

DICOM Conformance Statement
For Diagnostic Review Workstation
Software Version 5-x
MAN-00546

HOLOGIC[®]
CLARITY OF VISION

SecurView_{DX} DICOM Conformance Statement
Part Number MAN-00546
Revision 001

For Software version 5-X

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Table of Contents

1.0	OVERVIEW	4
2.0	INTRODUCTION	4
2.1.	AUDIENCE	5
2.2.	REMARKS	5
2.3.	DEFINITIONS, TERMS AND ABBREVIATIONS	5
2.4.	REFERENCES	6
3.0	NETWORKING	7
3.1.	IMPLEMENTATION MODEL.....	7
3.1.1	<i>Application Data Flow</i>	7
3.1.2	<i>Functional Definition of AE's</i>	8
3.1.3	<i>Sequencing of Real World Activities</i>	8
3.2.	AE SPECIFICATIONS	11
3.2.1	SCU AE.....	11
3.2.2	SCP AE.....	22
3.3.	NETWORK INTERFACES.....	25
3.3.1	<i>Physical Network Interface</i>	25
3.3.2	<i>Additional Protocols</i>	25
3.4.	CONFIGURATION.....	25
3.4.1	<i>AE Title/Presentation Address Mapping</i>	25
3.4.2	<i>Configuration Parameters</i>	25
4.0	MEDIA INTERCHANGE	26
5.0	SUPPORT OF CHARACTER SETS	26
6.0	SECURITY	26
7.0	ANNEXES	26
7.1.	IOD CONTENTS.....	26
7.1.1	<i>Created SOP Instance(s)</i>	26
7.1.2	<i>Usage of Attributes from Received IODs</i>	33
7.1.3	<i>Attribute Mapping</i>	35
7.1.4	<i>Coerced/Modified Attributes</i>	35
7.2.	DATA DICTIONARY OF PRIVATE ATTRIBUTES	35
7.3.	CODED TERMINOLOGY AND TEMPLATES	35
7.4.	GRAYSCALE IMAGE CONSISTENCY.....	35
7.5.	STANDARD EXTENDED/SPECIALIZED/PRIVATE SOP CLASSES	35
7.6.	PRIVATE TRANSFER SYNTAXES	35

1.0 Overview

The Hologic SecurView_{DX} Workstation is used primarily to display and facilitate interpretation of digital mammography and other breast imaging procedures. The SecurView_{DX} Workstation implements the necessary DICOM services to receive images and related information from networked devices, query for images and related information from a networked storage device, retrieve images and related information from a networked storage device, store user created screen capture images to a networked storage device, and print to a networked hardcopy device.

Table 1-1 provides an overview of the network services supported by the SecurView_{DX} Workstation.

Table 1-1
NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Computed Radiography Image Storage	No	Yes
Digital X-Ray Image Storage – For Presentation	No	Yes
Digital Mammography X-Ray Image Storage – For Presentation	No	Yes
Digital Mammography X-Ray Image Storage – For Processing	No	Yes
Secondary Capture Image Storage	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	No	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	Option	Yes
Multi-frame True Color Secondary Capture Image Storage	Option	Yes
Ultrasound Image Storage	No	Yes
Ultrasound Multi-frame Image Storage	No	Yes
Ultrasound Image Storage (Retired)	No	Yes
Ultrasound Multi-frame Image Storage (Retired)	No	Yes
MR Image Storage	No	Yes
Positron Emission Tomography Image Storage	No	Yes
CT Image Storage	No	Yes
Mammography CAD SR	No	Yes
Grayscale Softcopy Presentation State Storage	Yes	Yes
Print Management		
Basic Grayscale Print Management Meta SOP Class: <i>includes Basic Film Session, Basic Film Box, Basic Grayscale Image Box, Printer</i>	Yes	No
Query/Retrieve		
Study Root Query/Retrieve Information Model – FIND	Yes	No
Study Root Query/Retrieve Information Model – MOVE	Yes	No

2.0 Introduction

Hologic, Inc. develops and markets a full line of mammography products including the SecurView_{DX} Workstation, which is the Diagnostic Review Workstation for the Selenia full-field digital mammography system.

The SecurView_{DX} Workstation provides a user interface to radiologic technologists and radiologists, for reviewing digital mammography and other breast imaging procedures. The SecurView_{DX}

Workstation includes a graphical user interface (GUI) with a dedicated workflow keypad, pointing device, keyboard, and either two or three displays.

2.1. Audience

This document contains the DICOM conformance claim for the SecurView_{DX} Workstation. This document is intended to aid in connecting the SecurView_{DX} Workstation to other components that make use of the DICOM standard for interconnecting networked diagnostic review workstation devices.

The information within this document applies to SecurView_{DX} Software version 3-0-x. The reader of this document should be familiar with the DICOM standard and PACS components that utilize the standard.

2.2. Remarks

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

- The SecurView_{DX} 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 SecurView_{DX} 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 SecurView_{DX} 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

ACR: American College of Radiology

AE: Application Entity

CAD: Computer Aided Detection

CT: Computed Tomography

DICOM: Digital Imaging and Communications in Medicine

DIMSE: DICOM Message Service Element

GSPPS: Grayscale Softcopy Presentation State

IOD: Information Object Definition

JPEG: Joint Photographic Experts Group (data compression techniques)

LUT: Lookup Table

MR: Magnetic Resonance

NEMA: National Electrical Manufacturers Association

PACS: Picture Archive and Communications System (image management & long-term storage)

PDU: Protocol Data Unit

Q/R: Query/Retrieve

RLE: Run Length Encoding (data compression technique)

