AGFA NV
DICOM Conformance Statement

Workstation NX 3.0.23.00 / 4.0.23.00

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Conformance Statement Overview

NX 3.0.23.00 / 4.0.23.00, further referred to as 'NX x.0.23.00' throughout the rest of this document, implements the necessary DICOM services to facilitate receiving of unprocessed images from an AGFA CR/DR Modality, performing image processing and sending the processed images to a remote storage or print device over a Medical Imaging Systems network. NX x.0.23.00 may also acquire patient information from a Radiology Information System (RIS) for use in identifying processed images.

The table below provides an overview of the network services supported by NX x.0.23.00.

Table 1.1-1: Network Services Supported

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Computed Radiography Image Storage	Yes	No
Digital X-Ray Image Storage – For Presentation	Option	No
Digital X-Ray Image Storage – For Processing	Option	No
Grayscale Softcopy Presentation State Storage SOP Class	Yes	No
Digital Mammography Image Storage – For Presentation	Option	No
Digital Mammography Image Storage – For Processing	Option	No
X-Ray Radiofluoroscopic Image Storage	Option	No
X-Ray Radiation Dose SR Storage	Yes	No
Workflow Management		
Storage Commitment Push Model SOP Class	Yes	No
Modality Performed Procedure Step SOP Class	Option	No
Modality Worklist Information Model – FIND	Option	No
Print Management		
Basic Grayscale Print Management Meta SOP Class	Yes	No
Basic Film Session SOP Class	Yes	No
Basic Film Box SOP Class	Yes	No
Basic Grayscale Image Box SOP Class	Yes	No
Printer SOP Class	Yes	No
Print Job SOP Class	Yes	No
Presentation LUT SOP Class	Yes	No
Query/Retrieve		
Study Root Query/Retrieve Information Model – FIND	No	Yes
Study Root Query/Retrieve Information Model – MOVE	No	Yes

NX x.0.23.00 supports Media Services.

Table 1.1-2: Media Services Supported

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk - Recordable		
General Purpose CD-R/DVD	Yes	No

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1 INTRODUCTION

1.1 Revision Record

For detailed version history and version numbers, see Livelink.

DICOM Conformance Statement NX x.0.23.00		
Version	**Date**	**Reason for Change**
2-3-4-5-6	February 19 to April 1, 2021	Initial Version and corrections made in review cycle

1.2 Purpose and Intended Audience of this Document

This document is a DICOM Conformance Statement for the DICOM Services of the *NX x.0.23.00* product. It is written according to part PS 3.2 of Digital Imaging and Communications in Medicine (DICOM) 3.0, NEMA PS 3.1-3.20, 2017a.

The user of this document is involved with system integration and/or software design. We assume that the reader is familiar with the terminology and concepts that are used in the DICOM 3.0 standard and the IHE Technical Framework.

Readers not familiar with DICOM 3.0 terminology should first read the appropriate parts of the DICOM standard itself, prior to reading this conformance statement.

Although the use of this conformance statement in conjunction with the DICOM 3.0 standard is intended to facilitate communication with Agfa ADC imaging equipment, it is not sufficient to guarantee, by itself, the inter-operation of the connection.

1.3 General Remarks

1.3.1 Integration and Validation Activities

The integration of any device into a system of interconnected devices goes beyond the scope of the DICOM 3.0 standard and this conformance statement when interoperability is desired. The responsibility for analyzing the applications requirements and developing a solution that integrates the Agfa equipment with other vendors' systems is the user's responsibility and should not be underestimated.

In some circumstances it might be necessary to perform a validation to make sure that functional interoperability between the Agfa equipment and non-Agfa devices works as expected. The user should ensure that any non-Agfa provider accepts responsibility for any validation required for their connection with the Agfa equipment.

1.3.2 Future Evolution

As the DICOM 3.0 standard evolves to meet the user's growing requirements and to incorporate new features and technologies, Agfa will follow the evolution of the standard. This evolution of the standard may require changes to devices that have implemented DICOM 3.0. The user should ensure that any non-Agfa provider, who connects with Agfa devices, also plans for future evolution of the DICOM standard. A refusal to do so may result in the loss of functionality and/or connectivity between the different products.

1.4 Acronyms and Abbreviations

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard. Abbreviations and terms are as follows:

AE	DICOM Application Entity
AET	Application Entity Title
ACSE	Association Control Service Element
CD-R	Compact Disk Recordable
DICOM	Digital Imaging and Communications in Medicine
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
GSDF	Grayscale Standard Display Function
GSPS	Grayscale Softcopy Presentation State
IE	Information Entity
IOD	(DICOM) Information Object Definition
ISO	International Standard Organization
LUT	Lookup Table
MPPS	Modality Performed Procedure Step
MSPS	Modality Scheduled Procedure Step
PDU	DICOM Protocol Data Unit
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair
SR	Structured Report
UID	Unique Identifier
VR	Value Representation

1.5 Related Documents

- ACR-NEMA Digital Imaging and Communications in Medicine (DICOM) V3.0
- IHE Radiology Technical Framework

2 NETWORKING

2.1 Implementation Model

2.1.1 Application Data Flow Diagram

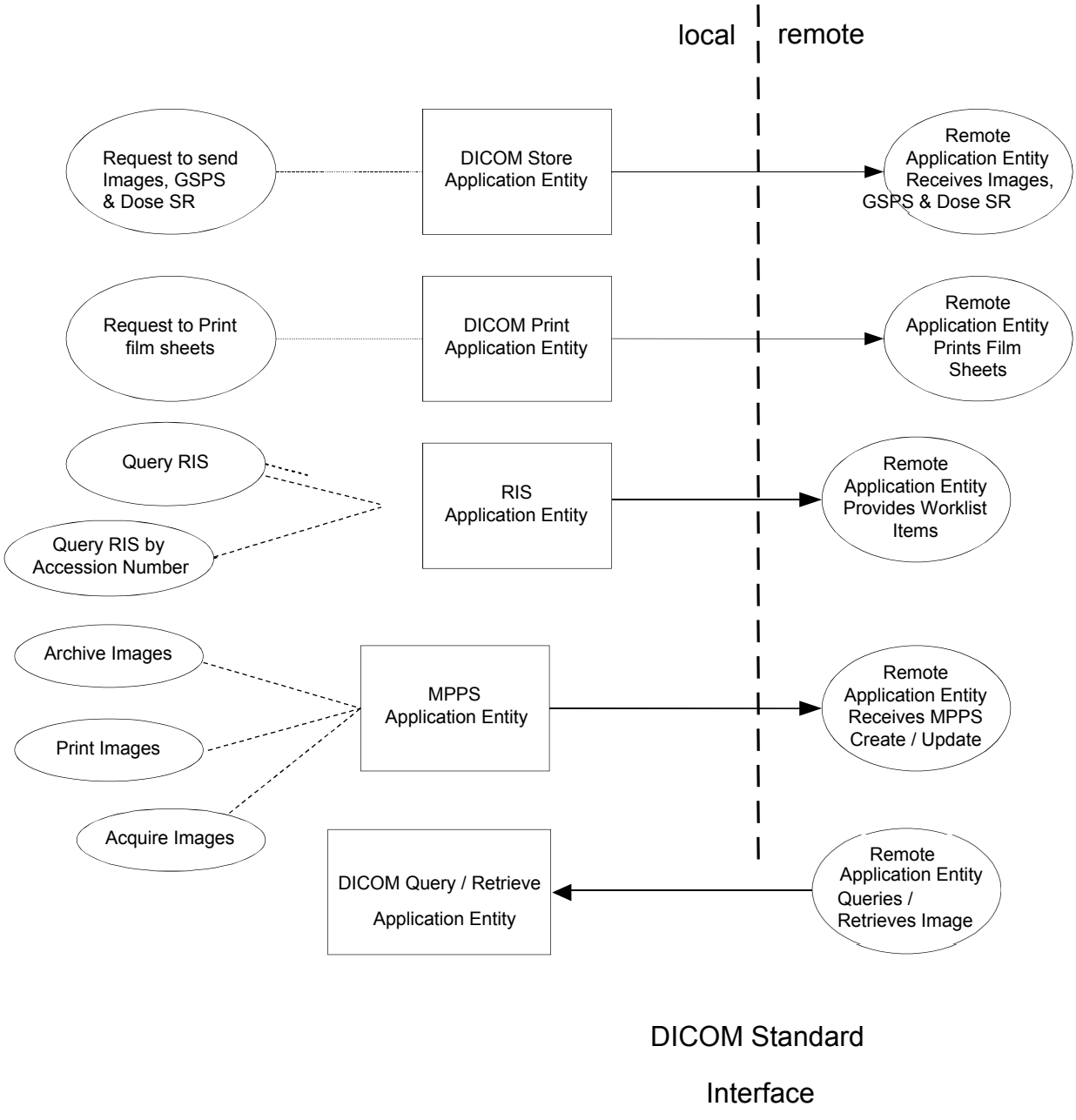


Figure 2.1-1: Functional Overview – Application Data Flow

2.1.2 Functional Definitions of AE's

2.1.2.1 Functional Definition of DICOM Store Application Entity

The DICOM Store Application Entity sends images and Presentation States to a remote AE (this can be a configured Archiving station, a diagnostic workstation …). It is associated with the local real-world activity "Send Images, GSPS & Dose SR". If Storage Commitment is configured for the archive destination, the DICOM Store AE will request Storage Commitment and a job will only be marked as successful when the commitment is successfully obtained. An image that has been successfully sent to an archive cannot be sent to that archive again.

2.1.2.2 Functional Definition of DICOM Print Application Entity

The DICOM Print Application Entity prints images on a remote AE (a configured Printer). It is associated with the local real-world activity "Request to print film sheets". A job will only be marked as "successful" when the sheet is successfully printed.

2.1.2.3 Functional Definition of RIS Application Entity

The RIS Application Entity receives Worklist information from a remote AE. It is associated with the local real-world activity "Query RIS". This can be triggered manually by clicking the "Query RIS" button or triggered automatically at a specified interval. When properly configured, the RIS can also be queried by Accession Number.

The RIS query can be configured in different ways (for the possible configurations, see § 2.4.1.2.2.1). The two that are relevant for DICOM are described in the following paragraphs:

2.1.2.3.1 DICOM Modality Worklist

The use of DICOM Modality Worklist (DMWL) queries the RIS by means of query keys. The query keys can be changed by the user in the configuration tool (see § 2.4.1.2.2.1). Based on these keys, the worklist will be populated during the next RIS query.

2.1.2.3.2 DICOM Modality Worklist query on Accession Number

By querying by Accession Number, only the worklist items that contain the specified Accession Number are returned. These results are parsed, mapped and shown as a Worklist.

2.1.2.4 Functional Definition of MPPS Application Entity

The MPPS Application Entity sends MPPS information to a remote AE when MPPS reporting is configured. The local real-world activities "Acquire Images", "Archive Images" and "Print Images" can trigger the creation of an MPPS instance. This can also be done by adding a new SOP Instance UID to an MPPS, by adding a Dose to an MPPS or by adding a Print Sheet to an MPPS. The local real-world activity "Close Session" or the modification of the session's Accession Number will complete the MPPS. This happens completely automatically and no user intervention is possible.

2.1.2.5 Functional Definition of DICOM Query / Retrieve Application Entity

2.1.2.5.1 Query from Other Devices

A remote AE initiates an association with the DICOM Query / Retrieve AE and sends a request. The DICOM Query / Retrieve AE searches the database for possible matches. The results of the query are returned to the remote AE using the same association.

2.1.2.5.2 Retrieve to Other Devices

A remote AE initiates an association with the DICOM Query / Retrieve AE and requests some composite SOP instances to be retrieved. The DICOM Query / Retrieve AE will search the database for possible matches with composite SOP instances. The resulting composite SOP instances are transferred to either the same AE that requested the retrieval or to another AE over a new association.

2.1.3 Sequencing of Real World Activities

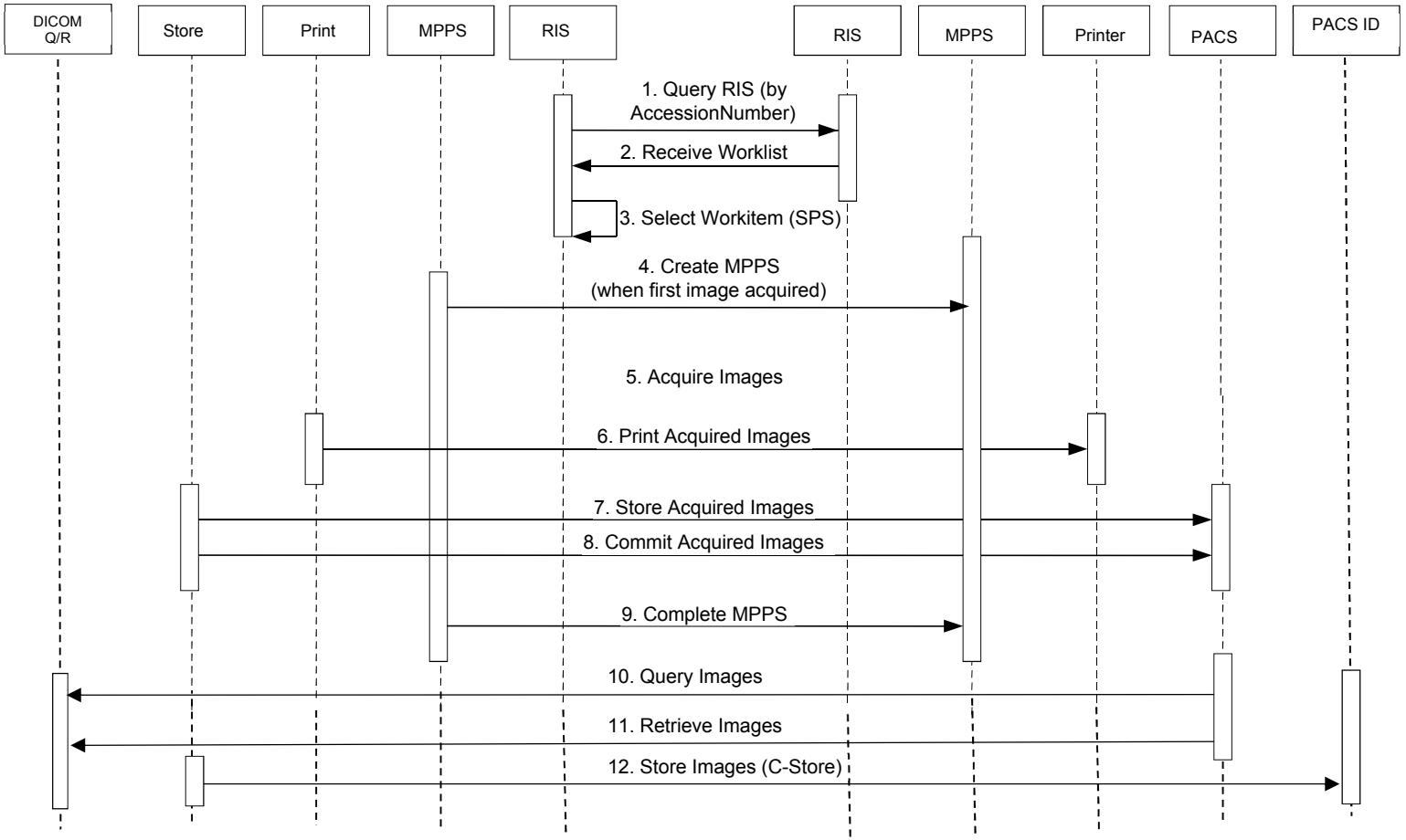


Figure 2.1-2: sequencing constraints

Under normal scheduled workflow conditions, the sequencing constraints illustrated in Figure 2.1-2 apply:

1. Query RIS
2. Receive Worklist
3. Select Work item
4. Create MPPS
5. Acquire Images
6. Print Acquired Images
7. Store Acquired Images (+ GSPS and Dose SR)
8. Commit Acquired Images
9. Finalize MPPS
10. Remote Application Entity Queries images
11. Remote Application Entity Retrieves images
12. Store images to Remote Image Display

2.2 AE Specifications

2.2.1 DICOM Store Application Entity Specification

2.2.1.1 SOP Classes Supported

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

Table 2.2-1: SOP Class(es) for the DICOM Store Application Entity

SOP Class Name	SOP Class UID	SCU	SCP
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
Digital X-ray Image Storage – for presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	No
Digital X-ray Image Storage – for processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	No
Digital Mammography Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	No
Digital Mammography Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	No
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes	No
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Yes	No
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes

2.2.1.2 Association Establishment Policies

2.2.1.2.1 General

The DICOM standard Application context is always proposed:

Table 2.2-2: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

2.2.1.2.2 Number of Associations

NX x.0.23.00 initiates one association at a time for each destination to which a transfer request is being processed in the active job queue list. Only one job per destination will be active at a time, the other remains pending until the active job for that destination is completed or failed. There can however be several simultaneous associations to different destinations.

Table 2.2-3: Number of Associations as an Association Initiator for DICOM Store AE

Maximum number of simultaneous associations initiated	***1 per destination (32 max)***

Table 2.2-4: Number of Associations as an Association Acceptor for DICOM Store AE

Maximum number of simultaneous associations accepted	***1 for storage commit response***

2.2.1.2.3 Asynchronous Nature

Table 2.2-5: Asynchronous Nature as an Association Initiator for DICOM Store AE

Maximum number of outstanding asynchronous transactions	1

The DICOM Store AE allows a single outstanding operation on any association. Therefore, it does not support asynchronous operations window negotiation, other than the default as specified by the DICOM specification.

2.2.1.2.4 Implementation Identifying Information

Table 2.2-6: DICOM implementation Class and Version for DICOM Store AE

Implementation Class UID	***1.3.51.0.1.3***
Implementation Version Name	***AGFA DTF1.0.XX*** [1]

2.2.1.3 Association Initiation Policies

2.2.1.3.1 Activity – Send Images

2.2.1.3.1.1 Description and Sequencing of Activity

A user can select an image and request it to be sent to a destination. The request is forwarded to the job queue and then processed. An image can also be sent automatically when closing an exam.

Note:

An image can only be sent to an archiving destination if it hasn't been archived there yet.

The DICOM Store AE is then invoked by the queue that is responsible for processing network archival tasks for a specific destination. The DICOM Store AE will attempt to initiate a new Association in order to issue a C-STORE request. If the job contains multiple images, then multiple C-STORE requests will be issued over the same Association. The association will be closed when the last image (or GSPS) is sent.

If the association cannot be opened, the job is set to a retry state. If after a configurable number of retries the job still fails, it is set to an error state ("Failed"). It can then be restarted by the user through the job control interface. If three successive jobs to a same destination fail, the queue for that destination will be stalled. It will retry to process the job three (3) more times. If this fails, the queue for that destination will be stalled for a longer time, meaning that it will only retry jobs to that destination every five (5) minutes.

When the association was rejected by the device due to a configuration issue, the queue for that device will be stalled when three (3) successive jobs experience a device failure.

If the Remote AE is configured to support Storage Commit, the DICOM Store AE will send a Storage Commit request (N-ACTION) over a new association and will then wait for an N-

[1] XX is the build version number.

EVENT-REPORT. If the N-EVENT-REPORT does not arrive within the waiting period, the AE closes the association and assumes that a separate association will be set up for the N-EVENT-REPORT. If this report does not arrive within a (configurable) amount of time, the job will be marked as FAILED.

NX x.0.23.00 does not foresee additional logic when the system is shut down, regarding storage commitment time outs. In other words: when a storage commit reply does not reach NX x.0.23.00 successfully, because NX x.0.23.00 was/is down at that point in time, the job will time out and go to FAILED.

A possible sequence of iterations between the DICOM Store AE and an Image Manager is illustrated in Figure 2.2-1.

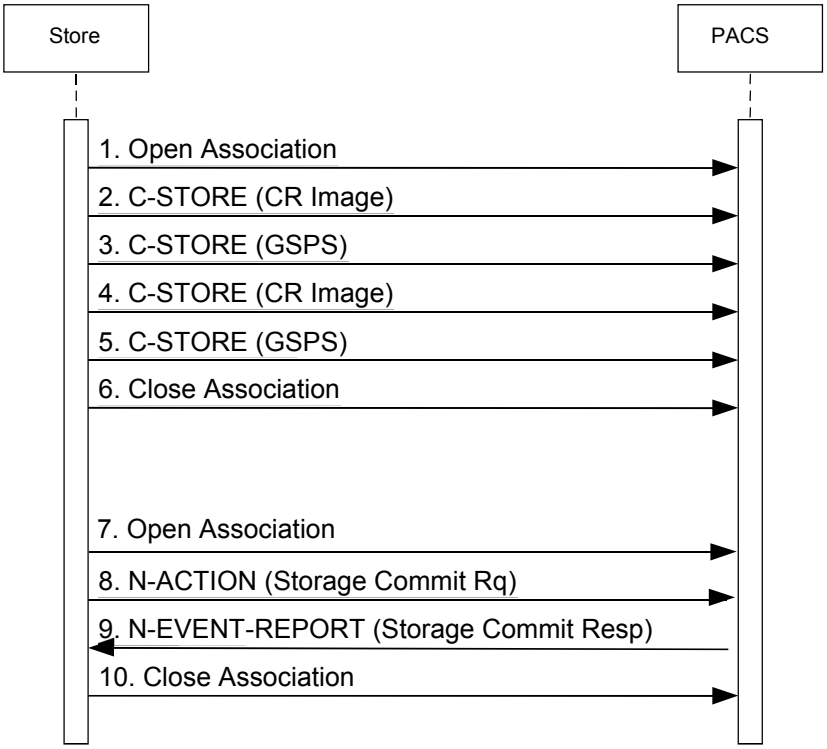


Figure 2.2-1: Example of a Storage AE Sequencing Diagram (with Storage Commit)

The DICOM Store AE may reject the association attempts as shown in the table below:

Table 2.2-7: Association Reject Reasons

Result	Response	Reason/Diag
The DICOM library refuses the association		SCU Device not known
The DICOM library refuses the association		Maximum number of association processing threads exceeded
The DICOM library refuses the association	A799	DICOM Library is not allowed to accept C-STORE commands from this device and therefore refuses the association.
The DICOM library refuses the association	A0102	SOP Class is not found back in the configuration.
The DICOM library refuses the association	A702	The DICOM library is unable to create the DICOM media file due to the fact that the disk is full.
The DICOM library refuses the association	A703	The DICOM library is unable to create the DICOM media file due to resource problems other than 'disk is full'.
The DICOM library refuses the association	A703	The DICOM library is unable to acquire the complete C-STORE request due to network problems.
The DICOM library refuses the association	A701	The DICOM library is unable to acquire the complete C-STORE request due to network problems (time-out while reading data from socket) [2].

[2] The time-out value is hard-coded in the DICOM library as being 60 seconds.

2.2.1.3.1.2 Proposed Presentation Contexts

The DICOM Store AE is capable of proposing the Presentation Contexts shown in the following table:

Table 2.2-8: Presentation Contexts Proposed by DICOM Store AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	JPEG LLNH1 Encoded (i.e. lossless) JPEG LLNHF Encoded (i.e. lossless) JPEG Lossy 8 bit JPEG Lossy 12 bit Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2.4.57 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4. 50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Digital X-ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	JPEG LLNH1 Encoded (i.e. lossless) JPEG LLNHF Encoded (i.e. lossless) JPEG Lossy 8 bit JPEG Lossy 12 bit Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2.4.57 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Digital X-ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	JPEG LLNH1 Encoded (i.e. lossless) JPEG LLNHF Encoded (i.e. lossless) JPEG Lossy 8 bit JPEG Lossy 12 bit Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2.4.57 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Digital Mammography Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	JPEG LLNH1 Encoded (i.e. lossless) JPEG LLNHF Encoded (i.e. lossless) JPEG Lossy 8 bit JPEG Lossy 12 bit Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2.4.57 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Digital Mammography Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	JPEG LLNH1 Encoded (i.e. lossless) JPEG LLNHF Encoded (i.e. lossless) JPEG Lossy 8 bit JPEG Lossy 12 bit Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2.4.57 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4. 50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	JPEG LLNH1 Encoded (i.e. lossless) JPEG LLNHF Encoded (i.e. lossless) JPEG Lossy 8 bit JPEG Lossy 12 bit Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2.4.57 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4. 50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Depending on the configuration of NX x.0.23.00, either the CR Image Storage, the Digital X-ray Image Storage – For Processing or For Presentation, the Digital Mammography Image Storage – For Processing or For Presentation or the X-Ray Radiofluoroscopic Image Storage will be proposed.

The Grayscale Softcopy Presentation State Storage SOP Class and the Storage Commitment Push Model SOP Class will only be proposed if configured.

2.2.1.3.1.3 SOP Specific Conformance

2.2.1.3.1.3.1 Image & Presentation State Storage

2.2.1.3.1.3.1.1 Computed Radiography Image Storage SOP Class (1.2.840.10008.5.1.4.1.1.1)

The Computed Radiography Image Storage SOP class is a Storage Standard SOP Class that uses the CR IOD (§ 6.1.1.2.1).

2.2.1.3.1.3.1.2 Digital X-ray Image Storage – for presentation SOP Class (1.2.840.10008.5.1.4.1.1.1.1)

The Digital X-Ray Image Storage - For Presentation SOP Class uses the DX IOD (§6.1.1.3.1) with an Enumerated Value of FOR PRESENTATION for Presentation Intent Type (0008, 0068).

2.2.1.3.1.3.3 Digital X-ray Image Storage – for processing SOP Class (1.2.840.10008.5.1.4.1.1.1.1)

The Digital X-Ray Image Storage - For Processing SOP Class uses the DX IOD (§6.1.1.3.1) with an Enumerated Value of FOR PROCESSING for Presentation Intent Type (0008, 0068).

As a SCU of the Digital X-Ray Image Storage - For Processing SOP Class, it also supports the Digital X-Ray Image Storage - For Presentation SOP Class.

2.2.1.3.1.3.4 Digital Mammography Image Storage – for presentation SOP Class (1.2.840.10008.5.1.4.1.1.1.2)

The Digital Mammography Image Storage - For Presentation SOP Class uses the MG IOD (§6.1.1.4.1) with an Enumerated Value of FOR PRESENTATION for Presentation Intent Type (0008, 0068).

2.2.1.3.1.3.5 Digital Mammography Image Storage – for processing SOP Class (1.2.840.10008.5.1.4.1.1.1.2.1)

The Digital Mammography Image Storage - For Processing SOP Class uses the MG IOD (§6.1.1.4.1) with an Enumerated Value of FOR PROCESSING for Presentation Intent Type (0008, 0068).

2.2.1.3.1.3.6 X-Ray Radiofluoroscopic Image Storage SOP Class

The X-Ray Radiofluoroscopic Image Storage SOP Class uses the X-Ray RF Image IOD (§6.1.1.5.1).

2.2.1.3.1.3.7 X-Ray Radiation Dose SR SOP Class

The X-Ray Radiation Dose SR SOP Class uses the X-Ray Radiation Dose SR IOD (§6.1.1.7.1).

2.2.1.3.1.3.8 Grayscale Softcopy Presentation State Storage SOP Class (1.2.840.10008.5.1.4.1.1.11.1)

The Grayscale Softcopy Presentation State Storage SOP Class extends the functionality of the Storage Service class to add the ability to convey an intended presentation state or record an existing presentation state.

It includes capabilities for specifying:

- the output grayscale space in P-Values
- grayscale contrast transformations including modality and VOI LUT
- selection of the area of the image to display
- image and display relative annotations, including graphics, text and overlays

Note:

A GSPS always refers to exactly one (1) image. Since re-sending an image is prohibited in NX x.0.23.00, an archived image can also have maximally one (1) GSPS that refers to it.

Depending on the configured SOP class to be used (CR (§ 2.2.1.3.1.3.1.1), DX for presentation (§2.2.1.3.1.3.1.2) or MG for presentation (§ 2.2.1.3.1.3.1.4) annotations and shutters are stored in the GSPS or burned in the image as described in the following table:

Table 2.2-9: Use of GSPS vs. Burning in the image

	CR **DX for presentation** **MG for presentation**	**DX for processing**
Image **(processing,W/L,collimation)**	Processed pixels + LUTs	RAW pixels
Annotations	GSPS or Burned in	Ignored
Shutters	GSPS or when GSPS is not used: In case of CR the shutter is burned into the Pixel data. In case of DX and MG the shutter is described in the shutter module of the image header.	
Zoom	GSPS or discarded	
Markers	Always burned in	

The following paragraphs describe into detail how each annotation is embedded in the GSPS:

2.2.1.3.1.3.1.8.1 Text

Graphic Layer Module

(0070,0060)	**Graphic Layer Sequence**	
(0070,0002)	>Graphic Layer	ID123
(0070,0068)	>Graphic Layer Description	Text

Graphic Annotation Module

(0070,0001)	**Graphic Annotation Sequence**	
(0070,0002)	> Graphic Layer	ID123
(0070,0008)	> Text Object Sequence	
(0070,0003)	>> Bounding box annotation units	PIXEL
(0070,0004)	>> Anchor Point Annotation Units	-
(0070,0006)	>> Unformatted Text Value	[value]
(0070,0010)	>> Bounding Box Top Left Hand Corner	[value]
(0070,0011)	>> Bounding Box Top Right Hand Corner	[value]
(0070,0012)	>> Bounding Box Text Horizontal Justification	LEFT
(0070,0014)	>> Anchor Point	-
(0070,0015)	>> Anchor Point Visibility	-

2.2.1.3.1.3.1.8.2 Arrow

A text is foreseen for each arrow, but it may be an empty string. The arrow consists of two polylines.

