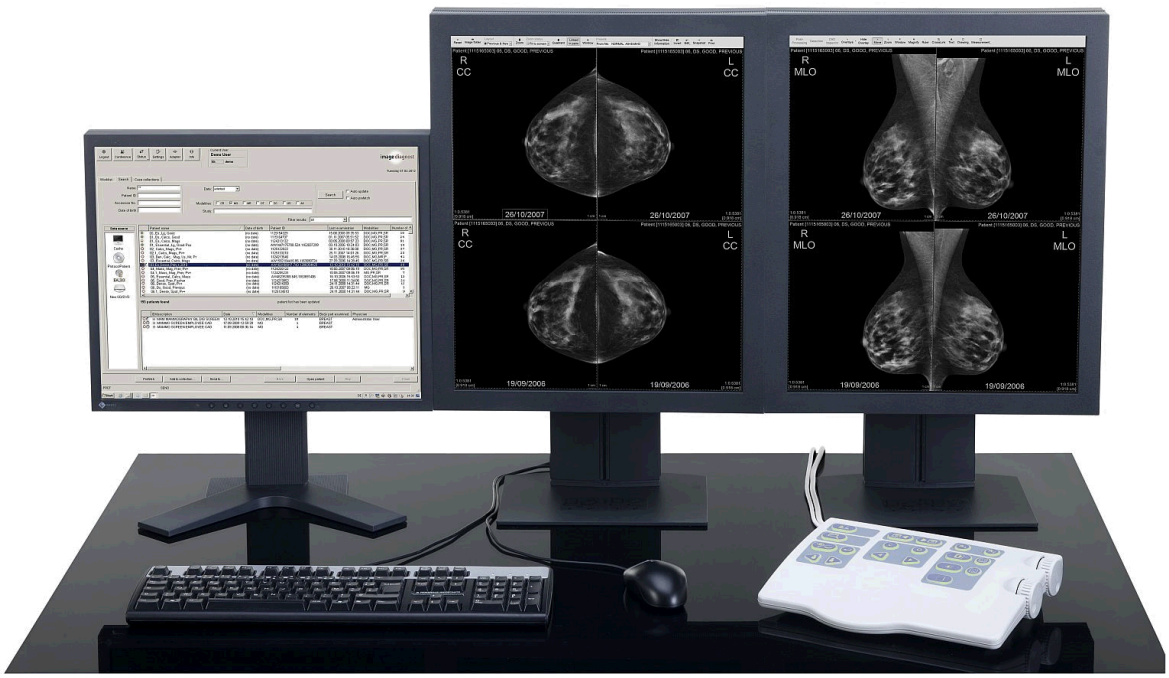
GE imagination at work

image diagnost

DICOM V3.0
Conformance Statement

SenoIris 1SP2.1



GE imagination at work

DOC1577748, rev. 7

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DICOM V3.01

1 INTRODUCTION

1.1 OVERVIEW

This is a conformance statement for the "SenoIris" mammography workstation. SenoIris is a diagnostic softcopy reading workstation for digital or digitized mammograms and related modalities. It is able to exchange DICOM data via network and DICOMDIR. The report generation module includes the creation of DICOM text SR, DICOM GSPS and DICOM encapsulated PDF. The print module supports printing including presentation LUTs.

1.2 INTENDED AUDIENCE

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

1.3 SCOPE AND FIELD OF APPLICATION

It is the intent of this document to provide an unambiguous specification for GEHC implementations. This specification, called a Conformance Statement, includes a DICOM Conformance Statement and is necessary to ensure proper processing and interpretation of GEHC medical data exchanged using DICOM. The GEHC Conformance Statements are available to the public.

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

If the user encounters unspecified private data elements while parsing a GEHC Data Set, the user is well advised to ignore those data elements (per the DICOM standard). Unspecified private data element information is subject to change without notice.

1.4 IMPORTANT REMARKS

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

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

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

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

- Future Evolution - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM Standard. DICOM will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEHC protocol is based on DICOM as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM. In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) described by these DICOM Conformance Statements. The user should ensure that any non–GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.

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

1.5 REFERENCES

NEMA PS3 Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/

1.6 DEFINITIONS

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples : Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

Application Entity (AE) – an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title – the externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.

Application Context – the specification of the type of communication used between Application Entities. Example: DICOM network protocol.

Association – a network communication channel set up between Application Entities.

Attribute – a unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Digital Breast Tomosynthesis (DBT) Digital breast tomosynthesis, also referred to as tomo or DBT, is a new 3-D mammography routine.

Information Object Definition (IOD) – the specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Joint Photographic Experts Group (JPEG) – a set of standardized image compression techniques, available for use by DICOM applications.

Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)

Module – a set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – first phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context – the set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.

Protocol Data Unit (PDU) – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data

Service Class Provider (SCP) – role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) – role of an Application Entity that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance – an information object; a specific occurrence of information exchanged in a SOP Class. Examples: a specific x-ray image.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), little endian explicit value representation.

Unique Identifier (UID) – a globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

1.7 Acronyms and abbreviations

This document uses the following abbreviations.

AE	Application Entity
CAD	Computer Aided Detection
CD-R	Compact Disk Recordable
CSE	Customer Service Engineer
CR	Computed Radiography
CT	Computed Tomography
DBT	Digital breast tomosynthesis
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIT	Directory Information Tree (LDAP)
DN	Distinguished Name (LDAP)
DNS	Domain Name System
DX	Digital X-ray
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
GSDF	Grayscale Standard Display Function
GSPS	Grayscale Softcopy Presentation State
HIS	Hospital Information System
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISO	International Organization for Standards
IO	Intra-oral X-ray
JPEG	Joint Photographic Experts Group
LUT	Look-up Table
MAR	Medication Administration Record
MPEG	Moving Picture Experts Group
MG	Mammography (X-ray)
MPPS	Modality Performed Procedure Step
MR	Magnetic Resonance Imaging
MSPS	Modality Scheduled Procedure Step
MTU	Maximum Transmission Unit (IP)
MWL	Modality Worklist
NTP	Network Time Protocol
O	Optional (Key Attribute)
OSI	Open Systems Interconnection
PACS	Picture Archiving and Communication System
PDU	Protocol Data Unit
R	Required (Key Attribute)
RDN	Relative Distinguished Name (LDAP)
RIS	Radiology Information System
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SPS	Scheduled Procedure Step

SR	Structured Reporting
TCP/IP	Transmission Control Protocol/Internet Protocol
U	Unique (Key Attribute)
UID	Unique Identifier
UL	Upper Layer
US	Ultrasound
VL	Visible Light
VR	Value Representation

2 Implementation model

2.1 Application data flow diagram

The application data flow models for the SenoIris are shown in the following Illustration:

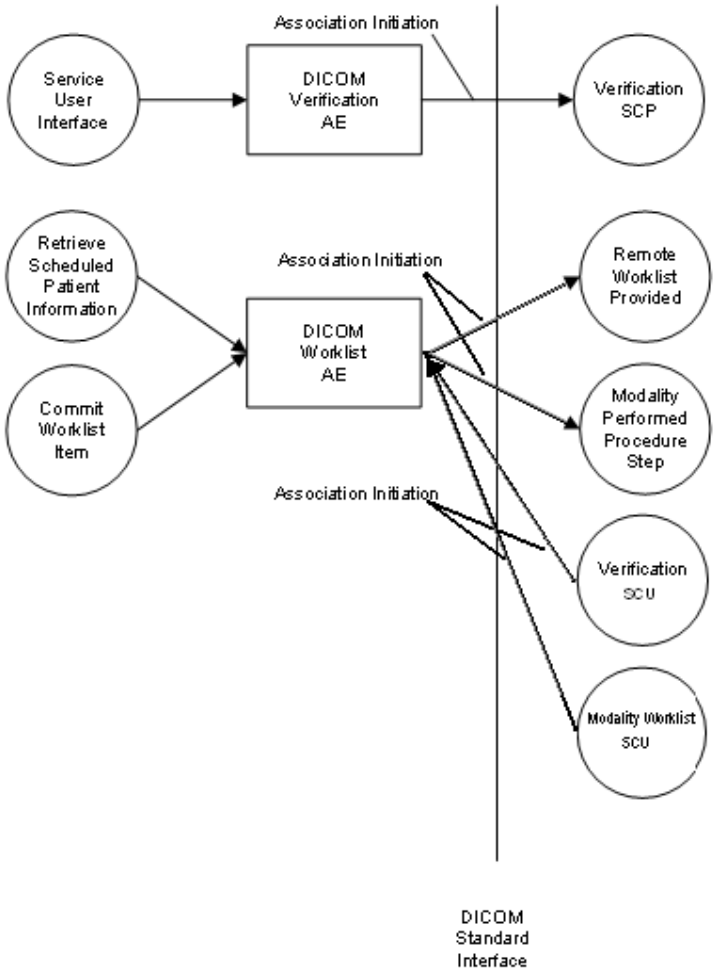


Figure 1.1-1 (Part1) – Application data flow diagram

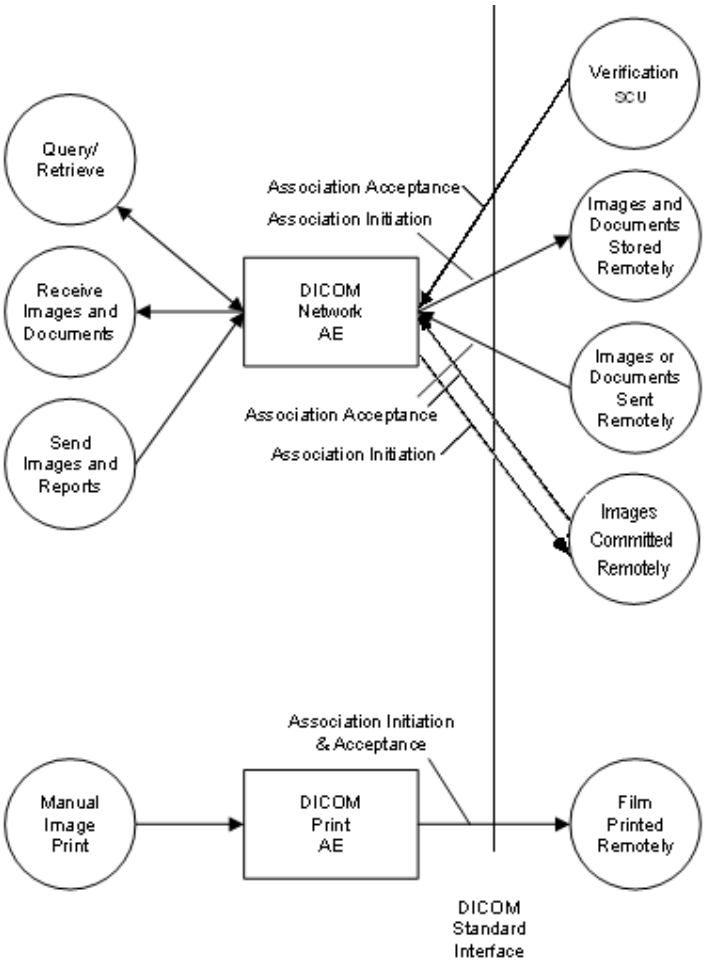


Figure 1.1-1 (Part2) – Application data flow diagram

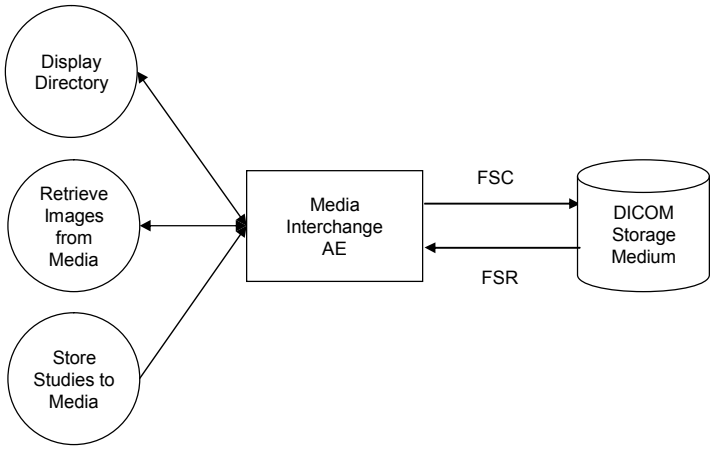


Figure 1.1-1 (Part3) – Application data flow diagram

The MammmoWorkstation application is composed of the following Application Entities (AE):

1. DICOM Worklist Application Entity
2. DICOM Network AE
3. DICOM Print AE
4. DICOM Media Interchange AE

See chapter "Functional definition of Application Entities (AE)" for a detailed description.

2.2 Functional definition of Application Entities (AE)

2.2.1 Verification AE

The **DICOM Verification** Application Entity provides DICOM protocol verification of remote DICOM Services. The DICOM Verification AE is activated, when an user with administrative privileges opens the configuration settings user interface and activates the "Echo" function for a selected DICOM partner configuration.

The DICOM Verification AE provides the following Real World Activities:

- Verify the ability of a foreign DICOM application on a remote node to respond to DICOM messages (DICOM Verification SCU).

2.2.2 Worklist AE

The **DICOM Worklist** Application Entity provides DICOM protocol communication with remote DICOM Modality Worklist SCPs and SCUs.

The DICOM Worklist AE acting as SCU is activated when the user opens the worklist tab of the SenoIris. He can search in the scheduled procedure steps inserted in a remote RIS using different filters (e.g. scheduled station, scheduled date). Then the scheduled procedure steps are shown in a list control of the SenoIris GUI. The user can select one item and start to review the corresponding patient. The Performed Procedure Step Manager is used to update status information. The DICOM Worklist AE provides the following Real World Activities:

- Retrieve scheduled patient information from a remote Worklist Server (DICOM Modality Worklist SCU).
- Set Modality Performed Procedure Step

The DICOM Worklist AE acting as SCP for other SCUs is activated automatically when SenoIris is started.

- Provide scheduled patient information from a remote worklist client (DICOM Modality Worklist SCP).
- Receive Modality Performed Procedure Step

2.2.3 Network AE

The **DICOM Network** Application Entity provides DICOM protocol communication for images, structured reports, GSPS data, encapsulated PDF and mammography CAD documents. The DICOM Network AE is automatically brought up when the SenoIris is powered on.

The DICOM Network AE provides the following Real World Activities:

- Manual and automatic Query/Retrieve a remote DICOM archive to obtain a list of data at Patient level by selecting the remote DICOM AE (DICOM Query/Retrieve SCU). From the list the user can select an entry and retrieve the SOP Classes supported by the SenoIris from the remote DICOM AE. The query is selective based on criteria described below in the document.

- Receive images, structured reports, GSPS data, encapsulated PDF and mammography CAD documents sent from a remote DICOM AE to the SenoIris (DICOM Receive SCP).

- Send images, structured reports, GSPS data, encapsulated PDF and mammography CAD documents to remote DICOM Storage stations (DICOM Store SCU).

- Initiate storage commit for documents created on the workstation (Storage Commitment N-ACTION).

- Receive storage commit (Storage Commitment N-EVENT-REPORT)

The DICOM Network AE initiates the following operations:

- Access patient demographics and pixel data in the local database.

- Initiate a DICOM association to ask for remote patient demographics.

- Initiate storage commit for documents created on the workstation (Storage Commitment N-ACTION).

- Initiate a DICOM association to ask for transmit SOP Classes (images, structured reports, mammography CAD documents) from a remote DICOM AE to SenoIris

- Initiate a DICOM association to send DICOM SOP Classes (secondary capture images, structured reports) to a remote DICOM AE.

The DICOM Network AE waits for association requests from Remote AE:

- Answer to DICOM associations transmitting DICOM SOP Classes (images, structured reports, mammography CAD documents) to be stored on the SenoIris

- Receive storage commit (Storage Commitment N-EVENT-REPORT). For documents created on the workstation, the status is updated in the local image database. For documents sent to the SenoIris, the storage commit answer is forwarded to the originator of the document.

- Receive storage commit request (Storage Commitment N-ACTION) for DICOM documents sent to the SenoIris and forward the request to a configurable PACS archive. The SenoIris is not an image archive, it does not answer storage commit requests directly.

2.2.4 Print AE

The **DICOM Print** Application Entity provides DICOM protocol communication with Remote DICOM Printers. The DICOM Print AE is activated when the user requests for a print.

The DICOM Print AE provides the following Real World Activities:

- Manual Image Print (DICOM Print SCU). For this operation the operator selects an image in the Viewer, then prints the image using the “Print” function.

The DICOM Print AE initiates the following operations:

- Initiate a DICOM association to send DICOM SOP Classes (corresponding to the DICOM Print Management service class) to a remote DICOM Printer.

2.2.5 Media Interchange AE

The **DICOM Media Interchange** Application Entity is activated when the user requests to browse a DICOM Media. The DICOM Media Interchange AE provides the following Real World Activities:

- Display Directory of a DICOM Storage Medium.
- Retrieve Images from a DICOM Storage Medium.
- Store studies to a DICOM Storage Medium.

Possible Media are local disk, CD or DVD.

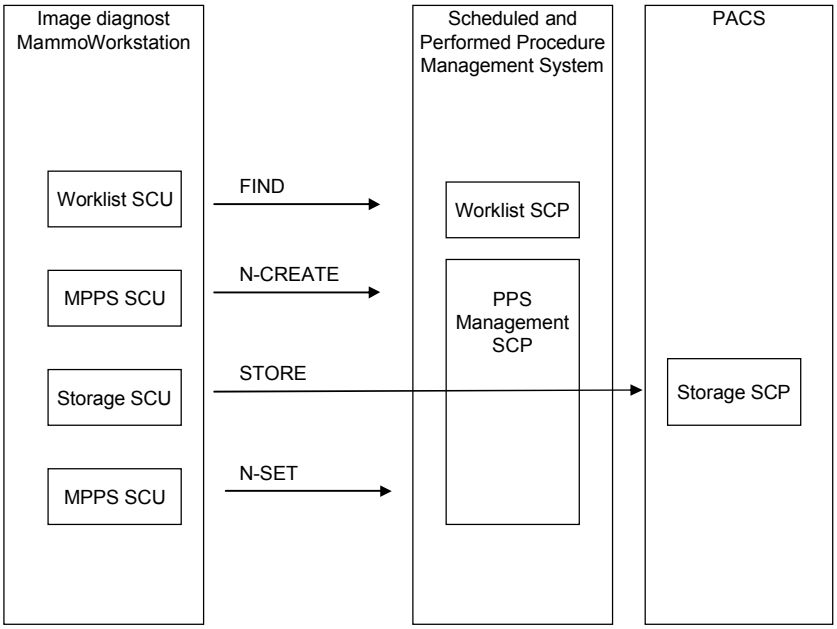
The DICOM **Media Interchange AE** initiates the following operations:

- When the user clicks on a configured "DICOM CD" source, referring to an existing media, the user can browse the media and he can select and import studies from the media.
- When the user clicks on the "Export to DICOM CD" button, the user can create a new media containing the selected studies.

