Carestream

ADAM Imaging System

Digital imaging system

DICOM Conformance Statement

D8K-40-007 Rev.Ø

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1. Conformance statement overview

The 8K software implements the necessary DICOM services to download work lists from an information system, save acquired X-ray images eventually accompanied with measurements in DICOM data format to a network storage device and print to a networked hardcopy device.

Table B.1-1 provides an overview of the network services supported by 8K software.

Table B.1-1

Network Services

SOP Classes	**Use of Service (SCU)**	**Provider of Service (SCP)**
Verification	Yes	No
Transfer		
Computed Radiography Image Storage	Yes	No
Digital X-Ray Image Storage for Presentation	Yes	No
X-Ray RF Image Storage	Yes	No
X-Ray Angiographic Image Storage	No	No
Enhanced X-Ray Angiographic Image Storage	No	No
Enhanced X-Ray RF Image Storage	No	No
X-Ray Radiation Dose SR	Yes	No
Storage Commitment Push Model	Yes	No
Workflow Management		
Modality Worklist	Yes	No
Modality Performed Procedure Step	Yes	No
Print Management		
Printer	Yes	No
Basic Film Session	Yes	No
Basic Film Box	Yes	No
Basic Grayscale Image Box	Yes	No
Basic Color Image Box	Yes	No

2. Introduction

2.1. Audience

This document is written for the people that need to understand how 8K software will integrate into their healthcare facility. This includes those responsible for overall imaging network policy and architecture. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features.

2.1.1. Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between 8K software and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

The comparison of different Conformance Statements is just the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.

Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

2.1.2. Terms and definitions

Terms and definitions should be listed here. The following example may be used as a template:

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

Abstract Syntax	The information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class
Application Entity (AE)	An end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.
Application Entity Title (AET)	The externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.
Application Context	The specification of the type of communication used between Application Entities. Example: DICOM network protocol.
Association	A network communication channel set up between Application Entities.
Attribute	A unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID

	(0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).
Information Object Definition (IOD)	The specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.
Joint Photographic Experts Group (JPEG)	A set of standardized image compression techniques, available for use by DICOM applications.
Media Application Profile	The specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)
Module	A set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.
Negotiation	First phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.
Presentation Context	The set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.
Protocol Data Unit (PDU)	A packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.
Security Profile	A set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data.
Service Class Provider (SCP)	Role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).
Service Class User (SCU)	Role of an Application Entity that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)
Service/Object Pair Class (SOP Class)	The specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.
Service/Object Pair Instance (SOP Instance)	An information object; a specific occurrence of information exchanged in a SOP Class. Examples: a specific x-ray image.

Tag	A 32-bit identifier for a data element, represented as a pair of four-digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]
Transfer Syntax	The encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), little endian explicit value representation.
Unique Identifier (UID)	A globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.
Value Representation (VR)	The format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

2.1.3. Basics of DICOM communication

This section describes terminology used in this Conformance Statement for the non-specialist. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two Application Entities (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network "handshake". One of the two devices must initiate an Association (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (Negotiation).

DICOM specifies a number of network services and types of information objects, each of which is called an Abstract Syntax for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted Transfer Syntaxes. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the Association; these combinations are called Presentation Contexts. The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on Roles - which one is the Service Class User (SCU - client) and which is the Service Class Provider (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (PDU) size, security information, and network service options (called Extended Negotiation information).

The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports), and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate Information Object Definition, and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most efficient for some use cases. Each transfer is explicitly acknowledged by the receiver with a Response Status indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a CD-R). Since there is no Association Negotiation possible, they both use a Media Application Profile that specifies "pre-negotiated" exchange media format, Abstract Syntax, and Transfer Syntax.

2.1.4. Abbreviations, references

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

AE	DICOM Application Entity
AET	Application Entity Title
ASCII	American Standard Code for Information Interchange
CSE	Customer Service Engineer
DB	Database
DCS	DICOM Conformance Statement
DICOM	Digital Imaging and Communications in Medicine
FSC	File Set Creator
FSR	File Set Reader
FSU	File Set Updater
GSDF	Grayscale Standard Display Function
HIS	Hospital Information System
IHE	Integrating the Healthcare Enterprise
IOD	DICOM Information Object Definition
ISO	International Standard Organization
MPPS	Modality Performed Procedure Step
n. a.	not applicable
NEMA	National Electrical Manufacturers Association
PDU	DICOM Protocol Data Unit
RIS	Radiology Information System
RP	Reference Point
SC	Secondary Capture
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM Server)
SOP	DICOM Service-Object Pair
SPS	Scheduled Procedure Step
SR	Structured Report
TFT	Thin Film Transistor (Display)
TID	Template ID
UID	Unique Identifier
UTF-8	Unicode Transformation Format-8
VR	Value Representation

REFERENCES

[NEMA PS3] Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/[1]

[1] *The DICOM Standard is under continuous maintenance, the current official version is available at http://dicom.nema.org*

3. Networking

3.1. Implementation model

3.1.1. Application data flow

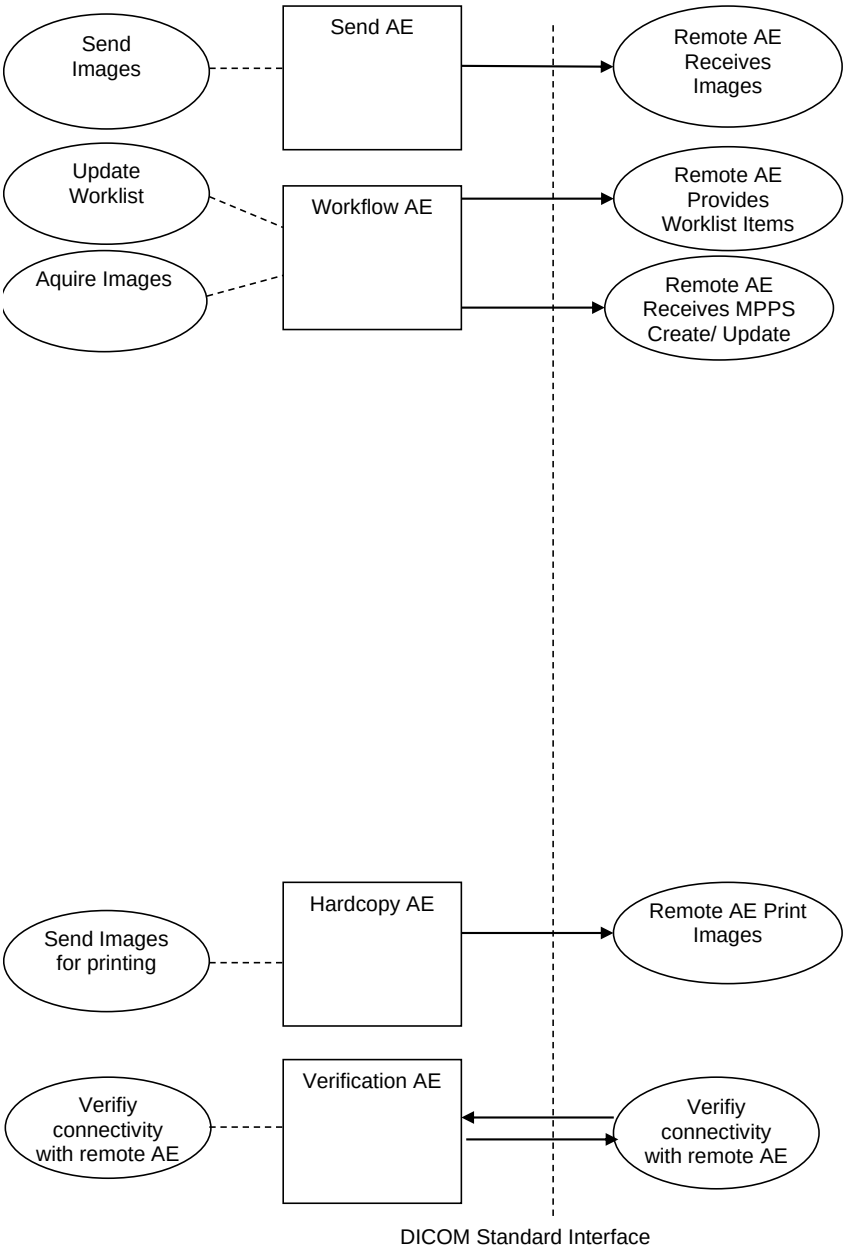


Figure 1: 8K software data flow diagram

Conceptually the network services may be modelled as the following separate AEs, though in fact all the AEs share a single (configurable) AE Title:

The Send Application Entity sends images and non-image objects to a remote AE. It is associated with the real-world activity "Send Images" which is performed upon user request for images selected by the user. If the remote AE is configured as an archive device, the Send AE will record successful transfers and remember the remote AE for subsequent retrievals of the images transferred.

The Workflow Application Entity receives worklist information from a remote AE. It is associated with the real-world activity "Update Worklist". Update Worklist is performed as a result of an operator request. The Workflow AE queries a remote AE for worklist items matching a query request defined by the operator.

In response to a Scheduled Procedure Step received via Modality Worklist, it will create and update Modality Performed Procedure Step instances managed by a remote AE. Acquisition of images will result in automated creation of an MPPS instance. Completion/Discontinuation of the MPPS is performed as the result of an operator action.

The Hardcopy Application Entity prints images on a remote AE (Printer). It is associated with the real-world activity “Send Images For Printing” which creates a print-job within the print queue containing one virtual film sheet composed from images selected by the user.

The Verification AE sends verification requests to a remote AE.

3.1.2. Functional definition of AE’s

3.1.2.1. Functional definition of verification application entity

The DICOM Verification AE is used to check if the configuration of the remote AE is correct and the remote AE is listening. The echo request can be triggered by the user. The result of the request is displayed to him, immediately.

3.1.2.2. Functional definition of send application entity

If a send-job is triggered for a file or a study, an association request is sent to the destination AE and upon successful negotiation of a Presentation Context the image transfer is started. If the association cannot be opened, an error is displayed to the user. The user must re-trigger the send job manually. If the remote AE is configured as an archive device Storage Commitment is requested in a different association initiated by the Send AE. Storage Commitment Responses are received in the same association, in subsequent associations initiated by the Send AE or in an association initiated by the destination AE.

3.1.2.3. Functional definition of workflow application entity

The Workflow Application Entity attempts to download a Worklist from a remote node. If the Workflow AE establishes an Association to a remote AE, it will transfer all worklist items via the open Association. During receiving the worklist response items are counted and the query processing is canceled if the configurable limit of items is reached. The results will be displayed in a separate list, which will be cleared with the next Worklist Update.
The Workflow AE performs the creation of a MPPS Instance automatically when images are acquired in response to a Scheduled Procedure Step previously received via modality worklist. The MPPS is created upon the start of the procedure, and a final message reporting the completion or discontinuation is sent when the imaging procedure is finished. No intermediate updates will be performed. The MPPS "Complete" or "Discontinued" states can only be set from the user interface.

3.1.2.4. Functional definition of hardcopy application entity

The user can manually select images for print in the 8K software. After selecting layout and print parameters, the transfer of the images to the remote DICOM printer is triggered by the user.

3.1.3. Sequencing of real-world activities

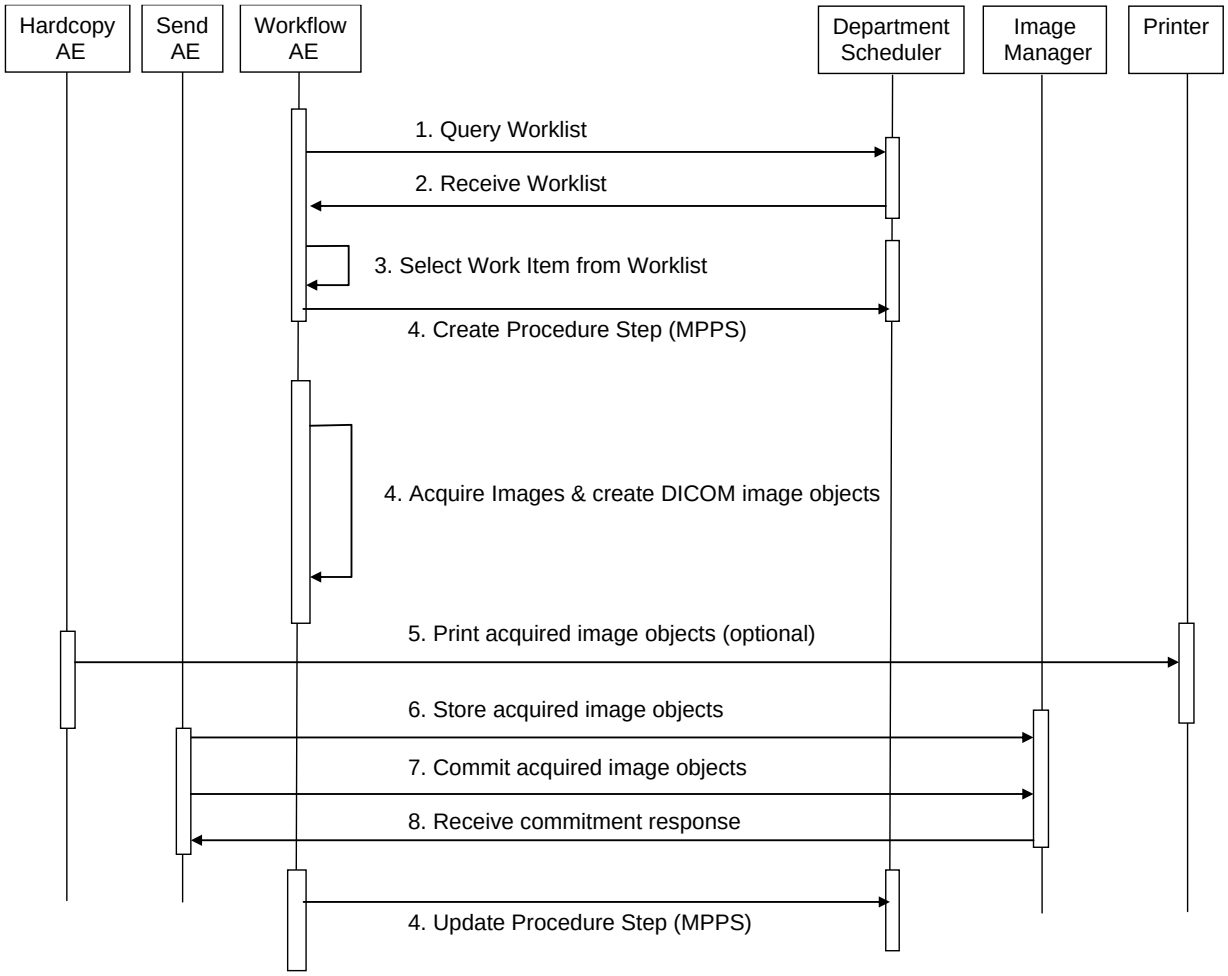


Figure 2: sequence diagram – image acquisition and archiving triggered by worklist

Figure 2 shows the sequence of activities to receive worklist items, create images and archive them.