Graphic Layer Module

(0070,0060)	**Graphic Layer Sequence**	

(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Arrow

Graphic Annotation Module

(0070,0001)	**Graphic Annotation Sequence**	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0008)	> Text Object Sequence	
(0070,0003)	>> Bounding box annotation units	PIXEL
(0070,0004)	>> Anchor Point Annotation Units	PIXEL
(0070,0006)	>> Unformatted Text Value	[value]
(0070,0010)	>> Bounding Box Top Left Hand Corner	[value]
(0070,0011)	>> Bounding Box Top Right Hand Corner	[value]
(0070,0012)	>> Bounding Box Text Horizontal Justification	LEFT
(0070,0014)	>> Anchor Point	[value of arrow point]
(0070,0015)	>> Anchor Point Visibility	N
(0070,0009)	> Graphic Object Sequence	
Arrow line		
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	2
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	POLYLINE
(0070,0024)	>> Graphic Filled	-
Arrow point		
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	3
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	POLYLINE
(0070,0024)	>> Graphic Filled	-

2.2.1.3.1.3.1.8.3 Rectangle

A rectangle is always provided with a corresponding text (for measurements). If the text is moved by the operator, an extra text object is added to the GSPS.

Graphic Layer Module

(0070,0060)	**Graphic Layer Sequence**	
(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Rectangle or Rectangle_SAL

Graphic Annotation Module

(0070,0001)	**Graphic Annotation Sequence**	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0008)	> Text Object Sequence	
(0070,0003)	>> Bounding box annotation units	PIXEL
(0070,0004)	>> Anchor Point Annotation Units	-
(0070,0006)	>> Unformatted Text Value	[value]
(0070,0010)	>> Bounding Box Top Left Hand Corner	[value]
(0070,0011)	>> Bounding Box Top Right Hand Corner	[value]
(0070,0012)	>> Bounding Box Text Horizontal Justification	LEFT
(0070,0014)	>> Anchor Point	-
(0070,0015)	>> Anchor Point Visibility	-
(0070,0009)	> Graphic Object Sequence	
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	5
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	POLYLINE

(0070,0001)	**Graphic Annotation Sequence**	
(0070,0024)	>> Graphic Filled	N

2.2.1.3.1.3.1.8.4 Circle

A circle is always provided with a corresponding text (for measurements). If the text is moved by the operator, an extra text object is added to the GSPS.

Graphic Layer Module

(0070,0060)	**Graphic Layer Sequence**	
(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Circle

Graphic Annotation Module

(0070,0001)	**Graphic Annotation Sequence**	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0008)	> Text Object Sequence	
(0070,0003)	>> Bounding box annotation units	PIXEL
(0070,0004)	>> Anchor Point Annotation Units	-
(0070,0006)	>> Unformatted Text Value	[value]
(0070,0010)	>> Bounding Box Top Left Hand Corner	[value]
(0070,0011)	>> Bounding Box Top Right Hand Corner	[value]
(0070,0012)	>> Bounding Box Text Horizontal Justification	LEFT
(0070,0014)	>> Anchor Point	-
(0070,0015)	>> Anchor Point Visibility	-
(0070,0009)	> Graphic Object Sequence	
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	2
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	CIRCLE
(0070,0024)	>> Graphic Filled	N

2.2.1.3.1.3.1.8.5 Polygon

A polygon is always provided with a corresponding text (for measurements). If the text is moved by the operator, an extra text object is added to the GSPS.

Graphic Layer Module

(0070,0060)	**Graphic Layer Sequence**	
(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Polygon

Graphic Annotation Module

(0070,0001)	**Graphic Annotation Sequence**	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0008)	> Text Object Sequence	
(0070,0003)	>> Bounding box annotation units	PIXEL
(0070,0004)	>> Anchor Point Annotation Units	-
(0070,0006)	>> Unformatted Text Value	[value]
(0070,0010)	>> Bounding Box Top Left Hand Corner	[value]
(0070,0011)	>> Bounding Box Top Right Hand Corner	[value]
(0070,0012)	>> Bounding Box Text Horizontal Justification	LEFT
(0070,0014)	>> Anchor Point	-
(0070,0015)	>> Anchor Point Visibility	-
(0070,0009)	> Graphic Object Sequence	

(0070,0001)	Graphic Annotation Sequence	
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	[value]
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	POLYLINE
(0070,0024)	>> Graphic Filled	N

2.2.1.3.1.3.1.8.6 Freehand

Graphic Layer Module

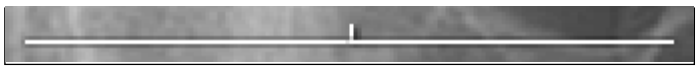
(0070,0060)	Graphic Layer Sequence	
(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Freehand

Graphic Annotation Module

(0070,0001)	Graphic Annotation Sequence	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0008)	> Text Object Sequence	
(0070,0003)	>> Bounding box annotation units	PIXEL
(0070,0004)	>> Anchor Point Annotation Units	-
(0070,0006)	>> Unformatted Text Value	[value]
(0070,0010)	>> Bounding Box Top Left Hand Corner	[value]
(0070,0011)	>> Bounding Box Top Right Hand Corner	[value]
(0070,0012)	>> Bounding Box Text Horizontal Justification	LEFT
(0070,0014)	>> Anchor Point	-
(0070,0015)	>> Anchor Point Visibility	-
(0070,0009)	> Graphic Object Sequence	
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	[value]
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	INTERPOLATED
(0070,0024)	>> Graphic Filled	N

2.2.1.3.1.3.1.8.7 Line

A line consists of two parts: the actual line, and a small line indicating the middle point of the line:



Graphic Layer Module

(0070,0060)	Graphic Layer Sequence	
(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Line

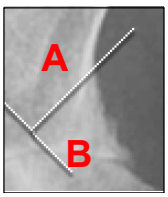
Graphic Annotation Module

(0070,0001)	Graphic Annotation Sequence	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0009)	> Graphic Object Sequence	
Item for the actual line		
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	2
(0070,0022)	>> Graphic Data	[values]

(0070,0001)	**Graphic Annotation Sequence**	
(0070,0023)	>> Graphic Type	POLYLINE
(0070,0024)	>> Graphic Filled	-
Item for the indication of the middle		
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	2
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	POLYLINE
(0070,0024)	>> Graphic Filled	-

2.2.1.3.1.3.1.8.8 Perpendicular

A perpendicular also consists of two lines A and B, as illustrated in the example below:



Graphic Layer Module

(0070,0060)	**Graphic Layer Sequence**	
(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Perpendicular

Graphic Annotation Module

(0070,0001)	**Graphic Annotation Sequence**	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0009)	> Graphic Object Sequence	
Item for the first line (A)		
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	2
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	POLYLINE
(0070,0024)	>> Graphic Filled	-
Item for the second line (B)		
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	2
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	POLYLINE
(0070,0024)	>> Graphic Filled	-

2.2.1.3.1.3.1.8.9 Calibration ruler

The calibration ruler is displayed at the side of the image and is the result of a calibration action of the operator.

It consists out of a ruler (constructed using several lines) and some text.

Graphic Layer Module

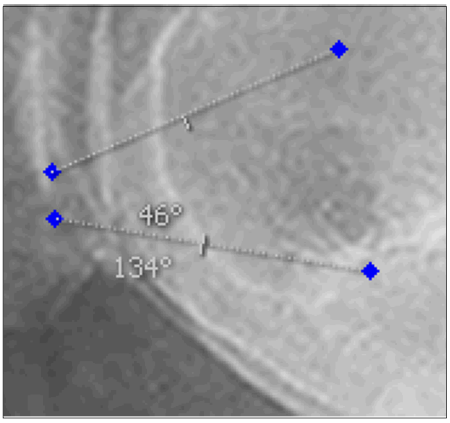
(0070,0060)	Graphic Layer Sequence	
(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Calibration Ruler

Graphic Annotation Module

(0070,0001)	Graphic Annotation Sequence	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0008)	> Text Object Sequence	
(0070,0003)	>> Bounding box annotation units	PIXEL
(0070,0004)	>> Anchor Point Annotation Units	-
(0070,0006)	>> Unformatted Text Value	[value]
(0070,0010)	>> Bounding Box Top Left Hand Corner	[value]
(0070,0011)	>> Bounding Box Top Right Hand Corner	[value]
(0070,0012)	>> Bounding Box Text Horizontal Justification	LEFT
(0070,0014)	>> Anchor Point	-
(0070,0015)	>> Anchor Point Visibility	-
(0070,0009)	> Graphic Object Sequence	
First ruler line		
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	2
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	CIRCLE
(0070,0024)	>> Graphic Filled	N
…		

2.2.1.3.1.3.1.8.10 Angle

An angle measurement is a combination of 2 lines and 2 short lines, with 2 angle texts.



Graphic Layer Module

(0070,0060)	Graphic Layer Sequence	
(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Angle

Graphic Annotation Module

(0070,0001)	Graphic Annotation Sequence	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0008)	> Text Object Sequence	-> 2 texts for the degrees
(0070,0009)	> Graphic Object Sequence	Long line 1
		Long line 2
		Small middle line 1
		Small middle line 2

2.2.1.3.1.3.1.8.11 Distance

A distance is composed of a line with a text value.

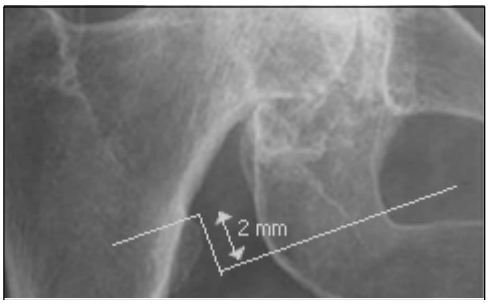
Graphic Layer Module

(0070,0060)	**Graphic Layer Sequence**	
(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Distance

Graphic Annotation Module

(0070,0001)	**Graphic Annotation Sequence**	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0008)	> Text Object Sequence	-> used for the distance text
(0070,0009)	> Graphic Object Sequence	
Item for the actual line		
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	2
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	POLYLINE
(0070,0024)	>> Graphic Filled	-
Items for the ruler (cfr. Calibration ruler)		
(0070,0005)	>> Graphic Annotation Units	PIXEL
(0070,0020)	>> Graphic Dimensions	2
(0070,0021)	>> Number of Graphic Points	2
(0070,0022)	>> Graphic Data	[values]
(0070,0023)	>> Graphic Type	POLYLINE
(0070,0024)	>> Graphic Filled	-

2.2.1.3.1.3.1.8.12 Leg Length Difference



Graphic Layer Module

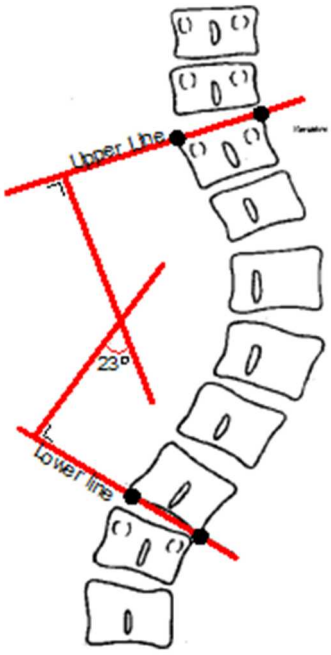
(0070,0060)	**Graphic Layer Sequence**	
(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Leg Length Difference

Graphic Annotation Module

(0070,0001)	**Graphic Annotation Sequence**	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0008)	> Text Object Sequence	Measurement text
(0070,0009)	> Graphic Object Sequence	First horizontal line
		Second horizontal line
		Vertical line
		Arrow point 1

		Arrow point 2
		Arrow line

2.2.1.3.1.3.1.8.13 Scoliosis



Graphic Layer Module

(0070,0060)	**Graphic Layer Sequence**	
(0070,0002)	>Graphic Layer	ID
(0070,0068)	>Graphic Layer Description	Scoliosis Measurement

Graphic Annotation Module

(0070,0001)	**Graphic Annotation Sequence**	
(0070,0002)	> Graphic Layer	[ID of the corresponding layer]
(0070,0008)	> Text Object Sequence	Measurement text
(0070,0009)	> Graphic Object Sequence	Upper line
		Upper line perpendicular
		Lower line
		Lower line perpendicular

2.2.1.3.1.3.1.8.14 Display Shutter

Display Shutter Module

(0018,1600)	Shutter Shape	RECTANGULAR
(0018,1602)	Shutter Left Vertical Edge	[value]
(0018,1604)	Shutter Right Vertical Edge	[value]
(0018,1606)	Shutter Upper Horizontal Edge	[value]
(0018,1608)	Shutter Lower Horizontal Edge	[value]

The manner in which the display area occluded by the shutter is neutralized (black-out, gray, or other means) is defined by the Attribute Shutter Presentation Value (0018,1622). This attribute present in the Presentation LUT module is mandatory when a display shutter is present in the GSPS. The value can go from 0000xH (black) to FFFFxH (white).

2.2.1.3.1.3.1.8.15 Flipping/ rotating/ zooming

Flipping and rotating is always done on pixel level. The relevant DICOM tags can be found in the following table:

Table 2.2-10: DICOM spatial transformation module attributes.

attribute	tag	Actions		
		Rotate 90° clockwise	**Rotate 90° counter clockwise**	**Flip horizontal**
Image Rotation	(0070,0042)	If image is not flipped : increased with 90 (modulo 360) Otherwise : decreased with 90 (modulo 360)	If image is not flipped: decreased with 90 (modulo 360) Otherwise : increased with 90 (modulo 360)	
Image horizontal flip	(0070,0041)			inverted (true ↔ false)

Zoom/Pan is integrated in the Displayed Area module of the GSPS.

2.2.1.3.1.3.2 Storage Commitment Push Model SOP Class (1.2.840.10008.1.20.1)

When the Storage Commitment Push Model has been configured, the DICOM Store AE will request storage commitment for instances of the Image Storage SOP Class and Grayscale Softcopy Presentation State Storage SOP Class with each successfully completed “sent” job. The DICOM Store AE transmits the SOP Instances to the Remote AE. The request for storage commitment is transmitted to the Remote AE together with a list of references to one or more SOP Instances. If the Provider accepts the Storage Commitment with Success Status, the generated Transaction UID, together with study identification data and a time-stamp, is kept. Success or failure of storage commitment is subsequently indicated by a notification from the Remote AE to **NX x.0.23.00**.

The DIMSE-N Services applicable to the Storage Commitment Push Model SOP Class are:

- N-EVENT_REPORT
- N-ACTION

The Storage Commitment Request operation allows a DICOM Store AE to request an SCP to commit to the safekeeping of a set of SOP Instances as described above. This operation is invoked through the N-ACTION primitive.

The N-ACTION is invoked by **NX x.0.23.00** and is sent by creating a new association.

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

Table 2.2-11: Storage Commitment N-ACTION Information

Action Type Name	Action Type ID	Attribute	Tag	Requirement Type SCU
Request Storage Commitment	1	Transaction UID	(0008,1195)	1
		Storage Media File-Set ID	(0088,0130)	3
		Storage Media File-Set UID	(0088,0140)	3

		Referenced SOP Sequence	(0008,1199)	1
		>Referenced SOP Class UID	(0008,1150)	1
		>Referenced SOP Instance UID	(0008,1155)	1
		>Storage Media File-Set ID	(0088,0130)	3
		>Storage Media File-Set UID	(0088,0140)	3

Table 2.2-12: Storage Commitment N-ACTION Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success		0000	successful Notification
Warning			
Error			

The behavior of the AE during communication failure is summarized in a table as follows:

Table 2.2-13: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	e.g. The Association is aborted using A-ABORT and command marked as failed. The reason is logged and reported to the user.
Association aborted	e.g. The command is marked as failed. The reason is logged and reported to the user.

The DICOM Store AE does not wait for an N-EVENT-REPORT. It closes the association as soon as it receives the N-ACTION-RP from the Remote AE. So, NX does not support N-EVENT-REPORT within the same association as the N-ACTION.

2.2.1.3.1.3.3 Verification SOP Class (1.2.840.10008.1.1)

The Storage AE provides standard conformance to the Verification SOP Class as an SCU. This verification is accomplished on an established Association using the C-ECHO DIMSE-C service.

These tests can be executed in the **Error! Unknown document property name.**.

The Configuration Tool opens an association when testing of a remote application is requested during a configuration session. This can be done when entering new data for remote application configuration or to verify existing configuration data using the C-ECHO DIMSE-C service.

2.2.1.4 Association Acceptance Policies

2.2.1.4.1 Receive Storage Commitment Response

2.2.1.4.1.1 Description and Sequencing of Activity

Each Storage Commitment Request that NX sends, is uniquely identified by the Transaction UID Attribute (0008,1195) value that is generated by NX. After sending a Storage Commitment Request, NX expects an N-EVENT-REPORT from the SCP. NX will then respond with an N-EVENT-REPORT response primitive with a status code.

The NX DICOM Store AE will accept associations in order to receive responses to a Storage Commitment Request.

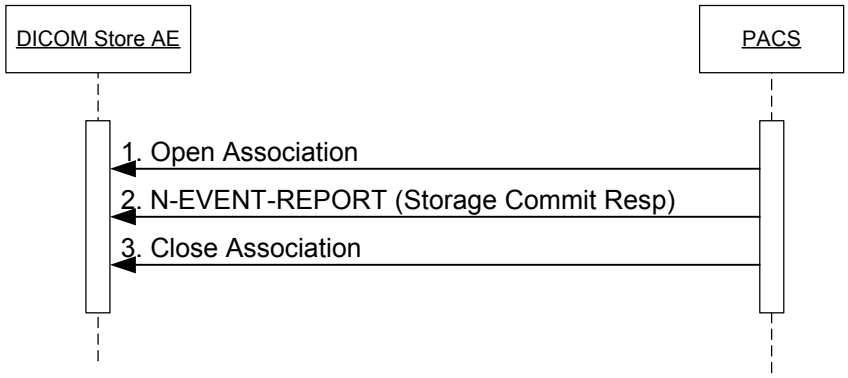


Figure 2.2-2: Sequencing of Receive Storage Commitment response

2.2.1.4.1.2 Accepted Presentation Contexts

Table 2.2-14: Acceptable Presentation Contexts for Receive Storage Commitment Response

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Verification	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

2.2.1.4.1.3 SOP Specific Conformance – Storage Commitment SOP Class (1.2.840.10008.1.20.1)

The AE will consider Storage Commitment FAILED if no N-EVENT-REPORT is received for a Transaction UID within a configurable time period.

Table 2.2-15: Storage Commitment N-EVENT-REPORT expected Information

Action Type Name	**Action Type ID**	**Attribute**	**Tag**	**Requirement Type SCU**
Storage Commitment Request Successful	1	Transaction UID	(0008,1195)	1
		Storage Media File-Set ID	(0088,0130)	3
		Storage Media File-Set UID	(0088,0140)	3
		Referenced SOP Sequence	(0008,1199)	1
		>Referenced SOP Class UID	(0008,1150)	1
		>Referenced SOP Instance UID	(0008,1155)	1

Action Type Name	Action Type ID	Attribute	Tag	Requirement Type SCU
		>Storage Media File-Set ID	(0088,0130)	3
		>Storage Media File-Set UID	(0088,0140)	3
Storage Commitment Request Complete-Failures Exist	2	Transaction UID	(0008,1195)	1
		Referenced SOP Sequence	(0008,1199)	1
		>Referenced SOP Class UID	(0008,1150)	1
		>Referenced SOP Instance UID	(0008,1155)	1
		Failed SOP sequence	(0008,1198)	1
		>Referenced SOP Class UID	(0008,1150)	1
		>Referenced SOP Instance UID	(0008,1155)	1
		>Failure Reason	(0008,1197)	1

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

Table 2.2-16: Storage Commitment N-EVENT-REPORT Behavior

Event Type Name	Event Type ID	Behavior
Storage Commitment Request Successful	1	The job will be marked as SUCCESSFUL
Storage Commitment Request Complete – Failure exists	2	The job will be marked as FAILED.

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

Table 2.2-17: Storage Commitment N-EVENT-REPORT Response Status Reasons

Service Status	Further Meaning	status Code	Reasons
Success		0000	The SCP has successfully returned all matching information.

The behavior of the DICOM Store AE when receiving Event types over this association is the same as when receiving them over the same association as documented in section 2.2.1.3.1.3.2 .

2.2.1.4.1.4 SOP Specific Conformance – Verification SOP Class (1.2.840.10008.1.1)

The Storage AE provides standard conformance to the Verification SOP Class as an SCP. This verification is accomplished on an established Association using the C-ECHO DIMSE-C service.

2.2.2 DICOM Print Application Entity Specification

2.2.2.1 SOP Classes Supported

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

Table 2.2-18: SOP Class(es) for the DICOM Print Application Entity

SOP Class	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes	No
Printer SOP Class	1.2.840.10008.5.1.1.16	Yes	No
Print Job SOP Class	1.2.840.10008.5.1.1.14	Yes	No
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Yes	No

2.2.2.2 Association Establishment Policies

2.2.2.2.1 General

The DICOM standard Application context is always proposed:

Table 2.2-19: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

2.2.2.2.2 Number of Associations

NX x.0.23.00 initiates one association at a time for each destination to which a print request is being processed in the active job queue list. Only one job per destination will be active at a time, the others remain pending until the active job for that destination is completed or failed. There can however be several simultaneous associations to different destinations.

Table 2.2-20: Number of Associations as an Association Initiator for DICOM Print AE

Maximum number of simultaneous associations initiated	1 per destination (32 max)

2.2.2.2.3 Asynchronous Nature

Table 2.2-21: Asynchronous Nature as an Association Initiator for DICOM Print AE

Maximum number of outstanding asynchronous transactions	*None*

DICOM Print AE allows a single outstanding operation on any association. Therefore, it does not support asynchronous operations window negotiation, other than the default as specified by the DICOM specification.

2.2.2.2.4 Implementation Identifying Information

Table 2.2-22: DICOM implementation Class and Version for DICOM Print AE

Implementation Class UID	***1.3.51.0.1.3***
Implementation Version Name	***DPM1.XX*** [3]

2.2.2.3 Association Initiation Policies

2.2.2.3.1 Activity – Print Images

2.2.2.3.1.1 Description and Sequencing of Activity

The user composes images into film sheets and requests them to be sent to a specific hardcopy device. A priori, the desired film format can be selected. Each sheet is internally processed, converted to a STANDARD/1,1 page and then one print job is forwarded to the job queue of the destination and processed individually.

The DICOM Print AE or NX x.0.23.00 will initiate a separate Association for each Print Session.

If the Printer rejects the Association, then NX x.0.23.00 issues a warning message. In case of a time-out (e.g. no answer from the Printer) or a warning message, the request will be retried after at least 20 seconds. In the meantime, requests to other destinations will be handled.

After an association is established, the NX x.0.23.00 will send one film session to the Printer. Each film session will contain one film box, which in turn contains one image box.

The N-ACTION DIMSE service on Film Session SOP class instructs the printer to print the film session.

The print job has finished printing when the job is transferred to the printer or when the printer has sent the N-EVENT-REPORT “Done” (in case print job sop class is supported by the printer).

The NX x.0.23.00 releases the association. In case of N-EVENT-REPORT it will not wait for print job status “Done”.

The default PDU size negotiated by the NX x.0.23.00 is 65542 bytes.

It is possible to print up to 16 bit (see §2.4.1.2.4).

[3] XX is the build version number

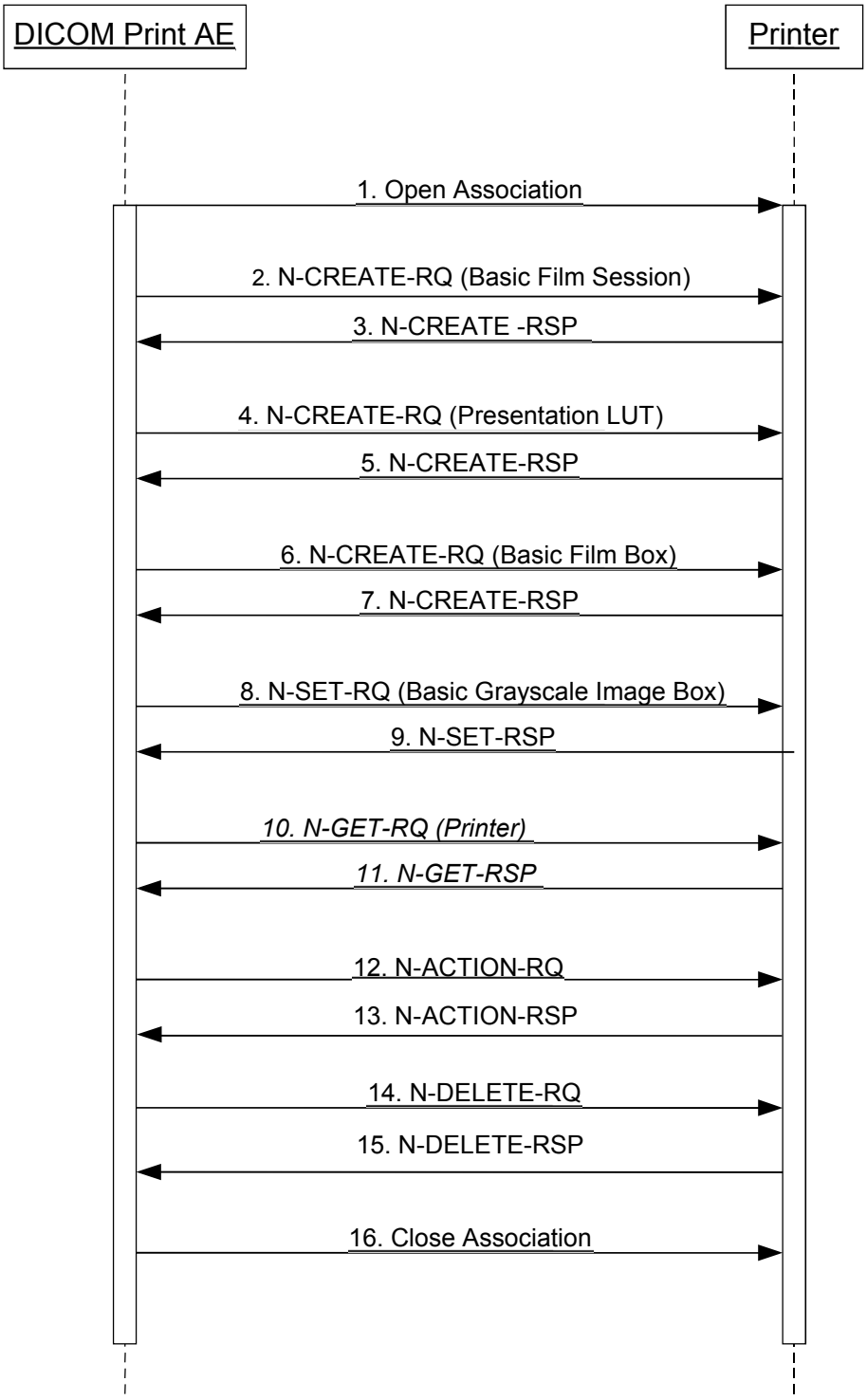


Figure 2.2-3: Sequencing of Print Images

2.2.2.3.1.2 Proposed Presentation Contexts

The DICOM Print AE is capable of proposing the Presentation Contexts shown in the following table:

Table 2.2-23: Presentation Contexts Proposed by DICOM Print AE

SOP Class		Transfer Syntax		Role	Extended Negotiation
SOP Class	**SOP Class UID**	**Name**	**UID**		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Print Job SOP Class	1.2.840.10008.5.1.1.14	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Print Queue Management SOP Class	1.2.840.10008.5.1.1.26	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Note:

The Presentation Context shall use Abstract Syntax IDs which correspond to the SOP Classes UID of the Meta SOP Class specified in the first column of the Transfer Syntax Table or included SOP Classes. None of the included SOP Classes supports extended negotiation.

2.2.2.3.1.3 SOP Specific Conformance - Basic Grayscale Print Management Meta SOP Class

NX x.0.23.00 provides Standard conformance to the DICOM Basic Grayscale Print Management Meta SOP Class (1.2.840.10008.1.1.9) as SCU.

It implies support for the following SOP classes as SCU:

1. Basic Film Session SOP Class
2. Basic Film Box SOP Class
3. Basic Grayscale Image Box SOP Class
4. Printer SOP Class

2.2.2.3.1.3.1 Basic Film Session SOP Class (1.2.840.10008.5.1.1.1)

The Basic Film Session IOD describes the presentation parameters which are common for all the films of a film session (e.g. number of films, film destination, …)

The Basic Film Session SOP Instance refers to one or more Basic Film Box SOP Instance (§2.2.2.3.1.3.2).