2.3 Sequencing of real-world activities

2.3.1 Scheduled Modality Performed Procedure Step

Sequencing of worklist, storage and performed procedure step management activities:



2.3.2 Manual Image Print

1. The user selects an image in the viewer and opens the Print Manager dialog.
2. The Print Manager dialog is displayed with the "Print" button initially locked. The Print manager retrieves the printer status by activating the DICOM Print SCU AE that initiates the following actions.
3. Initiates a DICOM association and selects a Presentation Context
4. N-GETs printer status from the Printer SOP Instance
    a. If Printer Status is NORMAL
        i. Association is released
        ii. The Print manager enables the "Print" button, i.e. the user may initiate printing.
    b. Else
        i. Signal printer failure to the user
        ii. The "Print" function remains locked
        iii. Association is aborted
5. The user may select options in the Print Manager such as applying a calibration LUT and then prints the image using the "Print" button.
6. The Print Manager receives the "Print" request, composes a film, and activates the DICOM Print AE again. The AE then initiates the following actions:
7. Initiate a DICOM association and select the Presentation Context
8. N-CREATEs a Basic Film Session SOP instance
9. N-CREATEs a Basic Film Box SOP instance for the current film
10. N-SETs the Basic Film Box SOP Instance with the Image Box SOP Instance for each image on the film.
11. If the user selected a calibration LUT:
    a. composes the corresponding Presentation LUT
    b. N-CREATEs a Presentation LUT SOP instance for the current film
    c. Creates a Referenced Presentation LUT Sequence in the Basic Film SOP Instance that contains a reference to this Presentation LUT SOP instance
12. N-ACTIONs on the Basic Film Box SOP Instance
13. N-DELETEs on the Basic Film Box SOP Instance

14. Releases the DICOM association after printing is successful or failure has been signaled to the user.

3 AE specifications

3.1 Verification AE

The Verification AE, provides Standard Conformance to the following DICOM V3.0 Service Object Pair (SOP) Class as a Verification Service Class User (SCU):

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1

3.1.1 Association establishment policies

General

The VERIFICATION AE will initiate an association for DIMSE C-ECHO service operations.

Number of associations

The VERIFICATION AE allows a single association for association initiation.

Asynchronous nature

The VERIFICATION AE does not support asynchronous communication (multiple outstanding transactions over a single association).

Implementation identifying information

The Implementation Class Unique Identifier (UID) for the VERIFICATION AE is:

Implementation UID	1.2.276.0.69.25.1.1

3.1.2 Association initiation by real-world activity

The following real world activities initiate association for the VERIFICATION AE:

1. Verify the ability of a foreign DICOM application on a remote node to respond to DICOM messages

Real-world activity: "Verification"

3.1.2.1.1 Associated real-world activity for "Request verification"

The DICOM Verification AE is activated when an user with administrative privileges opens the configuration settings user interface and activates the "Echo" function for selected DICOM partner configuration. The status of the C-ECHO Response from the remote application is indicated in the user interface. A GUI control indicates "success" and all other status.

3.1.2.1.2 Proposed presentation contexts for "Request verification"

The presentation contexts that are proposed by VERIFICATION AE for the verification operation are:

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.1.3 Association Acceptance Policy

VERIFICATION AE does not respond to attempts by a remote AE to open an association.

3.2 Worklist AE

The Worklist AE provides Standard Conformance to the following DICOM V3.0 Service Object Pair (SOP) Class as a Modality Worklist Service Class User (SCU):

SOP Class Name	**SOP Class UID**
Verification	1.2.840.10008.1.1
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3

3.2.1 Association establishment policies

General

The WORKLIST AE will initiate an association as a Modality Worklist Service Class User requesting Application Entity Title and patient data.

The PDU size is 64234 bytes.

Number of associations

The WORKLIST AE opens one association for each request. The WORKLIST AE will accept up to ten associations at the same time

Asynchronous nature

The WORKLIST AE does not support asynchronous communication (multiple outstanding transactions over a single association).

Implementation identifying information

The Implementation Class Unique Identifier (UID) for the WORKLIST AE is:

Implementation UID	1.2.276.0.69.25.1.1

3.2.2 Association initiation by real-world activity

The following real world activities initiate association for the WORKLIST AE:

1. Retrieve Scheduled Patient information
2. User Commits Worklist item

Real-world activity: "Retrieve Scheduled Patient information"

3.2.2.1.1 Associated real-world activity for "Retrieve Scheduled Patient information"

When the user clicks on the "Worklist" tab from the SenoIris and then on the "Refresh" button, the Worklist AE initiates an association for the appropriate Modality Worklist Service Class that corresponds to the set of data requested to be transferred. Then the Worklist AE performs a C-FIND and it is closed when all the response items are received from the remote SCP.

3.2.2.1.2 Proposed presentation contexts for "Retrieve Scheduled Patient information"

The presentation contexts that are proposed by WORKLIST AE for the FIND operation are:

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Worklist Find	1.2.840.10008.5.1.4.31	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.2.2.1.2.1 SOP Specific Conformance Statement for Modality Worklist Find

WORKLIST AE provides standard conformance as an SCU to the Modality Worklist Service Class and uses the following elements for this SOP class.:

Description / Name	Tag	Matching Key Type	Return Key Type
SOP Common			
Specific Character Set	(0008,0005)	O	1C
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	1
>Scheduled Station AE Title	(0040,0001)	R	1
>Scheduled Procedure Step Start Date	(0040,0002)	R	1
>Scheduled Procedure Step Start Time	(0040,0002)	R	1
>Modality	(0008,0060)	R	1
>Scheduled Performing Physician's Name	(0040,0006)	R	2
>Scheduled Procedure Step Description	(0040,0007)	O	1C
>Scheduled Station Name	(0040,0010)	O	2
>Scheduled Procedure Step ID	(0040,0009)	O	1
Requested Procedure			
Requested Procedure ID	(0040,1001)	O	1
Requested Procedure Description	(0032,1060)	O	1C
Study Instance UID	(0020,000D)	O	1
Imaging Service Request			
Accession Number	(0008,0050)	O	2
Referring Physician's Name	(0008,0090)	O	2
Patient Identification			
Patient's Name	(0010,0010)	R	1
Patient ID	(0010,0020)	R	1
Patient Demographic			

Patient's Birth Date	(0010,0030)	O	2
Patient's Sex	(0010,0040)	O	2

Real-world activity: "Commit Worklist item"

3.2.2.1.3 Associated real-world activity for "Commit Worklist item"

When the user selects an item from the worklist, the SenoIris sends a N-CREATE request.

3.2.2.1.4 Proposed presentation contexts for "Commit Worklist item"

The presentation contexts that are proposed by WORKLIST AE for the FIND operation are:

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.2.3 Association Acceptance Policy

When the WORKLIST AE accepts an association, it will process modality worklist find and modality performed procedure step request.

3.3 NETWORK AE

The Network AE provides Standard Conformance to the following DICOM V3.0 Service Object Pair (SOP) Classes as a Service Class User (SCU):

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11
Enhanced Structured Reporting	1.2.840.10008.5.1.4.1.1.88.22
Comprehensive Structured Reporting	1.2.840.10008.5.1.4.1.1.88.33
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1
Storage Commitment Push Model	1.2.840.10008.1.20.1

The Network AE provides Standard Conformance to the following DICOM V3.0 Service Object Pair (SOP) Classes as a Service Class Provider (SCP):

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11
Enhanced Structured Reporting	1.2.840.10008.5.1.4.1.1.88.22
Comprehensive Structured Reporting	1.2.840.10008.5.1.4.1.1.88.33
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1
Storage Commitment Push Model	1.2.840.10008.1.20.1
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1

3.3.1 Association establishment policies

General

The Network AE will initiate an association as an SCU of Storage Services when

- a local operator requests to send images or structured reports over the network to a remote Storage Service Class provider.

The PDU size is 64234bytes.

Number of associations

The Network AE opens one Store association for each image to be sent to the storage station. The Network AE will accept up to five associations at the same time.

Asynchronous nature

The Network AE does not support asynchronous communication (multiple outstanding transactions over a single association).

Implementation identifying information

The Implementation Class Unique Identifier (UID) for the NETWORK AE is:

Implementation UID	1.2.276.0.69.25.1.1

3.3.2 Association initiation by real-world activity

Real-world activity: "Query/Retrieve"

3.3.2.1.1 Associated real-world activity for "Query/Retrieve"

The operator queries a Remote database by selecting the "search" tab and clicking on the icon representing the DICOM Remote AE. A list control displays the results upon successful query.

Then the operator can select one or several Patients and can either click the "Prefetch" icon to retrieve the selection on the SenoIris database or click the "Select" icon to retrieve the selection on the SenoIris and start reviewing the first Patient in the list.

These operations will cause:

- The DICOM NETWORK AE to initiate a DICOM association
- The DICOM NETWORK AE to emit a C-FIND request to get a list of patients regarding the criteria listed below, to get the appropriate studies, series or images for the selected list of patients.
- The DICOM NETWORK AE to emit a C-FIND request to specify a selected list of studies/series/images to be sent by the Remote Host to the SenoIris

3.3.2.1.2 Association Initiation Policy

The NETWORK AE initiates a new association for querying Patient Folders (or Studies/Series/Images) on a remote DICOM AE. This association corresponds to one Real World Activity:

3.3.2.1.3 Proposed presentation contexts for "Query/Retrieve"

The presentation contexts that are proposed by NETWORK AE for the FIND and MOVE operation are:

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.3.2.1.3.1 SOP Specific Conformance Statement for the Model Patient Root Query/Retrieve Information Model – FIND SOP Class

Following are the status codes that are more specifically processed when receiving messages from a Query SCP equipment:

Service Status	Status Codes	Further Meaning	Application Behaviour When receiving Status Codes	Related Fields Processed if received
Refused	A700	Out of resources	Association is closed. Appropriate message is displayed to the user.	(0000,0902)

	0122	SOP Class not Supported	Association is closed. Appropriate message is displayed to the user.	(0000,0902)
Failed	A900	Identifier does not match SOP Class	Association is closed. Error message is displayed to the user.	(0000,0901) (0000,0902)
	Cxxx	Unable to process	Association is closed. Error message is displayed to the user.	(0000,0901) (0000,0902)
Cancel	FE00	Matching terminated due to cancel	Association is closed. Error message is displayed to the user.	None
Success	0000	Matching is complete – No final identifier is supplied		None
Pending	FF00	Matches are continuing – Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys		Identifier
	FF01	Matches are continuing – Warnung that one or more Optional Keys were not supported for existence and/or matching for this Identifier.		Identifier

3.3.2.1.3.2 SOP Specific Conformance Statement for the Model Study Root Query/Retrieve Information Model – FIND SOP Class

See section on Patient Root Query/Retrieve Information Model – FIND SOP Class.

Real-world activity: "Send Images and Reports"

3.3.2.1.4 Associated real-world activity for "Send Images and Reports"

When:

1. the user selects some studies/series/images, clicks on the "Send" button from the SenoIris database and then selects the remote AE,

2. the user closes a case with report data or annotations entered

3. the user creates a snapshot,

the NETWORK AE initiates an association for each image, report, annotation selected or created. Every association is closed when the DICOM data has been sent (successfully or not) to the remote SCP. The NETWORK AE supports lossless and lossy JPEG 2000 compression. Compression can be configured in the SenoIris and is invoked automatically for images.

3.3.2.1.5 Proposed presentation contexts for "Send Images and Reports"

The presentation contexts that are proposed by NETWORK AE for the "Manual Storing" real world activity are:

Presentation Context Table - Proposed					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1	Implicit VR Little Endian	1.2.840.10008.1.1	SCU	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		

		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		

		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		

		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		

3.3.2.1.5.1 SOP Specific Conformance Statement for Digital Mammography Image Storage – For Presentation SOP Class

The NETWORK AE will react in the following ways to the different C-STORE response status:

- Refused: the SCU will show the FAILED status for the image to be sent.
- Error: the SCU will show the FAILED status for the image to be sent.
- Warning: the SCU will show the SUCCESS status for the image to be sent.
- Success: the SCU will show the SUCCESS status for the image to be sent.

NETWORK AE will not attempt any extended negotiation.

3.3.2.1.5.2 SOP Specific Conformance Statement for Digital Mammography Image Storage – For Processing SOP Class

Same as SOP Specific Conformance Statement for Digital Mammography Image Storage – For Presentation SOP Class.

3.3.2.1.6 Storage commitment

The Storage commitment is initiated only for documents created on the SenoIris when the user closes a case with report data or annotations entered or when the user creates a snapshot. It is not initiated when the user selects some studies/series/images, clicks on the "Send" button from the SenoIris database and then selects the remote AE.

The declaration of remote host supporting Storage Commitment is done through a specific menu (DICOM Partner menu). When a successful commitment for some documents is received, the NETWORK AE flags them as committed in the local database.

The NETWORK AE initiates the following operations:

- Initiate a DICOM association to ask a remote host (Storage Commitment SCP) on specific images.

The NETWORK AE waits for association requests from remote storage commitment AE:

- Answer to DICOM associations transmitting Storage Commitment Notification (N-EVENT-REPORT)

3.3.3 Association Acceptance Policy

When the NETWORK AE accepts an association, it will receive any DICOM data transmitted on that association and store the supported SOP Classes on disk. By default, any Remote DICOM AE can send images to the NETWORK AE.

Real-world activity: "Receive Images and Documents"

The NETWORK AE accepts an association when it receives a valid association request from a DICOM Storage SCU.

3.3.3.1.1 Associated real-world activity for "Receive Images and Documents"

The NETWORK AE waits for any association. No operator is required to receive an image. If images are received for the currently opened patient context, these images are opened automatically.

3.3.3.1.2 Accepted presentation contexts for "Receive Images and Documents"

Presentation Context Table – Accepted					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1	Implicit VR Little Endian	1.2.840.10008.1.1	SCP	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG Baseline Lossy 8-Bit	1.2.840.10008.1.2.4.50		
		JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG Baseline Lossy 8-Bit	1.2.840.10008.1.2.4.50		
		JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
Digital X-Ray Image	1.2.840.10008.5.1.4.1.1.1.	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

Storage – For Processing	1.1	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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG Baseline Lossy 8-Bit	1.2.840.10008.1.2.4.50		
		JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG Baseline Lossy 8-Bit	1.2.840.10008.1.2.4.50		
		JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG Baseline Lossy 8-Bit	1.2.840.10008.1.2.4.50		

		JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG Baseline Lossy 8-Bit	1.2.840.10008.1.2.4.50		
		JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG Baseline Lossy 8-Bit	1.2.840.10008.1.2.4.50		
		JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG Baseline Lossy 8-Bit	1.2.840.10008.1.2.4.50		
		JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG Baseline Lossy 8-Bit	1.2.840.10008.1.2.4.50		
		JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

	04.1	Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG Baseline Lossy 8-Bit	1.2.840.10008.1.2.4.50		
		JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		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		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG Baseline Lossy 8-Bit	1.2.840.10008.1.2.4.50		
		JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51		
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		

Note: The Storage Commitment Provider initiating the association must use the role selection negotiation.

3.3.3.1.2.1 SOP Specific DICOM Conformance Statement for Storage SOP Classes

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

Service Status	Status Codes	Further Meaning	Application Behaviour When receiving Status Codes	Related Fields Processed if received
Refused	A7xx	Out of resources	Indicated that there was not enough space or some other internal resource to store the image.	(0000,0902)
Error	0110	Processing Failure	Indicates that an internal system call has failed while processing the image	(0000,0902)
Success	0000	---	---	None

Note: Images sent in JPEG-2000, JPEG 2000 (Lossless Only), JPEG Baseline Lossy 8-Bit, JPEG Baseline Lossy 12-Bit, JPEG Lossless Hierarch., First-order prediction transfer syntax are decompressed by the NETWORK AE by default.

Note: Correct transmission of images through the Network AE by itself does not guarantee an image to be visualized on SenoIris. All modalities are managed by the database.

For images to be displayed on SenoIris they must meet certain minimum DICOM requirements. Functionality, such as automatically sorted images in the Patient Folder can only be guaranteed when these DICOM requirements are met:

1. Accepted Modalities for X-ray mammography

General Series Module Attributes (C.7.3.1)

Tag	Attribute Name	Accepted Values
0008,0060	Modality	MG | CR* | OT
0018,0015	Body Part Examined	BREAST

Images from other modalities are not interpreted as X-Ray Mammography. Instead they appear in the “Additional Series” list.

*For Fuji-CR there is a “MG-Option” which is to be used instead of CR.

2. Sorted Patient Folder

General Image Module Attributes (C.7.6.1)

Tag	Attribute Name	Accepted Values
0020,0020	Patient Orientation	P,FL | A,FR | P,L | A,R | P,F | A,F

Mammography Image Module Attributes (C.8.11.7)

Tag	Attribute Name	Accepted Values
0020,0062	Image Laterality	R | L

CR-Image (C.8.1.2), X-Ray Image (C.8.7.1), DX Positioning Module Attr. (C.8.11.5)

Tag	Attribute Name	Accepted Values
0018,5101	View Position	CC | MLO | ML

Remark: For Agfa CR also the Series Description (0008,103E), General Series Module Attributes C.7-5) is interpreted.

Translation table for standard orientations:

Patient Orientation	Image Laterality	View Position
P, L	R	CC
A, R	L	CC
P, FL	R	MLO
A, FR	L	MLO
P, F	R	ML
A, F	L	ML

SenoIris supports additional values for patient orientation with automatic flip and rotation of images for proper display.

If Patient Orientation is missing, the „View Code Sequence" is used according to SRT. Legacy support for SNM3 is preserved, too.

Code Value	**Code Meaning**	**equivalent** **View Position**	**View Position in Workstation**
R-10242	cranio caudal	CC	CC
R-10224	medio-lateral	ML	ML
R-10226	medio-lateral oblique	MLO	MLO
R-10244	caudo-cranial	FB	FB
R-10228	latero-medial	LM	LM
R-10230	latero-medial oblique	LMO	LMO

R-102D0	superolateral to inferomedial oblique	SIO	SIO
R-102CF (deprecated)	cranio-caudal exaggerated	XCC	XCC
R-1024A	cranio-caudal exaggerated laterally	XCCL	XCCL
R-1024B	cranio-caudal exaggerated medially	XCCM	XCCM
Y-X1770 (retired)	cranio-caudal exaggerated laterally	XCCL	XCCL
Y-X1771 (retired)	cranio-caudal exaggerated medially	XCCM	XCCM

The following "View Modifier Sequence" values are supported:

Code Value	**Code Meaning**	**Image type in Workstation (ACR-BIRADS code in parentheses)**
R-102D6	Magnification	Magnification (M)
R-102D7	Spot Compression	Spot Compression (S)
R-102D2	Cleavage	Cleavage (CV)
R-102D5	Implant Displaced	Implant Displaced (ID)
R-102D1	Axillary tail	Axillary tail (AT)
R-102D3	Rolled lateral	Rolled lateral (RL)
R-102D4	Rolled medial	Rolled medial (RM)
R-102CA	Rolled inferior	Rolled inferior (RI)
R-102C9	Rolled superior	Rolled superior (RS)
R-102C2	Tangential view	Tangential (TAN)

If none of the above values are set, then the SenoIris cannot sort the images according to laterality and view position. The images will then be displayed unsorted in the Patient Folder.

3. Measurements and Scales, Quadrant-Zoom, DICOM-Print

First, the software checks if Imager Pixel Spacing and "Estimated Radiographic Magnification Factor":

Tag	**Attribute Name**	**Affected DICOM Modules**

0018, 1164	Imager Pixel Spacing	CR-Image (C.8.1.2) X-Ray Acquisition (C.8.7.2) DX Detector (C.8.11.4)

If the "Estimated Radiographic Magnification Factor" is present and the above Imager Pixel Spacing, then all measurement calculations are adjusted by the value of the magnification factor:

Tag	Attribute Name	Affected DICOM Modules
0008,1114	Estimated Radiographic Magnification Factor	DX Positioning (C.8.11.5)

Note: For modalities **GE Senographe 2000D, DS, Essential** the magnification factor is already pre-applied to the Imager Pixel Spacing. The SenoIris will therefore ignore this factor on images of these modalities for measurements.

