DICOM Conformance Statement

MULTIX Impact

VA10, VA11, VA20 and higher

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SIEMENS Healthineers

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1 Conformance Statement Overview

This document is the DICOM Conformance Statement for MULTIX Impact Image System (IS). Note that the format of this document strictly follows the format defined in DICOM Standard PS 3.2 (Conformance). Please refer to that part of the standard while reading this document.

Image System is an integrated digital radiography operating console to support the necessary DICOM Services to allow a smooth integration into the clinical network.

With DICOM services to export/import images to/from remote workstations:

The DICOM service "Storage" indicates established image storage in the DICOM image archive; and the DICOM service "Storage Commitment (Push Model)" can request storage commitment from the remote node.

With "DICOM Basic Worklist Management Service Class' the worklist containing patient data can be retrieved from the remote hospital or radiology department information system and afterwards examination data can be sent back to the information system by using 'Modality Performed Procedure Step Service Class".

Finally, IS supports the "Print Management Service Class" and the "Media Storage Service Class".

Table 1-1 provides an overview of the network services supported by IS.

Table 1-1 Network Services

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Computed Radiography Image Storage	Yes	Yes
Digital X-Ray Image Storage - For Presentation	Yes	Yes
Digital X-Ray Image Storage - For Processing	Yes	Yes
Secondary Capture Image Storage	Yes	Yes
X-Ray Radiation Dose SR	Yes	No
Query		
Study Root Query Information Model - FIND	Yes	No
Study Root Query Information Model - MOVE	Yes	No
Workflow Management		
Modality Worklist Information Model - FIND	Yes	No
Storage Commitment Push Model	Yes	No
Modality Performed Procedure Step	Yes	No
Print Management		
Basic Grayscale Print Management Meta	Yes	No
Basic Film Session	Yes	No
Basic Film Box	Yes	No
Basic Grayscale Image Box	Yes	No
Printer	Yes	No

Table 1-2 provides an overview of the Media Storage Application Profiles supported by IS.

Table 1-2 Media Services

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

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
General Purpose DVD-RAM	Yes	Yes
General Purpose USB Media Interchange with JPEG	Yes	Yes

2 Introductions

2.1 Intended Audience

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

2.2 SCOPE AND FIELD OF APPLICATION

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

The reader of this DICOM Conformance Statement should be aware that different devices can use different Information Object Definitions. For example, a IS may send images using the DX Information Object, CR Information Object, etc.

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

2.3 Remarks

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

- Integration - The integration of any device into an overall system of interconnected devices goes beyond the scope of DICOM standards, and of this introduction and associated DICOM Conformance Statements when interoperability with non-equipment is desired. The responsibility to analyse the applications requirements and to design a solution that integrates imaging equipment with non-manufacture systems is the user's responsibility and should not be underestimated. The user is strongly advised to ensure that such an integration analysis is correctly performed.
- Validation - Testing the complete range of possible interactions between any device and non-manufacture devices, before the connection is declared operational, should not be overlooked. Therefore, the user should ensure that any other provider accepts full responsibility for all validation required for their connection with our devices. This includes the accuracy of the image data once it has crossed the interface between our imaging equipment and the other device and the stability of the image data for the intended applications. Such a validation is required before any clinical use (diagnosis and/or treatment) is performed. It applies when images acquired on our imaging equipment are processed/displayed on somebody else's device, as well as when images acquired on somebody else's equipment is processed/displayed on our console or workstation.
- Future Evolution - The DICOM Standard will evolve to meet the user's growing requirements. DICOM standard will incorporate new features and technologies and we may follow the evolution of the Standard. The protocol is based on DICOM standard as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM standard. In addition, we reserve the right to discontinue or make changes to the support of communications features (on its products) reflected on by these DICOM Conformance Statements. The user should ensure that any other provider, which connects with our devices, also plans evolution of the DICOM Standard. Failures to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and

Products are enhanced to support these changes.

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

2.4 Terms and Definitions

A

Abstract Syntax: A DICOM term which is identical to a DICOM SOP Class; it identifies a set of SOPs which, when taken together, represent a logical grouping. An Abstract Syntax identifies one SOP Class or Meta SOP Class.

ACR: American College of Radiology.

Annotation Box: A DICOM name for annotation text printed on the film or other media.

ANSI: American National Standards Institute.

Application Entity (AE): A DICOM term for defining a particular user at an IP address.

Association: A DICOM term for a communication context which is used by two Application Entities that communicate to one another.

Association Negotiation: The software handshaking that occurs between two DICOM Application Entities to set up an Association.

Attribute: Each DICOM information object has its own set of characteristics or attributes. Each attribute has a name and may have a value (see IOD), depending on its category.

B

Big Endian: A term for encoding data where the most-significant byte appears first and remaining bytes follow in descending order of significance; sometimes known as “Motorola” format (see Little Endian). (The term is used because of an analogy with the story Gulliver's Travels, in which Jonathan Swift imagined a never-ending fight between the kingdoms of the Big-Endian and the Little-Endian, whose only difference is in where they crack open a hard-boiled egg.)

C

Calling (Requesting) AE Title: The name used by the receiver in a DICOM Association to indicate which Application Entity it received the data from. It is the AE Title of the AE that is initiating the transfer.

Called (Receiving) AE Title: The name used by the sender in a DICOM Association to indicate which Application Entity it wants to transmit its data to. It is the AE Title of the AE that is receiving the transfer.

Command Element: An encoding of a parameter of a command which conveys this parameter's value.

Command Stream: The result of encoding a set of DICOM Command Elements using the DICOM encoding scheme.

Composite Information Object: A DICOM information object (see IOD) whose attributes contain multiple real world objects.

Conformance: Conformance in the DICOM sense means to be in compliance with the parts of the DICOM Standard.

Conformance Statement: A document whose organization and content are mandated by the DICOM Standard, which allows users to communicate how they have chosen to comply with the Standard in their implementations (see Section 8).

Combined Print Image: a pixel matrix created by superimposing an image and an overlay, the size of which is defined by the smallest rectangle enclosing the superimposed image and overlay.

D

Data Dictionary: A registry of DICOM Data Elements which assigns a unique tag, a name, value characteristics, and semantics to each Data Element (see the DICOM Data Element Dictionary in DICOM PS 3.6-2004).

Data Element: A unit of information as defined by a single entry in the data dictionary. An encoded Information Object Definition (IOD) Attribute that is composed of, at a minimum, three fields: a Data Element Tag, a Value Length, and a Value Field. For some specific Transfer Syntaxes, a Data Element also contains a VR Field where the Value Representation of that Data Element is specified explicitly.

Data Set: Exchanged information consisting of a structured set of Attribute values directly or indirectly related to Information Objects. The value of each Attribute in a Data Set is expressed as a Data Element.

Data Stream: The result of encoding a Data Set using the DICOM encoding scheme (Data Element Numbers and representations as specified by the Data Dictionary).

DICOM: Digital Imaging and Communications in Medicine.

DICOM File: A DICOM File is a file with a content formatted according to the requirements of DICOM.

DICOM File Format: The DICOM File Format provides a means to encapsulate in a File the Data Set representing a SOP Instance related to a DICOM Information Object.

DIMSE: DICOM Message Service Element. This represents an abstraction of a common set of things that a user would do to a data element, would likely use over and over, and would appear in various different contexts.

DIMSE-C: DICOM Message Service Element—Composite.

DIMSE-C services: A subset of the DIMSE services which supports operations on Composite SOP Instances related to composite Information Object Definitions with peer DIMSE-service-users.

DIMSE-N: DICOM Message Service Element—Normalized.

DIMSE-N services: A subset of the DIMSE services which supports operations and notifications on Normalized SOP Instances related to Normalized Information Object Definitions with peer DIMSE service-users.

E, F

Film Box: A Normalized Information Object which is the DICOM name for the equivalent of a sheet of physical film.

Film Session: A Normalized Information Object which is the DICOM name for the equivalent of a typical “study” or “series”.

G, H, I

HIS: Hospital Information System.

IE: Information Entity.

Image Box: A Normalized Information Object which is the DICOM name for the equivalent of a typical “frame” or “image”.

Information Object Class or

Information Object [Definition] (IOD): A software representation of a real object (e.g., CT Image, Study, etc.). An Information Object is generally a list of characteristics (Attributes) which completely describe the object as far as the software is concerned. The formal description of an Information Object generally includes a description of its purpose and the Attributes it possesses.

Information Object Instance or

Instance (of an IOD): A software representation of a specific occurrence of a real object or entity, including values for the Attributes of the Information Object Class to which the entity belongs..

J, K, L

Little Endian: A term for encoding data where the least-significant byte appears first and remaining bytes follow in ascending order of significance; sometimes known as “Intel” format (see Big Endian).

LUT: Lookup Table.

M

Message: A data unit of the Message Exchange Protocol exchanged between two cooperating DICOM Application Entities. A Message is composed of a Command Stream followed by an optional Data Stream.

Meta SOP Class: A collection or group of related SOP Classes identified by a single Abstract Syntax UID, which, when taken together, represent a logical grouping and which are used together to provide a high-level functionality, e.g., for the purpose of negotiating the use of the set with a single item.

Module: A logical group of the valid attributes of DICOM information objects.

N

NEMA: National Electrical Manufacturers Association.

Normalized Information Object: A DICOM Information Object (see IOD) whose attributes contain a single real

world object. Note: the differentiation of normalized versus composite information object definitions is not strongly enforced in DICOM 3.0.

O, P

Presentation Context: A Presentation Context consists of an Abstract Syntax plus a list of acceptable Transfer Syntaxes. The Presentation Context defines both what data will be sent (Abstract Syntax) and how the data are encoded to be sent (Transfer Syntax).

Print Job SOP Class: A DICOM representation of a Print Job which consists of a set of IODs which describe a Print Job and a set of services which can be performed on those IODs.

Print Management Service Class or **Print Service Class (PSC):** A DICOM term for a logical grouping of Service Classes which all involve printing, also referred to as Print Management Service Class (an example of a Meta SOP Class).

Printer SOP Class: A DICOM representation of a Printer which consists of a set of IODs which describe a Printer and a set of services which can be performed on those IODs.

Protocol Data Unit (PDU): A data object which is exchanged by software protocol devices (entities, machines) within a given layer of the protocol stack.

Q, R

RIS: Radiology Information System.

Real-World Activity: Something which exists in the real world and which pertains to specific area of information processing within the area of interest of the DICOM Standard. A Real-World Activity may be represented by one or more SOP Classes.

Real-World Object: Something which exists in the real world and upon which operations may be performed which are within the area of interest of the DICOM Standard. A Real-World Object may be represented through a SOP Instance.

S

Service Class: A group of operations that a user might want to perform on particular Information Objects. Formally, a structured description of a service which is supported by cooperating DICOM Application Entities using specific DICOM Commands acting on a specific class of Information Object.

Service Class Provider (SCP, Provider, Server): A device which provides the services of a DICOM Service Class or Classes which are utilized by another device (SCU) and which performs operations and invokes notifications on a specific Association.

Service Class User (SCU, User, Client): A device which utilizes the DICOM Service Class or Classes which are provided by another device (SCP) and which invokes operations and performs notifications on a specific Association.

Service-Object Pair (SOP): The combination of a DICOM Information Object and the Service Class which operates upon that object.

SOP Class: A DICOM term which is identical to an Abstract Syntax; it identifies a set of SOPs which, when taken together, represent a logical grouping (see Meta SOP Class).

Storage Service Class (SSC): A DICOM term for a logical grouping of Service Classes which all involve storage of images.

T

Tag: A unique identifier for an element of information composed of an ordered pair of numbers (a Group Number followed by an Element Number), which is used to identify Attributes and corresponding Data Elements.

TCP/IP: Transmission Control Protocol / Internet Protocol.

Transfer Syntax: A part of the DICOM Presentation Context which specifies a set of encoding rules that allow Application Entities to unambiguously negotiate the encoding techniques (e.g., Data Element structure, byte ordering, compression) they are able to support, thereby allowing these Application Entities to communicate.

U

Unique Identifier (UID): A globally unique identifier (based on the structure defined by ISO 8824 for OSI Object

Identifiers) which is assigned to every DICOM information object as specified by the DICOM Standard (see Section 2.1.1.4) and which guarantees global unique identification for objects across multiple countries, sites, vendors and equipment.

V

Value Representation (VR): A VR is the defined format of a particular data element.

W, X, Y, Z

2.5 Abbreviations

ACC	American College of Cardiology
ACR	American College of Radiology
ASCII	American Standard Code for Information Interchange
AE	Application Entity
ANSI	American National Standards Institute
CEN TC251	Comite Europeen de Normalisation – Technical Committee 251 – Medical Informatics
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DICOM Message Service Element - Composite
DIMSE-N	DICOM Message Service Element – Normalized
HIS	Hospital Information System
HL7	Health Level 7
IE	Information Entity
IOD	Information Object Definition
ISO	International Standard Organization
NEMA	National Electrical Manufacturers Association
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
RIS	Radiology Information System
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier

2.6 Reference

[1] [DICOM] Digital Imaging and Communications in Medicine (DICOM), Part 1 – 16

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

3 Networking

3.1 Implementation Model

3.1.1 Application Data Flow

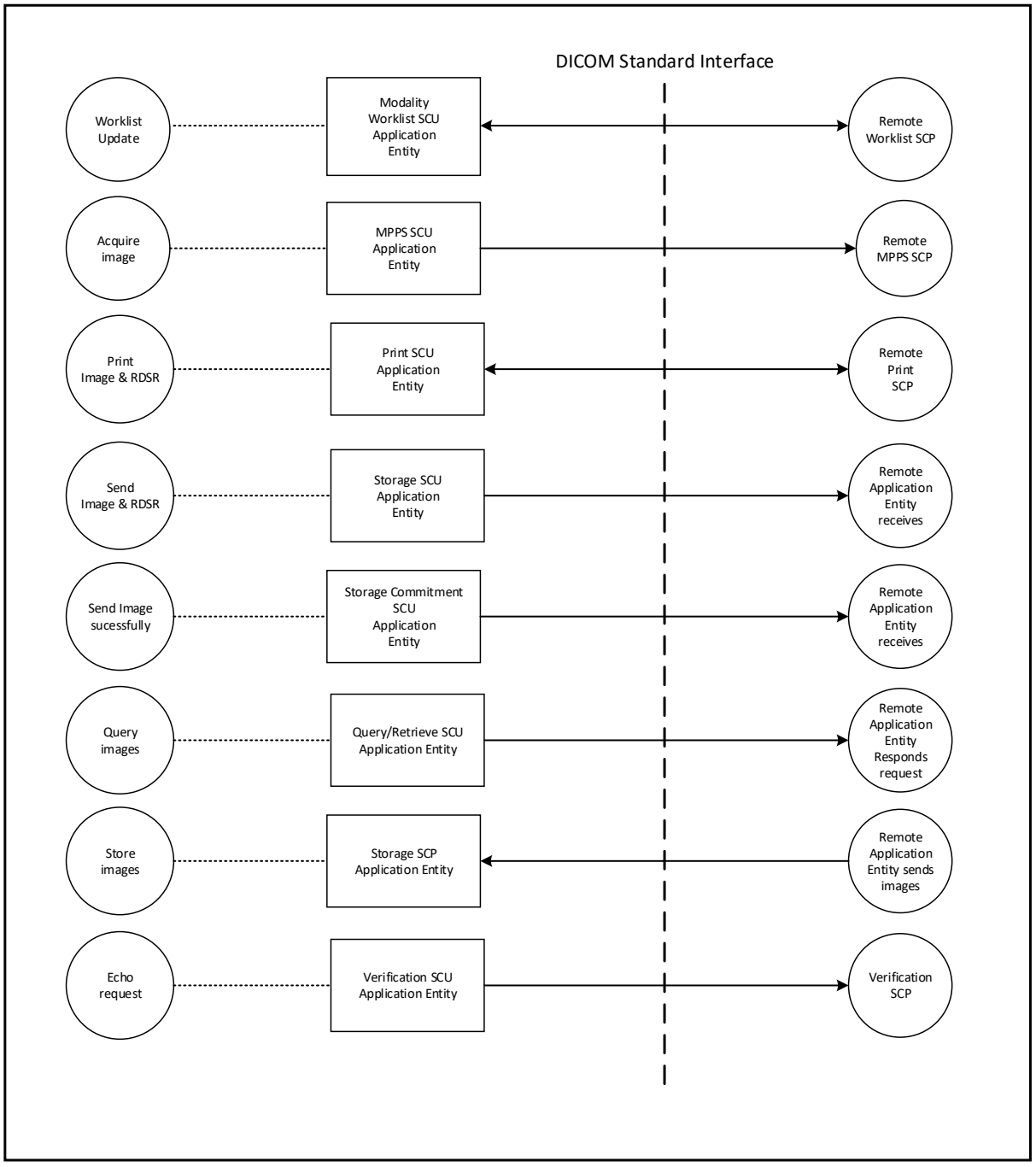

Figure 1 Application Data Flow Diagram

- The Modality Worklist Application Entity receives Worklist information from a remote AE. It is associated with the local real-world activities “Worklist Update” and "Acquire Images". When the "Worklist Update” local real-world activity is performed the Modality Worklist Application Entity queries a remote AE for worklist items and provides the set of worklist items matching the query request. “Worklist Update" is performed as a result of an operator request or can be performed automatically at specific time intervals.
- MPPS Application Entity creates and updates Modality Performed Procedure Step instances （sends MPPS information to a remote AE）.
- The Storage Application Entity sends images to a remote AE. It is associated with the local real-world activity "Send Images". "Send Images" is performed upon user request for each study completed or for specific images selected. When activated by user's settings (auto-send), each marked set of images and RDSR can be immediately stored to a preferred destination whenever a Patient/Study is closed by the user.
- If the remote AE is configured as an archive device the Storage AE will request Storage Commitment and if a commitment is successfully obtained will record this information in the local database.
- The Print Application Entity prints images on a remote AE (Printer). It is associated with the local real-world activity "Print Images". "Print Images" creates a print-job within the print queue containing one or more virtual film sheets composed from images selected by the user.

3.1.2 Functional Definition of AEs

3.1.2.1 Functional Definition of Modality Worklist Application Entity

Worklist Update attempts to download a Worklist from a remote node. If the Modality Worklist 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 results will be displayed in a separate list, which will be cleared with the next Worklist Update.

3.1.2.2 Functional Definition of MPPS Application Entity

The MPPS AE performs the creation of a MPPS Instance automatically. Further updates on the MPPS data can be performed interactively from the related MPPS user interface. The MPPS "Complete" or "Discontinued" states can only be set from the user interface.

3.1.2.3 Functional Definition of Storage Application Entity

The existence of a send-job queue entry with associated network destination will activate the Storage AE. 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, the related send-job is set to an error state and can be restarted by the user via job control interface. By default, the Storage AE will not try to initiate another association for this send-job automatically. However, an automatic retry (retry-timer, retry¬-count) can be configured.

3.1.2.4 Functional Definition of Storage Commitment Application Entity

The Storage Commitment AE accepts an association for Storage Commitment notification (N-EVENT-REPORT) only as a SCU. The Storage Commitment Provider initiating the association must use the role selection negotiation.

3.1.2.5 Functional Definition of Query Application Entity

IS DICOM query SCU requests the remote query SCP to perform a search (C-FIND) and match to the keys specified in the request in order to display the results in the user interface. Depending on user action (query data are input) the IS DICOM query SCU sends a C-MOVE DIMSE service to initiate a C-STORE sub-operation on the SCP to start an image transfer from remote Storage SCU (running on Query SCP) to local Storage SCP. The user has the possibility to cancel a running import by an “Import Cancel” function. IS DICOM application will perform only one running import operation at a time.

3.1.2.6 Functional Definition of Print Application Entity

The existence of a print-job in the print queue will activate the Print AE. An association is established with the printer and the printer's status determined. If the printer is operating normally, the film sheets described within

the print-job will be printed. Changes in printer status will be detected and reported to the user. If the printer is not operating normally, the print-job will set to an error state and can be restarted by the user via the job control interface.

3.1.2.7 Functional Definition of Verifications Application Entity

IS DICOM application opens an association when a "C-ECHO" of a remote application is requested from the Service User Interface. This can be done to verify the correct setup of a remote destinations configuration data.

3.1.3 Sequencing of Real-World Activities

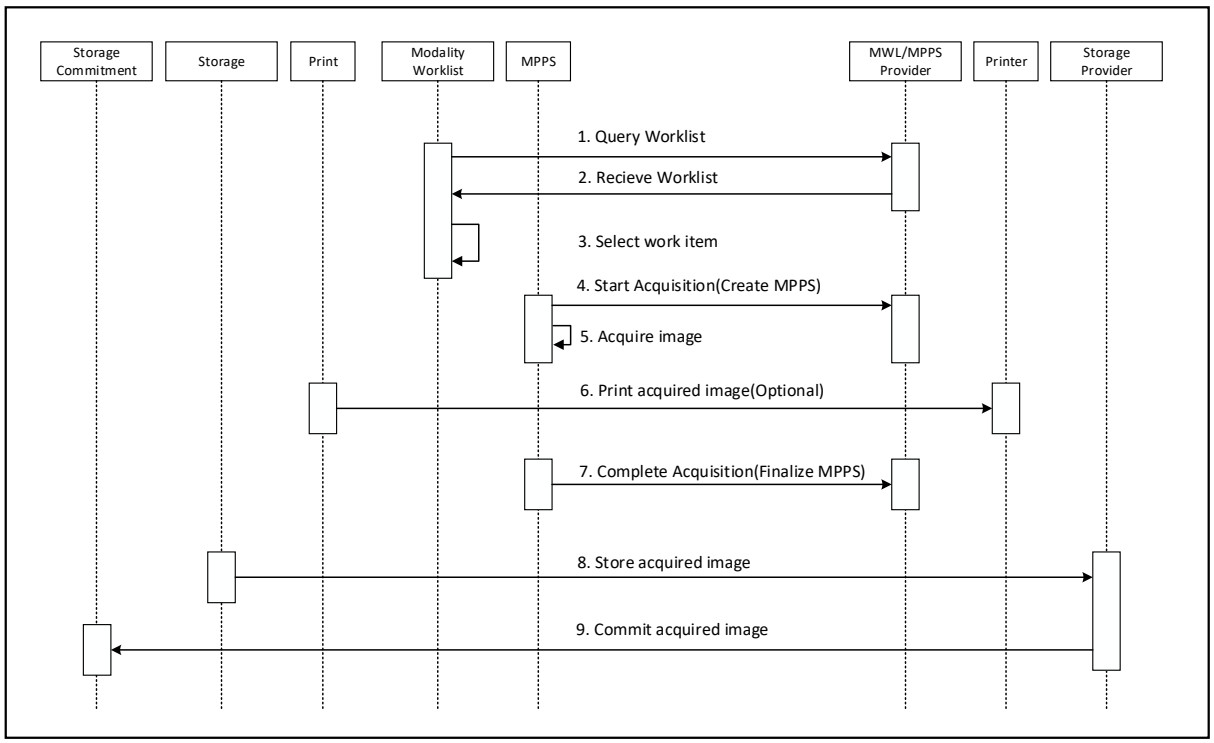

Figure 2 Sequencing Constraints

Under normal scheduled Modality Worklist conditions the sequencing constraints illustrated in Figure 2 apply:

1. Query Worklist
2. Receive Worklist
3. Select Work item from Worklist
4. Start acquisition and create MPPS
5. Acquire Images
6. Print acquired images (optional step)
7. Complete acquisition and finalize MPPS
8. Store acquired images
9. If the Storage Provider is configured as an archive device the Storage AE will request Storage Commitment for the images

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

3.2 AE Specifications

3.2.1 Modality Worklist Application Entity Specification

3.2.1.1 SOP Classes

IS provides Standard Conformance to the following SOP Classes as SCU:

Table 3-1 SOP Classes for AE Modality Worklist

SOP Class Name	SOP Class UID
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31

3.2.1.2 Association Policies

3.2.1.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 3-2 DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

3.2.1.2.2 Number of Associations

IS initiates one Association at a time for a Worklist request.

3.2.1.2.3 Asynchronous Nature

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

3.2.1.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 3-3 DICOM Implementation Identifying Information

Implementation Class UID	1.2.840.69677977.1.0
Implementation Version Name	EPACS20001.0

3.2.1.3 Association Initiation Policy

3.2.1.3.1 Activity - Worklist Update

3.2.1.3.1.1 Description and Sequencing of Activities

The request for a Worklist Update is initiated by user interaction, pressing the buttons “Query" on the user interface. The Modality Worklist AE will then initiate an association with the remote AE in order to query for the worklist. A user can configure a number of parameters which directly control the worklist query request. The user can request worklist items that are intended for the system the user is working at, all items that apply to the modality of the system the user is working at or all worklist items available. These selections and their effects on worklist query parameters are given below:

The interactive Patient Worklist Query will display a dialog for entering data as search criteria. When the Query is started on user request, only the data from the dialog will be inserted as matching keys into the query.

With automated worklist queries (including "Worklist Update") IS always requests all items for a Scheduled Procedure Step Start Date (actual date), Modality (DX/CR) and Scheduled Station AE Title. Query for the Scheduled Station AE Title is configurable by a Service Engineer.

Upon initiation of the request, IS will build an Identifier for the C-FIND request, will initiate an Association to send the request and will wait for Worklist responses. After retrieval of all responses, IS will access the local database to add or update patient demographic data.

IS will initiate an Association in order to issue a C-FIND request according to the Modality Worklist Information Model.

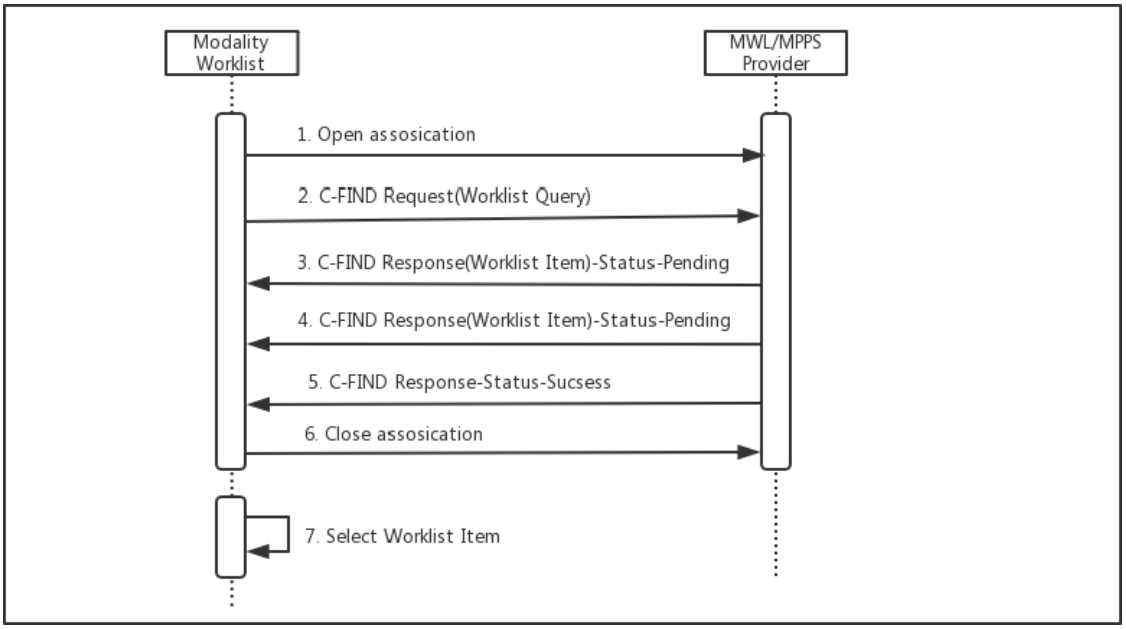

Figure 3 Sequencing of Activity - Worklist Update

The sequence of interactions between the Modality Worklist AE and a MWL/MPPS Provider (e.g., a device such as a RIS or HIS that supports the Modality Worklist SOP Class as an SCP) is illustrated in the Figure above:

1. The Modality Worklist AE opens an association with the MWL/MPPS Provider
2. The Modality Worklist AE sends a C-FIND request to the MWL/MPPS Provider containing the Worklist Query attributes.
3. The MWL/MPPS Provider returns a C-FIND response containing the requested attributes of the first matching Worklist Item.
4. The MWL/MPPS Provider returns another C-FIND response containing the requested attributes of the second matching Worklist Item.
5. The MWL/MPPS Provider 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 Modality Worklist AE closes the association with the MWL/MPPS Provider.
7. The user selects a Worklist Item from the Worklist and prepares to acquire new images.

3.2.1.3.1.2 Proposed Presentation Contexts

IS will propose Presentation Contexts as shown in the following table:

Table 3-4 Proposed Presentation Contexts for Activity Worklist Update

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

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
FIND					

3.2.1.3.1.3 SOP Specific Conformance for Modality Worklist

The behavior of IS 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 IS, a message "query failed" will appear on the user interface.

Table 3-5 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 aborted and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged.
Failed	Identifier does not match SOP Class	A900	The Association is aborted and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged.
Failed	Unable to Process	C000 - CFFF	The Association is aborted and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged.
Cancel	Matching terminated due to Cancel request	FE00	If the query was cancelled due to too many worklist items then the SCP has completed the matches. Worklist items are available for display or further processing. Otherwise, The Association is aborted and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query.
Pending	Matches are continuing	FF00	The worklist item contained in the Identifier is collected for later display or further processing.
Pending	Matches are continuing - Warning that one or more Optional Keys were not supported	FF01	The worklist item contained in the Identifier is collected for later display or further processing. The status meaning is logged only once for each C-FIND operation.
*	*	Any other status code.	The Association is aborted and the worklist is marked as failed. The status

Service Status	Further Meaning	Error Code	Behavior
			meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged.

The behavior of IS during communication failure is summarized in the table below.

Table 3-6 Modality Worklist Communication Failure Behavior

Exception	Behavior
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.

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

Requested return 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 ignored. No attempt is made it filter out possible duplicate entries.