Other workflow situations (e.g., unscheduled procedure steps) will have other sequencing constraints. Printing could equally take place after the acquired images have been stored. Depending on the timespan needed by the Image Manager to confirm Storage Commitment, the MPPS update may be performed prior to receiving the Storage Commitment response from the Image manager.

Printing could be omitted completely if no printer is connected, or hard copies are not required.

3.2. AE specifications

3.2.1. Send application entity specification

3.2.1.1. SOP classes

The Send Application Entity provides Standard Conformance to the following SOP Classes:

Table 1: SOP classes for send AE

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
X-Ray RF Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Yes	No

3.2.1.2. Association policies

3.2.1.2.1. General

The DICOM standard application context name for DICOM is always proposed:

Table 2: DICOM application context for send AE

Application Context Name	1.2.840.10008.3.1.1.1

3.2.1.2.2. Number of associations

The Send AE 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 will be active at a time, the other remains pending until the active job is completed or failed.

Table 3: Number of associations initiated for send AE

Maximum number of simultaneous Associations	1

The Send AE accepts Associations to receive N-EVENT-REPORT notifications for the Storage Commitment Push Model SOP Class.

3.2.1.2.3. Asynchronous nature

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

Table 4: Asynchronous nature as a SCU for send AE

Maximum number of outstanding asynchronous transactions	1

3.2.1.2.4. Implementation identifying information

The implementation information for this Application Entity is:

Table 5: DICOM implementation class and version for send AE

Implementation Class UID	1.2.250.1.396
Implementation Version Name	APELEM_2.0

3.2.1.3. Association initiation policy

3.2.1.3.1. Activity – send images

3.2.1.3.1.1. Description and sequencing of activities

A user can select image and non-image objects and request them to be sent to a configured destination. SOP instances of a specific study can be sent together or in different associations.

If a send-job is triggered for a file or a study, an association request is sent to the destination AE. Upon successful negotiation of a Presentation Context the object transfer is started, and a C-STORE request is initiated for each object selected for storage. If the association cannot be opened, an error is displayed to the user. For each file sent in a send-job, the C-STORE response is received. If one or more C-STORE operations fail, a message is displayed to the user. The user must re-trigger the send job manually for files that could not be sent, either because the association could not be established, or the C-STORE response status differs from the status SUCCESS or WARNING.

After all files of a send-job are sent, the association is released.

A new association is opened send an N-ACTION request for the Storage Commitment for the SOP Instances sent. After the request was successfully sent, the Send AE waits for a configurable interval (default: 30 seconds) for the Image Manager to send the N-EVENTREPORT. After the timespan has elapsed without receiving an N-EVENT-REPORT message, the Send AE will release the association. It is then expected that the Image Manager initiates an association to the Storage Service AE to send the Storage Commitment N-EVENT-REPORT asynchronously.

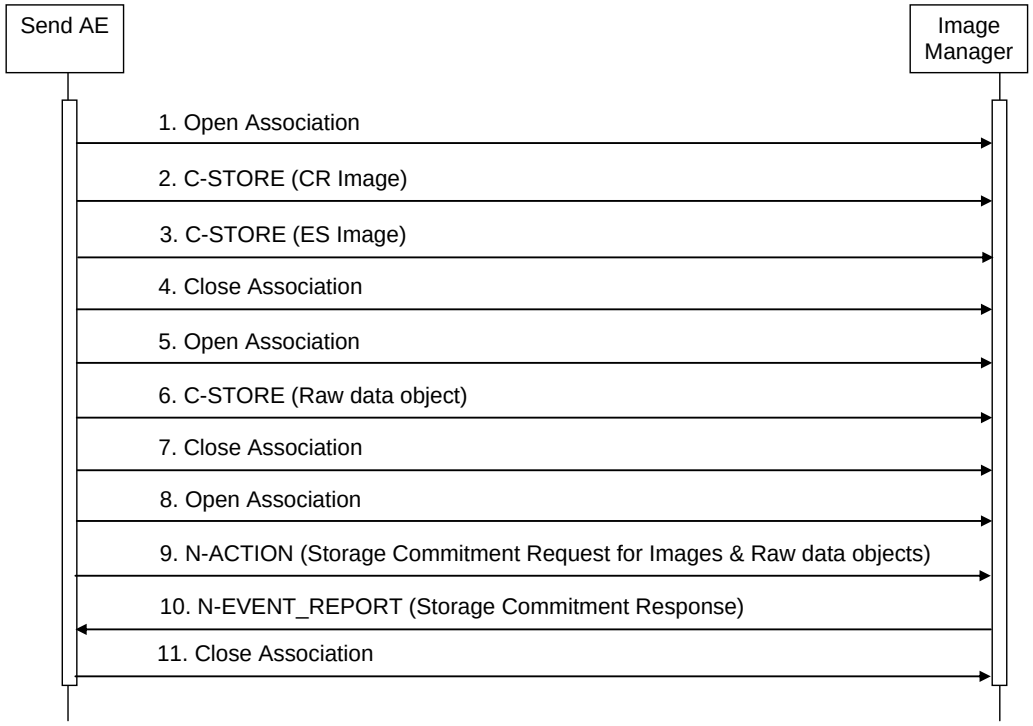


Figure 3: Sequencing of activity – send images

A possible sequence of interactions between the Send AE and an Image Manager (a storage or archive device supporting the Storage SOP Classes as a SCP) is illustrated in Figure 3:

1. The Send AE opens an association with the Image Manager

2. An acquired CR image is transmitted to the Image Manager using a C-STORE request and the Image Manager replies with a C-STORE response (status success).

3. An acquired DX image is transmitted to the Image Manager using a C-STORE request over the same association and the Image Manager replies with a C-STORE response (status success).

4. The Send AE closes the association with the Image Manager

5. The Send AE opens another association with the Image Manager

6. An N-ACTION request is transmitted to the Image Manager to obtain storage commitment of previously transmitted CR and DX images. The Image Manager replies with an N-ACTION response indicating the request has been received and is being processed.

7. The Image Manager immediately transmits an N-EVENT-REPORT request notifying the Send AE of the status of the Storage Commitment Request (sent in previous step using the N-ACTION message). The Storage AE replies with an N-EVENT-REPORT response confirming receipt. The Image Manager could send this message at any time or omit it entirely in favor of transmitting the NEVENT-REPORT over a separate dedicated association (see note)

8. The Storage AE closes the association with the Image Manager

> **Note** ☞ Many other message sequences are possible, depending on the number of images and data objects to be stored, the support for Storage Commitment and the time span before the N-EVENT-REPORT is sent by the Storage AE. The N-EVENT-REPORT can also be sent over a separate association initiated by the Image Manager

3.2.1.3.1.2. Proposed presentation contexts

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

Table 6: Proposed presentation contexts for activity send images

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Baseline JPEG Lossless Hier 14 JPEG Extended 2 4	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.51	SCU	None
Digital X-Ray Image Storage for Presentation	1.2.840.10008.5.1.4.1.1.1.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Baseline JPEG Lossless Hier 14 JPEG Extended 2 4	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.51	SCU	None
X-Ray RF Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Implicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

		Explicit VR Little Endian JPEG Baseline JPEG Lossless Hier 14 JPEG Extended 2 4	1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.51		
X-Ray Radiation Dose SR	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
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

The Transfer Syntaxes listed in this table define the potential Transfer Syntaxes which might be proposed. The uncompressed Transfer Syntaxes in this table will always be proposed. Compressed Transfer Syntaxes may not be proposed if they are inappropriate for a concrete SOP Instance to be transferred. E.g., JPEG Baseline will not be proposed if any of the SOP Instances to be transferred is encoded with more than 8 bits per pixel.

A Presentation Context for the Storage Commitment Push Model will only be proposed if the Remote AE is configured as an archive device.

3.2.1.3.1.3. SOP specific conformance for image storage SOP classes

All Image SOP Classes supported by the Send AE exhibit the same behavior, except where stated, and are described together in this section.

If none of the proposed Presentation Contexts is accepted by the SCP then the Association is aborted by the Send AE using A-ABORT and the send job is marked as failed. The job failure is logged and reported to the user.

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

Table 7: Storage C-store response status handling behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully stored the SOP Instance. If all SOP Instances in a send job have status success, then the job is marked as complete.
Refused	Out of Resources	A700-A7FF	The Association is released using A-RELEASE-RQ and the send job is marked as failed. The status meaning is logged, and the job failure is reported to the user. This is a transient failure.
Error	Data Set does not match SOP Class	A900-A9FF	The Association is released using A-RELEASE-RQ and the send job is marked as failed. The status meaning is logged, and the job failure is reported to the user via the job control application.
Error	Cannot Understand	C000-CFFF	The Association is released using A-RELEASE-RQ and the send job is marked as failed. The status meaning is logged, and the job failure is reported to the user.
Warning	Coercion of Data Elements	B000	Image transmission is considered successful, but the status meaning is logged.

Warning	Data Set does not match SOP Class	B007	Image transmission is considered successful, but the status meaning is logged.
Warning	Elements Discarded	B006	Image transmission is considered successful, but the status meaning is logged.
*	*	Any other status codes	The Association is released using A-RELEASE-RQ and the send job is marked as failed. The status code is logged, and the job failure is reported to the user.

The behavior of Storage AE during communication failure is summarized in the Table below:

Table 8: Storage communication failure behavior

Exception	Behavior
Timeout	The Association is released using A-RELEASE-RQ and the send job is marked as failed. The reason is logged, and the job failure is reported to the user.
Association aborted by the SCP or network layers	The send job is marked as failed. The reason is logged, and the job failure is reported to the user.

A failed send job can be restarted by user interaction.

The contents of all Image Storage SOP Instances created by 8K software conform to the DICOM IOD definitions and are described in chapter 9.1.

If the destination for the send-job is configured as an "Archive" (which is responsible for safe-keeping received SOP Instances) in the AE Table of the 8K software, for each successful image transfer the following information will be recorded in the local database of the 8K software:

- The AET that has successfully received the image
- The Patient ID
- The Study Instance UID
- The Series Instance UID
- The SOP Instance UID

3.2.1.3.1.4. SOP specific conformance for Storage Commitment SOP classes

3.2.1.3.1.4.1. Storage Commitment Operations (N-ACTION)

The Send AE will request storage commitment for instances of the supported Image Storage SOP Classes if the Remote AE is configured as an archive device and a presentation context for the Storage Commitment Push Model has been accepted.

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

Table 9: Storage Commitment N-ACTION response status handling behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The request for storage commitment is considered successfully sent. A timer is started that will expire if no N-EVENT-REPORT for the Transaction UID is received within a configurable timeout period.

*	*	Any other status codes	The Association is aborted using A-ABORT and the request for storage commitment is marked as failed. The status is logged and reported to the user. There is no automatic retry mechanism.

The behavior of Send AE during communication failure is summarized in the Table below:

Table 10: Storage commitment communication failure behavior

Exception	Behavior
Timeout	The Association is released using A-RELEASE-RQ and the send job is marked as failed. The reason is logged, and the job failure is reported to the user.
Association aborted by the SCP or network layers	The send job is marked as failed. The reason is logged, and the job failure is reported to the user.

3.2.1.3.1.4.2. Storage Commitment Operations (N-EVENT-REPORT)

The Send AE is capable of receiving an N-EVENT-REPORT notification if it has successfully negotiated a Presentation Context for the Storage Commitment Push Model (i.e., only associations established with archive devices).

Upon receipt of an N-EVENT-REPORT the timer associated with the Transaction UID will be canceled.

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

Table 11: Storage Commitment N-EVENT-REPORT behavior

Event Type Name	Event Type ID	Behavior
Storage Commitment Request Successful	1	The Referenced SOP Instances under Referenced SOP Sequence (0008,1199) are marked as "Stored & Committed (SC)". There is no automatic deletion mechanism.
Storage Commitment Request Complete - Failures Exist	2	The Referenced SOP Instances under Referenced SOP Sequence (0008,1199) are treated in the same way as in the success case (Event Type 1). The Referenced SOP Instances under Failed SOP Sequence (0008,1198) are marked as "Stored & Commit Failed (Sf)". There is no automatic retry mechanism.

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

Table 12: Storage commitment N-EVENT-REPORT response status reason

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The storage commitment result has been successfully received.
Failure	Failure	0110H	An internal error occurred during processing of the N-EVENT-REPORT. The expiration timer for the transaction UID will not be canceled. This case will be treated as if the Storage Commitment SCP had not issued the N-EVENT-REPORT. That is, subsequent attempts of the Storage Commitment SCP to answer to the Storage Commitment Transaction, which is subject of this message, will be handled by the SCU.

3.2.1.4. Association acceptance policy

3.2.1.4.1. Activity – Receive Storage Commitment response

3.2.1.4.1.1. Description and sequencing of activities

The Send AE will accept associations in order to receive responses to a Storage Commitment Request.