NX x.0.23.00 (SCU) can send the following DIMSE services:

- N-CREATE
- N-ACTION

N-CREATE is issued by NX x.0.23.00 (SCU) to create a Basic Film Session SOP instance, when an Association has been established. The N-CREATE causes the Basic Film Session (root element) to be created by the SCP AE and its attributes initialized. The following attributes are supported:

Table 2.2-24: Supported N-CREATE Attributes for a Basic Film Session

Attribute Name	Tag	Value
Number of Copies	(2000,0010)	Always set to 1
Print priority	(2000,0020)	Configurable
Medium Type	(2000,0030)	BLUE FILM ,CLEAR FILM, PAPER (configurable)
Film destination	(2000,0040)	MAGAZINE, BIN-i , PROCESSOR (configurable)

NX x.0.23.00 (SCU) will process the N-CREATE confirmation and response Status codes. The following status codes are recognized:

Table 2.2-25: N-CREATE Status Codes

Code	Status	Meaning
0000	Success	Film Session successfully created
0116H	Warning *(or Failure, depends on the selected Printer Profile)*	The SCP AE returns the attribute “Value Out of Range”. This may result in Image Quality Degradation. **NX x.0.23.00** will continue when its destination is an AGFA printer, but stops (ABORT) when its destination is a non-AGFA printer (might lead to unacceptable image quality).
0106H	Error	The SCP AE returns the attribute “Invalid Attribute Value”. This indicates that the requested memory allocation cannot be provided.
0213H		Resource Limitation is returned by the SCP AE for the Basic Film Session SOP Class to indicate that the requested allocation can temporarily not be provided.
*	Other Status codes	Other DICOM error codes result in the failure of the job. Other warnings are not communicated to the user.

N-ACTION is issued by NX x.0.23.00 (SCU) to print a Film Session. This means that all subordinate Basic Film Boxes will be assembled into a print job for printing (the job can therefore contain more than one film).

NX x.0.23.00 (SCU) will process the N-ACTION confirmation and response Status codes. The following status codes in Table 2.2-26 are recognized:

Table 2.2-26: N-ACTION Status Codes

Code	Status	Meaning
0000	Success	Normally returned by the SCP AE. Film(s) belonging to the film session are accepted for printing.
B601	Warning	Film session printing (collation) is not supported.
B602		Film Session SOP Instance hierarchy does not contain Image Box SOP Instances (empty page).
B604		Image size is larger than Image Box size, the image has been magnified.
C600	Error	Film Session SOP Instance hierarchy does not contain Film Box SOP instances.
C601		Unable to create Film SOP Instance; The print queue is full (device failure).
C603		Image size is larger than Image box size
*	Other Status codes	Other DICOM error codes result in the failure of the job. Other warnings are not communicated to the user.

N-DELETE is issued by NX x.0.23.00 (SCU) to delete a Film Session. This means that the complete Film Session SOP Instance hierarchy will be deleted.

2.2.2.3.1.3.2 Basic Film Box SOP Class (1.2.840.10008.5.1.1.2)

The Basic Film Box IOD is an abstraction of the presentation of one film of the film session. The Basic Film Box IOD describes the presentation parameters which are common for all images on a given sheet of film.

The Basic Film Box SOP Instance refers to one or more Image Box SOP Instances, zero or more film related Annotation Box SOP Instances, and zero or one Presentation LUT SOP Instance.

NX x.0.23.00 (SCU) can send the following DIMSE services:

- N-CREATE

N-CREATE is issued by NX x.0.23.00 (SCU) to create a Basic Film Box under the created Film Session and initialize its attributes. (The creation of a Basic Film Box also causes the subordinate Basic Image Boxes to be created for each location in the film format.)

The supported Film Box N-CREATE attributes are listed in the table below:

Table 2.2-27: Supported N-CREATE Attributes for a Basic Film Box

Attribute Name	Tag	Value
Image Display Format	(2010,0010)	STANDARD\1,1
Film Orientation	(2010,0040)	PORTRAIT,LANDSCAPE
Film Size ID	(2010,0050)	8INX10IN, 10INX12IN, 10INX14IN, 11INX14IN, 14INX14IN, 14INX17IN, A4, A3, 14INx36IN, 14INx51IN (configurable)
Magnification type	(2010,0060)	NONE, REPLICATE
Border Density	(2010,0100)	WHITE, BLACK or ODx100 (configurable)
Empty Image Density	(2010,0110)	WHITE, BLACK or ODx100 (configurable)
Min Density	(2010,0120)	Configurable
Max Density	(2010,0130)	Configurable
Trim	(2010,0140)	NO
Configuration Information	(2010,0150)	Configurable
Illumination	(2010,015E)	Configurable, only applicable for printing with P-Values

Attribute Name	Tag	Value
Reflective Ambient Light	(2010,0160)	Configurable, only applicable for printing with P-Values
Referenced Film Session Sequence	(2010,0500)	A sequence which provides references to a Film Session SOP Class/Instance pairs. Only a single item is permitted in this Sequence.
>Referenced SOP Class UID	(0008,1150)	Uniquely identifies the referenced SOP Class
>Referenced SOP Instance UID	(0008,1155)	Uniquely identifies the referenced SOP Instance.
Referenced Presentation LUT Sequence	(2050,0500)	A sequence which provides references to a Presentation LUT related SOP Class/Instance pairs. Only a single item shall be included in this sequence.
>Referenced SOP Class UID	(0008,1150)	Uniquely identifies the referenced SOP Class
>Referenced SOP Instance UID	(0008,1155)	Uniquely identifies the referenced SOP Instance.

NX x.0.23.00 (SCU) will process the N-CREATE confirmation and response Status codes. The status codes below are recognized:

Table 2.2-28: N-CREATE Status Codes

Code	Status	Meaning
0000	Success	Normally returned by the SCP AE. Film Box successfully created.
B605	Warning	Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.
*	Other Status codes	Other DICOM error codes result in the failure of the job. Other warnings are not communicated to the user.

2.2.2.3.1.3.3 Basic Grayscale Image Box SOP Class (1.2.840.10008.5.1.1.4)

The Basic Image Box IOD is an abstraction of the presentation of an image and image related data in the image area of a film. The Basic Image Box IOD describes the presentation parameters and image pixel data which apply to a single image of a sheet of film.

The Basic Grayscale Image Box SOP Instance is created by the SCP at the time the Basic Film Box SOP Instance (§ 2.2.2.3.1.3.2) is created, based on the value of the Basic Film Box Attribute Image Display Format (2010, 0010).

The Basic Grayscale Image Box SOP Instance refers to zero or one Image Overlay Box SOP Instance and zero or one Presentation LUT SOP Instance.

NX x.0.23.00 (SCU) can send the following DIMSE services:

- N-SET

N-SET is issued by NX x.0.23.00 (SCU) to update an instance of the Grayscale Image Box SOP Class.

When all needed Basic Grayscale Image Boxes have been set, NX x.0.23.00 (SCU) issues a print command. There can be empty image positions. By using N-SET, NX x.0.23.00 (SCU) can instruct the SCP to erase the image in the image position by setting a zero length and no value in the attribute Basic Grayscale Image Sequence. The N-Set attributes for the Basic Grayscale Image Box are listed below:

Table 2.2-29: Supported N-SET Attributes for a Basic Grayscale Image Box

Attribute Name	Tag	Value
Image Position	(2020,0010)	1
Polarity	(2020,0020)	NORMAL
Basic Grayscale Image Sequence	(2020,0110)	
>Samples Per Pixel	(0028,0002)	1
>Photometric Interpretation	(0028,0004)	MONOCHROME2
>Rows	(0028,0010)	larger than 0
>Columns	(0028,0011)	larger than 0
>Bits Allocated	(0028,0100)	8 – 16
>Bits Stored	(0028,0101)	8 – 16
>High Bit	(0028,0102)	7 to 15
>Pixel Representation	(0028,0103)	0
>Pixel Data	(7FE0,0010)	A data stream of the pixel samples that comprise the Image.

NX x.0.23.00 (SCU) will process the N-SET confirmation and response Status codes. The status codes listed below in Table 2.2-30 are recognized:

Table 2.2-30: N-SET Status Codes

Code	Status	Meaning
0000	Success	Normally returned by the SCP AE. Image successfully stored in Image Box
B604	Warning	Image size is larger than Image Box size, the image has been magnified.
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.
C603	Error	Image size is larger than Image box size
C605		Insufficient memory in printer to store the image.
*	Other Status codes	Other DICOM error codes result in the failure of the job. Other warnings are not communicated to the user.

2.2.2.3.1.3.4 Printer SOP Class (1.2.840.10008.5.1.1.16)

The Printer IOD is an abstraction of the hard copy printer and is the basic Information Entity to monitor the status of the printer. The Printer SOP Instance is created by the SCP during start-up of the hard copy printer and has a well-known SOP Instance UID.

The Printer SOP Class is used to monitor the status of the printer.

NX x.0.23.00 (SCU) will accept the following DIMSE services:

- N-EVENT-REPORT

NX x.0.23.00 (SCU) can send the following DIMSE services:

- N-GET

N-EVENT-REPORT is used to report the changes of the printer status in an asynchronous way. The SCP uses the N-EVENT-REPORT to inform NX x.0.23.00 about each execution change. NX x.0.23.00 will return the confirmation of the N-EVENT-REPORT operation.

Table 2.2-31: Notification Event Information

Event Type Name	Event Type ID	Attribute	Tag
Normal	1	Printer Status Info	(2110,0020)
		Film Destination	(2000,0040)
		Printer Name	(2110,0030)
Warning	2	Printer Status Info	(2110,0020)
		Film Destination	(2000,0040)
		Printer Name	(2110,0030)
Failure	3	Printer Status Info	(2110,0020)
		Film Destination	(2000,0040)
		Printer Name	(2110,0030)

Note:

If the Event Type Name = Warning or Failure then the warning/failure condition can be stored by the SCP Printer Status Info argument.

N-GET is issued by NX x.0.23.00 (SCU) to retrieve an instance of the Printer SOP class. NX x.0.23.00 specifies the UID of the SOP Instance to be retrieved. The supported N-GET attributes are listed in the table below:

Table 2.2-32: Supported Attributes for N-GET on a Printer

Attribute Name	Tag	Value
Printer Status	(2110,0010)	NORMAL, WARNING, FAILURE
Printer Status Info	(2110,0020)	Printer dependent
Printer Name	(2110,0030)	User defined name identifying the printer
Manufacturer	(0008,0070)	Manufacturer of the printer
Manufacturer Model Name	(0008,1090)	Manufacturer's model number of the printer
Device Serial Number	(0018,1000)	Manufacturer's serial number of the printer
Software Versions	(0018,1020)	Manufacturer's designation of software version of the printer
Date Last Calibration	(0018,1200)	Date when the printer was last calibrated
Time Last Calibration	(0018,1201)	Time when the printer was last calibrated

2.2.2.3.1.4 SOP Specific Conformance Print Job SOP Class (1.2.840.10008.5.1.1.14)

The Print Job IOD is an abstraction of the Print Job transaction and is the basic information entity to monitor the execution of the Print Process. A Print Job contains one film or multiple films, all belonging to the same film session.

The Print Job SOP Class is created by N-ACTION operation of the Film Session SOP Class (§2.2.2.3.1.3.1), Film Box SOP Class (§2.2.2.3.1.3.2), or Pull Print Request SOP Class. The Print Job SOP Instance is deleted after the films are printed or after a failure condition.

NX x.0.23.00 (SCU) will accept the following DIMSE services:

- N-EVENT-REPORT

NX x.0.23.00 (SCU) can send the following DIMSE services:

- N-GET

N-EVENT-REPORT is used by the SCP to report execution status changes to NX x.0.23.00 (SCU) in an asynchronous way.

N-EVENT-REPORT has the following arguments

Table 2.2-33: Notification Event Information

Event Type Name	Event Type ID	Attribute	Tag
Pending	1	Execution Status Info	(2100,0030)
		Print Job ID	(2100,0010)
		Film Session Label	(2000,0050)
		Printer Name	(2110,0030)
Printing	2	Execution Status Info	(2100,0030)
		Print Job ID	(2100,0010)
		Film Session Label	(2000,0050)
		Printer Name	(2110,0030)
Done	3	Execution Status Info	(2100,0030)
		Print Job ID	(2100,0010)
		Film Session Label	(2000,0050)
		Printer Name	(2110,0030)
Failure	4	Execution Status Info	(2100,0030)
		Print Job ID	(2100,0010)
		Film Session Label	(2000,0050)
		Printer Name	(2110,0030)

Note:

The SCU only releases the Association after the receipt of the event type Done or Failure, if the print job sop class is supported.

NX x.0.23.00 (SCU) returns the confirmation from the N-EVENT-REPORT operation.

N-GET is used to retrieve an instance of the Print Job SOP Class. NX x.0.23.00 (SCU) uses the N-GET to request the SCP to get a Print Job SOP Instance. NX x.0.23.00 specifies the UID of the SOP Instance to be retrieved.

Table 2.2-34: Supported N-GET Attributes for a Print Job

Attribute Name	Tag	Value
Execution Status	(2100,0020)	PENDING, PRINTING, DONE, FAILURE
Execution State Info	(2100,0030)	Printer dependent
Print Priority	(2000,0020)	HIGH, MED, LOW
Creation Date	(2100,0040)	Date of print job creation
Creation Time	(2100,0050)	Time of print job creation
Printer Name	(2110,0030)	User defined name identifying the printer
Originator	(2100,0070)	DICOM AE title that issued the print operation

2.2.2.3.1.5 SOP Specific Conformance Presentation LUT SOP Class (1.2.840.10008.5.1.1.23)

The Presentation LUT Information Object is an abstraction of a Presentation LUT. The objective of the Presentation LUT is to realize image display tailored for specific modalities, applications, and user preferences. It is used to prepare image pixel data for display on devices that conform to the Grayscale Standard Display Function.

The output of the Presentation LUT is Presentation Values (P-Values).

An **N-CREATE** is issued by NX x.0.23.00 (SCU) to create a Presentation LUT SOP Instance. The supported Presentation LUT attributes are listed below:

Table 2.2-35: Supported Attributes for Presentation LUT

Tag	Name	Supported	Default
(2050,0020)	Presentation LUT Shape	IDENTITY (see note)	IDENTITY

Note:

'Presentation LUT Sequence' is not supported.

NX x.0.23.00 (SCU) will process the N-CREATE confirmation and response Status codes. The status codes listed below are recognized:

Table 2.2-36: N-CREATE confirmation and response Status codes

Code	Status	Meaning
0000	Success	Presentation LUT successfully created
B605	Warning	Requested Min or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum value instead.

Note:

NX x.0.23.00 (SCU) uses the N-CREATE Service Element to request the SCP to create a Presentation LUT SOP Instance. NX x.0.23.00 shall initialize the Attributes of the SOP Class.

The Presentation LUT persists in the SCP as long as the Association in which it was created is open or an explicit N-DELETE is issued by the SCU.

2.2.2.3.1.6 SOP Specific Conformance Verification SOP Class (1.2.840.10008.1.1)

See § 2.2.1.4.1.4.

2.2.3 RIS Application Entity Specification

2.2.3.1 SOP Classes Supported

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

Table 2.2-37: SOP Class(es) for the DICOM Store Application Entity

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

2.2.3.2 Association Establishment Policies

2.2.3.2.1 General

The DICOM standard Application context is always proposed:

Table 2.2-38: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

2.2.3.2.2 Number of Associations

NX x.0.23.00 initiates one association at a time to query the worklist.

Table 2.2-39: Number of Associations as an Association Initiator for RIS AE

Maximum number of simultaneous associations initiated	***1***

2.2.3.2.3 Asynchronous Nature

Table 2.2-40: Asynchronous Nature as an Association Initiator for RIS AE

Maximum number of outstanding asynchronous transactions	***1***

NX x.0.23.00 does not support asynchronous communication (multiple outstanding transactions over a single connection).

2.2.3.2.4 Implementation Identifying Information

Table 2.2-41: DICOM implementation Class and Version for DICOM RIS AE

Implementation Class UID	***1.3.51.0.1.3***
Implementation Version Name	***AGFA DTF1.0.XX*** [4]

[4] XX is the build version number

2.2.3.3 Association Initiation Policies

2.2.3.3.1 Activity – Query RIS

2.2.3.3.1.1 Description and Sequencing of Activity

The request for Query RIS is initiated by user interaction (clicking the “Query RIS” button) or automatically at specific time intervals (configurable by the user). Depending on the configuration this can either be a query based on a user provided accession number or be a complete worklist update based on date, modality and Scheduled Station AE title.

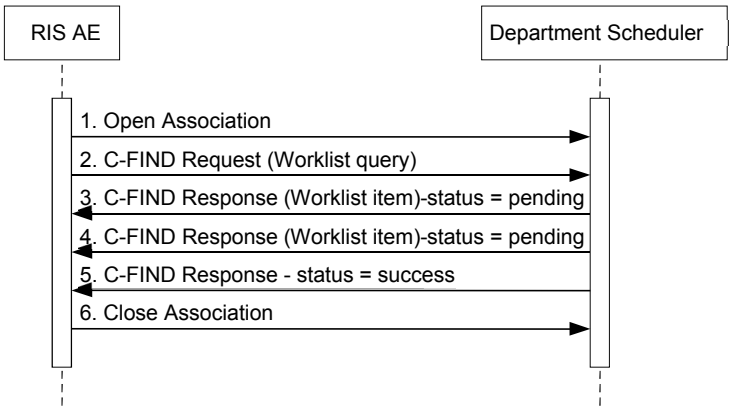


Figure 2.2-4: Sample Sequencing Diagram for Refresh Worklist

2.2.3.3.1.2 Proposed Presentation Contexts

The RIS Application Entity is capable of proposing the Presentation Contexts shown in the following table:

Table 2.2-42: Presentation Contexts Proposed by DICOM Store AE

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

2.2.3.3.1.3 SOP Specific Conformance – Modality Worklist SOP Class (1.2.840.10008.5.1.4.31)

The Modality Worklist SOP class, defined within the Basic Worklist Management Service Class, defines an application-level class of service which facilitates the communication of

information to the imaging modality about Scheduled Procedure Steps, and entities related to the Scheduled Procedure Steps.

This worklist is structured according to Scheduled Procedure Steps. A procedure step is a unit of service in the context of a requested imaging procedure.

The behavior of a RIS AE when encountering status codes in a C-FIND response is summarized in the Table below:

Table 2.2-43: C-Find Response Status Handling Behavior

Service Status	Status Code	Status Code
Success	0000	Matching is complete
Refused	A700	Out of resources
Failed	A900	Identifier does not match SOP Class
	C000-CFFF	Unable to Process
Cancel	FE00	Matching terminated due to Cancel request
Pending	FF00	Matches are continuing – Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.
	FF01	Matches are continuing – Warning that one or more Optional Keys were not supported
*	Other Status codes	Other DICOM error codes result in the failure of the job. Other warnings are not communicated to the user.

The behavior of the AE during communication failure is summarized in a table as follows:

Table 2.2-44: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	
Association aborted	

The table below provides a description of the Worklist Request Identifier. Unexpected attributes returned in a C-FIND response are ignored.

Table 2.2-45: Worklist request identifiers

Attribute name	Tag	Broad Query	Accession number query
Scheduled Procedure Step			
Scheduled Station AE Title	(0040,0001)	Single Value Matching	
Scheduled Procedure Step Start Date	(0040,0002)	Range Matching	
Scheduled Procedure Step Start Time	(0040,0003)		
Scheduled Procedure Step Location	(0040,0011)		
Modality	(0008,0060)	Single Value Matching	
Scheduled Procedure Step Description	(0040,0007)		
Scheduled Performing Physician's Name	(0040,0006)		
Scheduled Performing Physician's ID Sequence	(0040,000B)		
Scheduled Station Name	(0040,0010)		
Scheduled Protocol Code Sequence	(0040,0008)		
Pre-Medication	(0040,0012)		
Scheduled Procedure Step ID	(0040,0009)		

Attribute name	Tag	Broad Query	Accession number query
Request Contrast Agent	(0032,1070)		
Scheduled Procedure Step Status	(0040,0020)		
Scheduled Procedure Step Comment	(0040,0400)		
Requested Procedure			
Requested Procedure Description	(0032,1060)		
Requested Procedure Code Sequence	(0032,1064)		
Requested Procedure ID	(0040,1001)		
Study Instance UID	(0020,000D)		
Referenced Study Sequence	(0008,1110)		
Reason for the Requested Procedure	(0040,1002)		
Requested Procedure Priority	(0040,1003)		
Patient Transport Arrangement	(0040,1004)		
Requested Procedure Location	(0040,1005)		
Requested Procedure Comments	(0040,1400)		
Confidentiality Code	(0040,1008)		
Reporting Priority	(0040,1009)		
Names of Intended Recipients of Results	(0040,1010)		
Intended Recipients of Results Identification Sequence	(0040,1011)		
Imaging Service Request			
Accession Number	(0008,0050)		Wildcard matching
Requesting Physician	(0032,1032)		
Requesting Physician Identification Sequence	(0032,1031)		
Referring Physician's Name	(0008,0090)		
Referring Physician Identification Sequence	(0008,0096)		
Requesting Service	(0032,1033)		
Placer Order Number	(0040,2016)		
Filler Order Number	(0040,2017)		
Imaging Service Request Comments	(0040,2400)		
Issue Date of Imaging Service Request	(0040,2004)		
Issue Time of Imaging Service Request	(0040,2005)		
Order Entered by…	(0040,2008)		
Order Enterer's Location	(0040,2009)		
Order Callback Phone Number	(0040,2010)		
Reason for imaging service	(0040,2001)		
Visit Identification			
Admission ID	(0038,0010)		
Institution Name	(0008,0080)		
Institution Address	(0008,0081)		
Institution Code Sequence	(0008,0082)		
Issuer of Admission ID	(0038,0011)		
Visit Status			
Current Patient Location	(0038,0300)		
Visit Status ID	(0038,0008)		
Patient's Institution Residence	(0038,0400)		
Visit Comments	(0038,4000)		

Attribute name	Tag	Broad Query	Accession number query
Visit Relationship			
Referenced Patient Sequence	(0008,1120)		
Visit Admission			
Route of Admissions	(0038,0016)		
Admitting Date	(0038,0020)		
Admitting Time	(0038,0021)		
Scheduled Admission Date	(0038,001A)		
Scheduled Admission Time	(0038,001B)		
Admitting Diagnosis Description	(0008,1080)		
Admitting Diagnosis Code Sequence	(0008,1084)		
Patient Identification			
Patient's Name	(0010,0010)		
Patient ID	(0010,0020)		
Other Patient IDs	(0010,1000)		
Issuer of Patient ID	(0010,0021)		
Other Patient Names	(0010,1001)		
Patient's Birth Name	(0010,1005)		
Patient's Mother's Birth Name	(0010,1060)		
Medical Record Locator	(0010,1090)		
Referenced Patient Alias Sequence	(0038,0004)		
Patient Demographic			
Patients Birth Date	(0010,0030)		
Patient's Sex	(0010,0040)		
Patient's Birth Time	(0010,0032)		
Patient's Primary Language Code Sequence	(0010,0101)		
>Patient's Primary Language Code Modifier Sequence	(0010,0102)		
Patient's Weight	(0010,1030)		
Patient's Size	(0010,1020)		
Patient's Age	(0010,1010)		
Military Rank	(0010,1080)		
Branch of Service	(0010,1081)		
Ethnic Group	(0010,2160)		
Occupation	(0010,2180)		
Patient Comment	(0010,4000)		
Confidentiality constraint on patient data	(0040,3001)		
Patient's Insurance Plan Code Sequence	(0010,0050)		
Patient's Address	(0010,1040)		
Country of Residence	(0010,2150)		
Region of Residence	(0010,2152)		
Patient's Telephone Numbers	(0010,2154)		
Patient's Religious Preference	(0010,21F0)		
Patient Medical			
Patient State	(0038,0500)		
Pregnancy Status	(0010,21C0)		
Medical Alerts	(0010,2000)		
Contrast Allergies	(0010,2110)		
Special Needs	(0038,0050)		
Additional Patient History	(0010,21B0)		

Attribute name	Tag	Broad Query	Accession number query
Last Menstrual Date	(0010,21D0)		
Smoking Status	(0010,21A0)		

2.2.3.4 User Defined fields

There are five (5) optional (type 3) User Defined fields that can be mapped from the RIS and which can be sent out during archiving and exporting.

These fields can be found in the following Table:

Table 2.2-46: List of User defined DICOM fields

Tag	Description	VR
(0019,10F0)	User Defined field 1	LO
(0019,10F1)	User Defined field 2	LO
(0019,10F2)	User Defined field 3	LO
(0019,10F3)	User Defined field 4	LO
(0019,10F4)	User Defined field 5	LO

2.2.3.5 Custom Patient Field

There are five (5) optional (type 3) Custom Patient fields that can be mapped on the RIS and which can be sent out during archiving and exporting.

These fields can be found in the following Table:

Table 2.2-47: List of Custom Patient DICOM fields

Tag	Description	VR
(0019,10D0)	Custom Patient Field 1	LO
(0019,10D1)	Custom Patient Field 2	LO
(0019,10D2)	Custom Patient Field 3	LO
(0019,10D3)	Custom Patient Field 4	LO
(0019,10D4)	Custom Patient Field 5	LO

2.2.4 MPPS Application Entity Specification

2.2.4.1 SOP Classes Supported

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

Table 2.2-48: SOP Class(es) for the DICOM Store Application Entity

SOP Class Name	SOP Class UID	SCU	SCP
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Yes	No

2.2.4.2 Association Establishment Policies

2.2.4.2.1 General

The DICOM standard Application context is always proposed:

Table 2.2-49: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

2.2.4.2.2 Number of Associations

NX x.0.23.00 initiates one association at a time to query the worklist.

Table 2.2-50: Number of Associations as an Association Initiator for MPPS AE

Maximum number of simultaneous associations initiated	***1***

2.2.4.2.3 Asynchronous Nature

Table 2.2-51: Asynchronous Nature as an Association Initiator for MPPS AE

Maximum number of outstanding asynchronous transactions	***1***

NX x.0.23.00 does not support asynchronous communication (multiple outstanding transactions over a single connection)

2.2.4.2.4 Implementation Identifying Information

Table 2.2-52: DICOM implementation Class and Version for DICOM MPPS AE

Implementation Class UID	***1.3.51.0.1.3***
Implementation Version Name	***AGFA DTF1.0.XX*** [5]

[5] XX is the build version number

2.2.4.3 Association Initiation Policies

2.2.4.3.1 Activity – Acquire Images

2.2.4.3.1.1 Description and Sequencing of Activity

When the first image of a session arrives, an association will be opened to create an MPPS instance (via N-CREATE) on the MPPS manager. NX x.0.23.00 will wait for an N-CREATE response from the Department Scheduler (status success). When the N-CREATE response is received, the association with the Department Scheduler will be closed. When the session is closed on NX x.0.23.00, an association will be opened to complete the MPPS instance (via N-SET). Again NX x.0.23.00 will wait for an N-SET response from the Department Scheduler (status success). Once the response is received, the association will be closed.

When all images of a study are transferred to another study and no new images are acquired before the session is closed, an N-SET MPPS discontinued will be sent instead of the normal N-SET response.

When no images are available for 1 of 2 selected SPS, N-SET MPPS discontinued will be sent with discontinue reason code: “Incorrect Worklist Entry Selected”.

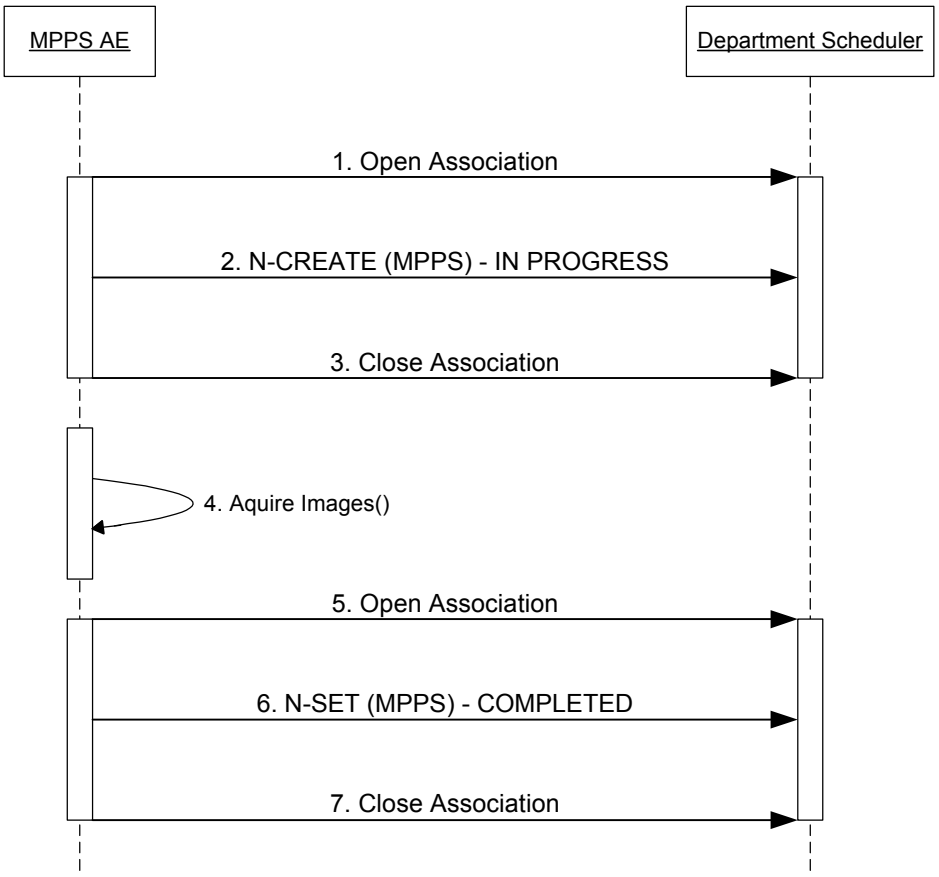


Figure 2.2-5: Sample Sequencing Diagram for MPPS

2.2.4.3.1.2 Proposed Presentation Contexts

The MPPS Application Entity is capable of proposing the Presentation Contexts shown in the following table:

Table 2.2-53: Presentation Contexts Proposed by DICOM Store AE

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	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

2.2.4.3.1.3 SOP Specific Conformance – MPPS (1.2.840.10008.3.1.2.3.3)

NX x.0.23.00 (SCU) can send the following DIMSE services:

- N-CREATE
- N-SET

An **N-CREATE** allows NX x.0.23.00 to create an instance of the Modality Performed Procedure Step SOP Class and provide information about a specific real-world Performed Procedure Step that is under control of NX x.0.23.00.