SC: Secondary Capture

SCP: Service Class Provider

SCU: Service Class User

SOP: Service Object Pair

SR: Structured Report

TCP/IP: Transmission Control Protocol/Internet Protocol

UID: Unique Identifier

VOI: Value of Interest

VPN: Virtual Private Network

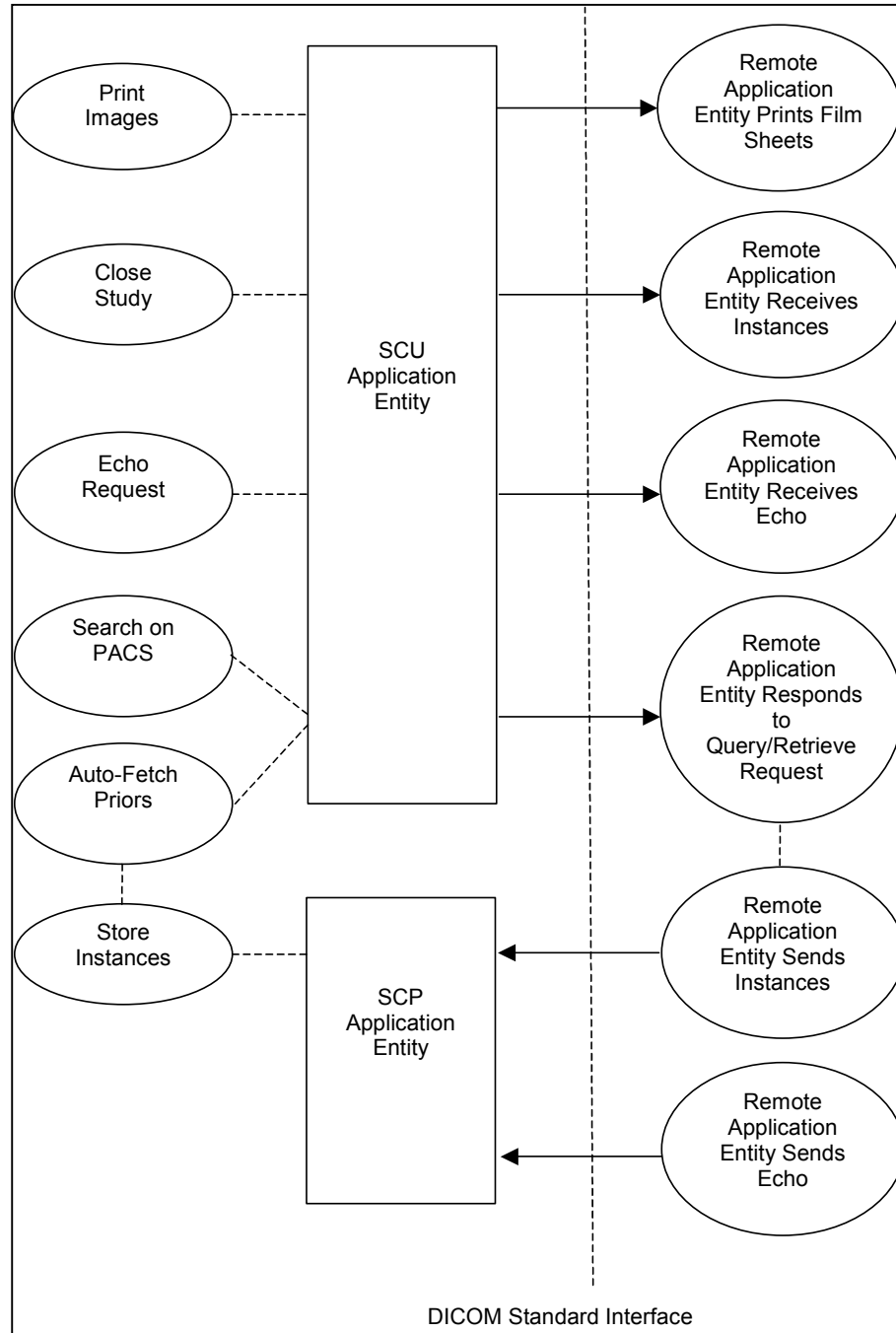
2.4. References

- ACR-NEMA DICOM Standard, 2007

3.0 Networking

3.1. Implementation Model

3.1.1 Application Data Flow



- The Print Images real world activity triggers the SCU Application Entity to print selected images to film on a selected remote AE (Printer).
- If configured to do so, the Close Study real world activity triggers the SCU Application Entity to send study state instances (or secondary capture images with annotations) and/or screen capture images created by the reading radiologist to a pre-selected remote AE.
- The Echo Request real world activity triggers the SCU Application Entity to send an echo request to a selected remote AE.
- The Search on PACS real world activity triggers the SCU Application Entity to query a remote AE for patient studies and series, and provides the list of series matching the query request. The user selects patient series to be retrieved. The SCU Application Entity issues a retrieve request for each image of the selected series.
- The SCP Application Entity is always available to receive instances from a remote AE, and triggers the Store Instances real world activity to make them available to the user.
- If configured to do so, the Store Instances real world activity may trigger the Auto-Fetch Priors real world activity. The Auto-Fetch Priors real world activity triggers the SCU Application Entity to query and retrieve prior instances related to a received instance. The amount and types of instances to retrieve are configurable.

3.1.2 Functional Definition of AE's

The SCU Application Entity and SCP Application Entity are implemented as two separate processes that run in the background. They are started automatically during startup of the SecurView_{DX} Workstation.

3.1.2.1 Functional Definition of SCU Application Entity

The SCU Application Entity initiates Print, Store, Echo, and Query/Retrieve requests as needed by the SecurView_{DX} Workstation.

3.1.2.2 Functional Definition of SCP Application Entity

The SCP Application Entity is available to accept echo and storage requests whenever the SecurView_{DX} Workstation is running. The SCP Application Entity stores received instances locally.

3.1.3 Sequencing of Real World Activities

For Print Images, a user triggers the SCU AE to perform DICOM print by selecting one or more images, or a portion of the screen from the reviewing display to print to a selected Print Provider.

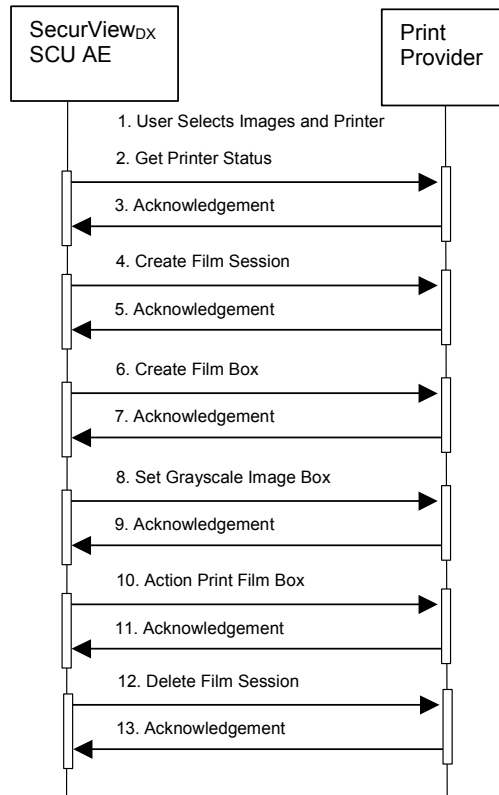


Figure 3.1-1: Print Images Sequence Diagram

For Close Study, a user triggers the SCU AE to perform DICOM store by marking one or more studies for a patient as read.

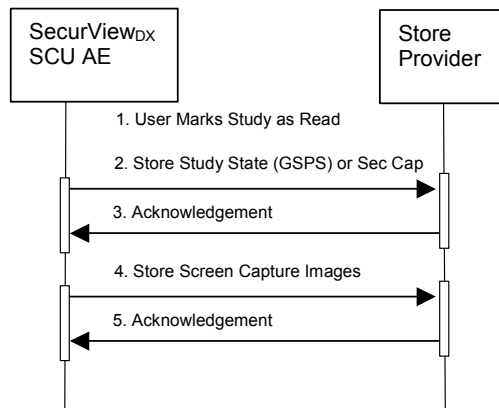


Figure 3.1-2: Close Study Sequence Diagram

For Search on PACS, a user triggers the SCU AE to perform DICOM query/retrieve by entering search criteria and executing a query. The matching patients' series are displayed to the user. The user selects one or more series to retrieve and executes a retrieve request. The SCP AE receives the instances sent by the Query/Retrieve Provider in response to the retrieve request.

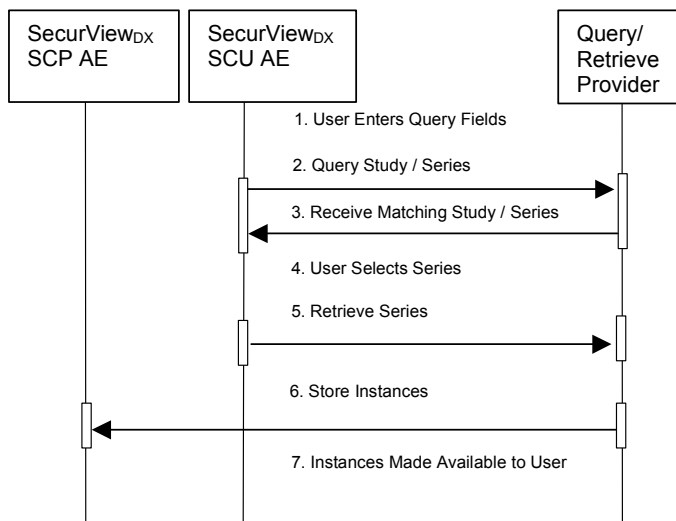


Figure 3.1-3: Search on PACS Sequence Diagram

For Auto-Fetch Priors, receiving an instance such as the first newly captured digital mammography image for a patient triggers the SCU AE to perform DICOM query/retrieve to search for studies matching the patient. Configurable auto-fetch criteria determine types of received instances that trigger auto-fetch, and the follow-up series and instance level query content. The SCU AE retrieves the matching instances. The SCP AE receives the instances sent by the Query/Retrieve Provider.

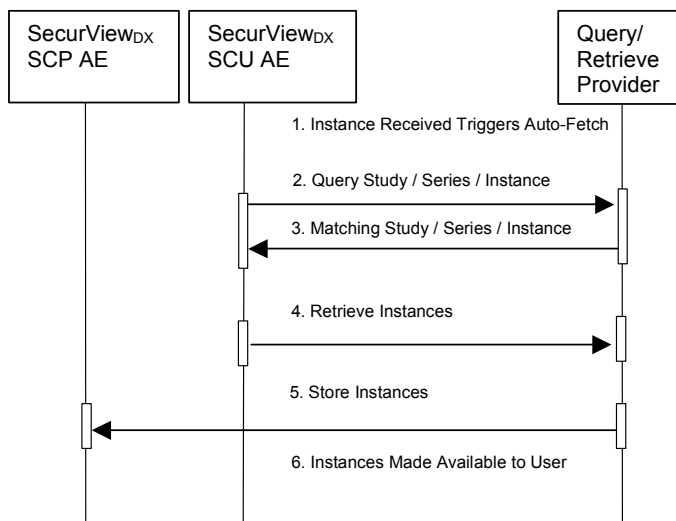


Figure 3.1-4: Auto-Fetch Priors Sequence Diagram

3.2. AE Specifications

3.2.1 SCU AE

3.2.1.1 SOP Classes

The SCU AE provides Standard Conformance to the following SOP Classes:

*Table 3.2.1-1
SOP CLASSES FOR SCU AE*

SOP Class Name	SOP Class UID	SCU	SCP
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Yes	No
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	No
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	No
Verification	1.2.840.10008.1.1	Yes	No
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

3.2.1.2 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

The SCU AE supports multiple associations. There are no enforced limits for the number of open associations.

