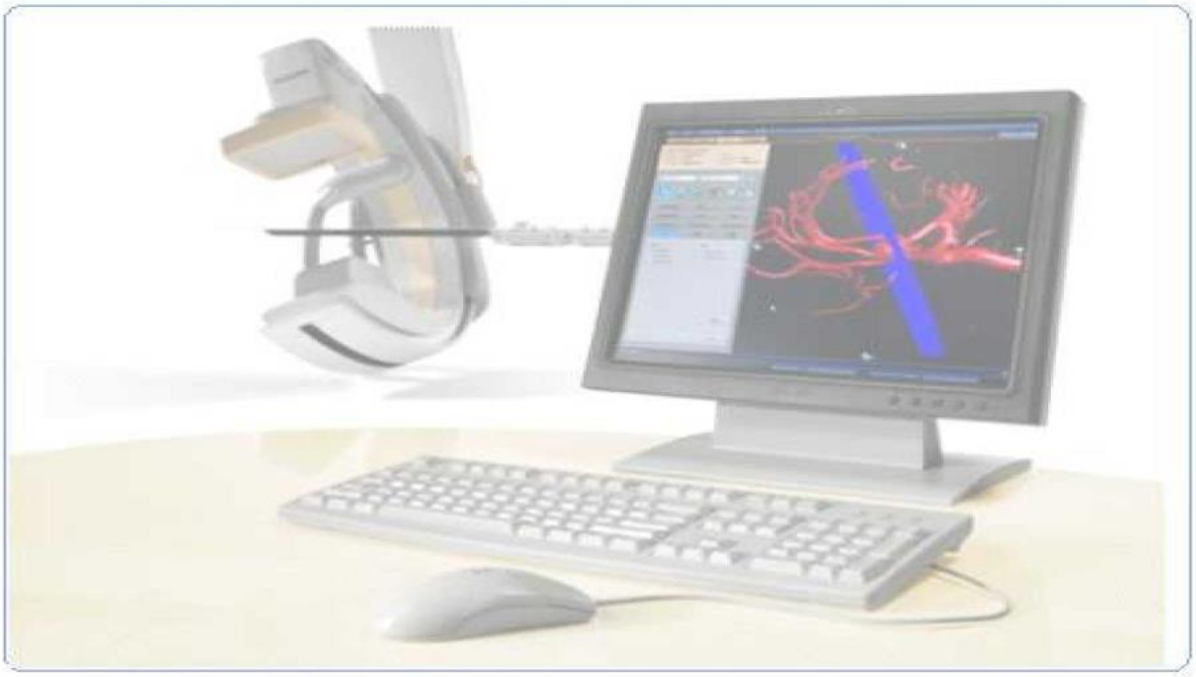
DICOM Conformance Statement

Interventional Workspot R1.8



- This page is left intentionally empty -

1. DICOM Conformance Statement Overview

This DICOM Conformance Statement is applicable to the Interventional Workspot R1.8, later referred to as Interventional Workspot. As a hosting platform, the Interventional Workspot provides common infrastructure and workstation functionality to support the user workflow with Interventional Tools (separate products). Some of the functionality offered by the Interventional Workspot are. Data Handling, Basic Viewer and Service Functionality and some will be offered as services (e.g. 3D Reconstructions, communication with Philips Interventional X-Ray System and- external systems).

Table 1: Network Services

SOP Class		User of Service (SCU)	Provider of Service (SCP)	Display
Name	UID			
Other				
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes	N/A
Print Management				
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes	No	N/A
>Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Yes	No	N/A
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No	N/A
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No	N/A
>Printer SOP Class	1.2.840.10008.5.1.1.16	Yes	No	N/A
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No	N/A
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No	N/A
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No	N/A
>Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes	No	N/A
>Printer SOP Class	1.2.840.10008.5.1.1.16	Yes	No	N/A
>Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Yes	No	N/A
Query/Retrieve				
Patient Root QR Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1.2.1.1	Yes	Yes	N/A
Patient Root QR Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1.2.1.2	Yes	Yes	N/A
Study Root QR Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes	N/A
Study Root QR Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes	N/A
PatientStudy Only QR Info. Model – FIND SOP Class (Retired)	1.2.840.10008.5.1.4.1.2.3.1	Yes	No	N/A
PatientStudy Only QR Info. Model – MOVE SOP Class (Retired)	1.2.840.10008.5.1.4.1.2.3.2	Yes	No	N/A
Transfer				
Philips Private Grayscale Softcopy Presentation State Storage SOP Class	1.3.46.670589.2.2.1.1	Yes	Yes	No
Philips Private X-Ray Image Storage SOP Class	1.3.46.670589.2.3.1.1	Yes	Yes	Yes
Philips Private X-Ray MF Image SOP Class	1.3.46.670589.7.8.1618510091	Yes	Yes	Yes