An **N-SET** allows NX x.0.23.00 to set Attribute Values of an instance of the Modality Performed Procedure Step SOP Class and provide information about a specific real-world Modality Performed Procedure Step that is under control of NX x.0.23.00.

Note:

NX x.0.23.00 informs the Information System as soon as possible that the performance of the Procedure Step has been started by sending the N-CREATE Service Request. This allows an SCP of the Modality Worklist SOP Class (if supported) to update the Modality Worklist. Some of the attribute values are already known at the beginning of the Procedure Step, they are sent in the N-CREATE command. Other mandatory attributes are known only at the end of the Performed Procedure Step, they are assigned a value in the N-SET command.

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

Table 2.2-54: N-CREATE/N-SET Response Status Handling Behavior

Service Status	Further Meaning	Status Code	Behavior
Success	Matching is complete	0000	The SCP has completed the operation successfully
Failure	Processing Failure – Performed Procedure Step Object may no longer be updated	0110H	

Service Status	Further Meaning	Status Code	Behavior
*	Other Status codes	*	Other DICOM error codes result in the failure of the job. Other warnings are not communicated to the user.

The behavior of the AE during communication failure is summarized in a table as follows:

Table 2.2-55: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	If the sending fails, the system will retry automatically until the session is cleaned up.
Association aborted	If the sending fails, the system will retry automatically until the session is cleaned up.

The following table provides a description of the MPPS N-CREATE and N-SET request identifiers sent by the MPPS AE. Empty cells in the N-CREATE and N-SET columns indicate that the attribute is not sent. An “X” indicates that an appropriate value will be sent.

Table 2.2-56: MPPS N-CREATE/N-SET Request Identifier

Attribute	Tag	N-CREATE	N-SET
Specific Character Set	(0008,0005)	X	X
Performed Procedure Step Relationship			
Scheduled Step Attribute Sequence	(0040,0270)		
>Study Instance UID	(0020,000D)	X	
>Referenced Study Sequence	(0008,1110)	From MWL or user input	
>>Referenced SOP Class UID	(0008,1150)	From MWL or user input	
>>Referenced SOP Instance UID	(0008,1155)	From MWL or user input	
>Accession Number	(0008,0050)	From MWL or user input	N/A
>Placer Order Number/Imaging Service Request	(0040,2016)	From MWL or user input	
>Filler Order Number/Imaging Service Request	(0040,2017)	From MWL or user input	
>Requested Procedure ID	(0040,1001)	From MWL or user input	
>Requested Procedure Description	(0032,1060)	From MWL or user input	
>Scheduled Procedure Step ID	(0040,0009)	From MWL or user input	
>Scheduled Procedure Step Description	(0040,0007)	From MWL or user input	
>Scheduled Protocol Code Sequence	(0040,0008)	From MWL or user input	
>>Code Value	(0008,0100)	From MWL or user input	
>>Coding Scheme designator	(0008,0102)	From MWL or user input	
>>Coding Scheme Version	(0008,0103)	From MWL or user input	
>>Code Meaning	(0008,0104)	From MWL or user input	
>>All other Attributes from Scheduled Protocol Code Sequence			
Patient’s Name	(0010,0010)	From MWL or user input	
Patient ID	(0010,0020)	From MWL or user input	
Patient’s Birth Date	(0010,0030)	From MWL or user input	
Patient’s Sex	(0010,0040)	From MWL or user input	
Referenced Patient Sequence	(0008,1120)	From MWL or user input	
>Referenced SOP Class UID	(0008,1150)	From MWL or user input	

Attribute	Tag	N-CREATE	N-SET
>Referenced Instance UID	(0008,1155)	From MWL or user input	
Performed Procedure Step Information			
Performed Procedure Step ID	(0040,0253)	X	
Performed Station AE Title	(0040,0241)	X	
Performed Station Name	(0040,0242)	X	
Performed Location	(0040,0243)	X	
Performed Procedure Step Start Date	(0040,0244)	X	
Performed Procedure Step Start Time	(0040,0245)	X	
Performed Procedure Step Status	(0040,0252)	"IN PROGRESS"	"COMPLETED"
Performed Procedure Step Description	(0040,0254)	Exam group names of the exposures in the study	X
Performed Procedure Type Description	(0040,0255)	set to the Requested Procedure Description from the SPS	X
Procedure Code Sequence	(0008,1032)	Zero length	Zero length
Performed Procedure Step End Date	(0040,0250)	Empty	close session date
Performed Procedure Step End Time	(0040,0251)	Empty	close session time
Comments on the Performed Procedure Step	(0040,0280)	Empty	only if user provided this information
Performed Procedure Step Discontinuation Reason Code Sequence	(0040,0281)	Empty	Available if discontinued
>Code Value	(0008,0100)	Empty	“”
>Coding Scheme Designator	(0008,0102)	Empty	“”
>Coding Scheme Version	(0008,0103)	Empty	“”
>Code Meaning	(0008,0104)	Empty	“”
Image Acquisition Results			
Modality	(0008,0060)	CR or DX	
Study ID	(0020,0010)	set to Requested Procedure ID or automatically generated for unscheduled case	
Performed Protocol Code Sequence	(0040,0260)	Empty	Empty
>Code Value	(0008,0100)	Empty	Empty
>Coding Scheme Designator	(0008,0102)	Empty	Empty
>Coding Scheme Version	(0008,0103)	Empty	Empty
>Code Meaning	(0008,0104)	Empty	Empty
>All other Attributes from Performed Protocol Code Sequence			
Performed Series Sequence	(0040,0340)	Empty	
>Performing Physician’s Name	(0008,1050)	Empty	If user provided this information. Otherwise empty.
>Protocol Name	(0018,1030)	Empty	concatenation of “CR ” or “DX ” plus all exam groups of the exposures, taken in this MPPS
>Operator’s Name	(0008,1070)	Empty	Operator who was logged in at the Create of this MPPS
>Series Instance UID	(0020,000E)	Empty	X

Attribute	Tag	N-CREATE	N-SET
>Series Description	(0008,103E)	Empty	BODY PART [space] VIEW POSITION
>Retrieve AE Title	(0008,0054)	Empty	Blank
>Referenced Image Sequence	(0008,1140)	Empty	X
>>Referenced SOP Class UID	(0008,1150)	Empty	X
>>Referenced SOP Instance UID	(0008,1155)	Empty	X
>Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)	Empty	X
>>Referenced SOP Class UID	(0008,1150)	Empty	X
>>Referenced SOP Instance UID	(0008,1155)	Empty	X
Billing And Material Management Code Module			
Film Consumption Sequence	(0040,0321)	Empty	X
>Number of Films	(2100,0170)	Empty	X
>Medium Type	(2000,0030)	Empty	X
>Film Size ID	(2010,0050)	Empty	X
Radiation Dose Module			
Total Number of Exposures	(0040,0301)	Empty	X
Distance Source to Detector	(0018,1110)	Empty	X
Distance Source to Entrance	(0040,0306)	Empty	X
Entrance Dose	(0040,0302)	Empty	X
Entrance Dose in mGy	(0040,8302)	Empty	X
Exposed Area	(0040,0303)	Empty	X
Image and Fluoroscopy Area Dose Product	(0018,115E)	Empty	X
Exposure Dose Sequence	(0040,030E)	Empty	X
>KVp	(0018,0060)	Empty	X
>X-ray Tube Current in µA	(0018,8151)	Empty	X
>Exposure Time	(0018,1150)	Empty	X
>Filter Type[6]	(0018,1160)	Empty	X
>Filter Material	(0018,7050)	Empty	X
>Comments on Radiation Dose[7]	(0040,0310)	Empty	X

Note:

1. The requirement for the final state is that which applies at the time that the Performed Procedure Step Status (0040,0252) is N-SET to a value of COMPLETED or DISCONTINUED. It is only described if it is different from the SCP requirement for the N-CREATE.
2. The Performed Series Sequence (0040,0340) may not be empty (zero length) at the time that the Performed Procedure Step Status (0040,0252) is N-SET to a value of COMPLETED or DISCONTINUED. In other words a Series must exist for every Performed Procedure Step, though it may contain no Images or Non-Image Composite objects, if none were created.
3. Only attributes that are specified in a SOP Instance at N-CREATE may later be updated through the N-SET. If NX x.0.23.00 wishes to use the PPS Discontinuation Reason

[6] The attribute 'Filter Type' (0018,1160) is implemented but no information is passed yet.
[7] The attribute 'Comments on Radiation Dose'(0040,0310) is implemented but no information is passed yet.

Code Sequence (0040,0281), it creates that attribute (zero-length) during MPPS N-CREATE.

2.2.5 DICOM Query / Retrieve Application Entity Specification

2.2.5.1 SOP Classes Supported

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

Table 2.2-57: SOP Class(es) for the DICOM Query / Retrieve Entity

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

2.2.5.2 Association Establishment Policies

2.2.5.2.1 General

The DICOM standard Application context is always proposed:

Table 2.2-58: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

2.2.5.2.2 Number of Associations

The maximum number of simultaneous associations accepted by the DICOM Query / Retrieve AE is configurable at run time, based on the system resources available. By default, the maximum number of associations is set at 32. There is no inherent limit to the number of associations other than limits imposed by the computer operating system.

Table 2.2-59: Number of Associations as an Association Acceptor for DICOM Query / Retrieve

Maximum number of simultaneous associations accepted	1 per initiator (32 max)

2.2.5.2.3 Asynchronous Nature

Table 2.2-60: Asynchronous Nature as an Association Acceptor for DICOM Query / Retrieve

Maximum number of outstanding asynchronous transactions	*None*

DICOM Query / Retrieve AE allows a single outstanding operation on any association. Therefore, it does not support asynchronous operations window negotiation, other than the default as specified by the DICOM specification.

2.2.5.2.4 Implementation Identifying Information

Table 2.2-61: DICOM implementation Class and Version for DICOM Query / Retrieve AE

Implementation Class UID	***1.3.51.0.1.3***

Implementation Version Name	***DTF1.0.XX*** [8]

2.2.5.3 Association Initiation Policies

2.2.5.3.1 Activity – Find Object (SCP)

2.2.5.3.1.1 Description and Sequencing of Activity

The DICOM Query / Retrieve AE will respond to query requests that are sent to it by an SCU.

[8] XX is the build version number

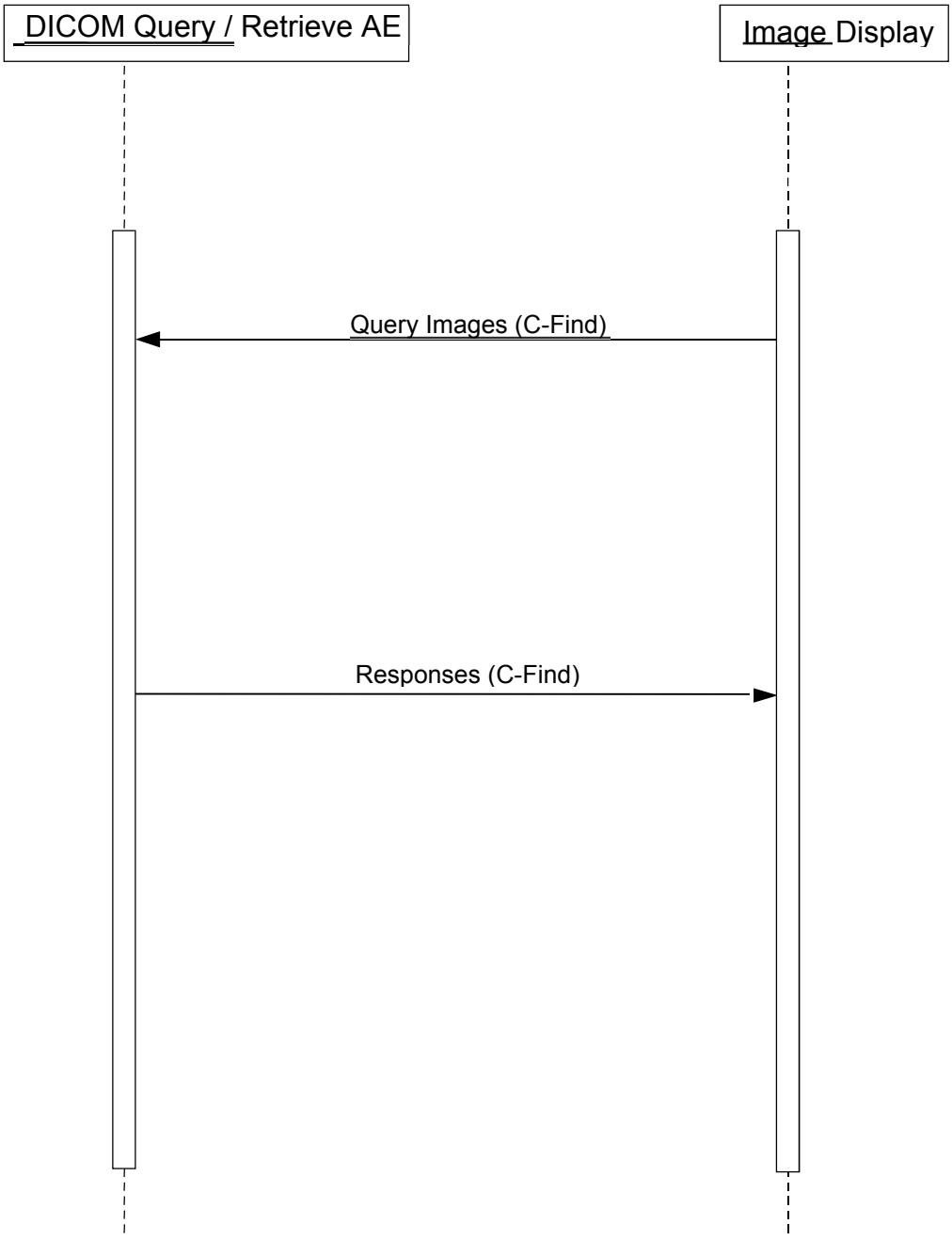


Figure 2.2-6: Sequencing of Query

2.2.5.3.1.2 Accepted Presentation Contexts

NX x.0.23.00 will accept any of the Presentation Contexts shown in the following table:

Table 2.2-62: Presentation Contexts Accepted by DICOM Query / Retrieve AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve IM Find	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Not supported

2.2.5.3.1.3 SOP Specific Conformance – Find Object (SCP)

NX x.0.23.00 provides standard conformance to the DICOM Query/Retrieve Service Class as an SCP.

NX x.0.23.00 provides support for the Instance Availability (0008,0056) Data Element.

NX x.0.23.00 supports hierarchical queries. The tables below contain detailed information on matching and returned keys:

Table 2.2-63: Patient Level Attributes

Description	Tag	Types of Matching
Patient Name	(0010,0010)	S, *, U
Patient ID	(0010,0020)	UNIQUE (for Patient Root Model) S, *, U (for Study Root Model)
Patient Birth Date	(0010,0030)	S, *, U, R
Patient Sex	(0010,0040)	S, *, U

Table 2.2-64: Study Level Attributes

Description	Tag	Types of Matching
Study Instance UID	(0020,000D)	UNIQUE
Study ID	(0020,0010)	S, *, U
Study Date	(0008,0020)	S, *, U, R
Study Time	(0008,0030)	S, *, U, R
Accession Number	(0008,0050)	S, *, U
Modalities in Study	(0008,0061)	S, *, U
Referring Physician's Name	(0008,0090)	S, *, U
Number of Study Related Series	(0020,1206)	NONE
Number of Study Related Instances	(0020,1208)	NONE

Table 2.2-65: Series Level Attributes

Description	Tag	Types of Matching
Series Instance UID	(0020,000E)	UNIQUE
Series Number	(0020,0011)	S, *, U
Modality	(0008,0060)	S, *, U
Series Description	(0008,103E)	U
Station Name	(0008,1010)	S, *, U

Description	Tag	Types of Matching
Number of Series Related Instances	(0020,1209)	NONE
Request Attribute Sequence	(0040,0275)	SEQUENCE
>> Requested Procedure ID	(0040,1001)	S, *, U
>> Scheduled Procedure Step ID	(0040,0009)	S, *, U
Performed Procedure Step Start Date	(0040,0244)	S, *, U, R
Performed Procedure Step Start Time	(0040,0245)	S, *, U, R

Table 2.2-66: Instance Level Attributes

Description	Tag	Types of Matching
Instance Number	(0020,0013)	S, *, U
SOP Instance UID	(0008,0018)	UNIQUE
SOP Class UID	(0008,0016)	S, *, U

Table 2.2-67: Image Level Attributes

Description	Tag	Types of Matching
Rows	(0028,0010)	NONE
Columns	(0028,0011)	NONE
Bits Allocated	(0028,0100)	NONE
Number of Frames	(0028,0008)	NONE

Types of Matching:

The types of Matching supported by the C-Find SCU. An “S” indicates the identifier attribute uses SingleValue Matching, an “R” indicates Range Matching, an “*” indicates Wildcard Matching, a “U” indicates Universal Matching, and an “L” indicates that UID lists are sent. “NONE” indicates that no matching is supported, but that values for this Element are requested to be returned (i.e. universal matching), and “UNIQUE” indicates that this is the Unique Key for that query level, in which case Universal Matching or Single Value Matching is used depending on the query level. “SEQUENCE” indicates Sequence Matching.

NX x.0.23.00 returns one of the following status codes to a C-FIND request.

Table 2.2-68: C-FIND Status Codes

Service Status	Further Meaning	Protocol Codes	Description
Refused	Out of Resources	A700	Out of resources.
Failed	Identifier does not match SOP Class	A900	The specified identifier contains a request that does not match the specified SOP Class.
	Unable to process	C001	For some reason (such as the database being off-line) this request cannot be processed at this time.
Cancel	Matching terminated due to Cancel Request	FE00	The original requester canceled this operation.
Pending	Pending	FF00	All Optional Keys are supported in the same manner as Required Keys.

	Pending	FF01	The matching operation is continuing. Warning that one or more Optional Keys were not supported in the same manner as Required Keys.
Success	Success	0000	Operation performed properly.

2.2.5.3.1.4 Presentation Context Acceptance Criterion – Find Object

NX x.0.23.00 will accept any number of Find Presentation Contexts per association request. Any single Abstract Syntax may be specified more than once in an association request, if the Transfer Syntaxes differ between the Presentation Contexts.

2.2.5.3.1.5 Transfer Syntax Selection Policies – Find Object

NX x.0.23.00 currently only supports the default transfer syntax of Implicit VR Little Endian.

2.2.5.3.2 Activity – Move Object (SCP)

2.2.5.3.2.1 Description and Sequencing of Activity

The DICOM Query / Retrieve AE will respond to query requests that are sent to it by an SCU.

The DICOM Query / Retrieve AE will establish a new Association with the Remote AE specified in the Move Destination for the C_STORE sub-operations. The DICOM Query / Retrieve AE will propose the transfer syntax used when the object was initially accepted by the server and Implicit VR Little Endian.

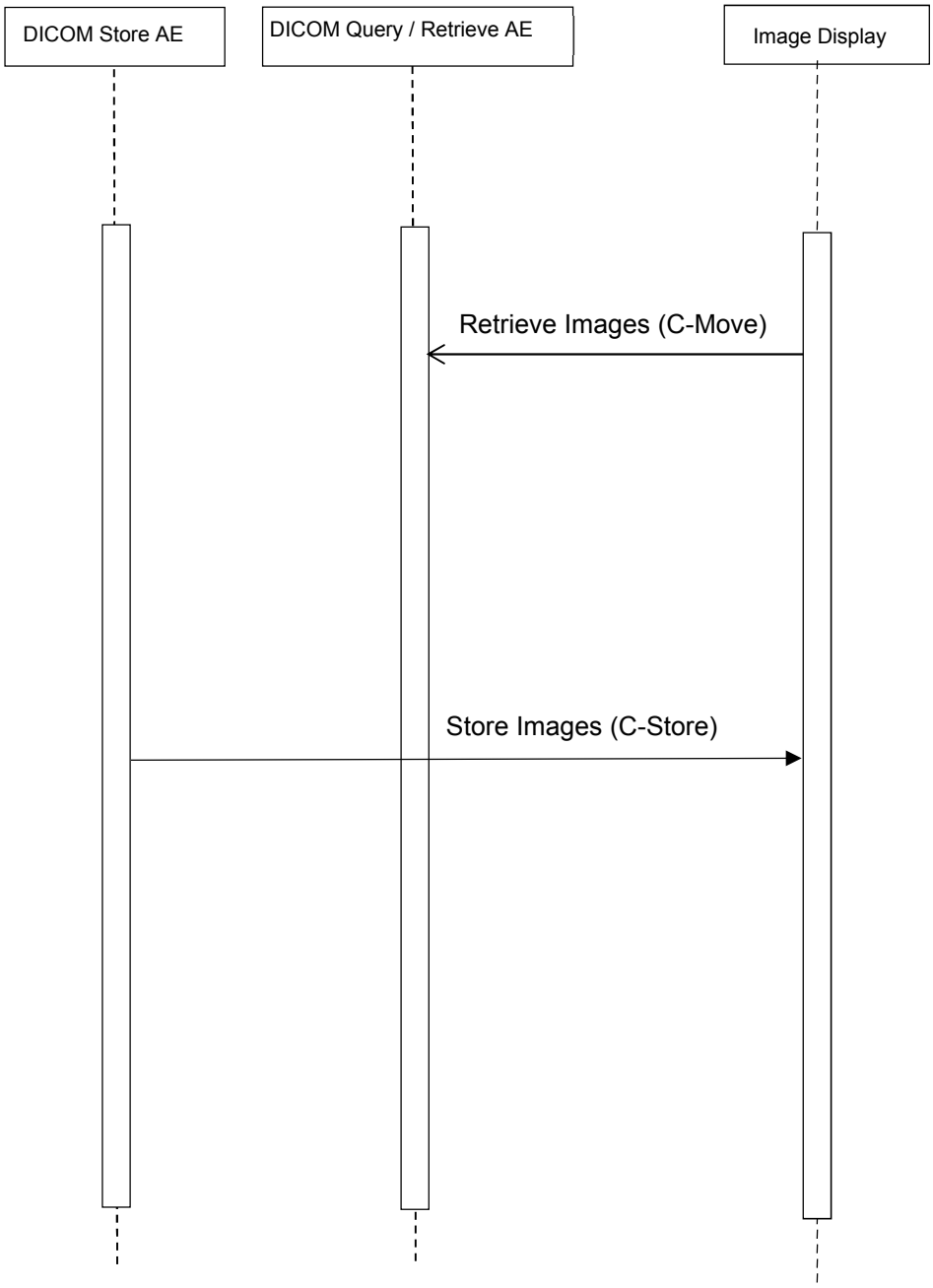


Figure 2.2-7: Sequencing of Retrieve

2.2.5.3.2.2 Accepted Presentation Contexts

NX x.0.23.00 will accept any of the Presentation Contexts shown in the following table:

Table 2.2-69: Presentation Contexts Accepted by DICOM Query / Retrieve AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve IM Move	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

2.2.5.3.2.3 SOP Specific Conformance – Move Object

NX x.0.23.00 will try to establish an association with the move destination specified in the Move request. One or more of the Presentation Contexts listed in the Store section of this document may be negotiated in this association.

NX x.0.23.00 returns one of the following status codes to a C-MOVE request.

Table 2.2-70: C-Move Status Codes

Service Status	Further Meaning	Protocol Codes	Description
Refused	Out of Resources	A701	Unable to calculate number of matches.
	Out of Resources	A702	Unable to perform storage of images to move destination.
Failed	Move destination unknown	A801	The destination of this move request is unknown.
	Identifier does not match SOP Class	A900	The specified identifier contains a request that does not match the specified SOP Class.
	Unable to process	C002	Indicates that the *PACS AE* cannot process this request at this time.
Cancel	Storage terminated due to Cancel Request	FE00	The original requester canceled this operation.
Warning	Warning	B000	Storage complete with one or more failures.
Pending	Pending	FF00	The storage operation is continuing.
	Pending for a long time	FF01	This operation is expected to require a long period of time to complete. The SCU may break the association at any time, but the operation will continue to completion.
Success	Success	0000	Operation performed properly.

2.2.5.3.2.4 Presentation Context Acceptance Criterion – Move Object

NX x.0.23.00 will accept any number of Move Presentation Contexts per association request. Any single Abstract Syntax may be specified more than once in an association request, if the Transfer Syntaxes differ between the Presentation Contexts.

2.2.5.3.2.5 Transfer Syntax Selection Policies – Move Object

By default, the PACS AE sends the IOD using the transfer syntax that was used when the image was originally stored. It will convert the IOD to Implicit VR Little Endian if the original transfer syntax is not supported by the destination.

The PACS AE can be configured on a per-destination basis to convert the IOD from the original transfer syntax to Implicit VR Little Endian.

2.3 Network Interfaces

NX x.0.23.00 provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8 of the DICOM Standard (2017a). NX x.0.23.00 inherits its TCP/IP stack from the computer system upon which it executes.

2.3.1 Physical Medium Support

NX x.0.23.00 is indifferent to the physical medium over which TCP/IP executes; it inherits the medium from the computer system upon which it is being executed.

2.3.2 Additional Protocols

NX x.0.23.00 can use DNS to resolve hostnames. It will use the TCP/IP stack from the Windows System it runs on.

For audit trailing the NX x.0.23.00 will query an NTP server as time reference. This NTP Server can be configured in the NX x.0.23.00. For all other cases the local system clock will be used as a time reference.

2.4 Configuration

2.4.1 AE Title/ Presentation Address Mapping

2.4.1.1 Local AE Titles

NX x.0.23.00 uses the AE Titles and TCP/IP Ports configured by means of the NX x.0.23.00. The Field Service Engineer can configure the TCP Port via the NX x.0.23.00. No Default AE Titles are provided. The AE Titles must be configured during installation. The local AE Title used by each individual application can be configured independently of the AE Title used by other local applications.

Table 2.4-1: AE Title Configuration Table

Application Entity	Default AE Title	Default TCP/IP Port
Storage	No Default	104
Hardcopy	No Default	Not Applicable
RIS	No Default	Not Applicable
MPPS	No Default	Not Applicable
Query / Retrieve	No Default	Not Applicable

2.4.1.2 Remote AE Title/ Presentation Address Mapping

The AE title, host names and port numbers of remote applications are configured using the NX x.0.23.00.

2.4.1.2.1 Storage

The NX x.0.23.00 must be used to set the AE Titles, port-numbers, host-names and capabilities for the remote Storage SCPs. Associations will only be accepted from known AE Titles while associations from unknown AE Titles will be rejected (an AE Title is known if it can be selected within the NX x.0.23.00). Multiple remote Storage SCPs can be defined. Any Storage SCP can be configured to be an “Archive” device causing storage commitment to be requested for images or presentation states transmitted to the device.

Storage Commit can be enabled or disabled.

The Archive Connection can be tested by means of a DICOM Ping (C-echo) test to the archive.

2.4.1.2.1.1 Archive options

Sending images to an archive can be done by means of the following SOP classes: CR, DX and MG for presentation or DX and MG for processing. The latter is a RAW image, without any annotations or measurements burned in.

Image pixels can be sent in the requested output type (configurable) depending on the used SOP class and whether GSPS is supported or not[9].

[9] anonymous archiving (i.e. without patient demographics) is not supported

CR image, WITHOUT GSPS:

- 8 bit OD
- 8 bit OD Gamma correction
- 8 bit P-Value
- 12-bit OD
- 12-bit OD Gamma correction
- 12 bit P-Value
- 12-bit OD REL
- 12-bit Image + VOI Lut OD REL
- 12-bit Image + VOI Lut Gamma
- 15-bit Image + VOI Lut P-Value

Note 1: '15-bit Image VOI Lut P-Value' is the AGFA recommended post-processing when it is supported by the SCP.

Note 2: it is possible to send P-values even in CR images, using the (2050,0020) Presentation Lut Shape = "Identity" in the General Image Module.