If either "Imager Pixel Spacing" or the "Estimated Radiographic Magnification Factor" is missing and the below value of "Pixel Spacing" is present, it will be used instead:

Tag	Attribute Name	Affected DICOM Modules
0028,0030	Pixel Spacing	Image Plane (C.7.6.2) CR-Image (C.8.1.2) DX Detector (C.8.11.4)

If both "Imager Pixel Spacing" and "Pixel Spacing" are missing (or the resulting value is zero), then the 1:1cm display function will be deactivated. Furthermore, the scales in the Magnifying Glass and measurement function will be deactivated. DICOM Print functionality will be limited as well, i.e. true-size printing is not available then.

4. Interpretation of different values for row Pixel Spacing and column Pixel Spacing

Although row and column values of Imager Pixel Spacing (or Pixel Spacing) might be different (i.e. anisotropic) the SenoIris expects both row Pixel Spacing and column Pixel spacing to be identical. Anisotropic images are therefore neither supported for viewing, nor for any measurement, nor for any other activity. This implementation is in line with the DICOM Correction Item CP-626 “Clarify pixel spacing row and column order”.

5. Windowing

VOI LUT Module Attributes (C.11.2)

0028,1050 Window Center

0028,1051 Window Width

0028,1055 Window Center & Width Explanation

0028,1056 VOI LUT Function

0028,3010 VOI LUT Sequence

If a VOI LUT Sequence is present, it overrides the Window Function attributes.

If none of these values are set, the SenoIris applies default values.

In addition, the VOI LUT Module is supported, cf. Appendix

3.3.3.1.3 VOI LUT Attributes Module

Attribute name	Tag	Attribute Description
VOI LUT Sequence	(0028,3010)	Defines a sequence of VOI LUTs.
> LUT Descriptor	(0028,3002)	Specifies the format of the LUT Data in this Sequence. See C.11.2.1.1 for further explanation. Required if the VOI LUT Sequence (0028,3010) is sent..
> LUT Explanation	(0028,3003)	Free form explanation of the meaning of the LUT
> LUT Data	(0028,3006)	LUT Data in this Sequence. Required if the VOI LUT Sequence (0028,3010) is sent.
Window Center	(0028,1050)	Window Center for display. See C.11.2.1.2 for further explanation
Window Width	(0028,1051)	Window Width for display. See C.11.2.1.2 for further explanation. Required if Window Center (0028,1050) is sent.
Window Center & Width Explanation	(0028,1055)	Free form explanation of the meaning of the Window Center and Width. Multiple values correspond to multiple Window
VOI LUT Function	(0028,1056)	Defines a VOI LUT function to apply to the values of Window Center and Window Width. Supported values: LINEAR (default) SIGMOID

3.3.3.1.4 Presentation Context Acceptance Criterion

Only known SOP Classes are accepted.

3.3.3.1.5 Storage commitment (storage commitment broker)

Storage commit requests for DICOM data sent to the SenoIris by a sending AE are never processed by the SenoIris itself, because the SenoIris is not a persistent DICOM archive. Instead, the SenoIris forwards these storage commitment requests to another receiving AE, which is configured as DICOM partner in the SenoIris. This functionality of the NETWORK AE is called "storage commitment broker". The declaration of remote hosts supporting storage commitment is done through a specific menu (DICOM Partner menu).

The storage commitment is initiated if the sending AE requests a storage commitment from the NETWORK AE for images sent to the SenoIris. The SenoIris forwards this storage commitment to the configured receiving SCP.

When a successful commitment for some received documents is received, the NETWORK AE forwards the result to the sending AE, which is the originator of the images and the originator storage commitment.

The NETWORK AE initiates the following operations:

- Initiate a DICOM association to ask a remote host (Storage Commitment SCP) on specific images.

The NETWORK AE waits for association requests from remote storage commitment AE:

- Answer to DICOM associations transmitting Storage Commitment Notification (N-EVENT-REPORT)

3.4 PRINT AE

The Print AE provides standard conformance to the following DICOM V3.0 Service Object Pair (SOP) Class as DICOM Print SCU.

SOP Class Name	SOP Class UID
Basic Grayscale Print Management (META)	1.2.840.10008.5.1.1.9
Basic Film Session	1.2.840.10008.5.1.1.1
Basic Film Box	1.2.840.10008.5.1.1.2
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4
Printer	1.2.840.10008.5.1.1.16
Presentation LUT	1.2.840.10008.5.1.1.23

3.4.1 Association establishment policies

General

The PRINT AE will initiate an association as DICOM Basic Print Class User.

The PDU size is 64234 bytes.

The Print Management Service Class does not support extended negotiation.

Number of associations

The PRINT AE supports only one association at a time. Requests are internally queued.

Asynchronous nature

The PRINT AE does not support asynchronous communication (multiple outstanding transactions over a single association).

Implementation identifying information

The Implementation Class Unique Identifier (UID) for the PRINT AE is:

Implementation UID	1.2.276.0.69.25.1.1

3.4.2 Association initiation by real-world activity

There is only one real world activity that initiates association for the PRINT AE:

1. Manual Image Print

The PRINT AE initiates one association with the selected remote DICOM Printer. No other association can be opened by the PRINT AE while the current association is active.

Real-world activity: "Manual Image Print"

3.4.2.1.1 Associated real-world activity for "Manual Image Print"

The user has the possibility to select an image in the Viewer and to print it through the "Print" function of the Print Manager. The Print Manger allows manipulating some print parameters like the number of copies. When the user requests to print by pushing the "Print" button, the PRINT AE tries to establish the association with the requested printer and sends the images to printing.

3.4.2.1.2 Proposed Presentation contexts for "Manual Image Print"

Presentation Context Table – Proposed					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Presentation LUT	1.2.840.10008.5.1.1.23	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.4.2.1.2.1 SOP Specific DICOM Conformance Statement for Print Management SOP Class

For each of the supported Print Management SOP and Meta SOP Classes, the optional attributed and service elements supported, the valid range of values for mandatory and optional attributes, and the status code behavior are described in Annex.

3.4.3 Association Acceptance Policy

PRINT AE does not respond to attempts by a remote AE to open an association.

3.5 MEDIA INTERCHANGE AE

3.5.1 Introduction

The Media Interchange AE provides standard conformance to DICOM V3.0 Media Interchange. Media created complies with the IHE PDI profile. Service Object Pair (SOP) Class as File-Set Creator (FSC) and File-Set Reader (FSR).

SenoIris provides capabilities to DICOM interchange on CD-Rs (Compact Disc-Recordable), and on CDROMs (Compact Disc Read Only Memory).

3.5.2 Implementation Model

Application Data Flow Diagram

Please confer to Figure 1.1.1.

3.5.3 Functional definition of the Media Interchange AE

The Media Interchange AE supports the following features:

- access to patient demographics and pixel data in the local database.
- generate a DICOM File Set (FSC) on the local disk to be burned on a CD-R or DVD-R.
- read a DICOM File Set (FSR) on a CD-R/DVD/CDROM or from local disk for showing the media directory.
- read a DICOM File Set (FSR) on a CD-R/ DVD/CDROM or from local disk for importing the selected studies.

3.5.4 File Meta Information For Implementation Class And Version

File Meta Information Version	1
Implementation UID	1.2.276.0.69.25.1.1

3.5.5 AE SPECIFICATION

Media Interchange AE Specification

The DICOM CDR/CDROM SERVER Application Entity provides standard conformance to

DICOM Interchange Option of the Media Storage Service Class. The application Profiles and roles are listed below.

Application Profiles Supported	Real World Activity	Role	SC Option
STD-AP	CD-R burning	FSC	Interchange
	CD-R/CDROM reading	FSR	Interchange

File Meta Information for the Application Entity

File Meta Information Version	1

Real world activities for the Media Interchange AE

3.5.5.1.1 Display Directory

3.5.5.1.2 Real world activity "CD-R burning"

In this fashion the Media Interchange AE acts as File-Set Creator (FSC) using the Interchange Option. After selecting at least one study the user can create a new DICOM file set by first clicking the DICOM CD button afterwards the Burn CD button. The Directory Information Module is always created and the Basic Directory IOD Definition Model is made from standard tags either of type 1 or 2 and from the Study Instance UID tag which is of type 1C.

3.5.5.1.2.1 Options

Following are the SOP Classes supported by the "CD-burning" activity:

Abstract Syntax		Transfer Syntax		Role
Name	UID	Name List	UID List	
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	FSC
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1			
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1			
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2			
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1			
CT Image Storage	1.2.840.10008.5.1.4.1.1.2			
MR Image Storage	1.2.840.10008.5.1.4.1.1.4			
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1			
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7			
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1			

Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11			
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50			
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1			
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3			
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1			

3.5.5.1.3 Real world activity "CD-R/CDROM reading"

In this fashion the Media Interchange acts as File-Set Reader (FSR) using the Interchange Option and the application entity supports any Basic Directory IOD made from tags either of type 1 (1C) or 2.

The user can browse a DICOM file set from a CD-R/CDROM by first clicking the DICOM CD button and then the Import CD button. At this point a new Dialog Window is displayed on the screen where there is the list of the studies burned on the CD-R/CDROM: the user may select one or more studies to import into the local database by clicking the Import Studies button.

3.5.5.1.3.1 Options

Following are the SOP Classes supported by the "CD-R/CDROM reading" activity:

Abstract Syntax		Transfer Syntax		Role
Name	UID	Name List	UID List	
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	FSR
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1			
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1			
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2			
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1			
CT Image Storage	1.2.840.10008.5.1.4.1.1.2			
MR Image Storage	1.2.840.10008.5.1.4.1.1.4			
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1			

Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7			
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1			
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11			
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50			
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1			
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3			
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1			

3.5.6 Augmented and Private Application Profiles

No augmented or private application profiles are implemented by this application entity.

3.5.7 Extensions, Specializations and Privatizations of SOP Classes and Transfer Syntaxes

No extensions, specialization or privatizations of SOP classes or transfer syntaxes are implemented by this application entity

4 Communication profiles

4.1 Supported Communication Stacks

SenoIris provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8.

4.2 TCP/IP Stack

SenoIris uses the MergeCOM-3 Advanced DICOM Tool Kit to communicate over the TCP/IP protocol stack on any physical interconnection media supporting the TCP/IP stack. The tool kit inherits the TCP/IP stack from the operating system upon which it executes.

4.2.1 Physical Media Support

The SenoIris is indifferent to the physical medium over which TCP/IP executes; it inherits this from the operating system on which it exists.

4.2.2 Internet Protocol Version 6 (IPv6)

Internet Protocol Version 6 (IPv6) is not supported by the SenoIris.

5 Extensions/specializations/privatizations

5.1 Standard extended/specialized/private SOPs

None supported.

5.2 Private Transfer Syntaxes

None supported.

6 Configuration

The DICOM configuration is set by a SenoIris configuration dialog available from the login screen. The operator may set the following parameters:

- SenoIris AE Title and receive SCP Port
- Add or remove Sources (DICOM Query/Retrieve, DICOM Media)
- Add or remove Destinations (DICOM Store)
- Configure DICOM Modality Worklist SCU
- Configure remote DICOM Printer

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

6.1 AE title/presentation address mapping

Before communicating with a remote AE (WORKLIST AE, NETWORK AE, PRINT AE) the operator must register it by using the SenoIris DICOM configuration. This task requires specifying the following information:

- Remote AE Title
- Remote IP Address
- Remote TCP/IP Port Number

This information is used to communicate over the TCP/IP protocol stack.

7 Support of extended character sets

The SenoIris uses the single single-byte extended character set ISO_IR 100 (Latin alphabet Number 1 supplementary set).

As a Storage SCP or Media Storage FSR, the product will accept SOP Instances with any value of Specific Character Set (0008,0005). However, it will display in the user interface only characters specified within ISO_IR 100 (Latin alphabet Number 1 supplementary set).

The product user interface will allow the user to enter characters from the console keyboard that are within ISO_IR 100 (Latin alphabet Number 1 supplementary set). If any such extended characters are included in SOP Instances or in query identifier matching fields, the product will appropriately specify the extended character set in Specific Character Set (0008,0005).

8 Supplement V-Preview extended functionality

DICOM conformance of generated V-Preview which is an instance of Breast Tomosynthesis Image Object is documented separately in the supplementary document with title "DICOM Conformance Statement V-Preview Extended Functionality".

9 Annex: Structured Reporting SOP Class Definition

9.1 Introduction

This section of the DICOM Conformance Statement specifies the supported DICOM Structured Report SOP Classes, the optional attributes supported, and the valid range of values for mandatory and optional attributes.

9.2 Structured Report SOP Class Definitions

ImageDiagnost follows DICOM Standard Part 16 und Supplement 79 for encoding for Mammography Structured Reports.

9.2.1 Templates

TID 4200 BREAST IMAGING REPORT

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (111400, DCM, "Breast Imaging Report")	1	M		
2	>	HAS CONCEPT MOD	INCLUDE	DTID (1204) Language of Content Item and Descendants	1	M		
3	>	CONTAINS	INCLUDE	DTID (4202) Breast Imaging Report Narrative	1	M		
4	>	CONTAINS	INCLUDE	DTID (4208) Breast Imaging Report Supplementary Data	1	U		

TID 1204 LANGUAGE OF CONTENT ITEM AND DESCENDANTS

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1		CONCEPT MOD	CODE	EV (121049,DCM,"Language of Content Item and Descendants"	1	M		DCID(5000) Image Diagnost wert ist: (RFC 3066, de-1996)
2		CONCEPT MOD	CODE	(121046,DCM,"Country of Language")	1	U		DCID(5001)

TID 4202 BREAST IMAGING REPORT NARRATIVE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (111412, DCM, "Narrative Summary"	1	M		
2	>	CONTAINS	CONTAINER	BCID (6052) Breast Imaging Report Section Title	1-n	M		
3	>>	HAS OBS CONTEXT	INCLUDE	DTID (1002) Observer Context	1-n	U	Not used by Image Diagnost	
4	>>	CONTAINS	TEXT	BCID (6053) Breast Imaging Report Elements	1	M		
5	>>>	INFERRED FROM	INCLUDE	DTID (350) References to Supporting Evidence	1	U	Not used by Image Diagnost	

TID 4208 BREAST IMAGING REPORT SUPPLEMENTARY DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER EV	(111414, DCM, "Supplementary Data")	1	M		
2	>	CONTAINS	INCLUDE	DTID (4201) Breast Imaging Procedure Reported	1-n	M		
3	>	CONTAINS	CODE	EV (111403, DCM, "Baseline screening mammogram")	1	U	Not used by Image Diagnost	DCID (230) Yes-No
4	>	CONTAINS	CODE	EV (111404, DCM, "First mammogram ever")	1	U	Not used by Image Diagnost	DCID (230) Yes-No
5	>	CONTAINS	INCLUDE	DTID (4205) Breast Composition Section	1	U		
6	>	CONTAINS	INCLUDE	DTID (4206) Breast Imaging Report Finding Section	1-n	U		
7	>	CONTAINS	INCLUDE	DTID (4204) Breast Imaging Report Intervention Section	1-n	U	Not used by Image Diagnost	
8	>	CONTAINS	CONTAINER	EV (IDI, I-420010) Additional Information	1	U		Image Diagnost Extension
9	>>	CONTAINS	CODE	EV (IDI, I-604400) Image Quality Assessment	1-2	U		Image Diagnost Extension
10	>>	CONTAINS	CONTAINER EV	(111413, DCM, "Overall Assessment")	1	U		
11	>>>	CONTAINS	INCLUDE	DTID (4203) Breast Imaging Assessment	1	M		

12	>>	CONTAINS	CONTAINER	EV (IDI, I-420025) Conference Participants	1	U		Image Diagnost Extension
13	>>>	CONTAINS	CODE	EV (IDI, I-X990500) "First reading physician present"	1	U		Image Diagnost Extension
13	>>	CONTAINS	TEXT	(IDI, IMAGE_ITEM, "Image Item")	1-n	U		Image Diagnost Extension
14	>>	CONTAINS	TEXT	(121106, DCM, "Comment")	1	U		

TID 4205 BREAST COMPOSITION SECTION

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (F-01710, SRT, "Breast composition")	1	M		
2	>	CONTAINS	INCLUDE	DTID (4201) Breast Imaging Procedure Reported	1-n	U	Not used by Image Diagnost	
3	>	CONTAINS	CODE	EV (F-01710, SRT, "Breast composition")	1-n	MC	At least one of row 3, 5 shall be present	DCID (6000) Overall Breast Composition
4	>>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality") 1		M		DCID (6022) Side
5	>	CONTAINS	NUM	EV (111046, DCM, "Percent Glandular Tissue")	1-n	MC	At least one of row 3, 5 shall be present. Not used by Image Diagnost	UNITS = (%, UCUM "Percent")
6	>>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality") 1		M	Not used by Image Diagnost	DCID (6022) Side

TID 4206 BREAST IMAGING REPORT FINDING SECTION

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (121070, DCM, "Findings")	1	M		
2	>	HAS OBS CONTEXT	INCLUDE	DTID (1002) Observer Context	1-n	U	Not used by Image Diagnost	
3	>	CONTAINS	INCLUDE	DTID (4201) Breast Imaging Procedure Reported	1	M		
4	>	CONTAINS	CODE	EV (121071, DCM, "Finding")	1-n	M		DCID (6054) Breast Imaging Findings (includes CID 6016, 6057, 6064)

5	>>	HAS CONCEPT MOD	CODE	EV (111405, DCM, "Implant type") 1-n		UC	May be present if value of row 4 is (A-04010, SRT, "Implant") . Not used by Image Diagnost	DCID (6059) Breast Implant Types
6	>>	HAS PROPERTIES	INCLUDE	DTID (4203) Breast Imaging Assessment	1	U		
7	>>	HAS PROPERTIES	CODE	EV (111014, DCM, "Clockface or region")		U	only if „Region in one plane" not set	DCID (6018) Clockface Location or Region
8	>>	HAS PROPERTIES	CODE	EV (111048, DCM, "Quadrant location")		U	Not used by Image Diagnost	DCID (6020) Quadrant Location
9	>>	HAS PROPERTIES	CODE	EV (I-601800, IDI, „Region in one plane")	1	U	only if "Clockface or region" not set	Image Diagnost Extension
10	>>	HAS PROPERTIES	INCLUDE	DTID (1400) Linear Measurement	1-n	U		
11	>>	HAS PROPERTIES	INCLUDE	DTID (1401) Area Measurement	1-n	U	Not used by Image Diagnost	
12	>>	HAS PROPERTIES	INCLUDE	DTID (1402) Volume Measurement	1-n	U	Not used by Image Diagnost	
13	>>	HAS PROPERTIES	CODE	EV (111020, DCM, "Depth") 1		U	Not used by Image Diagnost	DCID (6024) Depth
14	>>	HAS PROPERTIES	CODE	EV (111035, DCM, "Lesion Density") 1		U	Not used by Image Diagnost	DCID (6008) Density Modifier
15	>>	HAS PROPERTIES	CODE	EV (M-020F9, SRT, "Shape") 1-n		U	Not used by Image Diagnost	DCID (6004) Mammography Characteristics of Shape
16	>>	HAS PROPERTIES	CODE	EV (111037, DCM, "Margins") 1-n		U	Not used by Image Diagnost	DCID (6006) Mammography Characteristics of Margin
17	>>	HAS PROPERTIES	CODE	EV (111009, DCM, "Calcification Type") 1-n		U	Not used by Image Diagnost	DCID (6010) Mammography Calcification Types
18	>>	HAS PROPERTIES	CODE	EV (111008, DCM, "Calcification Distribution") 1		U	Not used by Image Diagnost	DCID (6012) Calcification Distribution Modifier
19	>>	HAS PROPERTIES	NUM	EV (111038, DCM, "Number of calcifications") 1		U	Not used by Image Diagnost	UNITS = EV ({calcifications}, UCUM, "calcifications") Value = Integer 1 – n
20	>>	HAS PROPERTIES	CODE	EV (111407, DCM, "Implant finding") 1-n		U	Not used by Image Diagnost	DCID (6072) Breast Implant Findings
21	>>	HAS PROPERTIES	CODE	EV (G-C189, SRT, "Associated Finding") 1-n		U	Not used by Image Diagnost	DCID (6056) Associated Findings for Breast (includes CID 6015)
22	>>	HAS	NUM	EV (111406, DCM, "Number of		U	Not used by	UNITS = EV ({findings}, UCUM,