Table 3-7 Worklist Request Identifier

Module Name Attribute Name	Tag	VR	M	R	Q	D	IOD
SOP Common							
Specific Character Set	(0008,0005)	CS		x			
Scheduled Procedure Step							
Scheduled Procedure Step Sequence	(0040,0100)	SQ		x			
>Scheduled Station AE Title	(0040,0001)	AE	S	x		x	
>Scheduled Procedure Step Start Date	(0040,0002)	DA	S	x		x	
>Scheduled Procedure Step Start Time	(0040,0003)	TM	S	x		x	
>Pre-Medication	(0040,0012)	LO		x		x	
>Modality	(0008,0060)	CS	S	x			
>Scheduled Performing Physician's Name	(0040,0006)	PN		x			x
>Scheduled Protocol Code Sequence	(0040,0008)	SQ		x			x
>> Code Value	(0008,0100)	SH		x			x
>> Coding Scheme Designator	(0008,0102)	SH		x			x
>> Coding Scheme Version	(0008,0103)	SH		x			x
>> Code Meaning	(0008,0104)	LO		x			x
>Scheduled Procedure Step ID	(0040,0009)	SH		x		x	x
>Scheduled Procedure Step Description	(0040,0007)	LO		x		x	x
Requested Procedure							
Requested Procedure Comments	(0040,1400)	LT					
Requested Procedure ID	(0040,1001)	SH		x		x	x
Requested Procedure Description	(0032,1060)	LO		x		x	x
Requested Procedure Code Sequence	(0032,1064)	SQ		x			x

Module Name Attribute Name	Tag	VR	M	R	Q	D	IOD
> Code Value	(0008,0100)	SH		x			x
> Coding Scheme Designator	(0008,0102)	SH		x			x
> Coding Scheme Version	(0008,0103)	SH		x			x
> Code Meaning	(0008,0104)	LO		x			x
Names of Intended Recipients of Results	(0040,1010)	PN					
Study Instance UID	(0020,000D)	UI		x			x
Requested Procedure Priority	(0040,1003)	SH		x			x
Referenced Study Sequence	(0008,1110)	SQ		x			x
> Referenced SOP Class UID	(0008,1150)	UI		x			x
> Referenced SOP Instance UID	(0008,1155)	UI		x			x
Imaging Service Request							
Accession Number	(0008,0050)	SH		x	x	x	x
Requesting Physician	(0032,1032)	PN		x			x
Referring Physician's Name	(0008,0090)	PN		x			x
Requesting Service	(0032,1033)	LO		x			
Imaging Service Request Comments	(0040,2400)	LT		x			
Visit Identification							
Admission ID	(0038,0010)	LO		x			
Institution Name	(0008,0080)	LO		x		x	x
Visit Status							
Current Patient Location	(0038,0300)	LO		x			
Visit Relationship							
Referenced Patient Sequence	(0008,1120)	SQ		x		x	x
> Referenced SOP Class UID	(0008,1150)	UI		x		x	x
> Referenced SOP Instance UID	(0008,1155)	UI		x		x	x
Visit Admission							
Admitting Diagnosis Description	(0008,1080)	LO		x		x	
Patient Identification							
Patient Name	(0010,0010)	PN		x	x	x	x
Patient ID	(0010,0020)	LO		x	x	x	x
Other Patient Ids	(0010,1000)	LO		x			x
Patient Demographic							
Patient's Birth Date	(0010,0030)	DA		x	x	x	x
Patient's Sex	(0010,0040)	CS		x	x	x	x
Confidentiality constraint on patient data	(0040,3001)	LO		x			
Ethnic Group	(0010,2160)	SH		x			x
Patient Comments	(0010,4000)	LT		x			x

Module Name Attribute Name	Tag	VR	M	R	Q	D	IOD
Patient Address	(0010,1040)	LO		x			
Patient Medical							
Patient State	(0038,0500)	LO		x			
Pregnancy Status	(0010,21C0)	US		x			
Medical Alerts	(0010,2000)	LO		x			
Allergies	(0010,2110)	LO		x			
Special Needs	(0038,0050)	LO		x			
Additional Patient History	(0010,21B0)	LT		x			

The above table should be read as follows:

Module Name The name of the associated module for supported worklist attributes.

Attribute Name Attributes supported to build an EXAMPLEINTEGRATED-MODALITY Worklist Request Identifier.

Tag DICOM tag for this attribute.

VR DICOM VR for this attribute.

M Matching keys for (automatic) Worklist Update. A "S" will indicate that IS will supply an attribute value for Single Value Matching, a "R" will indicate Range Matching and a "*" will denote wild card matching. It can be configured if "Scheduled Station AE Title" is additionally supplied "(S) " and if Modality is set to DX or CR.

R Return keys. An "x" will indicate that IS will supply this attribute as Return Key with zero length for Universal Matching. IS will support retired date format (yyyy.mm.dd) for "Patient's Birth Date" and "Scheduled Procedure Step Start Date" in the response identifiers. For "Scheduled Procedure Step Start Time" also retired time format as well as unspecified time components are supported.

Q Interactive Query Key. An "x" will indicate that IS will supply this attribute as matching key, if entered in the Query Patient Worklist dialog. For example, the Patient Name can be entered thereby restricting Worklist responses to Procedure Steps scheduled for the patient.

D 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.

The default Query Configuration is set to "Modality" and "Date". Optionally, matching for the own "Modality", "AE Title" and "Date" is configurable.

For the Modality Type attribute (0008,0060) of the DICOM Modality Worklist query any combination of the following values may be configured:

- CR
- DX

For "Date" one of the following settings could be configured:

- "1 Day"
- "2 Days"
- "1 Week"
- "All The Time"

3.2.1.4 Association Acceptance Policy

The Modality Worklist Application Entity does not accept Associations.

3.2.2 Modality Performed Procedure Step Application Entity Specifications

3.2.2.1 SOP Classes

IS provides Standard Conformance to the following SOP Classes as SCU:

Table 3-8 SOP Classes for AE MPPS

SOP Class Name	SOP Class UID
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3

3.2.2.2 Association Policies

3.2.2.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 3-9 DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

3.2.2.2.2 Number of Associations

IS initiates one Association at a time for a communication of MPPS information.

3.2.2.2.3 Asynchronous Nature

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

3.2.2.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 3-10 DICOM Implementation Class and Version

Implementation Class UID	1.2.840.69677977.1.0
Implementation Version Name	EPACS20001.0

3.2.2.3 Association Initiation Policy

3.2.2.3.1 Activity - Acquire Images

3.2.2.3.1.1 Description and Sequencing of Activities

After Patient registration, IS is awaiting the 1st application of X-Ray Dose to the patient. The trigger to create a MPPS SOP Instance is derived from this event. An Association to the configured MPPS SCP system is established immediately and the related MPPS SOP Instance will be created.

A manual update can be performed with the MPPS user interface where is it possible to set the final state of the MPPS to "COMPLETED" or "DISCONTINUED". In the "Discontinued" case the user can also select the discontinuation reason from a list corresponding to CID 9300 “Procedure Discontinuation Reasons”. A MPPS Instance that has been sent with a state of "COMPLETED" or "DISCONTINUED" can no longer be updated.

IS will support creation of "unscheduled cases" by allowing MPPS Instances to be communicated for locally registered Patients.

IS will initiate an Association to issue an:

- N-CREATE request according to the CREATE Modality Performed Procedure Step SOP Instance operation or a
- N-SET request to update the contents and state of the MPPS according to the SET Modality Performed Procedure Step Information operation.

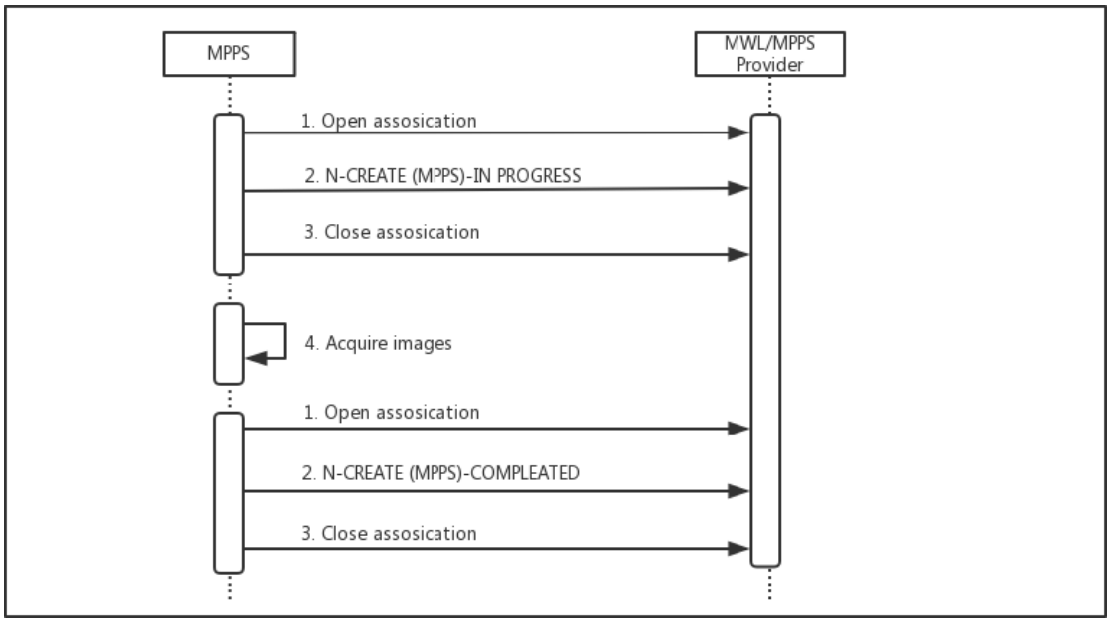

Figure 4 Sequencing of Activity - Acquire Images

A possible sequence of interactions between the MPPS AE and a MWL/MPPS Provider (e.g., a device such as a RIS or HIS that supports the MPPS SOP Class as an SCP) is illustrated in Figure 4:

1. The MPPS AE opens an association with the MWL/MPPS Provider.
2. The MPPS AE sends an N-CREATE request to the MWL/MPPS Provider to create an MPPS instance with status of "IN PROGRESS" and create all necessary attributes. The MWL/MPPS Provider acknowledges the MPPS creation with an N-CREATE response (status success).
3. The MPPS AE closes the association with the MWL/MPPS Provider.
4. All images are acquired and stored in the local database.
5. The MPPS AE opens an association with the MWL/MPPS Provider.
6. The MPPS AE sends an N-SET request to the MWL/MPPS Provider to update the MPPS instance with status of "COMPLETED" and set all necessary attributes. The MWL/MPPS Provider acknowledges the MPPS update with an N-SET response (status success).
7. The MPPS AE closes the association with the MWL/MPPS Provider.

3.2.2.3.1.2 Proposed Presentation Contexts

IS will propose Presentation Contexts as shown in the following table:

Table 3-11 Proposed Presentation Contexts for Real-World Activity Acquire Images

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

3.2.2.3.1.3 SOP Specific Conformance for MPPS

The behavior of IS when encountering status codes in an MPPS N-CREATE or N-SET response is summarized in Table 4.2-26. If any other SCP response status than "Success" or "Warning" is received by EXAMPLE¬INTEGRATED-MODALITY, a message "MPPS update failed" will appear on the user interface.

Table 3-12 MPPS N-CREATE / N-SET Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Failure	Processing Failure - Performed Procedure Step Object may no longer be updated	0110	The Association is aborted and the MPPS is marked as failed. The status meaning is logged and reported to the user. Additional information in the Response will be logged (i.e., Error Comment and Error ID).
Warning	Attribute Value Out of Range	0116H	The MPPS operation is considered successful but the status meaning is logged. Additional information in the Response identifying the attributes out of range will be logged (i.e., Elements in the Modification List/Attribute List)

The behavior of IS during communication failure is summarized in the table below:

Table 3-13 MPPS Communication Failure Behavior

Exception	Behavior
Timeout	The Association is aborted and MPPS marked as failed. The reason is logged and reported to the user.
Association aborted by the SCP or network layers	The MPPS is marked as failed. The reason is logged and reported to the user.

Table 3-14 provides a description of the MPPS N-CREATE and N-SET request identifiers sent by IS. Empty cells in the N-CREATE and N-SET columns indicate that the attribute is not sent. An "x" indicates that an appropriate value will be sent. A "Zero length" attribute will be sent with zero length.

Table 3-14 MPPS N-CREATE / N-SET Request Identifier

Attribute Name	Tag	VR	N-CREATE	N-SET
Specific Character Set	(0008,0005)	CS	X	X
Performed Procedure Step Relationship				
Scheduled Step Attributes Sequence	(0040,0270)	SQ	X	
> Study Instance UID	(0020,000D)	UI	X	
> Referenced Study Sequence	(0008,1110)	SQ	Zero length if not received from RIS	
>> Referenced SOP Class UID	(0008,1150)	UI	From RIS	
>> Referenced SOP Instance UID	(0008,1155)	UI	X	
> Accession Number	(0008,0050)	SH	From Modality Worklist or user input. The user can modify values provided via Modality Worklist.	
> Requested Procedure ID	(0040,1001)	SH	Zero length if not available	
> Requested Procedure Description	(0032,1060)	LO	Zero length if not received from RIS	
> Scheduled Procedure Step ID	(0040,0009)	SH	Zero length if not received	

Attribute Name	Tag	VR	N-CREATE	N-SET
			from RIS	
> Scheduled Procedure Step Description	(0040,0007)	LO	Zero length if not received from RIS	
> Scheduled Protocol Code Sequence	(0040,0008)	SQ	Zero length if not received from RIS	
> Code Value	(0008,0100)		X	
> Coding Scheme Designator	(0008,0102)		X	
> Coding Scheme Version	(0008,0103)		X	
> Code Meaning	(0008,0104)		X	
Patient's Name	(0010,0010)	PN	Zero length if not available	
Patient ID	(0010,0020)	LO	Zero length if not available	
Patient's Birth Date	(0010,0030)	DA	Zero length if not available	
Patient's Sex	(0010,0040)	CS	Zero length if not available	
Referenced Patient Sequence	(0008,1120)	SQ	Zero length if not received from RIS	
>> Referenced SOP Class UID	(0008,1150)	UI	X	
>> Referenced SOP Instance UID	(0008,1155)	UI	X	
Performed Procedure Step Information				
Performed Procedure Step ID	(0040,0253)	SH	copied from (0040,0009) if received from RIS internal created value otherwise	
Performed Station AE Title	(0040,0241)	AE	MPPS AE Title	
Performed Station Name	(0040,0242)	SH	same as (0008,1010) in storage objects	
Performed Location	(0040,0243)	SH	Zero length	Zero Length
Performed Procedure Step Start Date	(0040,0244)	DA	= (0008,0020) (IHE-8)	
Performed Procedure Step Start Time	(0040,0245)	TM	= (0008,0030) (IHE-8)	
Performed Procedure Step End Date	(0040,0250)	DA	Zero length	only in final N-SET
Performed Procedure Step End Time	(0040,0251)	TM	Zero length	only in final N-SET
Performed Procedure Step Status	(0040,0252)	CS	IN PROGRESS	X
Performed Procedure Step Description	(0040,0254)	LO	= (0008,1030) (IHE-8)	= (0008,1030) (IHE-8) or value from UI
Performed Procedure Type Description	(0040,0255)	LO	Zero length	
Performed Procedure Step	(0040,0281)	SQ	Zero length	

Attribute Name	Tag	VR	N-CREATE	N-SET
Discontinuation Reason Code Sequence				
Procedure Code Sequence	(0008,1032)		Zero length if not received from RIS Requested procedure code otherwise	Zero length if not received from RIS Requested procedure code otherwise
Image Acquisition Results				
Modality	(0008,0060)	CS	dependent on 1st image of procedure and configuration: "CR" or "DX"	
Study ID	(0020,0010)	SH	X	
Performed Protocol Code Sequence	(0040,0260)	SQ	Zero length	shall only be present if the performed Exams match to a saved Protocol Codes
> Code Value	(0008,0100)			X
> Coding Scheme Designator	(0008,0102)			X
> Coding Scheme Version	(0008,0103)			X
> Code Meaning	(0008,0104)			X
Performed Series Sequence	(0040,0340)	SQ	Zero length	One item for all performed series, one item for the according DICOM Dose Report
> Performing Physician's Name	(0008,1050)	PN		x
> Protocol Name	(0018,1030)	LO		x
> Operator's Name	(0008,1070)	PN		x
> Series Instance UID	(0020,000E)	UI		x
> Series Description	(0008,103E)	LO		x
> Retrieve AE Title	(0008,0054)	AE		x
> Referenced Image Sequence	(0008,1140)	SQ		One or more items
>> Referenced SOP Class UID	(0008,1150)			
>> Referenced SOP Instance UID	(0008,1155)			
> Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)			Only for dose report
>> Referenced SOP Class UID	(0008,1150)			X-Ray Radiation Dose SR
>> Referenced SOP Instance UID	(0008,1155)			UID OF DICOM DOSE SR
> Referenced Standalone SOP Instance Seq.	(0040,0220)	SQ	Zero length (SOP classes not supported)	Zero length (SOP classes not supported)
Radiation Dose Module				
Total Time of Fluoroscopy	(0040,0300)	US	Zero length	Total time
Total Number of Exposures	(0040,0301)	US	Zero length	Number of exposures, includes cassette images for series

Attribute Name	Tag	VR	N-CREATE	N-SET
				acquisition each frame is counted
Distance Source to Detector (SID)	(0018,1110)	DS	Zero length	minimum value
Distance Source to entrance	(0040,0306)			minimum value
Image Area Dose Product	(0018,115E)	DS	Zero length	includes fluoro and cassette images
Exposure Dose Sequence	(0040,030E)		Zero length	
Comments on Radiation Dose	(0040,0310)		Zero length	
Entrance Dose in mGy	(0040,8302)			-sum of irradiation event entrance dose
Billing and Material Code Module				
Billing Procedure Step Sequence	(0040,0320)		Zero length	Zero length
Film Consumption Sequence	(0040,0321)	SQ	Zero length	one item for each film size. Shall only be present if Number of Films for this film size > 0
> Film Size ID	(2010,0050)	CS		X
> Number of Films	(2100,0170)	IS		Expected film number

3.2.2.4 Association Acceptance Policy

The MMPS Application Entity does not accept Associations.

