


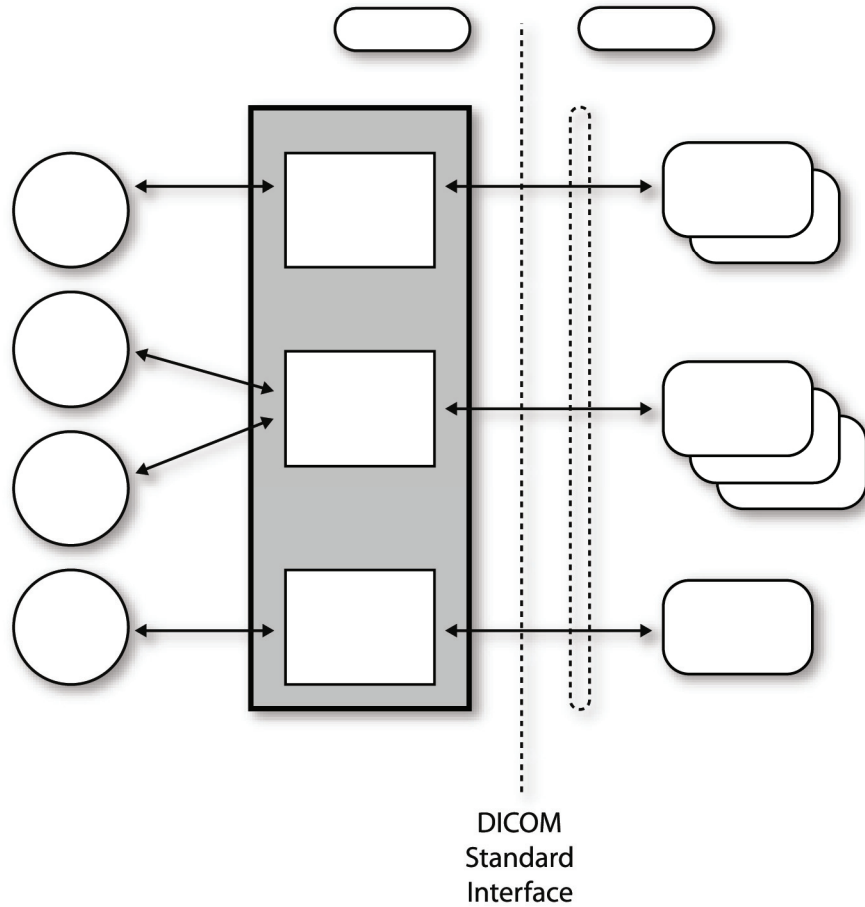
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DICOM Conformance Statement for MultiCare Platinum DSM

MultiCare[®]
PLATINUM

Stereotactic Breast Biopsy System

MultiCare® PLATINUM

Stereotactic Breast Biopsy System

MultiCare Platinum & M-IV StereoLoc II DSM v3.4 DICOM Conformance Statement Part Number MAN-02584 Revision 001

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Technical Support:

USA: +1 888 505 7910

Europe: +32 2 711 4690

Asia: +852 37487700

All Other: +1 203 731 8320

HOLOGIC®

Corporate Headquarters

35 Crosby Drive,
Bedford, MA 01730-1401 USA
Tel: 1 781 999 7300
Sales: 1 781 999 7453
Fax: 1 781 280 0668
www.hologic.com

Europe (EU Representative)

Hologic NV
Leuvensesteenweg 250A
1800 Vilvoorde, Belgium
Tel: +32 2 711 4680
Fax: +32 2 725 2087



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1.0 Overview

The Hologic® MultiCare® Platinum & M-IV™ StereoLoc® II Digital Spot Mammography (DSM™) implements the necessary DICOM services to download worklists from an information system, send acquired Digital Mammography For Presentation stereotactic images to a networked storage device, request Storage Commitment from a networked storage device, query and retrieve Hologic Digital Mammography For Presentation stereotactic images from a networked storage device, and print to a networked hardcopy device.

Table 1-1 provides an overview of the network services supported by the DSM.

*Table 1-1
Network Services*

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Digital Mammography X-Ray Image Storage – For Presentation	Option	Option
Print Management		
Basic Grayscale Print Management Meta SOP Class	Option	No
Workflow Management		
Modality Worklist Information Model – FIND	Option	No
Storage Commitment Push Model SOP Class	Option	No
Query/Retrieve		
Study Root Query/Retrieve Information Model - FIND	Option	No
Study Root Query/Retrieve Information Model – MOVE	Option	No

2.0 Introduction

Hologic, Inc. develops and markets a full line of mammography products. The DSM provides the capability to perform digital breast stereotactic imaging for prone or upright biopsy. The DSM provides a graphical user interface (GUI) with a keyboard, pointing device (trackball), monitor, and DICOM interfaces.

2.1. Audience

This document contains the DICOM conformance claim for the DSM. This document is intended to aid in connecting the DSM to other components that make use of the DICOM standard for interconnecting networked imaging devices.

The information within this document applies to DSM. The reader of this document should be familiar with the DICOM standard and PACS components that utilize the standard.

2.2. Remarks

A DICOM conformance statement—the structure and content of which are stipulated by the DICOM standard—is intended to aid in determining the suitability of interconnecting digital imaging devices. References to specific functionality in a conformance statement are not sufficient to guarantee interoperability between components. The following should be considered when evaluating interoperability:

- This conformance statement provides a starting point for ascertaining whether the product can communicate with other systems.
- The only way to know for certain whether the DSM can interoperate with other systems is to perform connectivity testing.
- This document represents a best effort to document the functionality of commercial versions of the DSM and is not a functional specification of any Hologic component or product. Hologic reserves the right to make changes at any time to the functionality of the DICOM components described herein, and is committed to following the evolution of the DICOM standard.