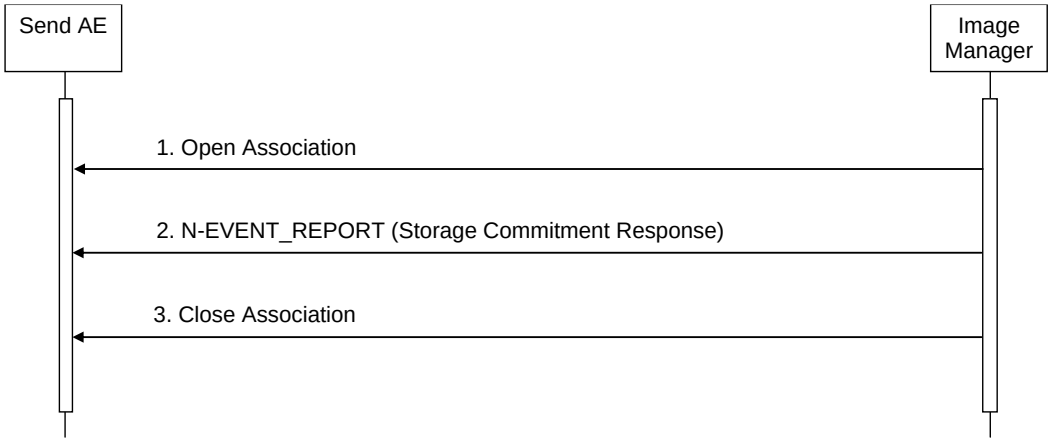


Figure 4: Sequencing of activity –receive storage commitment response

A possible sequence of interactions between the Send AE and an Image Manager (e.g., a storage or archive device supporting Storage Commitment SOP Classes as an SCP) is illustrated in the Figure above:

1. The Image Manager opens a new association with the Send AE.
2. The Image Manager sends an N-EVENT-REPORT request notifying the Send AE of

the status of a previous Storage Commitment Request. The Send AE replies with an NEVENT-

REPORT response confirming receipt.

3. The Image Manager closes the association with the Send AE.

3.2.1.4.1.2. Accepted Presentation Contexts

The Send AE will accept Presentation Contexts as shown in the Table below:

Table 13: Acceptable presentation contexts for activity receive storage commitment response

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
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	SCP	None

The Send AE will prefer to select the Explicit VR Little Endian Transfer Syntax if multiple transfer syntaxes are offered. The Send AE will only accept the SCU role (which must be proposed via SCP/SCU Role Selection Negotiation) within a Presentation Context for the Storage Commitment Push Model SOP Class.

3.2.2. Workflow application entity specification

3.2.2.1. SOP classes

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

Table 14: SOP classes for workflow AE

SOP Class Name	SOP Class UID	SCU	SCP
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	No
Modality Performed Procedures Step	1.2.840.10008.3.1.2.3.3	Yes	No

3.2.2.2. Association policies

3.2.2.2.1. General

The DICOM standard application context name for DICOM is always proposed:

Table 15: DICOM application context for workflow AE

Application Context Name	1.2.840.10008.3.1.1.1

3.2.2.2.2. Number of associations

The Workflow AE initiates one Association at a time for a Worklist request.

Table 16: Number of associations initiated for workflow AE

Maximum number of simultaneous Associations	1

The Workflow AE does not accept Association Requests by remote AEs.

3.2.2.2.3. Asynchronous nature

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

Table 17: Asynchronous nature as a SCU for workflow AE

Maximum number of outstanding asynchronous transactions	1

3.2.2.2.4. Implementation identifying information

The implementation information for this Application Entity is:

Table 18: DICOM implementation class and version for workflow AE

Implementation Class UID	1.2.250.1.396
Implementation Version Name	APELEM_2.0

3.2.2.3. Association initiation policy

The Workflow AE will initiate an Association to issue a C-FIND request according to the Modality Worklist Information Model Upon SOP Instances being acquired in the scope of a SPS received via Modality Worklist, it will initiate an Association for each status transition being reported via MPPS. That is, MPPS-N-CREATE and MPPS-N-SET will be sent in separate associations.

3.2.2.3.1. Activity – worklist update

3.2.2.3.1.1. Description and sequencing of activities

The request for a Worklist Update is initiated by user interaction. A user can select different search criteria, i.e., Scheduled Procedure Step Start Date, Modality and Scheduled Station AE Title (always set by default).

Upon initiation of the request, the Workflow AE will build a Request Identifier for the C-FIND request, initiate an Association to send the request with the search criteria and will wait for the Worklist responses. To protect the system from overflow, the Workflow AE can limit the number of processed worklist responses to a configurable maximum. By default, no limit is configured. During receiving the worklist response items are counted and the query processing is canceled by issuing a C-FIND-CANCEL if the configurable limit of items is reached. The results will be displayed in a list, which will be cleared with the next worklist update.

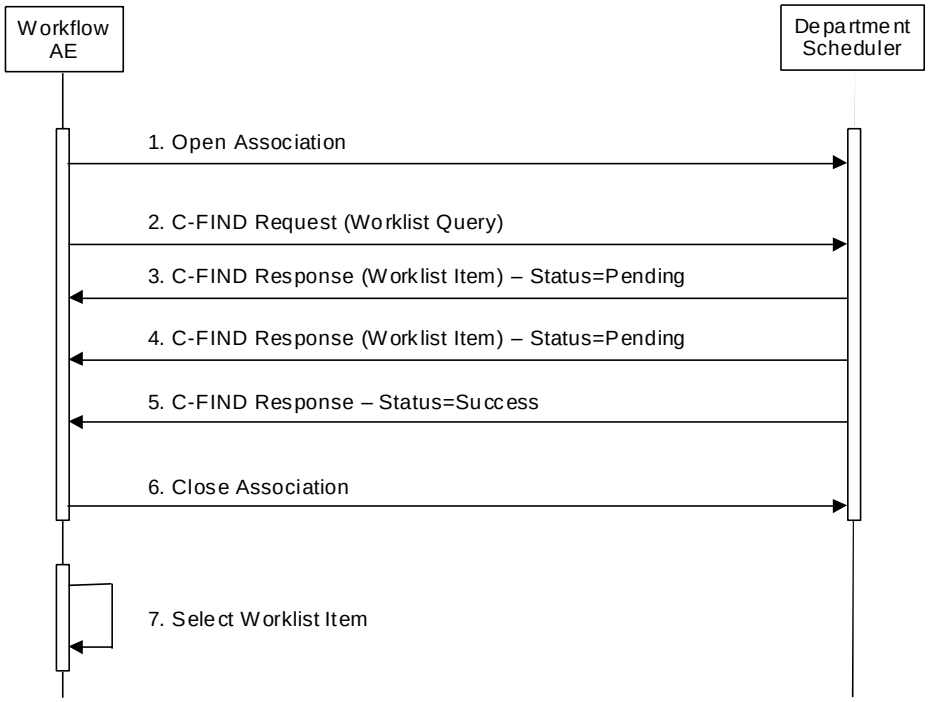


Figure 5: Sequencing of activity – worklist update

A possible sequence of interactions between the Workflow AE and a Departmental Scheduler (e.g., a device such as a RIS or HIS which supports the Modality Worklist SOP Class as a SCP) is illustrated in the Figure 4 above:

1. The Worklist AE opens an association with the Departmental Scheduler

2. The Worklist AE sends a C-FIND request to the Departmental Scheduler containing the Worklist Query attributes.

3. The Departmental Scheduler returns a C-FIND response containing the requested attributes of the first matching Worklist Item.

4. The Departmental Scheduler returns another C-FIND response containing the requested attributes of the second matching Worklist Item.

5. The Departmental Scheduler returns another C-FIND response with status Success indicating that no further matching Worklist Items exist. This example assumes that only 2 Worklist items match the Worklist Query.

6. The Worklist AE closes the association with the Departmental Scheduler.

7. The user selects a Worklist Item from the Worklist and prepares to acquire new images.

Proposed Presentation Contexts

The Workflow AE will propose Presentation Contexts as shown in the following table:

Table 19: Proposed presentation contexts for activity worklist update

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

3.2.2.3.1.2. SOP specific conformance for modality worklist

The Table below provides a description of the 8K software Worklist Request Identifier and specifies the attributes that are copied into the images. Unexpected attributes returned in a C-FIND response are ignored.

Requested returned attributes not supported by the SCP are set to have no value. Non-matching responses returned by the SCP due to unsupported optional matching keys are handled like matches of the request identifier. No attempt is made it filter out possible duplicate entries.

If an extended character set is used in the Request Identifier, Specific Character Set (0008,0005) will be included in the Identifier (see chapter 7 for supported values). Otherwise, Specific Character Set (0008,0005) will not be sent.

The table below should be read as follows:

Attribute Name	Attributes supported to build an 8K software Worklist Request Identifier. 8K software will supply this attribute as Return Key with zero length for Universal Matching, if it is not supplied as a matching key otherwise.
Tag	DICOM tag for this attribute.
Match	Type of matching supported for this attribute by 8K software. Matching keys for Worklist Update. A "S" will indicate that 8K software will supply an attribute value for Single Value Matching, a "R" will indicate Range Matching and a "*" will denote wild card matching.
Query	An "x" " will indicate that that 8K software will supply this attribute as matching key automatically. An (x) will indicate that this matching key is provided only, if entered in the Query Patient Worklist dialog.

Display	Displayed keys. An "x" indicates that this worklist attribute is displayed to the user during a patient registration dialog. For example, Patient Name will be displayed when registering the patient prior to an examination.
IOD	An "x" indicates that this Worklist attribute is included into all Object Instances created during performance of the related Procedure Step.

Table 20: Modality worklist - find SOP class - C-find request identifier

Attribute Name	Tag	Match	Query	Display	IOD	Note
Scheduled Procedure Step						
Scheduled Procedure Step Sequence	(0040,0100)					Only one item allowed
> Scheduled Station AE Title	(0040,0001)	S	x	x		
> Scheduled Procedure Step Start Date	(0040,0002)	S,R	(x)	x		
> Scheduled Procedure Step Start Time	(0040,0003)	S,R	(x)	x		
> Modality	(0008,0060)	S	(x)			
> Scheduled Physicians Name	(0040,0006)	S,*	(x)	x	x	Set as Performing Physician in IOD
> Scheduled Procedure Step Description	(0040,0007)			x		
> Scheduled Protocol Code Sequence	(0040,0008)					
>> Code Value	(0008,0100)					
>> Coding Scheme Designator	(0008,0102)					
>> Code Meaning	(0008,0104)			x		
> Scheduled Procedure Step ID	(0040,0009)					
> Scheduled Station Name	(0040,0010)	S	(x)	x		
> Scheduled Procedure Step Location	(0040,0011)	S	(x)	x		
> Pre-Medication	(0040,0012)			x		
> Requested Contrast Agent	(0032,1070)			x		
Requested Procedure						
Requested Procedure ID	(0040,1001)	S	(x)		x	Set as Study ID in IOD
Requested Procedure Description	(0032,1060)			x	x	Set as Study Description in IOD
Requested Procedure Code Sequence	(0032,1064)					Only one item allowed.
> Code Value	(0008,0100)					
> Coding Scheme Designator	(0008,0102)					
> Code Meaning	(0008,0104)			x		
Study Instance UID	(0020,000D)				x	
Patient Transport Arrangements	(0040,1004)			x		

Reason for the Requested Procedure	(0040,1002)					
Reason for Requested Procedure Code Sequence	(0040,100A)					
> Code Value	(0008,0100)					
> Coding Scheme Designator	(0008,0102)					
> Code Meaning	(0008,0104)					
Requested Procedure Priority	(0040,1003)					
Names Of Intended Recipients Of Results	(0040,1010)					
Requested Procedure Comments	(0040,1400)					
Imaging Service Request						
Accession Number	(0008,0050)	S	(x)	x	x	
Referring Physician's Name	(0008,0090)			x	x	
Requesting Physician	(0032,1032)			x		
Imaging Service Request Comments	(0040,2400)					
Visit Identification						
Admission ID	(0038,0010)				x	
Institution Name	(0008,0080)				x	
Institution Address	(0008,0081)				x	
Institutional Department Name	(0008,1040)				x	
Visit Status						
Current Patient Location	(0038,0300)					
Patient Identification						
Patient's Name	(0010,0010)	S,*	(x)	x	x	
Patient ID	(0010,0020)	S	(x)	x	x	
Issuer of Patient ID	(0010,0021)	S	(x)	x	x	
Patient Demographic						
Patient's Birth Date	(0010,0030)			x	x	
Patient's Sex	(0010,0040)			x	x	
Patient's Size	(0010,1020)			x	x	
Patient's Weight	(0010,1030)			x	x	
Patient Medical						
Patient State	(0038,0500)			x		
Pregnancy Status	(0010,21C0)			x		
Medical Alerts	(0010,2000)			x		
Allergies	(0010,2110)			x		
Special Needs	(0038,0050)			x		
Patient Comments	(0010,4000)			x	x	
Ethnic Group	(0010,2160)			x	x	
Additional Patient History	(0010,21B0)			x		
Confidentiality Constraint on Patient Data Description	(0040,3001)			x		

The behavior of The Workflow AE, when encountering status codes in a Modality Worklist C-FIND response is summarized in the Table below. If any other SCP response status than "Success" or "Pending" is received by The Workflow AE, a message "query failed" will appear on the user interface.

Table 21: Modality worklist C-find response status handling behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Matching is complete	0000	The SCP has completed the matches. Worklist items are available for display or further processing.
Refused	Out of Resources	A700	The Association is released using A-RELEASE-RQ and the worklist query is marked as failed. The status meaning is logged and reported to the user. Any additional error information in the Response will be logged.
Failed	Identifier does not match SOP Class	A900	The Association is released using A-RELEASE-RQ and the worklist query is marked as failed. The status meaning is logged and reported to the user. Any additional error information in the Response will be logged.
Failed	Unable to Process	C000 – CFFF	The Association is released using A-RELEASE-RQ and the worklist query is marked as failed. The status meaning is logged and reported to the user. Any additional error information in the Response will be logged.
Cancel	Matching terminated due to Cancel request	FE00	Worklist items are available for display or further processing. The status meaning is logged.
Pending	Matches are continuing	FF00	The worklist item contained in the Identifier is collected for later display or further processing.
*	*	Any other status code.	The Association is released using A-RELEASE-RQ and the worklist is marked as failed. The status meaning is logged and reported to the user. Any additional error information in the Response will be logged.

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

Table 22: Modality worklist communication failure behavior

Exception	Behavior
Timeout	The Association is aborted using A-ABORT and the worklist query marked as failed. The reason is logged and reported to the user if an interactive query.
Association aborted by the SCP or network layers	The worklist query is marked as failed. The reason is logged and reported to the user if an interactive query.