3.2.3 Storage Application Entity Specification

3.2.3.1 SOP Classes

IS provides Standard Conformance to the following SOP Classes as SCU:

Table 3-15 SOP Classes for AE Storage

SOP Class Name	SOP Class UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Second Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67

IS provides Standard Conformance to the following SOP Classes as SCP:

Table 3-16 SOP Classes for AE Storage

SOP Class Name	SOP Class UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Second Capture Image Storage	1.2.840.10008.5.1.4.1.1.7

3.2.3.2 Association Policies

3.2.3.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 3-17 DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

3.2.3.2.2 Number of Associations

IS accepts one Association at a time for the Storage SCP AE.

3.2.3.2.3 Asynchronous Nature

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

3.2.3.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 3-18 DICOM Implementation Class and Version

Implementation Class UID	1.2.840.69677977.1.0
Implementation Version Name	EPACS20001.0

3.2.3.3 Association Initiation Policy

3.2.3.3.1 Activity - Send Images

3.2.3.3.1.1 Description and Sequencing of Activities

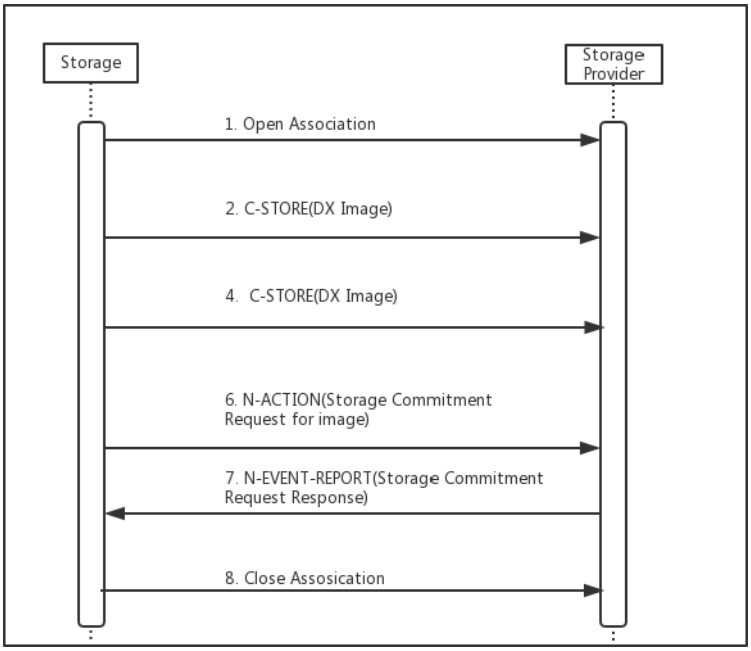

Figure 5 Sequencing of Activity - Send Images

A possible sequence of interactions between the Storage AE and a Storage Provider is illustrated in Figure 5:

1. The Storage AE opens an association with the Storage Provider
2. An acquired image is transmitted to the I Storage Provider using a C-STORE request and the Storage Provider replies with a C-STORE response (status success).
3. Another acquired DX image is transmitted to the Storage Provider using a C-STORE request and the Storage Provider replies with a C-STORE response (status success).
4. An N-ACTION request is transmitted to the Storage Provider to obtain storage commitment of previously transmitted DX images and RDSR. The Storage Provider replies with a N-ACTION response indicating the request has been received and is being processed.
5. The Storage Provider immediately transmits an N-EVENT-REPORT request notifying the Storage AE of the status of the Storage Commitment Request (sent in step 6 using the N-ACTION message). The Storage AE replies with a N-EVENT-REPORT response confirming receipt. The Storage Provider could send this message at any time or omit it entirely in flavour of transmitting the N-EVENT-REPORT over a separate dedicated association (see note).
6. The Storage AE closes the association with the Storage Provider.

3.2.3.3.1.2 Proposed Presentation Contexts

IS is capable of proposing the Presentation Contexts shown in the following table:

Table 3-19 Proposed Presentation Contexts for Activity Send Images

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Second Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.2.3.3.1.3 SOP Specific Conformance Image & RDSR Storage SOP Classes

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

If Digital X-Ray Image Storage SOP Instances are included in the Send Job and a corresponding Presentation Context is not accepted, then the Association is aborted using AP-ABORT and the send job is marked as failed. The job failure is logged and reported to the user via the job control application.

Table 3-20 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 aborted and the send job

Service Status	Further Meaning	Error Code	Behavior
			is marked as failed. The status meaning is logged and the job failure is reported to the user via the job control application. This is a transient failure.
Error	Data Set does not match SOP Class	A900-A9FF	The Association is aborted 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 aborted 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.

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

Table 3-21 Storage Communication Failure Behavior

Exception	Behavior
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 via the job control application.

A failed send job can be restarted by user interaction. The system can be configured to automatically resend failed jobs if a transient status code is received. The delay between resending failed jobs and the number of retries is also configurable.

3.2.3.4 Association Acceptance Policy

IS DICOM application attempts to accept a new association for

- DIMSE C-ECHO
- DIMSE C-STORE

service operations. Any Information Objects transmitted on that association will be checked on conformance and stored in database if check was successful.

3.2.3.4.1.1 Proposed Presentation Contexts

IS DICOM application will accept Presentation Contexts as shown in the following table:

Table 3-22 Proposed Presentation Contexts for Receive Images

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Second Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.2.3.4.1.2 SOP Specific Conformance Image Storage SOP Classes

Table 3-23 SOP Specific Conformance Image Storage SOP Classes

Attribute Name	Tag	Accepted Values
Image pixel		
Samples per Pixel	(0028,0002)	"1"
Photometric Interpretation	(0028,0004)	"MONOCHROME1", "MONOCHROME2"
Rows	(0028,0010)	up to 5000
Columns	(0028,0011)	up to 5000
Bits Allocated	(0028,0100)	8,16
Bits Stored	(0028,0101)	8,10,12,16
High Bit	(0028,0102)	Bits Stored - 1
Pixel Representation	(0028,0103)	0 or 1
Overlay Plan		
Overlay Rows	(6000,0010)	equal to 0028,0010
Overlay Columns	(6000,0011)	equal to 0028,0011
Overlay Type	(6000,0040)	"G"
Overlay Origin	(6000,0050)	"1\1"

Attribute Name	Tag	Accepted Values
Overlay Bits Allocated	(6000,0100)	"1" or "16"
Overlay Bit Position	(6000,0102)	"0" or "12"
Overlay Data	(6000,3000)	Only if (6000,0100) = 1

If images contain different values, they shall not be imported. An error text shall be written into the network job list and logged too.

3.2.4 Storage Commitment Application Entity Specification

3.2.4.1 SOP Classes

IS provides Standard Conformance to the following SOP Classes as a SCU:

Table 3-24 SOP Classes for AE Storage Commitment

SOP Class Name	SOP Class UID
Storage Commitment Push Model	1.2.840.10008.1.20.1

3.2.4.2 Association Policies

3.2.4.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 3-25 DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

3.2.4.2.2 Number of Associations

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

3.2.4.2.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

3.2.4.2.4 Implementation Identifying Information

Table 3-26 DICOM Implementation Class and Version

Implementation Class UID	1.2.840.69677977.1.0
Implementation Version Name	EPACS20001.0

3.2.4.3 Association Initiation Policy

3.2.4.3.1 Activity: Send images successfully to a remote host declared as a Storage Commitment Provider

3.2.4.3.1.1 Description and Sequencing of Activities

The Storage AE will request storage commitment for instances of the Digital X-Ray Image Storage SOP Class and X-Ray Radiation Dose Report Storage SOP Class if the Remote AE is configured as an archive device and a presentation context for the Storage Commitment Push Model has been accepted.

When an association is established, an N-ACTION service is sent to request storage commitment for stored images and RDSR. The Storage Commitment AE releases the association immediately after receiving the N-ACTION

response from the remote storage provider.

3.2.4.3.1.2 Proposed Presentation Contexts

Table 3-27 Proposed Presentation Context Table

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

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

The behavior of Storage Commitment AE when encountering status codes in a N-ACTION response is summarized in the table below:

Table 3-28 Storage Commitment N-ACTION Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The request for storage comment 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.

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

Table 3-29 Storage Commitment Communication Failure Behavior

Exception	Behavior
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 via the job control application.

3.2.4.4 Association Acceptance Policy

3.2.4.4.1 Activity - Receive Storage Commitment Response

3.2.4.4.1.1 Description and Sequencing of Activities

The Storage commitment AE will accept associations in order to receive responses to a Storage Commitment Request. A possible sequence of interactions between the Storage Commitment AE and a Storage Provider (e.g., a storage or archive device supporting Storage Commitment SOP Classes as an SCP) is:

1. The Storage Provider opens a new association with the Storage AE.
2. The Storage Provider sends an N-EVENT-REPORT request notifying the Storage AE of the status of a previous Storage Commitment Request. The Storage AE replies with a N-EVENT-REPORT response confirming receipt.
3. The Storage Provider closes the association with the Storage AE.

3.2.4.4.1.2 Accepted Presentation Contexts

The Storage Commitment AE will accept Presentation Contexts as shown in the table below.

Table 3-30 Acceptable Presentation Contexts for Activity Receive Storage Commitment Response

Presentation Context Table			
Abstract Syntax	Transfer Syntax	Role	Extended

Name	UID	Name List	UID List		Negotiation
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.2.4.4.1.3 SOP Specific Conformance for Storage Commitment SOP Class

Upon receipt of a N-EVENT-REPORT the timer associated with the Transaction UID will be cancelled.
The behavior of Storage Commitment AE when receiving Event Types within the N-EVENT-REPORT is summarized in Table 3-31.

Table 3-31 Storage Commitment N-EVENT-REPORT Behavior

Event Type Name	Event Type ID	Behaviour
Storage Commitment Request Successful	1	The Referenced SOP Instances under Referenced SOP Sequence (0008,1199) are marked within the database as "Stored & Committed (SC) " to the value of Retrieve AE Title (0008,0054). Successfully committed SOP Instances are candidates for automatic deletion from the local database if local resources become scarce. The conditions under which automatic deletion is initiated and the amount of space freed are site configurable. SOP Instances will not be deleted if they are marked with a lock flag. The least recently accessed SOP Instances are deleted first.
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 within the database as "Store & Commit Failed (Sf) ". The Failure Reasons are logged and the job failure is reported to the user via the job control application. A send job that failed storage commitment will not be automatically restarted but can be restarted by user interaction.

The reasons for returning specific status codes in a N-EVENT-REPORT response are summarized in Table 3-32.

Table 3-32 Storage Commitment N-EVENT-REPORT Response Status Reasons

Service Status	Further Meaning	Error Code	Reasons
Success	Success	0000	The storage commitment result has been successfully received.
Failure	Unrecognized Operation	0211H	The Transaction UID in the N-EVENT-REPORT request is not recognized (was never issued within an N-ACTION request).
Failure	Resource Limitation	0213H	The Transaction UID in the N-EVENT-REPORT request has expired (no N-EVENT-REPORT was received within a configurable time limit).

Service Status	Further Meaning	Error Code	Reasons
Failure	No Such Event Type	0113H	An invalid Event Type ID was supplied in the N-EVENT-REPORT request.
Failure	Processing Failure	0110H	An internal error occurred during processing of the N-EVENT-REPORT. A short description of the error will be returned in Error Comment (0000,0902).
Failure	Invalid Argument Value	0115H	One or more SOP Instance UIDs with the Referenced SOP Sequence (0008,1199) or Failed SOP Sequence (0008,1198) was not included in the Storage Commitment Request associated with this Transaction UID. The unrecognized SOP Instance UIDs will be returned within the Event Information of the N-EVENT-REPORT response.

3.2.4.4.1.4 SOP Specific Conformance for Verification SOP Class

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

3.2.5 Query Application Entity Specification

3.2.5.1 SOP Classes

IS provides Standard Conformance to the following SOP Classes as a SCU:

Table 3-33 SOP Classes for AE Query/Retrive

SOP Class Name	SOP Class UID
Study Root Query Information Model-Find	1.2.840.10008.5.1.4.1.2.2.1

3.2.5.2 Association Policies

3.2.5.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 3-34 DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

3.2.5.2.2 Number of Associations

IS initiates one Association at a time for each query request being processed to a remote node.

3.2.5.2.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

3.2.5.2.4 Implementation Identifying Information

Table 3-35 DICOM Implementation Identifying Information

Implementation Class UID	1.2.840.69677977.1.0
Implementation Version Name	EPACS20001.0

3.2.5.3 Association Initiation Policy

3.2.5.3.1 Real-World Activity: Query Request (FIND SCU)

3.2.5.3.1.1 Description and Sequencing of Activities

The associated Real-World activity is to fill out a query form with search data and pass it as a query request to the network application that issues one or more C-FIND requests over a previously built association. The remote SCP will respond with related data-entries that will be passed to a browser application. When data transfer is finished, the association is closed.

In case of error, the list is built up to the point where the error occurred. The user is informed about incomplete processing of the query results.