CR image, GSPS ENABLED:

→ Only P-value output formats are allowed, since the output of GSPS has to be P-values anyway:

- 8 bit P-Value
- 12 bit P-Value
- 15-bit Image + VOI Lut P-Value

Note 1: '15-bit Image VOI Lut P-Value' is the AGFA recommended post-processing when it is supported by the SCP.

Note 2: when GSPS is enabled, the LUT tables in the GSPS are a copy of the LUTs in the image object.

DX image "for presentation" and/or MG image "for presentation", both with or without GSPS:

- 8 bit P-Value
- 12 bit P-Value
- 15-bit Image + VOI Lut P-Value

Note: '15-bit Image VOI Lut P-Value' is the AGFA recommended post-processing when it is supported by the SCP.

DX image "for processing" or MG image "for processing"

→ this is always without GSPS, as it is the raw image.

→ the output type cannot be chosen either.

Table 2.4-2: Overview of the PACS DICOM CR-Image Types supported by NX x.0.23.00.

	PI	M-Lut Rescale			VOI-Lut			P-LUT	MU1	MU2
	(1)	Intercept	Slope	Type	Explanation	WinCenter	WinWidth	LUT-Shape	(2)	(3)
Description	28,0004	28,1052	28,1053	28,1054	28,3003	28,1050	28,1051	2050,0020		
8-bit OD	M1	200	10.9804	OD	-	1600	2800	-	X	X
	M2	3000	-10.9804	OD	-	1600	2800	-	X	X
8-bit ODGAMMA	M1	200	10.9804	OD	-	1600	2800	-	X	X
	M2	3000	-10.9804	OD	-	1600	2800	-	X	X
8-bit P-Value	M1	0.0	1.0	P-VALUES	-	128	256	INVERSE	X	X
	M2	0.0	1.0	P-VALUES	-	128	256	IDENTITY	X	X
12-bit OD	M1	200	0.684	OD	-	1600	2800	-	X	X
	M2	3000	-0.684	OD	-	1600	2800	-	X	X
12-bit ODGAMMA	M1	200	0.684	OD	-	1600	2800	-	X	X
	M2	3000	-0.684	OD	-	1600	2800	-	X	X
12-bit P-Value	M1	0.0	1.0	P-VALUES	-	2048	4096	INVERSE	X	X
	M2	0.0	1.0	P-VALUES	-	2048	4096	IDENTITY	X	X
12-bit OD REL	M1	0.0	1.0	OD REL	-	2048	4096	-	X	X
	M2	0.0	1.0	OD REL	-	2048	4096	-	X	X
12-bit Image --> VOI Lut OD REL (12)	M1	0.0	1.0	LOG_E REL	E25, NK5. …	- (7)	- (7)	-	X	
	M2	0.0	1.0	LOG_E REL	E25, NK5. …	- (7)	- (7)	-	X	
12-bit image --> VOI Lut ODGamma (12)	M1	0.0	1.0	LOG_E REL	E25, NK5. …	- (7)	- (7)	-	X	
	M2	0.0	1.0	LOG_E REL	E25, NK5. …	- (7)	- (7)	-	X	
15-bit Image --> VOI Lut P-Value (15)	M1	0.0	1.0	P-VALUES	E25, NK5. …	- (7)	- (7)	INVERSE	X	
	M2	0.0	1.0	P-VALUES	E25, NK5. …	- (7)	- (7)	IDENTITY	X	
12-bit Image --> VOI Lut OD REL (12)	M1	0.0	1.0	LOG_E REL	-	- (7)	- (7)	-		X
	M2	0.0	1.0	LOG_E REL	-	- (7)	- (7)	-		X
12-bit Image --> VOI Lut ODGamma (12)	M1	0.0	1.0	LOG_E REL	-	- (7)	- (7)	-		X
	M2	0.0	1.0	LOG_E REL	-	- (7)	- (7)	-		X
15-bit Image --> VOI Lut P-Value Lin	M1	0.0	1.0	P-VALUES	-	WC (9)	WW (9)	INVERSE		X
	M2	0.0	1.0	P-VALUES	-	WC (9)	WW (9)	IDENTITY		X
15-bit Image --> VOI Lut P-Value (15)	M1	0.0	1.0	P-VALUES	-	WC (7)	WW (7)	INVERSE		X
	M2	0.0	1.0	P-VALUES	-	WC (7)	WW (7)	IDENTITY		X

(1) Photometric Interpretation: MONOCHROME1 (M1) or MONOCHROME2 (M2)
(2) Formats supported by Musica1 processing
(3) Formats supported by Musica2 processing
(7) WinCenter/WinWidth are not present. Instead LUT Data (0028,3006) in VOI LUT sequence is present.
(9) Values are in pixel values (e.g. 16384, 16384). LUT Data (0028,3006) is not present (no VOI LUT sequence).
(12) After application of the VOI Lut, the bit depth will be equal to the bit depth before application of the VOI Lut, i.e. 12 bit
(15) After application of the VOI Lut, the bit depth will be equal to the bit depth before application of the VOI Lut, i.e. 15 bit
(15) '15-bit Image – VOI Lut P-Value' is the AGFA recommended post-processing (when supported by the SCP)

The above table should be read as follows:

- This table contains the properties for each DICOM CR-Image Type. The relevant DICOM tags are shown in the column headers and the values that define a specific DICOM CR-Image Type can be found below the corresponding tag.
- The PACS DICOM CR-Image Types supported by NX x.0.23.00 are marked with an “X”.

2.4.1.2.2 RIS

The NX x.0.23.00 must be used to set the AE Title, port-number, host-name and capabilities of the remote Modality Worklist SCP.

Only one single remote Modality Worklist SCP can be defined at the same time.

2.4.1.2.2.1 Configuration of a RIS

2.4.1.2.2.1.1 Query keys

Query keys are used when the RIS connection is configured for DICOM Modality Worklist. In the configuration Tool, the user is allowed to enter and/or modify certain query keys. Based on these keys, the worklist will be populated at the next RIS query.

See Table 2.2-45.

2.4.1.2.2.1.2 Protocol Codes

Note on Japanese Protocol Codes

In Japan, the use of protocol codes is slightly different. See the guidelines of the JIRA and JAHIS [JAPAN].

Each Scheduled *Protocol Code Sequence* consists of the following information:

Table 2.4-3: Information in a Japanese Scheduled Protocol Code Sequence.

Item	Coding Scheme Designator	No. of items	Code Value/Code Meaning
Procedure content	JJ1017T	1	Specified in Section 5.3 [10]
Target region	JJ1017P	1	Specified in Section 5.4 [10]
Imaging direction	JJ1017D	0-N	Specified in Section 5.5 [10]

(Table copied from [JAPAN], p.9)

Each item mentioned in the table is wrapped in a scheduled protocol code sequence item. As shown in the table, for each item a different coding scheme designator is used.

In practice, a triplet (with the imaging direction possibly omitted) refers to a single Exposure Type in the **NX x.0.23.00** exposure tree.

Example of a Japanese SPS

Example of a Scheduled Protocol Code Sequence in a Japanese SPS:

Coding Scheme Designator	Coding Scheme Version	Code Value	Code Meaning

[10] See guidelines of the JIRA and JAHIS [JAPAN].

JJ1017T	1.0	GX.01.00	Radiography – General Radiography – NOS
JJ1017P	1.0	25.6.201	Chest – Respiratory System – Lung
JJ1017D	1.0	G-5200	Anterior to posterior
JJ1017D	1.0	G-A101	Left lateral

This SPS schedules 2 exposures: Chest AP and Chest LL

NX x.0.23.00 can be configured for the use of the Japanese system of Protocol Codes (JJ1017) by means of the NX x.0.23.00.

2.4.1.2.2.2 Configuration of RIS Mapping

RIS mapping defines how incoming worklist attributes from the RIS are mapped to the SPS elements.

With RIS mapping, the incoming SPS attributes of the RIS are mapped to the internal data structure of NX x.0.23.00. Standard the system will provide a default (1:1) mapping. However, in cases where the RIS sends out the RIS data in a non DICOM conformant way, the customization of the mapping needs to be done by the operator. This can be done in the NX x.0.23.00.

2.4.1.2.3 MPPS

MPPS reporting can be enabled/ disabled by the operator.

The NX x.0.23.00 must be used to set the AE Title, port-number, host-name and capabilities of the remote MPPS SCP. Only one single remote MPPS SCP can be defined at a time.

2.4.1.2.4 Printing

The NX x.0.23.00 must be used to set the AE Titles, port-numbers, host-names and capabilities for the printers. Only the supported printers can be configured. Multiple printers can be defined.

The DICOM attributes per printer that are configurable are defined in Table 2.2-24, Table 2.2-27 and Table 2.2-29.

Additionally, the following parameters can be configured:

Table 2.4-4: Configurable Printer parameters.

Parameter	Configurable (yes/no)
Name	Yes
Description	Yes
Use N-Events	Yes
IP Address	Yes
Port Number	Yes
AE Title	Yes
SSL Enabled	Yes

2.4.1.2.5 Query / Retrieve

Query / Retrieve can be enabled / disabled by the operator. When enabled, the operator must configure:

- The Query / Retrieve SCP Settings (AE Title, port number, hostname and capabilities)

- The external DICOM viewers which are allowed to act as Query / Retrieve SCU

2.4.2 Queue Management & Job description

2.4.2.1 DICOM Store AE

2.4.2.1.1 Queue description

Each Remote Store AE destination has its own configuration (as described in § 2.4.1.2.1) and queue. For each destination, a different retry policy can be configured.

It is possible to configure the rerouting of a DICOM Store queue. A typical example for when this is needed is a PACS that is temporarily down. The queue can be rerouted to a web server. This web server will then later on forward the images to the PACS. A DICOM Store queue can only be rerouted to another DICOM Store queue with:

- The same output type configured (this includes the SOP class to be used)
- The same GSPS support

If the new destination is configured for Storage Commitment, the storage commit request will be sent to the new destination when processing the job.

By means of a SENT-flag, an image that has already been successfully sent to a specific archive cannot be sent to that archive twice. The SENT-flag can be applied to all DICOM store destinations, including both the archive and the other softcopy destinations (e.g. viewing stations).

2.4.2.1.2 Job description

One archive job can contain multiple images. All these images and their GSPS's will be sent to the archive through a single association.

The user can perform the following actions on existing jobs: "Delete job" and "Expedite job".

When an image in the archive job does not reach its destination, or when the storage commit replies "time out", the job is FAILED.

2.4.2.2 DICOM Print AE

There is only one entry per print job (with possible multiple sheets) in the queue.

All queue actions are done on one print job: retry, reprint, expedite …

2.4.3 Parameters

The specification of important operational parameters, and if configurable, their default value and range, are specified in the table below.

The parameters that apply to all Application Entities are specified in the “General Parameters” section. Those specific to particular Applications are specified in separate sections specific to each AE.

Table 2.4-5: Configurable Parameters for NX x.0.23.00.

Parameter	Configurable (yes/no)	Default value
General Parameters		
Max PDU Receive Size	No	65542
Max PDU Send Size (larger PDUs will never be sent, even if the receiver supports a larger Max PDU Receive Size. If the receiver supports a smaller Max PDU Receive Size then the Max PDU Send Size will be reduced accordingly for the duration of the Association. Max PDU Receive Size information is exchanged during DICOM Association Negotiation in the Maximum Length Sub-Item of the A-ASSOCIATION-RQ and A-ASSOCIATE-AC)	No	65542
Time-out waiting for an acceptance or rejection response to an Association Request (Application Level Timeout)	No	15 minutes
Time-out waiting for a response to an Association release request (Application Level Timeout)	No	15 minutes
Time-out waiting for completion of a TCP/IP connect request (Low-level timeout)	No	100 seconds
Time-out awaiting a Response to a DIMSE Request (Low-Level Timeout)	No	100 seconds
Time-out for waiting for data between TCP/IP-packets (Low Level Timeout)	No	100 seconds
Storage parameters		
Storage SCU time-out waiting for a response to a C-STORE-RQ	No	15 minutes
Number of times a failed send job may be retried	No	Manually: there’s no restriction of the number of retries of failed jobs as long as they aren’t deleted.
Delay between retrying failed send jobs	No	N/A
Supported Transfer Syntaxes (separately configurable for each remote AE)	Yes	
Secure DICOM (SSL)	Yes	
Is Archive?[11]	Yes	
Storage Commit Parameters		
Enable Storage Commit	Yes	
Enable secure DICOM Connection	Yes	
Timeout waiting for a Storage Commitment Notification (maximum duration of applicability for a Storage Commitment Transaction UID).	Yes	
Modality Worklist Parameters		

[11] If yes, images sent to this destination will be referenced in the MPPS.

Parameter	Configurable (yes/no)	Default value
Modality Worklist SCU time-out waiting for the final response to a C-FIND-RQ	No	15 minutes
Maximum number of Worklist Items	No	400
Supported Transfer Syntaxes for Modality Worklist	No	Implicit VR Little Endian Explicit VR Little Endian
Delay between automatic Worklist Updates	Yes	
MPPS Parameters		
Enable MPPS Reporting	Yes	
MPPS SCU time-out waiting for a response to a N-CREATE-RQ	No	15 minutes
MPPS SCU time-out waiting for a response to a N-SET-RQ	No	15 minutes
Supported Transfer Syntaxes for MPPS	No	Implicit VR Little Endian Explicit VR Little Endian
Print Parameters		
Print SCU time-out waiting for a response to a N-CREATE-RQ	No	10 minutes
Print SCU time-out waiting for a response to a N-SET-RQ	No	10 minutes
Print SCU time-out waiting for a response to a N-ACTION-RQ	No	10 minutes
Supported Transfer Syntaxes (separately configurable for each remote printer)	No	Taken from printer device model provided by Agfa.
Number of times a failed print-job may be retried	No	Automatically : 8 times
Delay between retrying failed print-jobs	No	2 times immediately, then the job gets parked for 3 minutes and retried 3 times again. In case the job still fails, it is parked for 5 minutes and retried 3 times.
Print SCU time-out waiting for a response to a N-CREATE-RQ	No	10 minutes

3 MEDIA INTERCHANGE

NX x.0.23.00 is able to create or read DICOM Interchange media. The related capabilities are described in the following sections.

3.1 Implementation Model

3.1.1 Application Data Flow Diagram

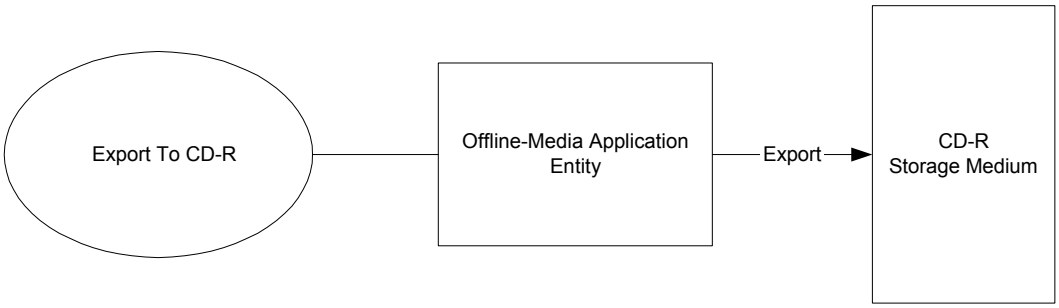


Figure 3.1-1: Application Data Flow Diagram for Media Storage

The Offline-Media Application Entity exports DICOM images and Presentation States to a CD-R Storage medium. It is associated with the local real-world activity “Export Images”. “Export Images” is performed upon user request.

3.1.2 Functional Definition of AEs

3.1.3 Sequencing of Real World Activities

At least one image or presentation state must exist and be selected before the Offline-Media Application Entity can be invoked. The Offline-Media Application Entity is invoked through the local real-world activity “Export Images”.

The operator must insert a new (blank) CD-R media before invocation of the Offline-Media Application Entity. If no CD-R is inserted, the Offline-Media Application Entity will prompt for a media to be inserted before starting to write to the CD-R device. The export job can be canceled from the job queue by clicking “Cancel” on this prompt.

Processed Images are exported in standard DICOM format. A DICOM Viewer is burned with the images on the CD, to view these images later on. The images can be read by any DICOM Compatible application.

Export to a hard disk is NOT supported by NX x.0.23.00.

3.1.4 File Meta Information for Implementation Class and Version

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

Table 3.1-1: File Meta Implementation Class and Version Name

Implementation Class UID	1.3.51.0.1.3
Implementation Version Name	AGFA DTF1.0.XX[12]

[12] XX is the build version number.

3.2 AE Specifications

3.2.1 Offline-Media Application Entity Specification

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

Table 3.2-1: AE Related Application Profiles, Real World Activities and Roles

Application Profile Supported	Real-World Activity	Roles	SC Option
Portable data for imaging	Export to CD-R	FSC (creation of a File-Set)	Interchange

3.2.1.1 Real World Activities

3.2.1.1.1 Real World Activity - Export to CD-R

The Offline-Media Application Entity acts as an FSC using the interchange option when requested to export SOP Instances from the local database to a CD-R medium. If the current contents selection does not fit on a single media, an error message is displayed and the export will fail. The user will be prompted to insert an empty CD-R for each export job. The contents of the export job will be written together with a corresponding DICOMDIR, which is placed in the root directory, to a single-session CD-R. Writing in multi-session mode is supported. The user can cancel an export job in the job queue.

The file names and directory names may reflect the patient name or ID if necessary, but in case the operator selects “anonymous export” these names and IDs should not refer to the actual patient. The aim of anonymous export is that any data, which could be used to derive the identity of the patient, is removed from the image. This includes all dates, UID and other ID’s, patient related information and all related physician’s names. All attributes from the following modules are therefore blanked:

- Patient
- Patient Study
- Patient Medical
- General Study
- General Series
- DX Series
- SOP Common
- General Image

Exceptions exist for attributes which are necessary to correctly import or interpret the image. Therefore the following values are kept or replaced by generated values:

Table 3.2-2: Necessary Values when performing an Anonymous Export.

Attribute	Tag	Set to …
Patient’s Name	(0010,0010)	“Anonymous”
Study Instance UID	(0020,000D)	Keep value
Modality	(0008,0060)	Keep value

Attribute	Tag	Set to …
Series Instance UID	(0020,000E)	Keep value
Laterality	(0020,0060)	Keep value
Series description	(0008,103E)	Keep value
Protocol name	(0018,1030)	Keep value
Body Part Examined	(0018,0015)	Keep value
Smallest Pixel Value in Series	(0028,0108)	Keep value
Largest Pixel Value in Series	(0028,0109)	Keep value
Presentation Intent Type	(0008,0068)	Keep value
SOP Instance UID	(0008,0018)	Keep value
SOP Class UID	(0008,0016)	Keep value
Specific character set	(0008,0005)	Keep value
Patient Orientation	(0020,0020)	Keep value
Image type	(0008,0008)	Keep value
Acquisition Date Time	(0008,002A)	Keep value
Image comments	(0020,4000)	Keep value
Presentation LUT shape	(2050,0020)	Keep value

3.2.1.1.1.1 Media Storage Application Profile

The Offline-Media Application Entity supports the STD-GEN-CD Application Profile.

3.2.1.1.1.1.1 Options

The Offline-Media Application Entity supports the SOP Classes and Transfer Syntaxes listed in the Table below:

Table 3.2-3: IOD'S, SOP Classes and Transfer syntaxes for offline media

IOD	SOP Class UID	Transfer Syntax	Transfer Syntax UID
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
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
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
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
Digital Mammography Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2
Digital Mammography Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Implicit VR Little Endian	1.2.840.10008.1.2
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Explicit VR Little Endian	1.2.840.10008.1.2.1

3.3 Media Configuration

The Source AE Title in the File Meta Information is the AE Title that can be configured in the General Settings in the NX x.0.23.00.

4 SUPPORT FOR EXTENDED CHARACTER SETS

NX x.0.23.00 supports the following character sets:

• ISO-IR 6 (default)	Basic G0 Set
• ISO-IR 100	Latin Alphabet No. 1
• ISO-IR 101	Latin Alphabet No. 2
• ISO-IR 109	Latin Alphabet No. 3
• ISO-IR 110	Latin Alphabet No. 4
• ISO-IR 148	Latin Alphabet No. 5
• ISO-IR 126	Greek
• ISO-IR 144	Cyrillic
• ISO-IR 127	Arabic
• ISO-IR 13	Japanese
• ISO-IR 138	Hebrew
Chinese Character Sets	
• GB18030	GB18030-2000
• ISO 2022 B5	Big 5
• ISO 2022 GBK	GB 2313-80
Japanese Character Sets	
• ISO 2022 IR 87	ASCII and Kanji
• ISO 2022 IR 13 ISO 2022 IR 87	Katakana, Roman and Kanji
• ISO 2022 IR 159	Japanese suppl. Kanji
Other Character Sets	
• ISO 2022 IR 126	Greek
• ISO 2022 IR 144	Cyrillic
• ISO 2022 IR 138	Hebrew
• ISO 2022 IR 149	Korean
• ISO 2022 IR 127	Arabic
• ISO 2022 IR 100	Latin alphabet No 1
• ISO 2022 IR 101	Latin alphabet No 2
• ISO 2022 IR 109	Latin alphabet No 3
• ISO 2022 IR 110	Latin alphabet No 4
• ISO 2022 IR 148	Latin alphabet No 5
• UTF-8	Unicode

5 SECURITY

5.1 Security Profiles

NX x.0.23.00 supports the following profiles:

- Basic TLS Secure Transport Connection Profile
- Basic Network Address Management Profile
- Basic Time synchronization Profile

5.2 Association Level Security

NX x.0.23.00 supports secure associations using TLS. Associations are only allowed to be opened when they are received from an AE title that is known to the Workstation (i.e. the specific AE title has been configured in the NX x.0.23.00).

5.3 Application Level Security

NX x.0.23.00 supports application level security by means of role based access control. These user roles are associated to the Windows OS users. In the NX x.0.23.00, user roles can be assigned to certain accounts. Some of the user roles can be modified or new ones can be created by a user with the appropriate rights.

By default the workstation will be configured to automatically log the current user out after a certain period of non-activity.

Audit logging to an external repository is supported.

NX x.0.23.00 can be configured to get its time from an NTP-server.

6 ANNEXES

6.1 IOD Contents

6.1.1 Created SOP Instances

The following tables use a number of abbreviations. The abbreviations used in the "Presence of Value"- column, are:

- VNAP Value Not Always Present (attribute sent zero length if no value is present)
- ANAP Attribute Not Always Present
- ALWAYS Always Present with a value
- EMPTY Attribute is sent without a value

The abbreviations used in the "Source"-column:

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

6.1.1.1 Common Modules

Table 6.1-1*: Common Modules*

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient					
Patient Identification					
Patient's Name	(0010,0010)	PN		VNAP	User / MWL
Patient ID	(0010,0020)	LO		VNAP	User / MWL
Issuer of Patient ID	(0010,0021)	LO		ANAP	MWL
Other Patient IDs	(0010,1000)	LO		ANAP	MWL / MWL
Other Patient Names	(0010,1001)	PN		ANAP	MWL
Patient's Birth Name	(0010,1005)	PN		ANAP	MWL
Patient's Mother's Birth Name	(0010,1060)	PN		ANAP	MWL
Medical Record Locator	(0010,1090)	LO		ANAP	MWL
Patient Demographic					
Patient's Age	(0010,1010)	AS		ANAP	User / MWL
Occupation	(0010,2180)	SH		ANAP	MWL
Confidentiality Constraint on Patient Data Description	(0040,3001)	LO		ANAP	MWL
Patient's Birth Date	(0010,0030)	DA		VNAP	User / MWL
Patient's Birth Time	(0010,0032)	TM		VNAP	User / MWL
Patient's Sex	(0010,0040)	CS		VNAP	User / MWL
Patient's Insurance Plan Code Sequence	(0010,0050)	SQ		ANAP	MWL
> Code Sequence					

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Primary Language Code Sequence	(0010,0101)	SQ		ANAP	MWL
> Patient's Primary Language Code Modifier Sequence	(0010,0102)	SQ		ANAP	MWL
>> Code Sequence					
Patient's Size	(0010,1020)	DS		ANAP	User / MWL
Patient's Weight	(0010,1030)	DS		ANAP	User / MWL
Patient's Address	(0010,1040)	LO		ANAP	MWL
Military Rank	(0010,1080)	LO		ANAP	User / MWL
Branch of Service	(0010,1081)	LO		ANAP	User / MWL
Country of Residence	(0010,2150)	LO		ANAP	MWL
Region of Residence	(0010,2152)	LO		ANAP	MWL
Patient's Telephone Numbers	(0010,2154)	SH		ANAP	MWL
Ethnic Group	(0010,2160)	SH		ANAP	User / MWL
Patient's Religious Preference	(0010,21F0)	LO		ANAP	MWL
Patient Comments	(0010,4000)	LT		ANAP	User / MWL
Responsible Person	(0010,2297)	PN		ANAP	MWL
Responsible Person Role	(0010,2298)	PN		ANAP	MWL
Organisation	(0010,2299)	LO		ANAP	MWL
Patient Species Description	(0010,2201)	LO			User / MWL
Patient Breed Code Sequence	(0010,2293)	SQ			
>CID7480					
Patient Breed Description	(0010,2292)	LO		ANAP	User / MWL
Breed Registration Sequence	(0010,2294)	SQ		ANAP	User / MWL
>Breed Registration Number	(0010,2295)	LO			User / MWL
>Breed Registry Code Sequence	(0010,2296)	SQ			User / MWL
>>CID7481					
Visit Status & Visit Relationship					
Referenced Patient Sequence	(0008,1120)	SQ		ANAP	MWL
>Referenced SOP Class UID	(0008,1150)	UI		ANAP	MWL
>Referenced SOP Instance UID	(0008,1155)	UI		ANAP	MWL
Current Patient Location	(0038,0300)	LO		ANAP	MWL
Patient's Institution Residence	(0038,0400)	LO		ANAP	MWL
Patient Medical					
Medical Alerts	(0010,2000)	LO		ANAP	MWL
Contrast Allergies	(0010,2110)	LO		ANAP	MWL
Smoking Status	(0010,21A0)	CS		ANAP	User / MWL
Pregnancy Status	(0010,21C0)	US		ANAP	User / MWL
Last Menstrual Date	(0010,21D0)	DA		ANAP	User / MWL
Special Needs	(0038,0050)	LO		ANAP	MWL
Patient State	(0038,0500)	LO		ANAP	MWL
Additional Patient's History	(0010,21B0)	LT		ANAP	MWL
Sexneutered	(0010,2203)	CS		ANAP	User / MWL
Study					
General Study					
Study Instance UID	(0020,000D)	UI		ALWAYS	MWL / Auto
Study Date	(0008,0020)	DA		ALWAYS	Auto
Study Time	(0008,0030)	TM		ALWAYS	Auto
Referring Physician's Name	(0008,0090)	PN		VNAP	User / MWL

Attribute Name	Tag	VR	Value	Presence of Value	Source
Referring Physician Identification Sequence	(0008,0096)	SQ		ANAP	MWL
Study ID	(0020,0010)	SH	Requested Procedure ID or generated for unscheduled (app A IHE note 5)	ALWAYS	Auto / MWL
Accession Number	(0008,0050)	SH		VNAP	User / MWL
Study Description	(0008,1030)	LO	Performed Procedure step Description	ANAP	Auto
Physician(s) of Record	(0008,1048)	PN		ANAP	MWL
Physician(s) of Record Identification Sequence	(0008,1049)	SQ		ANAP	MWL
Name of Physician(s) Reading Study	(0008,1060)	PN		ANAP	MWL
Physician(s) Reading Study Identification Sequence	(0008,1062)			ANAP	User
Referenced Study Sequence	(0008,1110)	SQ		ANAP	MWL
>Referenced SOP Class UID	(0008,1150)	UI		ANAP	MWL
>Referenced SOP Instance UID	(0008,1155)	UI		ANAP	MWL
Procedure Code Sequence	(0008,1032)	SQ		ANAP	MWL
Patient Study					
Admitting Diagnoses Description	(0008,1080)	LO		ANAP	MWL
Admitting Diagnoses Code Sequence	(0008,1084)	SQ		ANAP	MWL
Series					
General Series					
Modality	(0008,0060)	CS		ALWAYS	Config, >Archive settings SOP Class
Series Instance UID	(0020,000E)	UI	Different for each image	ALWAYS	Auto
Series Number	(0020,0011)	IS		ALWAYS	Auto
Laterality	(0020,0060)	CS	Based on protocol code	ALWAYS	User / Auto
Performing Physicians' Name	(0008,1050)	PN		ANAP	User
Performing Physician's Identification Sequence	(0008,1052)	SQ		ANAP	MWL
Series Description	(0008,103E)	LO	Exposure Type Name	ALWAYS	Auto
Operators' Name	(0008,1070)	PN	Depending on security setting either auto filled in with login	ANAP	User / Auto
Operator Identification Sequence	(0008,1072)	SQ		ANAP	
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ		ANAP	Auto
>Referenced SOP Class UID	(0008,1150)	UI		ANAP	Auto
>Referenced SOP Instance UID	(0008,1155)	UI		ANAP	Auto
Request Attributes Sequence	(0040,0275)	SQ		ANAP	MWL
>Requested Procedure ID	(0040,1001)	SH		ANAP	MWL
>Reason for Requested Procedure Code Sequence	(0040,100A)	SQ	Screening/Diagnostic		
>Scheduled Procedure Step ID	(0040,0009)	SH		ANAP	MWL

Attribute Name	Tag	VR	Value	Presence of Value	Source
>Scheduled Procedure Step Description	(0040,0007)	LO		ANAP	MWL
>Scheduled Protocol Code Sequence	(0040,0008)	SQ	[13]	ANAP	MWL
Requested Procedure Description	(0032,1060)	LO		ANAP	Manual / MWL
Performed Procedure Step ID	(0040,0253)	SH		ANAP	Auto
Performed Procedure Step Description	(0040,0254)	LO		Exam group names of exposures in the study	Auto
Performed Procedure Step Start Date	(0040,0244)	DA			Auto
Performed Procedure Step Start Time	(0040,0245)	TM			Auto
Performed Protocol Sequence	(0040,0260)	SQ			
Comments on the Performed Procedure Step	(0040,0280)	LO		ANAP	Auto
Equipment					
General Equipment					
Station Name	(0008,1010)	SH			Auto
Institution Name	(0008,0080)	LO		ANAP	MWL/ Config
Institution Address	(0008,0081)	ST		ANAP	MWL /Config
Institutional Department Name	(0008,1040)	LO		ANAP	MWL/ Config
Manufacturer	(0008,0070)	LO		ALWAYS	Auto (from digitizer)
Manufacturer's Model Name	(0008,1090)	LO		ANAP	Auto (from digitizer)
Device Serial Number	(0018,1000)	LO		ANAP	Auto
Gantry ID	(0018,1008)	LO		ANAP	Auto
Software Versions	(0018,1020)	LO		ANAP	Auto
Pixel Padding Value	(0028,0120)	US/SS		ANAP	
Pixel Padding Range Limit	(0028,0121	US/SS		ANAP	
Image[14]					
General Image					
Instance Number	(0020,0013)	CS		ALWAYS	Auto
Patient Orientation	(0020,0020)	IS		ALWAYS	Auto
Content Date	(0008,0023)	DT		VNAP	Auto
Content Time	(0008,0033)	TM		VNAP	Auto
Image Type	(0008,0008)	CS		ALWAYS	Auto
Acquisition Date	(0008,0022)	DA		ALWAYS	Auto / User
Acquisition Time	(0008,0032)	TM		ALWAYS	Auto / User
Acquisition Datetime	(0008,002A)	DT		ALWAYS	Auto
Derivation description	(0008,2111)	ST		ANAP	Auto
Source Image Sequence	(0008,2112)	SQ		ANAP	Auto
> Referenced SOP Class UID	(0008,1150)	UI			
> Referenced SOP Instance UID	(0008,1155)	UI			
> Referenced Frame Number	(0008,1160)	IS			

[13] The following rules are applicable for DICOM:
- When 0008,102 was not supplied by the RIS, its value will be "UNKNOWN".
- When 0008,103 was not supplied by the RIS, its value will be "UNKNOWN".
- When 0008,104 was not supplied by the RIS, its value will be "UNKNOWN".