2.3. Definitions, Terms and Abbreviations

ACR: American College of Radiology

AE: Application Entity

DICOM: Digital Imaging and Communications in Medicine

DIMSE: DICOM Message Service Element

DSM: MultiCare Platinum & M-IV StereoLoc II Digital Spot Mammography

GSDf: Grayscale Standard Display Function

IOD: Information Object Definition

LUT: Lookup Table

MWL: Modality Worklist

NEMA: National Electrical Manufacturers Association

PDU: Protocol Data Unit

SCP: Service Class Provider

SCU: Service Class User

SOP: Service Object Pair

TCP/IP: Transmission Control Protocol/Internet Protocol

VR: Value Representation

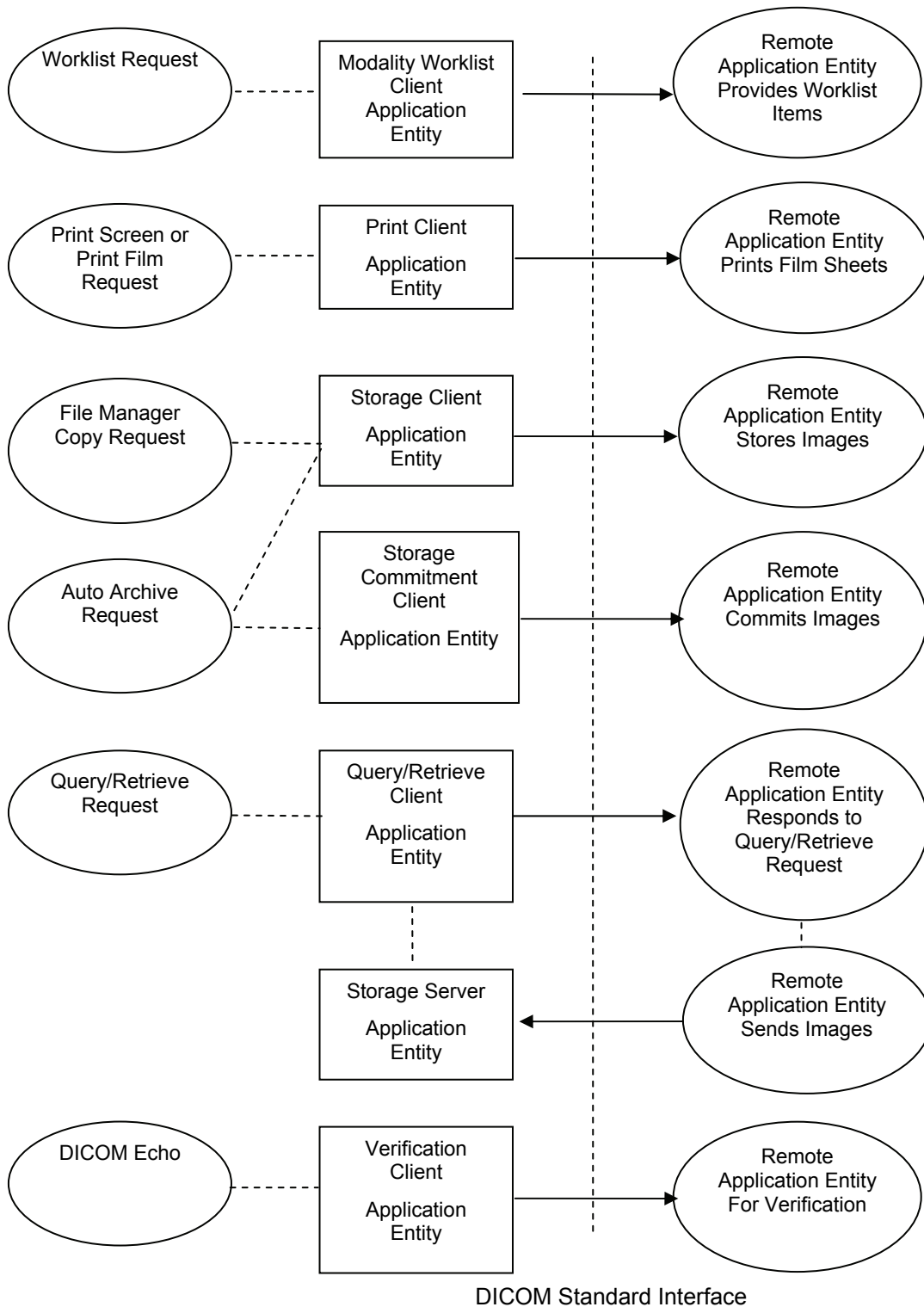
2.4. References

- NEMA PS3 / ISO 12052, Digital Imaging and Communications in Medicine (DICOM) Standard, National Electrical Manufacturers Association, Rosslyn, VA, USA (available free at <http://medical.nema.org/>)

3.0 Networking

3.1. Implementation Model

3.1.1 Application Data Flow



3.1.1.1 Modality Worklist Client

- The Modality Worklist Client Application Entity requests and receives Worklist information from a remote AE containing patient schedule and procedure information. The associated real-world activity Worklist Request is performed automatically during the DSM startup sequence, and by user request. The resulting set of worklist items is saved and made available to the user during image acquisition.

3.1.1.2 Print Client

- The DSM provides two methods for printing hardcopy:

Print Screen: The user selects the Contents (Left image, Right image, Image pair, Entire screen), Destination (DICOM Printer), and Number of copies (1 – 99, default = 1). The selected portion of the display screen is captured, and each film is printed as one-up (1x1). Left image and Right image are printed portrait orientation, while Image pair and Entire screen are printed landscape orientation.

Print Film: The user has selected one or more images from a list prior to selecting Print Film. From a dialog, the user selects the Destination (DICOM Printer), Film format (1x1, 2x2, 3x2, 4x3), Print resolution (Hi res), and Number of copies (1 – 99, default = 1). The images are prepared for printing, and all films are printed portrait orientation.

3.1.1.3 Storage and Storage Commitment Client

- The DSM provides two methods for sending images to a remote DICOM storage server:

File Manager Copy: The user selects one or more images from the list, selects a remote DICOM storage server as the destination, and selects Copy. The images are transmitted via network to the remote DICOM storage server. Up to three remote DICOM storage servers may be configured during Setup.

Auto Archive: During the DSM shut down procedure (if configured), or by user request from the main panel, all images that have not been archived are copied to the configured Auto Archive destination. A remote DICOM storage server may be configured as the Auto Archive destination during Setup. If the remote DICOM storage server supports Storage Commitment, DSM images are marked as archived after successful Storage and Storage Commitment. If not, DSM images are marked as archived after successful Storage, but there is no guarantee that the remote DICOM storage server will keep the images long-term.

3.1.1.4 Query/Retrieve Client

In the DSM DICOM Query dialog, the user may enter a Patient ID or Patient Name, and optionally a Study Date, then select a remote DICOM query server. Study and series level queries are performed, with Modality set to “MG”. The query results are presented to the user in a DICOM Retrieve dialog. The user may select one or more series for which to retrieve the associated images.

3.1.1.5 Verification Client

Selecting the DICOM Echo button in the DICOM Print Setup and DICOM Server Setup dialogs, accessed from the Setup menu, sends a Verification request to the associated remote DICOM Print, Storage, or Query/Retrieve server. A message box indicates success or failure.

3.1.2 Functional Definition of AE's

The Client AEs are finite modules within the DSM. They exist only one at a time, for the duration of a single Association.

3.1.2.1 Functional Definition of the Modality Worklist Client Application Entity

The Modality Worklist Client AE attempted to download a worklist from a remote node. If the Modality Worklist Client establishes an Association to a remote AE, it will accept all worklist item responses via the open Association. Query results are saved and made available to the user for selection.

3.1.2.2 Functional Definition of Print Client Application Entity

After receiving input from the DSM user regarding images to print and the associated configuration, the Print Client performs the following DICOM communications, making use of the Basic Grayscale Print Management Meta SOP Class by means of DIMSE services. The user is informed of progress via dialog:

- Attempt to establish an Association with the selected DICOM Printer, requesting Basic Grayscale Print Management Meta.
- Request the current Printer status. Report to the user if the status is warning or failure and give the user the opportunity continue the print request, or release the Association.
- Depending on the number of images and format selected, create a Film Session with one or more Film Boxes, each Film Box containing one or more Basic Grayscale Image Boxes. Each Basic Grayscale Image Box contains the preformatted image pixel data for a single position within a Film Box.
- Request action (print) for each Film Box.
- Delete the Film Session, and release the Association.

3.1.2.3 Functional Definition of Storage and Storage Commitment Client Application Entity

After receiving input from the user regarding images to copy, the Storage Client performs the following DICOM communications, making use of the Digital Mammography X-Ray Image Storage – For Presentation SOP Class by means of DIMSE services. The user is informed of errors via dialog:

- Attempt to establish an Association with the selected remote DICOM storage server, requesting Digital Mammography X-Ray Image Storage – For Presentation.
- Add DSM Private Attributes to the DICOM Data Dictionary.
- For each image to be stored, fill a composite DICOM Digital Mammography X-Ray Image IOD structure and send a C-STORE request.
- Release the Association after receiving the C-STORE response.

For Auto Archive, after successful DICOM storage, the following additional DICOM communications may be performed by the Storage Commitment Client, making use of the Storage Commitment Push Model SOP Class by means of DIMSE services. The user is informed of progress via dialog:

- Attempt to establish an Association with the configured remote DICOM storage server, requesting Storage Commitment Push Model.
- Send an N-ACTION request, providing a list of successfully stored image SOP instance UIDs in the request.
- Release the Association after receiving the N-ACTION response.
- If the N-ACTION request was successful, wait for an Association request from the remote DICOM storage server, expecting an N-EVENT-REPORT request after Association acceptance. This message contains the results of the storage commitment request.
- Wait for an Association release.
- The Storage Commitment Client times out and stops waiting after the configured commit timeout if the Association request, N-EVENT-REPORT request, or Association release is not received. The transaction UID is no longer valid after this occurs.
- Each successfully committed image is marked as archived on the DSM.

Note: If Storage Commitment is not configured, the image is marked as archived immediately after the Storage association is released.

3.1.2.4 Functional Definition of Query/Retrieve Client Application Entity

Upon receiving input from the user regarding query and then retrieve parameters, the Query/Retrieve Client performs the following DICOM communications, making use of the Study Root Query/Retrieve Information Model – FIND and Study Root Query/Retrieve Information Model – MOVE SOP Classes, respectively, by means of DIMSE services. The user is informed of errors via dialog:

- Attempt to establish an Association with the selected remote DICOM query server, requesting Study Root Query/Retrieve Information Model – FIND and Study Root Query/Retrieve Information Model – MOVE.
- Send a Study level C-FIND request, with the Patient ID or Patient Name, and optionally Study Date as input.
- If there are no matches or after the last match is received, release the Association.
- For each study returned, send a Series level C-FIND request, with Modality set to “MG”.
- Report the series level results to the user in a dialog. If there are no matches or after the last match is received, release the Association.
- For each selected series, send a Series level C-MOVE request, with a single Series UID as input.
- Release the Association after receiving the final C-MOVE response.

