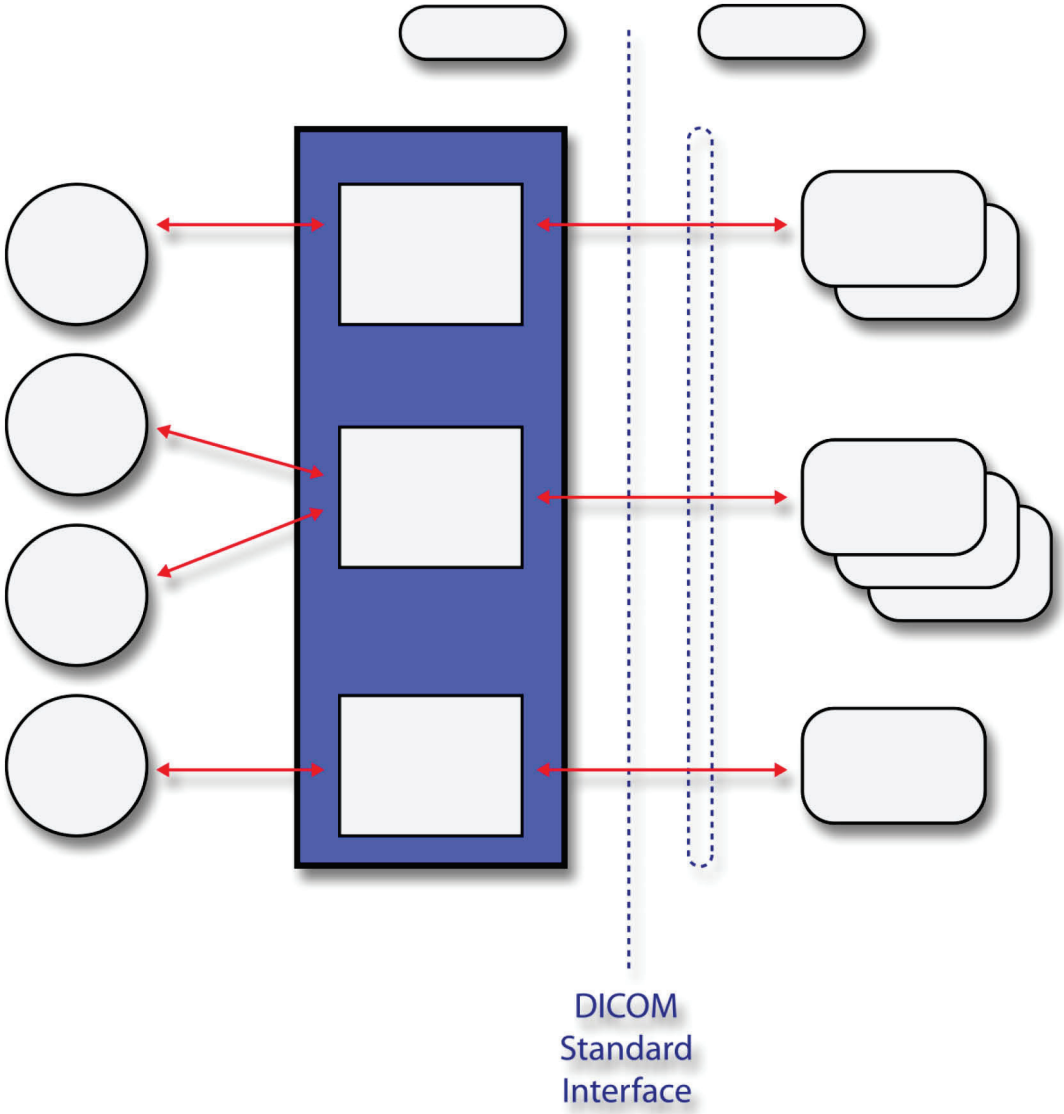
Faxitron™

Trident® HD

Specimen Radiography System



DICOM Conformance Statement

MAN-05635 Revision 002

HOLOGIC®

Trident® HD

Specimen Radiography System

DICOM Conformance Statement

For Software Version 1.0

Part Number MAN-05635
Revision 002
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1.0 Overview

The Hologic® Trident® HD Specimen Radiography System Workstation implements the necessary DICOM services to:

- Download worklists from one or more information systems,
- Send acquired and created images to a networked storage device or removable media,
- Request Storage Commitment from a networked storage device,
- Query and Retrieve images from a networked storage device,
- Receive images from a networked storage device,
- Import images from removable media,
- Print acquired and created images to a networked hardcopy device.

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

Table 1-1
NETWORK SERVICES

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

Table 1-2 provides an overview of the Media Storage Application Profiles supported by the Workstation.

Table 1-2
MEDIA SERVICES

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
General Purpose USB	Yes	Yes

2.0 Introduction

Hologic, Inc. develops and markets a full line of mammography products including the Trident® HD Specimen Radiography System Workstation.

The Workstation is a component of Trident HD Specimen Radiography system. It provides an interface to the amorphous selenium X-ray detector as an image acquisition device, routing acquired specimen images and accompanying information to output devices through DICOM interfaces. The Workstation uses a graphical user interface (GUI) with a touch screen, image display monitor, and pointing device (trackball).

2.1. Audience

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

The information within this document applies to Trident HD version 1.x. The reader of this document should be familiar with the DICOM standard and downstream devices 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:

- The Workstation 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 Workstation 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 Workstation 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

Amorphous Selenium: Semiconductor material used in the direct capture X-ray detector.

AE: Application Entity

DICOM: Digital Imaging and Communications in Medicine

DIMSE: DICOM Message Service Element

Direct Capture: Technique used to convert X-ray energy directly into electrical signals without using intensifying screens or scintillation.

FSC: File-set Creator

FSR: File-set Reader

IOD: Information Object Definition

JPEG: Joint Photographic Experts Group (data compression techniques)

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

UID: Unique Identifier

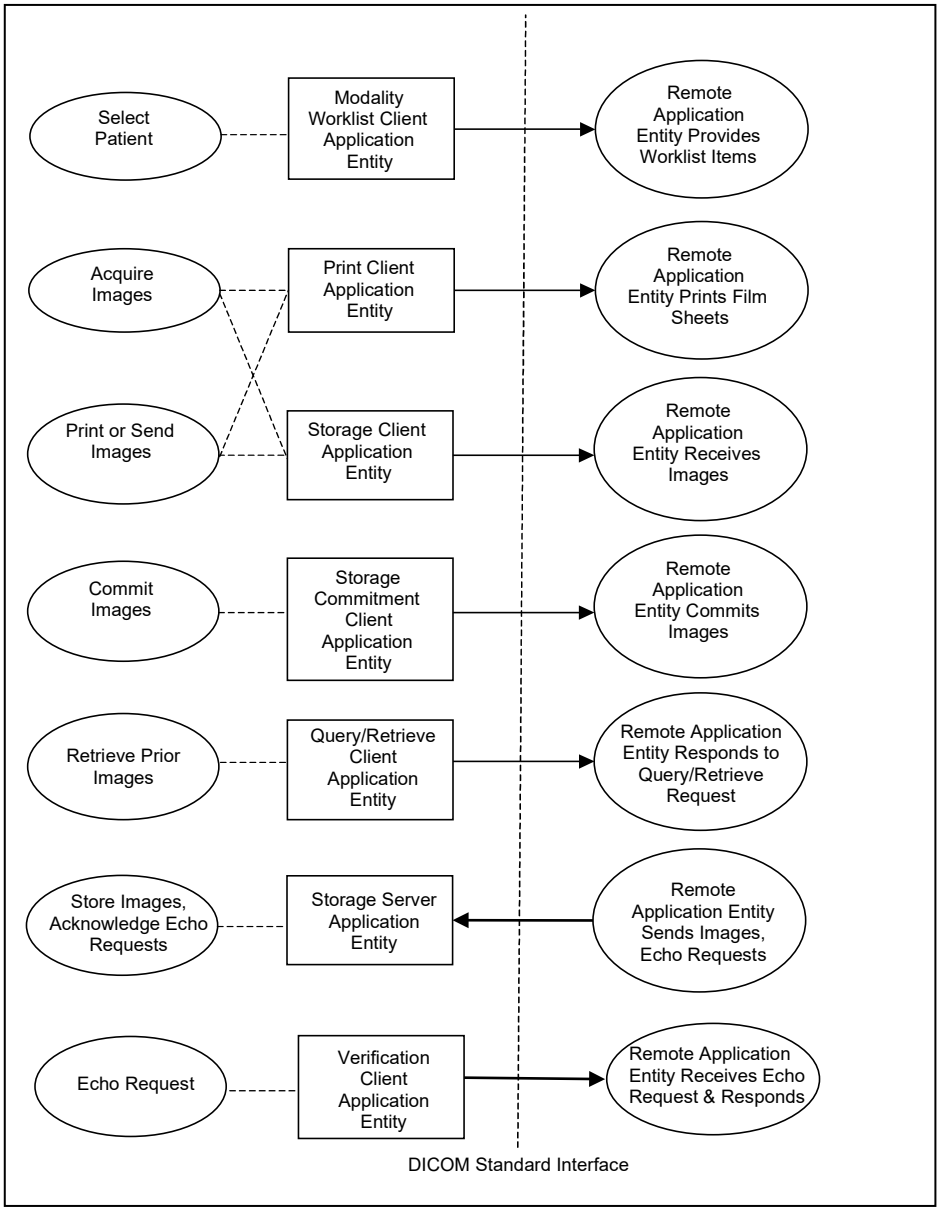
2.4. References

- 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



- The Modality Worklist Client Application Entity requests and receives Worklist information from a remote AE containing patient schedule and procedure information. It is associated with the local real-world activity “Select Patient”. “Select Patient” is performed as a result of a user request or can be performed automatically at specific time intervals. The Modality Worklist Client queries the selected remote AE for worklist items and provides to the user the set of worklist items matching the query request.

- The Print Client Application Entity prints images to film on a remote AE (Printer). It is associated with the local real-world activities “Acquire Images” and “Print or Send Images”. When a user performs the “Acquire Images” local real-world activity, remote Print AE destinations will receive images upon closing the patient. “Print or Send Images” can be performed upon a user request for a selected procedure or specific images. This allows the user to automatically print images based on system configurable parameters. When a selected remote AE is a Printer, the Print Client creates a print job within the print queue containing one or more virtual film sheets composed from the acquired or selected images.
- The Storage Client Application Entity sends images to a remote AE. It is associated with the local real-world activities “Acquire Images” and “Print or Send Images”. When a user performs the “Acquire Images” local real-world activity, remote AE destinations are selected to receive images as a group upon closing the patient. “Print or Send Images” is performed upon user request for a selected procedure or specific images to be sent to one or more remote AEs. If the remote AE is configured as an archive device with storage commitment enabled, the “Commit Images” local real-world activity is triggered.
- The Query/Retrieve Client Application Entity queries and retrieves images. “Retrieve Prior Images” is performed upon user request. The Query/Retrieve Client queries a remote AE for patient studies and provides the list of studies matching the query request. Through “Retrieve Prior Images” the user can select the patient studies to be retrieved. The Query/Retrieve Client issues a retrieve request for the selected patient studies.
- The Storage Server Application Entity receives images from a remote AE. The Storage Server Application Entity is available whenever the Workstation application is running and connected to a network. The Storage Server Application Entity can also receive an echo request from a remote AE.
- The Verification Application Entity sends an echo request to a remote AE. The Verification Application Entity is available as part of the Service Tool utility.

3.1.2 Functional Definition of AE’s

Multiple local Application Entities may be active simultaneously.

3.1.2.1 Functional Definition of Modality Worklist Client Application Entity

The Modality Worklist Client AE attempts to download a worklist from each configured 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. User interactive and automated query results are displayed and stored in a worklist. The resulting worklist is updated from subsequent automated worklist queries. While receiving the worklist responses, if the configurable limit of items is exceeded, an error is reported to the user. Those items that exceeded the configurable limit are not displayed.

3.1.2.3 Functional Definition of Print Client Application Entity

When an internal request to create a hardcopy of image data is generated, the Print Client AE will become active. The print job is created and resides in the Print Queue. The Print Client then attempts to establish an association with the remote printer. If the printer is operating normally, the film sheets described within the print job will be printed. Changes in printer status (e.g., out of film) are detected and reported to the user. If the printer is not operating normally, the print job will be set to an error state and retried a configured number of times. Upon reaching the retry limit, the user is notified, and the print job remains in the queue with a status of stopped. The user may view the status of the print job in the Print Queue and restart the job via a job control interface.

When the Print Job SOP Class is configured, a configured print job timeout controls how long Associations remain open waiting for the print job to complete. When the Print Job SOP Class is not used, the established Association remains open until the printer responds to a status request that is sent after print action is requested, or until the Print Client times out waiting for a response.