		PROPERTIES		similar findings") 1			Image Diagnost	"findings") Value = Integer 2 – n
23	>>	HAS PROPERTIES	CODE	EV (F-01720, SRT, "Change since last mammogram") 1-n		U	Not used by Image Diagnost	DCID (6002) Change Since Last Mammogram or Prior Surgery
24	>>	INFERRED FROM	INCLUDE	DTID (350) References to Supporting Evidence	1	U	Not used by Image Diagnost	
25	>	CONTAINS	CODE	EV (IDI, I-420012) Finding Position in Report GUI	1-n	U		Image Diagnost Extension
26	>>	HAS PROPERTIES	TEXT	(IDI, MLO_POS_X, "MLO Position X")	1	U		Image Diagnost Extension
27	>	CONTAINS	INCLUDE	Apply DTID (4206) Breast Imaging Report Finding Section with modifications: 1. CONTAINER EV is (IDI, I-420011) Related Finding in Other Procedure 2. Laterality is not used	1-n	U		Image Diagnost Extension

TID 4201 BREAST IMAGING PROCEDURE REPORTED

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CODE	EV (121058, DCM, "Procedure reported")	1	M		DCID (6050) Breast Procedure Reported Image Diagnost supported values: DCM 111408 Film Screen Mammography DCM 111409 Digital Mammography SRT P5-B8500 Ultrasonography of breast SRT P5-0900D MRI of breast
2	>	HAS CONCEPT MOD	CODE	EV (111464, DCM, "Procedure Modifier") 1-	n	U	Not used by Image Diagnost	DCID (6058) Procedure Modifiers for Breast
3	>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality") 1		M		DCID (6022) Side
4	>	HAS PROPERTIES	CODE	EV (111401, DCM, "Reason for procedure") 1		U	Not used by Image Diagnost	DCID (6051) Breast Procedure Reason

								Image Diagnost supported values SRT R-42453 Screening DCM 111402 Clinical finding
5	>>	HAS CONCEPT MOD	CODE	EV (G-D709, SRT, "Relative time") 1		U	Not used by Image Diagnost	DCID (12102) Temporal Periods Relating To Procedure or Therapy
6	>>	HAS CONCEPT MOD	CODE	EV (111402, DCM, "Clinical Finding") 1-	n	UC	IFF row 4 value is "Clinical Finding". Not used by Image Diagnost	DCID (6055) Breast Clinical Finding or Indicated Problem
7	>>>	HAS PROPERTIES	CODE	EV (G-C171, SRT, "Laterality") 1		U	Not used by Image Diagnost	DCID (6022) Side
8	>	HAS PROPERTIES	DATE	EV (111060, DCM, "Study Date") 1		U	Not used by Image Diagnost	

TID 4203 BREAST IMAGING ASSESSMENT

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CODE	EV (111005, DCM, "Assessment Category")	1	M		DCID (6026) Mammography Assessment
2			CODE	EV (111053, DCM, "Recommended Follow-up")	1-n	U		BCID (6028) Mammography Recommended Follow-up
3	>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality") 1		U	Not used by Image Diagnost	DCID (6022) Side
4	>	HAS PROPERTIES	NUM	EV (111055, DCM, "Recommended Follow-up Interval") 1		U	Not used by Image Diagnost	UNITS = DCID (6046) Units of Follow-up Interval Values = Integer ≥ 0, where 0 = immediate follow-up
5	>	HAS PROPERTIES	DATE	EV (111054, DCM, "Recommended Follow-up Date") 1		U	Not used by Image Diagnost	
6	>	HAS PROPERTIES	INCLUDE	DTID (4207) Breast Imaging Pathology Results	1-n	U	Not used by Image Diagnost	

TID 1400 LINEAR MEASUREMENT

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	DCID (7470) "Linear Measurements" Image Diagnost is using SNM3 M-02550 Diameter	1	M		UNITS = DCID(7460) "Units of Linear Measurement"
2	>	INFERRED FROM	SCOORD	EV (121055,DCM, "Path")	1	UC	XOR Row 5. Not used by Image Diagnost	GRAPHIC TYPE = {POLYLINE, CIRCLE, ELLIPSE}
3	>>	RSELECTED FROM	IMAGE		1	MC	XOR Row 4. Not used by Image Diagnost	
4	>>	SELECTED FROM	IMAGE		1	MC	XOR Row 3. Not used by Image Diagnost	
5	>>	INFERRED FROM	SCOORD	SCOORD EV (121230, DCM, "Path Vertex")	2-n	UC	XOR Row 2. Not used by Image Diagnost	GRAPHIC TYPE = {POINT}
6	>>	RSELECTED FROM	IMAGE		1	MC	XOR Row 7. Not used by Image Diagnost	
7	>>	SELECTED FROM	IMAGE		1	MC	XOR Row 6. Not used by Image Diagnost	

10 Annex: Print Management SOP Class Definition

10.1 Introduction

This section of the DICOM Conformance Statement specifies the supported Print Management SOP and Meta SOP Classes, the optional attributes and service elements supported, the valid range of values for mandatory and optional attributes, and the status code behavior.

10.2 Print Management SOP Class Definitions

10.2.1 Basic Film Session SOP Class

The DICOM Print SCU AE supports the N-CREATE DIMSE Service Element for the Basic Film Session SOP Class.

- The N-CREATE DIMSE Service element sent by the DICOM Print SCU AE requests the Remote DICOM Print SCP to create an instance of Basic Film Session.

IOD Description

10.2.1.1.1 IOD Modules

Module	Reference	Module Description
SOP Common	C.12.1	Contains SOP Common information
Basic Film Session Presentation Module	C.13.1	Contains Film Session presentations information
Basic Film Session Relationship	C.13.2	References to related SOPs

10.2.1.1.2 Basic Film Session Presentation Module

Attribute name	Tag	Attribute Description
Number of Copies	(2000,0010)	1 to 99; default is set to 1.
Print Priority	(2000,0020)	Depending on configuration of associated Remote DICOM printer. Supported values HIGH MED LOW
Film Session Label	(2000,0050)	Empty

Medium Type	(2000,0030)	Depending on configuration of associated Remote DICOM printer. Supported values PAPER CLEAR FILM BLUE FILM MAMMO CLEAR FILM MAMMO BLUE FILM
Film Destination	(2000,0040)	Empty

10.2.1.1.3 Basic Film Session Relationship Module

Attribute name	Tag	Attribute Description
Referenced Film Box Sequence	(2000,0500)	Empty
>Referenced SOP Class UID	(0008,1150)	Empty
>Referenced SOP Instance UID	(0008,1155)	Empty

DIMSE Service Group

DIMSE Service Element	Usage SCU
N-CREATE	M
N-SET	Not used
N-DELETE	Not used
N-ACTION	Not used

10.2.1.1.4 N-CREATE

10.2.1.1.4.1 Attributes

Attribute name	Tag	Usage SCU
Number of Copies	(2000,0010)	Used
Print Priority	(2000,0020)	Used

Medium Type	(2000,0030)	Used
Film Session Label	(2000,0050)	Not used
Memory Allocation	(2000,0060)	Not used
Film Destination	(2000,0040)	Not used

10.2.1.1.4.2 Status

Service Status	Status Codes	Further Meaning	Application Behaviour When receiving Status Codes
Warning	B600	Memory allocation not supported	Association is aborted
Success	0000	Film session successfully created	Next step describe in the sequencing of Real-World Activities paragraph is performed

10.2.1.1.4.3 Behavior

No specific behavior.

10.2.2 Basic Film Box SOP Class

The DICOM Print SCU AE supports the following DIMSE Service Element for the Basic Film Box SOP Class.

- The N-CREATE DIMSE Service element sent by the DICOM Print SCU AE requests the Remote DICOM Print SCP to create an instance of Basic Film Box
- The N-ACTION DIMSE Service element sent by the DICOM Print SCU AE requests the Remote DICOM Print SCP to print the Basic Film Box onto the hard copy printer.
- The N-DELETE DIMSE Service element sent by the DICOM Print SCU AE requests the Remote DICOM Print SCP to release the Basic Film Box instance.

IOD Description

10.2.2.1.1 IOD Modules

Module	Reference	Module Description
SOP Common	C.12.1	Contains SOP Common information
Basic Film Box Presentation Module	C.13.3	Contains Film Box presentations information
Basic Film Box Relationship	C.13.4	References to related SOPs

10.2.2.1.2 Basic Film Box Presentation Module

Attribute name	Tag	Attribute Description
Image Display Format	(2010,0010)	STANDARD\1,1 STANDARD\1,2 STANDARD\2,2 STANDARD\2,3 STANDARD\3,3 STANDARD\3,4 STANDARD\3,5 STANDARD\4,4 STANDARD\4,5 STANDARD\4,6
Annotation Display Format ID	(2010,0030)	Not sent.
Film Orientation	(2010,0040)	PORTRAIT LANDSCAPE
Film Size ID	(2010,0050)	8INX10IN 10INX12IN 10INX14IN 11INX14IN 14INX14IN 14INX17IN 24CMX24CM 24CMX30CM DIN A4 DIN A3

Border density	(2010,0100)	Not sent.
Empty Image Density	(2010,0110)	Not sent.
Magnification Type	(2010,0060)	Optional (value depending on configuration of associated Remote DICOM printer)
Smoothing Type	(2010,0080)	Optional (value depending on configuration of associated Remote DICOM printer)
Min Density	(2010,0120)	Optional (value depending on configuration of associated Remote DICOM printer)
Max Density	(2010,0130)	Optional (value depending on configuration of associated Remote DICOM printer)
Trim	(2010,0140)	Not sent.
Configuration Information	(2010,0150)	Optional (value depending on configuration of associated Remote DICOM printer)
Requested Resolution ID	(2020,0050)	Not sent.

10.2.2.1.3 Basic Film Box Relationship Module

Attribute name	Tag	Attribute Description
Referenced Film Session Sequence	(2010,0500)	Empty
>Referenced SOP Class UID	(0008,1150)	Empty
>Referenced SOP Instance UID	(0008,1155)	Empty
Referenced Image Box Sequence	(2010,0510)	Empty
>Referenced SOP Class UID	(0008,1150)	Empty
>Referenced SOP Instance UID	(0008,1155)	Empty
Referenced Basic Annotation Box Sequence	(2010,0520)	Empty
>Referenced SOP Class UID	(0008,1150)	Empty
>Referenced SOP Instance UID	(0008,1155)	Empty
Referenced Presentation LUT Sequence	(2050,0500)	Used if Presentation LUT SOP was created

>Referenced SOP Class UID	(0008,1150)	Used if Presentation LUT SOP was created
>Referenced SOP Instance UID	(0008,1155)	Used if Presentation LUT SOP was created

DIMSE Service Group

DIMSE Service Element	Usage SCU
N-CREATE	M
N-ACTION	M
N-DELETE	Used

10.2.2.1.4 N-CREATE

10.2.2.1.4.1 Attributes

Attribute name	Tag	Usage SCU
Image Display Format	(2010,0010)	M
Referenced Film Session Sequence	(2010,0500)	M
>Referenced SOP Class UID	(0008,1150)	M
>Referenced SOP Instance UID	(0008,1155)	M
Referenced Image Box Sequence	(2010,0510)	Not used
>Referenced SOP Class UID	(0008,1150)	Not used
>Referenced SOP Instance UID	(0008,1155)	Not used
Referenced Basic Annotation Box Sequence	(2010,0520)	Not used
>Referenced SOP Class UID	(0008,1150)	Not used
>Referenced SOP Instance UID	(0008,1155)	Not used
Film Orientation	(2010,0040)	Not used
Film Size ID	(2010,0050)	Used
Magnification Type	(2010,0060)	Used, not sent if empty
Smoothing Type	(2010,0080)	Used, not sent if empty

Min Density	(2010,0120)	Used, not sent if empty
Max Density	(2010,0130)	Used, not sent if empty
Configuration Information	(2010,0150)	Used, not sent if empty
Referenced Presentation LUT Sequence	(2050,0500)	Used
>Referenced SOP Class UID	(0008,1150)	Used
>Referenced SOP Instance UID	(0008,1155)	Used
Annotation Display Format ID	(2010,0030)	Not used
Smoothing Type	(2010,0080)	Not used
Border Density	(2010,0100)	Not used
Empty Image Density	(2010,0110)	Not used
Min Density	(2010,0120)	Not used
Trim	(2010,0140)	Not used
Requested Resolution ID	(2020,0050)	Not used

10.2.2.1.4.2 Status

There are no specific status codes.

10.2.2.1.4.3 Behavior

There is no specific behavior.

10.2.2.1.5 N-DELETE

10.2.2.1.5.1 Behavior

The SCU uses the N-DELETE to request the SCP to delete the Basic Film Box SOP Instance hierarchy.

10.2.2.1.6 N-ACTION

N-ACTION is used to print the current film of the film session.

10.2.2.1.6.1 Attributes

Action Type Name	Action Type ID	Attribute	Tag	Usage SCU

Print	1	Referenced Print Job Sequence	(2100,0500)	Not used
		>Referenced SOP Class UID	(0008,1150)	Not used
		>Referenced SOP Instance UID	(0008,1155)	Not used

10.2.2.1.6.2 Status

Service Status	Status Codes	Further Meaning	Application Behaviour When receiving Status Codes
Success	0000	Film accepted for printing.	Next Step described in the sequencing of Real- World Activities paragraph is performed
Warning	B603	Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page)	This case should not happen. This warning is considered as an error. Association is aborted.
Failure	C602	Unable to create Print Job SOP Instance; print queue is full	Appropriate message is returned to the user. Association is aborted.
	C604	Image position collision : multiple images assigned to single image position	Appropriate message is returned to the user. Association is aborted.
	C603	Image size is larger than image box size (by using the specified magnification value)	Appropriate message is returned to the user. Association is aborted.

10.2.2.1.6.3 Behavior

SCU uses the N-ACTION to request the SCP to print one or more copies of a single film of the film session.

10.2.3 Image Box SOP Class

Basic Grayscale Image Box SOP Class

The DICOM Print SCU AE supports the following DIMSE Service Element for the Basic Grayscale Image Box SOP Class.

- The N-SET DIMSE Service element sent by the DICOM Print SCU AE requests the Remote DICOM Print SCP to set the attributes of the Basic Grayscale Image Box Instance.

10.2.3.1.1 IOD Description

10.2.3.1.1.1 IOD Modules

Module	Reference	Module Description
SOP Common	C.12.1	Contains SOP Common information
Image Box Presentation Module	C.13.5	Contains Image Box presentations information

10.2.3.1.1.2 Image Box Pixel Presentation Module

Attribute name	Tag	Attribute Description
Image Position	(2020,0010)	Position ID for composite printing (1 .. 4). Default is 1 for single-image printing.
Polarity	(2020,0020)	NORMAL = pixels shall be printed as specified by the Photometric Interpretation (0028,0004) REVERSE = pixels shall be printed with the opposite polarity as specified by the Photometric Interpretation (0028,0004)
Magnification Type	(2010,0060)	Not Sent.
Smoothing Type	(2010,0080)	Not Sent
Configuration Information	(2010,0150)	Not Sent
Requested Image Size	(2020,0030)	Set to Original Film Size if Requested Resolution ID is not set.
Preformatted Grayscale Image Sequence	(2020,0110)	This sequence is always included if the Image Box is a Basic Grayscale Image Box
>Samples Per Pixel	(0028,0002)	1
>Photometric Interpretation	(0028,0004)	Set from original image. Supported values MONOCHROME1 MONOCHROME2
>Rows	(0028,0010)	Height of preformatted pixmap in pixel
>Columns	(0028,0011)	Width of preformatted pixmap in pixel
>Pixel Aspect Ratio	(0028,0034)	1\1
>Bits Allocated	(0028,0100)	8 or 16, depending on source image data

>Bits Stored	(0028,0101)	8 or 12, depending on source image data. If depth of source image differs from 8 or 12 the image data will be re-quantized accordingly
>High Bit	(0028,0102)	Set to Bits Stored -1 (i.e. 7 or 11)
>Pixel Representation	(0028,0103)	0 (Unsigned Integer)
>Pixel Data	(7FE0,0010)	

10.2.3.1.2 DIMSE Service Group

DIMSE Service Element	Usage SCU
N-SET	M

10.2.3.1.2.1 N-SET

10.2.3.1.2.1.1 Attributes

Attribute name	Tag	Usage SCU
Image Position	(2020,0010)	M
Preformatted Grayscale Image Sequence	(2020,0110)	M
>Samples Per Pixel	(0028,0002)	M
>Photometric Interpretation	(0028,0004)	M
>Rows	(0028,0010)	M
>Columns	(0028,0011)	M
>Pixel Aspect Ratio	(0028,0034)	1/1
>Bits Allocated	(0028,0100)	M
>Bits Stored	(0028,0101)	M
>High Bit	(0028,0102)	M
>Pixel Representation	(0028,0103)	M
>Pixel Data	(7FE0,0010)	M
Polarity	(2020,0020)	Used
Referenced Overlay Sequence	(0008,1130)	Not used

>SOP Class UID	(0008,1150)	Not used
>SOP Instance UID	(0008,1155)	Not used
Configuration Information	(2010,0150)	Not used
Magnification Type	(2010,0060)	Not used
Smoothing Type	(2010,0080)	Not used
Requested Image Size	(2020,0030)	Used, not sent if empty

10.2.3.1.2.1.2 Status

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Failure	C605	Insufficient memory in printer to store the image.	Appropriate message is returned to the user. Association is aborted.

10.2.3.1.2.1.3 Behavior

There is no specific behavior.

The SCU does not instruct the SCP to erase the image in the image position by setting a zero length and no value in the Attribute Pre-formatted Grayscale Image Sequence (2020,0110) or Pre-formatted Grayscale Image Sequence (2020,0111).

10.2.4 Printer SOP Class

The DICOM Print SCU AE supports the following DIMSE Service Element for the Basic Printer SOP Class.

- The N-EVENT_REPORT DIMSE Service element sent by the DICOM Print SCP to the local DICOM Print SCU AE. The DICOM Print SCU handles the Printer Status and Printer Status Info fields. All other received data are ignored.

- The N-GET DIMSE Service element sent by the DICOM Print SCU AE requests the Remote DICOM Print SCP to give information on the Remote DICOM Printer.