The Storage Server performs the following DICOM communications, making use of the Digital Mammography X-Ray Image Storage – For Presentation SOP Class by means of DIMSE services. Errors are recorded in a text output file:

- Started when user initiates retrieve (C-MOVE) request.
- Wait for an Association request from the remote DICOM query server, accepting Digital Mammography X-Ray Image Storage – For Presentation.
- Wait for and process C-STORE requests. Received images are stored on the DSM.
- Wait for an Association release.
- Terminate after association release.

3.1.2.5 Functional Definition of Verification Client Application Entity

Upon user request of DICOM Echo, the Verification Client performs the following DICOM communications, making use of the Verification SOP Class by means of DIMSE services. The user is informed of success or errors via dialog:

- Attempt to establish an Association with the remote DICOM Print, Storage, or Query/Retrieve server, requesting Verification.
- Send a C-ECHO request.
- Release the Association after receiving the C-ECHO response.

3.1.3 Sequencing of Real World Activities

Print: The order of DIMSE service requests is significant. A Film Session is created before the associated Film Box(es), and each Film Box is created before the associated Basic Grayscale Image Box(es).

Storage Commitment: The N-EVENT-REPORT is expected in a separate association from the N-ACTION request. The DSM releases the original Association and starts listening for an Association request after receiving a successful N-ACTION response.

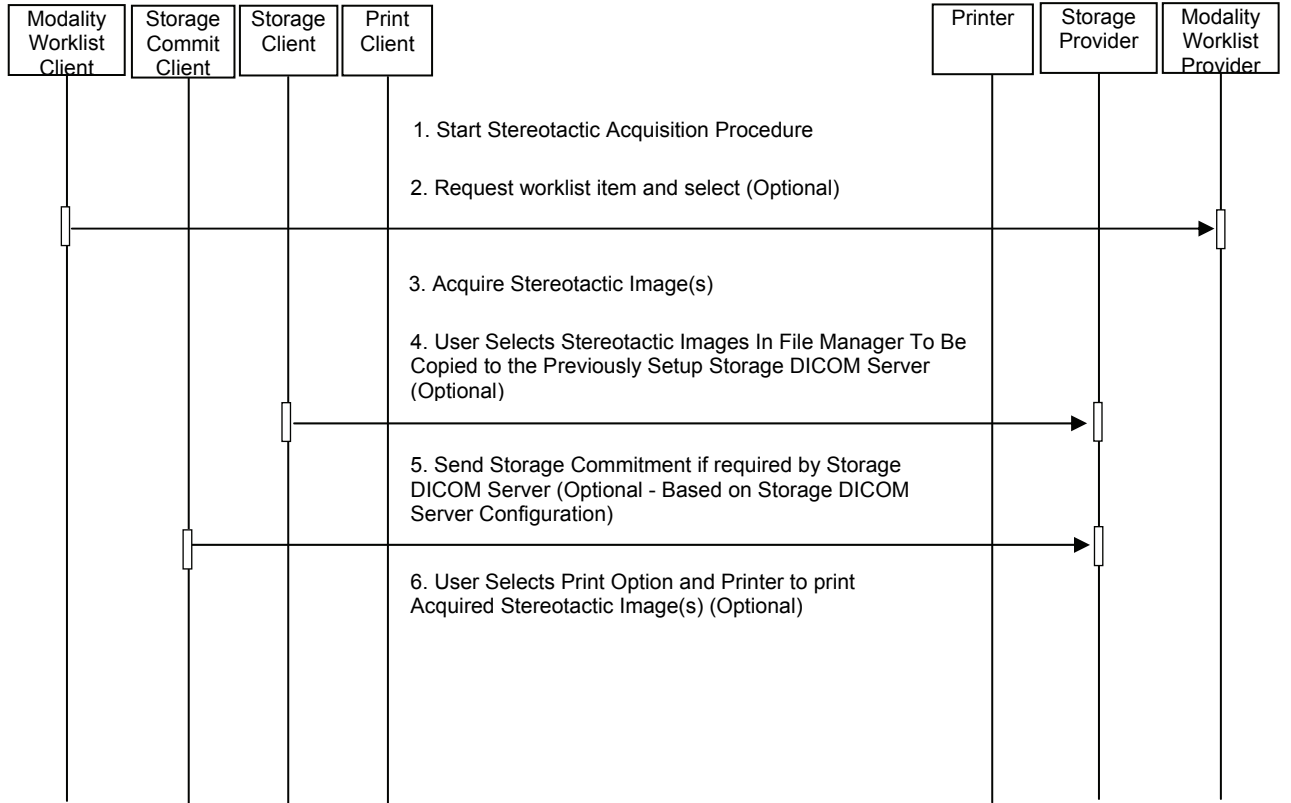


Figure 3.1-1: DSM Worklist/Image Storage/Print Sequence Diagram

Query/Retrieve:

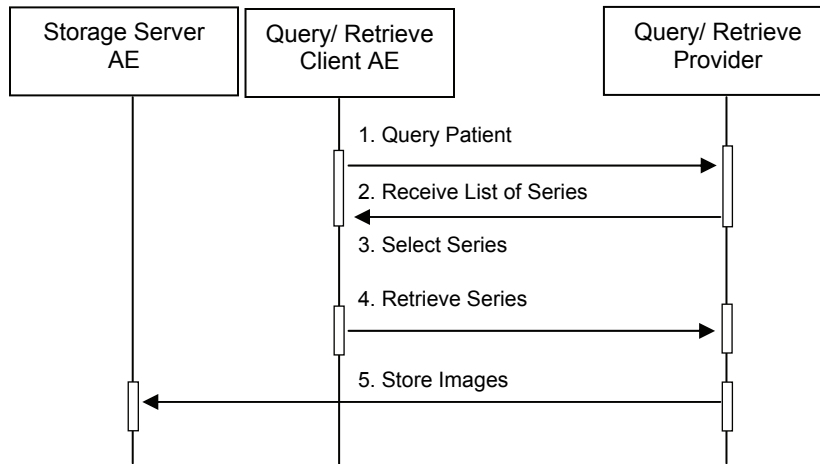


Figure 3.1-2: DSM Query/Retrieve Sequence Diagram

3.2. AE Specifications

3.2.1 DSM Client AEs

The DSM, using commercial DICOM library software, provides Standard Conformance to the following DICOM SOP Classes as an SCU:

Table 3.2.1-1 - SOP Classes For DSM Client AEs

SOP Class Name	SOP Class UID
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9
Basic Film Session	1.2.840.10008.5.1.1.1
Basic Film Box	1.2.840.10008.5.1.1.2
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4
Printer	1.2.840.10008.5.1.1.16
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Storage Commitment Push Model	1.2.840.10008.1.20.1
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31
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
Verification	1.2.840.10008.1.1

3.2.1.1 Association Policies

3.2.1.1.1 General

The DSM Client AEs are finite modules. They exist only one at a time, for the duration of a single Association. The Modality Worklist Client will attempt to establish an association at system startup and when the user invokes the Worklist Request feature. The Print Client will attempt to establish an association when the user invokes the Print Screen or Print Film feature. The Storage Client will attempt to establish an association when the user invokes the File Manager Copy or Auto Archive feature. The Storage Commitment Client may attempt to establish an association during Auto Archive. The Query/Retrieve Client will attempt to establish an association when the user invokes the DICOM Query feature. The Verification Client will attempt to establish an association when the user invokes DICOM Echo for one of the configured remote DICOM servers. The maximum PDU size requested is 31K bytes.

Table 3.2.1-2 - DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

3.2.1.1.2 Number of Associations

Each Client AE will attempt only one association establishment at a time. Each Modality Worklist, Print, Storage, Storage Commitment, Query/Retrieve, or Verification request results in a separate, sequential association establishment and release.

3.2.1.1.3 Asynchronous Nature

Asynchronous operations are not supported. The Print Client does however accept the asynchronous N-EVENT-REPORT message as defined in the supported SOP Classes, provided it is sent while the association is open.

3.2.1.1.4 Implementation Identifying Information

The Implementation Class UID is: 2.16.840.1.113816.40.19991231
The Implementation Version Name is: 1.0.3

3.2.1.2 Association Initiation Policy

A Client AE will establish a new association each time the user invokes features that activate DICOM Modality Worklist, Print, Storage, Storage Commitment, Query/Retrieve, or Verification. The association is released after a request has been completed.