3.1.2.4 Functional Definition of Storage Client Application Entity

The existence of a store job in the output queue will activate the Storage Client AE. An association request is sent to the destination AE and upon successful negotiation of a Presentation Context the image transfer is started. If the association cannot be opened or the store request fails, the related store job is set to an error state and can be restarted by the user via job control interface. For some error conditions, such as timeouts, the Storage Client will attempt to retry a failed store job automatically a configured number of times. Upon reaching the retry limit the user is notified, and the store job remains in the queue with a status of stopped. The user is notified when a store job does not complete successfully. The user may view the status of store jobs in the output queue.

3.1.2.5 Functional Definition of Storage Commitment Client Application Entity

The existence of a commit job in the output queue will activate the Storage Commitment Client AE. An association request is sent to the destination AE and upon successful negotiation commitment of the image is requested. The Storage Commitment Client AE waits for commitment confirmation on a separate association. The listening port is always active for commitment confirmation when the Workstation application is running and connected to a network.

If the commit request association cannot be opened or the commit request fails, the related commit job is set to an error state and can be restarted by the user via job control interface. For some error conditions, such as timeouts, the Storage Commitment Client will attempt to resend a failed commit job request automatically a configured number of times. The user is notified if the remote AE does not accept a commit job request. The user may also view the status of output queues.

3.1.2.6 Functional Definition of Query/Retrieve Client Application Entity

The Query/Retrieve Client AE is activated when a user initiates a query job to a remote AE. An association request is sent to the remote AE and upon successful negotiation, a query is sent to the remote AE. The query content is based on the query job and the configured query method (hierarchical or relational). Given the query results, user selection of one or more studies and/or series to be retrieved from the remote AE triggers the Query/Retrieve Client to send a retrieve request. The Storage Server AE is active whenever the application is running and connected to a network, and will receive the images. If an association cannot be opened or the query or retrieve request fails, an error is generated to notify the user and the query job is deleted.

3.1.2.7 Functional Definition of Storage Server Application Entity

The Storage Server AE is active to accept echo and storage requests whenever the Workstation application is running and connected to a network. The received Instances are stored to a temporary directory and then imported to the database, from which they may be listed and viewed through the user interface.

3.1.2.8 Functional Definition of Verification Application Entity

The Verification AE is available to the user as a DICOM troubleshooting tool in the Service Tool utility. It is available to test all remote SCP devices.

3.1.3 Sequencing of Real World Activities

A user initiates DICOM storage or print by selecting one or more output devices from a list, acquiring one or more specimen images, and then closing the patient. The images are transmitted to the selected remote AEs when the user closes the patient. When Storage Commitment is enabled, a storage commitment request is sent for each image that is stored successfully. The user may also initiate DICOM storage or print separate from the image acquisition procedure by selecting one or more images from the currently open patient and selecting a destination.

In cases where error(s) occur during transmission, the affected job(s) will be retried if the error condition is temporary—otherwise it will be stopped. The user is always notified when an error occurs. The user may be able to cancel the job or restart the job if desired (depending on the error condition).

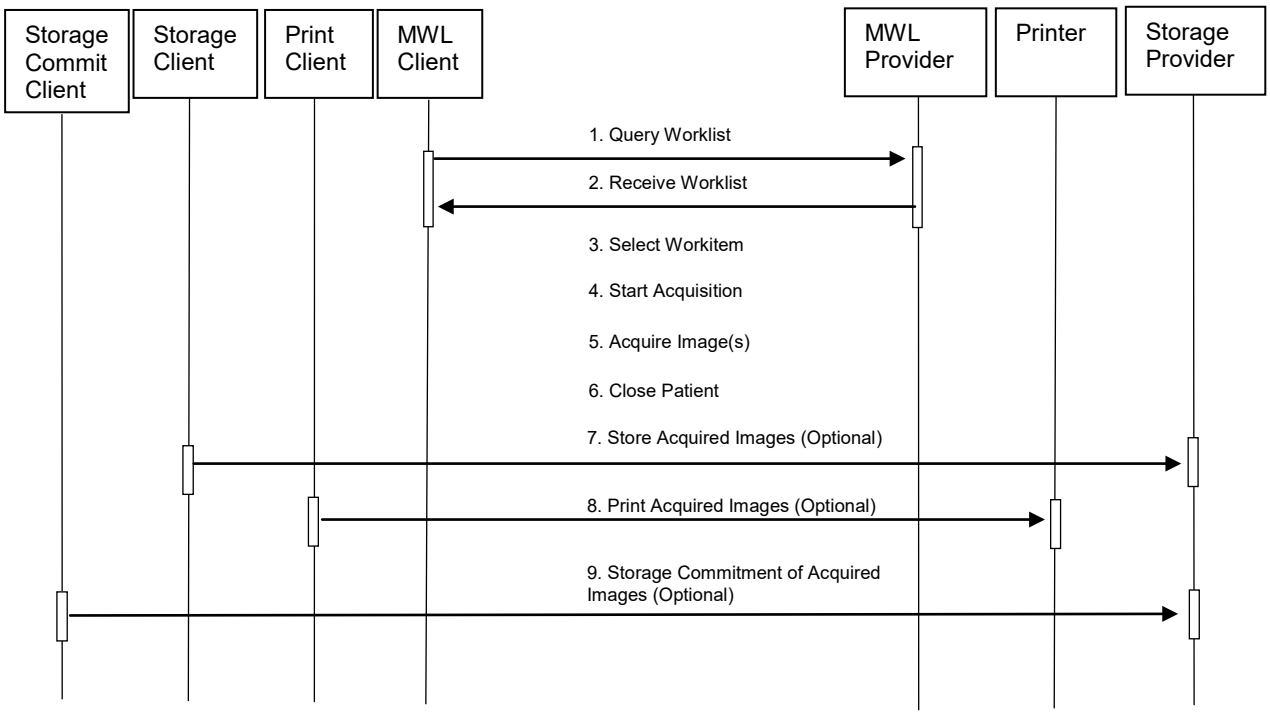


Figure 3.1-1: Image Acquisition Sequence Diagram

A user initiates DICOM query/retrieve by entering patient search criteria and executing a query. The matching patient's studies are displayed to the user. The user selects studies to retrieve and executes a retrieve request. The Workstation receives the selected studies sent by the Query/Retrieve Provider via the Storage Server AE.

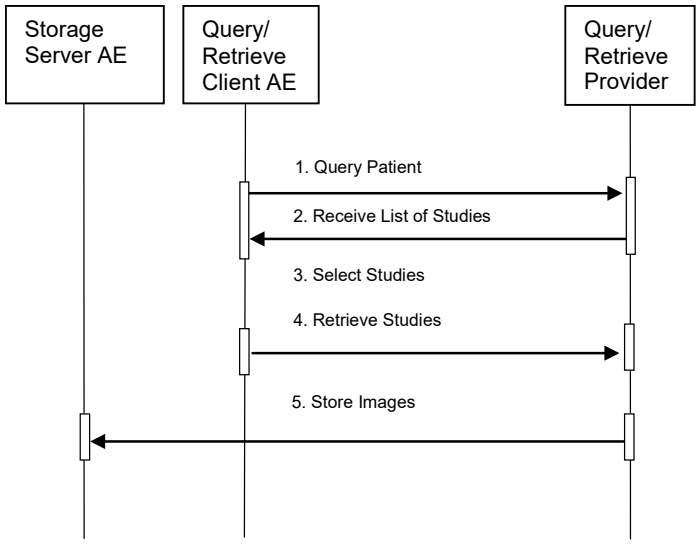


Figure 3.1-2: Query/Retrieve Sequence Diagram

3.2. AE Specifications

3.2.1 Modality Worklist Client AE

3.2.1.1 SOP Classes

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

Table 3.2.1-1
SOP CLASS FOR MODALITY WORKLIST CLIENT AE

SOP Class Name	SOP Class UID	SCU	SCP
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Yes	No

3.2.1.2 Association Policies

3.2.1.2.1 General

The DICOM standard Application context shall be specified.

Table 3.2.1-2
DICOM APPLICATION CONTEXT

Application Context Name	1.2.840.10008.3.1.1.1

3.2.1.2.2 Number of Associations

One association is initiated at a time for the Modality Worklist Client AE.

3.2.1.2.3 Asynchronous Nature

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

3.2.1.2.4 Implementation Identifying Information

Table 3.2.1-3
DICOM IMPLEMENTATION CLASS AND VERSION FOR MODALITY WORKLIST CLIENT

Implementation Class UID	1.2.840.114089.1.0.0.3.4.10
Implementation Version Name	DCF 3.4.10c

3.2.1.3 Association Initiation Policy

3.2.1.3.1 Select Patient

3.2.1.3.1.1 Description and Sequencing of Activities

The Select Patient request for a Modality Worklist update is initiated by user interaction, or automatically at defined periods (polling). When the user initiates Select Patient, the user enters data to be used as search criteria, and the data entered by the user are used as matching keys in the query. The search criteria (query keys) and return key attributes for user-entered queries and automatic updates are site configurable.

When an internal request for Modality Worklist update is received, the Modality Worklist Client attempts to establish an association with the configured remote AE. When the association is established a C-FIND request is made to retrieve a worklist using the defined matching and return keys. The Modality Worklist Client waits for C-FIND responses to be returned. The established association remains active until a C-FIND response from the remote AE indicates the end of worklist items or until a configurable timeout period expires. The Modality Worklist Client limits the number of stored worklist responses to a configurable maximum. If the maximum is exceeded during an interactive query, the user is notified that the maximum number of responses was exceeded. For an automatic query, an alarm is posted. In either case, when the maximum is exceeded none of the responses received after the maximum is exceeded is displayed or stored.

The activity of the Modality Worklist Client is transparent to the user. The Modality Worklist Client queries the remote AE using the C-FIND operation and displays the returned worklist items. The user selects a worklist item to begin a procedure. The Workstation associates information from the selected worklist item with the acquired images. The quality of the information returned in worklist items directly impacts the efficiency of the user. When the remote AE returns insufficient information or is off-line, or the Workstation is not connected to a network, the Workstation requires the user to manually enter information used to identify the patient and procedure.

3.2.1.3.1.2 Proposed Presentation Contexts

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

Table 3.2.1-4
PROPOSED PRESENTATION CONTEXTS FOR SELECT PATIENT

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name List**	**UID List**		**Negotiation**
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

3.2.1.3.1.3 SOP Specific Conformance for Modality Worklist

The behavior of the Workstation when encountering status codes in a Modality Worklist C-FIND response is summarized in the table below. If the Workstation receives a response status other than "Success" or "Pending", the user is notified.

Table 3.2.1-5
C-FIND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Matching is complete	0000	The SCP has completed the matches. Worklist items are available for display. However, if more than the configured maximum number of responses were received, the AE aborts the association and posts an error message to the user.
Pending	Matches are continuing	FF00	AE continues the association with the Worklist Provider.
	Matches are continuing-Warning	FF01	AE continues the association with the Worklist Provider.
Failure	Refused: Out of resources	A700	AE Aborts association. Error message to user indicates "Dimse Exception: Out of resources".
	Identifier does not match SOP Class	A900	AE Aborts association. Error message to user indicates "Dimse Exception: Data set does not match (error)".
	Unable to process	Cxxx	AE Aborts association. Error message to user indicates "Dimse Exception: Cannot understand".

The behavior of the Workstation during communication failure is summarized in the table below.

Table 3.2.1-6
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The Association is aborted and an error message is posted to the user.
Association aborted by SCP	The responses received prior to the association being aborted are displayed. The error message "remote AE aborted association" is posted to the user.

The Modality Worklist Client is designed to function using a configurable query strategy. The query strategy defines:

- Query method (on-demand, polling, or both)
- Matching keys used
- Return keys requested
- Timeout parameters
- User displayed attributes

For user interactive queries Modality Worklist Client supports any combination of the following matching key attributes as a default:

Table 3.2.1-7
MWL SOP Class: Default Matching Keys – User Interactive Queries

Matching Key Attribute	Tag	Matching Type
Patient's Name	(0010,0010)	Wild Card
Patient ID	(0010,0020)	Single Value
Accession Number	(0008,0050)	Single Value
Requested Procedure ID	(0040,1001)	Single Value
Scheduled Procedure Step Start Date	(0040,0002)	Range

Note: The Workstation supports all Matching Keys as specified in DICOM PS 3.4, Table K.6-1.

For automated queries the Modality Worklist Client supports any combination of the following matching key attributes:

Table 3.2.1-8
MWL SOP Class: Supported Matching Keys – Automated Queries

Matching Key Attribute	Tag	Matching Type
Modality	(0008,0060)	Single Value (default "MG")
Scheduled Procedure Step Start Date	(0040,0002)	Range
Scheduled Station Name	(0040,0010)	Single Value (Configurable Text)
Scheduled Station AE Title	(0040,0001)	Single Value (Configurable Text)

The Modality Worklist Client can be configured to request any combination of return key attributes. Table 3.2.1-9 contains the default list of attributes that may be requested. Unexpected attributes returned in a C-FIND response are ignored. Requested return key attributes that are not supported by the Modality Worklist SCP are set to have no value.

