DICOM
Conformance Statement

SenoIris 1SP4

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		
Computed Radiography Image Storage	Yes	Yes
Digital X-Ray Image Storage - For Presentation	Yes	Yes
Digital X-Ray Image Storage - For Processing	Yes	Yes
Digital Mammography X-Ray Image Storage - For Presentation	Yes	Yes
Digital Mammography X-Ray Image Storage - For Processing	Yes	Yes
CT Image Storage	Yes	Yes
Enhanced CT Image Storage	Yes	Yes
Ultrasound Multi-frame Image Storage	Yes	Yes
MR Image Storage	Yes	Yes
Ultrasound Image Storage	Yes	Yes
Secondary Capture Image Storage	Yes	Yes
Grayscale Softcopy Presentation State Storage	Yes	Yes
Breast Tomosynthesis Image Storage	Yes	Yes (*)
Basic Text SR	Yes	Yes
Enhanced SR	Yes	Yes
Comprehensive SR	Yes	Yes
Mammography CAD SR	Yes	Yes
X-Ray Radiation Dose SR	Yes	Yes
Encapsulated PDF 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		
Modality Performed Procedure Step SOP Class	Yes	No
Modality Worklist Information Model - FIND	Yes	No
Storage Commitment Push Model SOP Class	Yes	No
Print Management		
Basic Grayscale Print Management Meta SOP Class	Yes	No
Presentation LUT SOP Class	Yes	No

* License Option

Table 0.2 provides an overview of the Media Storage Application Profiles supported by SenoIris.

Table 0.2 – MEDIA SERVICES

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk - Recordable		
General Purpose CD-R	FSC	FSR