The Print Client AE does not have a timeout while waiting for an association response from the Remote Print SCP.

3.2.1.2.1 Worklist Request

3.2.1.2.1.1 Description and Sequencing of Activities

The Modality Worklist Client is responsible for defining a query for the mammography procedures scheduled for a given day. A single request is transmitted to a remote DICOM Modality Worklist SCP within a DICOM network association, using the Modality Worklist Information Model – FIND SOP Class, with its associated DIMSE services.

3.2.1.2.1.2 Proposed Presentation Contexts

The Modality Worklist Client attempts to establish associations using the following presentation contexts:

Table 3.2.1.2.1-1 - Proposed Presentation Contexts For Worklist Request

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1		

3.2.1.2.1.3 SOP Specific Conformance for Modality Worklist SOP Class

The general behavior of the Modality Worklist Client AE during communication failure is summarized in the Table below.

Table 3.2.1.2.1-2 - DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	DICOM Error Message will be displayed with the failed DICOM command, error code and reason.
Association aborted by SCP	DICOM Error Message will be displayed with the failed DICOM command, error code and reason.

The behavior of DSM when receiving status codes in a C-FIND response is summarized in the Table below.

Table 3.2.1.2.1-3 Modality Worklist C-FIND Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	C-FIND results are saved and made available to the user.
Pending	Matches are continuing	FF00, FF01	C-FIND matching results are collected and saved.
Warning or Failure	Any	Any	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason.

The Modality Worklist Client supports the following matching and return key attributes. The value to match for Modality and Scheduled Station AE Title are configurable. The first 50 matching responses received are made available to the user, and the rest are discarded.

Table 3.2.1.2.1-4 - Supported C-FIND Matching and Return Key Attributes

Matching Key Attribute	Tag	Matching Type
Scheduled Procedure Step Sequence	(0040,0100)	Sequence
>Scheduled Station AE Title	(0040,0001)	Single Value or Universal
>Scheduled Procedure Step Start Date	(0040,0002)	Single Value (today's date)
>Scheduled Procedure Step Start Time	(0040,0003)	Universal
>Modality	(0008,0060)	Single Value (default = "MG")
>Scheduled Performing Physician's Name	(0040,0006)	Universal
>Scheduled Procedure Step Description	(0040,0007)	Universal
>Scheduled Station Name	(0040,0010)	Universal
>Scheduled Protocol Code Sequence	(0040,0008)	Universal
>Scheduled Procedure Step ID	(0040,0009)	Universal
Requested Procedure ID	(0040,1001)	Universal
Requested Procedure Description	(0032,1060)	Universal
Requested Procedure Code Sequence	(0032,1064)	Universal
Study Instance UID	(0020,000D)	Universal
Accession Number	(0008,0050)	Universal
Referring Physician's Name	(0008,0090)	Universal
Patient's Name	(0010,0010)	Universal
Patient ID	(0010,0020)	Universal
Patient's Birth Date	(0010,0030)	Universal
Patient's Sex	(0010,0040)	Universal
Other Patient IDs	(0010,1000)	Universal

3.2.1.2.2 Print Screen / Print Film

3.2.1.2.2.1 Description and Sequencing of Activities

The Print Client is responsible for defining the contents of one or more films, and requesting that they be printed by the remote DICOM Print SCP. A single Film Session is defined with a number of copies and priority. Each associated Film Box is defined with format (i.e. number of images and layout), orientation, film size, and magnification. Each Basic Grayscale Image Box within a Film Box is defined with image size (rows, columns), position, bits allocated, bits stored, high bit, photometric interpretation, and the preformatted image pixel data. All of this information is transmitted to the remote DICOM Print SCP within a DICOM network association, using the Basic Grayscale Print Management Meta SOP Class, with its associated SOP Classes and DIMSE services.

3.2.1.2.2.2 Proposed Presentation Contexts

The Print Client attempts to establish associations using the following presentation contexts:

Table 3.2.1.2.2-1 - Proposed Presentation Contexts For Print Screen/Film

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.9	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1		

3.2.1.2.2.3 SOP Specific Conformance for Print SOP Classes

The general behavior of the Print Client AE during communication failure is summarized in the Table below. This behavior is common to all SOP Classes supported by the Print Client AE.

Table 3.2.1.2.2-2 - DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	The Print Client AE does not have a timeout while waiting for a DIMSE response from the Remote Print SCP.
Association aborted by SCP	DICOM Error Message will be displayed with the failed DICOM command, error code and reason. Print request is aborted.

3.2.1.2.2.4 Printer SOP Class

Table 3.2.1.2.2-3 – Printer SOP Class: Supported DIMSE operations

Name	Description
N-GET	Used to retrieve the current status of the Printer.

Table 3.2.1.2.2-4 – Printer SOP Class: Supported Attributes

Attribute Name	Tag	Supported Values	Default Value
Printer Status	(2110,0010)		None
Printer Status Info	(2110,0020)		None
Printer Name	(2110,0030)		None
Manufacturer	(0008,0070)		None

The behavior of Print Client AE when encountering status codes in an N-GET response is summarized in the Table below.

Table 3.2.1.2.2-5 - Printer SOP Class Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Proceed to create film session if Printer Status is NORMAL. Otherwise, a DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The print request is aborted.
Warning	Any	Any	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The print request is aborted.
Failure	Any	Any	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The print request is aborted.

3.2.1.2.2.5 Specific Conformance to Basic Film Session SOP Class

Table 3.2.1.2.2-6 - Basic Film Session SOP Class: Supported DIMSE operations

Name	Description
N-CREATE	Creates the film session
N-DELETE	Deletes the film session

Table 3.2.1.2.2-7 - Basic Film Session SOP Class: Supported Attributes

Attribute Name	Tag	Supported Values	Default Value
Number of Copies	(2000,0010)	1-99	1
Print Priority	(2000,0020)	HIGH	HIGH

The behavior of Print Client AE when encountering status codes in an N-CREATE or N-DELETE response is summarized in the Table below.

Table 3.2.1.2.2-8 - Film Session SOP Class Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The Print SCP completed the operation successfully. Proceed to next step.
Warning	Memory allocation	B600	DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The print request is aborted.
Failure	Any	Any	DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The print request is aborted.

3.2.1.2.2.6 Specific Conformance to Basic Film Box SOP Class

Table 3.2.1.2.2-9 - Basic Film Box SOP Class: Supported DIMSE operations

Name	Description
N-CREATE	Creates the film box
N-ACTION	Prints the film box

Table 3.2.1.2.2-10 - Basic Film Box SOP Class: Supported Attributes

Attribute Name	Tag	Supported Values	Default Value
Image Display Format	(2010,0010)	STANDARD\1,1 STANDARD\2,2 STANDARD\2,3 STANDARD\3,4	None
Film Orientation	(2010,0040)	PORTRAIT LANDSCAPE	None
Film Size ID	(2010,0050)	8INX10IN 10INX12in 11INX14IN 14INX14IN 14INX17IN	None
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	NONE

The behavior of Print Client AE when encountering status codes in a N-CREATE or N-ACTION response is summarized in the Table below.

Table 3.2.1.2.2-11 - Film Box SOP Class Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The Print SCP completed the operation successfully. Proceed to next step.
Warning or Failure	Any	Any	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The print request is aborted.

3.2.1.2.2.7 Specific Conformance to Basic Grayscale Image Box SOP Class

Table 3.2.1.2.2-12 - Basic Grayscale Image Box SOP Class: Supported DIMSE operations

Name	Description
N-SET	Updates an image box in a previously created film box.

Table 3.2.1.2.2-13 - Basic Grayscale Image Box SOP Class: Supported Attributes

Attribute Name	Tag	Supported Values	Default Value
Image Position	(2020,0010)	1-12 depending on display format	None
Preformatted Grayscale Image Sequence	(2020,0110)		
> Samples Per Pixel	(0028,0002)	1	1
> Photometric Interpretation	(0028,0004)	MONOCHROME2	MONOCHROME2
> Rows	(0028,0010)	512 - 1024	None
> Columns	(0028,0011)	512 - 1024	None
> Pixel Aspect Ratio	(0028,0034)	1\1	1\1
> Bits Allocated	(0028,0100)	8	8
> Bits Stored	(0028,0101)	8	8
> High Bit	(0028,0102)	7	7
> Pixel Representation	(0028,0103)	0	0
> Pixel Data	(7FE0,0010)		

The behavior of Print Client AE when encountering status codes in an N-SET response is summarized in the Table below:

Table 3.2.1.2.2-14
Basic Grayscale Image Box SOP Class N-SET Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The Print SCP completed the operation successfully. Proceed to next step.
Failure	Any	Any	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The print request is aborted.