3.2.5.3.1.2 Proposed Presentation Contexts

Table 3-36 Proposed Presentation Contexts for Activity Worklist Update

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query Information Model-Find	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2		

3.2.5.3.1.3 SOP Specific Conformance for Query

IS Query SCU supports following DICOM tags are used as return and matching keys:

Table 3-37 return and matching keys:

Attribute Name	Tag	Matching	UI	Return Key
Patient's Name	(0010,0010)		Yes	
Patient ID	(0010,0020)		Yes	
Patient's Birth Date	(0010,0030)			
Patient's Sex	(0010,0040)			
Patient Comments	(0010,4000)			
Study Instance UID	(0020,000D)			Yes
Study ID	(0020,0010)			
Study Date	(0008,0020)		Yes	Yes
Study Time	(0008,0030)			Yes
Accession Number	(0008,0050)	Wildcard	Yes	
Referring Physician's Name	(0008,0090)			
Study Description	(0008,1030)			Yes
Number of Study Related Series	(0028,1206)			Yes
Number of Study Related Instance	(0028,1208)			Yes
Series Instance UID	(0020,000E)			Yes

Attribute Name	Tag	Matching	UI	Return Key
Series Number	(0020,0011)			Yes
Modality	(0008,0060)			Yes
Number of Series Related Instances	(0020,1209)			Yes
Series Description	(0008,103E)			Yes
Body Part Examined	(0018,0015)			Yes

Table 3-38 Modality Worklist C-FIND Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behaviour
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 aborted and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged.
Failed	Identifier does not match SOP Class	A900	The Association is aborted and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged.
Failed	Unable to Process	C000 - CFFF	The Association is aborted and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged.
Cancel	Matching terminated due to Cancel request	FE00	If the query was cancelled due to too many worklist items then the SCP has completed the matches. Worklist items are available for display or further processing. Otherwise, The Association is aborted and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query.
Pending	Matches are continuing	FF00	The worklist item contained in the Identifier is collected for later display or further processing.
Pending	Matches are continuing - Warning that one or more Optional Keys were not supported	FF01	The worklist item contained in the Identifier is collected for later display or further processing. The status meaning is logged only once for each C-FIND operation.
*	*	Any other status code.	The Association is aborted and the worklist is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any

Service Status	Further Meaning	Error Code	Behaviour
			additional error information in the Response will be logged.

3.2.5.4 Association Acceptance Policy

The Workflow Application Entity does not accept Associations.

3.2.6 Print Application Entity Specification

3.2.6.1 SOP Classes

IS provides Standard Conformance to the following SOP Classes as SCU:

Table 3-39 SOP Classes for AE Print

SOP Class Name	SOP Class UID
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9

3.2.6.2 Association Policies

3.2.6.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 3-40 DICOM Application Context for AE Print

Application Context Name	1.2.840.10008.3.1.1.1

3.2.6.2.2 Number of Associations

IS initiates one Association at a time for each configured Printer. Multiple Printers can be configured.

Table 3-41 Number of Associations Initiated for AE Print

Maximum number of simultaneous Associations	(number of configured Printers)

3.2.6.2.3 Asynchronous Nature

IS does not support asynchronous communication (multiple outstanding transactions over a single Association). Asynchronous receiving of Printer Status (N_EVENT_REPORT) is supported

3.2.6.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 3-42 DICOM Implementation Class and Version for AE Print

Implementation Class UID	1.2.840.69677977.1.0
Implementation Version Name	EPACS20001.0

3.2.6.3 Association Initiation Policy

3.2.6.3.1 Activity - Print Images

3.2.6.3.1.1 Description and Sequencing of Activities

A user composes images onto film sheets and requests them to be sent to a specific Printer. The user can select the desired film format and number of copies. Each print-job is forwarded to the job queue and processed individually.

The Printer AE is invoked by the job control interface that is responsible for processing network tasks. The job consists of data describing the images and graphics to be printed as well as the requested layout and other parameters. The film sheet is internally processed, converted to a STANDARD/1,1 page and then the page image is sent. If no association to the printer can be established, the print-job is switched to a failed state and the user informed.

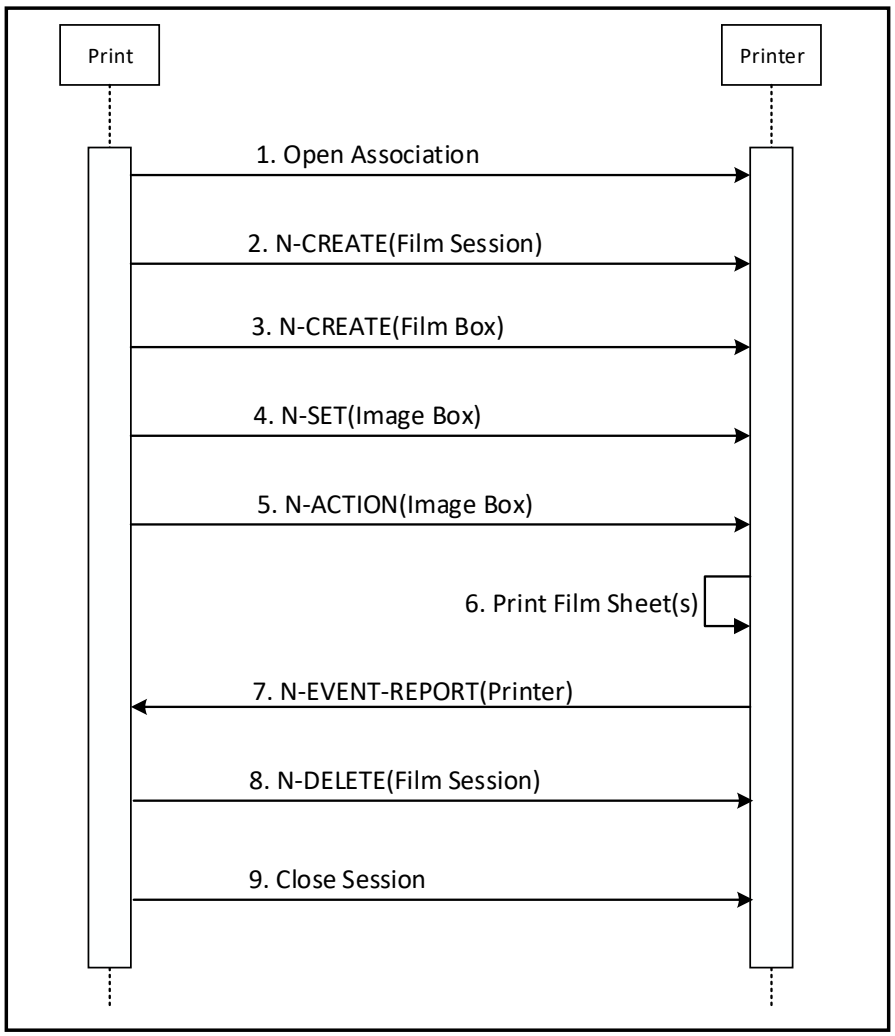

Figure 6 Sequencing of Activity - Print Images

A typical sequence of DIMSE messages sent over an association between Printer AE and a Printer is illustrated in Figure 6:

1. Printer AE opens an association with the Printer.
2. N-CREATE on the Film Session SOP Class creates a Film Session.
3. N-CREATE on the Film Box SOP Class creates a Film Box linked to the Film Session. A single Image Box will be created as the result of this operation. (Printer AE only uses the format STANDARD\1,1)
4. N-SET on the Image Box SOP Class transfers the contents of the film sheet to the printer.
5. N-ACTION on the Film Box SOP Class instructs the printer to print the Film Box.
6. The printer prints the requested number of film sheets.
7. The Printer asynchronously reports its status via N-EVENT-REPORT notification (Printer SOP Class). The printer can send this message at any time. Printer AE does not require the N-EVENT-REPORT to be sent. Printer AE is capable of receiving an N-EVENT-REPORT notification at any time during an association. If the Printer reports a status of FAILURE, the print-job is switched to a failed state and the user informed.
8. N-DELETE on the Film Session SOP Class deletes the complete Film Session SOP Instance hierarchy.
9. Printer AE closes the association with the Printer.

Status of the print-job is reported through the job control interface. Only one job will be active at a time for each separate Printer. If any Response from the remote Application contains a status other than Success or Warning, the Association is aborted and the related Job is switched to a failed state. It can be restarted any time by user interaction or, if configured, by automated retry.

3.2.6.3.1.2 Proposed Presentation Contexts

IS is capable of proposing the Presentation Contexts shown in the table below:

Table 3-43 Proposed Presentation Contexts for Activity Film Images

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.2.6.3.1.3 Common SOP Specific Conformance for All Print SOP Classes

The general behavior of Print AE during communication failure is summarized in the table below. This behavior is common for all SOP Classes supported by Print AE.

Table 3-44 Print Communication Failure Behavior

Exception	Behavior
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 via the job control application.

3.2.6.3.1.4 SOP Specific Conformance for the Film Session SOP Class

IS Print AE supports the following DIMSE operations for the Film Session SOP Class:

- N-CREATE
- N-DELETE

Details of the supported attributes and status handling behavior are described in the following subsections.

The attributes supplied in an N-CREATE Request are listed in the table below:

Table 3-45 Film Session SOP Class N-CREATE Request Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Copies	(2000,0010)	IS	1 .. 9	ALWAYS	User
Print Priority	(2000,0020)		MED	ALWAYS	User
Medium Type	(2000,0030)	CS	BLUE FILM, CLEAR FILM or PAPER	ALWAYS	User
Film Destination	(2000,0040)	CS	MAGAZINE or PROCESSOR	ALWAYS	User

The behavior of Print AE when encountering status codes in a N-CREATE response is summarized in the table below:

Table 3-46 Film Session SOP Class N-CREATE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Warning	Attribute Value Out of Range	0116H	The N-CREATE operation is considered successful but the status meaning is logged. Additional information in the Response identifying the attributes out of range will be logged (i.e., Elements in the Modification List/Attribute List)

Service Status	Further Meaning	Error Code	Behavior
Warning	Attribute List Error	0107H	The N-CREATE operation is considered successful but the status meaning is logged. Additional information in the Response identifying the attributes will be logged (i.e., Elements in the Attribute Identifier List)
*	*	Any other status code.	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.

The behavior of Printer AE when encountering status codes in a N-DELETE response is summarized in the table below:

Table 3-47 Printer SOP Class N-DELETE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
*	*	Any other status code.	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.

3.2.6.3.1.5 SOP Specific Conformance for the Film Box SOP Class

Print AE supports the following DIMSE operations for the Film Box SOP Class:

- N-CREATE
- N-ACTION

Details of the supported attributes and status handling behavior are described in the following subsections.

The attributes supplied in an N-CREATE Request are listed in the table below:

Table 3-48 Film Box SOP Class N-CREATE Request Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Display Format	(2010,0010)	CS	STANDARD\1,1	ALWAYS	Auto
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	ALWAYS	User
Film Size ID	(2010,0050)	CS	14INX17IN, 14INX14IN, 11INX14IN, 11INX11IN, 85INX11IN, 8INX10IN	ALWAYS	User
Referenced Presentation LUT Sequence	(2050,0500)	SQ	Only sent if Presentation LUT SOP Class has been negotiated.	ANAP	Auto
>Referenced SOP Class UID	(0008,1150)	UI	1.2.840.10008.5.1.1.23	ALWAYS	Auto
>Referenced SOP Instance UID	(0008,1155)	UI	From created Presentation LUT SOP Instance	ALWAYS	Auto

The behavior of Printer AE when encountering status codes in a N-CREATE response is summarized in the table below:

Table 3-49 Film Box SOP Class N-CREATE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Warning	Requested Min Density or Max Density outside of printer's operating range	B605H	The N-CREATE operation is considered successful but the status meaning is logged.
*	*	Any other status code.	The Association is aborted, and the print-job is marked as failed. The status meaning is logged and reported to the user.

An N-ACTION Request is issued to instruct the Print SCP to print the contents of the Film Box. The Action Reply argument in an N-ACTION response is not evaluated.

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

Table 3-50 Film Box SOP Class N-ACTION Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. The film has been accepted for printing.
Warning	Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page)	B603H	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.
Warning	Image size is larger than Image Box size. The image has been demagnified.	B604H	The N-ACTION operation is considered successful but the status meaning is logged.
Warning	Image size is larger than Image Box size. The image has been cropped to fit.	B609H	The N-ACTION operation is considered successful but the status meaning is logged.
Warning	Image size or Combined Print Image Size is larger than Image Box size. The image or combined Print Image has been decimated to fit.	B60AH	The N-ACTION operation is considered successful but the status meaning is logged.
Failure	Unable to create Print Job SOP Instance; print queue is full.	C602	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.
Failure	Image size is larger than Image Box size.	C603	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.
Failure	Combined Print Image Size is larger than Image Box size.	C613	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.
*	*	Any other status code.	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.

3.2.6.3.1.6 SOP Specific Conformance for the Image Box SOP Class

Print AE supports the following DIMSE operations for the Image Box SOP Class:

- N-SET

Details of the supported attributes and status handling behavior are described in the following subsections.
The attributes supplied in an N-SET Request are listed in the table below:

Table 3-51 Image Box SOP Class N-SET Request Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Position	(2020,0010)	US	1	ALWAYS	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 film size	ALWAYS	Auto
>Columns	(0028,0011)	US	Depends on film size	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
Request Image Size	(2020,0030)				Auto

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

Table 3-52 Image Box SOP Class N-SET Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. Image successfully stored in Image Box.
Warning	Image size is larger than Image Box size. The image has been demagnified.	B604H	The N-SET operation is considered successful but the status meaning is logged.
Warning	Requested Min Density or Max Density outside of printer's operating range.	B605H	The N-SET operation is considered successful but the status meaning is logged.
Warning	Image size is larger than Image Box size. The image has been cropped to fit.	B609H	The N-SET operation is considered successful but the status meaning is logged.
Warning	Image size or Combined Print Image Size is larger than Image Box size. The image or combined Print Image has been decimated to fit.	B60AH	The N-SET operation is considered successful but the status meaning is logged.
Failure	Image size is larger than Image Box size.	C603	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.

Service Status	Further Meaning	Error Code	Behavior
Failure	Insufficient memory in printer to store the image.	C605	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.
Failure	Combined Print Image Size is larger than Image Box size.	C613	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.
*	*	Any other status code.	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.

3.2.6.3.1.7 SOP Specific Conformance for the Printer SOP Class

Printer AE supports the following DIMSE operations and notifications for the Printer SOP Class:

- N-GET
- N-EVENT-REPORT

Details of the supported attributes and status handling behavior are described in the following subsections.

Printer AE uses the Printer SOP Class N-GET operation to obtain information about the current printer status. The attributes obtained via N-GET are listed in the table below:

Table 3-53 Printer SOP Class N-GET Request Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Printer Status	(2110,0010)	CS	Provided by Printer	ALWAYS	Printer
Printer Status Info	(2110,0020)	CS	Provided by Printer	ALWAYS	Printer
Printer Name	(2110,0030)				
Manufacturer	(0008,0070)				
Manufacturer Model Name	(0008,1090)				
Device Serial Number	(0018,1000)				
Software Versions	(0018,1020)				
Date Of Last Calibration	(0018,1200)				
Time Of Last Calibration	(0018,1201)				

The Printer Status information is evaluated as follows:

1. If Printer status (2110,0010) is NORMAL, the print-job continues to be printed.
2. If Printer status (2110,0010) is FAILURE, the print-job is marked as failed. The contents of Printer Status Info (2110,0020) is logged and reported to the user via the job ¬control application.
3. If Printer status (2110,0010) is WARNING, the print-job continues to be printed. The contents of Printer Status Info (2110,0020) is logged and reported to the user via the job¬ control application.

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

Table 3-54 Printer SOP Class N-GET Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The request to get printer status information was success.

Service Status	Further Meaning	Error Code	Behavior
*	*	Any other status code.	The Association is aborted and the print-job is marked as failed. The status meaning is logged and reported to the user.

Printer AE is capable of receiving an N-EVENT-REPORT request at any time during an association.