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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:
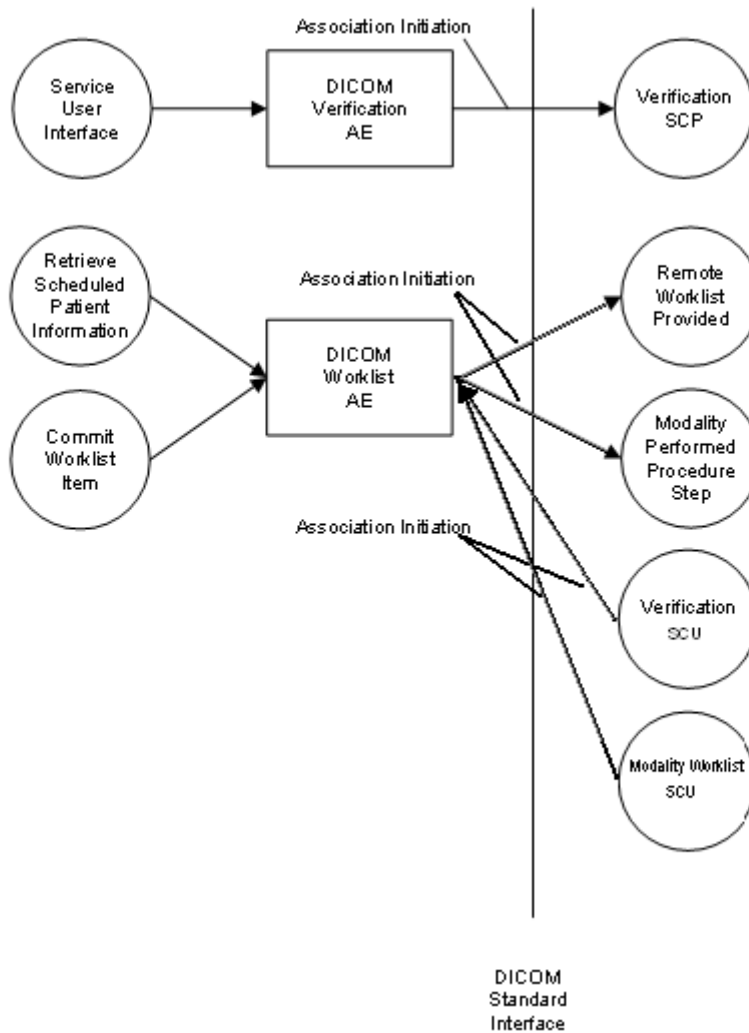
Figure 1.1-1 (Part1) – Application data flow diagram
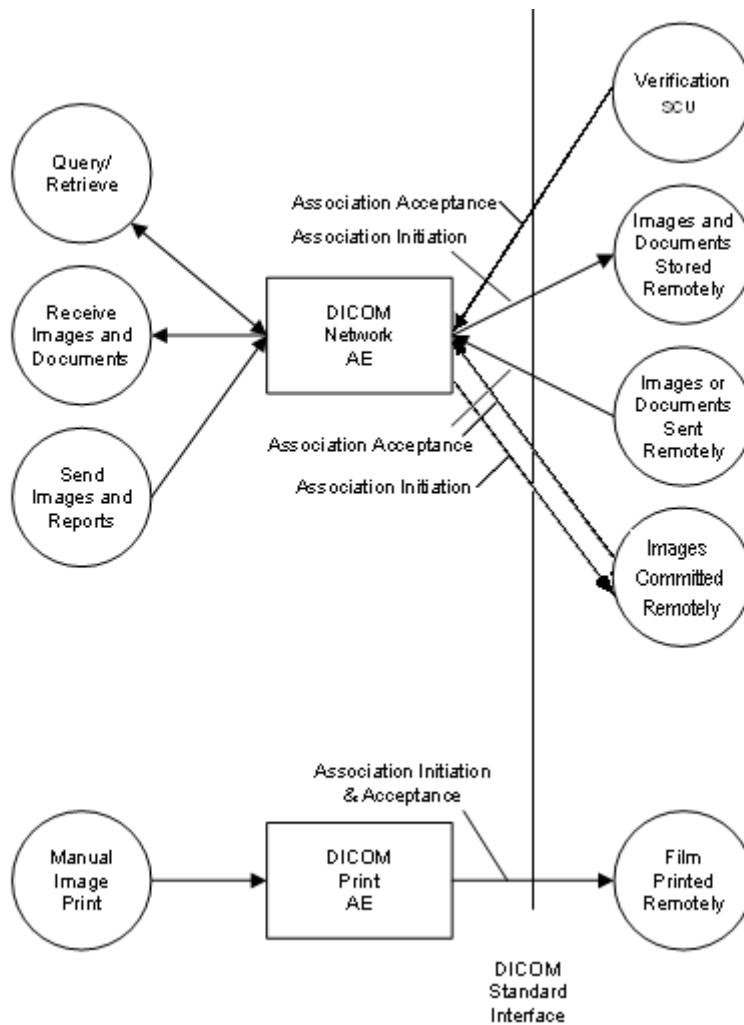
Figure 1.1-1 (Part2) – Application data flow diagram
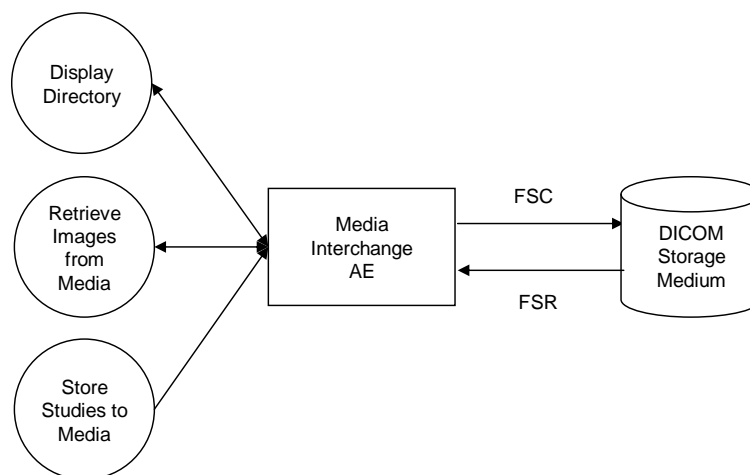
Figure 1.1-1 (Part3) – Application data flow diagram