Table 3.2.1-9
Modality Worklist SOP Class: Requested Return Key Attributes

Module/Attribute	Tag
SOP Common	
Specific Character Set	(0008,0005)
Scheduled Procedure Step	
Scheduled Procedure Step Sequence	(0040,0100)
>Modality	(0008,0060)
>Scheduled Station AE Title	(0040,0001)
>Scheduled Procedure Step Start Date	(0040,0002)
>Scheduled Procedure Step Start Time	(0040,0003)
>Scheduled Performing Physician's Name	(0040,0006)
>Scheduled Procedure Step Description	(0040,0007)
>Scheduled Protocol Code Sequence	(0040,0008)
>>Code Value	(0008,0100)
>>Coding Scheme Designator	(0008,0102)
>>Code Meaning	(0008,0104)

Module/Attribute	Tag
>Scheduled Procedure Step ID	(0040,0009)
>Scheduled Station Name	(0040,0010)
>Scheduled Procedure Step Location	(0040,0011)
Requested Procedure	
Referenced Study Sequence	(0008,1110)
>Referenced SOP Class UID	(0008,1150)
>Referenced SOP Instance UID	(0008,1155)
Study Instance UID	(0020,000D)
Requested Procedure Description	(0032,1060)
Requested Procedure Code Sequence	(0032,1064)
>Code Value	(0008,0100)
>Coding Scheme Designator	(0008,0102)
>Code Meaning	(0008,0104)
Requested Procedure ID	(0040,1001)
Reason for Requested Procedure Code Sequence	(0040,100A)
>Code Value	(0008,0100)
>Coding Scheme Designator	(0008,0102)
>Code Meaning	(0008,0104)
Imaging Service Request	
Accession Number Referring Physician's Name	(0008,0050) (0008,0090)
Requesting Physician	(0032,1032)
Visit Identification	
Admission ID	(0038,0010)
Visit Status	
Current Patient Location	(0038,0300)
Patient Identification	
Patient's Name	(0010,0010)
Patient ID	(0010,0020)
Issuer of Patient ID	(0010,0021)
Other Patient IDs	(0010,1000)
Patient Demographic	
Patient’s Birth Date	(0010,0030)
Patient's Sex	(0010,0040)
Patient’s Age	(0010,1010)
Patient’s Address	(0010,1040)
Patient Comments	(0010,4000)
Standard Extended	
Study Description	(0008,1030)
Procedure Code Sequence	(0008,1032)
>Code Value	(0008,0100)
>Coding Scheme Designator	(0008,0102)
>Code Meaning	(0008,0104)
Study ID	(0020,0010)

By default the attribute used to select the configured study code and configured procedure for a given modality worklist item is:

- Requested Procedure Code Sequence (0032,1064)

  >Code Value (0008,0100)

The Workstation may be configured to use an alternate attribute for the study code. The alternative attributes are:

- Requested Procedure Code Sequence (0032,1064)

  >Code Meaning (0008,0104)
- Scheduled Procedure Step Sequence (0040,0100)

  >Scheduled Procedure Step Description (0040,0007)

  >Scheduled Procedure Step ID (0040,0009)

  >Scheduled Protocol Code Sequence (0040,0008)

  >>Code Value (0008,0100)

  >>Code Meaning (0008,0104)
- Study Description (0008,1030)

When the configured study code attribute is missing from a returned modality worklist item or the value does not match a code in the procedure database, the user is prompted to select a procedure manually.

See Section 7.1.3 Attribute Mapping for the mapping of worklist item return key attributes to acquired image attributes.

3.2.1.4 Association Acceptance Policy

The Modality Worklist Client AE does not accept associations.

3.2.2 Print Client AE

3.2.2.1 SOP Classes

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

Table 3.2.2-1
SOP CLASSES FOR PRINT CLIENT AE

SOP Class Name	SOP Class UID	SCU	SCP
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Yes	No
Print Job SOP Class	1.2.840.10008.5.1.1.14	Yes	No
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Yes	No

3.2.2.2 Association Policies

3.2.2.2.1 General

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

3.2.2.2.2 Number of Associations

One association is initiated at a time for the Print Client AE.

3.2.2.2.3 Asynchronous Nature

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

3.2.2.2.4 Implementation Identifying Information

Table 3.2.2-3
DICOM IMPLEMENTATION CLASS AND VERSION FOR PRINT CLIENT

Implementation Class UID	1.2.840.114089.1.0.0.3.4.10
Implementation Version Name	DCF 3.4.10c

3.2.2.3 Association Initiation Policy

3.2.2.3.1 Acquire Images / Print or Send Images

3.2.2.3.1.1 Description and Sequencing of Activities

The Print Client attempts to establish an association with a remote print AE when an internal request to print one or more images is received. When the Print Job SOP Class is configured, the print job timeout controls how long associations remain open waiting for the print job to complete. When the Print Job SOP Class is not used, the association remains open until the remote print AE responds to a status request that is sent after print action is requested, or until the Print Client times out waiting for a response. The Presentation LUT SOP Class is an option that can be enabled on a per printer basis.

For requested image(s) to be printed the Print Client requests to establish an association with a Remote Print AE using the Basic Grayscale Print Management Meta SOP Class. If so configured the Print Client negotiates the optional Print Job SOP class and/or Presentation LUT SOP Class.

Once an association is established the Print Client sends print jobs to the remote print AE. Each print job consists of the following steps:

- The Print Client sends the remote print AE an N-GET request for the Printer SOP Class to determine the status of the printer. The Print Client records the status and continues. The Print Client sends an N-CREATE request to the remote print AE to create a film session. After receiving a successful N-CREATE response, the Print Client then sends an N-CREATE request to the remote print AE to create a film box containing a single image box. The remote print AE creates the film session, film box, and image box. The Presentation LUT SOP Class is an option that can be enabled on a per printer basis.

  Note: When configured, the Presentation LUT N-CREATE request is sent upon a receiving a successful Film Session N-CREATE response.

- The Print Client sends the remote print AE an N-SET request to update the image box with the image pixel data and other information needed for the image to be printed as part of a film box.

- Once the image has been transferred, the Print Client sends the remote print AE an N-ACTION request for the film box. This triggers the remote print AE to print the film. Note that the Print Client does not request N-ACTION at the film session level.

- When the Print Job SOP Class is negotiated the Print Client polls the remote print AE by sending alternate N-GET requests for the Print Job and Printer SOP Classes at pre-configured intervals until an execution status of either “FAILURE” or “DONE” is received in an N-GET response or N-EVENT-REPORT request, or until the configured job timeout period expires.

- When the Print Job SOP Class is not used, the Print Client sends one N-GET request for the Printer SOP Class after the N-ACTION response is received. The association remains open until the N-GET response or a N-EVENT-REPORT request is received, or until the Print Client times out waiting for the N-GET response.

- Before closing the association under any circumstance, the Print Client sends an N-DELETE request for the film box and then for the film session.

- An alarm is posted to the user when a printer warning or failure status message is received from the remote print AE.

3.2.2.3.1.2 Proposed Presentation Contexts

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

Table 3.2.2-4
PROPOSED PRESENTATION CONTEXTS FOR ACQUIRE IMAGES/PRINT OR SEND IMAGES

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name List**	**UID List**		**Negotiation**
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		
		Explicit VR, Big Endian	1.2.840.10008.1.2.2		
Print Job SOP Class	1.2.840.10008.5.1.14	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1		
		Explicit VR, Big Endian	1.2.840.10008.1.2.2		
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1		
		Explicit VR, Big Endian	1.2.840.10008.1.2.2		

3.2.2.3.1.3 SOP Specific Conformance for Print Client

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. Depending on the type of failure, and retry configuration, the print job may be retried several times before reporting an error to the user.

Table 3.2.2-5
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The Association is aborted and an error message is posted to the user: “Print job was not completed in the allotted time, or timeout waiting for response. Status of print job is unknown.”
Association aborted by SCP	An error message is posted to the user: “Cannot open socket to specified host/port, a network error has occurred, or received abort from remote system.”

The Print Client supports various printer types that may expect different values for the film session, film box, and image box attributes. These attribute values are defined within model files for each specific printer. This section describes the DIMSE services and the attributes supported for various remote print AEs and includes the particular attributes that may be configured per printer type.

3.2.2.3.1.3.1 Specific Conformance to Basic Film Session SOP Class

Table 3.2.2-6
Basic Film Session SOP Class: Supported DIMSE operations

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

Table 3.2.2-7
Basic Film Session SOP Class: Supported Attributes

Attribute Name	Tag	Supported Values	Default Value
Number Of Copies	(2000,0010)	1-10	1
Print Priority	(2000,0020)	HIGH, MED, LOW	HIGH
Medium Type	(2000,0030)	BLUE FILM CLEAR FILM MAMMO BLUE FILM MAMMO CLEAR FILM	Configurable
Film Destination	(2000,0040)	(Configurable)	(Configurable)
Film Session Label	(2000,0050)	64 characters max.	HOLOGIC TRIDENTHD

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

Table 3.2.2-8
DICOM COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. Proceed to next step.
Warning	Memory allocation	B600	Proceed to next step.
Failure	Any	Any	AE aborts association. Error message to user indicates "A DICOM DIMSE error was returned in a response." Specific status information is logged.

3.2.2.3.1.3.2 Specific Conformance to Basic Film Box SOP Class

Table 3.2.2-9
Basic Film Box SOP Class: Supported DIMSE operations

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

Table 3.2.2-10
Basic Film Box SOP Class: Supported Attributes

Attribute Name	Tag	Supported Values	Default Value
Image Display Format	(2010,0010)	STANDARD\1,1	STANDARD\1,1
Film Orientation	(2010,0040)	PORTRAIT LANDSCAPE	PORTRAIT
Film Size ID	(2010,0050)	8INX10IN 10INX12IN 10INX14IN 11INX14IN 11INX17IN 14INX14IN 14INX17IN (Configurable per printer)	Configured per each printer's requirements with image matrix size, or set to calculate automatically for true size printing.
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	Configured per printer.
Smoothing Type	(2010,0080)	(Configurable)	Configured per printer.
Border Density	(2010,0100)	BLACK WHITE	Configured per printer.
Empty Image Density	(2010,0110)	BLACK WHITE	Configured per printer.
Min Density	(2010,0120)	numeric, OD x 100	Configured per printer.

Attribute Name	Tag	Supported Values	Default Value
Max Density	(2010,0130)	numeric, OD x 100	Configured per printer.
Trim	(2010,0140)	YES NO	Configured per printer.
Configuration Information	(2010,0150)	Cxxx, where xxx = Code Value obtained from printer vendors	Configured per printer.
Illumination	(2010,015E)	0-65535	Sent regardless if Presentation LUT SOP Class is successfully negotiated. Configured per printer. Default = 5000
Reflected Ambient Light	(2010,1060)	0-65535	Sent regardless if Presentation LUT SOP Class is successfully negotiated. Configured per printer. Default = 10
Referenced Film Session Sequence	(2010,0500)		
>Referenced SOP Class UID	(0008,1150)		1.2.840.10008.5.1.1.1
>Referenced SOP Instance UID	(0008,1155)		Returned by SCP in the Basic Film Session N-CREATE-RSP
Referenced Image Box Sequence	(2010,0510)		Returned by SCP
Referenced Presentation LUT Sequence	(2050,0500)	Sent only when Presentation LUT is successfully negotiated	Returned by SCP only when Presentation LUT is successfully negotiated
>Referenced SOP Class UID	(0008,1150)		1.2.840.10008.5.1.1.23
>Referenced SOP Instance UID	(0008,1155)		Returned by SCP in the Basic Film Box N-CREATE-RSP

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

Table 3.2.2-11
DICOM COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. Proceed to next step.
Failure	Existing Film Box	C616	Proceed to next step.
Warning or Failure	Any	Any	AE aborts association. Error message to user indicates "A DICOM DIMSE error was returned in a response." Specific status information is logged.

3.2.2.3.1.3.3 Specific Conformance to Basic Image Box SOP Class

Table 3.2.2-12
Basic Image Box SOP Class: Supported DIMSE Operations

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

Table 3.2.2-13
Basic Image Box SOP Class: Supported Attributes

Attribute Name	Tag	Supported Values	Default Value
Image Box Position	(2020,0010)	1	1
Polarity	(2020,0020)	NORMAL	NORMAL
Basic Grayscale Image Sequence	(2020,0110)		
> Samples Per Pixel	(0028,0002)	1	
> Photometric Interpretation	(0028,0004)	MONOCHROME2	
> Rows	(0028,0010)		Depends on image size

Attribute Name	Tag	Supported Values	Default Value
> Columns	(0028,0011)		Depends on image size
> Pixel Aspect Ratio	(0028,0034)	180\180	
> Bits Allocated	(0028,0100)	16	
> Bits Stored	(0028,0101)	12	
> High Bit	(0028,0102)	11	
> Pixel Representation	(0028,0103)	0000H	
> Pixel Data	(7FE0,0010)		
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	Configured per printer. Overrides corresponding Film Box attribute.
Smoothing Type	(2010,0080)	(Configurable)	Configured per printer. Sent only if Magnification Type is CUBIC. Overrides corresponding Film Box attribute.
Requested Image Size	(2020,0030)		Indicates required row size (true size) in mm.