3.2.1.2.3 Asynchronous Nature

The SecurView_{DX} 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 SCU AE*

Implementation Class UID	1.2.276.0.28.3.0.12.400000
Implementation Version Name	MBC_SCR_0400000

3.2.1.3 Association Initiation Policy

3.2.1.3.1 Print Images

3.2.1.3.1.1 Description and Sequencing of Activities

Print Images is triggered when a user selects to print selected images to a selected remote Print AE either for diagnostic print or screen capture print. The SCU AE attempts to establish an association with a remote Print AE when a request to print one or more images is received. A remote Print AE configuration is predefined for each known printer manufacturer, model, and default film size.

Only one print request is permitted at a time. The user is not permitted to make another print request until the current request is completed. Each print request consists of Printer N-GET, Film Session N-CREATE, Film Box N-CREATE, Grayscale Image Box N-SET, Film Box N-ACTION, and Film Session N-DELETE. One association is negotiated per print request. The association is released after the N-DELETE response is received, if not released earlier due to failure.

3.2.1.3.1.2 Proposed Presentation Contexts

The SCU AE attempts to establish associations using the following presentation contexts:

*Table 3.2.1-4
PROPOSED PRESENTATION CONTEXTS FOR PRINT IMAGES*

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

3.2.1.3.1.3 SOP Specific Conformance for Print

The general behavior of the SCU AE during communication failure is summarized in the Table below. This behavior is common to all print SOP Classes supported by the SCU AE. The number of minutes to wait for a response from the remote Print AE before timing out is configurable.

*Table 3.2.1-5
PRINT COMMAND COMMUNICATION FAILURE BEHAVIOR*

Exception	Behavior
Timeout	The SCU AE releases the association, and the error is reported to the user.
Association rejected or aborted by SCP	The error is reported to the user.

The SCU AE provides baseline conformance. The SCU AE uses 12-bit grayscale images for print if supported by the remote Print AE. 8-bit grayscale is used otherwise. This section describes the DIMSE services and the attributes supported for various remote Print AEs.

3.2.1.3.1.3.1 Specific Conformance to Basic Film Session SOP Class

Table 3.2.1-6 - Basic Film Session SOP Class: Supported DIMSE operations

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

Table 3.2.1-7 - Basic Film Session SOP Class: Supported Attributes

Attribute Name	Tag	Supported Values	Default Value
Number Of Copies	(2000,0010)	1	1

Attribute Name	Tag	Supported Values	Default Value
Print Priority	(2000,0020)	MED	MED
Medium Type	(2000,0030)	BLUE FILM CLEAR FILM MAMMO BLUE FILM PAPER	Predefined per Printer

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

*Table 3.2.1-8
FILM SESSION SOP CLASS RESPONSE STATUS HANDLING BEHAVIOR*

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The remote Print AE has completed the operation successfully. Proceed to next step.
Warning	Any	Any	If relaxed error handling is enabled, proceed to next step as if successful. If not, the SCU AE releases the association and the error is reported to the user.
Failure	Any	Any	The SCU AE releases the association, and the error is reported to the user.

3.2.1.3.1.3.2 Specific Conformance to Basic Film Box SOP Class

Table 3.2.1-9 - Basic Film Box SOP Class: Supported DIMSE operations

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

Table 3.2.1-10 - 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	
Film Size ID	(2010,0050)	8INX10IN 10INX12IN 10INX10IN 11INX14IN (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)	CUBIC	CUBIC
Border Density	(2010,0100)	BLACK	BLACK
Empty Image Density	(2010,0110)	BLACK	BLACK
Min Density	(2010,0120)	Configurable per printer	Predefined per Printer
Max Density	(2010,0130)	Configurable per printer	Predefined per Printer
Trim	(2010,0140)	NO	NO
Configuration Information	(2010,0150)	Configurable per printer	Predefined per Printer
Referenced Film Session Sequence	(2010,0500)	One sequence Item identifies the film session for this film box	
Referenced Image Box Sequence	(2010,0510)	Returned by the printer	

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

Table 3.2.1-11

FILM BOX SOP CLASS RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The remote Print AE has completed the operation successfully. Proceed to next step.
Warning	Any	Any	If relaxed error handling is enabled, proceed to next step as if successful. If not, the SCU AE releases the association and the error is reported to the user.
Failure	Any	Any	The SCU AE releases the association, and the error is reported to the user.

3.2.1.3.1.3.3 Specific Conformance to Basic Grayscale Image Box SOP Class

Table 3.2.1-12 – Basic Grayscale Image Box SOP Class: Supported DIMSE operations

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

Table 3.2.1-13 – Basic Grayscale Image Box SOP Class: Supported Attributes

Attribute Name	Tag	Supported Values	Default Value
Image Position	(2020,0010)	1	1
Preformatted Grayscale Image Sequence	(2020,0110)		
> Samples Per Pixel	(0028,0002)	1	1
> Photometric Interpretation	(0028,0004)	MONOCHROME2	MONOCHROME2
> Rows	(0028,0010)	Per printed image	
> Columns	(0028,0011)	Per printed image	
> Pixel Aspect Ratio	(0028,0034)	1\1	1\1
> Bits Allocated	(0028,0100)	8 or 16	
> Bits Stored	(0028,0101)	8 or 12	
> High Bit	(0028,0102)	7 or 11	
> Pixel Representation	(0028,0103)	0	0
> Pixel Data	(7FE0,0010)	Per printed image	
Magnification Type	(2010,0060)	CUBIC	CUBIC
Requested Image Size	(2020,0030)	For diagnostic print, set to desired width per printer	Predefined per Printer

The behavior of the SCU AE when encountering status codes in a N-SET response is summarized in the Table below:

Table 3.2.1-14

IMAGE BOX SOP CLASS N-SET RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The remote Print AE has completed the operation successfully. Proceed to next step.
Warning	Any	Any	If relaxed error handling is enabled, proceed to next step as if successful. If not, the SCU AE releases the association and the error is reported to the user.
Failure	Any	Any	The SCU AE releases the association, and the error is reported to the user.

3.2.1.3.1.3.4 Specific Conformance to Printer SOP Class

Table 3.2.1-15 - Printer SOP Class: Supported DIMSE operations

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

N-EVENT-REPORT requests are accepted up until the Film Session N-DELETE response is received.

In the N-GET request, the SCU AE requests Printer Status, Printer Status Info, Printer Name, Manufacturer and Manufacturer's Model Name.

The behavior of the SCU AE when encountering status codes in a N-GET response is summarized in the Table below:

*Table 3.2.1-16
PRINTER SOP CLASS N-GET RESPONSE STATUS HANDLING BEHAVIOR*

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	If Printer Status returned is NORMAL, proceed to next step. If not, the SCU AE releases the association and the error is reported to the user.
Warning	Any	Any	If relaxed error handling is enabled and Printer Status is NORMAL, proceed to next step as if successful. If not, the SCU AE releases the association and the error is reported to the user.
Failure	Any	Any	The SCU AE releases the association, and the error is reported to the user.

3.2.1.3.2 Close Study

3.2.1.3.2.1 Description and Sequencing of Activities

Close Study is triggered when a radiologist user marks one or more studies for a patient as read. Close Study can be configured to trigger the SCU AE automatically to send study state instances (or secondary capture images) that include radiologist markings and annotations and Multi-Modality Viewer screen capture images created by the reading radiologist to a pre-selected remote Store AE. The SCU AE negotiates a separate association with the pre-selected remote Store AE to send each instance. The SCU AE releases each association upon completion of the storage request.

The secondary capture image is offered as an alternative if the remote Store AE does not support GSPS. A secondary capture image is created for each image in each study marked as read on which the radiologist has created markings and annotations in the SecurView_{DX} Workstation Mammography Viewer. The pixel data of each secondary capture image contains one image that has the user created markings and/or measurements burned in.

The pixel data of a screen capture image contains the current content of the SecurView_{DX} Workstation Multi-Modality Viewer display when the user requests creation of a screen capture image.

3.2.1.3.2.2 Proposed Presentation Contexts

The SCU AE attempts to establish associations using the following presentation contexts:

*Table 3.2.1-17
PROPOSED PRESENTATION CONTEXTS FOR CLOSE STUDY*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None

3.2.1.3.2.3 SOP Specific Conformance for Storage

The behavior of the SCU AE when encountering status codes in a C-STORE response is summarized in the Table below.

*Table 3.2.1-18
C-STORE RESPONSE STATUS HANDLING BEHAVIOR*

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The remote Store SCP has successfully stored the SOP Instance. Job complete.
Warning or Failure	Any	Any	The SCU AE releases the association, and the error is reported to the user.