3.2.1.2.3 File Manager Copy / Auto Archive

3.2.1.2.3.1 Description and Sequencing of Activities

The Storage Client as part of the File Manager Copy and Auto Archive features is responsible for defining the contents of a Digital Mammography X-Ray Image Instance and requesting that it be stored by a remote DICOM Storage SCP. One image at a time is transmitted to the remote DICOM Storage SCP within a DICOM network Association, using the Digital Mammography X-Ray Image Storage – For Presentation SOP Class, with its associated DIMSE services.

Level 2 (Full) conformance is expected from the DICOM storage AE.

3.2.1.2.3.2 Proposed Presentation Contexts

The Storage Client attempts to establish associations using the following presentation contexts:

Table 3.2.1.2.3-1 - Proposed Presentation Contexts For File Manager Copy / Auto Archive

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1		

3.2.1.2.3.3 SOP Specific Conformance for Storage SOP Class

The behavior of DSM during communication failure is summarized in the Table below.

Table 3.2.1.2.3-2 - Storage Communication Failure Behavior

Exception	Behavior
Timeout	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. Store request is aborted.
Association aborted by SCP	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. Store request is aborted.

The behavior of DSM when receiving status codes in a C-STORE response is summarized in the Table below.

Table 3.2.1.2.3-3 Storage C-STORE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP successfully stored the SOP Instance. Proceed to next step.
Warning	Coercion of Data Elements	B000	The system has a configurable parameter that when enabled, treats a C-STORE response with a status code of B000 as a successful operation.
Warning	Any	Any	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The store request is aborted.
Failure	Any	Any	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The store request is aborted.

Instance UIDs are globally unique for all SOP instances generated by DSM. The UID root is 2.16.840.1.113816.

3.2.1.2.4 Auto Archive

3.2.1.2.4.1 Description and Sequencing of Activities

The Storage Commitment Client as part of the Auto Archive feature is responsible for defining a transaction UID and a list of Digital Mammography X-Ray Image – For Presentation SOP Class and SOP Instance UIDs for which to request storage commitment. A single request is transmitted to a remote DICOM Storage Commitment SCP within a DICOM network association, using the Storage Commitment Push Model SOP Class, with its associated DIMSE services. The request contains the SOP Class and SOP Instance UIDs for all images successfully stored during Auto Archive. After successful N-ACTION, the Storage Commitment Client will wait a configurable number of minutes (commit timeout) for the SCP to request an Association and send the N-EVENT-REPORT.

It is preferred that the remote AE of which storage commitment is requested be the same remote AE to which the images were stored.

3.2.1.2.4.2 Proposed Presentation Contexts

The Storage Commitment Client attempts to establish associations using the following presentation contexts:

*Table 3.2.1.2.4-1
Proposed Presentation Contexts For Auto Archive*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

3.2.1.2.4.3 SOP Specific Conformance for Storage Commitment SOP Class

The behavior of DSM during communication failure is summarized in the Table below.

*Table 3.2.1.2.4-2
STORAGE COMMITMENT COMMUNICATION FAILURE BEHAVIOR*

Exception	Behavior
Timeout	A DICOM Error message will be displayed with the failed DICOM command, error code and reason. The Storage Commitment request is aborted.
Association aborted by SCP	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The Storage Commitment request is aborted.

The behavior of DSM when encountering status codes in a Storage Commitment N-ACTION response is summarized in the Table below.

*Table 3.2.1.2.4-3
STORAGE COMMITMENT N-ACTION RESPONSE STATUS HANDLING BEHAVIOR*

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Confirmation the request for Storage Commitment was successfully acknowledged by the SCP.
Warning	Any	Any	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The Storage Commitment request is aborted.
Failure	Any	Any	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The Storage Commitment request is aborted.

The Storage Commitment Client supports the following N-ACTION attributes:

Table 3.2.1.2.4-4 - Supported Storage Commitment N-ACTION Attributes

Action Type Name	Action Type ID	Attribute	Tag	Notes
Request Storage Commitment	1	Transaction UID	(0008,1195)	DSM generates
		Referenced SOP Sequence	(0008,1199)	DSM generates, one or more Items
		> Referenced SOP Class UID	(0008,1150)	1.2.840.10008.5.1.4.1.1.1.2
		> Referenced SOP Instance UID	(0008,1155)	SOP Instance UID of image to be committed

3.2.1.2.5 Query/Retrieve Request

3.2.1.2.5.1 Description and Sequencing of Activities

The Query/Retrieve Client uses the Hierarchical Search. It is responsible for defining Study and Series level queries (Find), followed by one or more Series level retrieve (Move) requests. All of this information is transmitted to a remove DICOM Query/Retrieve SCP within a DICOM network Association, using the Study Root Query/Retrieve Information Model – FIND and Study Root Query/Retrieve Information Model – MOVE SOP Classes, with their associated DIMSE services. It is intended for a DSM to retrieve only Series of images that it has stored previously to the queried SCP.

3.2.1.2.5.2 Proposed Presentation Contexts

The Query/Retrieve Client attempts to establish associations using the following presentation contexts:

Table 3.2.1.2.5-1 - PROPOSED PRESENTATION CONTEXTS FOR QUERY/RETRIEVE REQUEST

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
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	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
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	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

3.2.1.2.5.3 SOP Specific Conformance for Query/Retrieve SOP Classes

The behavior of the DSM during communication failure is summarized in the Table below.

Table 3.2.1.2.5-2 - C-FIND AND C-MOVE COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason.
Association aborted by SCP	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason.

The behavior of the DSM when encountering status codes in a C-FIND or C-MOVE response is summarized in the Table below.

Table 3.2.1.2.5-3 - C-FIND AND C-MOVE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Matching or sub-operations are complete	0000	<ul style="list-style-type: none"> C-FIND results are displayed to the user. Indicates all C-MOVE sub-operations completed successfully.
Pending	Matches are continuing	FF00, FF01	C-FIND: matching results are collected for display to user
Warning or Failure	Any	Any	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason.

The Query/Retrieve Client provides standard conformance to the Study Root Information Model. Using the hierarchical search method, a Study level query is sent, and the responses are used to send follow-up Series level queries automatically. The first 20 Series level matching responses received are displayed to the user, and the rest are discarded. For retrieve, a Series level move request is sent, containing the Study Instance UID and Series Instance UID of the series to retrieve.

For the Study level query, either Patient ID or Patient’s Name (or both) will contain a value, and Study Date may contain a value. The user supplies Matching Key Attribute values other than Modality, either by manual entry or date range selection.

Table 3.2.1.2.5-4 - Supported C-FIND Matching Key Attributes (Hierarchical Search Method)

Matching Key Attribute	Tag	Matching Type
Study Level		
Patient's Name	(0010,0010)	Single Value, Wild Card or Universal
Patient ID	(0010,0020)	Single Value, Wild Card or Universal
Study Date	(0008,0020)	Single Value or Universal
Study Time	(0008,0030)	Universal
Accession Number	(0008,0050)	Universal
Study ID	(0020,0010)	Universal
Study Instance UID	(0020,000D)	Universal
Series Level		
Study Instance UID	(0020,000D)	Single Value (from Study level result)
Series Number	(0020,0011)	Universal
Series Instance UID	(0020,000E)	Universal
Modality	(0008,0060)	Single Value = "MG"

3.2.1.2.6 DICOM Echo

3.2.1.2.6.1 Description and Sequencing of Activities

The Verification Client is responsible for performing an echo command with one of the configured remote DICOM Print, Storage or Query/Retrieve servers. A single request is transmitted to a remote SCP within a DICOM network Association, using the Verification SOP Class, with its associated DIMSE services.

3.2.1.2.6.2 Proposed Presentation Contexts

The Verification Client attempts to establish associations using the following presentation contexts:

*Table 3.2.1.2.6-1
Proposed Presentation Contexts For DICOM Echo*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification SOP Class	1.2.840.10008.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None

3.2.1.2.6.3 SOP Specific Conformance for Verification SOP Class

The behavior of DSM when encountering status codes in a C-ECHO response is summarized in the Table below.

*Table 3.2.1.2.6-2
C-ECHO Response Status Handling Behavior*

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Success is reported to the user.
Failure	Any	Any	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason.