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

Table 3.2.2-14
N-SET RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. Proceed to next step.
Failure	Any	Any	AE aborts association. Error message to user indicates "A DICOM DIMSE error was returned in a response." Specific status information is logged.

3.2.2.3.1.3.4 Specific Conformance to Printer SOP Class

Table 3.2.2-15
Printer SOP Class: Supported DIMSE operations

Name	Description
N-EVENT-REPORT	Receives status notification.
N-GET	Retrieves an instance of a physical printer.

The Print Client displays descriptive text corresponding to Printer Status Info (2110,0020) attribute values received from a remote print AE using the N-GET operation, or received via N-EVENT-REPORT. The displayed text is based on DICOM PS 3.3, C.13.9.1. When the remote print AE sends a Printer Status Info value that is not recognized, the Print Client displays the Printer Status Info value directly.

The behavior of Print Client AE when encountering status codes in a N-GET response is summarized in the table below:

Table 3.2.2-16
DICOM COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. Proceed to next step.
Failure	Any	Any	AE aborts association. Error message to user indicates "A DICOM DIMSE error was returned in a response." Specific status information is logged.

3.2.2.3.1.3.5 Specific Conformance to Presentation LUT SOP Class

Table 3.2.2-17
Presentation LUT SOP Class: Supported DIMSE operations

Name	Description
N-CREATE	Creates a Presentation LUT to be referenced by a film box

Table 3.2.2-18
Presentation LUT SOP Class: Supported Attributes

Attribute Name	Tag	Supported Values	Default Value
Presentation LUT Shape	(2050,0020)	IDENTITY INVERSE LIN OD	Configurable per printer.

The behavior of the Print Client when encountering status codes in the N-CREATE response is summarized in the table below:

Table 3.2.2-19
N-CREATE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. Proceed to next step.
Failure	Any	Any	AE aborts association. Error message to user indicates "A DICOM DIMSE error was returned in a response." Specific status information is logged.

3.2.2.3.1.3.6 Specific Conformance to Print Job SOP Class

Table 3.2.2-20
Print Job SOP Class: Supported DIMSE operations

Name	Description
N-EVENT-REPORT	Receives status notification.
N-GET	Retrieves an instance of an existing print job.

The Print Client displays descriptive text corresponding to Execution Status Info (2100,0030) attribute values received from a remote print AE using the N-GET operation, or received via N-EVENT-REPORT. The displayed text is based on DICOM PS 3.3, C.13.9.1. When the remote print AE sends an Execution Status Info value that is not recognized, the Print Client displays the Execution Status Info value directly.

The behavior of Print Client AE when encountering status codes in a N-GET response is summarized in the table below:

Table 3.2.2-21
DICOM COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. Proceed to next step.
Failure	Any	Any	AE aborts association. Error message to user indicates "A DICOM DIMSE error was returned in a response." Specific status information is logged.

3.2.2.4 Association Acceptance Policy

The Print Client AE does not accept associations.

3.2.3 Storage Client AE

3.2.3.1 SOP Classes

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

Table 3.2.3-1
SOP CLASSES FOR STORAGE CLIENT 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	Yes	No
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	No
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	No
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No

3.2.3.2 Association Policies

3.2.3.2.1 General

The DICOM standard Application context shall be specified.

Table 3.2.3-2
DICOM APPLICATION CONTEXT

Application Context Name	1.2.840.10008.3.1.1.1

3.2.3.2.2 Number of Associations

Up to three associations are initiated at a time for the Storage Client AE.

3.2.3.2.3 Asynchronous Nature

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

3.2.3.2.4 Implementation Identifying Information

Table 3.2.3-3
DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGE CLIENT

Implementation Class UID	1.2.840.114089.1.0.0.3.4.10
Implementation Version Name	DCF 3.4.10c

3.2.3.3 Association Initiation Policy

3.2.3.3.1 Acquire Images / Print or Send Images

3.2.3.3.1.1 Description and Sequencing of Activities

When the user closes a patient an internal request to transmit all the newly acquired image data to pre-selected remote storage AEs is generated. The Storage Client then attempts to establish an association with each remote storage AE and transmits the newly acquired images within one association. The Storage Client releases the association after receiving the last response from the remote storage AE.

When a storage request is generated to transmit images from the Workstation, the Storage Client establishes an association with a remote storage AE, requesting the configured SOP Classes. The SOP Classes are configured per remote storage AE. After the association is established a C-STORE request is made to transfer an image to the remote storage AE. The Storage Client waits for a C-STORE response to be received before sending the next C-STORE request or releasing the association.

3.2.3.3.1.2 Proposed Presentation Contexts

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

Table 3.2.3-4
PROPOSED PRESENTATION CONTEXTS FOR ACQUIRE IMAGES/PRINT OR SEND IMAGES

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	See Table 3.2.3-5		SCU	None
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	See Table 3.2.3-5		SCU	None
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	See Table 3.2.3-5		SCU	None
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	See Table 3.2.3-5		SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	See Table 3.2.3-5		SCU	None

Table 3.2.3-5
PROPOSED TRANSFER SYNTAXES FOR ACQUIRE IMAGES/PRINT OR SEND IMAGES

Transfer Syntax Table	
Name	**UID**
JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression	1.2.840.10008.1.2.4.70
Explicit VR Little Endian	1.2.840.10008.1.2.1
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Big Endian	1.2.840.10008.1.2.2
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90

3.2.3.3.1.3 SOP Specific Conformance for Storage

The behavior of the Workstation when encountering status codes in a C-STORE response is summarized in the table below.

Table 3.2.3-6
C-STORE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully stored the SOP Instance. Proceed to next step.
Warning	Coercion of Data Elements	B000	AE aborts association. Error message to user indicates “A DICOM DIMSE error was returned in a response: Data element coercion”.
	Data set does not match SOP Class	B007	AE aborts association. Error message to user indicates “A DICOM DIMSE error was returned in a response: Data set does not match (warning)”.

Service Status	Further Meaning	Error Code	Behavior
	Elements discarded	B006	AE aborts association. Error message to user indicates “A DICOM DIMSE error was returned in a response: Elements discarded”.
	Attribute list error	0107	AE aborts association. Error message to user indicates “A DICOM DIMSE error was returned in a response: Unrecognized attribute”.
Failure	Refused: Out of resources	A7xx	Upon receiving the initial error code, the AE aborts the association. The application will then begin a retry strategy. When the retry strategy fails an error message to user indicates “A DICOM DIMSE error was returned in a response: Out of resources”.
	Data set does not match SOP Class	A9xx	AE aborts association. Error message to user indicates “A DICOM DIMSE error was returned in a response: Data set does not match (error)”.
	Cannot understand	Cxxx	AE aborts association. Error message to user indicates “A DICOM DIMSE error was returned in a response: Cannot understand”.
	Class instance conflict	0119	AE aborts association. Error message to user indicates “A DICOM DIMSE error was returned in a response: Class instance conflict”.

The behavior of the Workstation during communication failure is summarized in the table below. Depending on the type of failure, and retry configuration, the send job may be retried several times before reporting an error to the user.

Table 3.2.3-7
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The Association is aborted and an error message is posted to the user: “Timeout waiting for response.”
Association aborted by SCP	The error message "Unable to connect to destination host/port" is posted to the user.

Instance UIDs are globally unique for all SOP instances generated by the Workstation. The UID root is “1.2.840.113681.”

- The Workstation populates all Type 1 attributes with valid data and always sends them to the Remote Storage AE.
- The Workstation sends all Type 2 attributes and populates them if valid source data are available.
- When configured the Workstation sends Type 3 (optional), standard extended, and private attributes to the Remote Storage AE and populates them if valid source data are available.

3.2.3.4 Association Acceptance Policy

The Storage Client AE does not accept associations.

3.2.4 Storage Commitment Client AE

3.2.4.1 SOP Classes

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

Table 3.2.4-1
SOP CLASS FOR STORAGE COMMITMENT CLIENT AE

SOP Class Name	SOP Class UID	SCU	SCP
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No

3.2.4.2 Association Policies

3.2.4.2.1 General

The DICOM standard Application context shall be specified.

Table 3.2.4-2
DICOM APPLICATION CONTEXT

Application Context Name	1.2.840.10008.3.1.1.1

3.2.4.2.2 Number of Associations

One association is initiated at a time for the Storage Commitment Client AE.

3.2.4.2.3 Asynchronous Nature

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

3.2.4.2.4 Implementation Identifying Information

Table 3.2.4-3
DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGE COMMITMENT CLIENT

Implementation Class UID	1.2.840.114089.1.0.0.3.4.10
Implementation Version Name	DCF 3.4.10c

3.2.4.3 Association Initiation Policy

3.2.4.3.1 Commit Images

3.2.4.3.1.1 Description and Sequencing of Activities

When the Storage Commitment Client is configured it attempts to establish an association with a remote storage commitment AE after the Storage Client AE receives successful C-STORE responses for one or more images. When an association is established, a N-ACTION request is sent to request storage commitment for previously stored images. The Storage Commitment Client releases the association immediately after receiving the N-ACTION response from the remote storage commitment AE.

3.2.4.3.1.2 Proposed Presentation Contexts

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

Table 3.2.4-4
PROPOSED PRESENTATION CONTEXTS FOR COMMIT IMAGES

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

3.2.4.3.1.3 SOP Specific Conformance for Storage Commitment

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

Table 3.2.4-5
N-ACTION RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The request for storage comment is considered successfully sent. The commit status of each image is set to REQUESTED.
Warning	Attribute value out of range	0106	AE aborts association. Error message to user indicates: “A DICOM DIMSE error was returned in a response. Storage Commit job failed.”
Failure	Unrecognized operation	0211	AE aborts association. Error message to user indicates: “A DICOM DIMSE error was returned in a response. Storage commit job failed.”

The behavior of the Workstation during communication failure is summarized in the table below. Depending on the type of failure, and retry configuration, the commit job request may be retried several times before reporting an error to the user.

Table 3.2.4-6
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The Association is aborted and an error message if posted to the user: “Storage Commit job was not acknowledged in the allotted time. Status of commit job is unknown.”
Association aborted by SCP	The error message “Cannot open socket to specified host/port, a network error has occurred, or received abort from remote system” is posted to the user.

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

Table 3.2.4-7
Supported Storage Commitment N-ACTION Attributes

Action Type Name	Action Type ID	Attribute	Tag	Notes
Request Storage Commitment	1	Transaction UID	(0008,1195)	Workstation generates
		Referenced SOP Sequence	(0008,1199)	One or more Items
		> Referenced SOP Class UID	(0008,1150)	1.2.840.10008.5.1.4.1.1.1.2 or 1.2.840.10008.5.1.4.1.1.1.2.1 or 1.2.840.10008.5.1.4.1.1.1.1 or 1.2.840.10008.5.1.4.1.1.1.1.1 or 1.2.840.10008.5.1.4.1.1.7
		> Referenced SOP Instance UID	(0008,1155)	Instance UID of image to be committed

3.2.4.4 Association Acceptance Policy

3.2.4.4.1 Receive Storage Commitment Response

3.2.4.4.1.1 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 an image. The Storage Commitment Client AE waits for a configurable time period, and if a N-EVENT-REPORT request is not received, the association is aborted.

The Transaction UID value in a received N-EVENT-REPORT request is checked. SOP Instance UIDs that are successfully committed are checked and recorded. SOP Instance UIDs that are not committed are logged.

3.2.4.4.1.2 Accepted Presentation Contexts

Table 3.2.4-8
ACCEPTED PRESENTATION CONTEXTS FOR 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

3.2.4.4.1.3 SOP Specific Conformance for Storage Commitment

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 request is summarized in the table below.

Table 3.2.4-9
STORAGE COMMITMENT N-EVENT-REPORT BEHAVIOR

Event Type Name	Event Type ID	Behavior
Storage Commitment Request Successful	1	The commit status of the Referenced SOP Instances under Referenced SOP Sequence (0008,1199) is set to ACKNOWLEDGED. Successfully committed SOP Instances are candidates for automatic deletion from the local database if local resources become scarce, unless they are otherwise protected from deletion. The conditions under which automatic deletion is initiated and the amount of space freed are site configurable.
Storage Commitment Request Complete – Failures Exist	2	The Referenced SOP Instances under Referenced SOP Sequence (0008,1199) are treated in the same way as in the success case (Event Type 1). A message is logged for each of the Referenced SOP Instances under Failed SOP Sequence (0008,1198).