The behavior of the SCU AE during communication failure is summarized in the Table below. A failed store request is automatically retried a configurable number of times before reporting failure.

Table 3.2.1-19
STORAGE COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The SCU AE releases the association, and the error is reported to the user.
Association rejected or aborted by SCP	The error is reported to the user.

Instance UIDs are globally unique for all SOP instances generated by the SCU AE. The UID root is "1.2.276.0.28.3".

The SCU AE provides standard conformance to the Grayscale Softcopy Presentation State Storage SOP Class. Color images may be referenced in the study state instances that are stored as GSPS instances. A separate study state GSPS instance is created for each study that is marked as read. Each study state GSPS instance references all the images in the study that are present on the SecurView_{DX} Workstation when the user marks the study as read. Each study state GSPS instance contains the markings, annotations and measurements made by the radiologist on any of the referenced images.

As an alternative to GSPS, the SCU AE provides standard conformance to the Secondary Capture Image Storage SOP Class and to the Multi-frame Grayscale Word Secondary Capture Image Storage SOP Class. It is configurable whether to store radiologist markings and annotations made in the Mammography Viewer as GSPS, Secondary Capture, or Multi-frame Grayscale Word Secondary Capture. If the remote Store AE does not support GSPS, Secondary Capture Image is the default. Each secondary capture instance contains a single image with burned in markings and annotations. Each secondary capture instance is assigned to the same Study as the source image. Each secondary capture instance is assigned to a separate Series.

The SCU AE provides standard conformance to the Secondary Capture Image Storage SOP Class and to the Multi-frame True Color Secondary Capture Image Storage SOP Class. It is configurable whether to store Multi-Modality Viewer screen capture images as Secondary Capture or Multi-frame True Color Secondary Capture. Each instance contains a single frame. Secondary Capture Image is the default.

All Multi-Modality Viewer screen capture instances that are created for a patient by one user during one login session are assigned to the same Study. Each screen capture instance is assigned to a separate Series.

3.2.1.3.3 Echo Request

3.2.1.3.3.1 Description and Sequencing of Activities

From the DICOM configuration dialog, the service user requests an Echo to test DICOM communication with a configured remote AE. The SCU AE issues a C-ECHO request to the remote AE, and provides the response to the user interface.

3.2.1.3.3.2 Proposed Presentation Contexts

The SCU AE attempts to establish associations using the following presentation contexts:

*Table 3.2.1-20
PROPOSED PRESENTATION CONTEXTS FOR ECHO REQUEST*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None

3.2.1.3.3.3 SOP Specific Conformance for Verification

The SCU AE provides baseline conformance. The behavior of the SCU AE when encountering status codes in a C-ECHO response is summarized in the Table below.

*Table 3.2.1-21
VERIFICATION C-ECHO RESPONSE STATUS HANDLING BEHAVIOR*

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Success is reported to the user.

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

*Table 3.2.1-22
VERIFICATION COMMUNICATION FAILURE BEHAVIOR*

Exception	Behavior
Timeout	The SCU AE releases the association, and the error is reported to the user.
Association rejected or aborted by remote AE	The error is reported to the user.

3.2.1.3.4 Search on PACS / Auto-Fetch Priors

3.2.1.3.4.1 Description and Sequencing of Activities

Search on PACS is triggered by user interaction. The user may enter matching keys that the SCU AE uses to query a selected remote Query/Retrieve AE using the C-FIND operation. The SCU AE then displays a list of patient series returned in the C-FIND responses. The user may select one or more patient series from the list to retrieve, which signals the SCU AE to generate a C-MOVE request to the remote Query/Retrieve AE, specifying the SCP AE as the move destination. The instances received are made available for the user to view on the SecurView_{DX} Workstation.

The default Search on PACS behavior is for the SCU AE to send an initial Study Root, Study Level hierarchical query, followed by Study Root, Series Level hierarchical queries for each study returned. Matching responses are displayed to the user at the series level. The default retrieve behavior is to send a Study Root, Series Level hierarchical move request for each selected patient series. Alternate behavior can be configured such that only Study Level hierarchical queries and retrieves are performed.

When configured as enabled, Auto-Fetch Priors is triggered when the first newly captured digital mammography image for a patient is received. The SCU AE performs C-FIND and C-MOVE operations in the background with a predefined remote Query/Retrieve AE. The default behavior is to send a Study Root, Study Level hierarchical query for the patient identified in the received image. Based on the configured quantity and types of prior instances to retrieve, the SCU AE sends follow-up Study Root, Series Level and Study Root, Image Level hierarchical queries to the remote Query/Retrieve AE. Instances are retrieved one at a time via Study Root, Image Level hierarchical move request. If a remote Query/Retrieve AE does not support Image Level C-FIND or C-MOVE, it is configurable to stop at the Series Level C-FIND and perform Series Level C-MOVE.

For each Search on PACS or Auto-Fetch Priors occurrence, the SCU AE negotiates a separate consecutive association for each C-FIND and C-MOVE request.

3.2.1.3.4.2 Proposed Presentation Contexts

The SCU AE attempts to establish associations using the following presentation contexts:

*Table 3.2.1-23
PROPOSED PRESENTATION CONTEXTS FOR SEARCH ON PACS*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None

3.2.1.3.4.3 SOP Specific Conformance for Query/Retrieve

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

*Table 3.2.1-24
C-FIND AND C-MOVE RESPONSE STATUS HANDLING BEHAVIOR*

Service Status	Further Meaning	Error Code	Behavior
Success	Matching or sub-operations are	0000	The remote SCP has successfully returned all matching information, or all sub-operations are complete.

Service Status	Further Meaning	Error Code	Behavior
	complete		For C-FIND, perform follow-up query or move, or display results to the user. For C-MOVE, success is reported to the user either in the Search on PACS dialog or the patient list.
Pending	Matches or sub-operations are continuing	FF00	For C-FIND, the matching query result contained in the Identifier is collected for display or automated follow-up. For C-MOVE, the SCU AE continues to wait for additional messages.
Warning or Failure	Any	Any	The SCU AE releases the association. For Search on PACS C-FIND, failure is reported to the user in a status bar in the Search on PACS dialog. For Auto-Fetch Priors C-FIND, failure is reported to the user in the patient list. For C-MOVE, failure is reported to the user either in the Search on PACS dialog or the patient list.

The behavior of the SCU AE during communication failure is summarized in the Table below. For Auto-Fetch Priors, a failed request is automatically retried a configurable number of times before reporting failure.

*Table 3.2.1-25
C-FIND AND C-MOVE COMMUNICATION FAILURE BEHAVIOR*

Exception	Behavior
Timeout	The SCU AE releases the association. For Search on PACS C-FIND, failure is reported to the user in a status bar in the Search on PACS dialog. For Auto-Fetch Priors C-FIND, failure is reported to the user in the patient list. For C-MOVE, failure is reported to the user either in the Search on PACS dialog or the patient list.
Association rejected or aborted by SCP	For Search on PACS C-FIND, failure is reported to the user in a status bar in the Search on PACS dialog. For Auto-Fetch Priors C-FIND, failure is reported to the user in the patient list. For C-MOVE, failure is reported to the user either in the Search on PACS dialog or the patient list.

The SCU AE provides standard conformance to the Study Root Information Model, hierarchical method only. The Relational method is not supported.

For Search on PACS, by default the SCU AE performs Study Level queries with follow-up Series Level queries as needed, and Series Level retrieves. It is possible to configure Study Level only queries and retrieves.

For Auto-Fetch Priors, by default the SCU AE performs Study Level, Series Level and Image Level queries, and Image Level retrieves. It is possible to configure Series Level queries and retrieves if Image Level is not supported by the remote Query/Retrieve AE.

For Search on PACS, the SCU AE supports query Matching Key Attributes as defined in the following table. The user supplies Matching Key Attribute values, either by manual entry, drop list selection, or date range selection. Wild Card matching is requested only if the user specifies a wild card character during manual entry. It is configurable to omit the optional Series level matching key attributes (Body Part Examined, Request Attributes Sequence, Current Patient Location).