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

Table 3-55 Printer SOP Class N-EVENT-REPORT Behavior

Event Type Name	Event Type ID	Behavior
Normal	1	The print-job continues to be printed.
Warning	2	The print-job continues to be printed. The contents of Printer Status Info (2110,0020) is logged and reported to the user via the job-control application.
Failure	3	The print-job is marked as failed. The contents of Printer Status Info (2110,0020) is logged and reported to the user via the job-control application.
*	*	An invalid Event Type ID will cause a status code of 0113H to be returned in a N-EVENT-REPORT response.

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

Table 3-56 Printer SOP Class N-EVENT-REPORT Response Status Reasons

Service Status	Further Meaning	Error Code	Reasons
Success	Success	0000	The notification event has been successfully received.
Failure	No Such Event Type	0113H	An invalid Event Type ID was supplied in the N-EVENT-REPORT request.
Failure	Processing Failure	0110H	An internal error occurred during processing of the N-EVENT-REPORT. A short description of the error will be returned in Error Comment (0000,0902).

3.2.6.4 Association Acceptance Policy

The Print Application Entity does not accept Associations.

3.2.7 Verification Application Entity Specification

3.2.7.1 SOP Classes

IS provides Standard Conformance to the following SOP Classes as a SCU:

Table 3-57 SOP Classes for AE Verification

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1

IS provides Standard Conformance to the following SOP Classes as a SCP:

Table 3-58 SOP Classes for AE Modality Verification

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1

3.2.7.2 Association Establishment Policies

3.2.7.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 3-59 DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

3.2.7.2.2 Number of Associations

IS initiates one Association at a time for each configured Printer. Multiple Printers can be configured.

3.2.7.2.3 Asynchronous Nature

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

3.2.7.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 3-60 DICOM Implementation Class and Version

Implementation Class UID	1.2.840.69677977.1.0
Implementation Version Name	EPACS20001.0

3.2.7.3 Association Initiation Policy

3.2.7.3.1 Activity – Verification SCU

3.2.7.3.1.1 Description and Sequencing of Activities

The associated Real-World activity is a C-ECHO request initiated by Service User Interface environment whenever a verification of a destination configuration is requested. If an association to a remote Application Entity is successfully established, verification with the configured AET is requested via the open association. If the C-ECHO Response from the remote Application is received, a message will be displayed indicating that the C–Echo was successful, and the association is closed.

3.2.7.3.1.2 Proposed Presentation Contexts

IS is capable of proposing the Presentation Contexts shown in the following table:

Table 3-61 Proposed Presentation Contexts for Activity Verification

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

3.3 Network Interfaces

3.3.1 Physical Network Interface

IS supports a single network interface. One of the following physical network interfaces will be available

depending on installed hardware options:

Table 3-62 Supported Physical Network Interfaces

Ethernet 1000baseT/100baseT/10baseT

3.3.2 Additional Protocols

EXAMPLE-INTEGRATED-MODLALITY conforms to the System Management Profiles listed in the table below. All requested transactions for the listed profiles and actors are supported. Support for optional transactions is listed in the table below:

Table 3-63 Supported System Management Profiles

Profile Name	Actor	Protocols Used	Optional Transactions	Security Support
Network Address Management	DHCP Client	DHCP	N/A	
	DNS Client	DNS	N/A	
Time Synchronization	NTP Client	NTP	Find NTP Server	
	DHCP Client	DHCP	N/A	
DICOM Application Configuration Management	LDAP Client	LDAP	Client Update LDAP Server	See Section B.7

3.3.2.1 DHCP

DHCP can be used to obtain TCP/IP network configuration information. The network parameters obtainable via DHCP are shown in the table below. The Default Value column of the table shows the default used if the DHCP server does not provide a value. Values for network parameters set in the Service/Installation tool take precedence over values obtained from the DHCP server. Support for DHCP can be configured via the Service/Installation Tool. The Service/Installation tool can be used to configure the machine name. If DHCP is not in use, TCP/IP network configuration information can be manually configured via the Service/Installation Tool.

Table 3-64 Supported DHCP Parameters

DHCP Parameter	Default Value
IP Address	None
Hostname	Requested machine name
List of NTP servers	Empty list
List of DNS servers	Empty list
Routers	Empty list
Static routes	None
Domain name	None
Subnet mask	Derived from IP Address (see service manual)
Broadcast address	Derived from IP Address (see service manual)
Default router	None
Time offset	Site configurable (from Time zone)
MTU	Network Hardware Dependent
Auto-IP permission	No permission

If the DHCP server refuses to renew a lease on the assigned IP address all active DICOM Associations will be aborted.

3.3.2.2 DNS

DNS can be used for address resolution. If DHCP is not in use or the DHCP server does not return any DNS server addresses, the identity of a DNS server can be configured via the Service/Installation Tool. If a DNS server is not in use, local mapping between hostname and IP address can be manually configured via the Service/Installation Tool.

3.3.2.3 NTP

The NTP client implements the optional Find NTP Server Transaction. The NTP client will issue an NTP broadcast to identify any local NTP servers. If no local servers can found via NTP broadcast, the NTP Servers identified by DHCP will be used as time references. Additionally, one or more NTP Servers can be configured via the Service/Installation Tool. If no NTP Servers are identified then the local clock will be used as a time reference and a warning written to the system log files.

3.3.3 IPv4 and IPv6 Support

This product only supports IPv4 connections.

3.4 Configuration

3.4.1 AE Title/Presentation Address Mapping

3.4.1.1 Local AE Titles

All local applications use the AE Titles and TCP/IP Ports configured via the Service/Installation Tool. The Field Service Engineer can configure the TCP Port via the Service/Installation Tool. The AE Titles must be configured during installation. The local AE Title used by each individual application can be configured independently of the AE Title used by other local applications. If so configured, all local AEs are capable of using the same AE Title.

Table 3-65 AE Title Configuration Table

Application Entity	Default AE Title	Default TCP/IP Port
Modality Worklist SCU	No Default	Not Applicable
MPPS SCU	No Default	Not Applicable
Storage SCU	No Default	Not Applicable
Storage SCP	No Default	104
Storage Commitment SCU	No Default	Not Applicable
Query SCU	No Default	Not Applicable
Print SCU	No Default	Not Applicable
Verification SCU	No Default	Not Applicable
Verification SCP	No Default	Not Applicable

3.4.1.2 Remote AE Title/Presentation Address Mapping

The AE Title, host names and port numbers of remote applications are configured using the IS Service/Installation Tool.

3.4.1.2.1 Modality Worklist

The IS Service/Installation Tool must be used to set the AE Title, port-number, host-name and capabilities of the remote Modality Worklist SCP. Only a single remote Modality Worklist SCP can be defined.

3.4.1.2.2 Modality Performed Procedure Step

The IS Service/Installation Tool must be used to set the AE Title, port-number, host-name and capabilities of the remote MPPS SCP. Only a single remote MPPS SCP can be defined.

3.4.1.2.3 Storage

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

3.4.1.2.4 Storage Commitment

If a remote AE is attached to a device containing a DICOM DeviceType attribute with value "ARCHIVE" it will be automatically configured as an "Archive" device provided the AE also supports Storage Commitment as an SCP.

3.4.1.2.5 Query

3.4.1.2.6 Print

The IS Service/Installation Tool must be used to set the AE Titles, port-numbers, host-names, IP¬ Addresses and capabilities for the remote Print SCPs.

Multiple remote Print SCPs can be defined.

3.4.1.2.7 Verification

3.4.2 Parameters

A large number of parameters related to acquisition and general operation can be configured using the Service/Installation Tool. The table below only shows those configuration parameters relevant to DICOM communication. See the IS Service Manual for details on general configuration capabilities.

Table 3-66 Configuration Parameters Table

Parameter	Configurable (Yes/No)	Default Value
General Parameters		
Max PDU Receive Size	No	65536 Bytes(64 kB)
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	65536 Bytes(64 kB)
Storage Parameters		
Number of times a failed send job may be retried	Yes	0 (Failed send jobs are not retried)
Delay between retrying failed send jobs	Yes	60 s
Maximum number of simultaneously initiated Associations by the Storage AE	Yes	1
Supported Transfer Syntaxes (separately configurable for each remote AE)	No	Implicit VR Little Endian

Parameter	Configurable (Yes/No)	Default Value
Storage Commitment Parameters		
Timeout waiting for a Storage Commitment Notification (maximum duration of applicability for a Storage Commitment Transaction UID).	Yes	24 hours
Maximum number of simultaneously accepted Associations by the Storage AE	Yes	5
Delay association release after sending a Storage Commitment Request (wait for a Storage Commitment Notification over the same association).	Yes	120 s
Modality Worklist Parameters		
Modality Worklist SCU time-out waiting for the final response to a C-FIND-RQ	Yes	600 s
Maximum number of Worklist Items	Yes	100
Supported Transfer Syntaxes for Modality Worklist	No	Implicit VR Little Endian
Delay between automatic Worklist Updates	Yes	10 mins
Query Worklist for specific Scheduled Station AE Title	Yes	EXINTMOD_WFL
Query Worklist for specific Modality Value	Yes	DX
MPPS Parameters		
Supported Transfer Syntaxes for MPPS	No	Implicit VR Little Endian
Print Parameters		
Supported Transfer Syntaxes (separately configurable for each remote printer)	No	Implicit VR Little Endian
Number of times a failed print-job may be retried	Yes	0 (Failed send jobs are not retried)
Delay between retrying failed print-jobs	Yes	60 s
Printer correction LUT (separately configurable for each remote printer)	Yes	Identity LUT

4 Media Interchange

4.1 Implementation Model

4.1.1 Application Data Flow

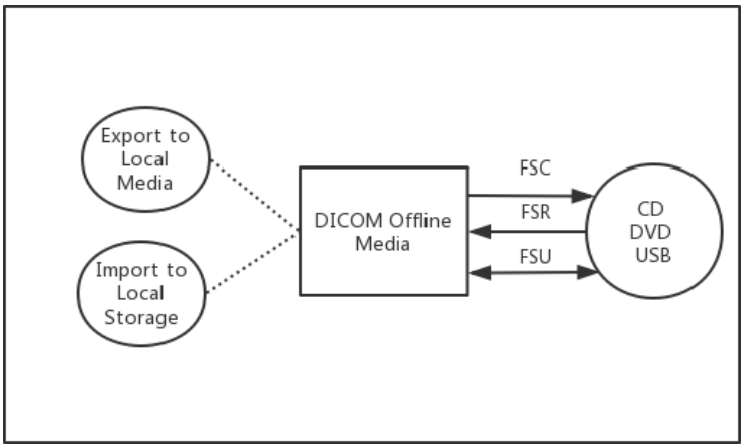

Figure 7 Application Data Flow Diagram for Media Storage

The Offline-Media Application Entity exports images and Presentation States to DICOM Storage medium. It is associated with the local real-world activity "Export to ..." and "Import to Local Storage".

"Export to ..." is performed upon user request for selected patients, studies, series or instances (images or presentation states).

Import is supported from local media.

4.1.2 Functional Definition of AEs

Functional Definition of Offline-Media Application Entity

IS DICOM offline media storage application entity is capable of:

1. Creating a new File-set onto an unwritten medium (Export to...)
2. Updating an existing File-set by writing new SOP Instances onto the medium (Export to...)
3. Importing SOP Instances from the medium onto local storage

4.1.3 Sequencing of Real-World Activities

- At least one image or presentation state must exist and be selected before the Offline-Media Application Entity can be invoked.
- The operator can insert a new CD-R/DVD or plug in a USB media at any time before or after invocation of the Offline-Media Application Entity.
- The Offline-Media Application Entity will wait indefinitely for a media to be inserted before starting to write to the CD-R/DVD/USB device.
- If no media is available the export job can be cancelled from the job queue.

4.1.4 File Meta Information Options

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

Table 4-1 DICOM Implementation Class and Version for Media Storage

Implementation Class UID	1.2.840.69677977.1.0
Implementation Version Name	EPACS20001.0

4.2 AE Specifications

4.2.1 Offline-Media Application Entity Specification

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

Table 4-2 Application Profiles, Activities and Roles for Offline-Media

Application Profiles Supported	Real World Activity	Role
STD-GEN-CD	Export to local Archive Media	FSC/FCU
	Import into local Storage	FSR
STD-GEN-DVD-JPEG	Export to local Archive Media	FSC/FCU
	Import into local Storage	FSR
STD-GEN-USB-JPEG	Export to local Archive Media	FSC/FCU
	Import into local Storage	FSR

4.2.1.1 File Meta Information for the Application Entity

The Source Application Entity Title included in the File Meta Header is configurable (see Section 4.4).

4.2.1.2 Real-World Activities

4.2.1.2.1 Activity - Export to ...

The Offline-Media Application Entity acts as an FSC when requested to export SOP Instances from the local database to a local medium.

A dialogue will be presented allowing the user to modify the suggested media label and provides control over the available media capacity. If the contents of the current selection do not fit on a single media an automatic separation into multiple export jobs will be suggested that can be adapted by the user.

The user will be prompted to prepare the local media for each export job. The contents of the export job will be written together with a corresponding DICOMDIR to a single-session CD¬R. Writing in multi-session mode is not supported. The user can cancel an export job in the job queue.

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

Table 4-3 IODs, SOP Classes and Transfer Syntaxes for Offline Media

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Second Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Second Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Explicit VR Little Endian	1.2.840.10008.1.2.1

4.3 Augmented and Private Application Profiles

IS does not support any augmented for private application profiles.

4.4 Media Configuration

All local applications use the AE Titles configured via the Service/Installation Tool. The Application Entity Titles configurable for Media Services are listed in the table below:

Table 4-4 AE Title Configuration Table

Application Entity	Default AE Title
Offline-Media	NA

5 Support of Character Sets

IS DICOM applications support the Character Set (0008, 0005) value:
ISO_IR 100: Latin-1 Latin alphabet
ISO_IR 101: Latin-2 Eastern European
ISO_IR 109: Latin alphabet #3
ISO_IR 110: Latin alphabet #4
ISO_IR 144: Cyrillic
ISO_IR 127: Arabic
ISO_IR 126: Greek
ISO_IR 138: Hebrew
ISO_IR 148: Latin alphabet #5
ISO_IR 166: Thai
ISO 2022 IR 13\ISO 2022 IR 87: Japanese
ISO 2022 IR 6\ISO 2022 IR 149: Korean
ISO 2022 IR 6\ISO 2022 IR 58: Chinese
GB18030: Chinese
GBK: Chinese
ISO_IR 192: Unicode
If IS creates Module, the Character Set (0008,0005) value ISO_IR 100, ISO_IR 192 will be supported.

6 Security

IS does not support any specific security measures.

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

a. Firewall or router protections to ensure that only approved external hosts have network access to IS.

b. Firewall or router protections to ensure that IS only has network access to approved external hosts and services.

c. 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.

7 Annexes

7.1 IOD Contents

7.1.1 Created SOP Instances

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

USER the attribute value source is from User input

AUTO the attribute value is generated automatically

MPPS the attribute value is the same as that use for Modality Performed Procedure Step

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.

7.1.1.1 X-Ray Digital Image IOD

Table 7-1 specifies the attributes of an X-Ray Digital Image transmitted by the IS storage application.

Table 7-2 specifies the attributes of a Grayscale Softcopy Presentation State transmitted by the IS storage application.