IOD Description

10.2.4.1.1 IOD Modules

Module	Reference	Module Description
SOP Common	C.12.1	Contains SOP Common information
Printer Module	C.13.9	Contains status information to monitor printer

10.2.4.1.2 Printer Module

Attribute name	Tag	Attribute Description
Printer Status	(2110,0010)	The behavior defined for the following term NORMAL : Association is established. FAILURE : Association is released. WARNING : Association is released.
Printer Status Info	(2110,0020)	Printer shall return value
Printer Name	(2110,0030)	Printer shall return value
Manufacturer	(0008,0070)	Printer shall return value
Manufacturer Model Name	(0008,1090)	Printer shall return value
Device Serial Number	(0018,1000)	Printer shall return value
Software Versions	(0018,1020)	Printer shall return value
Date Of Last Calibration	(0018,1200)	Printer shall return value
Time Of Last Calibration	(0018,1201)	Printer shall return value

DIMSE Service Group

DIMSE Service Element	Usage SCU
N-EVENT-REPORT	M
N-GET	U

10.2.4.1.3 N-EVENT-REPORT

10.2.4.1.3.1 Attributes

Event Type Name	Event Type ID	Attribute	Tag	Usage SCU
Normal	**1**			
Warning	2	Printer Name	(2110,0030)	
		Printer Status Info	(2110,0020)	

Failure	3	Printer Name	(2110,0030)	
		Printer Status Info	(2110,0020)	

10.2.4.1.3.2 Behavior

If Printer Status is FAILURE or WARNING

Signal print failure to the user

Else

Signal print success to the user

10.2.4.1.4 N-GET

10.2.4.1.4.1 Attributes

Attribute name	Tag	Attribute Description
Printer Status	(2110,0010)	Used
Printer Status Info	(2110,0020)	Used
Printer Name	(2110,0030)	Used
Manufacturer	(0008,0070)	Used
Manufacturer Model Name	(0008,1090)	Used
Device Serial Number	(0018,1000)	Used
Software Versions	(0018,1020)	Used
Date Of Last Calibration	(0018,1200)	Used
Time Of Last Calibration	(0018,1201)	Used

10.2.4.1.4.2 Behavior

If Printer Status is FAILURE

Signal print failure to the user

Else If Printer Status is WARNING and Printer Status Info is not equal to SUPPLY LOW or SUPPLY EMPTY

Signal print warning to the user

Else

Signal print success to the user

10.2.5 Presentation LUT SOP Class

The DICOM Print SCU AE supports the following DIMSE Service Element for the Presentation LUT SOP Class.

- The N-CREATE DIMSE Service element sent by the DICOM Print SCU AE requests the Remote DICOM Print SCP to create an Instance of Presentation LUT.

IOD Description

10.2.5.1.1 IOD Modules

Module	Reference	Module Description
SOP Common	C.12.1	Contains SOP Common information
Presentation LUT Module	C.11.4	Contains Image presentation LUT information

10.2.5.1.2 Presentation LUT Module

Attribute name	Tag	Attribute Description
Presentation LUT Sequence	(2050,0010)	Defines a sequence of Presentation LUTs.
>LUT Descriptor	(0028,3002)	Depends on original image pixel depth. For example a 12 bit image leads to 4096\0\12
>LUT Explanation	(0028,3003)	Set to "Printer_PLUT"
>LUT Data	(0028,3006)	LUT Data in this Sequence.
Presentation LUT Shape	(2050,0020)	Not sent.

DIMSE Service Group

DIMSE Service Element	Usage SCU
N-CREATE	M
N-DELETE	Not used

10.2.5.1.3 N-CREATE

10.2.5.1.3.1 Attributes

Attribute name	Tag	Usage SCU
Presentation LUT Sequence	(2050,0010)	Used
>LUT Descriptor	(0028,3002)	Used
>LUT Explanation	(0028,3003)	Used
>LUT Data	(0028,3006)	Used
Presentation LUT Shape	(2050,0020)	Not sent.

10.2.5.1.3.2 Status

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Warning	B605	Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.	
Success	0000	Presentation LUT successfully created	

10.2.5.1.3.3 Behavior

There is no specific behavior.

11 Annex: JPEG Decompression

The SenoIris supports the JPEG_BASELINE, JPEG_EXTENDED_2_4, JPEG_LOSSLESS_HIER_14, JPEG_2000, JPEG_2000_LOSSLESS_ONLY transfer syntaxes with photometric interpretations MONOCHROME1, MONOCHROME2, RGB, and YBR. There are limits on the performance. For JPEG_BASELINE, JPEG_EXTENDED_2_4, and JPEG_LOSSLESS_HIER_14, images can be compressed or decompressed at a maximum rate of 3 images (or frames) per second. For JPEG_2000 and JPEG_2000_LOSSLESS_ONLY, a dialog will be displayed on Windows each time the compressor or decompressor is used.

11.1 Transfer syntax UID 1.2.840.10008.1.2.4.50, JPEG Baseline (Process 1)

Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression. Table 19 details the photometric interpretation and bit depths supported for this transfer syntax.

JPEG Baseline			
Photometric Interpretation	MONOCHROME1 MONOCHROME2	RGB	YBR_FULL_422 YBR_FULL
Bits Stored	8	8	8
Bits Allocated	8	8	8
Samples Per Pixel	1	3	3

Table 19: JPEG Baseline Supported Photometric Interpretations and Bit Depths

11.2 Transfer syntax UID 1.2.840.10008.1.2.4.51, JPEG Extended (Process 2 & 4)

Table 20 details the photometric interpretation and bit depths supported by the decompressor for this transfer syntax.

JPEG Extended (Process 2 & 4)					
Photometric Interpretation	MONOCHROME1 MONOCHROME2			RGB	YBR_FULL_422 YBR_FULL
Bits Stored	8	10	12	8	8
Bits Allocated	8	16	16	8	8
Samples Per Pixel	1	1	1	3	2

Table 20: JPEG Extended Supported Photometric Interpretations and Bit Depths

11.3 Transfer syntax UID 1.2.840.10008.1.2.4.70, JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])

Table 21 details the photometric interpretation and bit depths supported by the decompressor for this transfer syntax.

JPEG Lossless Non-Hierchical Process 14			
Photometric Interpretation	MONOCHROME1 MONOCHROME2		RGB
Bits Stored	2 - 8	9 - 16	8
Bits Allocated	8	16	8
Samples Per Pixel	1	1	3

Table 21: JPEG Lossless Supported Photometric Interpretations and Bit Depths

New compressor decompressor allows lossless JPEG compression/decompression of images with the number of bits stored between 2 and 16. Previously only images with bits stored of 8, 10, 12 and 16 were accepted.

11.4 Transfer Syntax UID 1.2.840.10008.1.2.4.91, JPEG 2000 Image Compression

Table 22 details the photometric interpretation and bit depths supported by the compressor and decompressor for this transfer syntax.

JPEG 2000 (When used for Lossy)						
Photometric Interpretation	MONOCHROME1 MONOCHROME2				YBR_ICT	RGB
Bits Stored	8	10	12	16	8	8
Bits Allocated	8	16	16	16	8	8
Samples per Pixel	1	1	1	1	3	3

Table 22: JPEG 2000 Lossy Supported Photometric Interpretations and Bit Depths

11.5 Transfer syntax UID 1.2.840.10008.1.2.4.90, JPEG 2000 Image Compression (Lossless Only)

Table 23 details the photometric interpretation and bit depths supported by the compressor and decompressor for this transfer syntax.

JPEG 2000 Lossless						
Photometric Interpretation	MONOCHROME1 MONOCHROME2				YBR_RCT	RGB
Bits Stored	8	10	12	16	8	8
Bits Allocated	8	16	16	16	8	8
Samples Per Pixel	1	1	1	1	3	3

Table 23: JPEG 2000 Lossless Supported Photometric Interpretations and Bit Depths

All data needs to be right justified, i.e. bit 0 contains data, but the highest bits may not. RGB and YBR must be non-planar (R1G1B1, R2G2B2, … or Y1Y2B1R1, Y3Y4B3R3,…) `JPEG_2000` / `JPEG_2000_LOSSLESS_ONLY` will cause a irreversible, or reversible color transformation when compressing RGB data. The Photometric Interpretation is changed from `RGB` to:

- `YBR_ICT` for `l`ossy color transform for lossy compression
- `YBR_RCT` for `l`ossless color transform for lossless compression

Similarly, on the decompression end, the Photometric Interpretation is changed back to `RGB`.

12 Revision history

Revision	Date	Author	Reason for Change
1	July-2012	Robert Kühberger	Update document based on 4.6.1 Enhanced MG Enhanced CT Fixed typos.
2	Nov. 2012	Anamaria Voroneanu	4.7.0 design change release.
3	May 2014	Arun Kumar Raj Voruganti	Added reference to additional supplement which documents V-Preview Extended Functionality DICOM conformance.
4	April 2015	Arun Kumar Raj Voruganti	Updated "V-Preview Extended Functionality DICOM conformance" for 4.7.0 ECO218410 release.
5	December 2015	Arun Kumar Raj Voruganti	Updated for SenoIris v.1
6	June 2016	Arun Kumar Raj Voruganti	Updated "V-Preview Extended Functionality DICOM conformance" for SenoIris 1SP1 release.
7	December 2016	Arun Kumar Raj Voruganti	Updated "V-Preview Extended Functionality DICOM conformance" for 1SP2 release.
8	January 2017	Arun Kumar Raj Voruganti	Updated "V-Preview Extended Functionality DICOM conformance" for Enhanced V-Preview.
9	June 2017	Arun Kumar Raj Voruganti	Updated "V-Preview Extended Functionality DICOM conformance" to support MQSA review requirement.
10	July 2017	Arun Kumar Raj Voruganti	Updated file properties: Title, Author, and Company.
11	November 2017	Arun Kumar Raj Voruganti	Updated software version from 1SP2 to 1SP2.1

To contact your local GE Healthcare representative, please go to:
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China Service Agent Address:
GE Medical Systems Trade & Development (Shanghai) Co., Ltd. (Area B, Warehouse No. 4, #777 BingKe Road, Wai Gaoqiao Free Trade Zone, Shanghai, China, 200131)
Service Call Center: 800-810-8188
通用电气医疗系统贸易发展（上海）有限公司 (中国上海外高桥保税区冰克路777 号4 号仓库B 部位，邮编200131)
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http://www.gehealthcare.com/cnzh/contact/address.html

Manufacturing site for physical DVD-kit:
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Technical Publications

Direction DOC1577748
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SenoIris 1SP2.1
V-Preview Extended Functionality
DICOM CONFORMANCE STATEMENT

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CONFORMANCE STATEMENT OVERVIEW

Table 0.1 provides an overview of the network services supported by SenoIris.

Table 0.1 – NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Breast Tomosynthesis Image Storage	Yes	Yes
Query/Retrieve		
Patient Root Query/Retrieve Information Model – FIND	Yes	No
Patient Root Query/Retrieve Information Model – MOVE	Yes	No
Study Root Query/Retrieve Information Model – FIND	Yes	No
Study Root Query/Retrieve Information Model – MOVE	Yes	No
Workflow Management		
Storage Commitment Push Model SOP Class	Yes	No

TABLE OF CONTENTS

1. INTRODUCTION

1.1 OVERVIEW

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

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

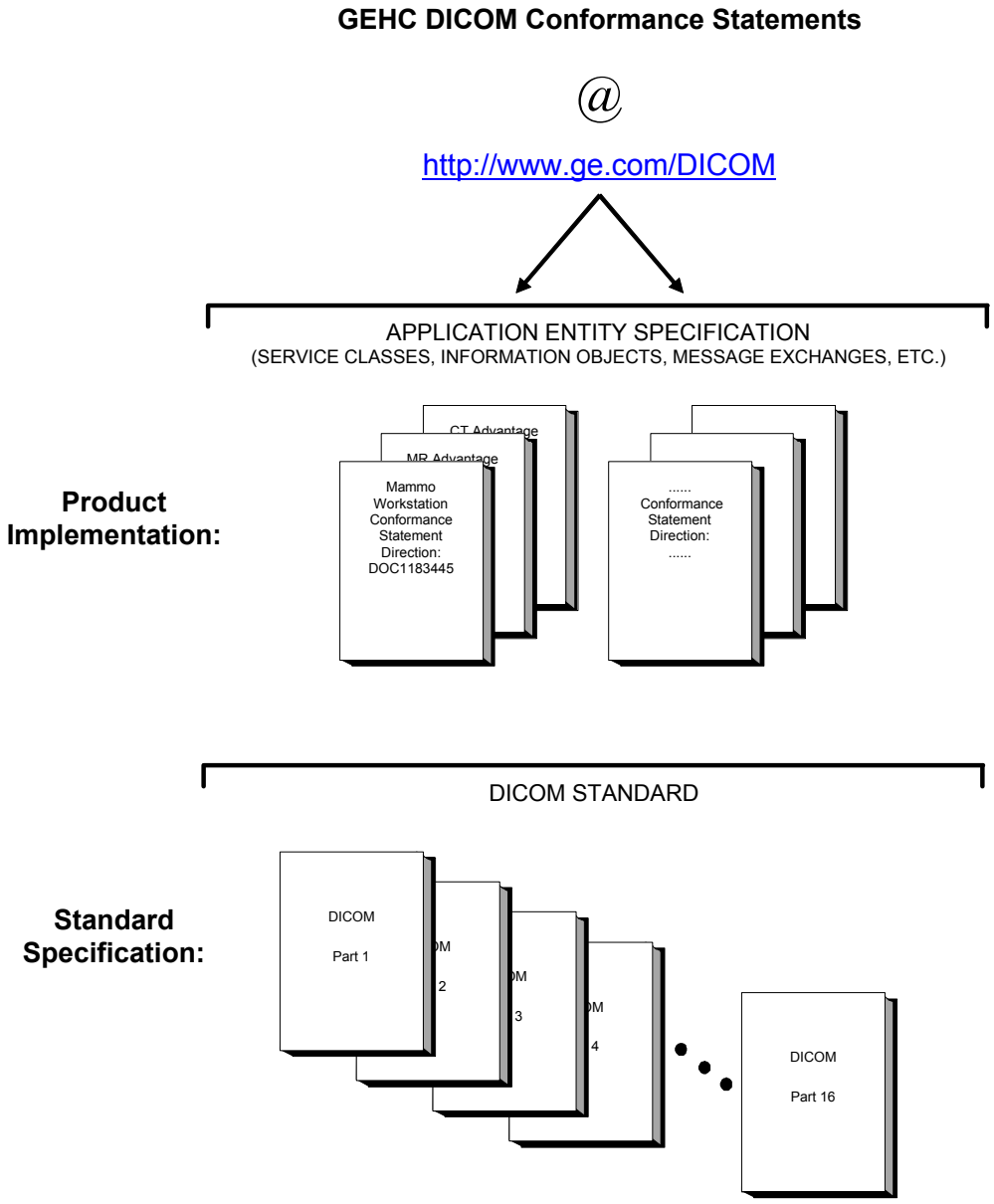
Section 2 Network Conformance Statement, which specifies the GEHC equipment compliance to the DICOM requirements for the implementation of Networking features.

Section 3 Breast Tomosynthesis Image Information Object Implementation, which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a Breast Tomosynthesis Image Information Object.

Section 4 Storage Commitment Push Model Implementation, which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Storage Commitment Push Model.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the GEHC DICOM Conformance Statements is shown in the Illustration below.



This document specifies the DICOM implementation. It is entitled:

SenoIris 1SP2.1
Conformance Statement for DICOM
Direction ***DOC1577748***

This DICOM Conformance Statement documents the DICOM Conformance Statement and Technical Specification required to interoperate with the GEHC network interface.

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

For more information regarding DICOM, copies of the Standard may be obtained on the Internet at http://medical.nema.org. Comments on the Standard may be addressed to:

DICOM Secretariat
NEMA
1300 N. 17th Street, Suite 1752
Rosslyn, VA 22209
USA
Phone: +1.703.841.3200

1.3 INTENDED AUDIENCE

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

1.4 SCOPE AND FIELD OF APPLICATION

It is the intent of this document to provide an unambiguous specification for GEHC implementations. This specification, called a Conformance Statement, includes a DICOM Conformance Statement and is necessary to ensure proper processing and interpretation of GEHC medical data exchanged using DICOM. The GEHC Conformance Statements are available to the public.

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

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

1.5 IMPORTANT REMARKS

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

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non–GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.
- **Validation** - Testing the complete range of possible interactions between any GE device and non–GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non–GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non–GE device and the stability of the image data for the intended applications.

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

- **Future Evolution** - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM Standard. DICOM will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEHC protocol is based on DICOM as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) described by these DICOM Conformance Statements**. The **user** should ensure that any non–GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.
- **Interaction** - It is the sole responsibility of the **non–GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1.6 REFERENCES

NEMA PS3 Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/

1.7 DEFINITIONS

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

Application Entity (AE) – an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title – the externally known name of an *Application Entity*, used to identify a DICOM application to other DICOM applications on the network.

Application Context – the specification of the type of communication used between *Application Entities*. Example: DICOM network protocol.

Association – a network communication channel set up between *Application Entities*.

Attribute – – a unit of information in an object definition; a data element identified by a *tag*. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010, 0020), Accession Number (0008, 0050), Photometric Interpretation (0028, 0004), Procedure Code Sequence (0008, 1032).

Information Object Definition (IOD) – the specified set of *Attributes* that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The *Attributes* may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Joint Photographic Experts Group (JPEG) – a set of standardized image compression techniques, available for use by DICOM applications.

Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)

Module – a set of *Attributes* within an *Information Object Definition* that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – first phase of *Association* establishment that allows *Application Entities* to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context – the set of DICOM network services used over an *Association*, as negotiated between *Application Entities*; includes *Abstract Syntaxes* and *Transfer Syntaxes*.

Protocol Data Unit (PDU) – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an *Application Entity* to ensure confidentiality, integrity, and/or availability of exchanged DICOM data

Service Class Provider (SCP) – role of an *Application Entity* that provides a DICOM network service; typically, a server that performs operations requested by another *Application Entity* (*Service Class User*). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) – role of an *Application Entity* that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance – an information object; a specific occurrence of information exchanged in a *SOP Class*. Examples: a specific x-ray image.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010, 0020) [Patient ID], (07FE, 0010) [Pixel Data], (0019, 0210) [private data element]

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages. Examples: *JPEG* compressed (images), little endian explicit value representation.

Unique Identifier (UID) – a globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

1.8 SYMBOLS AND ABBREVIATIONS

AE	Application Entity
AET	Application Entity Title
CR	Computed Radiography
CT	Computed Tomography
DBT	Digital Breast Tomosynthesis
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DNS	Domain Name System
DX	Digital X-ray
GSPS	Grayscale Softcopy Presentation State
HIS	Hospital Information System

HL7	Health Level 7 Standard
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISO	International Organization for Standards
JPEG	Joint Photographic Experts Group
LUT	Look-up Table
MG	Mammography (X-ray)
MTU	Maximum Transmission Unit (IP)
MWL	Modality Worklist
O	Optional (Key Attribute)
OSI	Open Systems Interconnection
PACS	Picture Archiving and Communication System
PDU	Protocol Data Unit
R	Required (Key Attribute)
RIS	Radiology Information System
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
U	Unique (Key Attribute)
VR	Value Representation

2. NETWORK CONFORMANCE STATEMENT

2.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the **SenoIris** compliance to DICOM requirements for **Networking** features.