Table 3.2.1-26 - Supported C-FIND Matching Key Attributes (Search on PACS)

Matching Key Attribute	Tag	Matching Type
Study Level		
Patient's Name	(0010,0010)	Wild Card or Universal Matching

Matching Key Attribute	Tag	Matching Type
Patient ID	(0010,0020)	Single Value, Wild Card or Universal Matching
Study Date	(0008,0020)	Single Value, Range or Universal Matching
Study Time	(0008,0030)	Universal Matching
Accession Number	(0008,0050)	Single Value, Wild Card or Universal Matching
Modalities in Study	(0008,0061)	Single Value, Wild Card or Universal Matching; only used if alternate Study Level only query is configured
Study ID	(0020,0010)	Single Value or Wild Card Matching
Study Instance UID	(0020,000D)	Universal Matching
Series Level		
Study Instance UID	(0020,000D)	Single Value Matching (from Study level result)
Series Instance UID	(0020,000E)	Universal Matching
Modality	(0008,0060)	Single Value, Wild Card or Universal Matching
Body Part Examined	(0018,0015)	Single Value or Universal Matching
Request Attributes Sequence	(0040,0275)	Universal Matching
>Scheduled Procedure Step ID	(0040,0009)	Universal Matching
>Requested Procedure ID	(0040,1001)	Single Value, Wild Card or Universal Matching
Current Patient Location	(0038,0300)	Single Value or Wild Card Matching [Standard Extended]

For Auto-Fetch Priors, the SCU AE requires the remote Query/Retrieve SCP to support query Matching Key Attributes as defined in the following table.

Table 3.2.1-27 - Supported C-FIND Matching Key Attributes (Auto-Fetch Priors)

Matching Key Attribute	Tag	Matching Type
Study Level		
Patient ID	(0010,0020)	Single Value Matching
Study Date	(0008,0020)	Universal Matching
Study Instance UID	(0020,000D)	Universal Matching
Series Level		
Study Instance UID	(0020,000D)	Single Value Matching (from Study level result)
Series Instance UID	(0020,000E)	Universal Matching
Modality	(0008,0060)	Universal Matching
Image Level		
Study Instance UID	(0020,000D)	Single Value Matching (from Study level result)
Series Instance UID	(0020,000E)	Single Value Matching (from Series level result)
SOP Instance UID	(0008,0018)	Universal Matching

3.2.1.4 Association Acceptance Policy

The SCU AE does not accept associations.

3.2.2 SCP AE

3.2.2.1 SOP Classes

The SCP AE provides Standard Conformance to the following SOP Classes:

Table 3.2.2-1
SOP CLASSES FOR SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	No	Yes
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
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	No	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	No	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	No	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	No	Yes
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	No	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	No	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	No	Yes
Verification SOP Class	1.2.840.10008.1.1	No	Yes

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

The SCP AE supports multiple associations. There are no enforced limits for the number of open associations.

3.2.2.2.3 Asynchronous Nature

The SecurView_{DX} 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 SCP AE

Implementation Class UID	1.2.276.0.28.3.0.12.400000
Implementation Version Name	MBC_SCR_0400000

3.2.2.3 Association Initiation Policy

The SCP AE does not initiate associations.

3.2.2.4 Association Acceptance Policy

When the SCP AE accepts an association, it will respond to storage and echo requests.

3.2.2.4.1 Activity – Store Instances

3.2.2.4.1.1 Description and Sequencing of Activities

The SCP AE is always running. Store Instances is triggered when a remote Application Entity requests to store instances to the SCP AE. Expected instances include images of several accepted modalities, Mammography CAD SR, and Grayscale Softcopy Presentation State. The SCP AE stores the instances received so that they can be made available to the user. If a received instance is a duplicate of an existing stored instance it is ignored. Instances remain on the SecurView_{DX} Workstation until all studies for the associated patient are read, until a configurable maximum storage period is reached, or until they are manually deleted.

3.2.2.4.1.2 Accepted Presentation Contexts

The SCP AE accepts associations using the following presentation contexts:

*Table 3.2.2-4
ACCEPTABLE PRESENTATION CONTEXTS FOR
STORE INSTANCES*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	See Table 3.2.2-5		SCP	None
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	See Table 3.2.2-5		SCP	None
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	See Table 3.2.2-5		SCP	None
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	See Table 3.2.2-5		SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	See Table 3.2.2-5		SCP	None
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	See Table 3.2.2-5		SCP	None
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	See Table 3.2.2-5		SCP	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	See Table 3.2.2-5		SCP	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	See Table 3.2.2-5		SCP	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	See Table 3.2.2-5		SCP	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	See Table 3.2.2-5		SCP	None
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	See Table 3.2.2-5		SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	See Table 3.2.2-5		SCP	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	See Table 3.2.2-5		SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	See Table 3.2.2-5		SCP	None
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	See Table 3.2.2-5		SCP	None
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	See Table 3.2.2-5		SCP	None

The SCP AE accepts presentation contexts using the following transfer syntaxes:

*Table 3.2.2-5
ACCEPTABLE TRANSFER SYNTAXES FOR
STORE INSTANCES*

Transfer Syntax Table	
Name	UID
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1

3.2.2.4.1.3 SOP Specific Conformance for Storage SOP Classes

The SCP AE provides Level 2 (full) conformance to all of the accepted Storage SOP Classes. All received attributes of Type 1, 2, 3, and Private Attributes are stored without modification, and may be used by the SecurView_{DX} Workstation. Instances that are stored successfully are not accessible by remote systems.

The SCP AE does not preserve or replace digital signatures.

The SecurView_{DX} Workstation displays only Mammography CAD SR instances produced by R2 Technology, Inc. or iCAD, Inc. All others are ignored.

The SecurView_{DX} Workstation displays only Grayscale Softcopy Presentation State instances produced by a SecurView_{DX} Workstation. All others are ignored. The SecurView_{DX} Workstation provides limited display conformance to Grayscale Softcopy Presentation State instances. The Softcopy VOI LUT module attributes are ignored.

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

*Table 3.2.2-6
STORAGE C-STORE RESPONSE STATUS*

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Image is stored locally and made available to the user.
Failure	Refused: Out of Resources	A700	There is not enough local storage capacity to store the instance.

3.2.2.4.2 Activity – Receive Echo Request

3.2.2.4.2.1 Description and Sequencing of Activities

The SCP AE is always available to respond to echo requests from any remote Application Entity.

3.2.2.4.2.2 Accepted Presentation Contexts

The SCP AE accepts associations using the following presentation contexts:

Table 3.2.2-6
ACCEPTABLE PRESENTATION CONTEXTS FOR
RECEIVE 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	SCP	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCP	None

3.2.2.4.2.3 SOP Specific Conformance for Verification SOP Class

The SCP AE provides standard conformance to the Verification Service Class.

3.3. Network Interfaces

3.3.1 Physical Network Interface

The SecurView_{DX} Workstation is tested and supports using 100-BaseT and 1000-BaseT Ethernet media.

3.3.2 Additional Protocols

None.

3.4. Configuration

3.4.1 AE Title/Presentation Address Mapping

A service user configures the SecurView_{DX} Workstation's SCU AE and SCP AE, and remote SCP AEs during site installation, by entering the AE Title, IP Address, and TCP/IP port number for each. When configuring a remote Print AE, a predefined printer specific configuration is also selected. There are no dedicated ports associated with dedicated services.

3.4.2 Configuration Parameters

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

Table 3.4-7 – CONFIGURATION PARAMETERS

Parameter	Configurable (Yes/No)	Default Value
Remote Print AE		
Printer name (manufacturer, model, default film size)	Yes	Per known printer
Configuration info	Yes	Per known printer
Dmin	Yes	Per known printer
Dmax	Yes	Per known printer
Portrait matrix (n x m)	Yes	Per known printer
Landscape matrix (n x m)	Yes	Per known printer
Portrait pixel spacing (n x m)	Yes	Per known printer
Landscape pixel spacing (n x m)	Yes	Per known printer
Bit depth (12 or 8)	Yes	Per known printer
Medium Type (blue film, clear film, mammo blue film, paper)	Yes	Per known printer
Medium Size (10inx10in, 10inx12in, 11inx14in, 8inx10in)	Yes	Per known printer
General Parameters		
Number of seconds to wait for association request or release	Yes	30
Number of seconds to wait for reply to association request	Yes	15
Number of seconds to wait for reply to association release	Yes	15
Maximum PDU size the local AE can receive	Yes	28K

Parameter	Configurable (Yes/No)	Default Value
Modules that invoke SCU AE		
Font size for patient info in diagnostic printing	Yes	12
Font size for all other text in diagnostic printing	Yes	8
Font size for annotations in screen capture printing	Yes	14
Print timeout waiting for response (minutes)	Yes	10
Relaxed error handling (for print)	Yes	On
Destination(s) for GSPS state instances (or secondary captures)	Yes	None
Store markings/annotations as GSPS or Secondary Capture	Yes	GSPS
SOP Class for secondary captures (SC Image/Multi-frame Grayscale Word)	Yes	SC Image
Destination(s) for screen captures	Yes	None
SOP Class for screen captures (SC Image/Multi-frame True Color)	Yes	SC Image
Number of automatic retries on store before reporting failure	Yes	5
Auto-fetch Digital Mammography images (On/Off)	Yes	On
Auto-fetch Hologic Screen Capture images (On/Off)	Yes	Off
Number of priors to Auto-fetch	Yes	2
Number of years of priors to Auto-fetch	Yes	2
Number of automatic retries on Auto-fetch before reporting failure	No	5
Auto-fetch uses Study Root Image Level Q/R (On/Off)	Yes	Off
Search on PACS uses only Study Root Study Level Q/R (On/Off)	Yes	Off
Search on PACS sends optional Series level attributes (On/Off)	Yes	On
SCP AE		
Auto-fetch trigger (On/Off)	Yes	Off
Received Mammography CAD SR triggers Auto-fetch (On/Off)	Yes	Off
Received GSPS triggers Auto-fetch (On/Off)	Yes	Off

4.0 Media Interchange

Not Supported.