Acquired images will always use the Study Instance UID specified for the Scheduled Procedure Step (if available). If an acquisition is unscheduled, a Study Instance UID will be generated locally.

3.2.2.3.2. Activity – acquire images

3.2.2.3.2.1. Description and sequencing of activities

Upon selection of a worklist record, the operator starts the image acquisition. The trigger to create an MPPS SOP Instance is derived from this event. An association to the configured MPPS SCP is established immediately and the related MPPS SOP Instance will be created.

The operator either completes the acquisition and confirms completion through the user interface of 8K software or cancels the acquisition. An MPPS Instance that has been sent with a state of "COMPLETED" or "DISCONTINUED" can no longer be updated.

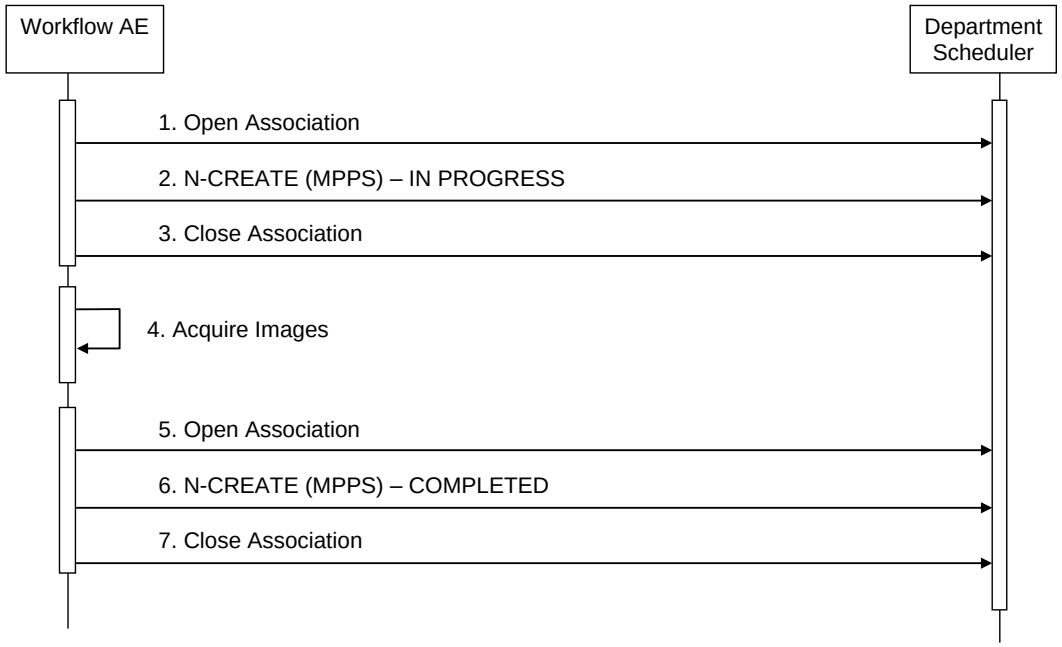


Figure 6: Sequencing of activity – acquire images

A possible sequence of interactions between the Workflow AE and a Departmental Scheduler is illustrated in Figure 6: the Workflow AE opens an association with the Departmental Scheduler

The Workflow AE sends an N-CREATE request to the Departmental Scheduler to create an MPPS instance with status of "IN PROGRESS" and create all necessary attributes. The Departmental Scheduler acknowledges the MPPS creation with an N-CREATE response (status SUCCESS).

The Workflow AE closes the association with the Departmental Scheduler

Images are acquired, stored in the local database, and transferred to a remote Storage AE.

The Workflow AE opens an association with the Departmental Scheduler

The Workflow AE sends an N-SET request to the Departmental Scheduler to update the MPPS instance with status of "COMPLETED" and set all necessary attributes. The Departmental Scheduler acknowledges the MPPS creation with an N-SET response (status SUCCESS).

The Workflow AE closes the association with the Departmental Scheduler.

3.2.2.3.2.2. Proposed presentation contexts

The 8K software will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
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

3.2.2.3.2.3. SOP specific conformance for MPPS

The behavior of the 8K software when encountering status codes in an MPPS N-CREATE or N-SET response is summarized in the following table. If any other response status than "SUCCESS" or "WARNING" is received, a message "MPPS update failed" will appear on the user interface.

Table 23: MPPS N-CREATE / N-SET status handling behavior

Service Status	**Further Meaning**	**Error Code**	**Behavior**
Success	Matching is complete	0000	The SCP has completed the operation successfully. The Association is released using A-RELEASE-RQ.
Warning	Attribute Value out of Range	0116H	The MPPS operation is considered successful but the status meaning is logged. Any additional status information in the Response will be logged. The Association is released using A-RELEASE-RQ.
Failure	Processing Failure – Performed Procedure Step Object may no longer be updated	0110H	The Association is aborted using A-ABORT-RQ. The status meaning is logged and reported to the user. Any additional error information in the Response will be logged. Any additional error information in the Response will be logged.
Failure	Resource Limitation	0213H	The Association is aborted using A-ABORT-RQ. The status meaning is logged and reported to the user. Any additional error information in the Response will be logged.
*	*	Any other Status code	The Association is aborted using A-ABORT-RQ. Any additional error information in the Response will be logged.

The behavior of the 8K software during communication failure is summarized in the table below:

Table 24: MPPS communication failure behavior

Exception	Behavior
Timeout	The Association is aborted using A-ABORT and the MPPS transfer is marked as failed. The reason is logged and reported to the user.
Association aborted by the SCP or network layers	The worklist query is marked as failed. The reason is logged and reported to the user if an interactive query.

The following table provides a description of the MPPS N-CREATE and N-SET request identifiers sent by

Table 25: MPPS N-CREATE / N-SET request identifier

Attribute Name	Tag	VR	N-CREATE	N-SET
Specific Character Set	(0008,0005)	CS	From Modality Worklist or Configuration. See also Chapter 6)	Copied from N-CREATE
Modality	(0008,0060)	CS	From Modality Worklist or user input	
Procedure Code Sequence	(0008,1032)	SQ	Zero or one item. From Modality Worklist (Copied from Requested Procedure Code Sequence.	
Referenced Patient Sequence	(0008,1120)	SQ	Zero length	
Patient's Name	(0010,0010)	PN	From Modality Worklist or user input (all 5 components). The user can modify values provided via Modality Worklist.	
Patient ID	(0010,0020)	LO	From Modality Worklist or user input. The user can modify values provided via Modality Worklist.	
Patient's Birth Date	(0010,0030)	DA	From Modality Worklist or user input. The user can modify values provided via Modality Worklist.	
Patient's Sex	(0010,0040)	CS	From Modality Worklist or user input. The user can modify values provided via Modality Worklist.	
Study ID	(0020,0010)	SH	From Modality Worklist (copied from Requested Procedure ID) or user input. The user can modify values provided via Modality Worklist.	
Admission ID	(0038,0010)	LO	From Modality Worklist or Zero length	
Performed Station AE Title	(0040,0241)	AE	From Modality worklist or user input. The user can modify values provided via Modality Worklist.	

Performed Station Name	(0040,0242)	SH	From Modality Worklist or user input. The user can modify values provided via Modality Worklist.	
Performed Location	(0040,0243)	SH	From Modality Worklist or user input. The user can modify values provided via Modality Worklist.	
Performed Procedure Step Start Date	(0040,0244)	DA	Current Date when N-CREATE message is constructed. The user can modify the value.	
Performed Procedure Step Start Time	(0040,0245)	TM	Current Time when N-CREATE message is constructed. The user can modify the value.	
Performed Procedure Step End Date	(0040,0250)	DA	Zero length	Default: Current Date when N-SET message is constructed.
Performed Procedure Step End Time	(0040,0251)	TM	Zero length	Default: Current Time when N-SET message is constructed. The user can modify the value.
Performed Procedure Step Status	(0040,0252)	CS	IN PROGRESS	DISCONTINUED or COMPLETED
Performed Procedure Step Discontinuation Reason Code Sequence	(0040,0281)	SQ		If Performed Procedure Step Status (0040,0252) is "DISCONTINUED" then a single item will be present containing a user-selected entry drawn from CID 9300 “Procedure Discontinuation Reasons”.
Performed Procedure Step ID	(0040,0253)	SH	From Modality Worklist (copied from Scheduled Procedure Step ID) in case of 1:1 correspondence between scheduled and performed procedure step. Otherwise, it is internally created. The user can modify the value.	
Performed Procedure Step Description	(0040,0254)	LO	From Modality Worklist (copied from Scheduled Procedure Step Description) in case of 1:1 correspondence between scheduled and performed procedure step. Otherwise, it is set to zero length. The user can modify the value.	
Performed Procedure Type Description	(0040,0255)	LO	Zero length	

Performed Protocol Code Sequence	(0040,0260)	SQ	From Modality Worklist (copied from Scheduled Protocol Code Sequence) in case of 1:1 correspondence between scheduled and performed procedure step. If more than one scheduled procedure steps are performed at once, the Performed Protocol Code Sequence is a concatenation of all Scheduled Protocol Code Sequences. The user can modify the value.	Transferred from N-CREATE dataset. The user can modify this value
Scheduled Step Attributes Sequence	(0040,0270)	SQ	One or more items. An item is added for each worklist item added to the Performed Procedure Step.	
> Accession Number	(0008,0050)	SH	From Modality Worklist or user input. The user can modify values provided via Modality Worklist.	
> Referenced Study Sequence	(0008,1110)	SQ	Zero length	
> Study Instance UID	(0020,000D)	UI	From Modality Worklist or automatically generated.	
> Requested Procedure Description	(0032,1060)	LO	From Modality Worklist or Zero length	
> Scheduled Procedure Step Description	(0040,0007)	LO	From Modality Worklist or Zero length	
> Scheduled Protocol Code Sequence	(0040,0008)	SQ	From Modality Worklist or Zero length	
> Scheduled Procedure Step ID	(0040,0009)	SH	From Modality Worklist or Zero length	
> Requested Procedure ID	(0040,1001)	SH	From Modality Worklist or Zero length	
Performed Series Sequence	(0040,0340)	SQ	Zero length	One or more items (One item per series created)
> Retrieve AE Title	(0008,0054)	AE		Obtained from Storage Commitment Response for successfully archived images
> Series Description	(0008,103E)	LO		User Input
> Performing Physician's Name	(0008,1050)	PN		User Input
> Operator's Name	(0008,1070)	PN		User Input
> Referenced Image Sequence	(0008,1140)	SQ		One or more items (One item per image instance in series)

>> Referenced SOP Class UID	(0008,1150)	UI		From image instance
>> Referenced SOP Instance UID	(0008,1155)	UI		From image instance
> Protocol Name	(0018,1030)	LO		From Modality Worklist (concatenated code meaning of Performed Protocol Codes) or user input. The user can modify values provided via Modality Worklist.
> Series Instance UID	(0020,000E)	UI		Automatically generated
> Referenced Standalone SOP Instance Seq.	(0040,0220)	SQ		One or more items (One item per non-image instance in series)
>> Referenced SOP Class UID	(0008,1150)	UI		From non-image instance
>> Referenced SOP Instance UID	(0008,1155)	UI		From non-image instance

3.2.2.4. Association acceptance policy

The Workflow AE does not accept Associations.

3.2.3. Hardcopy application entity specification

3.2.3.1. SOP classes

Hardcopy AE provides Standard Conformance to the following SOP Classes:

Table 26: SOP classes for hardcopy AE

SOP Class Name	SOP Class UID	SCU	SCP
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No
Printer SOP Class	1.2.840.10008.5.1.1.16	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
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

3.2.3.2. Association policies

3.2.3.2.1. General

The DICOM standard application context name for DICOM is always proposed:

Table 27: DICOM application context for hardcopy AE

Application Context Name	1.2.840.10008.3.1.1.1

3.2.3.2.2. Number of associations

Hardcopy AE 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 will be active at a time, the other remains pending until the active job is completed or failed.

Table 28: Number of associations initiated for hardcopy AE

Maximum number of simultaneous Associations	1

The Hardcopy AE does not accept association requests from remote AEs.

3.2.3.2.3. Asynchronous nature

Hardcopy AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 29: Asynchronous nature as a SCU for hardcopy AE

Maximum number of outstanding asynchronous transactions	1

3.2.3.2.4. Implementation identifying information

The implementation information for this Application Entity is:

Table 30: DICOM implementation class and version for hardcopy AE

Implementation Class UID	1.2.250.1.396
Implementation Version Name	APELEM_2.0

3.2.3.3. Association initiation policy

3.2.3.3.1. Activity – send images for printing

3.2.3.3.1.1. Description and sequencing of activities

Hardcopy AE will issue Print Management requests to a SCP supporting the DICOM Print services, in order to produce hard copy representations of DICOM images. The user can select a layout and one or more images for a print job. When the user initiates the print job, an association is established to the selected DICOM printer. After the association is established, the Hardcopy AE defines, if basic grayscale or basic color print management Meta SOP class is used, dependent on the selected images and the accepted presentation contexts. A film session and one or more film boxes are created, dependent on the number of selected images and the selected layout. If a selected image is incompatible to the Meta SOP Class of the print job it is converted. This means RGB images are converted to monochrome if Basic Grayscale Print Management Meta SOP Class is used and vice versa. After all image boxes are set, the printer is initiated to start the printing with a Film Session N-ACTION-Request and the Association is closed.

The following illustration demonstrates the sequence of messages after a print job is initiated.