Table 7-1 IOD of Created DX SOP Instance

IE	Module	Reference	Presence of Module
Patient	Patient	**Table 7-2**	ALWAYS
Study	General Study	**Table 7-3**	ALWAYS
	Patient Study	**Table 7-4**	ALWAYS
Series	General Series	**Table 7-5**	ALWAYS
	DX Series	**Table 7-16**	ALWAYS
Equipment	General Equipment	**Table 7-6**	ALWAYS
Image	General Image	**Table 7-7**	ALWAYS
	Image Pixel	**Table 7-8**	ALWAYS
	X-Ray Acquisition	**Table 7-11**	ALWAYS
	X-Ray Detector	**Table 7-12**	ALWAYS
	DX Image	**Table 7-13**	ALWAYS
	DX Detector	**Table 7-14**	ALWAYS
	DX Position	**Table 7-15**	ALWAYS
	DX Anatomy Imaged	**Table 7-17**	ALWAYS
	X-Ray Dose	**Table 7-18**	ALWAYS

IE	Module	Reference	Presence of Module
	X-Ray Filtration	**Table 7-19**	ALWAYS
	X-Ray Grid	**Table 7-20**	ALWAYS
	Modality LUT	**Table 7-21**	Only if Pixel Intensity Relationship (0028,1040) is LOG
	SOP Common	**Table 7-9**	ALWAYS

7.1.1.2 Common Modules

Table 7-2 Patient Module 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. Values supplied via user input will contain all 5 components (some possibly empty).. Maximum 64 characters.	ALWAYS	MWL/USER
Patient ID	(0010,0020)	LO	From Modality Worklist or user input. Maximum 64 characters.	ALWAYS	MWL/USER
Patient's Birth Date	(0010,0030)	DA	From Modality Worklist or user input	ALWAYS	MWL/USER
Patient's Sex	(0010,0040)	CS	From Modality Worklist or user input	ALWAYS	MWL/USER
Referenced Patient Sequence	(0008,1120)		From Modality Worklist	VNAP	MWL
Referenced SOP Class UID	(0008,1150)		From Modality Worklist	VNAP	MWL
Referenced SOP Instance UID	(0008,1155)		From Modality Worklist	VNAP	MWL
Other Patient IDs	(0010,1000)		From Modality Worklist	EMPTY	
Other Patient Names	(0010,1001)		From Modality Worklist	VNAP	MWL
Ethnic Group	(0010,2160)		From Modality Worklist or user input.	VNAP	MWL/USER
Patient Comments	(0010,4000)	LT	From User Input. Maximum 1024 characters.	VNAP	MWL/USER

Table 7-3 General Study Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	From Modality Worklist or generated by device	ALWAYS	MWL/AUTO
Study Date	(0008,0020)	DA	<yyyymmdd>	ALWAYS	MWL/AUTO
Study Time	(0008,0030)	TM	<hhmmss>	ALWAYS	MWL/AUTO
Referring Physician's Name	(0008,0090)	PN	From Modality Worklist or user input	VNAP	MWL/USER
Study ID	(0020,0010)	SH	Requested Procedure ID from	ALWAYS	MWL/USER

Attribute Name	Tag	VR	Value	Presence of Value	Source
			Worklist or User Input		
Accession Number	(0008,0050)	SH	From Modality Worklist or user input	ALWAYS	MWL/USER
Study Description	(0008,1030)	LO	Comment text box in study list. Maximum 1024 characters.	ALWAYS	MWL/AUTO
Referenced Study Sequence	(0008,1110)	SQ	From Modality Worklist	VNAP	MWL
>Referenced SOP Class UID	(0008,1150)	UI	From Modality Worklist	VNAP	MWL
>Referenced SOP Instance UID	(0008,1155)	UI	From Modality Worklist	VNAP	MWL
Procedure Code Sequence	(0008,1032)		From Modality Worklist	VNAP	MWL
Code Value	(0008,0100)		From Modality Worklist	VNAP	MWL
Coding Scheme Designator	(0008,0102)		From Modality Worklist	VNAP	MWL
Coding Scheme Version	(0008,0103)		From Modality Worklist	VNAP	MWL
Code Meaning	(0008,0104)		From Modality Worklist	VNAP	MWL

Table 7-4 Patient Study Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Admitting Diagnosis Description	(0008,1080)	LO	From Modality Worklist	VNAP	MWL
Patient's Age	(0010,1010)	AS	Calculated from DoB input on base of actual Date	ALWAYS	MWL/AUTO/USER
Patient's Size	(0010,1020)		From Modality Worklist or user input	VNAP	MWL/USER
Patient's Weight	(0010,1030)	DS	From Modality Worklist or user input	VNAP	MWL/USER
Additional Patient History	(0010,21B0)	3	From Modality Worklist	VNAP	MWL

Table 7-5 General Series Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	DX	ALWAYS	CONFIG
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	<yyyymmdd>	ALWAYS	AUTO
Series Time	(0008,0031)	TM	<hhmmss>	ALWAYS	AUTO
Performing Physician's Name	(0008,1050)	PN	Physician field in Study list. Maximum 64 characters.	VNAP	USER
Protocol Name	(0018,1030)	LO	Organ program	ALWAYS	MWL/AUTO
Series Description	(0008,103E)	LO	Organ from Study list. Maximum 512 characters.	VNAP	MWL/AUTO
Operator's Name	(0008,1070)	PN	Operator field in Study list. Maximum 64 characters.	VNAP	USER

Attribute Name	Tag	VR	Value	Presence of Value	Source
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	Identifies the MPPS SOP Instance to which this image is related	VNAP	MPPS
>Referenced SOP Class UID	(0008,1150)	UI	MPPS SOP Class UID	ALWAYS	MPPS
>Referenced SOP Instance UID	(0008,1155)	UI	MPPS SOP Instance UID	ALWAYS	MPPS
Body Part Examined	(0018,0015)	CS	Value from Configuration (OGP EDIT) -zero length if not available	ALWAYS	AUTO
Request Attributes Sequence	(0040,0275)	SQ	Zero or 1 item will be present	VNAP	AUTO
>Requested Procedure ID	(0040,1001)	SH	From Modality Worklist	VNAP	MWL
>Scheduled Procedure Step ID	(0040,0009)	SH	From Modality Worklist	VNAP	MWL
>Scheduled Procedure Step Description	(0040,0007)	LO	From Modality Worklist	VNAP	MWL
>Scheduled Protocol Code Sequence	(0040,0008)	SQ	From Modality Worklist	VNAP	MWL
Code Value	(0008,0100)	SH	From Modality Worklist	VNAP	MWL
Coding Scheme Designator	(0008,0102)	SH	From Modality Worklist	VNAP	MWL
Coding Scheme Version	(0008,0103)	SH	From Modality Worklist	VNAP	MWL
Code Meaning	(0008,0104)	LO	From Modality Worklist	VNAP	MWL
Performed Procedure Step ID	(0040,0253)	SH	Same as MPPS.	ALWAYS	MPPS/AUTO
Performed Procedure Step Start Date	(0040,0244)	DA	Same as MPPS	ALWAYS	MPPS/AUTO
Performed Procedure Step Start Time	(0040,0245)	TM	Same as MPPS	ALWAYS	MPPS/AUTO
Performed Procedure Step Description	(0040,0254)	LO	Same as MPPS. Maximum 64 characters.	VNAP	MPPS/AUTO
Performed Protocol Code Sequence	(0040,0260)	SQ	Same as MPPS	ALWAYS	MPPS/AUTO

Table 7-6 General Equipment Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	From Configuration	ALWAYS	CONFIG
Institution Name	(0008,0080)	LO	From Configuration	ALWAYS	CONFIG
Station Name	(0008,1010)	SH	From Configuration/Host name	ALWAYS	CONFIG
Manufacturer's Model Name	(0008,1090)	LO	MULTIX Impact	ALWAYS	CONFIG
Device Serial Number	(0018,1000)	LO	From Configuration	ALWAYS	CONFIG
Software Version	(0018,1020)	LO	From Configuration	ALWAYS	CONFIG
Date of Last Calibration	(0018,1200)	DA	Generated by device	VNAP	AUTO

Table 7-7 General Image Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Generated by software	ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS	Zero length	VNAP	AUTO
Content Date	(0008,0023)	DA	<yyyymmdd>	ALWAYS	AUTO
Content Time	(0008,0033)	TM	<hhmmss>	ALWAYS	AUTO
Image Type	(0008,0008)	CS	Pixel Data Characteristics and Patient Examination Characteristics	ALWAYS	AUTO
Acquisition Number	(0020,0012)	IS	Generated by device	ALWAYS	AUTO
Acquisition Date	(0008,0022)	DA	Generated by device	ALWAYS	AUTO
Acquisition Time	(0008,0032)	TM	Generated by device	ALWAYS	AUTO
Image Comments	(0020,4000)	LT	From user input. Maximum 1024 characters.	VNAP	USER
Burned In Annotation	(0028,0301)	CS	NO	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	CS	00	ALWAYS	AUTO
Presentation LUT Shape	(2050,0020)	CS	IDENTIY	ALWAYS	AUTO
Irradiation Event UID	(0008,3010)	UI	UID of the irradiation event associated with the acquisition of the image	ALWAYS	AUTO
Rescale Intercept	(0028,1052)	DS	“0”	ALWAYS	AUTO
Rescale Slope	(0028,1053)	DS	“1”	ALWAYS	AUTO
Rescale Type	(0028,1054)	LO	“US”	ALWAYS	AUTO
Anatomic Region Sequence	(0008,2218)	SQ	Zero Length	VNAP	MWL/AUTO
> Include 'Code Sequence Macro'	Baseline Context ID is 4009 (see also Section B.8.6)				

Table 7-8 Image Pixel Module of Created DX 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	"MONOCHROME1", "MONOCHROME2"	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	Bits Stored-1	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	0 or 1	ALWAYS	AUTO

Table 7-9 SOP Common Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	(0008,0005)	CS	"ISO_IR 100" or "ISO_IR 192"	ALWAYS	CONFIG
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.12.2	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	1.3.12.2.1107.5.3.....	ALWAYS	AUTO

Table 7-10 Softcopy Presentation LUT Module of SOP Instances

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

7.1.1.3 X-Ray Digital Image Modules

Table 7-11 X-Ray Acquisition Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
KVP	(0018,0060)	DS	From Acquisition parameters	ALWAYS	AUTO
X-Ray Tube Current	(0018,1151)	IS	From Acquisition parameters	ALWAYS	AUTO
X-Ray Tube Current in µA	(0018,8151)	DS	From Acquisition parameters	ALWAYS	AUTO
Exposure Time	(0018,1150)	IS	From Acquisition parameters	ALWAYS	AUTO
Exposure	(0018,1152)	IS	From Acquisition parameters	ALWAYS	AUTO
Exposure in µAs	(0018,1153)	IS	From Acquisition parameters	ALWAYS	AUTO
Image and Fluoroscopy Area Dose Product	(0018,115E)	DS	Generated from DAP	VNAP	AUTO
Relative X-Ray Exposure	(0018,1405)	IS	Generated from Calculation	ALWAYS	AUTO
Exposure Index	(0018,1411)	DS	Generated from Calculation	ALWAYS	AUTO
Target Exposure Index	(0018,1412)	DS	From Configuration	ALWAYS	CONFIG
Deviation Index	(0018,1413)	DS	Generated from Calculation	ALWAYS	AUTO

Table 7-12 X-Ray Detector Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Detector Type	(0018,7004)	CS	Generated by configuration	ALWAYS	CONFIG
Detector Description	(0018,7006)	LT	Generated by configuration	VNAP	CONFIG
Detector ID	(0018,700A)	SH	Generated by configuration	VNAP	CONFIG
Date of Last Detector Calibration	(0018,700C)	DA	Generated by software	VNAP	AUTO
Time of Last Detector Calibration	(0018,700E)	TM	Generated by software	VNAP	AUTO
Detector Conditions Nominal Flag	(0018,7000)	CS	Generated by software	VNAP	AUTO
Detector Temperature	(0018,7001)	DS	Generated by device	ALWAYS	AUTO

Table 7-13 DX Image Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source

Attribute Name	Tag	VR	Value	Presence of Value	Source
Pixel Intensity Relationship	(0028,1040)	CS	“LIN” or “LOG”	ALWAYS	AUTO
Acquisition Device Processing Description	(0018,1400)	LO	Generated by device	VNAP	AUTO
Acquisition Device Processing Code	(0018,1401)	LO	Generated by device	VNAP	AUTO

Table 7-14 DX Detector Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Detector Type	(0018,7004)	CS	Generated by configuration	VNAP	CONFIG
Detector Description	(0018,7006)	LT	Generated by configuration	VNAP	CONFIG
Detector ID	(0018,700A)	SH	Generated by configuration	VNAP	CONFIG
Date of Last Detector Calibration	(0018,700C)	DA	Generated by software	VNAP	AUTO
Time of Last Detector Calibration	(0018,700E)	TM	Generated by software	VNAP	AUTO
Detector Conditions Nominal Flag	(0018,7000)	CS	Generated by software	VNAP	AUTO
Detector Temperature	(0018,7001)	DS	Generated by device	ALWAYS	AUTO
Sensitivity	(0018,6000)	DS	Generated by Configuration	ALWAYS	CONFIG
Field of View Shape	(0018,1147)	CS	Generated by device	VNAP	AUTO
Field of View Dimension(s)	(0018,1149)	IS	Generated by device or software	ALWAYS	AUTO
Field of View Origin	(0018,7030)	DS	Generated by device or software	ALWAYS	AUTO
Field of View Rotation	(0018,7032)	DS	Generated by device or software	ALWAYS	AUTO
Field of View Horizontal Flip	(0018,7034)	CS	Generated by software	ALWAYS	AUTO
Imager Pixel Spacing	(0018,1164)	DS	Generated by device	ALWAYS	AUTO

Table 7-15 DX Position Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
View Position	(0018,5101)	CS	Generated by software	ALWAYS	AUTO
Distance Source to Patient	(0018,1111)	DS	Generated by device	ALWAYS	AUTO
Distance Source to Detector	(0018,1110)	DS	Generated by device	ALWAYS	AUTO
Estimated Radiographic Magnification Factor	(0018,1114)	DS	Generated by software	VNAP	AUTO
Positioner Type	(0018,1508)	CS	Generated by device	“COLUMN”	AUTO
Column Angulation	(0018,1450)	DS	Generated by device	VNAP	AUTO
Table Type	(0018,113A)	CS	Generated by device	VNAP	AUTO
Table Angle	(0018,1138)	DS	Generated by device	VNAP	AUTO

Table 7-16 DX Series Module of Created DX SOP Instances

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

Table 7-17 DX Anatomy Imaged Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Laterality	(0020,0062)	CS	Generated by configuration	VNAP	CONFIG
Anatomic Region Sequence	(0008,2218)	SQ	Zero Length	VNAP	AUTO

Table 7-18 X-Ray Dose Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
KVP	(0018,0060)	DS	From Acquisition parameters	ALWAYS	AUTO
X-Ray Tube Current	(0018,1151)	IS	From Acquisition parameters	ALWAYS	AUTO
X-Ray Tube Current in µA	(0018,8151)	DS	From Acquisition parameters	ALWAYS	AUTO
Exposure Time	(0018,1150)	IS	From Acquisition parameters	ALWAYS	AUTO
Exposure Time in µS	(0018,8150)	DS	From Acquisition parameters	ALWAYS	AUTO
Exposure	(0018,1152)	IS	Generated from Calculation	ALWAYS	AUTO
Exposure in µAs	(0018,1153)	IS	From Acquisition parameters	ALWAYS	AUTO
Image and Fluoroscopy Area Dose Product	(0018,115E)	DS	Generated from DAP	ALWAYS	AUTO
Relative X-Ray Exposure	(0018,1405)	IS	Generated from Calculation	ALWAYS	AUTO

Table 7-19 X-Ray Filtration Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Filter Type	(0018,1160)	SH	Generated by device	VNAP	AUTO