3.2.1.3 Association Acceptance Policy

The Print, Storage, Query/Retrieve and Verification Clients do not accept Associations.

The Storage Commitment Client does accept as Association, for the Storage Commitment Push Model SOP Class only, in order to receive the N-EVENT-REPORT notification from the Storage Commitment SCP, containing storage commitment results.

3.2.1.3.1 Auto Archive – Receive Storage Commitment Response

3.2.1.3.1.1 Description and Sequencing of Activities

The Storage Commitment Client AE will accept associations in order to receive responses to a Storage Commitment Request.

The Storage Commitment Client AE accepts a reverse role association request from a remote storage commitment AE using the Storage Commitment Push Model SOP Class. After accepting an association an N-EVENT-REPORT request is expected that provides the status of a previous request for storage commitment of one or more images. The Storage Commitment Client AE waits for a configurable period of time (commit timeout), and if a N-EVENT-REPORT request is not received, the association is released.

3.2.1.3.1.2 Accepted Presentation Contexts

*Table 3.2.1.3.1-1
Acceptable Presentation Contexts For
AUTO ARCHIVE Receive STORAGE COMMITMENT Response*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

3.2.1.3.1.3 SOP Specific Conformance for Storage Commitment SOP Class

Upon receipt of a N-EVENT-REPORT request, the commit status of the referenced images is updated, and a N-EVENT-REPORT response is sent.

The behavior of Storage Commitment Client AE when receiving Event Types within the N-EVENT-REPORT is summarized in the Table below.

Table 3.2.1.3.1-2 - STORAGE COMMITMENT N-EVENT-REPORT Behavior

Event Type Name	Event Type ID	Behavior
Storage Commitment Request Successful	1	The archive flag of the locally stored image file is reset, to indicate the image is eligible for deletion. The system will no longer attempt to archive the image to the remote DICOM storage server.
Storage Commitment Request Complete – Failures Exist	2	A DICOM Error Message will be displayed with the failed DICOM command, error code and reason. The next time Auto Archive is run, it will attempt to commit the image again.

The reasons for returning specific status codes in a N-EVENT-REPORT response are summarized in the Table below.

Table 3.2.1.3.1-3 - STORAGE COMMITMENT N-EVENT-REPORT RESPONSE STATUS

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Storage Commitment confirmation acknowledged.

3.2.2 Storage Server AE

This Application Entity provides Standard Conformance to the following SOP Classes:

*Table 3.2.2-1
SOP CLASSES FOR STORAGE SERVER AE*

SOP Class Name	SOP Class UID	SCU	SCP
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	No	Yes

3.2.2.1 Association Policies

3.2.2.1.1 General

The maximum PDU size requested is 31K bytes.

The DICOM standard Application context shall be specified.

*Table 3.2.2-2
DICOM APPLICATION CONTEXT*

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

3.2.2.1.2 Number of Associations

Only one association is accepted at a time, to service storage requests from a remote DICOM Storage SCU, such as in response to a retrieve (MOVE) request initiated by the Query/Retrieve Client.

3.2.2.1.3 Asynchronous Nature

DSM does not support asynchronous operations (multiple outstanding transactions over a single Association).

3.2.2.1.4 Implementation Identifying Information

Table 3.2.2-3 - DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGE SERVER

Implementation Class UID	2.16.840.1.113816.40.19991231
Implementation Version Name	1.0.3

3.2.2.2 Association Initiation Policy

The Storage Server AE does not initiate Associations.

3.2.2.3 Association Acceptance Policy

The Storage Server is started upon the user initiating a retrieve request.

The Storage Server accepts an association after matching the called AE Title. All associations must use the same destination TCP/IP port number. When the Storage Server AE accepts an association, it will respond to storage requests. The Storage Server terminates after the association is released.

3.2.2.3.1 Receive Requested Images

3.2.2.3.1.1 Description and Sequencing of Activities

The Storage Server AE is responsible for receiving and storing the images sent by a remote DICOM Storage SCU so they are available to the user. Images are received from the remote DICOM Storage SCU within a DICOM network association, using the Digital Mammography X-Ray Image Storage – For Presentation SOP Class, with its associated DIMSE services. The Storage Server AE is also

responsible for responding to a verification request made by the Storage SCU while it is running. The Storage Server accepts associations using the following presentation contexts:

*Table 3.2.2-4
ACCEPTABLE PRESENTATION CONTEXTS FOR
RECEIVE REQUESTED IMAGES*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

3.2.2.3.1.3 SOP Specific Conformance for Storage SOP Class

The Storage Server AE provides Level 2 conformance to the Storage Service Class.

The Storage Server AE will behave as described in the Table below when generating the C-STORE response.

Table 3.2.2-5 - STORAGE C-STORE RESPONSE STATUS

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Image is stored locally and made available to the user.
Failure	Refused: Out of Resources	A700	There is not enough local storage capacity to store the image.
Failure	Missing or Invalid Attribute	0106	The Pixel Data was not read successfully.

3.3. Network Interfaces

3.3.1 Physical Network Interface

The DSM is tested and supports using 10/100/1000-BaseT Ethernet media.

3.3.2 Additional Protocols

None.

3.4. Configuration

The Print Client configuration information is stored in a binary data file accessible to the DSM. All configuration parameters may be viewed and/or modified from the DICOM Print Film Setup dialog, which is accessed via the DICOM Print Setup menu item on the DSM Setup Menu.

The Modality Worklist Client, Storage Client, Storage Commitment Client, Query/Retrieve Client, and Storage Server configuration information is stored in a binary data file accessible to the DSM. All configuration parameters may be viewed and/or modified from the DICOM Server Setup dialog, which is accessed via the DICOM Server Setup menu item on the DSM Setup Menu.

3.4.1 AE Title/Presentation Address Mapping

3.4.1.1 Local AE Titles

*Table 3.4-1
AE TITLE CONFIGURATION TABLE*

Application Entity	Default AE Title	Default TCP/IP Port
Modality Worklist Client	DSM_MG_SCU	N/A
Storage Client	DSM_MG_SCU	N/A
Print Client	DSM_MG_SCU	N/A
Storage Commitment Client	DSM_MG_SCU	104
Query/Retrieve Client	DSM_MG_SCU	N/A
Storage Server	DSM_MG_SCP	104

The SCU AE Title may be modified in the DICOM Print Film Setup dialog. This AE Title applies to all Client AEs.

The Storage Server AE Title and port number may be modified in the DICOM Server Setup dialog.

3.4.1.2 Remote AE Title/Presentation Address Mapping

Up to three Remote Storage SCPs can be configured as well as up to three Remote Print SCPs, along with one Modality Worklist SCP.

3.4.1.2.1 Remote Modality Worklist SCP

The following are the configurable items for the Modality Worklist SCP in the DICOM Server Setup dialog:

Table 3.4-2 – Remote Modality Worklist SCP Configuration

Parameter	Value Description
AE Title	The DSM supports one AE acting as Remote Modality Worklist SCP.
Hostname	IP address or hostname.
TCP/IP Port Number	Port number to use when establishing TCP/IP connection.
# association attempts	Default = 20, applies to MWL query upon startup only. All attempts complete before notifying the user in case all fail.
Delay between association attempts	Default = 2 seconds, applies to MWL query upon startup only.