[14] These tags are only applicable to Image SOP Classes (not valid for SR and GSPS)

Attribute Name	Tag	VR	Value	Presence of Value	Source
> Purpose of Reference Code Sequence	(0040,A170)	SQ		ANAP	Auto
Image Comments	(0020,4000)	LT		ANAP	User
Quality Control Image	(0028,0300)	CS	When exposure is defined as QC in study tree	ANAP	Auto
Burned in Annotation	(0028,0301)	CS	No	ALWAYS	Fixed
Lossy Image Compression	(0028,2110)	CS		EMPTY	Empty
Lossy Image Compression Ratio	(0028,2112)	DS		ANAP	Auto
Patient Position	(0018,5100)	CS		ANAP	
Irradiation Event UID	(0008,3010)	CS		ALWAYS	Auto
Image Pixel					
Samples per Pixel	(0028,0002)	US	1	ALWAYS	Fixed
Photometric Interpretation [15]	(0028,0004)	CS	M1 or M2	ALWAYS	Auto
Planar Configuration	(0028,0006)	US		ALWAYS	
Rows	(0028,0010)	US		ALWAYS	Auto
Columns	(0028,0011)	US		ALWAYS	Auto
Pixel Aspect Ratio	(0028,0034)	IS		ANAP	Auto
Bits Allocated	(0028,0100)	US		ALWAYS	Auto
Bits Stored	(0028,0101)	US		ALWAYS	Auto
High Bit	(0028,0102)	US		ALWAYS	Auto
Pixel Representation [16]	(0028,0103)	US		ALWAYS	Auto
Pixel Spacing	(0028,0030)	DS		ALWAYS	
Pixel Spacing Calibration Type	(0028,0A02)	CS	FIDUCIAL GEOMETRY	ANAP	Auto
Pixel Spacing Calibration Description	(0028,0A04)	LO	▪ In case of FLFS stitched image: “Stitching grid, 5x5cm“ ▪ In case of ERMF tool: “Manually entered distance in cm” ▪ In case of calibration tool: “Manually entered size in cm of an object in the image”	ALWAYS[17]	Auto
Pixel Data	(7FE0,0010)	OW/OB		ALWAYS	Auto
SOP Common					
SOP Class UID	(0008,0016)	UI		ALWAYS	Fixed
SOP Instance UID	(0008,0018)	UI		ALWAYS	Auto
Specific Character Set	(0008,0005)	CS		ANAP	Config
Instance Creation Date	(0008,0012)	DA		ANAP	Auto
Instance Creation Time	(0008,0013)	TM		ANAP	Auto
Instance Creator UID	(0008,0014)	UI		ANAP	

[15] Fixed M1 when using DX for Processing
[16] Depends on digitizer type. In case of DX for Processing, the pixel representation is fixed 0
[17] Attribute always present when (0028,0A02) is present

6.1.1.2 CR

6.1.1.2.1 CR Image IOD

Table 6.1-2*: IOD of Created CR Image SOP Instances*

IE	Module	Reference	Presence of Module
Patient	Patient Identification	Table 6.1-1	ALWAYS
	Extended Patient	Table 6.1-1	If received from MWL
Study	General Study	Table 6.1-1	ALWAYS
	Patient Study	Table 6.1-1	ALWAYS
Series	General Series	Table 6.1-1	ALWAYS
	CR Series	Table 6.1-3	ALWAYS
Equipment	General Equipment	Table 6.1-1	ALWAYS
Image	General Image	Table 6.1-1	ALWAYS
	Image Pixel	Table 6.1-1	ALWAYS
	CR Image	Table 6.1-3	ALWAYS
	Modality LUT	Table 6.1-3	ALWAYS
	VOI LUT	Table 6.1-3	ALWAYS
	SOP Common	Table 6.1-1	ALWAYS

6.1.1.2.2 CR Modules

Table 6.1-3*: CR Modules of Created SOP Instances*

Attribute Name	Tag	VR	Value	Presence of Value	Source
Series					
CR Series					
View Position	(0018,5101)	CS	Based on protocol code	ALWAYS	Auto / User
Focal Spot	(0018,1190)	DS	0 to 1 (mm), 0 = small focus, 1 = large focus		Auto/XRDI(1)
Filter Type	(0018,1160)	SH			Auto
Body Part Examined	(0018,0015)	CS	Based on protocol code	ALWAYS	Auto / User
Collimator/ Grid Name	(0018,1180)	SH			
Plate Type	(0018,1260)	SH		ALWAYS	Auto
Image					
CR Image					
Photometric Interpretation	(0028,0004)	CS		ALWAYS	Fixed per archive model
KVP	(0018,0060)	DS		ANAP (1)	Auto
Plate ID	(0018,1004)	LO		ALWAYS	Auto
Distance Source to Detector	(0018,1110)	DS		ANAP (1)	Auto
Distance Source to Patient	(0018,1111)	DS		ANAP (1)	Auto
Exposure Time	(0018,1150)	IS		ANAP (1)	Auto
X-Ray Tube Current	(0018,1151)	IS		ANAP (1)	Auto
Exposure	(0018,1152)	IS		ANAP (1)	Auto
Exposure in µAs	(0018,1153)	IS		ANAP (1)	Auto
Imager Pixel Spacing	(0018,1164)	DS		ALWAYS	Auto
Pixel Spacing	(0028,0030)	DS		ALWAYS	Auto

Attribute Name	Tag	VR	Value	Presence of Value	Source
Acquisition Device Processing Description	(0018,1400)	LO		ANAP	Auto
Acquisition Device Processing Code	(0018,1401)	LO		ANAP	Auto
Cassette Orientation	(0018,1402)	CS		ALWAYS	Auto / User
Cassette Size	(0018,1403)	CS		ALWAYS	Auto
Exposures on Plate	(0018,1404)	US		ANAP	
Relative X-Ray Exposure	(0018,1405)	IS	Lgm value multiplied by 100	ANAP	Auto
Exposure Index	(0018,1411)	DS		ANAP[18]	Auto
Target Exposure Index	(0018,1412)	DS		ANAP[19]	Auto
Deviation Index	(0018,1413)	DS		ANAP[20]	Auto
Sensitivity	(0018,6000)	DS		ANAP	Config / User
Modality LUT					
Modality LUT Sequence	(0028,3000)	SQ		ANAP	Auto
> LUT Descriptor	(0028,3002)	SS		ANAP	Auto
> LUT Explanation	(0028,3003)	LO		ANAP	Auto
> Modality LUT Type	(0028,3004)	LO		ANAP	
> LUT Data	(0028,3006)	SS		ANAP	Auto
Rescale Intercept	(0028,1052)	DS		ANAP	Auto
Rescale Slope	(0028,1053)	DS		ANAP	Auto
Rescale Type	(0028,1054)	LO		ANAP	Auto
VOI LUT					
VOI LUT Sequence	(0028,3010)	SQ		ANAP	Config
> LUT Descriptor	(0028,3002)	SS		ANAP	Auto
> LUT Explanation	(0028,3003)	LO		ANAP	Auto
> LUT Data	(0028,3006)	SS		ANAP	Auto
Window Center	(0028,1050)	DS		ANAP	Auto
Window Width	(0028,1051)	DS		ANAP	Auto
Window Center & Width Explanation	(0028,1055)	LO		ANAP	Auto

(1): Can only be available in case of XRDI.

6.1.1.3 DX

6.1.1.3.1 DX Image IOD

Table 6.1-4*: IOD of Created DX Image SOP Instances*

IE	Module	Reference	Presence of Module
Patient	Patient Identification	Table 6.1-1	ALWAYS
	Extended Patient	Table 6.1-1	If received from MWL
Study	General Study	Table 6.1-1	ALWAYS

[18] Present when NX is configured for EI and not for lgm
[19] Present when NX is configured for EI and not for lgm and when the dose statistic is complete or fixed
[20] Present when NX is configured for EI and not for lgm and when the dose statistic is complete or fixed

IE	Module	Reference	Presence of Module
	Patient Study	Table 6.1-1	ALWAYS
Series	General Series	Table 6.1-1	ALWAYS
	DX Series	Table 6.1-5	ALWAYS
Equipment	General Equipment	Table 6.1-1	ALWAYS
Image	General Image	Table 6.1-1	ALWAYS
	Image Pixel	Table 6.1-1	ALWAYS
	Display Shutter	Table 6.1-5	When shutter is applied
	DX Anatomy	Table 6.1-5	ALWAYS
	DX Image	Table 6.1-5	ALWAYS
	DX Detector	Table 6.1-5	ALWAYS
	X-Ray Tomography Acquisition	Table 6.1-5	When the XRDI Module is installed
	X-Ray Acquisition Dose	Table 6.1-5	When the XRDI Module is installed
	X-Ray Collimator	Table 6.1-5	When the XRDI Module is installed
	DX Positioning	Table 6.1-5	
	VOI LUT	Table 6.1-5	ALWAYS
	Acquisition Context	Table 6.1-5	ALWAYS
	SOP Common	Table 6.1-1	ALWAYS

6.1.1.3.2 DX Modules

Table 6.1-5*: DX Module of Created SOP Instances*

Attribute Name	Tag	VR	Value	Presence of Value	Source
Series					
DX Series					
Modality	(0008,0060)	CS	DX	ALWAYS	Config
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ		ANAP	Auto
> Referenced SOP Class UID	(0008,1150)	UI		ANAP	Auto
> Referenced SOP Instance UID	(0008,1155)	UI		ANAP	Auto
Presentation Intent Type	(0008,0068)	CS	For Processing/For Presentation	ALWAYS	Config
Image					
Display Shutter					
Shutter Shape	(0018,1600)	CS		ALWAYS	User
Shutter Left Vertical Edge	(0018,1602)	IS		ANAP	User
Shutter Right Vertical Edge	(0018,1604)	IS		ANAP	User
Shutter Upper Horizontal Edge	(0018,1606)	IS		ANAP	User
Shutter Lower Horizontal Edge	(0018,1608)	IS		ANAP	User
Center of Circular Shutter	(0018,1610)	IS		ANAP	User
Radius of Circular Shutter	(0018,1612)	IS		ANAP	User
Vertices of Polygonal Shutter	(0018,1620)	IS		ANAP	User
Shutter Presentation Value	(0018,1622)	US		ANAP	User
DX Anatomy					
Anatomic Region Sequence	(0008,2218)	SQ		ANAP	Config / User
> Anatomic Region Modifier Sequence	(0008,2220)	SQ		ANAP	Config
Image Laterality	(0020,0062)	CS		ALWAYS	Config / User
DX Image					

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS	ORIGINAL when coming from a digitizer, DERIVED when the image comes from a Save as new. The sub-attribute IOD Specific Characteristics is filled in with the exposure type name for QA images (used by Auto-QC2)	ALWAYS	Auto
Samples per Pixel	(0028,0002)	US		ALWAYS	Auto
Photometric Interpretation	(0028,0004)	CS		ALWAYS	Config
Bits Allocated	(0028,0100)	US		ALWAYS	Auto
Bits Stored	(0028,0101)	US		ALWAYS	Auto
High Bit	(0028,0102)	US		ALWAYS	Auto
Pixel Representation	(0028,0103)	US		ALWAYS	Auto
Planar Configuration	(0028,0006)	US		ALWAYS	
Pixel Intensity Relationship	(0028,1040)	CS		ALWAYS	Auto
Pixel Intensity Relationship Sign	(0028,1041)	SS		ALWAYS	Auto
Rescale Intercept [21]	(0028,1052)	DS	0 and 1	ALWAYS	Config
Rescale Slope [22]	(0028,1053)	DS	0 and 1	ALWAYS	Config
Rescale Type	(0028,1054)	LO		ALWAYS	Config
Presentation LUT Shape	(2050,0020)	CS	IDENTITY	ALWAYS	Fixed
Lossy Image Compression	(0028,2110)	CS	00	ALWAYS	Fixed
Lossy Image Compression Ratio	(0028,2112)	DS		ANAP	Auto
Derivation Description	(0008,2111)	ST		ANAP	Auto
Acquisition Device Processing Description	(0018,1400)	LO		ANAP	Auto
Acquisition Device Processing Code	(0018,1401)	LO		ANAP	Auto
Patient Orientation	(0020,0020)	CS		ALWAYS	Auto
Calibration Image	(0050,0004)	CS		ANAP	Config
Burned in Annotation	(0028,0301)	CS	YES	ALWAYS	Fixed
VOI LUT Sequence	(0028,3010)	SQ		ANAP	Auto
>LUT Descriptor	(0028,3002)	SS		ANAP	Auto
>LUT Explanation	(0028,3003)	LO		ANAP	Auto
>LUT Data	(0028,3006)	SS		ANAP	Auto
Window Center	(0028,1050)	DS		ANAP	Auto
Window Width	(0028,1051)	DS		ANAP	Auto
Window Center & Width Explanation	(0028,1055)	LO		ANAP	Auto
DX Detector					
Detector Type	(0018,7004)	CS		ANAP	Auto
Detector Description	(0018,7006)	LT	For the DX/S family of digitizers: 0 = Phosphor IP 1 = Needle IP	ANAP	Auto

[21] Fixed when using DX for Processing
[22] Fixed when using DX for Processing

Attribute Name	Tag	VR	Value	Presence of Value	Source
			For the ADC Compact family of digitizers: - Label of the type of storage phosphor plates (e.g. MD10)		
Detector Mode	(0018,7008)	LT		ANAP(1)	Auto
Detector ID	(0018,700A)	SH	For the DX/S family of digitizers, this is the Image plate ID. For the ADC Compact family of digitizers, this is the cassette ID.	ALWAYS	Auto
Date of Last Detector Calibration	(0018,700C)	DA		ANAP	Auto
Time of Last Detector Calibration	(0018,700E)	TM		ANAP	Auto
Detector temperature	(0018,7001)	DS		ANAP (1)	Auto
Sensitivity	(0018,6000)	DS		ANAP	Config / User
Field of View Shape	(0018,1147)	CS		ANAP (1)	Auto
Field of view Dimension(s)	(0018,1149)	IS		ANAP (1)	Auto
Field of View Origin	(0018,7030)	DS		ANAP (1)	Auto
Field of View Rotation	(0018,7032)	DS		ANAP	User
Field of View Horizontal Flip	(0018,7034)	CS		ANAP	User
Imager Pixel Spacing	(0018,1164)	DS		ALWAYS	Auto
Pixel Spacing	(0028,0030)	DS		ANAP	Auto
Detector Element Physical Size	(0018,7020)	DS		ANAP	Auto
Detector Element Spacing	(0018,7022)	DS		ANAP	Auto
Detector Active Shape	(0018,7024)	CS	RECTANGLE	ANAP	Fixed
Detector Active Dimension(s)	(0018,7026)	DS	Cassette size translated into MM	ANAP	Auto
X-Ray Collimator					
Collimator Shape	(0018,1700)	CS		ALWAYS	Auto / User
Collimator Left Vertical Edge	(0018,1702)	IS		ANAP	Auto / User
Collimator Right Vertical Edge	(0018,1704)	IS		ANAP	Auto / User
Collimator Upper Horizontal Edge	(0018,1706)	IS		ANAP	Auto / User
Collimator Lower Horizontal Edge	(0018,1708)	IS		ANAP	Auto / User
Center of Circular Collimator	(0018,1710)	IS		ANAP	Auto / User
Radius of Circular Collimator	(0018,1712)	IS		ANAP	Auto / User
Vertices of the Polygonal Collimator	(0018,1720)	IS		ANAP	Auto / User
DX Positioning					
Patient Position	(0018,5100)	CS		ANAP	User
View Position	(0018,5101)	CS	Based on protocol code	ANAP	Auto / User
View Code Sequence	(0054,0220)	SQ		ANAP	Auto
>View Modifier Code Sequence	(0054,0222)	SQ		ANAP	Auto
Distance Source to Patient	(0018,1111)	DS		ANAP (1)	Auto
Distance Source to Detector	(0018,1110)	DS		ANAP (1)	Auto
Estimated Radiographic Magnification Factor	(0018,1114)	DS	0.00 to 9.99	ANAP (1)	User/XRDI(1)
Positioner Type	(0018,1508)	CS		ANAP (1)	Auto
Positioner Primary Angle	(0018,1510)	DS	-180 to +180 (Degree)	ANAP (1)	Auto/XRDI(1)
Positioner Secondary Angle	(0018,1511)	DS		ANAP (1)	Auto
Detector Primary Angle	(0018,1530)	DS		ANAP (1)	Auto

Attribute Name	Tag	VR	Value	Presence of Value	Source
Detector Secondary Angle	(0018,1531)	DS		ANAP (1)	Auto
Body Part Thickness	(0018,11A0)	DS	0 to 999 (mm)	ANAP	User/XRDI(1)
Compression Force	(0018,11A2)	DS	0 to 99 (kg)	ANAP	User/XRDI(1)
X-Ray Tomography Acquisition					
Tomo Layer Height	(0018,1460)	DS		ALWAYS	Auto
Tomo Angle	(0018,1470)	DS		ANAP	Auto
Tomo Time	(0018,1480)	DS		ANAP	Auto
Tomo Type	(0018,1490)	CS	Enumerated Values: LINEAR SPIRAL CIRCULAR POLYCYCLOIDAL	ANAP	Auto
Tomo Class	(0018,1491)	CS	Enumerated Values: MOTION TOMOSYNTHESIS	ANAP	Auto
Number of Tomosynthesis Source	(0018,1495)	IS		ANAP	Auto
X-Ray Acquisition dose					
KVP	(0018,0060)	DS	0 to 99	ANAP (1)	User/XRDI(1)
X-Ray Tube Current	(0018,1151)	IS		ANAP (1)	User/XRDI(1)
Exposure Time	(0018,1150)	IS	0 to 99999 (ms)	ANAP (1)	User/XRDI(1)
Exposure	(0018,1152)	IS	0 to 999	ANAP (1)	User/XRDI(1)
Exposure in µAs	(0018,1153)	IS	0 to 999	ANAP (1)	Auto/XRDI(1)
Image Area Dose Product	(0018,115E)	DS		ANAP (1)	Auto
Relative X-Ray Exposure	(0018,1405)	IS	Lgm value multiplied by 100	ANAP	Auto
Entrance Dose in mGy	(0040,8302)	US		ANAP (1)	User/XRDI(1)
Exposed Area	(0040,0303)	US		ANAP (1)	Auto
X-Ray Output	(0040,0312)	DS		ANAP (1)	Auto
Organ Dose	(0040,0316)	DS	0.0 to 99.9, 100 to 999, Calculation error = "----" (4 blanks), >999mGy = "----" (4 blanks)	ANAP (1)	User/XRDI(1)
Organ Exposed	(0040,0318)	CS		ANAP (1)	Auto
Exposure Index	(0018,1411)	DS		ANAP[23]	Auto
Target Exposure Index	(0018,1412)	DS		ANAP[24]	Auto
Deviation Index	(0018,1413)	DS		ANAP[25]	Auto
Anode target Material	(0018,1191)	CS	0 to 1, 0 = W, 1= Mo	ANAP (1)	User/XRDI(1)
Filter Material	(0018,7050)	CS	0 to 1, 0 = Rh, 1= Mo	ANAP (1)	User/XRDI(1)
Filter Thickness Maximum	(0018,7054)	DS		ANAP (1)	Auto
Grid	(0018,1166)	CS	0 to 1, 0 = Grid, 1 = No Grid	ANAP (1)	User/XRDI(1)
Grid Absorbing Material	(0018,7040)	LT		ANAP (1)	User/XRDI(1)
Grid Spacing Material	(0018,7041)	DS		ANAP (1)	User/XRDI(1)
Grid Thickness	(0018,7042)	DS		ANAP (1)	User/XRDI(1)
Grid Pitch	(0018,7044)	DS		ANAP (1)	User/XRDI(1)
Grid Aspect Ratio	(0018,7046)	IS		ANAP (1)	User/XRDI(1
Grid Period	(0018,7048)	DS		ANAP (1)	User/XRDI(1

[23] Present when NX is configured for EI and not for lgm
[24] Present when NX is configured for EI and not for lgm and when the dose statistic is complete or fixed
[25] Present when NX is configured for EI and not for lgm and when the dose statistic is complete or fixed

Attribute Name	Tag	VR	Value	Presence of Value	Source
Exposure Control Mode	(0018,7060)	CS	- Manual - Automatic	ANAP (1)	User/XRDI(1)
Exposure Control Mode Description	(0018,7062)	LT		ANAP (1)	User/XRDI(1)
Phototimer Setting	(0018,7065)	DS		ANAP (1)	User/XRDI(1)
Grid Focal Distance	(0018,704C)	DS		ANAP (1)	User/XRDI(1)
VOI LUT					
VOI LUT Sequence	(0028,3010)	SQ		ANAP	Auto
>LUT Descriptor	(0028,3002)	SS		ANAP	Auto
>LUT Explanation	(0028,3003)	LO		ANAP	Auto
>LUT Data	(0028,3006)	SS		ANAP	Auto
Window Center	(0028,1050)	DS		ANAP	Auto
Window Width	(0028,1051)	DS		ANAP	Auto
Window Center & Width Explanation	(0028,1055)	LO		ANAP	Auto
Acquisition Context					
Acquisition Context Sequence	(0040,0555)	SQ		EMPTY	Fixed
>Acquisition Context Description	(0040,0556)	ST		ANAP(2)	Auto
> Measurement Units Code Sequence	(0040,08EA)	SQ		EMPTY	Fixed
> Concept Name Code Sequence	(0040,A043)	SQ		EMPTY	Fixed
> Numeric Value	(0040,A30A)	DS		EMPTY	Fixed
> Date	(0040,A121)	DT		EMPTY	Fixed
> Time	(0040,A122)	TM		EMPTY	Fixed
> Person Name	(0040,A123)	PN		EMPTY	Fixed
> Referenced Frame numbers	(0040,A136)	US		EMPTY	Fixed
> Text Value	(0040,A160)	UT		EMPTY	Fixed
> Concept Code Sequence	(0040,A168)	SQ		EMPTY	Fixed
>Numeric Value	(0040,A30A)			EMPTY	Fixed

(1) Can only be available in case of XRDI.
(2) Never present

6.1.1.4 MG

6.1.1.4.1 MG Image IOD

Table 6.1-6*: IOD of Created MG Image SOP Instances*

IE	Module	Reference	Presence of Module
Patient	Patient Identification	Table 6.1-1	ALWAYS
	Extended Patient	Table 6.1-1	If received from MWL
Study	General Study	Table 6.1-1	ALWAYS
	Patient Study	Table 6.1-1	ALWAYS
Series	General Series	Table 6.1-1	ALWAYS
	DX Series	Table 6.1-5	ALWAYS
	Mammography Series	Table 6.1-7	ALWAYS
Equipment	General Equipment	Table 6.1-1	ALWAYS
Image	General Image	Table 6.1-1	ALWAYS

IE	Module	Reference	Presence of Module
	Image Pixel	Table 6.1-1	ALWAYS
	Display Shutter	Table 6.1-5	When shutter is applied
	DX Anatomy	Table 6.1-5	ALWAYS
	DX Image	Table 6.1-5	ALWAYS
	DX Detector	Table 6.1-5	ALWAYS
	X-Ray acquisition dose	Table 6.1-5	When the XRDI Module is installed
	X-Ray Collimator	Table 6.1-5	When the XRDI Module is installed
	DX Positioning	Table 6.1-5	
	Mammography Image	Table 6.1-7	ALWAYS
	VOI LUT	Table 6.1-5	ALWAYS
	Acquisition Context	Table 6.1-5	ALWAYS
	SOP Common	Table 6.1-1	ALWAYS

6.1.1.4.2 MG Modules

Table 6.1-7*: MG Module of Created SOP Instances*

Attribute Name	Tag	VR	Value	Presence of Value	Source
Series					
Mammography Series					
Modality	(0008,0060)	CS	MG	ALWAYS	Config
Request Attributes Sequence	(0040,0275)	DS	Sequence that contains attributes from the Imaging Service Request	ANAP	MWL
Equipment					
General Equipment					
Pixel Padding Value	(0028,0120)	US or SS		ANAP	Auto
Image					
Mammography Image					
Positioner Type	(0018,1508)	CS	Mammographic None	ALWAYS	Auto
Distance Source to detector	(0018,1110)	DS		ANAP	Auto
Distance Source to patient	(0018,1111)	DS		ANAP	Auto
Positioner Primary Angle	(0018,1510)	DS		ANAP	User/XRDI[26]
Positioner Secondary Angle	(0018,1511)	DS		ANAP	User/XRDI
Image Laterality	(0020,0062)	CS	R = right L = left B = both (e.g. cleavage)	ALWAYS	Auto
Organ Exposed	(0040,0318)	CS	BREAST	ALWAYS	Auto
Implant Present	(0028,1300)	DS	YES NO	ANAP	Config
View Code Sequence	(0054,0220)	CS		Always	Config / User
View Modifier Code Sequence	(0054,0222)	SQ		ANAP	Config / User
Image Pixel					

[26] Value is supplied by user of XRDI component in case of XRDI configuration

Attribute Name	Tag	VR	Value	Presence of Value	Source
Pixel Padding Range Limit	(0028,0121)	US or SS		ANAP	Auto

6.1.1.5 XRF

6.1.1.5.1 XRF Image IOD

Table 6.1-8*: IOD of Created XRF Image SOP Instances*

IE	Module	Reference	Presence of Module
Patient	Patient Identification	Table 6.1-1	ALWAYS
	Extended Patient	Table 6.1-1	If received from MWL
Study	General Study	Table 6.1-1	ALWAYS
	Patient Study	Table 6.1-1	ALWAYS
Series	General Series	Table 6.1-1	ALWAYS
Frame of Reference	Synchronization	Table 6.1-9	
Equipment	General Equipment	Table 6.1-1	ALWAYS
Image	General Image	Table 6.1-9	ALWAYS
	Image Pixel	Table 6.1-9	ALWAYS
	Contrast/Bolus	Table 6.1-9	When Contrast Media was used
	Cine	Table 6.1-9	When pixel data is Multi-Frame Cine Data
	Multi-Frame	Table 6.1-9	When pixel data is Multi-Frame Cine Data
	Mask	Table 6.1-9	When image may be subtracted
	Display Shutter	Table 6.1-9	When shutter is applied
	X-Ray Image	Table 6.1-9	ALWAYS
	X-Ray Acquisition	Table 6.1-9	ALWAYS
	X-Ray Collimator	Table 6.1-9	When the XRDI Module is installed
	X-Ray Table	Table 6.1-9	
	XRF Positioner	Table 6.1-9	
	DX Detector	Table 6.1-9	
	Overlay Plane	Table 6.1-9	
	Multi-frame Overlay	Table 6.1-9	Required if Overlay Data contains multiple frames
	Modality LUT	Table 6.1-9	
	VOI LUT	Table 6.1-9	
	Frame Extraction	Table 6.1-9	Required if the SOP Instance was created in response to a Frame-Level retrieve request
	SOP Common	Table 6.1-9	ALWAYS