5.0 Support of Character Sets

The SecurView_{DX} Workstation supports the following character sets:

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

6.0 Security

The SecurView_{DX} Workstation does not support any specific DICOM security measures.

It is assumed that the SecurView_{DX} Workstation is used within a secured environment. For additional information about Hologic security policies, see Hologic's Cyber-security Best Practices for SecurView products.

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 Grayscale Softcopy Presentation State IOD

The attributes that are contained in created GSPS Instances are listed in the following tables.

*Table 7.1.1-1
IOD OF CREATED GSPS SOP INSTANCES*

IE	Module	Reference	Presence of Module
Patient	Patient	Table 7.1.1-2	ALWAYS
Study	General Study	Table 7.1.1-3	ALWAYS
	Patient Study	Table 7.1.1-4	ALWAYS
Series	General Series	Table 7.1.1-5	ALWAYS
	Presentation Series	Table 7.1.1-5	ALWAYS
Equipment	General Equipment	Table 7.1.1-6	ALWAYS
Presentation State	Presentation State	Table 7.1.1-7	ALWAYS
	Displayed Area	Table 7.1.1-8	ALWAYS
	Graphic Annotation	Table 7.1.1-9	ANAP
	Graphic Layer	Table 7.1.1-10	ANAP
	Softcopy VOI LUT	Table 7.1.1-11	ALWAYS
	Softcopy Presentation LUT	Table 7.1.1-12	ALWAYS
	SOP Common	Table 7.1.1-13	ALWAYS

7.1.1.2 Grayscale Softcopy Presentation State Modules

Table 7.1.1-2 Patient Module of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Patient's Name	(0010,0010)	Copied from current patient	ALWAYS	AUTO
Patient ID	(0010,0020)	Copied from current patient	ALWAYS	AUTO
Patient Birth Date	(0010,0030)	Copied from current patient	VNAP	AUTO
Patient Sex	(0010,0040)	Copied from current patient	VNAP	AUTO
All other Patient Attributes		Copied from current patient	ANAP	AUTO

Table 7.1.1-3 General Study Module of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Study Date	(0008,0020)	Copied from current study	ALWAYS	AUTO
Study Time	(0008,0030)	Copied from current study	ALWAYS	AUTO
Accession Number	(0008,0050)	Copied from current study	VNAP	AUTO
Referring Physician's Name	(0008,0090)	Copied from current study	VNAP	AUTO
Study Description	(0008,1030)	Copied from current study	ANAP	AUTO
Study Instance UID	(0020,000D)	Copied from current study	ALWAYS	AUTO
Study ID	(0020,0010)	Copied from current study	VNAP	AUTO
All other Study Attributes		Copied from current study	ANAP	AUTO

Table 7.1.1-4 Patient Study Module of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Patient's Age	(0010,1010)	Copied from current patient	ANAP	AUTO
All other Patient Study Attributes		Copied from current patient or study	ANAP	AUTO

Table 7.1.1-5 General & Presentation Series Modules of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Modality	(0008,0060)	PR	ALWAYS	AUTO
Series Instance UID	(0020,000E)	Unique worldwide	ALWAYS	AUTO
Series Number	(0020,0011)	1	ALWAYS	AUTO

Table 7.1.1-6 General Equipment Module of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Manufacturer	(0008,0070)	HOLOGIC, Inc.	ALWAYS	AUTO
Institution Name	(0008,0080)		ALWAYS	CONFIG
Institution Address	(0008,0081)		ANAP	CONFIG
Station Name	(0008,1010)	Local SCU AE Title	ALWAYS	CONFIG
Manufacturer's Model Name	(0008,1090)	SecurView	ALWAYS	AUTO
Software Versions	(0018,1020)	The current software version	ALWAYS	AUTO

Table 7.1.1-7 Presentation State Module of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Referenced Series Sequence	(0008,1115)	All images in current study available on SecurView _{DX}	ALWAYS	AUTO
>Series Instance UID	(0020,000E)		ALWAYS	AUTO
>Referenced Image Sequence	(0008,1140)		ALWAYS	AUTO
>>Referenced SOP Class UID	(0008,1150)		ALWAYS	AUTO
>>Referenced SOP Instance UID	(0008,1155)		ALWAYS	AUTO
Instance Number	(0020,0013)	1	ALWAYS	AUTO
Content Label	(0070,0080)	HOLOGIC REPORT	ALWAYS	AUTO
Content Description	(0070,0081)	User name, Date, Time	ALWAYS	AUTO
Presentation Creation Date	(0070,0082)		ALWAYS	AUTO
Presentation Creation Time	(0070,0083)		ALWAYS	AUTO
Content Creator's Name	(0070,0084)	Current user name	ALWAYS	AUTO

Table 7.1.1-8 Displayed Area Module of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Displayed Area Selection Sequence	(0070,005A)	One Item per image in Referenced Series Seq	ALWAYS	AUTO
>Referenced Image Sequence	(0008,1140)	One Item	ALWAYS	AUTO
>>Referenced SOP Class UID	(0008,1150)		ALWAYS	AUTO
>>Referenced SOP Instance UID	(0008,1155)		ALWAYS	AUTO
>Displayed Area Top Left Hand Corner	(0070,0052)	0\0	ALWAYS	AUTO
>Displayed Area Bottom Right Hand Corner	(0070,0053)	Columns\Rows	ALWAYS	AUTO
>Presentation Size Mode	(0070,0100)	SCALE TO FIT	ALWAYS	AUTO
>Presentation Pixel Aspect Ratio	(0070,0102)	1\1	ALWAYS	AUTO

Table 7.1.1-9 Graphic Annotation Module of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Graphic Annotation Sequence	(0070,0001)	Zero or more Items	ANAP	USER
>Referenced Image Sequence	(0008,1140)	One Item	ALWAYS	AUTO
>>Referenced SOP Class UID	(0008,1150)		ALWAYS	AUTO
>>Referenced SOP Instance UID	(0008,1155)		ALWAYS	AUTO
>Graphic Layer	(0070,0002)	LAYER n , where $n=0,1,2..$	ALWAYS	AUTO
>Text Object Sequence	(0070,0008)	Zero or more Items	ANAP	USER
>>Anchor Point Annotation Units	(0070,0004)	PIXEL	ALWAYS	AUTO
>>Unformatted Text Value	(0070,0006)		ALWAYS	USER
>>Anchor Point	(0070,0014)		ALWAYS	AUTO
>>Anchor Point Visibility	(0070,0015)	N	ALWAYS	AUTO
>Graphic Object Sequence	(0070,0009)	Zero or more Items	ANAP	USER
>>Graphic Annotation Units	(0070,0005)	PIXEL	ALWAYS	AUTO
>>Graphic Dimensions	(0070,0020)	2	ALWAYS	AUTO
>>Number of Graphic Points	(0070,0021)	Depends on Graphic Type	ALWAYS	AUTO
>>Graphic Data	(0070,0022)	Depends on Graphic Type	ALWAYS	USER
>>Graphic Type	(0070,0023)	ELLIPSE or POLYLINE	ALWAYS	USER
>>Graphic Filled	(0070,0024)	N	ALWAYS	AUTO

Table 7.1.1-10 Graphic Layer Module of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Graphic Layer Sequence	(0070,0060)	One or more Items, if Graphic Annotation Sequence is present	ANAP	AUTO
>Graphic Layer	(0070,0002)	LAYER n , where $n=0,1,2..$	ALWAYS	AUTO
>Graphic Layer Order	(0070,0062)	1	ALWAYS	AUTO
>Graphic Layer Recommended Display Grayscale Value	(0070,0066)	FFFFH	ALWAYS	AUTO

Table 7.1.1-11 Softcopy VOI LUT Module of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Softcopy VOI LUT Sequence	(0028,3110)	One Item per image in Referenced Series Seq	ANAP	AUTO
>Referenced Image Sequence	(0008,1140)	One Item	ALWAYS	AUTO
>>Referenced SOP Class UID	(0008,1150)		ALWAYS	AUTO
>>Referenced SOP Instance UID	(0008,1155)		ALWAYS	AUTO
>Window Center	(0028,1050)	Single value	ALWAYS	USER
>Window Width	(0028,1051)	Single value	ALWAYS	USER

Table 7.1.1-12 Softcopy Presentation LUT Module of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Presentation LUT Shape	(2050,0020)	IDENTITY	ALWAYS	AUTO

Table 7.1.1-13 SOP Common Module of Created GSPS Instances

Attribute Name	Tag	Value	Presence of Value	Source
Specific Character Set	(0008,0005)	ISO_IR 100	ALWAYS	AUTO
Instance Creation Date	(0008,0012)	Current date	ALWAYS	AUTO
Instance Creation Time	(0008,0013)	Current time	ALWAYS	AUTO
SOP Class UID	(0008,0016)	Grayscale Softcopy Presentation State Storage	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	Unique worldwide	ALWAYS	AUTO

7.1.1.3 Secondary Capture Image IODs

The attributes that are contained in created Secondary Capture Image, Multi-frame True Color Secondary Capture Image, and Multi-frame Grayscale Word Secondary Capture Image Instances are listed in the following tables.