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

Table 3.2.4-10
STORAGE COMMITMENT N-EVENT-REPORT RESPONSE STATUS

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	

3.2.5 Query/Retrieve Client AE

3.2.5.1 SOP Classes

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

Table 3.2.5-1
SOP CLASSES FOR QUERY/RETRIEVE CLIENT AE

SOP Class Name	SOP Class UID	SCU	SCP
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

3.2.5.2 Association Policies

3.2.5.2.1 General

The DICOM standard Application context shall be specified.

Table 3.2.5-2
DICOM APPLICATION CONTEXT

Application Context Name	1.2.840.10008.3.1.1.1

3.2.5.2.2 Number of Associations

One association is initiated at a time for the Query/Retrieve Client AE.

3.2.5.2.3 Asynchronous Nature

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

3.2.5.2.4 Implementation Identifying Information

Table 3.2.5-3
DICOM IMPLEMENTATION CLASS AND VERSION FOR QUERY/RETRIEVE CLIENT

Implementation Class UID	1.2.840.114089.1.0.0.3.4.10
Implementation Version Name	DCF 3.4.10c

3.2.5.3 Association Initiation Policy

3.2.5.3.1 Retrieve Prior Images

3.2.5.3.1.1 Description and Sequencing of Activities

The Query/Retrieve Client allows the user to enter matching keys that are used to query the remote Query/Retrieve AE using C-FIND requests. The Query/Retrieve Client then displays a list of patients returned in the C-FIND response until the configurable maximum is exceeded. If the maximum query response is exceeded, the user is notified and the remaining query responses are not displayed. The user may select one or more patients from the list, which signals the Query/Retrieve Client to generate C-MOVE request(s) to the remote Query/Retrieve AE. As C-MOVE requests are successfully completed the number of remaining C-MOVE requests decrements until there are no more outstanding C-MOVE requests remaining in the queue. The images received are made available for the user to view on the Workstation. The Query/Retrieve Client will post an alarm to the user when a C-MOVE operation fails.

The Query/Retrieve Client attempts to establish an association with a remote Query/Retrieve AE when an internal request to transmit a C-FIND -or C-MOVE request to a given remote Query/Retrieve AE is received. The Query/Retrieve Client releases the association after receiving the final C-FIND or C-MOVE response from the remote Query/Retrieve AE.

3.2.5.3.1.2 Proposed Presentation Contexts

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

Table 3.2.5-4
PROPOSED PRESENTATION CONTEXTS FOR RETRIEVE PRIOR IMAGES

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
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	See Table 3.2.5-5
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
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		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

Table 3.2.5-5

Field Name	Value	Description of Field
Relational-queries	1	Relational queries supported

3.2.5.3.1.3 SOP Specific Conformance for Query/Retrieve

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

Table 3.2.5-6
C-FIND AND C-MOVE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Matching is complete	0000	The SCP has returned all matching information, or sub-operations are complete. For C-FIND, perform follow-up query or display results to the user.
Pending	Matches or sub-operations are continuing	FF00	For C-FIND, the matching query result contained in the identifier is collected for later display.
Warning or Failure	Any	Any	Workstation aborts association. Error message to the user indicates the Query Response Status error code, error comment, and DIMSE Status description.

The behavior of the Workstation during communication failure is summarized in the table below.

Table 3.2.5-7
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The Association is aborted and an error message is posted to the user: Query/Retrieve not acknowledged in the allotted time.
Association aborted by SCP	The Association is aborted and any C-FIND results received before this occurs are displayed to the user. For C-MOVE, an error is indicated: “There were error(s) when pulling back the image(s): Cannot open socket to specified host/port, a network error has occurred, or received abort from remote system.”

The Query/Retrieve Client provides standard conformance to the Study Root Information Model. When the hierarchical method is configured, a Study level query is sent, and the responses are used to send follow-up Series level queries automatically. For retrieve, a Series level move request is sent, containing the Study Instance UID of the study to retrieve and the Series Instance UID of the series to retrieve. When the relational method is configured, one Study level query is sent. The relational method is not used for retrieve:

The Query/Retrieve Client supports default query Matching Key Attributes as defined in the following tables. The Matching Key Attributes are contained in configuration files per Query/Retrieve provider and can be modified as required for compatibility with remote Query/Retrieve AEs. The user supplies Matching Key Attribute values other than Modality either my manual entry or range selection.

Table 3.2.5-8
DEFAULT C-FIND MATCHING KEY ATTRIBUTES (HIERARCHICAL)

Matching Key Attribute	Tag	Matching Type
Study Level		
Study Date	(0008,0020)	Single Value, Range or Universal
Study Time	(0008,0030)	Universal
Accession Number	(0008,0050)	Single Value or Universal
Referring Physician's Name	(0008,0090)	Universal
Patient's Name	(0010,0010)	Wild Card
Patient ID	(0010,0020)	Single Value or Wild Card
Patient's Sex	(0010,0040)	Universal
Study Instance UID	(0020,000D)	Universal
Series Level		
Modality	(0008,0060)	Single Value or Wild Card (MG)
Series Description	(0008,103E)	Universal
Study Instance UID	(0020,000D)	Single Value (from Study level result)
Series Instance UID	(0020,000E)	Universal
Series Number	(0020,0011)	Universal
Scheduled Procedure Step ID	(0040,0009)	Universal
Performed Procedure Step Start Date	(0040,0244)	Universal
Performed Procedure Step Start Time	(0040,0245)	Universal
Requested Procedure ID	(0040,1001)	Universal

Table 3.2.5-9
DEFAULT C-FIND MATCHING KEY ATTRIBUTES (RELATIONAL)

Matching Key Attribute	Tag	Matching Type
Study Date	(0008,0020)	Single Value, Range or Universal
Study Time	(0008,0030)	Universal
Accession Number	(0008,0050)	Single Value or Universal
Modality	(0008,0060)	Single Value or Wild Card (MG)
Modalities in Study	(0008,0061)	Wild Card (MG)
Referring Physician's Name	(0008,0090)	Single Value or Universal
Patient's Name	(0010,0010)	Wild Card
Patient ID	(0010,0020)	Single Value or Wild Card
Patient's Sex	(0010,0040)	Single Value or Universal
Study Instance UID	(0020,000D)	Universal
Series Instance UID	(0020,000E)	Universal
Study ID	(0020,0010)	Universal
Series Number	(0020,0011)	Universal

3.2.5.4 Association Acceptance Policy

The Query/Retrieve Client AE does not accept associations.

3.2.6 Storage Server AE

3.2.6.1 SOP Classes

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

Table 3.2.6-1
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
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	No	Yes
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	No	Yes
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	No	Yes
Breast Projection X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.13.1.4	No	Yes
Breast Projection X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.13.1.5	No	Yes
Verification SOP Class	1.2.840.10008.1.1	No	Yes

3.2.6.2 Association Policies

3.2.6.2.1 General

The DICOM standard Application context shall be specified.

Table 3.2.6-2
DICOM APPLICATION CONTEXT

Application Context Name	1.2.840.10008.3.1.1.1

3.2.6.2.2 Number of Associations

The Storage Server AE by default accepts up to 30 simultaneous associations.

3.2.6.2.3 Asynchronous Nature

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

3.2.6.2.4 Implementation Identifying Information

Table 3.2.6-3
DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGE SERVER

Implementation Class UID	1.2.840.114089.1.0.0.3.4.10
Implementation Version Name	DCF 3.4.10c

3.2.6.3 Association Initiation Policy

The Storage Server AE does not initiate associations.

3.2.6.4 Association Acceptance Policy

When the Storage Server AE accepts an association, it will respond to storage requests.

3.2.6.4.1 Store Images, Acknowledge Echo Requests

3.2.6.4.1.1 Description and Sequencing of Activities

The Storage Server AE starts upon launching the Workstation application. The Storage Server AE stores images that are received so they can be made available to the user. When the Workstation application receives a request to shut down, the Storage Server AE stops running after the configurable time (in seconds) assigned to the Shutdown Wait Seconds parameter has elapsed.

As a default, if a received SOP instance is a duplicate of an existing stored SOP instance, the received SOP instance is ignored, and the Workstation sends a success status in the C-STORE response. However, the Storage Server AE can be configured instead to delete the first received SOP instance and import the duplicate SOP instance, or to alert the user of an existing SOP instance.

3.2.6.4.1.2 Accepted Presentation Contexts

The Storage Server accepts establish associations using the following presentation contexts.

Note: Implicit VR Little Endian is the Transfer Syntax the Workstation will accept as a default when more than one transfer syntax is proposed within a presentation context.

Table 3.2.6-4
ACCEPTED PRESENTATION CONTEXTS FOR STORE IMAGES, ACK ECHO

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	See Table 3.2.3-5		SCP	None
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	See Table 3.2.3-5		SCP	None
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	See Table 3.2.3-5		SCP	None
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	See Table 3.2.3-5		SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	See Table 3.2.3-5		SCP	None
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	See Table 3.2.3-5		SCP	None
Breast Projection X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.13.1.4	See Table 3.2.3-5		SCP	None
Breast Projection X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.13.1.5	See Table 3.2.3-5		SCP	None
Verification SOP Class	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		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.2.6.4.1.3 SOP Specific Conformance for Storage

The Storage Server AE provides standard conformance to the Storage Service Class.

The Workstation will accept but discard non-Hologic For Processing images.

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

Table 3.2.6-5
C-STORE RESPONSE STATUS

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Image is stored locally and made available to the user, or C-ECHO request is acknowledged.
Failure	Processing failure	0110	There is not enough local storage capacity to store the image. Error commend (0000,0902) is sent.

3.2.7 Verification Client AE

3.2.7.1 SOP Classes

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

Table 3.2.7-1
SOP CLASS FOR VERIFICATION CLIENT AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	No

3.2.7.2 Association Policies

3.2.7.2.1 General

The DICOM standard Application context shall be specified.

Table 3.2.7-2
DICOM APPLICATION CONTEXT

Application Context Name	1.2.840.10008.3.1.1.1

3.2.7.2.2 Number of Associations

One association is initiated at a time for the Verification Client AE.

3.2.7.2.3 Asynchronous Nature

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

3.2.7.2.4 Implementation Identifying Information

Table 3.2.7-3
DICOM IMPLEMENTATION CLASS AND VERSION FOR VERIFICATION CLIENT

Implementation Class UID	1.2.840.114089.1.0.0.3.4.10
Implementation Version Name	DCF 3.4.10c

3.2.7.3 Association Initiation Policy

3.2.7.3.1 Echo Request

3.2.7.3.1.1 Description and Sequencing of Activities

The Workstation provides the user with the capability to C-ECHO any remote Service Class Provider configured on the system as a virtual device.

3.2.7.3.1.2 Proposed Presentation Contexts

The Verification Client attempts to establish associations using the following Presentation Contexts.

Table 3.2.7-4
PROPOSED PRESENTATION CONTEXTS FOR ECHO REQUEST

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

3.2.7.3.1.3 SOP Specific Conformance for Verification SOP Class

Verification Client provides standard conformance to the Verification Service Class. The behavior of the Workstation when encountering status codes in a C-ECHO response is summarized in the table below.

Table 3.2.7-5
C-ECHO RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Indicate a status of success to the user.
Failure	Any	Any	Indicate a status of failure to the user.

3.2.7.4 Association Acceptance Policy

The Verification Client AE does not accept associations.

3.3. Network Interfaces

3.3.1 Physical Network Interface

The Workstation is tested and supports using 10-BaseT, 100-BaseT and 1000-BaseT Ethernet media.

3.3.2 Additional Protocols

None.

3.4. Configuration

The DICOM Query/Retrieve, Storage, Storage Commitment, Print, and Modality Worklist Clients are configured during site installation.

The Verification Client, used primarily as a troubleshooting tool, is made available through a service tool utility. It attempts to establish an association with a remote Verification SCP when invoked by the service tool utility. It requests one presentation context, the Verification SOP Class with the DICOM default transfer syntax.

The Storage Server acts as a Verification SCP. It accepts associations from any remote AE Title.

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
Storage Client	DIRECT_DIGXRAY	N/A
Print Client	DIRECT_DIGXRAY	N/A
Modality Worklist Client	DIRECT_DIGXRAY	N/A
Storage Commitment Client	DIRECT_DIGXRAY	104
Query/Retrieve Client	DIRECT_DIGXRAY	N/A
Local Storage Server	DIRECT_DIGXRAY	104
Verification Client	DIRECT_DIGXRAY	N/A

The default AE Title and TCP/IP Port number may be modified.

3.4.1.2 Remote AE Title/Presentation Address Mapping

Up to 64 Remote Storage or Print SCPs can be configured.