Table 7-20 X-Ray Grid Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Grid	(0018,1166)	CS	Generated by device	VNAP	AUTO
Grid Focal Distance	(0018,704C)	DS	Generated by device	VNAP	AUTO

Table 7-21 Modality LUT Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality LUT Sequence	(0028,3000)	SQ	present if (0028,1040) = LOG	ANAP	AUTO
> LUT Descriptor	(0028,3002)	US	<1024,0,16>	ANAP	AUTO
> Modality LUT Type	(0028,3004)	LO	US	ANAP	AUTO
> LUT Data	(0028,3006)	US	LUT	ANAP	AUTO

7.1.1.4 Computed Radiography Image IOD

Table 7-22 Computed Radiography Image IOD

IE	Module	Reference	Presence of Module
Patient	Patient	**Table 7-2**	ALWAYS

IE	Module	Reference	Presence of Module
Study	General Study	**Table 7-3**	ALWAYS
	Patient Study	**Table 7-4**	ALWAYS
Series	General Series	**Table 7-5**	ALWAYS
	CR Series	**Table 7-23**	ALWAYS
Equipment	General Equipment	**Table 7-6**	ALWAYS
Image	General Image	**Table 7-7**	ALWAYS
	Image Pixel	**Table 7-8**	ALWAYS
	CR Image	**Table 7-24**	ALWAYS
	SOP Common	**Table 7-9**	ALWAYS

7.1.1.5 Computed Radiography Image Modules

Table 7-23 CR Series Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Body Part Examined	(0018,0015)	CS	From configuration	ALWAYS	CONFIG
View Position	(0018,5101)	CS	From configuration	ALWAYS	CONFIG

Table 7-24 CR Image Module of Created SOP Instances

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

7.1.1.6 X-Ray Radiation Dose SR IOD

Table 7-25 X-Ray Radiation Dose SR IOD

IE	Module	Reference	Presence of Module
Study	General Study	**Table 7-3**	ALWAYS
	Patient Study	**Table 7-4**	ALWAYS
Series	General Series	**Table 7-5**	ALWAYS
	SR Document Series	**Table 7-26**	ALWAYS
Equipment	General Equipment	**Table 7-6**	ALWAYS
Document	SOP Common	**Table 7-9**	ALWAYS

7.1.1.7 X-Ray Radiation Dose SR Modules

Table 7-26 SR Document Series Module of Created DX SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	SR	ALWAYS	CONFIG
Series Instance UID	(0020,000E)	UI	Generated by device	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Series Number	(0020,0011)	IS	Generated by device	ALWAYS	AUTO
Series Date	(0008,0021)	DA	<yyyymmdd>	ALWAYS	AUTO
Series Time	(0008,0031)	TM	<hhmmss>	ALWAYS	AUTO
Series Description	(0008,103E)	LO	Organ from Study list. Maximum 512 characters.	VNAP	MWL/AUTO

Table 7-27 Projection X-Ray Radiation Dose (TID 10001)

NL	Rel with Parent	VT	Concept Name	Value
		CONTAINER	EV (113701, DCM, "X-Ray Radiation Dose Report")	
>	HAS CONCEPT MOD	CODE	EV (121058, DCM, "Procedure reported")	(113704, DCM, "Projection X-Ray")
>>	HAS CONCEPT MOD	CODE	EV (G-C0E8, SRT, "Has Intent")	(R-408C3, SRT, "Diagnostic Intent")
>		INCLUDE	DTID 1002 “Observer Context”	See **Table 7-28**
>	HAS OBS CONTEXT	CODE	EV (113705, DCM, "Scope of Accumulation")	(113014, DCM, “Study”)
>>	HAS PROPERTIES	UIDREF	DCID 10001 “UID Types”	
>	CONTAINS	CODE	EV (113945, DCM, "X-Ray Detector Data Available")	(R-0038D, SRT, "Yes")
>	CONTAINS	CODE	EV (113943, DCM, "X-Ray Source Data Available")	(R-0038D, SRT, "Yes")
>	CONTAINS	CODE	EV (113944, DCM, "X-Ray Mechanical Data Available")	(R-0038D, SRT, "Yes")
>	CONTAINS	INCLUDE	DTID 10002 “Accumulated X-Ray Dose”	See **Table 7-30**
>	CONTAINS	INCLUDE	DTID 10003 “Irradiation Event X-Ray Data”	See **Table 7-33**
>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	
>	CONTAINS	CODE	EV (113854, DCM, "Source of Dose Information")	DCID 10020 “Source of Projection X-Ray Dose Information” (113858, DCM, "MPPS Content")

Table 7-28 Observer Context (TID 1002)

NL	Rel with Parent	VT	Concept Name	Value
	HAS OBS CONTEXT	CODE	EV (121005, DCM, "Observer Type")	(121007 DCM, "Device")
	HAS OBS CONTEXT	INCLUDE	DTID 1004 “Device Observer Identifying Attributes”	See **Table 7-29**

Table 7-29 Device Observer Identifying Attributes (TID 1004)

NL	Rel with Parent	VT	Concept Name	Value
		UIDREF	EV (121012, DCM, "Device Observer UID")	Instance Creator UID value
		TEXT	EV (121013, DCM, "Device Observer	Defaults to value of Station Name

NL	Rel with Parent	VT	Concept Name	Value
			Name")	(0008,1010) in General Equipment Module
		TEXT	EV (121014, DCM, "Device Observer Manufacturer")	Defaults to value of Manufacturer (0008,0070) in General Equipment Module
		TEXT	EV (121015, DCM, "Device Observer Model Name")	Defaults to value of Manufacturer's Model Name (0008,1090) in General Equipment Module
		TEXT	EV (121016, DCM, "Device Observer Serial Number")	Defaults to value of Device Serial Number (0018,1000) in General Equipment Module

Table 7-30 Accumulated X-Ray Dose (TID 10002)

NL	Rel with Parent	VT	Concept Name	Value Set Constraint
		CONTAINER	EV (113702, DCM, "Accumulated X-Ray Dose Data")	
>	HAS CONCEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	$Plane
>	CONTAINS	CONTAINER	EV (122505, DCM, "Calibration")	
>>	HAS CONCEPT MOD	CODE	EV (113794, DCM, "Dose Measurement Device")	DCID 10010 “Dose Measurement Devices”
>>	CONTAINS	DATETIME	EV (113723, DCM, "Calibration Date")	
>>	CONTAINS	NUM	EV (122322, DCM, "Calibration Factor")	UNITS = EV (1, UCUM, "no units")
>>	CONTAINS	NUM	EV (113763, DCM, "Calibration Uncertainty")	UNITS = EV (%, UCUM, "Percent")
>>	CONTAINS	TEXT	EV (113724, DCM, "Calibration Responsible Party")	
>>	CONTAINS	TEXT	EV (113720, DCM, "Calibration Protocol")	

Table 7-31 Accumulated Total Projection Radiography Dose (TID 10007)

NL	Rel with Parent	VT	Concept Name	Value Set Constraint
		NUM	EV (113722, DCM, "Dose Area Product Total")	UNITS = EV (Gy.m2, UCUM, "Gy.m2")
		NUM	EV (113725, DCM, "Dose (RP) Total")	UNITS = EV (Gy, UCUM, "Gy")
		NUM	EV (113737, DCM, "Distance Source to Reference Point")	UNITS = EV (mm, UCUM, "mm")
		NUM	EV (113731, DCM, "Total Number of Radiographic Frames")	UNITS = EV (1, UCUM, "no units")
		CODE	EV (113780, DCM, "Reference Point Definition")	DCID 10025 “Radiation Dose Reference Points”

Table 7-32 Accumulated Cassette-Based Projection Radiography Dose (TID 10006)

NL	Rel with Parent	VT	Concept Name	Value Set Constraint

NL	Rel with Parent	VT	Concept Name	Value Set Constraint
		NUM	EV (113731, DCM, "Total Number of Radiographic Frames")	UNITS = EV (1, UCUM, "no units")

Table 7-33 Irradiation Event X-Ray Data (TID 10003)

NL	Rel with Parent	VT	Concept Name	Value Set Constraint
		CONTAINER	EV (113706, DCM, "Irradiation Event X-Ray Data")	
>	HAS CONCEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	DCID 10003 “Equipment Plane Identification”
>	CONTAINS	UIDREF	EV (113769, DCM, "Irradiation Event UID")	
>	CONTAINS	DATETIME	DT (111526, DCM, "DateTime Started")	
>	CONTAINS	CODE	EV (113721, DCM, "Irradiation Event Type")	DCID 10002 “Irradiation Event Types”
>	CONTAINS	TEXT	EV (125203, DCM, "Acquisition Protocol")	
>	CONTAINS	CODE	EV (113745, DCM, "Patient Table Relationship")	DCID 21 “Patient Equipment Relationship”
>	CONTAINS	CODE	EV (113743, DCM, "Patient Orientation")	（F-10440, SRT, “erect”）
>>	HAS CONCEPT MOD	CODE	EV (113744, DCM, "Patient Orientation Modifier")	（F-10320, SRT, “standing”）
>	CONTAINS	CODE	EV (123014, DCM, "Target Region")	DCID 4031 “Common Anatomic Regions”
>	CONTAINS	NUM	EV (122130, DCM, "Dose Area Product")	UNITS = EV (Gy.m2, UCUM, "Gy.m2")
>	CONTAINS	NUM	EV (111638, DCM, "Patient Equivalent Thickness")	UNITS = EV (mm, UCUM, "mm")
>	CONTAINS	TEXT	EV (113780, DCM, "Reference Point Definition")	
>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	
>	CONTAINS	INCLUDE	DTID 10003A “Irradiation Event X-Ray Detector Data”	
>	CONTAINS	INCLUDE	DTID 10003B “Irradiation Event X-Ray Source Data”	
>	CONTAINS	INCLUDE	DTID 10003C “Irradiation Event X-Ray Mechanical Data”	

Table 7-34 Irradiation Event X-Ray Detector Data (TID 10003A)

NL	Rel with Parent	VT	Concept Name	Value Set Constraint
		NUM	EV (113845, DCM, "Exposure Index")	UNITS = EV (1, UCUM, "no units")
		NUM	EV (113846, DCM, "Target Exposure Index")	UNITS = EV (1, UCUM, "no units")
		NUM	EV (113847, DCM, "Deviation Index")	UNITS = EV (1, UCUM, "no units")

NL	Rel with Parent	VT	Concept Name	Value Set Constraint
		INCLUDE	DTID 1021 “Device Participant”	$DeviceProcedureRole = EV (113942, DCM, "X-Ray Reading Device")
		IMAGE	EV (113795, DCM, "Acquired Image")	

Table 7-35 Irradiation Event X-Ray Source Data (TID 10003B)

NL	Rel with Parent	VT	Concept Name	Value Set Constraint
		NUM	EV (113738, DCM, "Dose (RP) ")	UNITS = EV (Gy, UCUM, "Gy")
		TEXT	EV (113780, DCM, "Reference Point Definition")	
		CODE	EV (113780, DCM, "Reference Point Definition")	DCID 10025 “Radiation Dose Reference Points”
		NUM	EV (113742, DCM, "Irradiation Duration")	UNITS = EV (s, UCUM, "s")
		NUM	EV (113733, DCM, "KVP")	UNITS = EV (kV, UCUM, "kV")
		NUM	EV (113734, DCM, "X-Ray Tube Current")	UNITS = EV (mA, UCUM, "mA")
		NUM	EV (113824, DCM, "Exposure Time")	UNITS = EV (ms, UCUM, "ms")
		NUM	EV (113736, DCM, "Exposure")	UNITS = EV (uA.s, UCUM, "uA.s")
		NUM	EV (113766, DCM, "Focal Spot Size")	UNITS = EV (mm, UCUM, "mm")
		CONTAINER	EV (113771, DCM, "X-Ray Filters")	
>	CONTAINS	CODE	EV (113772, DCM, "X-Ray Filter Type")	DCID 10007 “X-Ray Filter Types”
		NUM	EV (113790, DCM, "Collimated Field Area")	UNITS = EV (m2, UCUM, "m2")
		NUM	EV (113788, DCM, "Collimated Field Height")	UNITS = EV (mm, UCUM, "mm")
		NUM	EV (113789, DCM, "Collimated Field Width")	UNITS = EV (mm, UCUM, "mm")
		INCLUDE	DTID 1021 “Device Participant”	$DeviceProcedureRole = EV (113859, DCM, "Irradiating Device")

Table 7-36 Irradiation Event X-Ray Mechanical Data (TID 10003C)

NL	Rel with Parent	VT	Concept Name	Value Set Constraint
		NUM	EV (113770, DCM, "Column Angulation")	UNITS = EV (deg, UCUM, "deg")

Table 7-37 Device Participant (TID 1021)

NL	Rel with Parent	VT	Concept Name	Value
		CODE	EV (113876, DCM, "Device Role in Procedure")	(113859, DCM, “Irradiating Device “)
>	HAS PROPERTIES	TEXT	EV (113877, DCM, "Device Name")	
>	HAS PROPERTIES	TEXT	EV (113878, DCM, "Device Manufacturer")	
>	HAS PROPERTIES	TEXT	EV (113879, DCM, "Device Model Name")	
>	HAS PROPERTIES	TEXT	EV (113880, DCM, "Device Serial Number")	

NL	Rel with Parent	VT	Concept Name	Value
>	HAS PROPERTIES	UIDREF	EV (121012, DCM, "Device Observer UID")	Instance Creator UID Value

7.1.2 Used Fields in Received IOD by Application

The IS storage application does not receive SOP Instances. The usage of attributes received via Modality Worklist is described in Section 3.2.1 .

7.1.3 Attribute Mapping

The relationships between attributes received via Modality Worklist, stored in acquired images and communicated via MPPS are summarized in Table 7-38. The format and conventions used in DICOM Table 7-38 are the same as the corresponding table in Section J.6 in PS3.17.

Table 7-38 Attribute Mapping Between Modality Worklist, Image and MPPS

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

Modality Worklist	Image IOD	MPPS IOD
Sequence		
----	Referenced Study Component Sequence	----
----	>Referenced SOP Class UID	SOP Class UID
----	>Referenced SOP Instance UID	SOP Instance UID
----	Protocol Name	Protocol Name

7.1.4 Coerced/Modified Fields

The Modality Worklist AE will truncate attribute values received in the response to a Modality Worklist Query if the value length is longer than the maximum length permitted by the attribute's VR.

7.2 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 7-38. During installation, a service technician will establish a mapping between the site-specific codes and the Protocol Names used internally to identify acquisition protocols.

The contents of Anatomic Region Sequence (0008,2218) in generated images will be filled with an anatomic code selected by the user from a catalog. The default catalog of anatomic codes corresponds to CID 4009 “DX Anatomy Imaged” but can be extended using the Service/Installation Tool.

The contents of Performed Procedure Step Discontinuation Reason Code Sequence (0040,0281) for a discontinued MPPS will be filled with a code selected by the user from a fixed list corresponding to CID 9300 "Procedure Discontinuation Reasons".

7.3 Grayscale Image Consistency

The high-resolution display monitor attached to the product 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 IS 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.

7.4 Standard Extended / Specialized / Private SOP Classes

No Specialized or Private SOP Classes are supported.

7.4.1 X-Ray Digital Image Storage SOP Class

The X-Ray Digital Image Storage SOP Class is extended to create a Standard Extended SOP Class by addition of standard and private attributes to the created SOP Instances as documented in Section 7.1 .

7.5 Private Transfer Syntaxes

No Private Transfer Syntaxes are supported.

8 List of Figures

9 List of Tables

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