*Table 7.1.1-14
IOD OF CREATED SC IMAGE INSTANCES*

IE	Module	Reference	Presence of Module
Patient	Patient	Table 7.1.1-16	ALWAYS
Study	General Study	Table 7.1.1-17	ALWAYS
Series	General Series	Table 7.1.1-18	ALWAYS
Equipment	General Equipment	Table 7.1.1-19	ALWAYS
	SC Equipment	Table 7.1.1-19	ALWAYS
Image	General Image	Table 7.1.1-20	ALWAYS
	Image Pixel	Table 7.1.1-21	ALWAYS
	SOP Common	Table 7.1.1-22	ALWAYS

*Table 7.1.1-15
IOD OF CREATED MULTI-FRAME SC IMAGE INSTANCES*

IE	Module	Reference	Presence of Module
Patient	Patient	Table 7.1.1-16	ALWAYS
Study	General Study	Table 7.1.1-17	ALWAYS
Series	General Series	Table 7.1.1-18	ALWAYS
Equipment	General Equipment	Table 7.1.1-19	ALWAYS
	SC Equipment	Table 7.1.1-19	ALWAYS
Image	General Image	Table 7.1.1-20	ALWAYS
	Image Pixel	Table 7.1.1-21	ALWAYS
	Multi-frame	Table 7.1.1-23	ALWAYS
	SC Multi-frame Image	Table 7.1.1-24	ALWAYS
	SOP Common	Table 7.1.1-22	ALWAYS

7.1.1.4 Secondary Capture Image Modules

Table 7.1.1-16 Patient Module of Created SC Image Instances

Attribute Name	Tag	Value	Presence of Value	Source
Patient's Name	(0010,0010)	Copied from current patient	ALWAYS	AUTO
Patient ID	(0010,0020)	Copied from current patient	ALWAYS	AUTO
Patient Birth Date	(0010,0030)	Copied from current patient	VNAP	AUTO
Patient Sex	(0010,0040)	Copied from current patient	VNAP	AUTO
All other Patient Attributes		Copied from current patient	ANAP	AUTO

Table 7.1.1-17 General Study Module of Created screen capture Image Instances

Attribute Name	Tag	Value	Presence of Value	Source
Study Date	(0008,0020)	Current date	ALWAYS	AUTO
Study Time	(0008,0030)	Current time	ALWAYS	AUTO
Accession Number	(0008,0050)	Zero length	VNAP	AUTO
Referring Physician's Name	(0008,0090)	Zero length	VNAP	AUTO
Study Description	(0008,1030)	SecurView Screen Capture	ALWAYS	AUTO
Study Instance UID	(0020,000D)	Unique worldwide	ALWAYS	AUTO
Study ID	(0020,0010)	HLX_MM_SC	ALWAYS	AUTO

Table 7.1.1-18 General Study Module 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	VNAP	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	ANAP	AUTO
Study Instance UID	(0020,000D)	Copied from source image	ALWAYS	AUTO
Study ID	(0020,0010)	Copied from source image	VNAP	AUTO

Table 7.1.1-19 General Series Module of Created screen capture Image Instances

Attribute Name	Tag	Value	Presence of Value	Source
Series Date	(0008,0021)	Current date	ALWAYS	AUTO
Series Time	(0008,0031)	Current time	ALWAYS	AUTO
Modality	(0008,0060)	OT	ALWAYS	AUTO
Series Description	(0008,103E)	SecurView Screen Capture (default)	ALWAYS	USER
Performing Physician's Name	(0008,1050)	Current user name	ALWAYS	AUTO
Body Part Examined	(0018,0015)	Copied from source image	ANAP	AUTO
Protocol Name	(0018,1030)	Copied from source image	ANAP	AUTO
Series Instance UID	(0020,000E)	Unique worldwide	ALWAYS	AUTO
Series Number	(0020,0011)	Zero length	VNAP	AUTO
Laterality	(0020,0060)	Copied from source image (single viewer only)	ANAP	AUTO

Table 7.1.1-20 General Series Module of Created secondary capture Image Instances

Attribute Name	Tag	Value	Presence of Value	Source
Series Date	(0008,0021)	Current date	ALWAYS	AUTO
Series Time	(0008,0031)	Current time	ALWAYS	AUTO
Modality	(0008,0060)	Copied from source image	ALWAYS	AUTO
Series Description	(0008,103E)	SecurView Secondary Capture	ALWAYS	AUTO
Performing Physician's Name	(0008,1050)	Current user name	ALWAYS	AUTO
Body Part Examined	(0018,0015)	Copied from source image	ANAP	AUTO
Protocol Name	(0018,1030)	Copied from source image	ANAP	AUTO
Series Instance UID	(0020,000E)	Unique worldwide	ALWAYS	AUTO
Series Number	(0020,0011)	04100	ALWAYS	AUTO
Laterality	(0020,0060)	Copied from source image	ANAP	AUTO

Table 7.1.1-21 General & SC Equipment Modules of Created SC Image Instances

Attribute Name	Tag	Value	Presence of Value	Source
Conversion Type	(0008,0064)	WSD	ALWAYS	AUTO
Manufacturer	(0008,0070)	HOLOGIC, Inc.	ALWAYS	AUTO
Institution Name	(0008,0080)		ALWAYS	CONFIG
Institution Address	(0008,0081)		ALWAYS	CONFIG
Station Name	(0008,1010)	Local SCU AE Title	ALWAYS	CONFIG
Manufacturer's Model Name	(0008,1090)	SecurView	ALWAYS	AUTO
Software Versions	(0018,1020)	Current software version	ALWAYS	AUTO

Table 7.1.1-22 General Image Module of Created SC Image Instances

Attribute Name	Tag	Value	Presence of Value	Source
Image Type	(0008,0008)	DERIVED\SECONDARY	ALWAYS	AUTO
Acquisition Date	(0008,0022)	Current date	ALWAYS	AUTO

Attribute Name	Tag	Value	Presence of Value	Source
Content Date	(0008,0023)	Current date	ALWAYS	AUTO
Acquisition Time	(0008,0032)	Current time	ALWAYS	AUTO
Content Time	(0008,0033)	Current time	ALWAYS	AUTO
Derivation Description	(0008,2111)	Screen Capture or Secondary Capture	ALWAYS	AUTO
Source Image Sequence	(0008,2112)	One or more Items, reference images in screen capture	ALWAYS	AUTO
>Referenced SOP Class UID	(0008,1150)		ALWAYS	AUTO
>Referenced SOP Instance UID	(0008,1155)		ALWAYS	AUTO
Instance Number	(0020,0013)		ALWAYS	AUTO
Patient Orientation	(0020,0020)		VNAP	AUTO
Image Comments	(0020,4000)	SecurView Screen Capture (Screen Capture only)	ALWAYS	AUTO

Table 7.1.1-23 Image Pixel Module of Created screen capture Image Instances

Attribute Name	Tag	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	3	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	RGB	ALWAYS	AUTO
Planar Configuration	(0028,0006)	0	ALWAYS	AUTO
Rows	(0028,0010)	# rows in screen capture	ALWAYS	AUTO
Columns	(0028,0011)	# rows in screen capture	ALWAYS	AUTO
Bits Allocated	(0028,0100)	8	ALWAYS	AUTO
Bits Stored	(0028,0101)	8	ALWAYS	AUTO
High Bit	(0028,0102)	7	ALWAYS	AUTO
Pixel Representation	(0028,0103)	0	ALWAYS	AUTO
Pixel Data	(7FE0,0010)		ALWAYS	USER