3.4.1.2.1 Remote Modality Worklist SCP

The following are some of the relevant configurable items for the Remote Modality Worklist SCP:

Table 3.4-2
Remote Modality Worklist SCP Configuration

Parameter description	Range
Application Entity Title (Called AE)	The Workstation supports multiple AEs acting as a Modality Worklist provider.
Remote Host/IP Address	IP address and hostname associated with the Modality Worklist provider AE.
Remote Port Number	Port number to use when establishing TCP/IP connection to the Modality Worklist provider AE. Range = 1 to 65,535
Study Code	The attribute used to match the procedure to be performed to the procedure codes available on the Workstation. The available Study Code attributes include: • (default) Requested Procedure Code Sequence, Code Value (0032,1064.0008,0100) • Requested Procedure Code Sequence, Code Meaning (0032,1064.0008,0104) • Scheduled Procedure Step Sequence, Scheduled Protocol Code Sequence, Code Meaning (0040,0100.0040,0008,0008,0104) • Scheduled Procedure Step Sequence, Scheduled Protocol Code Sequence, Code Value (0040,0100.0040,0008,0008,0100) • Scheduled Procedure Step Sequence, Scheduled Procedure Step Description (0040,0100.0040,0007) • Scheduled Procedure Step Sequence, Scheduled Procedure Step ID (0040,0100.0040,0009) • Study Description (0008,1030)

3.4.1.2.2 Remote Print SCP

The following are some of the relevant configurable items for each Remote Print SCP:

Table 3.4-3
Remote Print SCP Configuration

Parameter Description	Range
Application Entity Title (Called AE)	The Workstation supports multiple AEs acting as Remote Print SCP.

Parameter Description	Range
Remote Host/IP Address	IP address and hostname, one per Remote Print AE.
Remote Port Number	Port number to use when establishing TCP/IP connection, one per Remote Print AE. Range = 1 to 65,535
Transfer Syntax	• Implicit VR Little Endian • Explicit VR Little Endian • Explicit VR Big Endian
Print Job SOP Class	Enable or Disable
Presentation LUT Shape	• IDENTITY • INVERSE • LINEAR OD
Send Presentation LUT Info	Enable or Disable negotiation of Presentation LUT SOP Class

3.4.1.2.3 Remote Storage SCP

The following are some of the relevant configurable items for each Remote Storage SCP:

Table 3.4-4
Remote Storage SCP Configuration

Parameter Description	Range
Application Entity Title (Called AE)	The Workstation supports multiple AEs acting as Remote Storage SCP.
Remote Host/IP Address	IP address and hostname, one per Remote Storage AE.
Remote Port Number	Port number to use when establishing TCP/IP connection, one per Remote Storage AE. Range = 1 to 65,535
Store SOP Class(es)	• Digital Mammography X-Ray Image Storage - For Processing and/or • Digital Mammography X-Ray Image Storage – For Presentation and/or • Digital X-Ray Image Storage - For Processing and/or • Digital X-Ray Image Storage – For Presentation and/or • Secondary Capture Image Storage
Storage Commitment	Enable or disable
Transfer Syntax	• Implicit VR Little Endian • Explicit VR Little Endian • Explicit VR Big Endian • JPEG Lossless Non-Hierarchical First Order Prediction • JPEG 2000 (Lossless Only)

3.4.1.2.4 Remote Storage Commitment SCP

The following are some of the relevant configurable items for the Remote Storage Commitment SCP:

Table 3.4-5
Remote Storage Commitment SCP Configuration

Parameter description	Range
Application Entity Title (Called AE)	One Remote Storage AE should be configured for storage commitment, if desired.
Remote Host/IP Address	IP address and hostname of Remote Storage Commitment AE.
Port Number	Port number to be used when establishing TCP/IP connection to the Remote Storage Commitment SCP. Range = 1 to 65,535

3.4.1.2.5 Remote Query/Retrieve SCP

The following are some of the relevant configurable items for the Remote Query/Retrieve SCP:

Table 3.4-6
Remote Query/Retrieve SCP Configuration

Parameter description	Range
Application Entity Title (Called AE)	The Workstation supports one AE acting as a Query/Retrieve provider.

Parameter description	Range
Remote Host/IP Address	IP address and hostname of Remote Query/Retrieve provider.
Port Number	Port number to be used when establishing TCP/IP connection to the Remote Query/Retrieve provider. Range = 1 to 65,535
Transfer Syntax	• Implicit VR Little Endian or • Explicit VR Little Endian or • Explicit VR Big Endian
Query method	Hierarchical or Relational
Information Model	Study Root

3.4.2 Configuration Parameters for Local AEs

The following are some of the relevant configurable items for the local AEs:

Table 3.4-8 – CONFIGURATION PARAMETERS

Parameter	Configurable (Yes/No)	Default Value
Modality Worklist Client		
Polling (On/Off)	Yes	Off
Poll interval in minutes	Yes	10
MWL query timeout: Number of seconds to wait for C-FIND response	Yes	30
Maximum number of MWL items accepted	Yes	500
Matching Keys: Configured and mapped using attributes defined in section 3.2.1.3.1.3	Yes	
Return Keys: Configured and mapped using attributes defined in section 3.2.1.3.1.3	Yes	
Storage Commitment Client		
Response timeout: Number of seconds to wait for N-EVENT-REPORT request.	Yes	3600
Query/Retrieve Client		
C-FIND Timeout: Number of seconds to wait for C-FIND response.	Yes	60
C-MOVE Timeout: Number of seconds to wait for C-MOVE response	Yes	600
Date Display Format:	Yes	DICOM Date Format
Max Entries: Maximum number of entries listed as a result of a query.	Yes	300
Storage Server		
Host: The IP address of the Storage Server. When it is set to 0.0.0.0 the system default IP will be used.	Yes	0.0.0.0
AE Title: The AE Title of the Storage Server	Yes	DIRECT_DIGXRAY
TCP port: Port on which the Acquisition Workstation Association Manager listens.	Yes	104
Maximum Concurrent Associations	Yes	30
AE Title Case Sensitive	Yes	No
Duplicate UID: determines how a duplicate SOP Instance is handled	Yes	Ignore

4.0 Media Interchange

4.1. Implementation Model

4.1.1 Application Data Flow Diagram

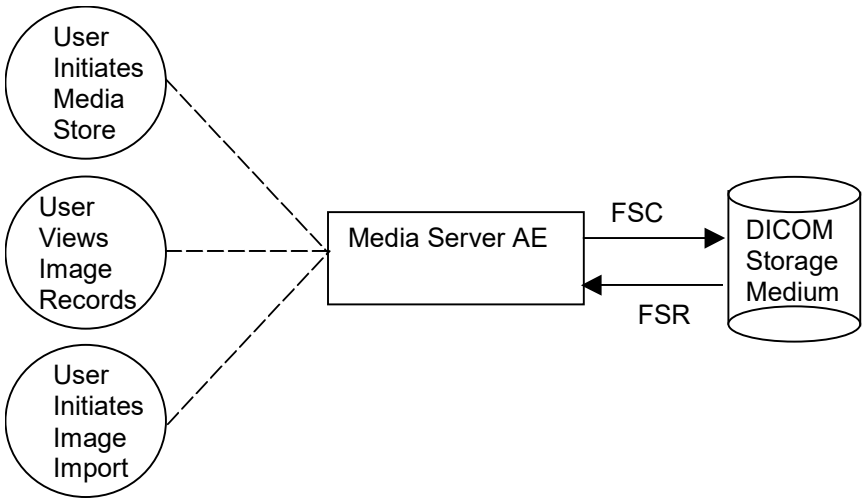


Figure 4.1-1 Application Data Flow Diagram for Media Storage

The Media Server AE provides a means to export image instances using DICOM PS 3.10: Media Storage and File Format for Media Interchange. The instances can be recorded and read via removable media. This feature is provided as a matter of convenience for users to move objects from one system to another via removable media. This feature is not intended to serve as an archive for permanently storing images.

4.1.2 Functional Definition of AEs

The Media Server AE can store Digital Mammography X-Ray For Processing, For Presentation, Digital X-Ray For Processing, For Presentation and Secondary Capture images to removable media as DICOM PS 3.10 media files (see Table 1-2).

The Media Server AE can read Digital Mammography X-Ray For Processing, For Presentation, Digital X-Ray For Processing, For Presentation, Breast Tomosynthesis Image, Breast Projection X-Ray For Processing, For Presentation and Secondary Capture images DICOM PS 3.10 media files from removable media

The Workstation supports DICOM Media Storage as both FSC and FSR.

4.1.3 Sequencing of Real World Activities

The Workstation user interface provides access to configure and use removable media as an output device to export acquired and created images to removable media.

The Workstation user interface provides access to view the content of removable media and to select items to import from removable media to the Workstation.

4.1.4 File Meta Information for Implementation Class Version

The implementation information written to the File Meta Header in each file is:

Table 4.1-1
DICOM IMPLEMENTATION CLASS AND VERSION FOR MEDIA STORAGE

Implementation Class UID	1.2.840.114089.1.0.0.3.4.10
Implementation Version Name	DCF 3.4.10c

4.2. AE Specifications

4.2.1 Media Server AE Specification

The Media Server AE provides standard conformance to the DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed below:

Table 4.2-1
AE RELATED APPLICATION PROFILES, REAL-WORLD ACTIVITIES, AND ROLES

Supported Application Profile	Real-World Activity	Roles
STD-GEN-USB	User Initiates Media Store	FSC
	User Views Image Records	FSR
	User Initiates Image Import	FSR
STD-GEN-USB-JPEG	User Initiates Media Store	FSC
	User Views Image Records	FSR
	User Initiates Image Import	FSR
STD-GEN-USB-J2K	User Initiates Media Store	FSC
	User Views Image Records	FSR
	User Initiates Image Import	FSR

4.2.1.1 File Meta Information for Media Server AE

The Source Application Entity Title included in the File Meta Header is ‘DCF’.

4.2.1.2 Real-World Activities

4.2.1.2.1 User Initiates Media Store

The Media Server AE acts as an FSC using the interchange option when requested to export images to removable media such as USB.

A service utility is available to configure the SOP Classes to write to removable media. The removable media device is available as an output destination via the Export utility found on the Performed Exam Page (PEP).

4.2.1.2.1.1 Media Storage Application Profile

The Media Server AE FSC supports the STD-GEN-USB, STD-GEN-USB-JPEG and STD-GEN-USB-J2K Application Profiles.

4.2.1.2.1.1.1 Options

The Media Server AE FSC supports the SOP Classes and Transfer Syntaxes listed in the table below:

Table 4.2-2
SOP CLASSES AND TRANSFER SYNTAXES FOR MEDIA SERVER

SOP Class Name	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Media Storage Directory Storage	1.2.840.10008.1.3.10	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	See Table 3.2.3-5	
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	See Table 3.2.3-5	
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	See Table 3.2.3-5	
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	See Table 3.2.3-5	
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	See Table 3.2.3-5	

4.2.1.2.2 User Views Image Records, User Initiates Image Import

User Views Image Records: No installation or configuration is required to view the contents of removable media. Using the Import tool found in the Admin utility, the Workstation user can view the directory of removable media including patient, study, series, and image information.

User Initiates Image Import: Images can be imported from removable media to the Workstation database without any special installation or configuration. Using the Import tool, the Workstation can import any DICOM PS 3.10 conformant media file of the supported SOP Classes, except non-Hologic For Processing images. The user can choose to import the entire media content, all images of a specific patient, study, or specific image(s). A validation utility that is part of the import process ensures proper patient and study identification.

4.2.1.2.2.1 Media Storage Application Profile

The Media Server AE FSR supports the STD-GEN-USB, STD-GEN-USB-JPEG and STD-GEN-USB-J2K Application Profiles.

4.2.1.2.2.1.1 Options

The Media Server AE FSR supports the SOP Classes and Transfer Syntaxes listed in the table below:

Table 4.2-3
SOP CLASSES AND TRANSFER SYNTAXES FOR MEDIA SERVER

SOP Class Name	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Media Storage Directory Storage	1.2.840.10008.1.3.10	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	See Table 3.2.3-5	
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	See Table 3.2.3-5	
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	See Table 3.2.3-5	
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	See Table 3.2.3-5	
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	See Table 3.2.3-5	
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	See Table 3.2.3-5	
Breast Projection X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.13.1.4	See Table 3.2.3-5	
Breast Projection X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.13.1.5	See Table 3.2.3-5	

4.3. Augmented and Private Application Profiles

None

4.4. Media Configuration

The Media output device may be configured to store Digital Mammography X-Ray Image Storage - For Presentation, Digital Mammography X-Ray Image Storage - For Processing, Digital X-Ray Image Storage – For Presentation, Digital X-Ray Image Storage – For Processing and Secondary Capture Image Storage SOP instances. The Media label, File-set ID (0004,1130), is configurable.

5.0 Support of Character Sets

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

- Default: ISO-IR 6
- Latin Alphabet No. 1: ISO-IR 100

6.0 Security

The Trident HD Workstation does not support any specific DICOM security measures.