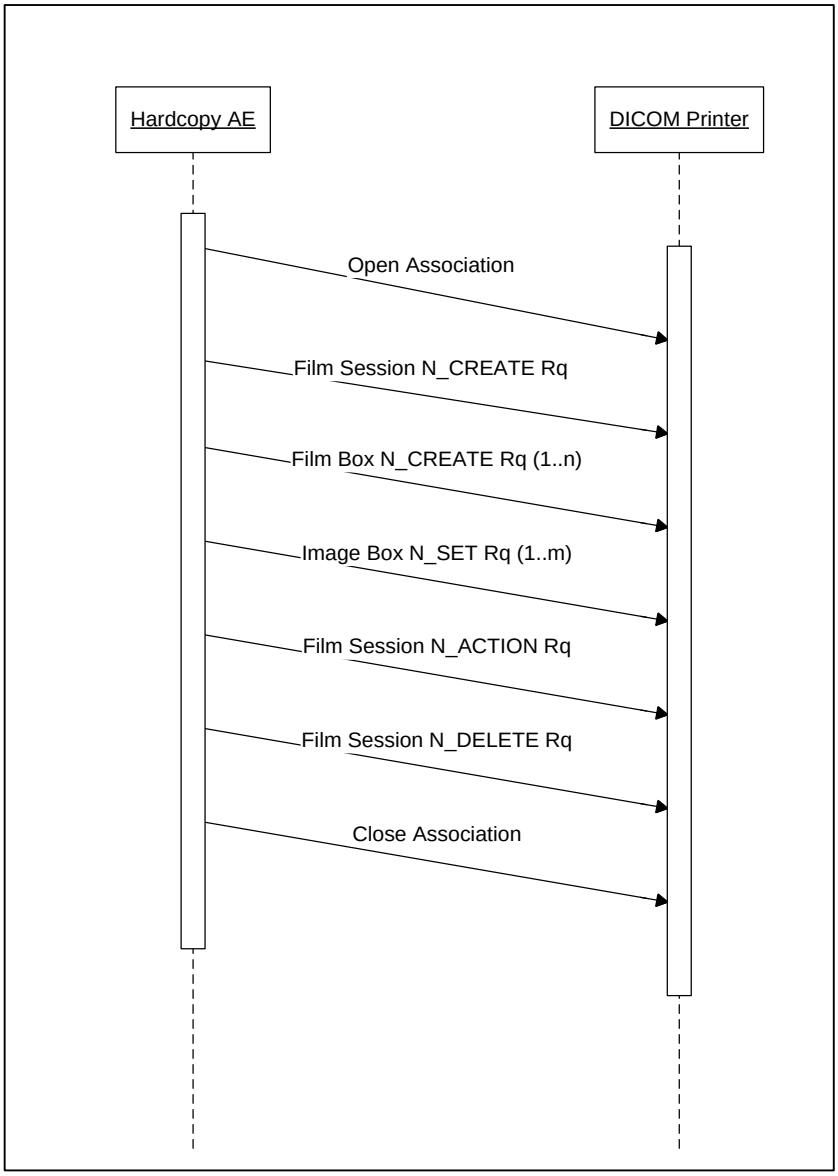


Figure 7: Sequencing of messages after print job is initiated

3.2.3.3.1.2. Proposed presentation contexts

The Hardcopy AE can propose the Presentation Contexts shown in the following table:

Table 31: Proposed presentation contexts for activity print images

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

3.2.3.3.1.3. SOP specific conformance image SOP classes

The behavior of Hardcopy AE during communication failure is summarized in the Table below:

Table 32: Print communication failure behavior

Exception	Behavior
Timeout	The Association is released using A-RELEASE-RQ and the send job is marked as failed. The reason is logged and the job failure is reported to the user.
Association aborted by the SCP or network layers	The print job is marked as failed. The reason is logged and the job failure is reported to the user.

A failed print job can be restarted by user interaction.

The contents of all Image Storage SOP Instances created by 8K software conform to the DICOM IOD definitions and are described in section 8.1.

3.2.3.3.1.3.1. Basic film session SOP class

The Hardcopy AE issues the following DIMSE-N commands for the Basic Film Session SOP Class: N-CREATE, N-ACTION and N-DELETE Print.

Table 33: BASIC FILM SESSION N-CREATE request attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Copies	(2000,0010)	IS	1 .. 10	ANAP	User

Print Priority	(2000,0020)	CS	HIGH, MED, LOW	ANAP	Config
Medium Type	(2000,0030)	CS	BLUE FILM, CLEAR FILM or PAPER	ANAP	Config
Film Destination	(2000,0040)	CS	MAGAZINE, PROCESSOR or Bin_x (x = 1..8)	ANAP	Config
Film Session Label	(2000,0050)	LO		ANAP	Config
Owner ID	(2100,0160)	SH		ANAP	Config

The behavior of Hardcopy AE when encountering status codes in a Basic Film Session N-CREATE response is summarized in the Table below:

Table 34: BASIC FILM SESSION N-CREATE response status handling behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully created the Film Session. The print job is continued. No user interaction necessary
*	*	Any other status codes	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.

The behavior of Hardcopy AE when encountering status codes in a Basic Film Session N-DELETE response is summarized in the Table below:

Table 35: BASIC FILM SESSION N-DELETE response status handling behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully deleted the Film Session. The association will be closed
*	*	Any other status codes	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.

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

Table 36: BASIC FILM SESSION N-ACTION response status handling behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP starts to print the Film Session. The print job is continued. No user interaction necessary
Warning	Film session printing (collation) is not supported	B601	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.

	Film Session SOP Instance hierarchy does not contain Image Box SOP Instances (empty page)	B602	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.
	Image size is larger than image box size, the image has been demagnified.	B604	The print job is continued. The status code is logged.
	Image size is larger than the Image Box size. The Image has been cropped to fit.	B609	The print job is continued. The status code is logged.
	Image size or Combined Print Image size is larger than the Image Box size. Image or Combined Print Image has been decimated to fit.	B60A	The print job is continued. The status code is logged.
Failure	Film Session SOP Instance hierarchy does not contain Film Box SOP Instances	C600	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.
	Unable to create Print Job SOP Instance; print queue is full	C601	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.
	Image size is larger than image box size	C603	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.
	Combined Print Image size is larger than the Image Box size	C613	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.
*	*	Any other status codes	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.

3.2.3.3.1.4. Basic film box SOP class

The Hardcopy AE issues the following DIMSE-N commands for the Basic Film Box SOP Class: N-CREATE.

Table 37: BASIC FILM BOX N-CREATE request attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Display Format	(2010,0010)	CS	STANDARD\1,1	ALWAYS	User
Referenced Film Session Sequence	(2010,0500)	SQ		ALWAYS	Auto
>Referenced SOP Class UID	(0008,1150)	UI	1.2.840.10008.5.1.1.1	ALWAYS	Auto
>Referenced SOP Instance UID	(0008,1155)	UI	From created Film Session SOP Instance	ALWAYS	Auto
Film Orientation	(2010,0040)	CS	PORTRAIT or LANDSCAPE	ANAP	User
Film Size ID	(2010,0050)	CS	8INX10IN, 8_5INX11IN, 10INX12IN, 10INX14IN, 11INX14IN, 11INX17IN, 14INX14IN, 14INX17IN, 24CMX24CM, 24CMX30CM, A4, A3	ANAP	Config
Magnification Type	(2010,0060)	CS	REPLICATE, BILINEAR, CUBIC or NONE	ANAP	Config
Border Density	(2010,0100)	CS	BLACK or WHITE	ANAP	Config
Empty Image Density	(2010,0110)	CS	BLACK or WHITE	ANAP	Config
Max Density	(2010,0130)	US	Integer value	ANAP	Config
Min Density	(2010,0120)	US	Integer value	ANAP	Config
Trim	(2010,0140)	CS	YES or NO	ANAP	Config
Configuration Information	(2010,0150)	ST		ANAP	Config
Requested Resolution ID	(2020,0050)	CS	STANDARD or HIGH	ANAP	Config

The behaviour of Hardcopy AE when encountering status codes in a Basic Film Box N-CREATE response is summarized in the Table below:

Table 38: BASIC FILM BOX N-CREATE response status handling behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully created the Film Box. The print job is continued. No user interaction necessary
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.	B605	The print job is continued. The status code is logged.
Warning	Attribute value out of range.	0116	The print job is continued. The status code is logged.
Failure	There is an existing Film Box that has not been printed and N-ACTION at the Film Session level is not supported. A new Film Box will not be created when a previous Film Box has not been printed.	C616	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.
*	*	Any other status codes	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.

3.2.3.3.1.5. Basic grayscale image Box SOP class

The Hardcopy AE issues the following DIMSE-N commands for the Basic Grayscale Image Box SOP Class: N-SET.

Table 39: GRAYSCALE IMAGE BOX N-SET request attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Position	(2020,0010)	US	1	ALWAYS	Auto
Requested Image Size	(2020,0030)	DS	Calculated value of width (x-dimension) in mm of the image to be printed. This value overrides the size that corresponds with optimal filling of the Image Box by the size of the original image. (only possible for images where pixel spacing information is available)	ANAP	Auto
Requested Decimate/CropBehavior	(2020,0040)	CS	Set to CROP if Requested Image Size is present	ANAP	Auto
Basic Grayscale Image Sequence	(2020,0110)	SQ		ALWAYS	Auto
>Samples Per Pixel	(0028,0002)	US	1	ALWAYS	Auto

>Photometric Interpretation	(0028,0004)	CS	MONOCHROME2	ALWAYS	Auto
>Rows	(0028,0010)	US	Depends on original image	ALWAYS	Auto
>Columns	(0028,0011)	US	Depends on original image	ALWAYS	Auto
>Pixel Aspect Ratio	(0028,0034)	IS	1\1	ALWAYS	Auto
>Bits Allocated	(0028,0100)	US	8	ALWAYS	Auto
>Bits Stored	(0028,0101)	US	8	ALWAYS	Auto
>High Bit	(0028,0102)	US	7	ALWAYS	Auto
>Pixel Representation	(0028,0103)	US	0	ALWAYS	Auto
>Pixel Data	(7FE0,0010)	OB	Pixels of rendered film sheet	ALWAYS	Auto

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

Table 40: BASIC GRAYSCALE IMAGE BOX N-SET response status handling behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully set the image box. The print job is continued. No user interaction necessary
Warning	Image size larger than image box size, the image has been de-magnified.	B604	The print job is continued. The status code is logged.
	Image size is larger than the Image Box size. The Image has been cropped to fit.	B609	The print job is continued. The status code is logged.
	Image size or Combined Print Image size is larger than the Image Box size. The Image or Combined Print Image has been decimated to fit.	B60A	The print job is continued. The status code is logged.
Failure	Image size is larger than image box size	C603	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.
	Insufficient memory in printer to store the image	C605	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.
	Combined Print Image size is larger than the Image Box size	C613	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.
*	*	Any other status codes	The Association is released using A-RELEASE-RQ and the print job is marked as failed. The status code is logged, and the job failure is reported to the user.

3.2.3.3.1.6. Printer SOP class

The Hardcopy AE issues the following DIMSE-N commands for the Printer SOP Class: N-GET.

3.2.4. Verification application entity

3.2.4.1. SOP classes

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

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

3.2.4.2. Association policies

The Verification AE can both accept and propose Association Requests for the Verification Service. The Verification AE will accept associations from any AET, no pre-configuration of known AEs is required. However, the Verification AE will reject associations if the Called AE Title does not match the preconfigured AET of 8K software.

3.2.4.2.1. General

The DICOM standard Application Context Name for DICOM is always accepted and proposed.

Table 41: DICOM application context for verification AE

Application Context Name	1.2.840.10008.3.1.1.1

3.2.4.2.2. Number of associations

The Verification AE initiates one Association at a time for each destination that DICOM connectivity shall be verified.

The association will be rejected if the maximum allowable number of associations is exceeded.

Table 42: Number of simultaneous associations for verification AE

Maximum number of simultaneous Associations initiated by the Verification AE	1 (not configurable)

3.2.4.2.3. Asynchronous nature

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

Table 43: Asynchronous nature as a SCU for verification AE

Maximum number of outstanding asynchronous transactions	1

3.2.4.2.4. Implementation identifying information

The implementation information for this Application Entity is:

Table 44: DICOM implementation class and version for verification AE

Implementation Class UID	1.2.250.1.396
Implementation Version Name	APELEM_2.0

3.2.4.3. Association initiation and acceptance policy

3.2.4.3.1. Activity: verify connectivity with remote AE

3.2.4.3.1.1. Description and sequencing of activity

The Verification AE will initiate a new Association each time the user selects to verify connectivity for a specific AE. (Figure 8)

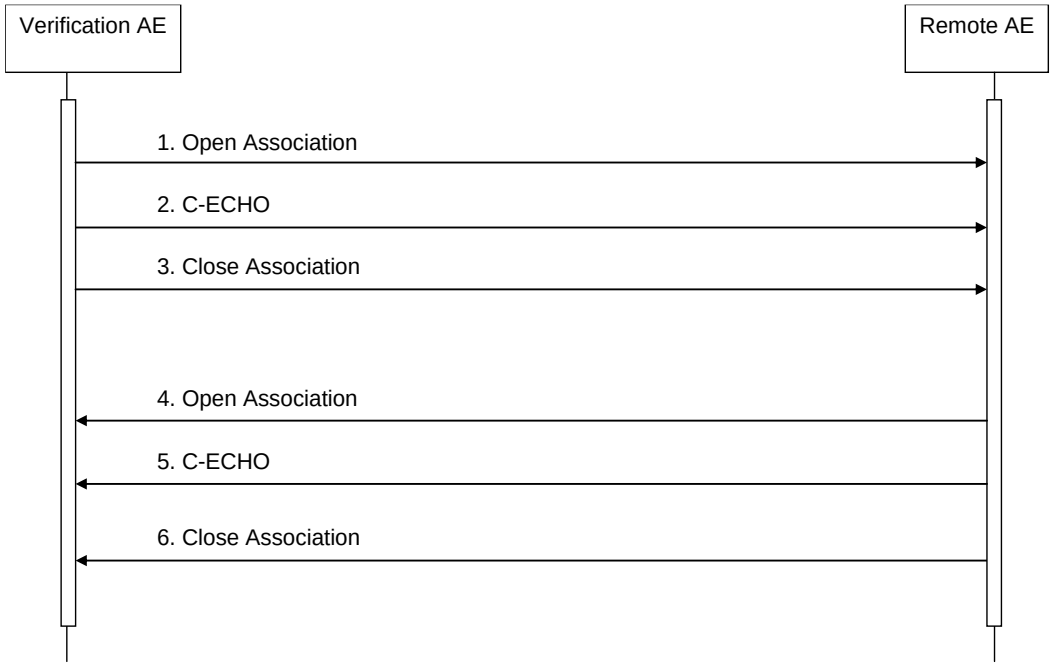


Figure 8: Sequencing of activity: verify connectivity with remote AE

8K software verifies the connectivity to a Remote AE.