6.1.1.5.2 XRF Modules

Table 6.1-9*: XRF Module of Created SOP Instances*

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image					
General Image					
Instance Number	(0020,0013)	IS		VNAP	

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient Orientation	(0020,0020)	CS		ANAP	
Content Date (Image Date)	(0008,0023)	DA		ANAP	
Content Time (Image Time)	(0008,0033)	TM		ANAP	
Image Type	(0008,0008)	CS		ANAP	
Acquisition Date	(0008,0022)	DA		ANAP	
Acquisition Time	(0008,0032)	TM		ANAP	
Acquisition DateTime	(0008,002A)	DT		ANAP	
Derivation Description	(0008,2111)	ST		ANAP	
Source Image Sequence	(0008,2112)	SQ		ANAP	
>Referenced SOP Class UID	(0008,1150)			ALWAYS	
>Referenced SOP Instance UID	(0008,1155)			ALWAYS	
>Referenced Frame Number	(0008,1160)			ANAP	
>Purpose of Reference Code Sequence	(0040,A170)	SQ		ANAP	
>>Code Sequence Macro					
>Spatial Locations Preserved	(0028,135A)			ANAP	
Image Comments	(0020,4000)	LT		ANAP	
Quality Control Image	(0028,0300)	CS	Enumerated Values: YES, NO	ANAP	
Burned In Annotation	(0028,0301)	CS	Enumerated Values: YES, NO	ANAP	
Lossy Image Compression	(0028,2110)	CS	Enumerated Values: 00 = Image has NOT been subjected to lossy compression. 01 = Image has been subjected to lossy compression.	ANAP	
Lossy Image Compression Ratio	(0028,2112)	DS		ANAP	
Presentation LUT Shape	(2050,0020)	CS		ANAP	
Irradiation Event UID	(0008,3010)	UI		ANAP	
Image Pixel					
Samples per Pixel	(0028,0002)	US		ALWAYS	Fixed
Planar Configuration	(0028,0006)	US		ANAP	
Photometric Interpretation	(0028,0004)	CS		ALWAYS	Auto
Rows	(0028,0010)	US		ALWAYS	Auto
Columns	(0028,0011)	US		ALWAYS	Auto
Pixel Spacing	(0028,0030)	DS		ALWAYS	
Pixel Aspect Ratio	(0028,0034)	IS		ANAP	Auto
Bits Allocated	(0028,0100)	US		ALWAYS	Auto
Bits Stored	(0028,0101)	US		ALWAYS	Auto
High Bit	(0028,0102)	US		ALWAYS	Auto
Pixel Representation	(0028,0103)	US		ALWAYS	Auto
Pixel Data	(7FE0,0010)	OW/OB		ALWAYS	Auto
Contrast/Bolus					
Contrast/Bolus Agent	(0018,0010)	LO		VNAP	
Contrast/Bolus Volume	(0018,1041)	DS		ANAP	
Contrast/Bolus Total Dose	(0018,1044)	DS		ANAP	
Cine					

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame Time	(0018,1063)	DS		ANAP	
Cine Rate	(0018,0040)	IS		ANAP	
Effective Duration	(0018,0072)	DS		ANAP	
Actual Frame Duration	(0018,1242)	IS		ANAP	
Multi-Frame					
Number of Frames	(0028,0008)	IS		ALWAYS	
Frame Increment Pointer	(0028,0009)	AT		ALWAYS	
Mask					
Mask Subtraction Sequence	(0028,6100)	SQ		ALWAYS	
>Mask Operation	(0028,6101)	CS		ALWAYS	
>Subtraction Item ID	(0028,9416)	US		ANAP	
>Applicable Frame Range	(0028,6102)	US		ANAP	
>Mask Frame Numbers	(0028,6110)	US		ANAP	
>Contrast Frame Averaging	(0028,6112)	US		ANAP	
>Mask Sub-pixel Shift	(0028,6114)	FL		ANAP	
>TID Offset	(0028,6120)	SS		ANAP	
>Mask Operation Explanation	(0028,6190)	ST		ANAP	
>Mask Selection Mode	(0028,9454)	CS		ANAP	
Recommended Viewing Mode	(0028,1090)	CS		VNAP	
Display Shutter					
Shutter Shape	(0018,1600)	CS	Enumerated Values: RECTANGULAR, CERCULAR, POLYGONAL	ALWAYS	User
Shutter Left Vertical Edge	(0018,1602)	IS		ANAP	User
Shutter Right Vertical Edge	(0018,1604)	IS		ANAP	User
Shutter Upper Horizontal Edge	(0018,1606)	IS		ANAP	User
Shutter Lower Horizontal Edge	(0018,1608)	IS		ANAP	User
Center of Circular Shutter	(0018,1610)	IS		ANAP	User
Radius of Circular Shutter	(0018,1612)	IS		ANAP	User
Vertices of Polygonal Shutter	(0018,1620)	IS		ANAP	User
Shutter Presentation Value	(0018,1622)	US		ANAP	User
X-Ray Image					
Lossy Image Compression	(0028,2110)	CS		ANAP	
Image Type	(0008,0008)	CS		ALWAYS	
Pixel Intensity Relationship	(0028,1040)	CS	LIN / LOG / DISP	ALWAYS	
Samples per Pixel	(0028,0002)	US	1	ALWAYS	
Photometric Interpretation	(0028,0004)	US	MONOCHROME2	ALWAYS	
Bits Allocated	(0028,0100)	US		ALWAYS	
Bits Stored	(0028,0101)	US		ALWAYS	
High Bit	(0028,0102)	US		ALWAYS	
Pixel Representation	(0028,0103)	US		ALWAYS	
Referenced Image Sequence	(0008,1140)	SQ		ANAP	
>Image SOP Instance Reference Macro					
>Purpose of Reference Code Sequence	(0040,A170)	SQ		ANAP	
>>Code Sequence Macro					
Derivation Description	(0008,2111)	ST		ANAP	
Acquisition Device Processing Description	(0018,1400)	LO		ANAP	

Attribute Name	Tag	VR	Value	Presence of Value	Source
X-Ray Acquisition					
KVP	(0018,0060)	DS		VNAP	
Radiation Setting	(0018,1155)	CS		ALWAYS	
X-Ray Tube Current	(0018,1151)	IS		ANAP	
X-Ray Tube Current in µA	(0018,8151)	DS		ANAP	
Exposure Time	(0018,1150)	IS		ANAP	
Exposure Time in µS	(0018,8150)	DS		ANAP	
Exposure	(0018,1152)	IS		ANAP	
Exposure in µAs	(0018,1153)	IS		ANAP	
Grid	(0018,1166)	CS		ANAP	
Average Pulse Width	(0018,1154)	DS		ANAP	
Radiation Mode	(0018,115A)	CS		ANAP	
Type of Filters	(0018,1161)	LO		ANAP	
Focal Spot	(0018,1190)	DS		ANAP	
Image and Fluoroscopy Area Dose Product	(0018,115E)	DS		ANAP	
X-Ray Collimator					
Collimator Shape	(0018,1700)	CS	Enumerated Values: RECTANGULAR, CIRCULAR, POLYGONAL	ALWAYS	
Collimator Left Vertical Edge	(0018,1702)	IS		ANAP	
Collimator Right Vertical Edge	(0018,1704)	IS		ANAP	
Collimator Upper Horizontal Edge	(0018,1706)	IS		ANAP	
Collimator Lower Horizontal Edge	(0018,1708)	IS		ANAP	
Center of Circular Collimator	(0018,1710)	IS		ANAP	
Radius of Circular Collimator	(0018,1712)	IS		ANAP	
Vertices of the Polygonal Collimator	(0018,1720)	IS		ANAP	
X-Ray Table					
Table Motion	(0018,1134)	CS	Defined terms: STATIC / DYNAMIC	VNAP	
Table Vertical Increment	(0018,1135)	DS		ANAP	
Table Longitudinal Increment	(0018,1137)	DS		ANAP	
Table Lateral Increment	(0018,1136)	DS		ANAP	
Table Angle	(0018,1138)	DS		ANAP	
XRF Positioner					
Distance Source to Detector	(0018,1110)	DS		ANAP	
Distance Source to Patient	(0018,1111)	DS		ANAP	
Estimated Radiographic Magnification Factor	(0018,1114)	DS		ANAP	
Column Angulation	(0018,1450)	DS		ANAP	
DX Detector					
Detector Type	(0018,7004)	CS	Defined terms: DIRECT / STORAGE	VNAP	
Detector Configuration	(0018,7005)	CS	Defined terms: AREA / SLOT	ANAP	
Detector Description	(0018,7006)	LT		ANAP	
Detector Mode	(0018,7008)	LT		ANAP	
Detector ID	(0018,700A)	SH		ANAP	

Attribute Name	Tag	VR	Value	Presence of Value	Source
Date of Last Detector Calibration	(0018,700C)	DA		ANAP	
Time of Last Detector Calibration	(0018,700E)	TM		ANAP	
Exposures on Detector Since Last Calibration	(0018,7010)	IS		ANAP	
Exposures on Detector Since Manufactured	(0018,7011)	IS		ANAP	
Detector Time Since Last Exposure	(0018,7012)	DS		ANAP	
Detector Binning	(0018,701A)	DS		ANAP	
Detector Manufacturer Name	(0018,702A)	LO		ANAP	
Detector Manufacturer's Model Name	(0018,702B)	LO		ANAP	
Detector Conditions Nominal Flag	(0018,7000)	CS	Enumerated Values: YES, NO	ANAP	
Detector Temperature	(0018,7001)	DS		ANAP	
Sensitivity	(0018,6000)	DS		ANAP	
Detector Element Physical Size	(0018,7020)	DS		ANAP	
Detector Element Spacing	(0018,7022)	DS		ANAP	
Detector Active Shape	(0018,7024)	CS		ANAP	
Detector Active Dimension(s)	(0018,7026)	DS		ANAP	
Detector Active Origin	(0018,7028)	DS		ANAP	
Detector Active Time	(0018,7014)	DS		ANAP	
Detector Activation Offset From Exposure	(0018,7016)	DS		ANAP	
Field of View Shape	(0018,1147)	CS		ANAP	
Field of View Dimensions(s)	(0018,1149)	IS		ANAP	
Field of View Origin	(0018,7030)	DS		ANAP	
Field of View Rotation	(0018,7032)	DS	Enumerated Values: YES, NO	ANAP	
Field of View Horizontal Flip	(0018,7034)	CS		ANAP	
Imager Pixel Spacing	(0018,1164)	DS		ALWAYS	
Pixel Spacing	(0028,0030)	DS		ANAP	
Pixel Spacing Calibration Type	(0028,0A02)	CS		ANAP	
Pixel Spacing Calibration Description	(0028,0A04)	LO		ANAP	
Cassette ID	(0018,1007)	LO		ANAP	
Plate ID	(0018,1004)	LO		ANAP	
Overlay Plane					
Overlay Rows	(60xx,0010)	US		ALWAYS	
Overlay Columns	(60xx,0011)	US		ALWAYS	
Overlay Type	(60xx,0040)	CS		ALWAYS	
Overlay Origin	(60xx,0050)	SS		ALWAYS	
Overlay Bits Allocated	(60xx,0100)	US		ALWAYS	
Overlay Bit Position	(60xx,0102)	US		ALWAYS	
Overlay Data	(60xx,3000)	OB/OW		ALWAYS	
Overlay Description	(60xx,0022)	LO		ANAP	
Overlay Subtype	(60xx,0045)	LO		ANAP	
Overlay Label	(60xx,1500)	LO		ANAP	
ROI Area	(60xx,1301)	IS		ANAP	
ROI Mean	(60xx,1302)	DS		ANAP	
ROI Standard Deviation	(60xx,1303)	DS		ANAP	
Multi-Frame Overlay					

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Frames in Overlay	(60xx,0015)	IS		ALWAYS	
Image Frame Origin	(60xx,0051)	US		ANAP	
Modality LUT					
Rescale Intercept	(0028,1052)	DS		ANAP	
Rescale Slope	(0028,1053)	DS		ANAP	
Rescale Type	(0028,1054)	LO		ANAP	
Modality LUT Sequence	(0028,3000)	SQ		ANAP	
>LUT Descriptor	(0028,3002)	US/SS		ANAP	
>LUT Explanation	(0028,3003)	LO		ANAP	
>MOD LUT Type	(0028,3004)	LO		ANAP	
>LUT Data	(0028,3006)	US/SS or OW		ANAP	
VOI LUT					
Window Center	(0028,1050)	DS		ANAP	
Window Width	(0028,1051)	DS		ANAP	
Window Center & Width Explanation	(0028,1055)	LO		ANAP	
VOI LUT Function	(0028,1056)	CS		ANAP	
VOI LUT Sequence	(0028,3010)	SQ		ANAP	
>LUT Descriptor	(0028,3002)	US/SS		ALWAYS	
>LUT Explanation	(0028,3003)	LO		ANAP	
>LUT Data	(0028,3006)	US/SS or OW		ALWAYS	
Frame Extraction					
Frame Extraction Sequence	(0008,1164)	SQ		ALWAYS	
>Multi-Frame Source SOP Instance UID	(0008,1167)	UI		ALWAYS	
>Simple Frame List	(0008,1161)	UL		ANAP	
>Calculated Frame List	(0008,1162)	UL		ANAP	
>Time Range	(0008,1163)	FD		ANAP	
SOP Common					
SOP Class UID	(0008,0016)	UI		ALWAYS	
SOP Instance UID	(0008,0018)	UI		ALWAYS	
Specific Character Set	(0008,0005)	CS		ANAP	
Instance Creation Date	(0008,0012)	DA		ANAP	
Instance Creation Time	(0008,0013)	TM		ANAP	

6.1.1.6 GSPS

6.1.1.6.1 GSPS IOD

Table 6.1-10*: IOD of Created GSPS SOP Instances*

IE	Module	Reference	Presence of Module
Patient	Patient Identification	Table 6.1-1	ALWAYS
	Extended Patient	Table 6.1-1	If received from MWL

IE	Module	Reference	Presence of Module
Study	General Study	Table 6.1-1	ALWAYS
	Patient Study	Table 6.1-1	ALWAYS
Series	General Series	Table 6.1-1	ALWAYS
	Presentation Series	Table 6.1-11	ALWAYS
Equipment	General Equipment	Table 6.1-1	ALWAYS
Image	Presentation State	Table 6.1-11	ALWAYS
	Display Shutter	Table 6.1-11	When shutter is applied
	Bitmap Display Shutter	Table 6.1-11	When shutter is applied
	Overlay Plane	Table 6.1-11	When shutter is applied
	Displayed Area	Table 6.1-11	ALWAYS
	Graphic Annotation	Table 6.1-11	When graphic annotations are present
	Graphic Layer	Table 6.1-11	When graphic annotations are present
	Modality LUT	Table 6.1-11	ALWAYS
	Softcopy VOI LUT	Table 6.1-11	ALWAYS
	Softcopy Presentation LUT	Table 6.1-11	ALWAYS
	Spatial Transformation	Table 6.1-11	ALWAYS
	SOP Common	Table 6.1-1	ALWAYS

6.1.1.6.2 GSPS Modules

Table 6.1-11*: GSPS Modules of Created SOP Instances*

Attribute Name	Tag	VR	Value	Presence of Value	Source
Series					
Presentation Series					
Modality	(0008,0060)	CS	PR	ALWAYS	Fixed
Presentation State					
Presentation State Identification Module					
Instance Number	(0020,0013)	IS		ALWAYS	Auto
Presentation State Relationship Module					
Referenced Series Sequence	(0008,1115)	SQ		ALWAYS	Auto
>Series Instance UID	(0020,000E)	UI		ALWAYS	Auto
>Retrieve AE Title	(0008,0054)	AE		ANAP	
>Storage Media File-Set ID	(0088,0130)	SH			
>Storage Media File-Set UID	(0088,0140)	UI			
>Referenced Image Sequence	(0008,1140)	SQ		ALWAYS	Auto
>>Referenced SOP Class UID	(0008,1150)	UI		ALWAYS	Auto
>>Referenced SOP Instance UID	(0008,1155)	UI		ALWAYS	Auto
Display Shutter					
Shutter Shape	(0018,1600)	CS		ANAP	User
Shutter Left Vertical Edge	(0018,1602)	IS		ANAP	User
Shutter Right Vertical Edge	(0018,1604)	IS		ANAP	User
Shutter Upper Horizontal Edge	(0018,1606)	IS		ANAP	User
Shutter Lower Horizontal Edge	(0018,1608)	IS		ANAP	User
Center of Circular Shutter	(0018,1610)	IS		ANAP	
Radius of Circular Shutter	(0018,1612	IS		ANAP	

Attribute Name	Tag	VR	Value	Presence of Value	Source
Vertices of the Polygonal Shutter	(0018,1620)	IS		ANAP	User
Shutter Presentation Value	(0018,1622)	US		ANAP	
Bitmap Display Shutter					
Shutter Shape	(0018,1600)	CS	BITMAP	ALWAYS	User
Shutter Presentation Value	(0018,1622)	US	0	ALWAYS	User
Shutter Overlay Group	(0018,1623)	US	6000	ANAP	Auto
Overlay Plane					
Overlay Rows	(60xx,0010)	US		ANAP	Auto
Overlay Columns	(60xx,0011)	US		ANAP	Auto
Overlay Description	(60xx,0022)	LO	Background darkening	ANAP	Auto
Overlay Type	(60xx,0040)	CS	G	ANAP	Auto
Overlay Subtype	(60xx,0045)	LO	AUTOMATED	ANAP	Auto
Overlay Origin	(60xx,0050)	SS	1	ANAP	Auto
Overlay Bits Allocated	(60xx,0100)	US	1	ANAP	Auto
Overlay Bit Position	(60xx,0102)	US	0	ANAP	Auto
Overlay Activation Layer	(60xx,1001)	CS		ANAP	Auto
Overlay Label	(60xx,1500)	LO	Mask image	ANAP	Auto
Overlay Data	(60xx,3000)	OB or OW		ANAP	Auto
Displayed Area					
Displayed Area Selection Sequence	(0070,005A)	SQ		ALWAYS	Auto
>Referenced Image Sequence	(0008,1140)	SQ		ANAP	Auto
>>Referenced SOP Class UID	(0008,1150)	UI		ANAP	Auto
>>Referenced SOP Instance UID	(0008,1155)	UI		ANAP	Auto
>>Referenced Frame Number	(0008,1160)	IS		ANAP	Auto
>Displayed Area Top Left Hand Corner	(0070,0052)	SL		ALWAYS	Auto
>Displayed Area Bottom Right Hand Corner	(0070,0053)	SL		ALWAYS	Auto
>Presentation Size Mode	(0070,0100)	CS	SCALE TO FIT	ALWAYS	Auto
>Presentation Pixel Spacing	(0070,0101)	DS		ALWAYS	Auto
> Presentation Pixel Aspect Ratio	(0070,0102)	IS		ANAP	Auto
> Presentation Pixel Magnification Ratio	(0070,0103)	FL		ANAP	Auto
Spatial Transformation					
Image Rotation	(0070,0042)	US		ALWAYS	User
Image Horizontal Flip	(0070,0041)	CS		ALWAYS	User
Graphic Annotation					
Graphic Annotation Sequence	(0070,0001)	SQ		ALWAYS	User
>Referenced Image Sequence	(0008,1140)	SQ		ALWAYS	Auto
>>Referenced SOP Class UID	(0008,1150)	UI		ALWAYS	Auto
>>Referenced SOP Instance UID	(0008,1155)	UI		ALWAYS	Auto
>>Referenced Frame number	(0008,1160)	IS			

Attribute Name	Tag	VR	Value	Presence of Value	Source
>Graphic Layer	(0070,0002)	CS		ALWAYS	Auto
>Text Object Sequence	(0070,0008)	SQ		ANAP	Auto
>>Bounding Box Annotation Units	(0070,0003)	CS	PIXEL	ANAP	Auto
>>Anchor Point Annotation Units	(0070,0004)	CS	PIXEL	ANAP	Auto
>>Unformatted Text Value	(0070,0006)	ST		ANAP	Auto
>>Bounding Box Top Left Hand Corner	(0070,0010)	FL		ANAP	Auto
>>Bounding Box Bottom Right Hand Corner	(0070,0011)	FL		ANAP	Auto
>>Bounding Box Text Horizontal Justification	(0070,0012)	CS		ANAP	Auto
>>Anchor Point	(0070,0014)	FL		ANAP	Auto
>>Anchor Point Visibility	(0070,0015)	CS		ANAP	Auto
>Graphic Object Sequence	(0070,0009)	SQ		ANAP	Auto
>>Graphic Annotation Units	(0070,0005)	CS		ANAP	Auto
>>Graphic Dimensions	(0070,0020)	US		ANAP	Auto
>>Number of Graphic Points	(0070,0021)	US		ANAP	Auto
>>Graphic Data	(0070,0022)	FL		ANAP	Auto
>>Graphic Type	(0070,0023)	CS		ANAP	Auto
>>Graphic Filled	(0070,0024)	CS		ANAP	Auto
Softcopy Presentation LUT					
Presentation LUT Shape	(2050,0020)	CS	IDENTITY	ALWAYS	Auto
Graphic Layer					
Graphic Layer Sequence	(0070,0060)	SQ		ALWAYS	Auto
>Graphic Layer	(0070,0002)	CS		ALWAYS	Auto
>Graphic Layer Order	(0070,0062)	IS		ALWAYS	Auto
>Graphic Layer Recommended Display Grayscale Value	(0070,0066)	US		ANAP	Auto
>Graphic Layer Recommended Display RGB Value	(0070,0067)	US		ANAP	Auto
>Graphic Layer Description	(0070,0068)	LO		ANAP	Auto
Modality LUT					
Modality LUT Sequence	(0028,3000)	SQ		ANAP	Auto
>Modality LUT Type	(0028,3004)	LO		ANAP	Auto
>LUT Descriptor	(0028,3002)	US/SS		ANAP	Auto
>LUT Explanation	(0028,3003)	LO		ANAP	Auto
>LUT Data	(0028,3006	US/SS or OW		ANAP	Auto
Rescale Intercept	(0028,1052)	DS		ANAP	Auto
Rescale Slope	(0028,1053)	DS		ANAP	Auto
Rescale Type	(0028,1054)	LO		ANAP	Auto
VOI LUT					
Softcopy VOI LUT Sequence	(0028,3110)	SQ		ALWAYS	
>Referenced Image Sequence	(0008,1140)	SQ		ANAP	Auto
>>Referenced SOP Class UID	(0008,1150)	UI		ANAP	Auto
>>Referenced SOP Instance UID	(0008,1155)	UI		ANAP	Auto
>>Referenced Frame Number	(0008,1160)	IS		ANAP	Auto
VOI LUT Sequence	(0028,3010)	SQ		ANAP	Auto
>LUT Descriptor	(0028,3002)	SS		ANAP	Auto

Attribute Name	Tag	VR	Value	Presence of Value	Source
>LUT Explanation	(0028,3003)	LO		ANAP	Auto
>LUT Data	(0028,3006)	SS		ANAP	Auto
Window Center	(0028,1050)	DS		ANAP	Auto
Window Width	(0028,1051)	DS		ANAP	Auto
Window Center & Width Explanation	(0028,1055)	LO		ANAP	Auto

6.1.1.7 X-Ray Radiation Dose SR Storage

6.1.1.7.1 X-Ray Radiation Dose SR IOD

Table 6.1-12*: IOD of Created X-Ray Radiation Dose SR SOP Instances*

IE	Module	Reference	Presence of Module
Patient	Patient	Table 6.1-13	
	Patient Identification	Table 6.1-13	
	Patient Demographic	Table 6.1-13	
	Patient Medical	Table 6.1-13	
Study	General Study	Table 6.1-13	
	Patient Study	Table 6.1-13	
Series	SR Document Series	Table 6.1-13	
Equipment	General Equipment	Table 6.1-13	
	Enhanced General Equipment	Table 6.1-13	
Document	SR Document General	Table 6.1-13	
	SR Document Content	Table 6.1-14	
	SOP Common	Table 6.1-13	

6.1.1.7.2 X-Ray Radiation Dose SR Modules

Table 6.1-13*: X-Ray Radiation Dose SR Modules of Created SOP Instances*

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient					
Patient Identification					
Patient's Name	(0010,0010)	PN		VNAP	User / MWL
Patient ID	(0010,0020)	LO		VNAP	User / MWL
Issuer of Patient ID	(0010,0021)	LO		ANAP	MWL
Other Patient IDs	(0010,1000)	LO		ANAP	MWL / MWL
Other Patient Names	(0010,1001)	PN		ANAP	MWL
Patient's Birth Name	(0010,1005)	PN		ANAP	MWL
Patient's Mother's Birth Name	(0010,1060)	PN		ANAP	MWL
Medical Record Locator	(0010,1090)	LO		ANAP	MWL
Patient Demographic					

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Age	(0010,1010)	AS		ANAP	User / MWL
Occupation	(0010,2180)	SH		ANAP	MWL
Confidentiality Constraint on Patient Data Description	(0040,3001)	LO		ANAP	MWL
Patient's Birth Date	(0010,0030)	DA		VNAP	User / MWL
Patient's Birth Time	(0010,0032)	TM		ANAP	User / MWL
Patient's Sex	(0010,0040)	CS		VNAP	User / MWL
Patient's Insurance Plan Code Sequence	(0010,0050)	SQ		ANAP	MWL
> Code Sequence					
> Patient's Primary Language Code Sequence	(0010,0101)	SQ		ANAP	MWL
> Code Sequence					
> Patient's Primary Language Code Modifier Sequence	(0010,0102)	SQ		ANAP	MWL
>> Code Sequence					
Patient's Size	(0010,1020)	DS		ANAP	User / MWL
Patient's Weight	(0010,1030)	DS		ANAP	User / MWL
Patient's Address	(0010,1040)	LO		ANAP	MWL
Military Rank	(0010,1080)	LO		ANAP	User / MWL
Branch of Service	(0010,1081)	LO		ANAP	User / MWL
Country of Residence	(0010,2150)	LO		ANAP	MWL
Region of Residence	(0010,2152)	LO		ANAP	MWL
Patient's Telephone Numbers	(0010,2154)	SH		ANAP	MWL
Ethnic Group	(0010,2160)	SH		ANAP	User / MWL
Patient's Religious Preference	(0010,21F0)	LO		ANAP	MWL
Patient Comments	(0010,4000)	LT		ANAP	User / MWL
Current Patient Location	(0038,0300)	LO		ANAP	MWL
Patient's Institution Residence	(0038,0400)	LO		ANAP	MWL
Referenced Patient Sequence	(0008,1120)	SQ		ANAP	MWL
>Referenced SOP Class UID	(0008,1150)	UI		ANAP	MWL
>Referenced SOP Instance UID	(0008,1155)	UI		ANAP	MWL
Patient Medical					
Medical Alerts	(0010,2000)	LO		ANAP	MWL
Contrast Allergies	(0010,2110)	LO		ANAP	MWL
Smoking Status	(0010,21A0)	CS		ANAP	User / MWL
Pregnancy Status	(0010,21C0)	US		ANAP	User / MWL
Last Menstrual Date	(0010,21D0)	DA		ANAP	User / MWL
Special Needs	(0038,0050)	LO		ANAP	MWL
Patient State	(0038,0500)	LO		ANAP	MWL
Additional Patient's History	(0010,21B0)	LT		ANAP	MWL
Sex neutered	(0010,2203)	CS		VNAP	
Study					
General Study					
Study Instance UID	(0020,000D)	UI		ALWAYS	MWL / Auto
Study Date	(0008,0020)	DA		VNAP	Auto
Study Time	(0008,0030)	TM		VNAP	Auto
Referring Physician's Name	(0008,0090)	PN		VNAP	User / MWL
Referring Physician Identification Sequence	(0008,0096)	SQ		ANAP	MWL