It is assumed that the Workstation 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 Workstation.
- Firewall or router protections to ensure that the Workstation 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

7.1.1.1 Digital Mammography X-Ray Image and Digital X-Ray Image IODs

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	ALWAYS
Series	General Series	Table 7.1-4	ALWAYS
	DX Series	Table 7.1-4	ALWAYS
	Mammography Series	Table 7.1-4	ALWAYS (Mammography)
Equipment	General Equipment	Table 7.1-5	ALWAYS
Image	General Reference	Table 7.1-6	ANAP
	General Image	Table 7.1-7	ALWAYS
	Image Pixel	Table 7.1-8	ALWAYS
	DX Anatomy Imaged	Table 7.1-7	ALWAYS
	DX Image	Table 7.1-7	ALWAYS
	DX Detector	Table 7.1-9	ALWAYS
	DX Positioning	Table 7.1-10	ALWAYS
	X-Ray Acquisition Dose	Table 7.1-11	ALWAYS
	X-Ray Generation	Table 7.1-12	ALWAYS
	X-Ray Filtration	Table 7.1-11	ALWAYS
	Mammography Image	Table 7.1-7	ALWAYS (Mammography)
	VOI LUT	Table 7.1-7	ALWAYS
	Acquisition Context	Table 7.1-13	ALWAYS
	SOP Common	Table 7.1-14	ALWAYS

Table 7.1-2
Patient Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Patient's Name	(0010,0010)		ALWAYS	MWL, USER
Patient ID	(0010,0020)		ALWAYS	MWL, USER
Issuer of Patient ID	(0010,0021)		ANAP	MWL
Patient's Birth Date	(0010,0030)		ALWAYS	MWL, USER
Patient's Sex	(0010,0040)		ALWAYS	MWL, USER
Other Patient IDs	(0010,1000)		ANAP	MWL

Table 7.1-3
General / Patient Study Modules 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	MWL, USER
Referring Physician's Name	(0008,0090)		VNAP	MWL, USER
Study Description	(0008,1030)	Based on selected procedure	ALWAYS	MWL, AUTO
Patient's Age	(0010,1010)	Calculated from (0010,0030) and (0008,0020), the patient's age when the study was performed	ALWAYS	AUTO
Study Instance UID	(0020,000D)	Unique value generated if not provided by MWL	ALWAYS	MWL, AUTO
Study ID	(0020,0010)		ALWAYS	AUTO

Table 7.1-4
General / DX / Mammography Series Modules of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Series Date	(0008,0021)		ALWAYS	AUTO
Series Time	(0008,0031)		ALWAYS	AUTO
Modality	(0008,0060)	Based on selected procedure: MG or DX	ALWAYS	AUTO
Presentation Intent Type	(0008,0068)	Original image: "FOR PROCESSING" Derived image: "FOR PRESENTATION"	ALWAYS	AUTO
Series Description	(0008,103E)	Based on selected procedure: 'L SPECIMEN', 'R SPECIMEN' or 'SPECIMEN'	ALWAYS	AUTO
Operators' Name	(0008,1070)		ALWAYS	AUTO
Body Part Examined	(0018,0015)	Based on selected procedure, e.g., BREAST	ALWAYS	AUTO/USER
Series Instance UID	(0020,000E)	Unique value generated	ALWAYS	AUTO
Series Number	(0020,0011)	1	ALWAYS	AUTO
Request Attributes Sequence	(0040,0275)	One Item	ALWAYS	AUTO
>Requested Procedure Description	(0032,1060)		ANAP	MWL
>Requested Procedure Code Sequence	(0032,1064)		ANAP	MWL
>>Code Value	(0008,0100)		ANAP	MWL
>>Coding Scheme Designator	(0008,0102)		ANAP	MWL
>>Code Meaning	(0008,0104)		ANAP	MWL
>Scheduled Procedure Step Description	(0040,0007)		ANAP	MWL

Attribute Name	Tag	Value	Presence of Value	Source
>Scheduled Protocol Code Sequence	(0040,0008)		ANAP	MWL
>>Code Value	(0008,0100)		ANAP	MWL
>>Coding Scheme Designator	(0008,0102)		ANAP	MWL
>>Code Meaning	(0008,0104)		ANAP	MWL
>Scheduled Procedure Step ID	(0040,0009)		ANAP	MWL
>Requested Procedure ID	(0040,1001)		ANAP	MWL
>Reason for Requested Procedure Code Sequence	(0040,100A)	At least one Item, representing (R-408C3, SRT, “Diagnostic”)	ALWAYS	AUTO/MWL
>>Code Value	(0008,0100)		ALWAYS	AUTO/MWL
>>Coding Scheme Designator	(0008,0102)		ALWAYS	AUTO/MWL
>>Code Meaning	(0008,0104)		ALWAYS	AUTO/MWL

Table 7.1-5
General Equipment Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Manufacturer	(0008,0070)	HOLOGIC, Inc.	ALWAYS	CONFIG
Institution Name	(0008,0080)		ALWAYS	CONFIG
Institution Address	(0008,0081)		ALWAYS	CONFIG
Station Name	(0008,1010)		ALWAYS	CONFIG
Institutional Department Name	(0008,1040)		ALWAYS	CONFIG
Manufacturer's Model Name	(0008,1090)	Trident HD	ALWAYS	CONFIG
Device Serial Number	(0018,1000)		ALWAYS	CONFIG
Software Versions	(0018,1020)	Multiple values	ALWAYS	AUTO

Table 7.1-6
General Reference Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Source Image Sequence	(0008,2112)	Original image: not included Derived image: One item	ANAP	AUTO
>Referenced SOP Class UID	(0008,1150)	Digital Mammography X-Ray Image – For Processing or Digital X-Ray Image – For Processing	ANAP	AUTO
>Referenced SOP Instance UID	(0008,1155)	SOP Instance UID of the source For Processing image	ANAP	AUTO
>Spatial Locations Preserved	(0028,135A)	YES	ANAP	AUTO
>Purpose of Referenced Code Sequence	(0040,A170)	One Item	ANAP	AUTO
>>Code Value	(0008,0100)	121322	ANAP	CONFIG
>>Coding Scheme Designator	(0008,0102)	DCM	ANAP	CONFIG
>>Code Meaning	(0008,0104)	Source image for image processing operation	ANAP	CONFIG

Table 7.1-7
General / DX / Mammography Image / DX Anatomy Imaged / VOI LUT Modules of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Image Type	(0008,0008)	Original: ORIGINAL\PRIMARY Derived: DERIVED\PRIMARY	ALWAYS	AUTO
Acquisition Date	(0008,0022)		ALWAYS	AUTO
Content Date	(0008,0023)	Same as Acquisition Date (0008,0022)	ALWAYS	AUTO

Attribute Name	Tag	Value	Presence of Value	Source
Acquisition Time	(0008,0032)		ALWAYS	AUTO
Content Time	(0008,0033)	Same as Acquisition Time (0008,0032)	ALWAYS	AUTO
Anatomic Region Sequence	(0008,2218)	One Item based on selected procedure, e.g., representing (T-04000, SRT, “Breast”)	ALWAYS	AUTO/USER
>Code Value	(0008,0100)		ALWAYS	AUTO
>Code Scheme Designator	(0008,0102)		ALWAYS	AUTO
>Code Meaning	(0008,0104)		ALWAYS	AUTO
Distance Source to Detector	(0018,1110)		ALWAYS	CONFIG
Distance Source to Patient	(0018,1111)	Depends on contact, 1.5 mag or 2.0 mag	ALWAYS	CONFIG
Positioner Type	(0018,1508)	NONE	ALWAYS	AUTO
Positioner Primary Angle	(0018,1510)	0	ALWAYS	AUTO
Instance Number	(0020,0013)		ALWAYS	AUTO
Patient Orientation	(0020,0020)		EMPTY	AUTO
Image Laterality	(0020,0062)	Based on selected procedure: R, L or U	ALWAYS	AUTO/USER
Image Comments	(0020,4000)	Included if user enters	ANAP	USER
Samples per Pixel	(0028,0002)	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	Original image: MONOCHROME1 Derived image: MONOCHROME2	ALWAYS	AUTO
Bits Allocated	(0028,0100)	16	ALWAYS	AUTO
Bits Stored	(0028,0101)	Original: 14 Derived: 12	ALWAYS	AUTO
High Bit	(0028,0102)	Original: 13 Derived: 11	ALWAYS	AUTO
Pixel Representation	(0028,0103)	0000H	ALWAYS	AUTO
Burned in Annotation	(0028,0301)	NO	ALWAYS	AUTO
Pixel Intensity Relationship	(0028,1040)	Original image: LIN Derived image: LOG	ALWAYS	AUTO
Pixel Intensity Relationship Sign	(0028,1041)	Original image: 1 Derived image: -1	ALWAYS	AUTO
Window Center	(0028,1050)		ALWAYS	AUTO/CONFIG
Window Width	(0028,1051)		ALWAYS	AUTO/CONFIG
Rescale Intercept	(0028,1052)	0	ALWAYS	AUTO
Rescale Slope	(0028,1053)	1	ALWAYS	AUTO
Rescale Type	(0028,1054)	US	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	00	ALWAYS	AUTO
Organ Exposed	(0040,0318)	Mammography: BREAST	ANAP	AUTO
View Code Sequence	(0054,0220)	One Item based on selected procedure: (G-8310, SRT, “tissue specimen from breast”) or (G-8300, SRT, “tissue specimen”)	ALWAYS	AUTO/USER
>Code Value	(0008,0100)		ALWAYS	AUTO
>Code Scheme Designator	(0008,0102)		ALWAYS	AUTO
>Code Meaning	(0008,0104)		ALWAYS	AUTO
>View Modifier Code Sequence	(0054,0222)	Zero or one Item	VNAP	AUTO/USER
>>Code Value	(0008,0100)	R-102D6	ANAP	AUTO
>>Code Scheme Designator	(0008,0102)	SRT	ANAP	AUTO
>>Code Meaning	(0008,0104)	Magnification	ANAP	AUTO
Presentation LUT Shape	(2050,0020)	Original image: INVERSE Derived image: IDENTITY	ALWAYS	AUTO

Table 7.1-8
Image Pixel Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	See Table 7.1-7		
Photometric Interpretation	(0028,0004)	See Table 7.1-7		
Rows	(0028,0010)		ALWAYS	AUTO
Columns	(0028,0011)		ALWAYS	AUTO
Bits Allocated	(0028,0100)	See Table 7.1-7		
Bits Stored	(0028,0101)	See Table 7.1-7		
High Bit	(0028,0102)	See Table 7.1-7		
Pixel Representation	(0028,0103)	See Table 7.1-7		
Pixel Data	(7FE0,0010)		ALWAYS	AUTO

Table 7.1-9
DX Detector Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Imager Pixel Spacing	(0018,1164)	.70\.70	ALWAYS	AUTO
Detector Temperature	(0018,7001)		ALWAYS	AUTO
Detector Type	(0018,7004)	DIRECT	ALWAYS	AUTO
Detector ID	(0018,700A)		ALWAYS	AUTO
Date of Last Detector Calibration	(0018,700C)		ALWAYS	AUTO
Time of Last Detector Calibration	(0018,700E)		ALWAYS	AUTO
Detector Binning	(0018,701A)	1\1	ALWAYS	AUTO
Field of View Origin	(0018,7030)		ALWAYS	AUTO
Field of View Rotation	(0018,7032)	90	ALWAYS	AUTO
Field of View Horizontal Flip	(0018,7034)	NO	ALWAYS	AUTO
Pixel Spacing	(0028,0030)	Depends on magnification factor	ALWAYS	AUTO

Table 7.1-10
DX Positioning Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
Distance Source to Detector	(0018,1110)	See Table 7.1-7		
Distance Source to Patient	(0018,1111)	See Table 7.1-7		
Estimated Radiographic Magnification Factor	(0018,1114)	Contact: 1.033 1.5 mag: 1.5 2.0 mag: 2.0	ALWAYS	CONFIG
Positioner Type	(0018,1508)	See Table 7.1-7		
Positioner Primary Angle	(0018,1510)	See Table 7.1-7		
View Code Sequence	(0054,0220)	See Table 7.1-7		

Table 7.1-11
X-ray Acquisition Dose / X-Ray Filtration Modules of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
KVP	(0018,0060)		ALWAYS	AUTO
Distance Source to Detector	(0018,1110)	See Table 7.1-7		
Distance Source to Patient	(0018,1111)	See Table 7.1-7		
Exposure Time	(0018,1150)		ALWAYS	AUTO
X-Ray Tube Current	(0018,1151)		ALWAYS	AUTO
Exposure	(0018,1152)		ALWAYS	AUTO
Exposure in µAs	(0018,1153)		ALWAYS	AUTO
Filter Type	(0018,1160)	NONE	ALWAYS	AUTO
Anode Target Material	(0018,1191)	TUNGSTEN	ALWAYS	AUTO
Organ Exposed	(0040,0318)	See Table 7.1-7		
Relative X-Ray Exposure	(0018,1405)		ALWAYS	AUTO

Table 7.1-12
X-Ray Generation Module of Created SOP Instances

Attribute Name	Tag	Value	Presence of Value	Source
KVP	(0018,0060)	See Table 7.1-11		
Exposure Time	(0018,1150)	See Table 7.1-11		
X-ray Tube Current	(0018,1151)	See Table 7.1-11		
Exposure	(0018,1152)	See Table 7.1-11		
Exposure in uAs	(0018,1153)	See Table 7.1-11		
Focal Spot	(0018,1190)		ALWAYS	AUTO
Anode Target Material	(0018,1191)	See Table 7.1-11		
Exposure Control Mode	(0018,7060)	MANUAL or AUTOMATIC	ALWAYS	AUTO
Exposure Control Mode Description	(0018,7062)	Manual or Auto	ALWAYS	AUTO

Table 7.1-13
Acquisition Context Module of Created SOP Instances

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

Table 7.1-14
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)	Digital Mammography X-ray Image Storage – For Presentation, Digital Mammography X-Ray Image Storage – For Processing, Digital X-Ray Image Storage – For Presentation or Digital X-Ray Image Storage – For Processing	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	Unique value generated	ALWAYS	AUTO
Timezone Offset From UTC	(0008,0201)		ALWAYS	AUTO

7.1.1.2 Secondary Capture Image IOD

The attributes that are contained in created Secondary Capture Image Instances are listed in the following tables.