The Verification AE opens an Association with the Remote AE.

The Verification AE sends a C-ECHO-Request to the remote AE. It awaits the C-ECHO-Response and propagates the result of the verification (successful/unsuccessful) to the user.

The Verification AE closes the association.

A Remote AE verifies the connectivity to the 8K software

The Remote AE opens an Association with the Verification AE.

The Remote AE sends a C-ECHO-Request to the Verification AE. The Verification AE will send a Successful response.

The Remote AE closes the Association.

3.2.4.3.1.2. Proposed / accepted presentation contexts

The Verification AE will propose and accept Presentation Contexts as shown in the following table:

Table 45: Proposed presentation contexts for verification AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		

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	SCU / SCP	None

3.2.4.3.1.3. SOP specific conformance for verification SOP class

The Verification AE provides standard conformance to the Verification SOP Class as an SCU.

If the C-ECHO request was successfully received, a 0000 (Success) status code will be returned in the C-ECHO response. Otherwise, a C000 (Error - Cannot Understand) status code will be returned in the C-ECHO response.

In turn, the Verification AE treats a successfully received C-ECHO response with 0000 (Success) status code as a successful verification. Any other result will be treated as a verification failure.

3.3. Network interfaces

3.3.1. Physical network interface

The DICOM Interface of the 8K software provides DICOM TCP/IP Network Communication Support and uses the TCP/IP protocol stack from the operating system. All available Ethernet interfaces are supported.

3.3.2. Additional protocols

Not applicable.

4. Configuration

4.1. AE Title/presentation address mapping

4.1.1. Local AE titles

AE Title can be configured via the configuration interface. The default AE Title is ADAM_SCU.

All local AE's are using the same local AE Title.

Table 46: AE title configuration table

Application Entity	Default AE Title	Default TCP/IP Port
Send	ADAM_SCU	Not Applicable
Workflow		Not Applicable
Print		Not Applicable
Verification		Not Applicable

5. Parameters

Many parameters related to acquisition and general operation can be configured using the Service/Installation Tool or through editing configuration files manually. The Table below only shows those configuration parameters relevant to DICOM communication.

Table 47: Configuration parameters table

Parameter	Configurable (Yes/No)	Default Value
General Parameters		
Max PDU Receive Size	Yes	64234 Bytes
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)	Yes	64234 Bytes
Time-out waiting for association request or waiting for the peer to shut down an association. (ARTIM Timeout)	Yes	30 s
Time-out awaiting a reply to associate request	Yes	15 s
Time-out awaiting a reply to associate release	Yes	15 s
Time-out awaiting a network-write to be accepted	Yes	15 s
Time-out awaiting a network-connect to be accepted	Yes	3 s

6. Support of character sets

8K software support character sets

ISO_IR 6 (ISO 646 Default repertoire) ISO_IR 100 (ISO 8859-1 Latin Alphabet No. 1 supplementary set)

ISO_IR 101 (ISO 8859-2 Latin Alphabet No. 2 supplementary set)

ISO_IR 109 (ISO 8859-3 Latin Alphabet No. 3 supplementary set)

ISO_IR 110 (ISO 8859-4 Latin Alphabet No. 4 supplementary set)

ISO_IR 148 (ISO 8859-9 Latin Alphabet No. 5 supplementary set)

ISO_IR 144 (ISO 8859-5 Cyrillic Alphabet supplementary set)

ISO_IR 127 (ISO 8859-6 Arabic Alphabet supplementary set)

ISO_IR 126 (ISO 8859-7 Greek Alphabet supplementary set)

ISO_IR 138 (ISO 8859-8 Hebrew Alphabet supplementary set)

ISO_IR 13 (JIS X 0201: Katakana)

ISO_IR 166 (TIS 620-2533: Thai)

ISO_IR 192 (Unicode in UTF-8 for Chinese Alphabet)

GB18030

GBK

8K software does not support code extension techniques as described in ISO/IEC 2022:1994

7. Security

8K software does not support any specific security measures.

It is assumed that 8K software is used within a secured environment. It is assumed that a secured environment includes at a minimum:

Firewall or router protections to ensure that only approved external hosts have network access to 8K software.

Firewall or router protections to ensure that 8K software only has network access to approved external hosts and services.

Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g., such as a Virtual Private Network (VPN))

Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

8. Annexes

8.1. IOD contents

8.1.1. Created SOP instances

The sections in this chapter specify the attributes of SOP Instances handled by 8K software. This refers to both, SOP Instances created by 8K software and sent to remote AEs by the Send AE and SOP Instances received by the Storage Service AE to be processed by 8K software.

The following tables use a number of abbreviations.

The abbreviations used in the “Presence of …” column are:

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

The abbreviations used in the “Source” column:

MWL	the attribute value source Modality Worklist, see chapter 8.1.3
USER	the attribute value source is from User input
AUTO	the attribute value is generated automatically
CONFIG	the attribute value source is a configurable parameter

Note ☞	All dates and times are encoded in the local configured calendar and time. Date, Time, and Time zone are configured using the Service/Installation Tool.

8.1.1.1. Computed radiography image IOD

Table 48: IOD of created CR SOP instances

IE	Module	Reference	Presence of Module
Patient	Patient	Table 53	ALWAYS
	Clinical Trial Subject	-	NEVER
Study	General Study	Table 54	ALWAYS
	Patient Study	-	NEVER
	Clinical Trial Study	-	NEVER
Series	General Series	Table 55	ALWAYS
	CR Series	-	ALWAYS
	Clinical Trial Series	-	NEVER
Equipment	General Equipment	Table 56	ALWAYS
Image	General Image	Table 58	ALWAYS
	Image Pixel	Table 59	ALWAYS
	Contrast/Bolus	-	NEVER
	Display Shutter	-	NEVER
	Device	-	NEVER
	Specimen	-	NEVER
	CR Image	Table 61	ALWAYS
	Overlay Plane	-	NEVER
	Modality LUT	-	NEVER
	VOILUT	-	NEVER
	SOP Common	Table 60	ALWAYS
	Common Instance Reference	-	NEVER

8.1.1.2. Digital X-ray image storage for presentation

Table 49: Acquisition context module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Acquisition Context Sequence	(0040,0555)	SQ	Empty Sequence generated by device	ALWAYS	AUTO

Table 50: Digital X-ray image module table

IE	Module	Reference	Presence of Module
Patient	Patient	Table 53	ALWAYS
	Clinical Trial Subject	-	NEVER
Study	General Study	Table 54	ALWAYS
	Patient Study	-	NEVER
	Clinical Trial Study	-	NEVER
Series	General Series	Table 55	ALWAYS
	Clinical Trial Series	-	NEVER
	DX Series	Table 62	ALWAYS
Equipment	General Equipment	Table 56	ALWAYS
Image	General Image	Table 58	ALWAYS
	General Reference	-	NEVER
	Image Pixel	Table 59	ALWAYS
	Contrast/Bolus	-	NEVER
	Display Shutter	-	NEVER
	Device	-	NEVER
	Intervention	-	NEVER
	Specimen	-	NEVER
	DX Anatomy Imaged	Table 63	ALWAYS
	DX Image	Table 64	ALWAYS
	DX Detector	Table 65	ALWAYS
	X-Ray Collimator	-	NEVER
	DX Positioning	-	NEVER
	X-Ray Tomography Acquisition	-	NEVER
	X-Ray Acquisition Dose	Table 66	NEVER
	X-Ray Generation	-	NEVER
	X-Ray Filtration	-	NEVER
	X-Ray Grid	-	NEVER
	Overlay Plane	-	NEVER
	VOI LUT	-	ALWAYS
	Image Histogram	-	NEVER
	Acquisition Context	Table 49	ALWAYS
	SOP Common	Table 60	ALWAYS
	Common Instance Reference	-	NEVER

8.1.1.3. X-ray RF image IOD

Table 51: X-ray RF image module table

IE	Module	Reference	Presence of Module
Patient	Patient	Table 53	ALWAYS
	Clinical Trial Subject	-	NEVER
Study	General Study	Table 54	ALWAYS
	Patient Study	-	NEVER
	Clinical Trial Study	-	NEVER
Series	General Series	Table 55	ALWAYS
	Clinical Trial Series	-	NEVER
Frame of Reference	Synchronization	-	NEVER
Equipment	General Equipment	Table 56	ALWAYS
Image	General Image	Table 58	ALWAYS
	General Reference	-	NEVER
	Image Pixel	Table 59	ALWAYS
	Contrast/Bolus	Table 67	ALWAYS
	Cine	Table 68	ALWAYS IF OBJECT IS MULTI-FRAME
	Multi-frame	Table 69	ALWAYS IF OBJECT IS MULTI-FRAME
	Frame Pointers	-	NEVER
	Mask	-	NEVER
	Display Shutter	-	NEVER
	Device	-	NEVER
	Intervention	-	NEVER
	Specimen	-	NEVER
	X-Ray Image	Table 70	ALWAYS
	X-Ray Acquisition	Table 71	ALWAYS
	X-Ray Collimator	-	NEVER
	X-Ray Table	-	NEVER
	XRF Positioner	-	NEVER
	X-Ray Tomography Acquisition	-	NEVER
	DX Detector	Table 65	ALWAYS
	Overlay Plane	-	NEVER
	Multi-frame Overlay	-	NEVER
	Multi-frame Functional Groups	Table 75	ALWAYS
	Modality LUT	-	NEVER
	VOI LUT	-	ALWAYS
	SOP Common	Table 60	ALWAYS
	Common Instance Reference	-	NEVER
	Frame Extraction	-	NEVER

8.1.1.4. X-ray radiation dose SR IOD

Table 52: IOD of created X-ray radiation dose SR storage SOP instances

IE	Module	Reference	Presence of Module
Patient	Patient	Table 53	ALWAYS
	Clinical Trial Subject	-	NEVER
Study	General Study	Table 54	ALWAYS

	Patient Study	Table 57	NEVER
	Clinical Trial Study	-	NEVER
Series	SR Document Series	Table 76	ALWAYS
	Clinical Trial Series	-	NEVER
Frame of Reference	Synchronization	-	NEVER
Equipment	General Equipment	Table 56	ALWAYS
	Enhanced General Equipment	Table 74	ALWAYS
Document	SR Document General	Table 77	ALWAYS
	SR Document Content	Table 78	ALWAYS
	SOP Common	Table 60	ALWAYS

8.1.2. IOD module definitions

8.1.2.1. Common modules

Table 53: Patient module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	From Modality Worklist or user input. Values supplied via Modality Worklist will be entered as received. Maximum 64 characters.	VNAP	MWL/ USER
Patient ID	(0010,0020)	LO	From Modality Worklist or user input. Maximum 64 characters.	VNAP	MWL/ USER
Issuer of Patient ID	(0010,0021)	LO	From Modality Worklist or user input. Maximum 64 characters.	ANAP	MWL/ USER
Patient's Birth Date	(0010,0030)	DA	From Modality Worklist or user input	VNAP	MWL/ USER
Patient's Sex	(0010,0040)	CS	From Modality Worklist or user input	VNAP	MWL/ USER
Ethnic Group	(0010,2160)	SH	From Modality Worklist or user input	ANAP	MWL/ USER
Patient Comments	(0010,4000)	LT	From Modality Worklist or user input	ANAP	MWL/ USER

Table 54: General study module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Date	(0008,0020)	DA	Generated by device	ALWAYS	AUTO
Study Time	(0008,0030)	TM	Generated by device	ALWAYS	AUTO
Accession Number	(0008,0050)	SH	From Modality Worklist or user input	VNAP	MWL/ USER
Referring Physician's Name	(0008,0090)	PN	From Modality Worklist or user input	VNAP	MWL/ USER
Study Description	(0008,1030)	LO	User Input	VNAP	USER
Study Instance UID	(0020,000D)	UI	From Modality Worklist or generated by device	ALWAYS	MWL/ AUTO
Study ID	(0020,0010)	SH	From Modality Worklist or user input	VNAP	USER

Table 55: General series module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Series Date	(0008,0021)	DA	Generated by device	ALWAYS	AUTO
Series Time	(0008,0031)	TM	Generated by device	ALWAYS	AUTO
Modality	(0008,0060)	CS	From Configuration or Worklist	ALWAYS	AUTO
Series Description	(0008,103E)	LO	User input	VNAP	USER
Performing Physician's Name	(0008,1050)	PN	Physician field in Study list. Maximum 64 characters.	EMPTY	USER
Operator's Name	(0008,1070)		Name(s) of the operator(s) supporting the Series	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Generated by device	ALWAYS	AUTO
Series Number	(0020,0011)	IS	Generated by device	ALWAYS	AUTO

Table 56: General equipment module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	Apelem	ALWAYS	AUTO
Institution Name	(0008,0080)	LO	From Configuration or Worklist	VNAP	CONFIG
Institution Address	(0008,0080)	ST	From Configuration or Worklist	VNAP	CONFIG
Manufacturer's Model Name	(0008,1090)	LO	ADAM	ALWAYS	AUTO
Software Version	(0018,1020)	LO	Applicable Version	ALWAYS	AUTO

Table 57: Patient study module attributes of created image SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's size	(0010,1020)	DS	From Modality Worklist or user input	ANAP	AUTO
Patient's weight	(0010,1030)	DS	From Modality Worklist or user input	ANAP	AUTO

8.1.2.2. Common image specific modules

The modules described below are included in all Image IODs, i.e. all of the above mentioned IODs created by the application

Table 58: General image module attributes of created image SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Generated by device	ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS	L\F	ALWAYS	AUTO
Burned In Annotation	(0028,0301)	CS	NO	ANAP ONLY for Secondary Capture Image IOD and Digital X-Ray Image Storage	USER

Table 59: Image pixel module attributes of created image SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	Generated by device	ALWAYS	AUTO
Rows	(0028,0010)	US	Generated by device	ALWAYS	AUTO
Columns	(0028,0011)	US	Generated by device	ALWAYS	AUTO
Bits Allocated	(0028,0100)	US	Generated by device	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	Generated by device	ALWAYS	AUTO
High Bit	(0028,0102)	US	Generated by device	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	0000H	ALWAYS	AUTO
Pixel Data	(7FE0,0010)	OW		ALWAYS	AUTO