SenoIris implements the following networking features

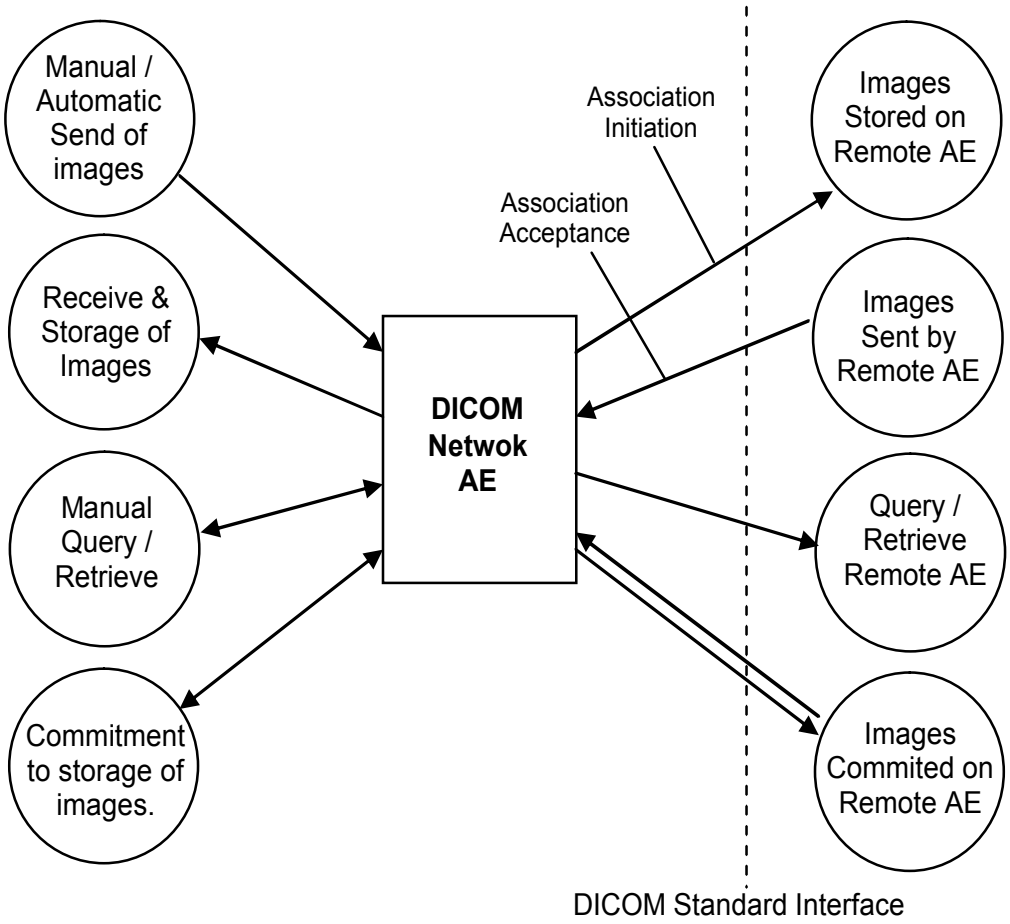
- Storage Service Class to facilitate manual / automatic transfer of images.
- Query / Retrieve Service Class to facilitate manual querying or retrieving of Patient, Study, Series, and Images.
- Storage Commitment Service Class to facilitate commitment to storage of information objects.

2.2 IMPLEMENTATION MODEL

2.2.1 Application Data Flow Diagram

The network application model for the SenoIris is shown in the following Illustration :

ILLUSTRATION 2–1
SENOIRIS NETWORK APPLICATION MODEL AND DATA FLOW DIAGRAM



2.2.2 Functional Definition of AE's

2.2.2.1 Network AE

The DICOM Network AE provides DICOM protocol communication for images. The DICOM Network AE is automatically brought up when the SenoIris is powered on.

The DICOM Network AE provides the following Real World Activities:

- Manual Query/Retrieve of a remote DICOM archive to obtain a list of data **Patient/Study level** by selecting the remote DICOM AE. From the list, the user can select an entry and retrieve the SOP Classes supported by the SenoIris from the remote DICOM AE.
- Manual and automatic send of images to remote DICOM Storage AE.
- Initiate storage commitment for documents created on the workstation (Storage Commitment N-ACTION).
- Flags documents in database on receiving storage commitment confirmation (N-EVENT-REPORT) from a remote AE.
- Receival and storage of images from any remote AE.

The DICOM Network AE initiates the following operations:

- Initiate a DICOM association to send DICOM SOP Classes (images) to a remote DICOM AE.
- Initiate a DICOM association to ask remote DICOM AE for transmit of SOP Classes (images) to SenoIris.
- Initiate a DICOM association to ask remote DICOM AE storage commitemment (Storage Commitment N-ACTION) for specific images on SenoIris.
- Initiate a DICOM association to ask remote DICOM AE for patient demographics.

The DICOM Network AE waits for association requests from Remote AE:

- Accepts DICOM associations from remote DICOM AE to store DICOM SOP Classes (images) on the SenoIris.
- Accepts DICOM associations from remote DICOM AE transmitting storage commitment notification (Storage Commitment N-EVENT-REPORT).

2.2.3 Sequencing of Real-World Activities

In case of automatic send of documents (images) to a remote host:

1. Operator configures remote AE as a communication partner for auto-send of documents.
2. User imports case, and starts exam.
3. User clicks on close exam.
4. Configured document types are sent to remote hosts.

In case of storage commitment of specific documents:

1. Operator configures remote AE as a communication partner for auto push & storage commitment.
2. Images are sent to remote AE automatically by the system, either on generation.
3. When images are sent successfully, the NETWORK AE emits an N-ACTION request.
4. On reception of N-ACTION success response, Network AE is ready to receive at any time from Storage Commitment Provider the N-EVENT-REPORT-RQ notification on a new association.
5. On reception of N-EVENT-REPORT-RQ notification from Storage Commitment Provider, system flags the images in the database as committed.
6. When all images are flagged, Network AE sends a N-EVENT-REPORT-RSP to the Storage Commitment Provider.

2.3 AE -SPECIFICATIONS

2.3.1 Network AE Specification

The Network Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCU** and/or as an **SCP.**

SOP Class Name	SOP Class UID	SCU	SCP
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Yes	Yes
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	No
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	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
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No

2.3.1.1 Association Establishment Policies

2.3.1.1.1 General

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

Application Context Name	**1.2.840.10008.3.1.1.1**

The maximum length PDU receive size for the Network Application Entity is:

Maximum Length PDU	**64234 bytes** **(Not Configurable)**

2.3.1.1.2 Number of Associations

The NETWORK AE will initiate one or moreDICOM association at a time to perform a Query/Retrieve with a Remote Host AE.

The NETWORK AE will initiate only one DICOM association at a time to perform a DICOM store operation as a SCU to a Remote Host AE.

The NETWORK AE can accept a maximum of five DICOM associations at a time to perform a DICOM store operation as a SCP or respond to an echo.

The NETWORK AE will initiate only one DICOM association at a time to perform a DICOM storage commitment operation as a SCU to a Remote Host AE.

2.3.1.1.3 Asynchronous Nature

Asynchronous mode is supported while initiating Query/Retrieve operation with a remote host. Send & storage commitment operations are initiated synchronously on a single association with a remote host.

2.3.1.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

SenoIris Implementation UID	**1.2.276.0.69.25.1.1**
SenoIris Implementation Version Name	**GE_SenoIris_1**

2.3.1.2 Association Initiation Policy

When the Network AE initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities; i.e., there is only a single, comprehensive Presentation Context Negotiation proposed for the AE.

The Network AE proposes one or more Transfer Syntax in each Presentation Context.

2.3.1.2.1 Real-World Activity: Manual Query / Retrieve

2.3.1.2.1.1 Associated Real-World Activity

Manual Query / Retrieve of patient demographics:

1. The operator configures the remote AE as the Query / Retrieve communication partner.
2. The operator selects the remote AE from the list of communication partners, and queries for the list of patient (s) by clicking the Search button.
3. A list widget displays the results upon successful query.
4. The operator selects one or more Patients from the query list.
5. The selected list can be either prefetched by selecting prefetch option, or can be directly opened to fetch and start reviewing..

These operations will cause:

- The DICOM NETWORK AE to initiate a DICOM association.
- The DICOM NETWORK AE to emit a C-FIND request to get a list of patients regarding the criteria listed below, to get the appropriate studies, series or images for the selected list of patients.
- The DICOM NETWORK AE to emit a C-MOVE request to specify a selected list of Patients/Studies/Series/Images to be sent by the Remote AE to the SenoIris.

2.3.1.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by Network AE for Manual Query / Retrieve.					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

2.3.1.2.1.2.1 SOP Specific DICOM Conformance Statement for the Patient Root Query/Retrieve Information Model - FIND, Study Root Query/Retrieve Information Model – FIND.

A C-FIND CANCEL will be sent if the maximum number of Pending responses received during a C-FIND request is more than 2000.

Following are the status codes that are more specifically processed when receiving messages from a **Query** SCP equipment :

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	A700	Refused: Out of resources	Association is closed. Appropriate message is displayed to the user.
	A900	Error: Identifier does not match SOP Class	Association is closed. Appropriate message is displayed to the user.
	C000-001	Error: Unable to process	Association is closed. Appropriate message is displayed to the user.
	C100	Error: More than one match found	Association is closed. Appropriate message is displayed to the user.
	C200	Unable to support requested template	Association is closed. Appropriate message is displayed to the user.
Cancel	FE00	Matching terminated due to cancel	Association is closed. Error message is displayed to the user.
Success	0000	Matching is complete - No final identifier is supplied	
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	
	FF01	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	

2.3.1.2.1.2.2 SOP Specific DICOM Conformance Statement for the Patient Root Query/Retrieve Information Model - MOVE , Study Root Query/Retrieve Information Model – MOVE.

C-MOVE CANCEL is never sent to the Retrieve SCP.

Following are the status codes that are more specifically processed when receiving messages from a **Retrieve** SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	A701	Refused: Out of resources - Unable to calculate number of matches	Association is closed. Error message is displayed to the user.
	A702	Refused: Out of resources - Unable to perform sub-operations	Association is closed. Error message is displayed to the user.
	A801	Refused: Move Destination Unknown	Association is closed. Error message is displayed to the user.
	A900	Error: Identifier does not match SOP Class	Association is closed. Error message is displayed to the user.
	C001	Error: Unable to process	Association is closed. Error message is displayed to the user.
Cancel	FE00	Sub-operations terminated due to a Cancel indication	Association is closed. Error message is displayed to the user.
Warning	B000	Sub-operations Complete - One or more Failures.	Association is closed. Appropriate message is displayed to the user.
Success	0000	Sub-operations Complete - No Failure.	
Pending	FF00	Sub-operations are continuing -	

2.3.1.2.2 Real-World Activity: Manual/Automatic Transfer of Images

2.3.1.2.2.1 Associated Real-World Activity

Manual send of images:

1. Operator selects the database, and searches for the patient.
2. Operator selects the images from the search result, and clicks Send button to send the images.
3. Preferred remote AE can be selected in the Send GUI dialog before confirming send operation.

Automatic send of images:

1. Operator configures the remote AE for automatic send of images.
2. Operator imports the cases to the database.
3. On import, the configured type of images (generated or imported) are automatically sent to the configured remote AE.

This operation causes:

– The SenoIris to retrieve the selected images from the database.

- The NETWORK AE to initiate a DICOM association, negotiate with the Remote AE an appropriate Abstract and Transfer Syntax.
- The emission of a C-STORE command to send the images, if the negotiation is successful.

The NETWORK AE initiates an association for each image. Every association is closed when the DICOM data has been sent (successfully or not) to the remote SCP. The NETWORK AE supports lossless and lossy JPEG 2000 compression. Compression can be configured in the SenoIris and is invoked automatically for images while sending images to remote AE.

2.3.1.2.2.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by Network AE for Manual / Automatic send of images.					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG 2000 Image Compression (Lossless Only) JPEG 2000 Image Compression	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91	SCU	None

2.3.1.2.2.2.1 SOP Specific DICOM Conformance Statement for All Storage SOP Classes

The Network AE includes optional data elements in the SOP Instances as described in Section 3.

Following are the status codes that are more specifically processed when receiving messages from a **Storage** SCP equipment:

Service Status	**Status Code**	**Further Meaning**	**Application Behavior When Receiving Status Code**
Failure	A700	Refused: Out of resources	Association is closed with Remote AE. Appropriate message is displayed to the user. Error is logged.
	A900	Error: Data Set does not match SOP Class	Association is closed with Remote AE. Appropriate message is displayed to the user. Error is logged.
	C000	Error: Cannot Understand	Association is closed with Remote AE. Appropriate message is displayed to the user. Error is logged.
	0110	Error: Processing failure	Association is closed with Remote AE. Appropriate message is displayed to the user. Error is logged.

Warning	B000	Coercion of Data Elements	Association is closed with Remote AE. A success message is displayed to the user. Warning is logged.
	B006	Elements Discarded	Association is closed with Remote AE. Appropriate message is displayed to the user. Warning is logged.
	B007	Data Set does not match SOP Class	Association is closed with Remote AE. Appropriate message is displayed to the user. Warning is logged.
Success	0000		A success message is displayed to the user.

2.3.1.2.3 Real-World Activity: Commitment to storage of images.

2.3.1.2.3.1 Associated Real-World Activity

Commitment to storage of images:

1. Operator configures remote AE as communication partner for auto push & storag commitment.
2. Images sent to remote AE automatically by the system on generation.

This operation causes:

- To send images to the remote AE.
- To initiate a DICOM association and negotiates abstract and transfer syntax, once the images are successfully sent.
- If the negotiation is successful, NETWORK AE emits a N-ACTION request.
- Waits for N-ACTION-RSP from Storage Commitment Provider.
- On reception of failure in N-ACTION-RSP, an error is logged.
- On reception of success, Network AE is ready to receive at any time from Storage Commitment Provider the N-EVENT-REPORT-RQ notification on a new association.
- On reception of N-EVENT-REPORT-RQ notification from Storage Commitment Provider, system flags the images in the database as committed.
- When all images are flagged, Network AE sends a N-EVENT-REPORT-RSP to the Storage Commitment Provider.

2.3.1.2.3.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by Network AE for Storage Commitment.					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

2.3.1.2.3.2.1 SOP Specific DICOM Conformance Statement for the Storage Commitment Push Model SOP Class SCU

The NETWORK AE may request Storage Commitment for Instances of any of the Composite SOP Classes it supports as an SCU (see Section 3).

The Storage Commitment Information Object is described in Section 4.

Following are the status codes that are more specifically processed when receiving N-Action responses from a **Storage Commitment** SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	0119	Class-instance conflict	Association is closed with Remote AE. Error is logged.
	0210	Duplicate invocation	Association is closed with Remote AE. Error is logged.
	0115	Invalid argument value	Association is closed with Remote AE. Error is logged.
	0212	Mistyped argument	Association is closed with Remote AE. Error is logged.
	0113	No such event type	Association is closed with Remote AE. Error is logged.
	0114	No such argument	Association is closed with Remote AE. Error is logged.
	0118	No such SOP Class	Association is closed with Remote AE. Error is logged.
	0112	No such SOP Instance	Association is closed with Remote AE. Error is logged.
	0110	Processing failure	Association is closed with Remote AE. Error is logged.
	0213	Resource limitation	Association is closed with Remote AE. Error is logged.
	0211	Unrecognized operation	Association is closed with Remote AE. Error is logged.
Success	0000		

2.3.1.3 Association Acceptance Policy

2.3.1.3.1 Real-World Activity "Receive of Images"

2.3.1.3.1.1 Associated Real-World Activity

Receive of Images:

1. The NETWORK AE waits for an association.
2. The NETWORK AE accepts an association when it receives a valid association request from a DICOM Storage SCU.
3. When the association is accepeted, it will receive DICOM data transmitted on that association and store the supported SOP Classes in the database.

These operations will cause:

1. NETWORK AE to receive A-ASSOCIATE requests from remote Storage SCU.
2. Send A-ASSOCIATE acknowledgement message.
3. Receives C_STORE request from remote Storage SCU.
4. On successful storage of image objects, sends C-STORE response, and releases the association on receiving a A-RELEASE request.

By default, any Remote DICOM AE (Storage SCU) can send images to the NETWORK AE. No operator is required to receive an image. If images are received for the currently opened patient context, these images are opened automatically.

2.3.1.3.1.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by AE NETWORK AE for Activity "Receive & Storage of Images"					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG 2000 Image Compression (Lossless Only) JPEG 2000 Image Compression JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]) JPEG Baseline (Process 1) JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	SCP	None

Note: The Storage Commitment Provider initiating the association must use the role selection negotiation.

2.3.1.3.1.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

The NETWORK AE provides Level 2 (FULL) Conformance, and stores all standard and private data elements of received SOP Instances.

The AE does not validate if the Attributes of the SOP Instance meet the requirements of the IOD with respect to Value Representation, presence of Type 1 and 2 elements, valid values, and consistency between image attributes and pixel data.

The AE provides Digital Signature Level 3 support, as it provides full fidelity storage of received SOP Instances.

Images sent in JPEG-2000, JPEG 2000 (Lossless Only), JPEG Baseline Lossy 8-Bit, JPEG Baseline Lossy 12-Bit,JPEG Lossless Hierarch., First-order prediction transfer syntax are decompressed by the NETWORK AE by default.

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

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Failure	A700	Refused: Out of resources	Indicated that there was not enough space or some other internal resource to store the image.	(0000,0902)
	A900	Error: Invalid Dataset	Indicates that an invalid SOP instance is received, and cannot be stored.	(0000,0902)
	0110	Processing Failure	Indicates that an internal system call has failed while processing the image.	(0000,0902)
Success	0000			None

Successfully received SOP Instances may be accessed via the user interface and by DICOM network query retrieve. SOP Instances are stored until manually deleted by the user.

2.3.1.3.1.3 Presentation Context Acceptance Criterion

The NETWORK AE evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for any Real-World Activity.

2.3.1.3.1.4 Transfer Syntax Selection Policies

Within each Presentation Context, the NETWORK AE will select Transfer Syntaxes according to the following priority (highest priority first):

1. Explicit VR Little Endian
2. Implicit VR Little Endian
3. Explicit VR Big Endian

2.4 COMMUNICATION PROFILES

2.4.1 Supported Communication Stacks

SenoIris provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8.

SenoIris uses the MergeCOM-3 Advanced DICOM Tool Kit to communicate over the TCP/IP protocol stack on any physical interconnection media supporting the TCP/IP stack. The tool kit inherits the TCP/IP stack from the operating system upon which it executes.

2.4.2 Physical Media Support

The SenoIris is indifferent to the physical medium over which TCP/IP executes; it inherits this from the operating system on which it exists.

2.4.3 Internet Protocol Version 6 (IPv6)

Internet Protocol Version 6 (IPv6) is not supported by the SenoIris.

2.5 EXTENSIONS / SPECIALIZATIONS/ PRIVATIZATIONS

2.5.1 Standard Extended / Specialized / Private SOP Classes

None supported.

2.5.2 Private Transfer Syntaxes

None supported.

2.6 CONFIGURATION

2.6.1 AE Title/Presentation Address Mapping

Before communicating with a remote AE (WORKLIST AE, NETWORK AE, PRINT AE) the operator must register it by using the SenoIris DICOM configuration. This task requires specifying the following information:

- Remote AE Title
- Remote IP Address
- Remote TCP/IP Port Number

This information is used to communicate over the TCP/IP protocol stack.

2.6.2 Configurable Parameters

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

- Local AE Title
- Local IP Address
- Local Listening Port Number

The following fields are configurable for every remote DICOM AE:

- Remote AE Title
- Remote IP Address
- Listening TCP/IP Port Number

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

2.7 SUPPORT OF EXTENDED CHARACTER SETS

The SenoIris uses the single single-byte extended character set ISO_IR 100 (Latin alphabet Number 1 supplementary set).