The SenoIris 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 a 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:
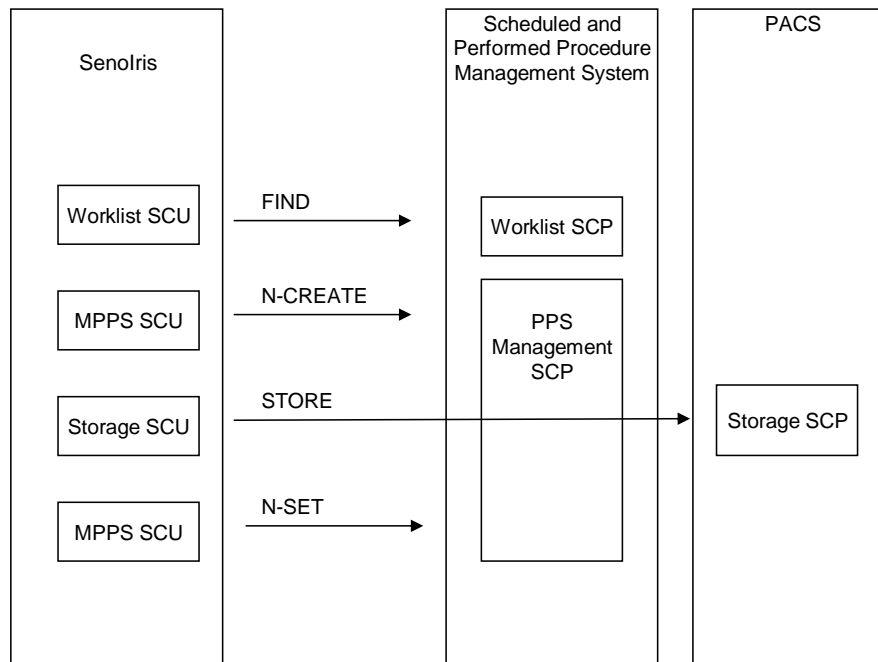
2.3.2   Manual Image Print

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:

SenoIris 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 a 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
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Ultrasound 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
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3
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
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67
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
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Ultrasound 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
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22
Comprehensive SR	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

X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1
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 – Warning 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,

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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		
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	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		
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		
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	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		
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Little Endian	Explicit VR Little Endian	SCU	None
		Implicit VR Little Endian	Implicit VR Little Endian		
		Explicit VR Big Endian	Explicit VR Big Endian		
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		
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	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.

Real-World Activity: "Commitment to storage of images"

3.3.2.1.6 Associated Real-World Activity for Commitment to storage of images

The Storage commitment is initiated for documents created or generated 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.

Storage Commitment brokering:

SenoIris as a storage commitment broker also forwards storage commitment requests received from any remote AE to another storage commitment provider, which is configured as DICOM partner in the SenoIris. The declaration of remote hosts supporting storage commitment is done through a specific menu (DICOM Partner menu).

Commitment to storage of images:

1. Operator configures remote AE as communication partner for auto push & storage commitment.
2. SenoIris generates images or receives images to route to a storage commitment provider.
3. Images sent to remote AE automatically by the system.

This operation causes:

- Network AE to initiate a DICOM association and negotiate abstract and transfer syntax, once the images are successfully sent to remote SCP.
- 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 closes the association.

3.3.2.1.7   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

3.3.2.1.7.1   SOP Specific Conformance for Storage Commitment SOP Class

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

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Success	0000	Success	The request for storage comment is considered successfully sent.	None
*	*		The Association is aborted using A-ABORT and the request for storage comment is marked as failed. The status meaning is logged and reported to the user.	None

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 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	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 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		
		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		
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.2.1	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		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	SCP	None
		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		
		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		
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	JPEG Baseline Lossy 12-Bit	1.2.840.10008.1.2.4.51	SCP	None
		JPEG Lossless Hierarch., First-order prediction	1.2.840.10008.1.2.4.70		
		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		
		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		

		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90	SCP(*)	None
		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		
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	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		

* Receiving and storing of Breast Tomosynthesis Image Storage objects is a license option.

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.

Real-World Activity: "Commitment to storage of images"

3.3.3.1.5   Associated Real-World Activity for Commitment to storage of images

Network AE as storage commitment service class SCU waits for new associations from storage commitment provider after sending images to remote storage AE.

Commitment to storage of images:

1. Operator configures remote AE as communication partner for auto push & storage commitment.
2. Images sent to remote AE, and on success, waits for new associations.

This operation causes:

- Network AE to wait for new association from remote storage AE to receive N-EVENT-REPORT-RQ notification.
- On reception of N-EVENT-REPORT-RQ notification from remote storage AE, 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.
- Network AE closes the association.