Table 60: SOP common module attributes of created image SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	(0008,0005)	CS	Configuration dependent, depending on the locale settings of the device. See Chapter 6.	ALWAYS	CONFIG
SOP Class UID	(0008,0016)	UI	Dependent on / according to the type of created object	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Generated by device	ALWAYS	AUTO

8.1.2.3. Computed radiography image specific modules

Table 61: CR image module attributes of created CR SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Photometric Interpretation	(0028,0004)	CS	MONOCHROME2	ALWAYS	AUTO

8.1.2.4. Digital X-ray image specific attributes

Table 62: DX series attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	DX	ALWAYS	AUTO
Presentation Intent Type	(0008,0068)	CS	FOR PRESENTATION	ALWAYS	AUTO

Table 63: DX anatomy imaged attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Laterality	(0020,0062)	CS	One of the following enumerated values may be present: R right L left U unpaired B both left and right	VNAP	USER
Anatomic Region Sequence	(0008,2218)	SQ	One or Zero Code Sequence Item. CID 4009 is applied for humans	ALWAYS	AUTO

Table 64: DX image attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS	ORIGINAL\PRIMARY	ALWAYS	AUTO
Samples per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	MONOCHROME2	ALWAYS.	AUTO
Bits Allocated	(0028,0100)	US	16	ALWAYS.	AUTO
Bits Stored	(0028,0101)	US	16 or 12	ALWAYS	AUTO
High Bit	(0028,0102)	US	15 or 11	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	0000H Unsigned Integer	ALWAYS	AUTO
Pixel Intensity Relationship	(0028,1040)	CS	LIN Linearly proportional to X-Ray beam intensity	ALWAYS	AUTO
Pixel Intensity Relationship Sign	(0028,1041)	SS	+1 Lower pixel values correspond to less X-Ray beam intensity	ALWAYS	AUTO
Rescale Intercept	(0028,1052)	DS	0	ALWAYS	AUTO
Rescale Slope	(0028,1053)	DS	0.	ALWAYS	AUTO
Rescale Type	(0028,1054)	LO	US Unspecified	ALWAYS	AUTO

Presentation LUT Shape	(2050,0020)	CS	One of the following enumerated values may be present: IDENTITY if Photometric Interpretation (0028,0004) is MONOCHROME2. INVERSE if Photometric Interpretation (0028,0004) is MONOCHROME1.	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	CS	One of the following enumerated values may be present: 00 Image has NOT been subjected to lossy compression. 01 Image has been subjected to lossy compression.	ALWAYS	AUTO
Lossy Image Compression Ratio	(0028,2112)	DS	The approximate lossy compression ratio(s) that have been applied to this image. Present if Lossy Image Compression (0028,2110) is "01", not present otherwise.	ANAP	AUTO
Lossy Image Compression Method	(0018,2114)	CS	ISO_10918_1 Present if Lossy Image Compression (0028,2110) is "01", not present otherwise.	ANAP	AUTO
Patient Orientation	(0020,0020)	CS	L\F	ALWAYS	AUTO
Burned In Annotation	(0028,0301)	CS	NO	ALWAYS	AUTO
Window Center	(0028,1050)	DS	Window Center for display.	ALWAYS	USER
Window Width	(0028,1051)	DS	Window Width for display.	ALWAYS	USER

Table 65: DX detector attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Detector Type	(0018,7004)	2	SCINTILLATOR	ALWAYS	AUTO
Detector Mode	(0018,7008)	LT	Text description of operating mode of detector (implementation specific)	ALWAYS	AUTO
Detector ID	(0018,700A)	SH	The ID or serial number of the detector used to acquire this image.	ALWAYS	AUTO
Detector Binning	(0018,701A)	DS	Number of active detectors used to generate a single pixel. Specified as number of row detectors per pixel then column	ALWAYS	AUTO
Detector Manufacturer Name	(0018,702A)	LO	Name of the manufacturer of the detector component of the acquisition system	ALWAYS	AUTO
Detector Manufacturer's Model Name	(0018,702B)	LO	Model name of the detector component of the acquisition system	ALWAYS	AUTO
Imager Pixel Spacing	(0018,1164)	DS	Physical distance measured at the front plane of the detector housing	ALWAYS	AUTO

			between the center of each image pixel specified by a numeric pair - row spacing value(delimiter) column spacing value in mm.		
Pixel Spacing	(0028,0030)	DS	Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm.	ALWAYS	AUTO
Pixel Spacing Calibration Type	(0028,0A02)	CS	GEOMETRY	ALWAYS	AUTO
Pixel Spacing Calibration Description	(0028,0A04)	LO	Thales coeff (oid/sid) applied all over the image	ALWAYS	AUTO

Table 66: DX X-ray acquisition dose attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
KVP	(0018,0060)	DS	Peak kilo voltage output of the X-Ray generator used	ALWAYS	AUTO
Distance Source to Detector	(0018,1110)	DS	Distance in mm from source to detector center	ALWAYS	AUTO
Distance Source to Patient	(0018,1111)	DS	Distance in mm from source to the table, support or bucky side that is closest to the Imaging Subject, as measured along the central ray of the X-Ray beam.	ALWAYS	AUTO
Exposure Time	(0018,1150)	IS	Duration of X-Ray exposure in msec	ALWAYS	AUTO
X-Ray Tube Current	(0018,1151)	IS	X-Ray Tube Current in mA	ALWAYS	AUTO
Exposure	(0018,1152)	IS	The exposure expressed in mAs	ALWAYS	AUTO
Exposure in µAs	(0018,1153)	IS	The exposure expressed in µAs	ALWAYS	AUTO
Image and Fluoroscopy Area Dose Product	(0018,115E)	DS	X-Ray dose, measured in dGy*cm*cm, to which the patient was exposed for the acquisition of this image plus any non-digitally recorded fluoroscopy that may have been performed to prepare for the acquisition of this image	ALWAYS	AUTO

8.1.2.5. X-ray angiography / RF image specific attributes

Table 67: X-ray RF contrast/bolus module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Contrast/Bolus Agent	(0018,0010)	LO	Contrast or bolus agent	EMPTY	AUTO

Table 68: X-ray RF cine module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame Time	(0018,1063)	DS	250	ALWAYS	AUTO

Table 69: X-ray RF multi-frame module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number Of Frames	(0028,0008)	IS	Generated by device Only present if number of images > 1	ANAP	AUTO
Frame Increment Pointer	(0028,0009)	AT	(0018,1063) Only present if number of images > 1	ANAP	AUTO

Table 70: X-ray RF X-ray image module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame Increment Pointer	(0028,0009)	AT	(0018,1063)	ANAP	AUTO
Lossy Image Compression	(0028,2110)	CS	00 Image has NOT been subjected to lossy compression.	ALWAYS	AUTO
Image Type	(0008,0008)	CS	"ORIGINAL\PRIMARY "	ALWAYS	AUTO
Pixel Intensity Relationship	(0028,1040)	CS	"LIN"	ALWAYS	AUTO
Samples per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	MONOCHROME2	ALWAYS	AUTO
Bits Allocated	(0028,0100)	US	16	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	16 or 12	ALWAYS	AUTO
High Bit	(0028,0102)	US	15 or 11	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	0000H	ALWAYS	AUTO
Referenced Image Sequence	(0008,1140)	SQ		ANAP	AUTO
> Referenced SOP Class UID	(0008,1150)	UI	Uniquely identifies the referenced SOP Class.	ALWAYS	USER
> Referenced SOP Instance UID	(0008,1155)	UI	Uniquely identifies the referenced SOP Instance.	ALWAYS	USER
> Referenced Frame Number	(0008,1160)	IS	Identifies the frame numbers within the Referenced SOP Instance to which the reference applies.	ANAP	USER

Table 71: X-ray RF image X-ray acquisition module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
KVP	(0018,0060)	DS	Peak kilo voltage output of the X-Ray generator used.	ALWAYS	AUTO

Radiation Setting	(0018,1155)	CS	Enumerated Values: SC GR	ALWAYS	AUTO
X-Ray Tube Current	(0018,1151)	IS	X-Ray Tube Current in mA.	ALWAYS	AUTO
Exposure Time	(0018,1150)	IS	Duration of X-Ray exposure in msec.	ALWAYS	AUTO
Exposure	(0018,1152)	IS	The exposure expressed in mAs.	ALWAYS	AUTO
Exposure in µAs	(0018,1153)	IS	The exposure expressed in µAs.	ALWAYS	AUTO
Imager Pixel Spacing	(0018,1164)	DS	Physical distance measured at the front plane of the Image Receptor housing between the center of each pixel specified by a numeric pair - row spacing value(delimiter) column spacing value in mm.	ALWAYS	AUTO
Pixel Spacing	(0028,0030)	DS	Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm.	ALWAYS	AUTO

Table 72: X-ray RF image DX detector module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Detector Type	(0018,7004)	CS	SCINTILLATOR	ALWAYS	AUTO
Imager Pixel Spacing	(0018,1164)	DS	Physical distance measured at the front plane of the Image Receptor housing between the center of each pixel specified by a numeric pair - row spacing value(delimiter) column spacing value in mm.	ALWAYS	AUTO

Table 73: X-ray RF image VOI LUT module attributes of created SOP instances

Attribute Name	Tag	VR	Attribute Description	Type of support by library	Source
Window Center	(0028,1050)	DS	Window Center for display.	ALWAYS	USER
Window Width	(0028,1051)	DS	Window Width for display.	ALWAYS	USER

Table 74: Enhanced general equipment module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	APELEM	ALWAYS	AUTO
Manufacturer's Model Name	(0008,1090)	LO	ADAM	ALWAYS	AUTO
Device Serial Number	(0018,1000)	LO	Manufacturer's serial number of the equipment that produced the composite instances.	ANAP	AUTO
Software Versions	(0018,1020)	LO	Manufacturer's designation of software version of the equipment	ALWAYS	AUTO

			that produced the composite instances.		

Table 75: Multi-frame functional groups module attributes of created SOP instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	A number that identifies this instance.	ALWAYS	AUTO
Content Date	(0008,0023)	DA	The date the data creation was started.	ALWAYS	AUTO
Content Time	(0008,0033)	TM	The time the data creation was started.	ALWAYS	AUTO
Number of Frames	(0028,0008)	IS	Number of frames in a multi-frame image.	ALWAYS	AUTO

8.1.2.6. X-ray radiation dose SR specific attributes

Table 76: SR document series module attributes of created SOP instances (RDSR)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	SR	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Generated by device	ALWAYS	AUTO
Series Number	(0020,0011)	IS	Generated by device	ALWAYS	AUTO
Series Date	(0008,0021)	DA	Generated by device	ALWAYS	AUTO
Series Time	(0008,0031)	TM	Generated by device	ALWAYS	AUTO
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	Generated by device	VNAP	AUTO

Table 77: SR document general module attributes of created SOP instances (RDSR)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Generated by device	ALWAYS	AUTO
Completion Flag	(0040,A491)	CS	The estimated degree of completeness of this SR Document. Enumerated Value: COMPLETE Complete content.	ALWAYS	AUTO
Verification Flag	(0040,A493)	CS	Indicates whether this SR Document is Verified. Enumerated Values: UNVERIFIED Not attested to.	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Generated by device	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Generated by device	ALWAYS	AUTO
Performed Procedure Code Sequence	(0040,A372)	SQ	A Sequence that conveys the codes of the performed procedures pertaining to this SOP Instance. Zero or more Items shall be included in this Sequence.	VNAP	AUTO

Table 78: SR document content module attributes of created SOP instances (RDSR)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Value Type	(0040,A040)	CS	CONTAINER	ALWAYS	AUTO
Concept Name Code Sequence	(0040,A043)	SQ	Coded concept name of this name-value Item	ALWAYS	AUTO
Continuity of Content	(0040,A050)	CS	SEPARATE	ALWAYS	AUTO
Content Template Sequence	(0040,A504)	SQ	Template that describes the content of this Content Item and its subsidiary Content Items.	ALWAYS	AUTO

8.1.2.6.1. SR document content descriptions

The product supports the following root Templates for SR SOP Instances created, processed, or displayed by the product.

Table 79: SR root templates

SOP Class	Template ID	Template Name	Use
X-Ray Radiation Dose SR	10001	X-Ray Radiation Dose	Create

8.1.3. Attribute mapping

The relationships between attributes received via Modality Worklist, stored in acquired images and communicated via MPPS are summarized in Table **80**.

The format and conventions used in Table **80** are the same as the corresponding table in DICOM Part 4, Annex M.6 [DICOM].

Table 80: Attribute mapping between modality worklist, and created instances and MPPS

Modality Worklist	Instance IOD	MPPS
Patient Name	Patient Name	Patient Name
Patient ID	Patient ID	Patient ID
Issuer of Patient ID	Issuer of Patient ID	Issuer of 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 Size	Patient's Size	----
Patient's Weight	Patient's Weight	----
Ethnic Group	Ethnic Group	----
Patient Comments	Patient Comments	-----
----	----	Performed Series Sequence
----	Series Instance UID	>Series Instance UID
----	Series Description	>Series Description
----	Protocol Name	>Protocol Name
----	Operator's Name	>Operator's Name
----	----	>Referenced Image Sequence
----	SOP Class UID	>>SOP Class UID
----	SOP Instance UID	>>SOP Instance UID

Scheduled Performing Physician's Name	Performing Physician's Name	>Performing Physician's Name
Referring Physician's Name	Referring Physician's Name	----
Admission ID	Admission ID	Admission ID
----	----	Scheduled Step Attributes Sequence
Study Instance UID	Study Instance UID	>Study Instance UID
Accession Number	Accession Number	>Accession Number
Scheduled Protocol Code Sequence	----	>Scheduled Protocol Code Sequence
Requested Procedure Description	Study Description	>Requested Procedure Description
Requested Procedure ID	Study ID	>Requested Procedure ID Study ID
Scheduled Procedure Step ID	----	>Scheduled Procedure Step ID Performed Procedure Step ID
Modality	Modality[2]	Modality[2]
Scheduled Station AE Title	----	Performed Station AE Title[2]
Scheduled Station Name	----	Performed Station Name[2]
Scheduled Procedure Step Location	----	Performed Procedure Step Location[2]
Scheduled Procedure Step Description	----	Performed Procedure Step Description[2]
Scheduled Protocol Code Sequence	----	Performed Protocol Code Sequence[2]
Requested Procedure Code Sequence	----	Procedure Code Sequence[2]
Institution Name	Institution Name	----
Institution Address	Institution Address	----
Institutional Department Name	Institutional Department Name	----

8.1.4. Coerced/modified fields

No coercion / modification of fields received by other DICOM AEs is performed by the AEs which are part of 8K software.