As a Storage SCP or Media Storage FSR, the product will accept SOP Instances with any value of Specific Character Set (0008,0005). However, it will display in the user interface only characters specified within ISO_IR 100 (Latin alphabet Number 1 supplementary set).

The product user interface will allow the user to enter characters from the console keyboard that are within ISO_IR 100 (Latin alphabet Number 1 supplementary set). If any such extended characters are included in SOP Instances or in query identifier matching fields, the product will appropriately specify the extended character set in Specific Character Set (0008,0005).

2.8 CODES AND CONTROLLED TERMINOLOGY

The product uses no coded terminology.

2.9 SECURITY PROFILES

The product does not conform to any defined DICOM Security Profiles.

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

1. Firewall or router protections to ensure that only approved external hosts have network access to the product.
2. Firewall or router protections to ensure that the product only has network access to approved external hosts and services.
3. Any communications with external hosts and services outside the locally secured environment use appropriate secure network channels (such as a Virtual Private Network (VPN))

3. BREAST TOMOSYNTHESIS IMAGE INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

This section specifies the use of the DICOM Digital Mammography X-Ray Image IOD to represent the information included in MG Images produced and received by this implementation. Corresponding attributes are conveyed using the module construct.

3.2 SENOIRIS MAPPING OF DICOM ENTITIES

The SenoIris maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 3-1
MAPPING OF DICOM ENTITIES TO SENOIRIS ENTITIES

DICOM IE	SenoIris Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image

3.3 IOD MODULE TABLE

The MG Image Information Object Definition comprises the modules of the following table.

TABLE 3-2
BREAST TOMOSYNTHESIS IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.5.1.1
	Clinical Trial Subject	Not used	N/A
Study	General Study	Used	3.5.2.1
	Patient Study	Used	3.5.2.2
	Clinical Trial Study	Not used	N/A
Series	General Series	Used	3.5.3.1
	Clinical Trial Series	Not used	N/A
	Enhanced Mammography Series	Used	**Error! Reference source not found.**
Frame of Reference	Frame of Reference	Used	3.5.4.1
	Synchronization	Not used	N/A
Equipment	General Equipment	Used	3.5.5.1
	Enhanced General Equipment	Used	3.5.5.2

Image	Image Pixel	Used	**Error! Reference source not found.**
	Enhanced Contrast/Bolus	Not used	N/A
	Device	Not used	N/A
	Intervention	Not used	N/A
	Acquisition Context	Used	3.5.6.2
	Multi-frame Functional Groups	Used	3.5.6.3
	Multi-frame Dimension Module	Not used	N/A
	Image - Equipment Coordinate Relationship	Not used	N/A
	Specimen	Not used	N/A
	X-Ray 3D Image	Used	3.5.6.4
	Breast Tomosynthesis Contributing Sources	Used	3.5.6.5
	Breast Tomosynthesis Acquisition	Used	3.5.6.6
	X-Ray 3D Reconstruction	Used	3.5.6.7
	Breast View	Used	3.5.6.8
	SOP Common	Used	3.5.6.9
	Frame Extraction	Not used	N/A

3.4 BREAST TOMOSYNTHESIS IMAGE FUNCTIONAL GROUP MACROS

Table 3-3 specifies the use of the Functional Group macros used in the Multi-frame Functional Groups Module for the Breast Tomosynthesis Image IOD.

TABLE 3-3
BREAST TOMOSYNTHESIS IMAGE FUNCTIONAL GROUP MACROS

Functional Group Macro	Usage
Pixels Measure	Used as a Shared Functional Group
Frame Content	Used as a Per-frame Functional Group
Plane Position (Patient)	Used as a Per-frame Functional Group
Plane Orientation (Patient)	Used as a Shared Functional Group
Referenced Image	Not Used

Derivation Image	Used as a Shared Functional Group for Volume Preview
Frame Anatomy	Used as a Shared Functional Group
Identity Pixel Value Transformation	Used as a Shared Functional Group
Frame VOI LUT With LUT	Used as a Shared Functional Group
Real World Value Mapping	Not Used
Contrast/Bolus Usage	Not Used
X-Ray 3D Frame Type	Used as a Per-frame Functional Group

3.5 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the Breast Tomosynthesis Image Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported and expected. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from when generating the instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

3.5.1 Patient Entity Modules

3.5.1.1 Patient Module

This section specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

TABLE 3-4
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Sent with value set in source image.
Patient ID	(0010,0020)	2	Sent with value set in source image.
Patient's Birth Date	(0010,0030)	2	Sent with value set in source image.
Patient's Sex	(0010,0040)	2	Sent with value set in source image.
Referenced Patient Sequence	(0008,1120)	3	Sent with value set in source image.
> Referenced SOP Class UID	(0008,1150)	1C	Sent with value set in source image.
> Referenced SOP Instance UID	(0008,1155)	1C	Sent with value set in source image if present.
Issuer of Patient ID	(0010,0021)	3	Not used
Issuer of Patient ID Qualifiers Sequence	(0010,0024)	3	Not used
>Universal Entity ID	(0040,0032)	3	Not used
>Universal Entity ID Type	(0040,0033)	1C	Not used
>Identifier Type Code	(0040,0035)	3	Not used

Patient's Birth Time	(0010,0032)	3	Not used
Other Patient IDs	(0010,1000)	3	Not used
Other Patient IDs Sequence	(0010,1002)	3	Not used
>Patient ID	(0010,0020)	1	Not used
>Issuer of Patient ID	(0010,0021)	1	Not used
>Type of Patient ID	(0010,0022)	1	Not used
>Issuer of Patient ID Qualifiers Sequence	(0010,0024)	1	Not used
>>Universal Entity ID	(0040,0032)	3	Not used
>>Universal Entity ID Type	(0040,0033)	1C	Not used
>>Identifier Type Code	(0040,0035)	3	Not used
Other Patient Names	(0010,1001)	3	Not used
Ethnic Group	(0010,2160)	3	Not used
Patient Comments	(0010,4000)	3	Not used
Patient Identity Removed	(0012,0062)	3	Used only in de-identified images with the value "YES"
De-identification Method	(0012,0063)	1C	Used only in de-identified images with the value "De-identification"

3.5.2 Study Entity Modules

3.5.2.1 General Study Module

This section specifies the Attributes which describe and identify the Study performed upon the Patient.

TABLE 3-5
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Sent with value set in the source image.
Study Date	(0008,0020)	2	The system set it to today's date when generating a new study, else set to value set in source image.
Study Time	(0008,0030)	2	The system set it to current time when generating a new study, else set to value set source image.
Referring Physician's Name	(0008,0090)	2	Sent with value set in the source image.
Study ID	(0020,0010)	2	Sent with value set in the source image.
Accession Number	(0008,0050)	2	Sent with value set in the source image.
Study Description	(0008,1030)	3	Sent with value set in the source image.
Referenced Study Sequence	(0008,1110)	3	Sent with value set in the source image.
> Referenced SOP Class UID	(0008,1150)	3	Sent with value set in the source image.
> Referenced SOP Instance UID	(0008,1155)	3	Sent with value set in the source image.
Procedure Code Sequence	(0008,1032)	3	Sent with value set in the source image.
>Code Value	(0008,0100)	1	Sent with value set in the source image.

>Coding Scheme Designator	(0008,0102)	1	Sent with value set in the source image.
>Code Meaning	(0008,0104)	1C	Sent with value set in the source image.

3.5.2.2 Patient Study Module

This section specifies the Attributes which provide information about the patient at the time the study was performed.

TABLE 3-6
PATIENT STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Age	(0010,1010)	3	Sent with value set in the source image.

3.5.3 Series Entity Modules

3.5.3.1 General Series Module

This section specifies the Attributes which identify and describe general information about the Series within a Study.

TABLE 3-7
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Always set to "MG"
Series Instance UID	(0020,000E)	1	UID is generated by the system.
Series Number	(0020,0011)	2	Set to '1' first instance in the Series.
Laterality	(0020,0060)	2C	Not used
Series Date	(0008,0021)	3	The system sets it to today's date when generating a new series.
Series Time	(0008,0031)	3	The system sets it to current time when generating a new series.
Performing Physicians' Name	(0008,1050)	3	Sent with value set in the source image.
Protocol Name	(0018,1030)	3	Sent with value set in the source image.
Series Description	(0008,103E)	3	Set to "V-Preview" or "Enhanced V-Preview"
Operators' Name	(0008,1070)	3	Sent with value set in the source image if present.
Body Part Examined	(0018,0015)	3	Set to BREAST
Request Attributes Sequence	(0040,0275)	3	Sent with value set in the source image if present.
>Requested Procedure ID	(0040,1001)	1C	Sent with value set in the source image if present.
>Scheduled Procedure Step ID	(0040,0009)	1C	Sent with value set in the source image if present.
>Scheduled Procedure Step Description	(0040,0007)	3	Sent with value set in the source image if present.
>Scheduled Protocol Code Sequence	(0040,0008)	1C	Sent with value set in the source image if present.
>>Code Value	(0008,0100)	1	Sent with value set in the source image if

			present or attribute is not sent otherwise
>>Coding Scheme Designator	(0008,0102)	1	Sent with value set in the source image if present or attribute is not sent otherwise
>>Code Meaning	(0008,0104)	1C	Sent with value set in the source image if present or attribute is not sent otherwise

3.5.3.2 Enhanced mammography Series Module

This Module contains IOD Attributes that describe a series performed on the patient for the context of a Breast Tomosynthesis device.

TABLE 3-8
ENHANCED MAMMOGRAPHY SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Described in General Series Module

3.5.4 Frame of reference Entity Modules

3.5.4.1 Frame of reference module

This section specifies the Attributes necessary to uniquely identify a frame of reference, which insures the spatial relationship of Images within a Series.

TABLE 3-9
FRAME OF REFERENCE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Frame of Reference UID	(0020,0052)	1	Sent with value set in the source image if present.
Position Reference Indicator	(0020,1040)	1	Sent with value set in the source image if present.

3.5.5 Equipment Entity Modules

3.5.5.1 General Equipment Module

This section specifies the Attributes which identify and describe the piece of equipment which produced a Series of Images.

TABLE 3-10
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Set to "GE MEDICAL SYSTEMS"
Institution Name	(0008,0080)	3	Set to value read from workstation settings.
Institution Address	(0008,0081)	3	Set to value read from workstation settings.
Station Name	(0008,1010)	3	Set to value read from workstation settings.
Manufacturer's Model Name	(0008,1090)	3	Set to “SenoIris_[version](build number)”
Device Serial Number	(0018,1000)	3	Set to hardware serial number if available. Empty if otherwise.
Software Versions	(0018,1020)	3	Set to SenoIris software version.
Pixel Padding Value	(0028,0120)	1C	Set to 0.

Pixel Padding Range Limit	(0028,0121)	1	Set to the range limit of the pixel padding values.

3.5.5.2 Enhanced General Equipment Module

This section specifies the Attributes which identify and describe the piece of equipment which produced a Series of Composite Instances.

TABLE 3-11
ENHANCED GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	1	Described in General Equipment Module.
Manufacturer's Model Name	(0008,1090)	1	Described in General Equipment Module.
Device Serial Number	(0018,1000)	1	Described in General Equipment Module.
Software Versions	(0018,1020)	1	Described in General Equipment Module.

3.5.6 Image Entity Modules

3.5.6.1 Image Pixel Module

This section specifies the Attributes that describe the pixel data of the image.

TABLE 3-12
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Always set to 1
Photometric Interpretation	(0028,0004)	1	Set to "MONOCHROME2" (i.e. 0 is black)
Rows	(0028,0010)	1	Set to the number of rows.
Columns	(0028,0011)	1	Set to the number of columns.
Bits Allocated	(0028,0100)	1	Set to 16
Bits Stored	(0028,0101)	1	Set to 12
High Bit	(0028,0102)	1	Set to 11
Pixel Representation	(0028,0103)	1	Always set to 0000H (unsigned integer)
Pixel Data	(7FE0,0010)	1	Contains the image pixel data.

3.5.6.2 Acquisition Context Module

The table in this Section contains IOD Attributes that describe the acquisition context while acquiring the MG image.

TABLE 3-13
ACQUISITION CONTEXT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Acquisition Context Sequence	(0040,0555)	2	Zero length value is sent

3.5.6.3 Multi-frame Functional Groups Module

The table in this Section contains IOD Attributes that describe Multi-frame Functional Groups Module.

TABLE 3-14
MULTI-FRAME FUNCTIONAL GROUPS MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Shared Functional Groups Sequence	(5200,9229)	2	Sent with one item.
>Pixel Measures Sequence	(0028,9110)	1	Sent with one item.
>>Pixel Spacing	(0028,0030)	1C	Sent with two values indicating
>>Slice Thickness	(0018,0050)	1C	Sent with value set to attribute Body Part Thickness (0018,11A0) in source image.
>Plane Orientation Sequence	(0020,9116)	1	Sent with one item.
>>Image Orientation (Patient)	(0020,0037)	1C	Sent with 6 values. Row value for the x, y, and z axes respectively, followed by the Column value for the x, y, and z axes respectively.
>Derivation Image Sequence	(0008,9124)	2	Sent with one or two items for V-Preview. Sent with zero items otherwise.
>Derivation Description	(0008,2111)	3	Set to "V-Preview([version])" for V-Preview image. OR "Enhanced V-Preview([algorithm_version/cad_version])" for Enhanced V-Preview image.
>>Derivation Code Sequence	(0008,9215)	1	Sent with one or two items
>>>Code Value	(0008,0100)	1	Set to "113089"
>>>Coding Scheme Designator	(0008,0102)	1	Sent with value set to "DCM"
>>>Code Meaning	(0008,0104)	1C	Set to "Unsharp mask"
>>Source Image Sequence	(0008,2112)	2	Contains source images.
>>>Referenced SOP Class UID	(0008,1150)	1C	Set to SOP Class "1.2.840.10008.5.1.4.1.1.1.2.1" or 1.2.840.10008.5.1.4.1.1.13.1.3
>>>Referenced SOP Instance UID	(0008,1155)	1C	SOP Instance UID of Projection Image.
>>>Purpose of Reference Code Sequence	(0040,A170)	1	Sent with one or two items.
>>>>Code Value	(0008,0100)	1	Sent with value set to "121322"
>>>>Coding Scheme Designator	(0008,0102)	1	Sent with value set to "DCM"
>>>>Code Meaning	(0008,0104)	1C	Sent with value set to "Source image for image processing operation"
>Frame Anatomy Sequence	(0020,9071)	1	Sent with one item

>>Frame Laterality	(0020,9072)	1	Supported Values: R = right L = left B = both
>>Anatomic Region Sequence	(0008,2218)	1	Sent with one item.
>>>Code Value	(0008,0100)	1	Used Code: T-04000 for Breast
>>>Coding Scheme Designator	(0008,0102)	1	Always set to SRT
>>>Code Meaning	(0008,0104)	1C	Set to Breast
>Pixel Value Transformation Sequence	(0028,9145)	1	Sent with one item.
>>Rescale Intercept	(0028,1052)	1	Sent with value set to "0"
>>Rescale Slope	(0028,1053)	1	Sent with value set to "1"
>>Rescale Type	(0028,1054)	1	Sent with value set to "US"
>Frame VOI LUT Sequence	(0028,9132)	1	Sent with one item.
>>Window Center	(0028,1050)	1	Sent with three values.
>>Window Width	(0028,1051)	1	Sent with three values.
>>Window Center and Width Explanation	(0028,1055)	3	Set to "NORMAL\HARDER\SOFTER".
>>VOI LUT Function	(0028,1056)	3	Sent with value set to "SIGMOID"
Per-frame Functional Groups Sequence	(5200,9230)	1	Sent with as many items as there are frames
>Frame Content Sequence	(0020,9111)	1	Sent with one item
>>Frame Reference DateTime	(0018,9151)	1C	Sent with value set to date and time when half the exposures were made to acquire the image.
>>Frame Acquisition DateTime	(0018,9074)	1C	Sent with value set to the date and time the first exposure was made to acquire the image.
>>Frame Acquisition Duration	(0018,9220)	1C	Sent with value set to the time elapsed between first and last exposures made to acquire the image.
>Plane Position Sequence	(0020,9113)	1	Sent with one item
>>Image Position (Patient)	(0020,0032)	1C	Sent with value set to "x\y\z" where x, y and z are the coordinates of the upper left hand corner of the V-Preview in mm
>X-Ray 3D Frame Type Sequence	(0018,9504)	1	Sent with one item
>>Frame Type	(0008,9007)	1	V-Preview: Set to "DERIVED\PRIMARY\TOMOSYNTHESIS\G

			ENERATED_2D” Enhanced V-Preview: Set to “DERIVED\PRIMARY\TOMOSYNTHESIS\GENERATED_2D\\ENHANCED”
>>Pixel Presentation	(0008,9205)	1	Set to "MONOCHROME"
>>Volumetric Properties	(0008,9206)	1	Set to “SAMPLED”
>>Volume Based Calculation Technique	(0008,9207)	1	Set to “NONE”
>>Reconstruction Index	(0020,9536)	1C	Set to "1"
Instance Number	(0020,0013)	1	First image generated for the series: value is 1.
Content Date	(0008,0023)	1	Sent with value set to the date the image is created.
Content Time	(0008,0033)	1	Sent with value set to the time the image is created.
Number of Frames	(0028,0008)	1	Set to “1”

3.5.6.4 X-Ray 3D Image Module

The table in this Section contains IOD Attributes that describe an X-Ray 3D image by specializing Attributes of the General Image and Image Pixel Modules, and adding additional attributes.

TABLE 3-15
X-RAY 3D IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	V-Preview: Set to “DERIVED\PRIMARY\TOMOSYNTHESIS\GENERATED_2D” Enhanced V-Preview: Set to “DERIVED\PRIMARY\TOMOSYNTHESIS\GENERATED_2D\\ENHANCED”
Pixel Presentation	(0008,9205)	1	Always set to "MONOCHROME"
Volumetric Properties	(0008,9206)	1	Set to “SAMPLED”
Volume Based Calculation Technique	(0008,9207)	1	Set to "NONE"
Bits Allocated	(0028,0100)	1	Sent in Image Pixel Module.
Bits Stored	(0028,0101)	1	Sent in Image Pixel Module.
High Bit	(0028,0102)	1	Sent in Image Pixel Module.

Samples per Pixel	(0028,0002)	1	Sent in Image Pixel Module.
Photometric Interpretation	(0028,0004)	1	Sent in Image Pixel Module.
Content Qualification	(0018,9004)	1	Set to "PRODUCT".
Burned In Annotation	(0028,0301)	1	Set to "NO".
Lossy Image Compression	(0028,2110)	1	Set to "00"
Presentation LUT Shape	(2050,0020)	1	Set to "IDENTITY".

3.5.6.5 Breast Tomosynthesis Contributing Sources Module

The table in this Section contains IOD Attributes that describes the overall characteristics of one or more source images that were used to create a Breast Tomosynthesis Image SOP Class instance.