3.3.3.1.6   Accepted Presentation Context Table

Presentation Context Table – Accepted 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

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

3.3.3.1.6.1   SOP Specific Conformance for Storage Commitment SOP Class

Following are the status codes the application may send back to the storage commitment provider SCP equipment:

Service Status	Status Codes	Further Meaning	Application Behaviour When receiving Status Codes	Related Fields Processed if received
Failure	0211H	Unrecognized Operation	The Association is aborted, and the send job is marked as failed. The status meaning is logged and notified to the user.	None
Failure	0110H	Processing Failure	The Association is aborted, and the send job is marked as failed. The status meaning is logged and notified to the user.	None
Failure	0115H	Invalid Argument Value	The Association is aborted, and the send job is marked as failed. The status meaning is logged and notified to the user.	
Success	0000	Success	The storage commitment result has been successfully received. Corresponding images are flagged as committed in the system.	None

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-GEN-CD	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			
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1			
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			
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67			
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			

Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1			
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			
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67			
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 either an instance of Breast Tomosynthesis Image Object, or Digital Mammography X-Ray 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

SenoIris 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 (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 SenoIris	
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 SenoIris	

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 SenoIris	DCID (230) Yes-No
4	>	CONTAINS	CODE	EV (111404, DCM, "First mammogram ever")	1	U	Not used by SenoIris	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 SenoIris	
8	>	CONTAINS	CONTAINER	EV (IDI, I-420010) Additional Information	1	U		SenoIris Extension
9	>>	CONTAINS	CODE	EV (IDI, I-604400) Image Quality Assessment	1-2	U		SenoIris 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		SenoIris Extension
13	>>>	CONTAINS	CODE	EV (IDI, I-X990500) "First reading physician present"	1	U		SenoIris Extension
13	>>	CONTAINS	TEXT	(IDI, IMAGE_ITEM, "Image Item")	1-n	U		SenoIris 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 SenoIris	
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 SenoIris	UNITS = (%, UCUM "Percent")
6	>>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality") 1		M	Not used by SenoIris	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 SenoIris	
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 SenoIris	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 SenoIris	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	SenoIris 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 SenoIris	
12	>>	HAS PROPERTIES	INCLUDE	DTID (1402) Volume Measurement	1-n	U	Not used by SenoIris	
13	>>	HAS PROPERTIES	CODE	EV (111020, DCM, "Depth") 1		U	Not used by SenoIris	DCID (6024) Depth
14	>>	HAS PROPERTIES	CODE	EV (111035, DCM, "Lesion Density") 1		U	Not used by SenoIris	DCID (6008) Density Modifier
15	>>	HAS PROPERTIES	CODE	EV (M-020F9, SRT, "Shape") 1-n		U	Not used by SenoIris	DCID (6004) Mammography Characteristics of Shape
16	>>	HAS PROPERTIES	CODE	EV (111037, DCM, "Margins") 1-n		U	Not used by SenoIris	DCID (6006) Mammography Characteristics of Margin
17	>>	HAS PROPERTIES	CODE	EV (111009, DCM, "Calcification Type") 1-n		U	Not used by SenoIris	DCID (6010) Mammography Calcification Types
18	>>	HAS PROPERTIES	CODE	EV (111008, DCM, "Calcification Distribution") 1		U	Not used by SenoIris	DCID (6012) Calcification Distribution Modifier
19	>>	HAS PROPERTIES	NUM	EV (111038, DCM, "Number of calcifications") 1		U	Not used by SenoIris	UNITS = EV ({calcifications}, UCUM, "calcifications") Value = Integer 1 – n
20	>>	HAS PROPERTIES	CODE	EV (111407, DCM, "Implant finding") 1-n		U	Not used by SenoIris	DCID (6072) Breast Implant Findings
21	>>	HAS PROPERTIES	CODE	EV (G-C189, SRT, "Associated Finding") 1-n		U	Not used by SenoIris	DCID (6056) Associated Findings for Breast (includes CID 6015)

22	>>	HAS PROPERTIES	NUM	EV (111406, DCM, "Number of similar findings") 1		U	Not used by SenoIris	UNITS = EV ({findings}, UCUM, "findings") Value = Integer 2 – n
23	>>	HAS PROPERTIES	CODE	EV (F-01720, SRT, "Change since last mammogram") 1-n		U	Not used by SenoIris	DCID (6002) Change Since Last Mammogram or Prior Surgery
24	>>	INFERRED FROM	INCLUDE	DTID (350) References to Supporting Evidence	1	U	Not used by SenoIris	
25	>	CONTAINS	CODE	EV (IDI, I-420012) Finding Position in Report GUI	1-n	U		SenoIris Extension
26	>>	HAS PROPERTIES	TEXT	(IDI, MLO_POS_X, "MLO Position X")	1	U		SenoIris 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		SenoIris 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 SenoIris 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 SenoIris	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 SenoIris	DCID (6051) Breast Procedure Reason