Table 7.1.1-24 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)	# rows in secondary capture	ALWAYS	AUTO
Columns	(0028,0011)	# rows in secondary capture	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)	0	ALWAYS	AUTO
Pixel Data	(7FE0,0010)		ALWAYS	USER

Table 7.1.1-25 SOP Common Module of Created SC 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)	Secondary Capture Image Storage, Multi-frame True Color Secondary Capture Image Storage, or Multi-frame Grayscale Word Secondary Capture Image Storage	ALWAYS	CONFIG
SOP Instance UID	(0008,0018)	Unique worldwide	ALWAYS	AUTO

Table 7.1.1-26 Multi-frame Module of Created SC Image Instances

Attribute Name	Tag	Value	Presence of Value	Source
Number of Frames	(0028,0008)	1	ALWAYS	AUTO

Table 7.1.1-27 SC Multi-frame Image Module of Created SC Image Instances

Attribute Name	Tag	Value	Presence of Value	Source
Burned in Annotation	(0028,0301)	YES or NO for screen capture; Always NO for secondary capture	ALWAYS	USER or AUTO
Rescale Intercept	(0028,1052)	0, present if MONOCHROME2	ANAP	AUTO
Rescale Slope	(0028,1052)	1, present if MONOCHROME2	ANAP	AUTO
Rescale Type	(0028,1053)	US, present if MONOCHROME2	ANAP	AUTO
Presentation LUT Shape	(2050,0020)	IDENTITY, present if MONOCHROME2	ANAP	AUTO

Table 7.1.1-28 Standard Extended Attributes of Created secondary capture Image Instances

Attribute Name	Tag	Value	Presence of Value	Source
Imager Pixel Spacing	(0018,1164)	Of created image	ALWAYS	AUTO
View Position	(0018,5101)	Copied from source image	ANAP	AUTO
View Code Sequence	(0054,0220)	Copied from source image	ANAP	AUTO
>Code Value	(0008,0100)	Copied from source image	ANAP	AUTO
>Coding Scheme Designator	(0008,0102)	Copied from source image	ANAP	AUTO
>Code Meaning	(0008,0104)	Copied from source image	ANAP	AUTO
>View Modifier Code Sequence	(0054,0222)	Copied from source image	ANAP	AUTO

7.1.2 Usage of Attributes from Received IODs

Attributes with incorrect values may cause undesirable behaviors, or disable certain SecurView_{DX} Workstation functionality. In most instances, it is not possible for the SecurView_{DX} Workstation software to detect incorrect attribute values.

The following attributes and values are expected for successful interpretation of received SOP Instances.

Table 7.1.2-1 Expected Attributes in all Received Instances

Attribute Name	Tag	Expected Value
SOP Class UID	(0008,0016)	Matches the Pixel Data
SOP Instance UID	(0008,0018)	Unique worldwide
Study Date	(0008,0020)	Non-zero length
Modality	(0008,0060)	Matches the SOP Class UID
Patient's Name	(0010,0010)	Non-zero length
Patient ID	(0010,0020)	Unique within institution
Study Instance UID	(0020,000D)	Unique worldwide
Series Instance UID	(0020,000E)	Unique worldwide

Table 7.1.2-2 Expected Attributes in all Received Image Instances

Attribute Name	Tag	Expected Value
Imager Pixel Spacing	(0018,1164)	Required to convert measurement units to mm, if Pixel Spacing is missing
Patient Orientation	(0020,0020)	Required for automatic hanging of mammography images
Laterality	(0020,0060)	If the anatomy is a paired body part,

Attribute Name	Tag	Expected Value
Image Laterality	(0020,0062)	required for automatic hanging: "L", "R", or "B"
Samples per Pixel	(0028,0002)	1 or 3
Photometric Interpretation	(0028,0004)	MONOCHROME1, MONOCHROME2, RGB, PALETTE COLOR, YBR_FULL, YBR_FULL_422, or YBR_PARTIAL_422
Planar Configuration	(0028,0006)	Expected with Samples per Pixel > 1
Rows	(0028,0010)	Matches the Pixel data
Columns	(0028,0011)	Matches the pixel data
Pixel Spacing	(0028,0030)	Required to convert measurement units to mm
Bits Allocated	(0028,0100)	Up to 16, matches Pixel Data
Bits Stored	(0028,0101)	Up to 16, matches Pixel Data
View Code Sequence	(0054,0220)	Required for automatic hanging of mammography images
>View Modifier Code Sequence	(0054,0222)	Values factored into automatic hanging of mammography images when present
Pixel Data	(7FE0,0010)	Rows*Columns*Bits Allocated

Table 7.1.2-3 Expected Attributes in Digital Mammography X-Ray Images

Attribute Name	Tag	Expected Value
Presentation Intent Type	(0008,0068)	FOR PRESENTATION or FOR PROCESSING
Manufacturer	(0008,0070)	Manufacturer of the equipment used to create the image
Window Center	(0028,1050)	Valid values if present
Window Width	(0028,1051)	Valid values if present
Rescale Intercept	(0028,1052)	0
Rescale Slope	(0028,1053)	1
Rescale Type	(0028,1054)	US
VOI LUT Sequence	(0028,3010)	Valid values in Items if present

Table 7.1.2-4 Expected Attributes in Hologic Selenia Digital Mammography X-Ray Images

Attribute Name	Tag	Expected Value
Manufacturer	(0008,0070)	"LORAD" or "HOLOGIC, Inc."
Source Image Sequence	(0008,2112)	FOR PRESENTATION images only
>Referenced SOP Class UID	(0008,1150)	Digital Mammography X-Ray Image – For Processing
>Referenced SOP Instance UID	(0008,1155)	SOP Instance UID
Private Attributes	(0019,xxxx)	Creator ID = LORAD Selenia

Table 7.1.2-5 Expected Attributes in Mammography CAD SR Instances

Attribute Name	Tag	Expected Value
Manufacturer	(0008,0070)	"R2 Technology, Inc.", "CADx" or "iCAD, Inc.": to display appropriate logo; instances with other values are ignored
Software Versions	(0018,1020)	Non-zero length value

Table 7.1.2-6 Supported Content Items in Mammography CAD SR Instances

Template	Rows	Expected Value
TID 4000, Mammography CAD Document Root	1-9	All mandatory content items
TID 4001, Mammography CAD Overall Impression/Recommendation	1, 3	All mandatory content items
TID 4003, Mammography CAD Individual Impression/Recommendation	1, 2, 5	All mandatory content items

Template	Rows	Expected Value
TID 4006, Mammography CAD Single Image Finding	1-4, 6, 10, 11, 12, 20	
TID 4009, Mammography CAD Individual Calcification	2	Linear Measurement
TID 4010, Mammography CAD Calcification Cluster	3, 4	Number of calcifications, Linear Measurement
TID 4011, Mammography CAD Density	4	Linear Measurement
TID 4015, CAD Detections Performed	1-4	All mandatory content items
TID 4016, CAD Analyses Performed	1-4	All mandatory content items
TID 4017, CAD Detection Performed	1, 2, 4, 6, 8	
TID 4018, CAD Analysis Performed	1, 2, 4, 6, 8	
TID 4019, CAD Algorithm Performed	1-3	
TID 4020, CAD Image Library Entry	1-12	All mandatory content items
TID 4021, Mammography CAD Geometry	1-4	Row 3, Outline: POLYLINE, CIRCLE, ELLIPSE

7.1.3 Attribute Mapping

Not applicable.

7.1.4 Coerced/Modified Attributes

Regarding received Instances, the SecurView_{DX} Workstation will attempt to fill in missing attributes and correct invalid attribute values that are required for internal use. All Patient and Study attributes and Referenced SOP Instance UIDs that are copied from received instances to create new instances use the unmodified values as they were received.

If the Referenced SOP Instance UID (0008,1155) within a Source Image Sequence (0008,2112) Item of a Hologic Selenia Digital Mammography – For Presentation image is detected to be incorrect, it is corrected for use within the SecurView_{DX} Workstation.

7.2. Data Dictionary of Private Attributes

Not applicable.

7.3. Coded Terminology and Templates

Not applicable.

7.4. Grayscale Image Consistency

Display calibrations are performed according to the DICOM Grayscale Standard Display Function.

7.5. Standard Extended/Specialized/Private SOP Classes

When communicating with Siemens Magic-Store PACS as a remote Query/Retrieve AE, the SCU AE sends a non-conformant C-MOVE request at the Study Level prior to sending C-MOVE requests at the Series or Image Level. The non-conformant aspect is that (0000,0600) Move Destination is sent zero length. This behavior is expected by Siemens Magic-Store PACS.

7.6. Private Transfer Syntaxes

None.