Series Instance UID	(0020,000E)	U	Single Value Matching, Universal Matching, Wild Card Matching
Performing Physician's Name	(0008,1050)	O	Single Value Matching, Universal Matching, Wild Card Matching
Institution Name	(0008,0080)	O	Single Value Matching, Universal Matching, Wild Card Matching

Institution Address	(0008,0081)	O	Single Value Matching, Universal Matching, Wild Card Matching

TABLE 4.4-5
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)	-	None

4.4.4 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 4.4-6
IMAGE LEVEL ATTRIBUTES FOR THE STUDY ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	R	Single Value Matching, Universal Matching, Wild Card Matching
SOP Instance UID	(0008,0018)	U	Single Value Matching, Universal Matching, Wild Card Matching
SOP Class UID	(0008,0016)	O	Single Value Matching, Universal Matching, Wild Card Matching
Image Type	(0008,0008)	O	Single Value Matching, Universal Matching, Wild Card Matching
Private Creator Code	(0087,00xx)	O	Single Value Matching (See Section 4.5)
Media Type	(0087,xx10)	O	Existence (See Section 4.5)
Media Location	(0087,xx20)	O	Existence (See Section 4.5)
Storage File ID	(0087,xx30)	O	Existence (See Section 3.5)
Size in MB	(0087,xx40)	O	Existence (See Section 4.5)

TABLE 4.4-7
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)	-	None

4.5 PRIVATE DATA DICTIONARY

The GEMnet Image Vault Application Entity provides Standard Extended Conformance to the supported DICOM Study Root Query SOP Class as an SCP by adding support for private attributes.

TABLE 4.5-1
PRIVATE QUERY KEY ATTRIBUTES

Attribute Name	Tag	VR	VM	Notes
Private Data Element Creator	(0087,00xx)	LO	1	Enumerated value: 1.2.840.113708.794.1.1.2.0
Media Type	(0087,xx10)	CS	1	Type of storage media. Supported at IMAGE query level only. Defined terms: DISK - image is on magnetic disk DLT - image is on DLT media
Media Location	(0087,xx20)	CS	1	Defined terms: ONLINE - media is first tier magnetic disk NEARLINE - media is in automatic disk or tape library (jukebox) OFFLINE - media must be manually loaded into system
Storage File ID	(0087,xx30)	ST	1	Full file pathname
Size in MB	(0087,xx40)	DS	1	Size of study or image (depending on query level)
Estimated Retrieve Time	(0087,xx50)	IS	1	Estimated Retrieve Time in seconds: -1 indicates item is OFFLINE and time cannot be estimated.

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

5.1 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:

5.2 - Information Model Description

5.3 - Information Model Entity-Relationship Model

5.4 - Information Model Keys

5.5 - Private Data Dictionary

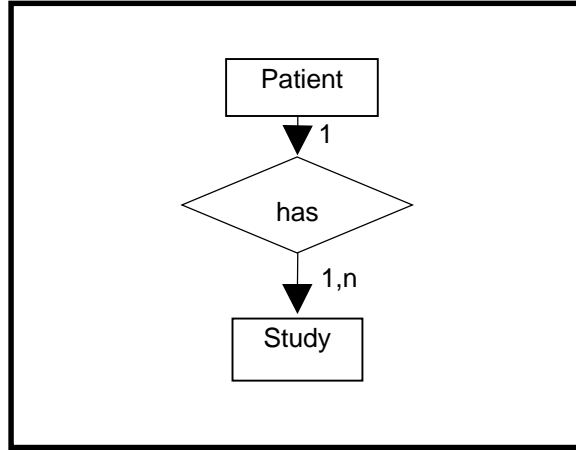## 5.2 PATIENT/STUDY ONLY INFORMATION MODEL DESCRIPTION

5.3 PATIENT/STUDY ONLY INFORMATION MODEL ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Patient/Study only Information Model schema is shown in Illustration 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 Patient and Study can have up to n Studies per Patient.

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

5.3.1 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.

5.3.2 GEMnet Image Vault Mapping of DICOM entities

TABLE 5.3-1
MAPPING OF DICOM ENTITIES TO GEMNET IMAGE VAULT ENTITIES

DICOM	GEMnet Image Vault Entity
Patient	Patient
Study	Exam or Case

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 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).

5.4.1 Supported Matching

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

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

1.1.2 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 5.4-1
PATIENT LEVEL ATTRIBUTES FOR THE PATIENT/STUDY ONLY
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Note
Patient's Name	(0010,0010)	R	Single Value Matching, Universal Matching, Wild Card Matching
Patient ID	(0010,0020)	U	Single Value Matching, Universal Matching, Wild Card Matching
Patient's Birth Date	(0010,0030)	O	Single Value Matching, Universal Matching, Wild Card Matching, Range of Date Matching

TABLE 5.4-2
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)	-	None

5.4.3 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 5.4-3
STUDY LEVEL ATTRIBUTES FOR THE PATIENT/STUDY ONLY
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Study Date	(0008,0020)	R	Single Value Matching, Universal Matching, Wild Card Matching, Range of Date Matching
Study Time	(0008,0030)	R	Single Value Matching, Universal Matching, Wild Card Matching, Range of Time Matching

Accession Number	(0008,0050)	R	Single Value Matching, Universal Matching, Wild Card Matching
Study ID	(0020,0010)	R	Single Value Matching, Universal Matching, Wild Card Matching
Study Instance UID	(0020,000D)	U	Single Value Matching, Universal Matching, Wild Card Matching
Referring Physician's Name	(0008,0090)	O	Single Value Matching, Universal Matching, Wild Card Matching
Study Description	(0008,1030)	O	Single Value Matching, Universal Matching, Wild Card Matching
Name of Physician(s) Reading Study	(0008,1060)	O	Single Value Matching, Universal Matching, Wild Card Matching
Admitting Diagnoses Description	(0008,1080)	O	Single Value Matching, Universal Matching, Wild Card Matching
Interpretation Author	(4008,010C)	O	Single Value Matching, Universal Matching, Wild Card Matching
Private Creator Code	(0087,00xx)	O	Single Value Matching (See Section 3.5)
Media Location	(0087,xx20)	O	Existence (See Section 3.5)
Size in MB	(0087,xx40)	O	Existence (See Section 3.5)
Estimated Retrieve Time	(0087,xx50)	O	Existence (See Section 3.5)

TABLE 5.4-4
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)	-	None

5.5 PRIVATE DATA DICTIONARY

The GEMnet Image Vault Application Entity provides Standard Extended Conformance to the supported DICOM Patient Study Only Query SOP Class as an SCP by adding support for private attributes.

TABLE 5.5-1
PRIVATE QUERY KEY ATTRIBUTES

Attribute Name	Tag	VR	VM	Notes
Private Data Element Creator	(0087,00xx)	LO	1	Enumerated value: 1.2.840.113708.794.1.1.2.0
Media Location	(0087,xx20)	CS	1	Defined terms: ONLINE - media is first tier magnetic disk NEARLINE - media is in automatic disk or tape library (jukebox) OFFLINE - media must be manually loaded into system
Size in MB	(0087,xx40)	DS	1	Size of study
Estimated Retrieve Time	(0087,xx50)	IS	1	Estimated Retrieve Time in seconds: -1 indicates item is OFFLINE and time cannot be estimated.