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
								SenoIris 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 SenoIris	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 SenoIris	DCID (6055) Breast Clinical Finding or Indicated Problem
7	>>>	HAS PROPERTIES	CODE	EV (G-C171, SRT, "Laterality") 1		U	Not used by SenoIris	DCID (6022) Side
8	>	HAS PROPERTIES	DATE	EV (111060, DCM, "Study Date") 1		U	Not used by SenoIris	

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 SenoIris	DCID (6022) Side
4	>	HAS PROPERTIES	NUM	EV (111055, DCM, "Recommended Follow-up Interval") 1		U	Not used by SenoIris	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 SenoIris	
6	>	HAS PROPERTIES	INCLUDE	DTID (4207) Breast Imaging Pathology Results	1-n	U	Not used by SenoIris	

TID 1400 LINEAR MEASUREMENT

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

10 Annex: Print Management SOP Class Definition

10.1 Introduction

This section of the DICOM Conformance Statement specifies the supported Basic Grayscale Print Management Meta SOP Class, 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 Behavior 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 to 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 lossy color transform for lossy compression
- YBR_RCT for lossless color transform for lossless compression

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

12 Revision history

File-Revision	MyWorkshop	Date	Author	Reason for Change
1	DOC1183445 Rev1	July-2012	Robert Kühberger	Update document based on 4.6.1 Enhanced MG Enhanced CT Fixed typos.
2	DOC1183445 Rev2	Nov. 2012	Anamaria Voroneanu	4.7.0 design change release.
3	DOC1183445 Rev3	May 2014	Arun Kumar Raj Voruganti	Added reference to additional supplement which documents V-Preview Extended Functionality DICOM conformance.
4	DOC1183445 Rev4	April 2015	Arun Kumar Raj Voruganti	Updated "V-Preview Extended Functionality DICOM conformance" for 4.7.0 ECO218410 release.
5	DOC1577748 Rev1	December 2015	Arun Kumar Raj Voruganti	Updated for SenoIris v.1
6	DOC1577748 Rev2	June 2016	Arun Kumar Raj Voruganti	Updated "V-Preview Extended Functionality DICOM conformance" for SenoIris 1SP1 release.
7	DOC1577748 Rev3	December 2016	Arun Kumar Raj Voruganti	Updated "V-Preview Extended Functionality DICOM conformance" for 1SP2 release.
8	DOC1577748 Rev4	January 2017	Arun Kumar Raj Voruganti	Updated "V-Preview Extended Functionality DICOM conformance" for Enhanced V-Preview.
9	DOC1577748 Rev5	June 2017	Arun Kumar Raj Voruganti	Updated "V-Preview Extended Functionality DICOM conformance" to support MQSA review requirement.
10	DOC1577748 Rev6	July 2017	Arun Kumar Raj Voruganti	Updated file properties: Title, Author, and Company.
11	DOC1577748 Rev7	November 2017	Arun Kumar Raj Voruganti	Updated software version from 1SP2 to 1SP2.1
12	DOC1577748 Rev8	May/2018	Michael Hermes	Updated software version to SenoIris 1 SP3
13	DOC1577748 Rev9	September/ 2018	Arun Kumar Raj Voruganti	Updated V-Preview Extended Functionality DICOM conformance document. Added Digital Mammography X-Ray Image IOD to document V-Preview MG image.
14	DOC1577748 Rev10	February 2019	Arun Kumar Raj Voruganti	Updated manufacturer and electronic delivery address.
15	DOC1577748 Rev11	March 2019	Arun Kumar Raj Voruganti	Added conformance statement overview. Made changes identified by Herve Hoehn during document review.
16	DOC1577748 Rev12	9/Jan/2020	Michael Hermes	Updated for SenoIris 1 SP4 - Updated Software Version to SP4 - added Dose SR - Aligned last page with current Operator Manual

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