Table 7.1-15
IOD OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

IE	Module	Reference	Presence of Module
Patient	Patient	Table 7.1-16	ALWAYS
Study	General Study	Table 7.1-17	ALWAYS
	Patient Study	Table 7.1-17	ALWAYS
Series	General Series	Table 7.1-18	ALWAYS
Equipment	General Equipment	Table 7.1-19	ALWAYS
	SC Equipment	Table 7.1-20	ALWAYS
Image	General Reference	Table 7.1-21	ALWAYS
	General Image	Table 7.1-22	ALWAYS
	SC Image	Table 7.1-22	ALWAYS
	Image Pixel	Table 7.1-23	ANAP
	Modality LUT	Table 7.1-24	ALWAYS
	VOI LUT	Table 7.1-25	ALWAYS
	SOP Common	Table 7.1-26	ALWAYS

Table 7.1-16
PATIENT MODULE OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

Attribute Name	Tag	Value	Presence of Value	Source
Patient's Name	(0010,0010)	Copied from source image	ALWAYS	AUTO
Patient ID	(0010,0020)	Copied from source image	ALWAYS	AUTO
Issuer of Patient ID	(0010,0021)	Copied from source image	ANAP	AUTO
Patient's Birth Date	(0010,0030)	Copied from source image	ALWAYS	AUTO
Patient's Sex	(0010,0040)	Copied from source image	ALWAYS	AUTO
Other Patient IDs	(0010,1000)	Copied from source image	ANAP	AUTO

Table 7.1-17
GENERAL / PATIENT STUDY MODULES OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

Attribute Name	Tag	Value	Presence of Value	Source
Study Date	(0008,0020)	Copied from source image	ALWAYS	AUTO
Study Time	(0008,0030)	Copied from source image	ALWAYS	AUTO
Accession Number	(0008,0050)	Copied from source image	VNAP	AUTO
Referring Physician's Name	(0008,0090)	Copied from source image	VNAP	AUTO
Study Description	(0008,1030)	Copied from source image	ALWAYS	AUTO
Patient's Age	(0010,1010)	Copied from source image	ALWAYS	AUTO
Study Instance UID	(0020,000D)	Copied from source image	ALWAYS	AUTO
Study ID	(0020,0010)	Copied from source image	ALWAYS	AUTO

Table 7.1-18
GENERAL SERIES MODULE OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

Attribute Name	Tag	Value	Presence of Value	Source
Series Date	(0008,0021)		ALWAYS	AUTO
Series Time	(0008,0031)		ALWAYS	AUTO
Modality	(0008,0060)	See Table 7.1-20		
Series Description	(0008,103E)	'SC' appended to source image value	ALWAYS	AUTO
Operators' Name	(0008,1070)		ALWAYS	AUTO
Body Part Examined	(0018,0015)	Copied from source image	ALWAYS	AUTO
Series Instance UID	(0020,000E)	Unique value generated	ALWAYS	AUTO
Series Number	(0020,0011)	1	ALWAYS	AUTO
Laterality	(0020,0060)	Copied from source image (0020,0062) Image Laterality	ALWAYS	AUTO

Table 7.1-19
GENERAL EQUIPMENT MODULE OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

Attribute Name	Tag	Value	Presence of Value	Source
Manufacturer	(0008,0070)	HOLOGIC, Inc.	ALWAYS	CONFIG
Institution Name	(0008,0080)		ALWAYS	CONFIG
Institution Address	(0008,0081)		ALWAYS	CONFIG
Station Name	(0008,1010)		ALWAYS	CONFIG
Institutional Department Name	(0008,1040)		ALWAYS	CONFIG
Manufacturer's Model Name	(0008,1090)	Trident HD	ALWAYS	CONFIG
Software Versions	(0018,1020)		ALWAYS	AUTO

Table 7.1-20
SC EQUIPMENT MODULE OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

Attribute Name	Tag	Value	Presence of Value	Source
Modality	(0008,0060)	Copied from source image	ALWAYS	AUTO
Conversion Type	(0008,0064)	WSD	ALWAYS	AUTO

Table 7.1-21
GENERAL REFERENCE MODULE OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

Attribute Name	Tag	Value	Presence of Value	Source
Derivation Description	(0008,2111)	Secondary Capture	ALWAYS	AUTO
Source Image Sequence	(0008,2112)	One Item	ALWAYS	AUTO
>Referenced SOP Class UID	(0008,1150)	For Presentation source image	ALWAYS	AUTO
>Referenced SOP Instance UID	(0008,1155)	Of source image	ALWAYS	AUTO
>Spatial Locations Preserved	(0028,135A)	NO	ALWAYS	AUTO
>Purpose of Reference Code Sequence	(0040,A170)	One Item	ALWAYS	AUTO
>>Code Value	(0008,0100)	121324	ALWAYS	AUTO
>>Coding Scheme Designator	(0008,0102)	DCM	ALWAYS	AUTO
>>Code Meaning	(0008,0104)	Source image	ALWAYS	AUTO

Table 7.1-22
GENERAL / SC IMAGE MODULES OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

Attribute Name	Tag	Value	Presence of Value	Source
Image Type	(0008,0008)	DERIVED\SECONDARY	ALWAYS	AUTO
Acquisition Date	(0008,0022)		ALWAYS	AUTO
Content Date	(0008,0023)		ALWAYS	AUTO
Acquisition Time	(0008,0032)		ALWAYS	AUTO
Content Time	(0008,0033)		ALWAYS	AUTO
Instance Number	(0020,0013)	1	ALWAYS	AUTO
Patient Orientation	(0020,0020)		EMPTY	AUTO
Image Comments	(0020,4000)	Copied from source image, user may edit	ANAP	AUTO, USER
Burned in Annotation	(0028,0301)	YES or NO	ALWAYS	USER
Lossy Image Compression	(0028,2110)	00	ALWAYS	AUTO
View Code Sequence	(0054,0220)	One Item copied from source image	ALWAYS	AUTO
>Code Value	(0008,0100)		ALWAYS	AUTO
>Coding Scheme Designator	(0008,0102)		ALWAYS	AUTO
>Code Meaning	(0008,0104)		ALWAYS	AUTO
>View Modifier Code Sequence	(0054,0222)	Zero or one Item copied from source image	VNAP	AUTO
>>Code Value	(0008,0100)		ANAP	AUTO
>>Coding Scheme Designator	(0008,0102)		ANAP	AUTO
>>Code Meaning	(0008,0104)		ANAP	AUTO
Presentation LUT Shape	(2050,0020)	IDENTITY	ALWAYS	AUTO

Table 7.1-23
IMAGE PIXEL MODULE OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

Attribute Name	Tag	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	MONOCHROME2	ALWAYS	AUTO
Rows	(0028,0010)		ALWAYS	AUTO
Columns	(0028,0011)		ALWAYS	AUTO
Bits Allocated	(0028,0100)	16	ALWAYS	AUTO
Bits Stored	(0028,0101)	12	ALWAYS	AUTO
High Bit	(0028,0102)	11	ALWAYS	AUTO
Pixel Representation	(0028,0103)	0000H	ALWAYS	AUTO
Pixel Data	(7FE0,0010)		ALWAYS	AUTO

Table 7.1-24
MODALITY LUT MODULE OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

Attribute Name	Tag	Value	Presence of Value	Source
Rescale Intercept	(0028,1052)	0	ALWAYS	AUTO
Rescale Slope	(0028,1053)	1	ALWAYS	AUTO
Rescale Type	(0028,1054)	US	ALWAYS	AUTO

Table 7.1-25
VOI LUT MODULE OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

Attribute Name	Tag	Value	Presence of Value	Source
Window Center	(0028,1050)	Default: 2047	ALWAYS	CONFIG
Window Width	(0028,1051)	Default: 4096	ALWAYS	CONFIG

Table 7.1-26
SOP COMMON MODULE OF CREATED SECONDARY CAPTURE IMAGE INSTANCES

Attribute Name	Tag	Value	Presence of Value	Source
Specific Character Set	(0008,0005)	ISO_IR 100	ALWAYS	AUTO
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.7	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	Unique value generated	ALWAYS	AUTO
Timezone Offset from UTC	(0008,0201)		ALWAYS	AUTO

7.1.2 Usage of Attributes from Received IODs

The following attributes are required to be present with a non-zero length value for successful interpretation of received SOP instances

- (0008,0016) SOP Class UID: one of the supported values
- (0010,0020) Patient ID
- (0020,0011) Series Number: for Hologic SCO
- (0028,0004) Photometric Interpretation
- (0028,0008) Number of Frames: for multi-frame SOP Classes
- (0028,0010) Rows
- (0020,0011) Columns
- (0028,0101) Bits Stored
- (0054,0220) View Code Sequence or equivalent attribute that identifies the view
- (7FE0,0010) Pixel Data

7.1.3 Attribute Mapping

The default relationships between attributes received via Modality Worklist and stored in acquired images are summarized in Table 7.1-27. Attribute mapping is configurable.

Table 7.1-27
Attribute Mapping between Modality Worklist and Image

Modality Worklist	Image SOP instance
Patient's Name	Patient's Name
Patient ID	Patient ID
Issuer of Patient ID	Issuer of Patient ID
Patient's Birth Date	Patient's Birth Date
Patient's Sex	Patient's Sex
Other Patient IDs	Other Patient IDs
Referring Physician's Name	Referring Physician's Name
Study Description	Study Description
Study Instance UID	Study Instance UID
Accession Number	Accession Number
Scheduled Procedure Step Sequence	Request Attributes Sequence
>Scheduled Procedure Step Description	>Scheduled Procedure Step Description
>Scheduled Protocol Code Sequence	>Scheduled Protocol Code Sequence
>>Code Value	>>Code Value
>>Coding Scheme Designator	>>Coding Scheme Designator
>>Code Meaning	>>Code Meaning
>Scheduled Procedure Step ID	>Scheduled Procedure Step ID
Reason for Requested Procedure Code Sequence	>Reason for Requested Procedure Code Sequence
>Code Value	>>Code Value

Modality Worklist	Image SOP instance
>Coding Scheme Designator	>>Coding Scheme Designator
>Code Meaning	>>Code Meaning
Requested Procedure ID	>Requested Procedure ID
Requested Procedure Description	>Requested Procedure Description
Requested Procedure Code Sequence	>Requested Procedure Code Sequence
>Code Value	>>Code Value
>Coding Scheme Designator	>>Coding Scheme Designator
>Code Meaning	>>Code Meaning

The following additional rules apply for mapping Modality Worklist attributes to image Instances:

Attributes mapped to the Request Attribute Sequence Item in image Instances:

- For a scheduled procedure the Workstation incorporates the attributes from the worklist item into the Request Attributes Sequence (0040,0275) Item of the SOP instance.
- For unscheduled procedures the Request Attributes Sequence (0040,0275) in the SOP instance contains only Reason for Requested Procedure Code Sequence (0040,100A) with one Item.

7.1.4 Coerced/Modified Attributes

The Workstation can be configured to add, edit or remove specific attributes in received SOP instances.

The following characters in textual return key attribute values of a Modality Worklist item are modified automatically by the Workstation when mapped to an image SOP instance:

- Ampersand Symbol (&): Mapped to ".AND."
- Double Quote Symbol ("): Mapped to "'" (single quote)
- Greater Than Symbol (>): Mapped to ".GT."
- Less than Symbol (<): Mapped to ".LT."

7.2. Data Dictionary of Private Attributes

Created Digital Mammography X-Ray Image and Digital X-Ray Image SOP Instances may contain a Private Group (0019) labeled HOLOGIC, Inc., containing proprietary image characteristics.

No patient identification information is included in these private attributes.

7.3. Coded Terminology and Templates

None.

7.4. Grayscale Image Consistency

None.

7.5. Standard Extended/Specialized/Private SOP Classes

None.

7.6. Private Transfer Syntaxes

None.