TABLE 3-16
BREAST TOMOSYNTHESIS CONTRIBUTING SOURCES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Contributing Sources Sequence	(0018,9506)	1	Sent with one item.
>Contributing SOP Instances Reference Sequence	(0020,9529)	1C	Sent with one item.
>>Study Instance UID	(0020,000D)	1	Sent with value set to attribute Study Instance UID (0020, 000D) in source images.
>>Referenced Series Sequence	(0008,1115)	1	Sent with one item.
>>>Series Instance UID	(0020,000E)	1	Sent with value set to attribute Series Instance UID (0020, 000E) in source image.
>>>Series Number	(0020,0011)	2	Sent with value set to attribute Series Number (0020, 0011) in source image.
>>>Referenced Instance Sequence	(0008,114A)	1	Sent with as many items as source images.
>>>>Referenced SOP Class UID	(0008,1150)	1	Sent with value set to attribute SOP Class UID (0008, 0016) of source image.
>>>>Referenced SOP Instance UID	(0008,1155)	1	Sent with value set to attribute SOP Instance UID (0008, 0018) of source image.
>>>>Instance Number	(0020,0013)	2	Sent with value set to attribute Instance Number (0020, 0013) of source image.
>Manufacturer	(0008,0070)	2	Sent with value set to attribute Manufacturer (0008, 0070) of source image.
>Manufacturer's Model Name	(0008,1090)	2	Sent with value set to attribute Manufacturer's Model Name (0008, 1090) in source image.
>Device Serial Number	(0018,1000)	1C	Sent with value set to attribute Device Serial Number (0018, 1000) in source image. This attribute is always present in source image.
>Software Versions	(0018,1020)	1C	Sent with value set to attribute Software versions (0018, 1020) in source image. This attribute is always present in source image.
>Acquisition DateTime	(0008,002A)	1C	Sent with value set to combination of attributes Acquisition Date (0008, 0022) and Acquisition Time (0008, 0032) in source image.
>Station Name	(0008,1010)	1C	Sent with value set to attribute Station Name (0008, 1010) in source image.

>Operators' Name	(0008,1070)	1C	Sent with value set to attribute Operator's name (0008, 1070) in source image.
>Protocol Name	(0018,1030)	1C	Sent with value set to attribute Protocol Name (0018, 1030) in source image.
>Acquisition Protocol Name	(0018,9423)	1C	Sent with value set to attribute Protocol Name (0018, 1030) in source image.
>Rows	(0028,0010)	1	Sent with value set to attribute Rows (0028, 0010) in source image.
>Columns	(0028,0011)	1	Sent with value set to attribute Columns (0028, 0011) in source image.
>Bits Stored	(0028,0101)	1	Sent with value set to attribute Bits Stored (0028, 0101) in source image.
>Lossy Image Compression	(0028,2110)	1C	Sent with value set to attribute Lossy Image Compression (0028, 2110) in source image.
>Detector Type	(0018,7004)	1	Sent with value set to attribute Detector Type (0018, 7004) in source image.
>Detector ID	(0018,700A)	1	Sent with value set to attribute Detector ID (0018, 700A) in source image.
>Date of Last Detector Calibration	(0018,700C)	1	Sent with value set to attribute Date of Last Detector Calibration (0018, 700C) in source image.
>Time of Last Detector Calibration	(0018,700E)	1	Sent with value set to attribute Time of Last Detector Calibration (0018, 700E) in source image.
>Detector Element Spacing	(0018,7022)	1	Sent with value set to attribute Detector Element Spacing (0018, 7022) in source image.

3.5.6.6 Breast Tomosynthesis Acquisition Module

The table in this Section contains IOD Attributes that describe the Breast Tomosynthesis acquisition module.

TABLE 3-17
BREAST TOMOSYNTHESIS ACQUISITION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
X-Ray 3D Acquisition Sequence	(0018,9507)	1	Sent with one item.
>Field of View Shape	(0018,1147)	1	Sent with value set to attribute Field of View Shape (0018, 1147) in source image.
>X-Ray Receptor Type	(0018,9420)	3	Set to "DIGITAL_DETECTOR"
>Source Image Sequence	(0008,2112)	1C	Sent with as many items as source images.
>>Referenced SOP Class UID	(0008,1150)	1	Sent with value set to attribute SOP Class UID (0008, 0016) in source image.
>>Referenced SOP Instance UID	(0008,1155)	1	Sent with value set to attribute SOP Class UID (0008, 0018) in source image.
>Field of View Dimension(s) in Float	(0018,9461)	1C	Sent with value set to attribute Field of View Dimensions (0018, 1149) in source image.
>Field of View Origin	(0018,7030)	1C	Sent with value set to attribute Field of View Origin (0018, 7030) in source image.

>Field of View Rotation	(0018,7032)	1C	Sent with value set to attribute (0018, 7032) in source image.
>Field of View Horizontal Flip	(0018,7034)	1C	Sent with value set to attribute Field of View Rotation (0018,7034) in source image
>Grid	(0018,1166)	1C	Sent with value set to attribute Grid (0018, 1166) in source image.
>KVP	(0018,0060)	1C	Sent with value set to the average of the source images attribute KVP (0018, 0060).
>X-Ray Tube Current in mA	(0018,9330)	1C	Sent with value set to the average of source images attribute X-Ray Tube Current (0018, 1151).
>Exposure Time in ms	(0018,9328)	1C	Sent with value set the converted total of the source images attribute Exposure Time (0018, 1150).
>Exposure in mAs	(0018,9332)	1C	Sent with value set the converted total of the source images attribute Exposure.
>Start Acquisition DateTime	(0018,9516)	1C	Sent with value set to combination of source image attributes Acquisition Date (0008, 0022) and Acquisition Time (0008, 0032).
>Primary Positioner Scan Arc	(0018,9508)	1C	Sent with value set to the difference between attribute Positioner Primary Angle (0018, 1510) in the last and first acquired source images.
>Primary Positioner Scan Start Angle	(0018,9510)	1C	Sent with value set to the converted value from first source image attribute Positioner Primary Angle (0018, 1510).
>Primary Positioner Increment	(0018,9514)	1C	Sent with value set to converted absolute value from the difference between the values from the last and first source images Positioner Primary Angle (0018, 1510), divided by the number of source images.
>Distance Source to Detector	(0018,1110)	1	Sent with value (0018, 1110) in source image.
>Distance Source to Patient	(0018,1111)	1	Sent with value (0018, 1111) in source image.
>Estimated Radiographic Magnification Factor	(0018,1114)	1	Sent with value set to attribute Estimated Radiographic Magnification Factor (0018, 1114) in source image.
>Anode Target Material	(0018,1191)	1	Sent with value set to attribute Anode Target Material (0018, 1191) in source image.
>Body Part Thickness	(0018,11A0)	1	Sent with value set to attribute Body Part Thickness (0018, 11A0) in source image.
>Compression Force	(0018,11A2)	1	Sent with value set to attribute Compression Force (0018, 11A2) in source image.
>Exposure Control Mode	(0018,7060)	1	Sent with value set to attribute Exposure Control Mode (0018, 7060) in source image.
>Exposure Control Mode Description	(0018,7062)	1	Sent with value set to attribute exposure Control Mode Description (0018, 7062) in source image.
>Half Value Layer	(0040,0314)	1	Sent with value set to attribute Half Value Layer (0040, 0314) in source image.
>Focal Spot	(0018,1190)	1	Sent with value set to attribute Focal Spot (0018, 1190) in source image.

>Detector Temperature	(0018,7001)	1	Sent with value set to attribute Detector Temperature (0018, 7001) in source image.
>Filter Type	(0018,1160)	1	Sent with value set to attribute Filter Type (0018, 1160) in source image.
>Filter Material	(0018,7050)	1	Sent with value set to attribute Filter Material (0018, 7050) in source image.
>Paddle Description	(0018,11A4)	1	Sent with value set to attribute Paddle Description (0018,11A4) in source image.
>Organ Dose	(0040,0316)	3	Sent with value set to the cumulative organ dose of the source projections.
> Entrance Dose in mGy	(0040,8302)	3	Sent with value set to the cumulative entrance dose of the source projections.
>Per Projection Acquisition Sequence	(0018,9538)	1	Sent with as many items as source images.
>>KVP	(0018,0060)	1C	Sent with value set to attribute KVP (0018, 0060) in source image.
>>X-Ray Tube Current in mA	(0018,9330)	1C	Sent with value set to conversion from attribute X-Ray Tube Current (0018, 1151) in source image.
>>Collimator Shape	(0018,1700)	1C	Sent with value set to attribute Collimator Shape (0018, 1700) in source image.
>>Collimator Left Vertical Edge	(0018,1702)	1C	Sent with value set to attribute Collimator Left Vertical Edge (0018, 1702) in source image.
>>Collimator Right Vertical Edge	(0018,1704)	1C	Sent with value set to attribute Collimator Right Vertical Edge (0018, 1704) in source image.
>>Collimator Upper Horizontal Edge	(0018,1706)	1C	Sent with value set to attribute Collimator Upper Horizontal Edge (0018, 1706) in source image.
>>Collimator Lower Horizontal Edge	(0018,1708)	1C	Sent with value set to attribute Collimator Lower Horizontal Edge (0018, 1708).
>>Positioner Primary Angle	(0018,1510)	1	Sent with value set to attribute Positioner Primary Angle (0018, 1510) in source image.
>> Positioner Primary Angle Direction	(0018,9559)	3	Sent with value set to “CC”
>>Exposure Time in ms	(0018,9328)	1	Sent with value set to the conversion from attribute Exposure Time (0018, 1150) in source image.
>>Exposure in mAs	(0018,9332)	1	Sent with value set to the convention from attribute Exposure (0018, 1152) in source image.
>>Relative X-ray Exposure	(0018,1405)	1	Sent with value set to attribute Relative X-ray Exposure (0018, 1405) in source image.
>>Organ Dose	(0040,0316)	3	Sent with value set to attribute Organ Dose (0040, 0316) in source image.
>>Entrance Dose in mGy	(0040,8302)	3	Sent with value set to attribute Entrance Dose in mGy (0040, 8302) in source image.

3.5.6.7 X-Ray 3D Reconstruction Module

The table in this Section contains IOD Attributes that describe the reconstructions used to create this SOP Instance.

TABLE 3-18
X-RAY 3D RECONSTRUCTION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
X-Ray 3D Reconstruction Sequence	(0018,9530)	1	Sent with one or more items
>Reconstruction Description	(0018,9531)	3	Set to “2D Synthesized”
>Application Name	(0018,9524)	1	Set to “SenoIris_[version](build number)”
>Application Version	(0018,9525)	1	Set to SenoIris version & build number
>Application Manufacturer	(0018,9526)	1	Set to "GE MEDICAL SYSTEMS"
>Algorithm Type	(0018,9527)	1	Set to " IMAGE_ENHANCER”
>Acquisition Index	(0020,9518)	1	Set to “1”

3.5.6.8 Breast View Module

The table in this Section contains IOD Attributes that describe the view of a Breast Tomosynthesis Image.

TABLE 3-19
BREAST VIEW MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
View Code Sequence	(0054,0220)	1	Sent with one item.
>Code Value	(0008,0100)	1	Sent with value copied from source image.
>Coding Scheme Designator	(0008,0102)	1	Sent with value copied from source image.
>Code Meaning	(0008,0104)	1	Sent with value copied from source image.
>View Modifier Code Sequence	(0054,0222)	2	Sent with zero or more items.
>>Code Value	(0008,0100)	1C	Sent with value copied from source image.
>>Coding Scheme Designator	(0008,0102)	1C	Sent with value copied from source image.
>>Code Meaning	(0008,0104)	1C	Sent with value copied from source image.
Breast Implant Present	(0028,1300)	1C	Sent with value copied from source image.

3.5.6.9 SOP Common Module

The table in this Section contains IOD attributes for SOP Common Module.

TABLE 3-20
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Specific Character Set	(0008,0005)	1C	Set to “ISO_IR 100”, i.e. all European characters
SOP Class UID	(0008,0016)	1	Set to the Breast Tomosynthesis SOP Class UID: “1.2.840.10008.5.1.4.1.1.13.1.3”
SOP Instance UID	(0008,0018)	1	UID is generated by the system.
Contributing Equipment Sequence	(0018,A001)	3	Sent with one item describing the contributing acquisition equipment..

->Purpose of Reference Code Sequence	(0040,A170)	1	Sent with acquisition equipment as purpose of reference.
>>Code Value	(0008,0100)	1C	Set to “109101”
>>Coding Scheme Designator	(0008,0102)	1C	Set to “DCM”
>>Code Meaning	(0008,0104)	1	Set to “Acquisition Equipment”
>Manufacturer	(0008,0070)	1	Set to manufacturer of the acquisition equipment.
>Institution Name	(0008,0080)	3	Set to instituition where the acquisition equipment is located.
>Institution Address	(0008,0081)	3	Set to address of the institution where the acquisition equipment is located.
>Station Name	(0008,1010)	3	Set to station name identifying the acquisition equipment.
>Institutional Department Name	(0008,1040)	3	Set to department in the institution where the acquisition equipment is located.
>Operators' Name	(0008,1070)	3	Set to name(s) of the operator(s) of the acquisition equipment.
>Manufacturer's Model Name	(0008,1090)	3	Set to manufacturer's model name of the acquisition equipment.
>Device Serial Number	(0018,1000)	3	Set to manufacturer's serial number of the acquisition equipment.
>Software Versions	(0018,1020)	3	Set to manufacturer's designation of the software version of the acquisition equipment.

4. STORAGE COMMITMENT PUSH MODEL IMPLEMENTATION

4.1 STORAGE COMMITMENT PUSH MODEL INFORMATION OBJECT DEFINITION

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the attributes contained within the Storage Commitment Information Object.

The Storage Commitment Information Object is used both for N-ACTION Storage Commitment Requests by the SCU and N-EVENT-REPORT Storage Commitment Notifications by the SCP.

4.1.1 STORAGE COMMITMENT MODULE FOR N-ACTION

N-ACTION is sent by SCU when the documents are successfully sent to a remote host declared as Storage Commitment Provider on SenoIris. Storage Commitment can be requested for the newly created documents on SenoIris only.

The SCP role is not supported.

TABLE 4-1
STORAGE COMMITMENT MODULE FOR N-ACTION

Attribute Name	Tag	SCU Use	SCP Use
Transaction UID	(0008,1195)	Newly created per requested transaction	Not supported
Storage Media File-Set ID	(0088,0130)	Not used	Not supported
Storage Media File-Set UID	(0088,0140)	Not used	Not supported
Referenced SOP Sequence	(0008,1199)	Used to identify documents to commit	Not supported
>Referenced SOP Class UID	(0008,1150)	Used to identify documents to commit	Not supported
>Referenced SOP Instance UID	(0008,1155)	Used to identify documents to commit	Not supported
>Storage Media File-Set ID	(0088,0130)	Not used	Not supported
>Storage Media File-Set UID	(0088,0140)	Not used	Not supported

4.1.2 STORAGE COMMITMENT MODULE FOR N-EVENT-REPORT

When receiving N-EVENT-REPORT notification the system looks for the successfully committed documents and flags them in local database. Then the system looks for the documents for which commitment failed and records the failure status for them in local database; the failure reason is ignored.

The SCP role is not supported.

TABLE 4-2
STORAGE COMMITMENT MODULE FOR N-EVENT-REPORT

Attribute Name	Tag	SCU Use	SCP Use
Transaction UID	(0008,1195)	Supported but ignored	Not supported
Retrieve AE Title	(0008,0054)	Supported but ignored	Not supported
Storage Media File-Set ID	(0088,0130)	Not used	Not supported
Storage Media File-Set UID	(0088,0140)	Not used	Not supported

Referenced SOP Sequence	(0008,1199)	Used to identify successfully commited documents	Not supported
>Referenced SOP Class UID	(0008,1150)	Used to identify successfully commited documents	Not supported
>Referenced SOP Instance UID	(0008,1155)	Used to identify successfully commited documents	Not supported
>Retrieve AE Title	(0008,0054)	Supported but ignored	Not supported.
>Storage Media File-Set ID	(0088,0130)	Not used	Not supported
>Storage Media File-Set UID	(0088,0140)	Not used	Not supported
Failed SOP Sequence	(0008,1198)	Used when event type ID is 2 to identify the documents whose commitment has failed	Not supported
>Referenced SOP Class UID	(0008,1150)	Used when event type ID is 2 to identify the documents whose commitment has failed	Not supported
>Referenced SOP Instance UID	(0008,1155)	Used when event type ID is 2 to identify the documents whose commitment has failed	Not supported
>Failure Reason	(0008,1197)	See Section 4.1.2.1 for the list of processed values.	Not supported.

4.1.2.1 Processing of Failure Reason when received in a N-Event-Report

When receiving an N-Event-Report request with an Event Type ID equal to 2, meaning that Storage Commitment is complete, but failure exists, following is the set of value that this Storage Commitment SCU AE is able to process:

Failure Reason	Meaning	Application Behavior When Receiving Reason Code
0110H	Processing failure	Supported but ignored
0112H	No such object instance	Supported but ignored
0213H	Resource limitation	Supported but ignored
0122H	Referenced SOP Class not supported	Supported but ignored
0119H	Class / Instance conflict	Supported but ignored
0131H	Duplicate transaction UID	Supported but ignored
*	Other Failure Reason code values	Supported but ignored

4.1.2.2 Set of possible values that may be sent in Failure Reason in a N-Event-Report

When generating an N-Event-Report stating that failure exists in the completion of the Storage Commitment request, following is the list of Failure Reason (0008, 1197) code that this Storage Commitment SCP AE may generate:

Failure Reason	Meaning	Failure Reason Explanation
0110H	Processing failure	Not supported
0112H	No such object instance	Not supported
0213H	Resource limitation	Not supported

0122H	Referenced SOP Class not supported	Not supported
0119H	Class / Instance conflict	Not supported
0131H	Duplicate transaction UID	Not supported

5. REVISION HISTORY

Revision	Date	Author	Description
3	May 2014	Arun Kumar Raj Voruganti	Documented DICOM conformance of MWS V-Preview Extended Functionality.
4	April 2015	Arun Kumar Raj Voruganti	Updated for 4.7.0 ECO218410 release.
5	December 2015	Arun Kumar Raj Voruganti	Updated for SenoIris v.1
6	June 2016	Arun Kumar Raj Voruganti	Updated for SenoIris 1SP1
7	December 2016	Arun Kumar Raj Voruganti	Updated for SenoIris 1SP2 release with introduction of Enhanced V-Preview object.
8	January 2017	Arun Kumar Raj Voruganti	Changed Enhanced V-Preview Image Type to “DERIVED\PRIMARY\TOMOSYNTHESIS\GENERATED_2D\\ENHANCED”
9	June 2017	Arun Kumar Raj Voruganti	Added Contributing Equipment Sequence (0018, A001) to support MQSA requirement for review.
10	July 2017	Arun Kumar Raj Voruganti	Updated file properties: Title, Author, and Company.
11	November 2017	Arun Kumar Raj Voruganti	Updated software version from 1SP2 to 1SP2.1

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China Service Agent Address:
GE Medical Systems Trade & Development (Shanghai) Co., Ltd. (Area B, Warehouse No. 4,
#777 BingKe Road, Wai Gaoqiao Free Trade Zone, Shanghai, China, 200131)
Service Call Center: 800-810-8188
通用电气医疗系统贸易发展（上海）有限公司 (中国上海外高桥保税区冰克路777 号4 号仓库B 部位，邮编200131)
售后服务热线：800-810-8188

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Manufacturing site for physical DVD-kit:
GE MEDICAL SYSTEMS SCS
283 RUE DE LA MINIERE
78530 BUC FRANCE

Manufacturing site for electronic delivery:
IMAGE DIAGNOST INTERNATIONAL
OSKAR-SCHLEMMER-STRASSE 11
80807 MUNICH GERMANY

IMAGE DIAGNOST INTERNATIONAL
OSKAR-SCHLEMMER-STRASSE 11
80807 MUNICH GERMANY