3.4.1.2.2 Remote Print SCP

The following are the configurable items for each Remote Print SCP in the DICOM Print Film Setup dialog:

Table 3.4-3 – Remote Print SCP Configuration

Parameter	Value Description
Printer AE Title	The DSM supports multiple AEs acting as Remote Print SCP.
Printer Hostname	IP address and hostname, one per Remote Print AE.
TCP/IP Port Number	Port number to use when establishing TCP/IP connection, one per Remote Print AE.
Printer Name	User defined printer name that appears on the Print Screen/Print Film destination list
Film Size	8INX10IN, 10INX12IN, 11INX14IN, 14INX14IN, 14INX17IN
Magnification Type	None, Replicate, Bilinear, Cubic

3.4.1.2.3 Remote Storage, Storage Commitment, Query/Retrieve SCP

The following are the configurable items for each Remote Storage SCP in the DICOM Server Setup dialog:

Table 3.4-4 – Remote Storage SCP Configuration

Parameter	Value Description
DICOM Server AE Title	The DSM supports up to three AEs acting as Remote Storage, Storage Commitment and/or Query/Retrieve SCP.
DICOM Server Hostname	IP address or hostname, one per Remote Storage AE.
TCP/IP Port Number	Port number to use when establishing TCP/IP connection, one per Remote Storage AE.
DICOM Server Name	User defined server name that appears in the File Manager Copy destination list, Auto Archive Setup destination list, and/or Query/Retrieve destination list
DICOM Request timeout	Default = 30 seconds, range = 1-65535 seconds, controls time to wait for association response and C-STORE, N-ACTION, C-FIND and C-MOVE responses.
DICOM Commit timeout	Default = 60 minutes, range = 1-65535 minutes, controls time to wait for N-EVENT-REPORT request that confirms storage commitment.
Mammography Storage	Enable or Disable
Request Storage Commitment for Archive	Enable or Disable
Query/Retrieve	Enable or Disable
Treat Coercion Warnings as Success	Enable or Disable
Image Orientation	Store images with standard DICOM orientation tags (chest wall on top) or Store with non-standard tags to rotate images 90 degrees (chest wall on left or right)

3.4.2 Configurable Parameters for Local AEs

The following are the configurable items for the local AEs:

Table 3.4-5 – CONFIGURATION PARAMETERS

Parameter	Configurable (Yes/No)	Default Value
Modality Worklist Client		
MWL AssocTime (time to wait for association response and C-FIND responses, in seconds)	Yes	30
Storage Client		
Study Description Format	Yes	Digital Spot Compression: value of Study ID
Print Client		
Film Format (1 x 1, 2 x 2, 3 x 2, 4 x 3)	Yes	
Print Resolution 1024x1024	No	High (1024)
Institution Name (applies to Created SOP Instances also)	Yes	
Institution Address (applies to Created SOP Instances also)	Yes	
Query/Retrieve Client		
Allow Partial Patient ID's	Yes	No
Allow Partial Patient Name	Yes	Yes
Storage Server		
SCP AssocTime (time to wait for association request, in seconds)	Yes	15
SCP ReadTime (time to wait for storage request, in seconds)	Yes	30

4.0 Media Interchange

Not Applicable

5.0 Support of Character Sets

The DSM supports the following character set for the values of Data Elements with a VR of SH, LO, ST, PN or LT:

- Latin alphabet No. 1 (ISO-IR 100 & ISO-IR 6)

6.0 Security

The DSM does not support any specific DICOM security measures.

It is assumed that the DSM is used within a secured environment. It is assumed that a secured environment includes at a minimum:

- Firewall or router protections to ensure that only approved external hosts have network access to the DSM.
- Firewall or router protections to ensure that the DSM only has network access to approved external hosts and services.
- Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g. such as a Virtual Private Network (VPN)).
- Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

7.0 Annexes

7.1. IOD Contents

7.1.1 Created SOP Instance(s)

Abbreviations for Presence of Value:

- ALWAYS Attribute always present with a value
- ANAP Attribute not always present
- EMPTY Attribute is sent without a value (zero length)
- VNAP Attribute value not always present (zero length if no value is present)

Abbreviations for Source:

- AUTO Attribute value is generated automatically
- CONFIG Attribute value source is a configurable parameter
- MWL Attribute value is the same as the value received using Modality Worklist
- USER Attribute value source is from User input

Digital Mammography X-Ray Image IOD

The default attributes that are contained in created SOP Instances are listed in the following tables. The attributes contained in created SOP Instances are configurable.

Table 7.1-1
IOD OF CREATED DIGITAL MAMMOGRAPHY X-RAY IMAGE SOP INSTANCES

IE	Module	Reference	Presence of Module
Patient	Patient	Table 7.1-2	ALWAYS
Study	General Study	Table 7.1-3	ALWAYS
	Patient Study	Table 7.1-3	ANAP
Series	General Series	Table 7.1-4	ALWAYS
	DX Series	Table 7.1-6	ALWAYS
	Mammography Series	Table 7.1-6	ALWAYS
Equipment	General Equipment	Table 7.1-5	ALWAYS
Image	General Image	Table 7.1-7	ALWAYS
	Image Pixel	Table 7.1-8	ALWAYS
	DX Anatomy Imaged	Table 7.1-9	ALWAYS
	DX Image	Table 7.1-10	ALWAYS
	DX Detector	Table 7.1-11	ALWAYS
	DX Positioning	Table 7.1-12	ALWAYS
	X-Ray Acquisition Dose	Table 7.1-13	ALWAYS
	X-Ray Generation	Table 7.1-14	ALWAYS
	Mammography Image	Table 7.1-15	ALWAYS
	Image Histogram	Table 7.1-16	ALWAYS
	Acquisition Context	Table 7.1-17	ALWAYS
SOP Common	Table 7.1-18	ALWAYS	

7.1.1.2 Common Modules

Table 7.1-2 Patient Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Patient's Name	(0010,0010)		ALWAYS	USER/MWL
Patient ID	(0010,0020)		ALWAYS	USER/MWL
Patient's Birth Date	(0010,0030)		ALWAYS	USER/MWL
Patient's Sex	(0010,0040)		VNAP	USER/MWL
Other Patient IDs	(0010,1000)		ANAP	MWL

Table 7.1-3 General Study / Patient Study Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Study Date	(0008,0020)		ALWAYS	AUTO
Study Time	(0008,0030)		ALWAYS	AUTO
Accession Number	(0008,0050)		VNAP	USER/MWL
Referring Physician's Name	(0008,0090)		VNAP	USER/MWL
Study Description	(0008,1030)	Default = Digital Spot Compression: value of Study ID Or can be mapped from one of two MWL attributes, or a single entered value applied to all studies	ALWAYS	CONFIG/MWL
Study Instance UID	(0020,000D)		ALWAYS	AUTO/MWL
Study ID	(0020,0010)		ALWAYS	USER/MWL
Patient's Age	(0010,1010)	Calculated from Patient's Birth Date (0010,0030) and Study Date (0008,0020)	ALWAYS	AUTO

Table 7.1-4 General Series Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Modality	(0008,0060)	See Table 7.1-6		
Series Instance UID	(0020,000E)	Unique value	ALWAYS	AUTO
Series Number	(0020,0011)	1	ALWAYS	AUTO
Operators' Name	(0008,1070)		ALWAYS	USER
Body Part Examined	(0018,0015)	BREAST	ALWAYS	AUTO

Table 7.1-5 General Equipment Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Manufacturer	(0008,0070)	HOLOGIC, Inc. (default)	ALWAYS	CONFIG
Institution Name	(0008,0080)		ALWAYS	CONFIG
Institution Address	(0008,0081)		ALWAYS	CONFIG
Station Name	(0008,1010)	Hostname	ALWAYS	AUTO
Manufacturer's Model Name	(0008,1090)	DSM	ALWAYS	AUTO
Software Versions	(0018,1020)		ALWAYS	AUTO

7.1.1.3 Digital Mammography X-Ray Image Modules

Table 7.1-6 DX Series / Mammography Series Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Modality	(0008,0060)	MG	ALWAYS	AUTO
Presentation Intent Type	(0008,0068)	FOR PRESENTATION	ALWAYS	AUTO

Table 7.1-7 General Image Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Instance Number	(0020,0013)	Incremental within series starting with 1	ALWAYS	AUTO
Patient Orientation	(0020,0020)	See Table 7.1-10		
Content Date	(0008,0023)		ALWAYS	AUTO
Content Time	(0008,0033)		ALWAYS	AUTO
Image Type	(0008,0008)	See Table 7.1-15		
Image Comments	(0020,4000)		ANAP	USER
Acquisition Date	(0008,0022)		ALWAYS	AUTO
Acquisition Time	(0008,0023)		ALWAYS	AUTO
Burned in Annotation	(0028,0301)	See Table 7.1-10		
Lossy Image Compression	(0028,2110)	See Table 7.1-10		

Table 7.1-8 Image Pixel Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	MONOCHROME1 (default) or MONOCHROME2 (user inverted)	ALWAYS	AUTO/USER
Rows	(0028,0010)	512 or 1024	ALWAYS	AUTO
Columns	(0028,0011)	512 or 1024	ALWAYS	AUTO
Bits Allocated	(0028,0100)	16	ALWAYS	AUTO
Bits Stored	(0028,0101)	14	ALWAYS	AUTO
High Bit	(0028,0102)	13	ALWAYS	AUTO
Pixel Representation	(0028,0103)	0	ALWAYS	AUTO
Pixel Data	(7FE0,0010)		ALWAYS	AUTO

Table 7.1-9 DX Anatomy Imaged Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
The supported attributes are listed in Table 7.1-15				