8.2. Data dictionary of private attributes

The 8K software does not use private attributes.

[2] These attributes may be changed if the Performed Procedure Step is different from the Scheduled Procedure Step

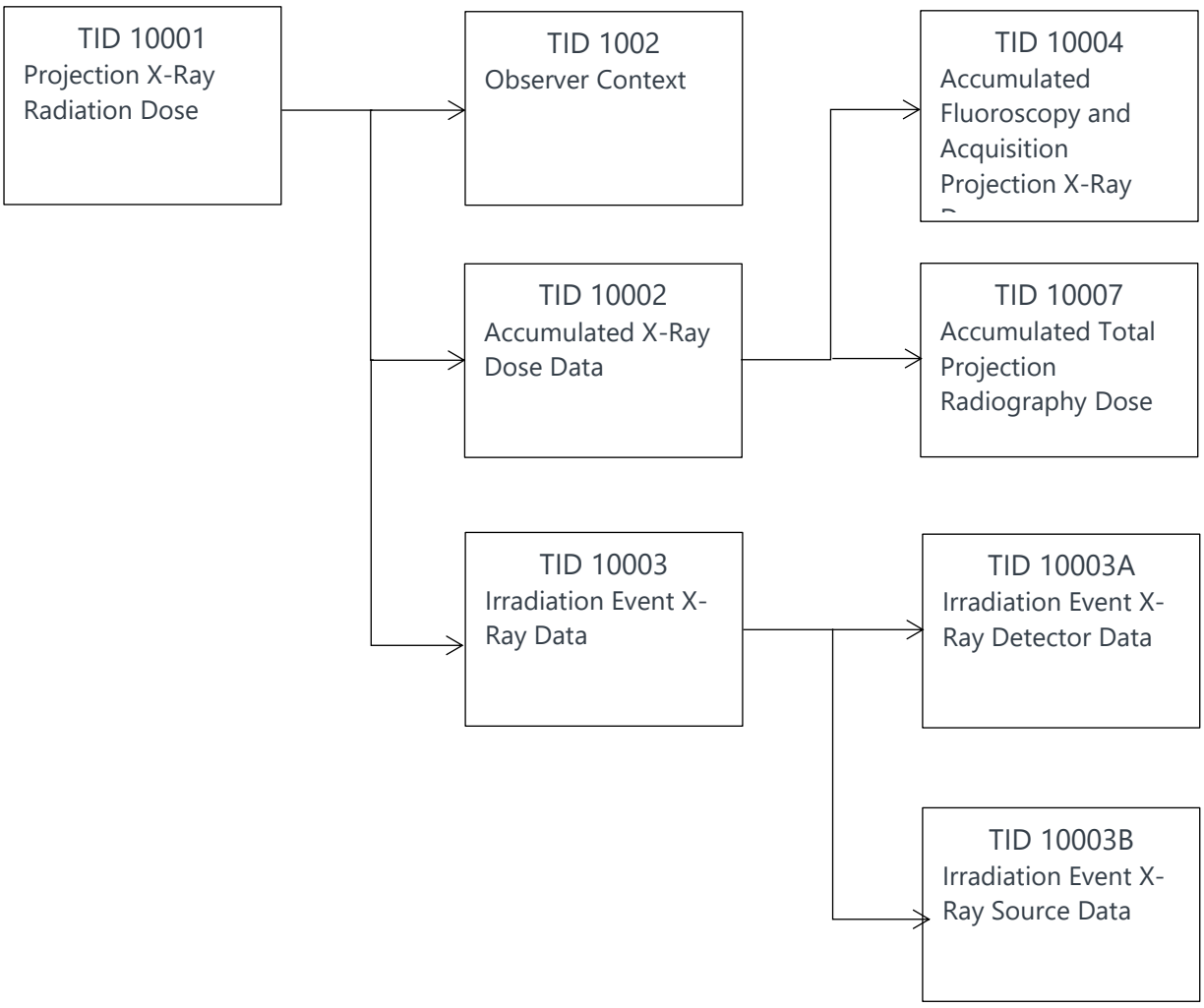
8.3. Coded terminology and templates

The Workflow AE is capable of supporting arbitrary coding schemes for Procedure and Protocol Codes. The contents of Requested Procedure Code Sequence (0032,1064) and Scheduled Protocol Code Sequence (0040,0008) supplied in Worklist Items will be mapped to Image IOD and MPPS attributes as described in Table B.8.1-31. During installation, a service technician will establish a mapping between the site-specific codes and the Protocol Names used internally to identify acquisition protocols.

8.3.1. Template specifications

8.3.1.1. X-ray radiation dose SR IOD templates

The templates that comprise the X-Ray Radiation Dose SR are interconnected as indicated in the figure below:



This section describes the content of all the templates used in the X-Ray Radiation Dose Reporting SR.

Table 81: TID 10001. projection X-ray radiation dose

NL	Rel with Parent	VT	Concept Name	VM	Presence of Value	Value
		CONTAINER	EV (113701, DCM, "X-Ray Radiation Dose Report")	1	ALWAYS	Root node
>	HAS CONCEPT MOD	CODE	EV (121058, DCM, "Procedure reported")	1	ALWAYS	Constant: DT (113704, DCM, "Projection X-Ray")
>>	HAS CONCEPT MOD	CODE	EV (G-C0E8, SRT, "Has Intent")	1	ALWAYS	Constant: DCID 3629 (R-408C3,SRT," Diagnostic Intent")
>		INCLUDE	DTID 1002 "Observer Context"	1	ALWAYS	
>	HAS OBS CONTEXT	CODE	EV (113705, DCM, "Scope of Accumulation")	1	ALWAYS	
>>	HAS PROPERTIES	UIDREF	DCID 10001 "UID Types" (derived from scope of accumulation)	1	ALWAYS	
>	CONTAINS	INCLUDE	DTID 10002 "Accumulated X-Ray Dose"	1	CONDITIONAL	$Plane = EV (113622, DCM, "Single Plane")
>	CONTAINS	INCLUDE	DTID 10003 "Irradiation Event X-Ray Data"	1-n	ALWAYS	
>	CONTAINS	CODE	EV (113854, DCM, "Source of Dose Information")	1-n	ALWAYS	

Table 82: TID 1002. observer context

NL	Rel with Parent	VT	Concept Name	VM	Presence of Value	Value
	HAS OBS CONTEXT	CODE	EV (121005, DCM, "Observer Type")	1	ALWAYS	Constant: (121007,DCM,"Device")
	HAS OBS CONTEXT	UIDREF	EV (121012, DCM, "Device Observer UID")	1	ALWAYS	

Table 83: TID 10002 accumulated X-ray dose

NL	Rel with Parent	VT	Concept Name	VM	Presence of Value	Value
		CONTAINER	EV (113702, DCM, "Accumulated X-Ray Dose Data")	1	ALWAYS	
>	HAS CONCEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	1	ALWAYS	Plane (Coded term identifying to which acquisition plane the encoded information belongs.)
>	CONTAINS	CONTAINER	EV (122505, DCM, "Calibration")	1-n	CONDITIONAL	
>>	HAS CONCEPT MOD	CODE	EV (113794, DCM, "Dose Measurement Device")	1	ALWAYS	Constant: (A-2C090,SRT,"Dosimeter")
>>	CONTAINS	DATETIME	EV (113723, DCM, "Calibration DateTime")	1	ALWAYS	
>>	CONTAINS	NUM	EV (122322, DCM, "Calibration Factor")	1	ALWAYS	UNITS = EV (1, UCUM, "no units")
>>	CONTAINS	NUM	EV (113763, DCM, "Calibration Uncertainty")	1	ALWAYS	UNITS = EV (1, UCUM, "no units")
>>	CONTAINS	TEXT	EV (113724, DCM, "Calibration Responsible Party")	1	ALWAYS	
>	CONTAINS	INCLUDE	DTID 10004 "Accumulated Fluoroscopy and Acquisition	1	CONDITIONAL	

			Projection X-Ray Dose"			
>	CONTAINS	INCLUDE	DTID 10007 "Accumulated Total Projection Radiography Dose"	1	ALWAYS	

Table 84: TID 10004 accumulated fluoroscopy and acquisition projection X-ray dose

NL	Rel with Parent	VT	Concept Name	VM	Presence of Value	Value
	CONTAINS	NUM	EV (113726, DCM, "Fluoro Dose Area Product Total")	1	CONDITIONAL	UNITS = EV (Gy.m2, UCUM, "Gy.m2")
	CONTAINS	NUM	EV (113728, DCM, "Fluoro Dose (RP) Total")	1	CONDITIONAL	UNITS = EV (Gy, UCUM, "Gy")
	CONTAINS	NUM	EV (113730, DCM, "Total Fluoro Time")	1	CONDITIONAL	UNITS = EV (s, UCUM, "s")
	CONTAINS	NUM	EV (113727, DCM, "Acquisition Dose Area Product Total")	1	CONDITIONAL	UNITS = EV (Gy.m2, UCUM, "Gy.m2")
	CONTAINS	NUM	EV (113729, DCM, "Acquisition Dose (RP) Total")	1	CONDITIONAL	UNITS = EV (Gy, UCUM, "Gy")
	CONTAINS	NUM	EV (113855, DCM, "Total Acquisition Time")	1	CONDITIONAL	UNITS = EV (s, UCUM, "s")

Table 85: TID 10007 accumulated total projection radiography dose

NL	Rel with Parent	VT	Concept Name	VM	Presence of Value	Value
	CONTAINS	NUM	EV (113722, DCM, "Dose Area Product Total")	1	ALWAYS	UNITS = EV (Gy.m2, UCUM, "Gy.m2")
	CONTAINS	NUM	EV (113725, DCM, "Dose (RP) Total")	1	CONDITIONAL	UNITS = EV (Gy, UCUM, "Gy")
	CONTAINS	CODE	EV (113780, DCM, "Reference Point Definition")	1	CONDITIONAL	
	CONTAINS	TEXT	EV (113780, DCM, "Reference Point Definition")	1	CONDITIONAL	

Table 86: TID 10003. irradiation event X-ray data

NL	Rel with Parent	VT	Concept Name	VM	Presence of Value	Value
		CONTAINER	EV (113706, DCM, "Irradiation Event X-Ray Data")	1	ALWAYS	

>	HAS CONCEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	1	ALWAYS	
>	CONTAINS	UIDREF	EV (113769, DCM, "Irradiation Event UID")	1	ALWAYS	
>	CONTAINS	DATETIME	DT (111526, DCM, "DateTime Started")	1	ALWAYS	
>	CONTAINS	CODE	EV (113721, DCM, "Irradiation Event Type")	1	ALWAYS	
>	CONTAINS	CODE	EV (123014, DCM, "Target Region")	1	ALWAYS	
>	CONTAINS	NUM	EV (122130, DCM, "Dose Area Product")	1	ALWAYS	UNITS = EV (Gy.m2, UCUM, "Gy.m2")
>	CONTAINS	INCLUDE	DTID 10003A "Irradiation Event X-Ray Detector Data"	1	CONDITIONAL	
>	CONTAINS	INCLUDE	DTID 10003B "Irradiation Event X-Ray Source Data"	1	CONDITIONAL	

Table 87: 10003A irradiation event X-ray detector data

NL	Rel with Parent	VT	Concept Name	VM	Presence of Value	Value
>	CONTAINS	NUM	EV (113845, DCM, "Exposure Index")	1	CONDITIONAL	UNITS = EV (1, UCUM, "no units")
>	CONTAINS	NUM	EV (113846, DCM, "Target Exposure Index")	1	CONDITIONAL	UNITS = EV (1, UCUM, "no units")
>	CONTAINS	NUM	EV (113847, DCM, "Deviation Index")	1	CONDITIONAL	UNITS = EV (1, UCUM, "no units")
>	CONTAINS	IMAGE	EV (113795, DCM, "Acquired Image")	1-n	CONDITIONAL	

Table 88: 10003B. irradiation event X-ray source data value

NL	Rel with Parent	VT	Concept Name	VM	Presence of Value	Value
>	CONTAINS	NUM	EV (113738, DCM, "Dose (RP) ")	1	CONDITIONAL	UNITS = EV (Gy, UCUM, "Gy")
>	CONTAINS	TEXT	EV (113780, DCM, "Reference Point Definition")	1	CONDITIONAL	
>	CONTAINS	CODE	EV (113780, DCM, "Reference Point Definition")	1	CONDITIONAL	
>	CONTAINS	CODE	EV (113768, DCM, "Number of Pulses")	1	ALWAYS	UNITS = EV (1, UCUM, "no units")
>	CONTAINS	NUM	EV (113733, DCM, "KVP")	1-n	ALWAYS	UNITS = EV (kV, UCUM, "kV")

>	CONTAINS	NUM	EV (113734, DCM, "X-Ray Tube Current")	1-n	CONDITIONAL	UNITS = EV (mA, UCUM, "mA")
>	CONTAINS	NUM	EV (113824, DCM, "Exposure Time")	1	CONDITIONAL	UNITS = EV (ms, UCUM, "ms")
>	CONTAINS	NUM	EV (113736, DCM, "Exposure")	1-n	CONDITIONAL	UNITS = EV (uA.s, UCUM, "uA.s")

8.4. Grayscale image consistency

The high-resolution display monitor attached to 8K software can be calibrated according to the Grayscale Standard Display Function (GSDF). The Service/Installation Tool is used together with a luminance meter to measure the Characteristic Curve of the display system and the current ambient light. See the 8K software Service Manual for details on the calibration procedure and supported calibration hardware. The result of the calibration procedure is a Monitor Correction LUT that will be active within the display subsystem after a system reboot.

8.5. Standard extended / specialized / private sop classes

No specialized or private SOP classes are supported.

8.6. Private transfer syntaxes

No private transfer syntaxes are supported.