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study ID	(0020,0010)	SH		VNAP	Auto / MWL
Accession Number	(0008,0050)	SH		VNAP	User / MWL
Study Description	(0008,1030)	LO		ANAP	Auto
Physician(s) of Record	(0008,1048)	PN		ANAP	MWL
Physician(s) of Record Identification Sequence	(0008,1049)	SQ		ANAP	MWL
Name of Physician(s) Reading Study	(0008,1060)	PN		ANAP	MWL
Physician(s) Reading Study Identification Sequence	(0008,1062)	SQ		ANAP	User
Referenced Study Sequence	(0008,1110)	SQ		ANAP	MWL
>Referenced SOP Class UID	(0008,1150)	UI		ANAP	MWL
>Referenced SOP Instance UID	(0008,1155)	UI		ANAP	MWL
Patient Study					
Admitting Diagnoses Description	(0008,1080)	LO		ALWAYS	MWL
Admitting Diagnoses Code Sequence	(0008,1084)	SQ		ALWAYS	MWL
Series					
SR Document Series					
Modality	(0008,0060)	CS		ALWAYS	
Series Instance UID	(0020,000E)	UI	Different for each image	ALWAYS	Auto
Series Number	(0020,0011)	IS		ALWAYS	Auto
Series Description	(0008,103E)	LO	Radiation Dose Information	ALWAYS	
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ		ALWAYS	
>Referenced SOP Class UID	(0008,1150)	UI		ALWAYS	
>Referenced SOP Instance UID	(0008,1155)	UI		ALWAYS	
Equipment					
General Equipment					
Institution Name	(0008,0080)	LO		ANAP	MWL/ Config
Institution Address	(0008,0081)	ST		ANAP	MWL /Config
Station Name	(0008,1010)	SH		ANAP	Auto
Institutional Department Name	(0008,1040)	LO		ANAP	MWL/ Config
Enhanced General Equipment					
Manufacturer	(0008,0070)	LO		ALWAYS	
Manufacturer's Model Name	(0008,1090)	LO		ALWAYS	
Device Serial Number	(0018,1000)	LO		ALWAYS	
Software Versions	(0018,1020)	LO		ALWAYS	
Document					
SR Document General					
Instance Number	(0020,0013)	CS		ALWAYS	Auto
Preliminary Flag	(0040,A496)	CS		ANAP	
Completion Flag	(0040,A491)	CS		ALWAYS	
Completion Flag Description	(0040,A492)	LO		ANAP	
Verification Flag	(0040,A493)	CS		ALWAYS	
Content Date	(0008,0023)	DA		ALWAYS	

Attribute Name	Tag	VR	Value	Presence of Value	Source
Content Time	(0008,0033)	TM		ALWAYS	
Verifying Observer Sequence	(0040,A073)	SQ		ALWAYS	
>Verifying Observer Name	(0040,A075)	PN		ALWAYS	
>Verifying Observer Identification Code Sequence	(0040,A088)	SQ		VNAP	
>>Include 'Code Sequence Macro'					
>Verifying Organization	(0040,A027)	LO		ALWAYS	
>Verification DateTime	(0040,A030)	DT		ALWAYS	
Author Observer Sequence	(0040,A078)	SQ		ANAP	
> Code sequence					
Predecessor Documents Sequence [1..n]	(0040,A360)	SQ		ALWAYS	
> Study Instance UID	(0020,000D)	UI		ALWAYS	
> Referenced Series Sequence [1..n]	(0008,1115)	SQ		ALWAYS	
>> Series Instance UID	(0020,000E)	UI		ALWAYS	
>> Referenced SOP Sequence	(0008,1199)	SQ		ALWAYS	
>>> Referenced SOP Class UID	(0008,1150)	UI		ALWAYS	
>>> Referenced SOP Instance UID	(0008,1155)	UI		ALWAYS	
>>> Purpose of Reference Code Sequence	(0040,A170)	SQ		ANAP	
>>>> Include ‘Code Sequence Macro’					
Referenced Request Sequence [1..n]	(0040,A370)	SQ		ALWAYS	
>Study Instance UID	(0020,000D)	UI		ALWAYS	
>Referenced Study Sequence	(0008,1110)	SQ		VNAP	
>> Include ‘SOP Instance Reference Macro'					
>Accession Number	(0008,0050)	SH		VNAP	
>Placer Order Number/Imaging Service Request	(0040,2016)	LO		VNAP	
>Filler Order Number/Imaging Service Request	(0040,2017)	LO		VNAP	
>Requested Procedure ID	(0040,1001)	SH		VNAP	
>Requested Procedure Description	(0032,1060)	LO		ALWAYS	
>Requested Procedure Code Sequence	(0032,1064)	SQ		VNAP	
>>Include 'Code Sequence Macro'					
>Reason for the Requested Procedure	(0040,1002)	LO		ALWAYS	
>Reason for Requested Procedure Code Sequence	(0040,100A)	SQ		ALWAYS	
>>Include 'Code Sequence Macro'					
Performed Procedure Code Sequence [0..n]	(0040,A372)	SQ		ALWAYS	
> Code Value	(0008,0100)	SH		ALWAYS	
> Coding Scheme Designator	(0008,0102)	SH		ALWAYS	
> Coding Scheme Version	(0008,0103)	SH		ALWAYS	
> Code Meaning	(0008,0104)	LO		ALWAYS	
SOP Common					
SOP Class UID	(0008,0016)	UI		ALWAYS	
SOP Instance UID	(0008,0018)	UI		ALWAYS	
Specific Character Set	(0008,0005)	CS		ALWAYS	

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Creation Date	(0008,0012)	DA		ANAP	
Instance Creation Time	(0008,0013)	TM		ANAP	
Instance Creator UID	(0008,0014)	UI		ANAP	
Related General SOP Class UID	(0008,001A)	UI		ANAP	
Original Specialized SOP Class UID	(0008,001B)	UI		ANAP	
Coding Scheme Identification Sequence	(0008,0110)	SQ		ANAP	
>Coding Scheme Designator	(0008,0102)	SH		ALWAYS	
>Coding Scheme Registry	(0008,0112)	LO		ALWAYS	
>Coding Scheme UID	(0008,010C)	UI		ALWAYS	
>Coding Scheme External ID	(0008,0114)	ST		VNAP	
>Coding Scheme Name	(0008,0115)	ST		ANAP	
>Coding Scheme Version	(0008,0103)	SH		ANAP	
>Coding Scheme Responsible Organization	(0008,0116)	ST		ANAP	
Timezone Offset From UTC	(0008,0201)	SH		ANAP	
Contributing Equipment Sequence	(0018,A001)	SQ		ALWAYS	
> Purpose of Reference Code Sequence	(0040,A170)	SQ		ALWAYS	
>> Code Value, Code Meaning, …					
> Manufacturer	(0008,0070)	LO		ALWAYS	

Table 6.1-14*: Dose Structured Report Document Content*

Report ID	Line Number	Reference ID	Attribute	VM	Req Type	Condition	Value	Units
1		TID 10001	**X-Ray Radiation Dose**	1	M			
1.1	1	113701	X-Ray Radiation Dose Report Container					
1.2	2	121058	Procedure reported	1	M		"Projection X-Ray" / "Mammography"	
1.2.1	3	G-C0E8	Has Intent	1	M		"Diagnostic Intent"	
1.3	4	TID 1002	**Observer Context**	1-n	M			
1.3.1	1	121005	Observer Type	1	MC	IF Observer type is device	"Device"	
1.3.2	3	TID 1004	**Device Observer Identifying Attributes Container**	1	MC	IFF row 1 value is "Device"		
1.3.2.1	1	121012	Device Observer UID	1	M		"1.3.51.0.7.1104921769.4906.39497.36025.41322.41911.30231"	
1.3.2.2	2	121013	Device Observer Name	1	U		NX workstation Name	
1.3.2.3	3	121014	Device Observer Manufacturer	1	U		"Agfa"	
1.3.2.4	4	121015	Device Observer Model Name	1	U		"NX"	
1.3.2.5	5	121016	Device Observer Serial Number	1	U		xx-xx-xx-xx-xx-xx	
1.4	5	113705	Scope of Accumulation	1	M		"Performed Procedure Step"	
1.4.1	6	121126	Performed Procedure Step SOP instance UID	1	M		MPPSInstanceUID	
1.5	7	TID 10002	**Accumulated X-Ray Dose Data**	1	MC	IFF single plane system		
1.5.1	1	113702	Accumulated X-Ray Dose Data Container	1	M			
1.5.2	2	113764	Acquisition Plane	1	M		"Single Plane"	
1.5.3	3	122505	**Calibration Container**	1-n	MC	IFF Calibration Data is available		
1.5.3.1	4	113794	Dose Measurement Device	1	M		"Dosimeter"	
1.5.3.2	5	113723	Calibration Date	1	M			
1.5.3.3	6	122322	Calibration Factor	1	M			No units
1.5.3.4	7	113763	Calibration Uncertainty	1	M			Percent
1.5.3.5	8	113724	Calibration Responsible Party	1	M			
1.5.4	10	TID 10004	**Accumulated Projection X-Ray Dose**	1	MC	XOR row 11, 12 ; IFF TID(10001) Row 2 = "Projection X-Ray"		
1.5.4.1	1	113722	Dose Area Product Total	1	M			Gym2
1.5.4.2	2	113725	Dose (RP) Total	1	MC	IF any of the values of TID (10001) Row 14 are not "MPPS Content". May be present otherwise.		Gy

Report ID	Line Number	Reference ID	Attribute	VM	Req Type	Condition	Value	Units
1.5.4.3	6	113727	Acquisition Dose Area Product Total	1	M			Gym2
1.5.4.4	7	113729	Acquisition Dose (RP) Total	1	MC	IF any of the values of TID (10001) Row 14 are not “MPPS Content”. May be present otherwise.		Gy
1.5.4.5	8	113855	Total Acquisition Time	1	M			s
1.5.4.6	11	113780	Reference Point Definition	1	MC	IF Row 2 or Row 7 is present AND Row 10 is not present		
1.5.5	11	TID 10005	**Accumulated Mammography X-Ray Dose**	1	MC	XOR row 10, 12 ; IFF TID(10001) Row 2 = “Mammography”		
1.5.5.1	1	111637	Accumulated Average Glandular Dose	1-2	M			dGy
1.5.5.2	2	G-C171	Laterality	1	M		“Left breast” / “Right breast” / “Both breasts”	
1.6	10	TID 10003	**Irradiation Event X-Ray Data**	1-n	M			
1.6.1	1	113706	Irradiation Event X-Ray Data Container	1	M			
1.6.2	2	113764	Acquisition Plane	1	M		“Single Plane”	
1.6.3	3	111526	DateTime Started	1	M			
1.6.4	4	113721	Irradiation Event Type	1	M		“Stationary Acquisition”	
1.6.5	5	125203	Acquisition Protocol	1	U			
1.6.6	6	T-D0005	Anatomical Structure	1	U			
1.6.6.1	7	G-C171	Laterality	1	UC	IF anatomy is bi-lateral	“Bilateral” / “Unilateral”	
1.6.7	8	113780	Reference Point Definition	1	MC	IF Row 13 or Row 14 is present AND Row 9 is not present		
1.6.8	10	113769	Irradiation Event UID	1	M			
1.6.9	11	122130	Dose Area Product	1	MC	IFF TID(10001) Row 2 = “Projection X-Ray”		Gym2
1.6.10	12	111631	Average Glandular Dose	1	MC	IFF TID(10001) Row 2 = “Mammography”		dGy
1.6.11	13	113738	Dose (RP)	1	MC	IFF TID(10001) Row 2 = “Projection X-Ray” AND any of the values of TID (10001) Row 14 are not “MPPS Content”		Gy
1.6.12	14	111636	Entrance Exposure at RP	1	MC	IFF TID(10001) Row 2 = “Mammography”		mGy

Report ID	Line Number	Reference ID	Attribute	VM	Req Type	Condition	Value	Units
1.6.13	15	112011	Positioner Primary Angle	1	UC	XOR row 19		°
1.6.14	16	112012	Positioner Secondary Angle	1	UC	XOR row 19		°
1.6.15	20	113790	Collimated Field Area	1	U			m2
1.6.16	21	113771	**X-Ray Filters Container**	1-n	U			
1.6.16.1	22	113772	X-Ray Filter Type	1	U		“Strip filter” / “Wedge filter” / “Butterfly filter” / “No filter”	
1.6.16.2	23	113757	X-Ray Filter Material	1	U			
1.6.16.3	24	113758	X-Ray Filter Thickness Minimum	1	U			mm
1.6.16.4	25	113773	X-Ray Filter Thickness Maximum	1	U			mm
1.6.17	30	113733	KVP	1-n	U			kV
1.6.18	31	113734	X-Ray Tube Current	1-n	U			mA
1.6.19	32	113735	Exposure Time	1	U			ms
1.6.20	34	113736	Exposure	1	U			uAs
1.6.21	35	113766	Focal Spot Size	1	U			mm
1.6.22	36	113742	Irradiation Duration	1	U			mA
1.6.23	37	113767	Average X-Ray Tube Current	1	U			
1.6.24	45	123014	Target Region	1	M			
1.6.25	46	111632	Anode Target Material	1	U			
1.6.26	47	111633	Compression Thickness	1	U			mm
1.6.27	53	TID 1021	**Device Participant**	1	MC	Required if the irradiating device is not the recording device XOR row 54 ; IF TID (10001) Row 2 is not “Cassette-based X-Ray”		
1.6.27.1	1	113876	Device Role in Procedure	1	M		“Irradiating Device”	
1.6.27.2	2	113877	Device Name	1	U			
1.6.27.3	3	113878	Device Manufacturer	1	M			
1.6.27.4	4	113879	Device Model Name	1	M			
1.6.27.5	5	113880	Device Serial Number	1	M			
1.6.27.6	6	121012	Device Observer UID	1	M			
1.6.28	55	113795	Acquired Image	1-n	MC	IFF image object is created for this irradiation event		
1.6.29	56	113845	Exposure Index	1	U			No units
1.6.30	57	113846	Target Exposure Index	1	U			No units
1.6.31	58	113847	Deviation Index	1	U			No units
1.7	14	113854	Source of Dose Information	1-n	M		“Automated Data Collection”	

6.2 Data dictionary of Private Attributes

Table 6.2-1: Private Attributes

Tag	VR	VM	Attribute Name	Meaning / Values	Presence of Value	SOP Class
(0019,0010)	LO	1	Private Creator	Agfa ADC NX	ALWAYS	All
(0019,1001)	FL	n	Contrast		Musica on Pacs : enabled	GSPS
(0019,1002)	FL	n	Brightness		Musica on Pacs : enabled	GSPS
(0019,1003)	FL	1	Sharpness		Musica on Pacs : enabled	GSPS
(0019,1004)	LO	1	Package		Musica on Pacs : enabled	GSPS
(0019,1005)	IS	1	Processing Version	Indicates the version of the package used for processing the image	Musica on Pacs : enabled Only present if version >1	GSPS
(0019,1006)	FL	1	Border Contrast Density		Musica on Pacs : enabled	GSPS
(0019,1007)	CS	1	Is Speedclass Free	Required for Auto-QC2 Enum: YES / NO	ALWAYS	CR,DX,MG
(0019,1008)	CS	1	Applicationtype		Musica on Pacs : enabled	CR,DX,MG
(0019,1009)	SQ		Collimator shape sequence	Collimator Presentation Selection List	ALWAYS	GSPS
> (0019,0010)	LO	1	Identification Code	"Agfa ADC NX"		GSPS
> (0019,100D)	CS	1	Is Diagnostic Area Inside	Enum : YES/NO		GSPS
> (0018,1700)	CS	1(-3)	Collimator Shape	"RECTANGULAR", “POLYGONAL”		GSPS
> (0018,1702)	IS	1	Collimator Left Vertical Edge	If "RECTANGULAR"		GSPS
> (0018,1704)	IS	1	Collimator Right Vertical Edge	If "RECTANGULAR"		GSPS
> (0018,1706)	IS	1	Collimator Upper Horizontal Edge	If "RECTANGULAR"		GSPS
> (0018,1708)	IS	1	Collimator Lower Horizontal Edge	If "RECTANGULAR"		GSPS
> (0018,1720)	IS	2-2n	Vertices of the Polygonal Collimator	List of vertices, if “POLYGONAL”		GSPS
(0019,100A)	CS	1	Background darkening calculate	Enum : YES/NO	Musica on Pacs : enabled	GSPS
(0019,100B)	CS	1	Background darkening padding smooth	Enum : YES/NO	Musica on Pacs : enabled	GSPS
(0019,100C)	CS	1	Is Invert Enabled	Enum : YES/NO	Musica on Pacs : enabled	GSPS
(0019,1010)	ST	1	Image Processing Parameters	Required for Auto-QC2 & Musica 1 (& 2)	When importing AutoQC2 Exam Tree	DX for Proc MG for Proc
(0019,1020)	CS	1	Is Border Contrast Enabled	Enum: YES / NO	Musica on Pacs : enabled	GSPS
(0019,1021)	FL	1	Calibration Factor	Required for QC-Mammo	ALWAYS	CR,DX,MG

Tag	VR	VM	Attribute Name	Meaning / Values	Presence of Value	SOP Class
(0019,1026)	LO	n	Stitch Zone Parameters	Used in NX for Stiching up to 4 images [27] Quality label for every stitch zone : Vxx.x Hxx.x M Y G N A [28]	Case of image Stiching	CR,DX,MG
(0019,1028)	CS	1	Is IP Signature enabled	Enum: YES / NO	If IPSR license is enabled	CR,DX,MG
(0019,1030)	LT	1	AEC Dose	High, Medium or Low If Age class (Adult or Pediatric) is known, then following list is used: “A_Low”, “A_Medium”, “A_High”, “P_Low”, “P_Medium”, “P_High”	If AEC is Automatic	DX,MG
(0019,1036)	LO	1	Solution Type	DXD800, DR800, Sedecal_DXD100, Sedecal_DXD600_FULLAUTO, …	XrayDeviceComponent-ModelType	CR,DX,MG,XRF
(0019,1037)	LO	1	Acquisition Type	Static Image, Fluoroscopy for Positioning, Rapid Sequence, Constructed Image, …	ALWAYS	CR,DX,MG,XRF
(0019,1038)	DS	1	Dose Reference Level	Configurable max. DAP level [dGy cm^2]		CR,DX,MG,[XRF]
(0019,1040)	DS	1	Slice Interval	Dimensions: mm	TOMOSYNTHESIS (reconstructed images)	DX
(0019,1041)	DS	1	Fulcrum Height	Dimensions: mm	TOMOSYNTHESIS (original & reconstructed images)	DX
(0019,1042)	CS	1	Number of Iterations	LOW, MEDIUM or HIGH	TOMOSYNTHESIS (reconstructed images)	DX
(0019,1043)	DS	1	Start Height	Dimensions: mm	TOMOSYNTHESIS (reconstructed images)	DX

[27] Stitch Zone Parameters (0019,1026) - VR=LO - VM=1-n - Type=VR=LO
Used in CR, DX or MG images together with the ‘Basic Pixel Spacing Calibration Macro’ :
- Pixel spacing (0028,0030) - VR=DS - VM=2 - Type=1C (C: if image is calibrated)
- Pixel spacing Calibration Type (0028,0A02) - VR=CS - VM=1 - Type=3
- Pixel spacing Calibration Description (0028,0A04) - VR=LO - VM=1 - Type=1C (C: if Type is present)

[28] Where:
- Vxx.x Hxx.x: the deviation in cm from grid only stitched position in Vertical / Horizontal direction.
- M G A: indicates the way the images are stitched: Manually corrected or manipulated / GRID auto stitched / Anatomical auto stitched.
- Y N: result of patient movement estimation: Yes or No.

Tag	VR	VM	Attribute Name	Meaning / Values	Presence of Value	SOP Class
(0019,1044)	IS	1	Number of Slices		TOMOSYNTHESIS (reconstructed images)	DX
(0019,1045)	OB	1	Tomo Positioning Data	XML presentation	TOMOSYNTHESIS (original & reconstructed images)	DX
(0019,1046)	CS	1	Tomo Completion State	COMPLETE, INCOMPLETE, RECOVERED	TOMOSYNTHESIS (original & reconstructed images)	DX
(0019,1047)	DS	1	Tabletop to Detector Distance	Dimensions: mm	TOMOSYNTHESIS (original & reconstructed images)	DX
(0019,1050)	LT	1	ABS (Automatic Brightness Stabilization)	ON, OFF	FLUO	XRF
(0019,1051)	LT	1	Curve	ID of used curve Only filled in when ABS = ON	FLUO	XRF
(0019,1052)	LT	1	ABS Dose Level (Fluo Dose Level)	LOW, LOWLOW, MEDIUM, HIGH Only filled in when ABS = ON	FLUO	XRF
(0019,1053)	LO	1	ABS ROI	e.g. 2x2 (only filled when ABS=ON)	FLUO	XRF
(0019,1054)	LO	1	Age Class	ADULT, PEDIATRIC	If available	CR,DX,MG,XRF
(0019,1055)	DS	1	Air Kerma	Format xxxx.xx [mGy]	If available	CR,DX,MG,XRF
(0019,1056)	DS	1	Air Kerma Rate	Format xxxx.xx [mGy/min]	FLUO	XRF
(0019,1057)	DS	1	DAP Rate	Format xxxx.xx [cGy.cm²/s]	FLUO	XRF
(0019,1058)	UI	1	Group Scopy UID	UID of group	FLUO (not for RS)	XRF
(0019,1059)	DS	1	Group Scopy Total Time [sec]	Sum of all irradiationduration times of all scopies of the same group.	FLUO (not for RS)	XRF
(0019,105A)	IS	1	Start Frame	Frame number of the first frame of a multi-frame sequence	(*) *Each image fraction contains the same Start & Stop frame numeber*	DX(*), XRF
(0019,105B)	IS	1	Stop Frame	Frame number of the last frame of a multi-frame sequence		DX(*), XRF
(0019,105C)	DS	1	Total Air Kerma of Image Group	Format xxxx.xx [mGy]	Image group	CR,DX,MG,XRF
(0019,105D)	DS	1	Total DAP Rate of Image Group	Format xxxx.xx [cGy.cm²/s]	Image group	CR,DX,MG,XRF
(0019,1060)	IS	1	SDR Patient Thickness	Patient thickness as measured before exposure Format: integer [mm]	SDR / Dose Adaptation Guidance (DR600)	CR,DX
(0019,1061)	UI	1	SDR Radiation UID	UID that is created during exposure to link the irradiation parameters with the image	SDR / VirtualDR (DR600)	CR,DX

Tag	VR	VM	Attribute Name	Meaning / Values	Presence of Value	SOP Class
(0019,1062)	IS	1	SDR Detector Angle	Angle between the perpendicular to the panel (or detector) and the perpendicular to the ground Format: integer [°]	SDR / Panel Alignment Guidance (DR100S)	CR,DX
(0019,1063)	IS	1	SDR Tube Angle	Angle between the tube axis and the perpendicular to the ground Format: integer [°]	SDR / Panel Alignment Guidance (DR100S)	CR,DX
(0019,10A0)	OB	1	Image Metadata	XML Presentation	Orthogon	CR,DX,MG
(0019,10B0)	LO	1	Target AETitle	Used for MusicaMicro: Target AETitle	If Musica Micro License is active	MG
(0019,10B1)	LO	1	Target IP address	Used for MusicaMicro: Target IP address	If Musica Micro License is active	MG
(0019,10B2)	LO	1	Target Port number	Used for MusicaMicro: Target Port number	If Musica Micro License is active	MG
(0019,10B3)	LO	1	Session UID	Used for MusicaMicro: Session UID	If Musica Micro License is active	MG
(0019,10D0)	LO	1	Custom Patient Field 1	Used to map unknown DICOM attributes from the RIS (Worklist). Stored on ID Session level	Configurable	CR,DX,MG,XRF
(0019,10D1)	LO	1	Custom Patient Field 2			CR,DX,MG,XRF
(0019,10D2)	LO	1	Custom Patient Field 3			CR,DX,MG,XRF
(0019,10D3)	LO	1	Custom Patient Field 4			CR,DX,MG,XRF
(0019,10D4)	LO	1	Custom Patient Field 5			CR,DX,MG,XRF
(0019,10E0)	LO	1	Custom Image Field 1	Used to map unknown DICOM attributes from the RIS (Worklist). Stored on Workflow X-RAY image level	Configurable	CR,DX,MG,XRF
(0019,10E1)	LO	1	Custom Image Field 2			CR,DX,MG,XRF
(0019,10E2)	LO	1	Custom Image Field 3			CR,DX,MG,XRF
(0019,10E3)	LO	1	Custom Image Field 4			CR,DX,MG,XRF
(0019,10E4)	LO	1	Custom Image Field 5			CR,DX,MG,XRF
(0019,10F0)	LO	1	User defined field 1	Used to map unknown DICOM attributes from the RIS (Worklist). Stored on SPS level.	Configurable	CR,DX,MG,XRF
(0019,10F1)	LO	1	User defined field 2			CR,DX,MG,XRF
(0019,10F2)	LO	1	User defined field 3			CR,DX,MG,XRF
(0019,10F3)	LO	1	User defined field 4			CR,DX,MG,XRF
(0019,10F4)	LO	1	User defined field 5			CR,DX,MG,XRF
(0019,10F5)	CS	1	Cassette orientation	Required for Auto-QC2 LANDSCAPE or PORTRAIT	ALWAYS	DX (MG)
(0019,10F6)	DS	1	Image plate sensitivity	Required for Auto-QC2	ALWAYS	CR,DX,MG
(0019,10F7)	DS	1	Image plate erasability	Required for Auto-QC2	ALWAYS	CR,DX,MG
(0019,10F8)	IS	1	Breast density percentage	Is filled-in by IPD	If Breast Density license is active	(CR,DX),MG
(0019,10FA)	IS	1	Exposure index	Related with Xray Exposure Dose [29]	Configurable	CR,DX,MG

[29] Official tags were created to replace the private tags.
Now both are used for compatibility reason but contain the same information.

Tag	VR	VM	Attribute Name	Meaning / Values	Presence of Value	SOP Class
(0019,10FB)	FL	1	Deviation index	Related with Xray Exposure Dose [29]	Configurable	CR,DX,MG
(0019,10FC)	IS	1	Target exposure index	Related with Xray Exposure Dose [29]	Configurable	CR,DX,MG
(0019,10FD)	CS	1	Is overexposed	Related with Xray Exposure Dose Enum: YES / NO	Configurable	CR,DX,MG
(0019,10FE)	CS	1	Study Priority ID	Enum: HIGH, MED (=default), LOW, NULL	ALWAYS	CR,DX,MG

Name	Tag		Type	VR		Units	VM
Exposure Index	(0018, 1411)	*(0019,10FA)*	3	DS	*IS*	100.uGy	1
Target Exposure Index	(0018, 1412)	*(0019,10FC)*	3	DS	*IS*	100.uGy	1
Deviation Index	(0018, 1413)	*(0019,10FB)*	3	DS	*FL*	-	1

6.3 Attribute Mapping

The relationships between attributes received via Modality Worklist, stored in acquired images and communicated via MPPS are summarized in Table 6.3-1.

Table 6.3-1: Attribute Mapping between Modality Worklist, Image and MPPS

Modality Worklist	Image IOD	MPPS IOD
Patient Name	Patient Name	Patient Name
Patient ID	Patient ID	Patient ID
Patient's Birth Date	Patient's Birth Date	Patient's Birth Date
Patient's Sex	Patient's Sex	Patient's Sex
Patient's Weight	Patient's Weight	
Referring Physician's Name	Referring Physician's Name	
----	----	Scheduled Step Attributes Sequence
Study Instance UID	Study Instance UID	> Study Instance UID
Referenced Study Sequence	Referenced Study Sequence	> Referenced Study Sequence
Accession Number	Accession Number	> Accession Number
----	Request Attributes Sequence	----
Requested Procedure ID	> Requested Procedure ID	> Requested Procedure ID
Requested Procedure Description		> Requested Procedure Description
Scheduled Procedure Step ID	> Scheduled Procedure Step ID	> Scheduled Procedure Step ID
Scheduled Procedure Step Description	> Scheduled Procedure Step Description	> Scheduled Procedure Step Description
Scheduled Protocol Code Sequence	> Scheduled Protocol Code Sequence	----
----	Performed Protocol Code Sequence	Performed Protocol Code Sequence
----	Study ID	Study ID
----	Performed Procedure Step ID	Performed Procedure Step ID
----	Performed Procedure Step Start Date	Performed Procedure Step Start Date
----	Performed Procedure Step Start Time	Performed Procedure Step Start Time
----	Performed Procedure Step Description	Performed Procedure Step Description
----	Comments on the Performed Procedure Step	Comments on the Performed Procedure Step
----	----	Performed Series Sequence
Scheduled Performing Physician's Name	Performing Physician's Name	> Performing Physician's Name
Requested Procedure Code Sequence	----	Procedure Code Sequence
----	Referenced Study Component Sequence	----
----	> Referenced SOP Class UID	SOP Class UID
----	> Referenced SOP Instance UID	SOP Instance UID
----	Protocol Name	Protocol Name

6.4 Grayscale Image Consistency

The display monitor attached to NX x.0.23.00 can be calibrated according to the Grayscale Standard Display Function (GSDF).

6.5 Veterinary Extensions

This section lists the DICOM attributes that are supported by NX x.0.23.00 for the veterinary market (only available when VET license is activated). The attributes have been incorporated based on DICOM correction item CP-643.

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient					
Patient species description	(0010,2201)	LO			User/MWL
Patient breed description	(0010,2292)	LO		ANAP	User/MWL
Breed registration sequence	(0010,2294)	SQ		ANAP	User/MWL
> Breed registration number	(0010,2295)	LO			User/MWL
> Breed registry code sequence	(0010,2296)	SQ			User/MWL
Responsible person	(0010,2297)	PN		ANAP	MWL
Responsible person Role	(0010,2298)	PN		ANAP	MWL
Responsible organization	(0010,2299)	LO		ANAP	MWL
Patient's Sex Neutered	(0010,2203)	CS		ANAP	User/MWL