Table 7.1-10 DX Image Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Image Type	(0008,0008)	See Table 7.1-15		
Samples per Pixel	(0028,0002)	See Table 7.1-8	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	See Table 7.1-8	ALWAYS	AUTO
Bits Allocated	(0028,0100)	See Table 7.1-8	ALWAYS	AUTO
Bits Stored	(0028,0101)	See Table 7.1-8	ALWAYS	AUTO
High Bit	(0028,0102)	See Table 7.1-8	ALWAYS	AUTO
Pixel Representation	(0028,0103)	See Table 7.1-8	ALWAYS	AUTO
Pixel Intensity Relationship	(0028,1040)	LIN	ALWAYS	AUTO
Pixel Intensity Relationship Sign	(0028,1041)	1	ALWAYS	AUTO
Rescale Intercept	(0028,1052)	0	ALWAYS	AUTO
Rescale Slope	(0028,1053)	1	ALWAYS	AUTO
Rescale Type	(0028,1054)	US	ALWAYS	AUTO
Presentation LUT Shape	(2050,0020)	INVERSE (default) or IDENTITY (user inverted)	ALWAYS	AUTO/USER
Lossy Image Compression	(0028,2110)	00	ALWAYS	AUTO
Patient Orientation	(0020,0020)	chest wall on top or rotated 90 degrees (chest wall on left for L, chest wall on right for R); values vary per laterality and view	ALWAYS	CONFIG
Burned in Annotation	(0028,0301)	NO	ALWAYS	AUTO
Window Center	(0028,1050)	1 or 2 values – Current and Saved (if different)	ALWAYS	AUTO
Window Width	(0028,1051)	1 or 2 values – Current and Saved (if different)	ALWAYS	AUTO

Table 7.1-11 DX Detector Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Detector Type	(0018,7004)	SCINTILLATOR	ALWAYS	AUTO
Imager Pixel Spacing	(0018,1164)	0.100\0.100 (512) 0.050\0.050 (1024)	ALWAYS	AUTO
Pixel Spacing	(0028,0030)	Imager Pixel Spacing / ERMF	ALWAYS	AUTO

Table 7.1-12 DX Positioning Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
View Code Sequence	(0054,0220)	See Table 7.1-15		
Estimated Radiographic Magnification Factor	(0018,1114)	1.0256 (512 default) 0.5128 (1024 default)	ALWAYS	CONFIG
Positioner Type	(0018,1508)	See Table 7.1-15		
Positioner Primary Angle	(0018,1510)	See Table 7.1-15		
Body Part Thickness	(0018,11A0)	Configurable to be user entered or from DSM	ALWAYS	USER/AUTO

Table 7.1-13 X-ray Acquisition Dose Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
The other supported attributes are listed in Tables 7.1-12, 7.1-14, 7.1-15				
Entrance Dose	(0040,0302)	Less than 1 dGy	EMPTY	AUTO
Entrance Dose in mGy	(0040,8302)	DSM calculates if calibrated	ANAP	AUTO
Organ Dose	(0040,0316)	DSM calculates if calibrated	ANAP	AUTO

Table 7.1-14 X-ray Generation Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
KVP	(0018,0060)	From x-ray system	ALWAYS	AUTO
Exposure Time	(0018,1150)	From x-ray system	ALWAYS	AUTO
Exposure	(0018,1152)	From x-ray system	ALWAYS	AUTO

Table 7.1-15 Mammography Image Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Image Type	(0008,0008)	ORIGINAL\PRIMARY\value 3, where value 3 is one of STEREO_SCOUT STEREO_MINUS STEREO_PLUS PREFIRE_MINUS PREFIRE_PLUS POSTFIRE_MINUS POSTFIRE_PLUS POSTBIOPSY_MINUS POSTBIOPSY_PLUS POSTBIOPSY	ALWAYS	AUTO/USER
Positioner Type	(0018,1508)	MAMMOGRAPHIC	ALWAYS	AUTO
Positioner Primary Angle	(0018,1510)		ALWAYS	AUTO
Image Laterality	(0020,0062)	R, L	ALWAYS	USER
Organ Exposed	(0040,0318)	BREAST	ALWAYS	AUTO
Anatomic Region Sequence	(0008,2218)	One Item	ALWAYS	AUTO
> Code Value	(0008,0100)	T-04000	ALWAYS	AUTO
> Coding Scheme Designator	(0008,0102)	SNM3 or SRT (default)	ALWAYS	CONFIG
> Code Meaning	(0008,0104)	Breast	ALWAYS	AUTO
View Code Sequence	(0054,0220)	One Item representing CC, FB, MLO, LMO, LM, ML, SIO or Specimen <Default = CC, user must edit>	ALWAYS	USER
> Code Value	(0008,0100)		ALWAYS	AUTO
> Coding Scheme Designator	(0008,0102)	SNM3 or SRT (default)	ALWAYS	CONFIG
> Code Meaning	(0008,0104)		ALWAYS	AUTO
>View Modifier Code Sequence	(0054,0222)	One Item	ALWAYS	AUTO
>> Code Value	(0008,0100)	R-102D7	ALWAYS	AUTO
>> Coding Scheme Designator	(0008,0102)	SNM3 or SRT (default)	ALWAYS	CONFIG
>> Code Meaning	(0008,0104)	Spot Compression	ALWAYS	AUTO

Table 7.1-16 Image Histogram Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Histogram Sequence	(0060,3000)	One Item	ALWAYS	AUTO
>Histogram Number of Bins	(0060,3002)		ALWAYS	AUTO
>Histogram First Bin Value	(0060,3004)		ALWAYS	AUTO
>Histogram Last Bin Value	(0060,3006)		ALWAYS	AUTO
>Histogram Bin Width	(0060,3008)		ALWAYS	AUTO
>Histogram Explanation	(0060,3010)		ALWAYS	AUTO
>Histogram Data	(0060,3020)		ALWAYS	AUTO

Table 7.1-17 Acquisition Context Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Acquisition Context Sequence	(0040,0555)		EMPTY	AUTO

Table 7.1-18 SOP Common Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Specific Character Set	(0008,0005)	ISO_IR 100	ALWAYS	AUTO
SOP Class UID	(0008,0016)	UID for Digital Mammography X-ray Image Storage – For Presentation	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	Unique value generated by DSM	ALWAYS	AUTO
Instance Number	(0020,0013)	See Table 7.1-7		

7.1.2 Usage of Attributes from Received IODs

The only requirement for SOP Instance acceptance is that the Pixel Data is read successfully.

7.1.3 Attribute Mapping

The relationships between attributes received via Modality Worklist and stored in acquired images are summarized in Table 7.1-19. Attribute mapping is not configurable. The user may manually edit the attribute values received via Modality Worklist before the acquired images are stored, except for Study Instance UID.

Table 7.1-19 Attribute Mapping Between Modality Worklist and Images

Modality Worklist	Image IOD
Scheduled Procedure Step Sequence	
>Scheduled Procedure Step ID	Study ID
>Scheduled Procedure Step Description or Requested Procedure Description	Study Description
Study Instance UID	Study Instance UID
Accession Number	Accession Number
Referring Physician's Name	Referring Physician's Name
Patient's Name	Patient's Name
Patient ID	Patient ID
Patient's Birth Date	Patient's Birth Date
Patient's Sex	Patient's Sex
Other Patient IDs	Other Patient IDs

7.1.4 Coerced/Modified Attributes

Any attribute whose source is USER can be modified by the user, including certain attribute values that were obtained via Modality Worklist. See section 7.1.1 Created SOP Instances for attributes with a source of USER. The Storage Client incorporates user modified attribute values into created SOP Instances.

If a SOP Instance is received with missing or empty Patient ID (0010,0020) or Accession Number (0008,0050), the Storage Server assigns a generic value to the attribute so that the SOP Instance can be accepted. If Study Date (0008,0020) or Content Time (0008,0033) is missing or empty, the Storage Server assigns the current date or time, respectively.

7.2. Data Dictionary of Private Attributes

Created SOP Instances may contain a Private Group (0071) labeled LORAD - A Hologic Company, containing proprietary image characteristics relating to target, target coordinates, reference and scout information.

7.3. Coded Terminology and Templates

Not Applicable

7.4. Grayscale Image Consistency

The DSM monitor used to perform stereotactic procedures is calibrated according to the DICOM Grayscale Standard Display Function (GSDF).

7.5. Standard Extended/Specialized/Private SOP Classes

Not Applicable

7.6. Private Transfer Syntaxes

None