Philips Private Stent Boost WorkItem	1.3.46.670589.7.8.16185100912	Yes	Yes	No
Philips Private Live Run WorkItems	1.3.46.670589.7.8.1618510092	Yes	Yes	No
Philips Private Run WorkItems	1.3.46.670589.7.8.16185100129	Yes	Yes	No
Philips Private Reco WorkItems	1.3.46.670589.7.8.16185100130	Yes	Yes	No
Philips Private Three DCA WorkItem	1.3.46.670589.7.8.16185100913	Yes	Yes	No
Embedded Document	1.3.46.670589.2.8.1.1	Yes	Yes	N/A
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	Yes	Yes	Yes
Positron Emission Tomography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.128	Yes	Yes	Yes
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Yes	Yes	Yes
Digital X-Ray Image Storage – For Pres. SOP Class	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes	Yes
Nuclear Medicine Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.20	Yes	Yes	Yes
Encapsulated PDF Storage SOP Class	1.2.840.10008.5.1.4.1.1.104.1	Yes	Yes	N/A
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes	Yes
X-Ray Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes	Yes
Digital Mammography X-Ray Image Storage – Pres. SOP Class	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes	Yes
Digital X-Ray Image Storage – For Proc. SOP Class	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes	Yes
Enhanced CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes	Yes
Enhanced XA Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1.1	Yes	Yes	Yes
X-Ray Radiofluoroscopic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes	Yes
X-Ray 3D Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.13.1.1	Yes	Yes	Yes
Digital Mammography X-Ray Image Storage – Proc. SOP Class	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes	Yes
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4	Yes	Yes	Yes
Ultrasound Multi-frame Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes	Yes
Enhanced XRF Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.2.1	Yes	Yes	Yes
Enhanced MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4.1	Yes	Yes	Yes
RT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes	Yes
MR Spectroscopy Storage SOP Class	1.2.840.10008.5.1.4.1.1.4.2	Yes	Yes	Yes
Raw Data Storage SOP Class	1.2.840.10008.5.1.4.1.1.66	Yes	Yes	N/A
RT Dose Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes	N/A
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Yes	Yes	Yes
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes	Yes
Spatial Registration Storage SOP Class	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes	N/A
RT Structure Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes	N/A

Multi-frame Single Bit Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.1	Yes	Yes	Yes
RT Beams Treatment Record Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.4	Yes	Yes	N/A
Multi-frame Grayscale Byte SC Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes	Yes
RT Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes	N/A
Basic Text SR SOP Class	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes	N/A
Multi-frame Grayscale Word SC Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.3	Yes	Yes	Yes
12-Lead ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	Yes	N/A
Enhanced SR SOP Class	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes	N/A
Multi-frame True Color Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes	Yes
General ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	Yes	N/A
Hemodynamic Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	Yes	N/A
Comprehensive SR SOP Class	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes	N/A
Ambulatory ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	Yes	N/A
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes	N/A

A table of Supported Media Storage Application Profiles (with roles) is provided.

Table 2: Media Services

Media Storage Application Profile	File-set Creator (FSC)	File-set Updater (FSU)	File-set Reader (FSR)
Compact Disk-Recordable			
General Purpose CD-R Interchange	Yes	No	Yes
DVD			
General Purpose DVD Interchange with JPEG	Yes	No	Yes
General Purpose DVD Interchange with JPEG 2000	Yes	No	Yes

2. Contents

3. Introduction

3.1. Revision History

The revision history provides dates and differences of the different releases.

Table 3: Revision History

Document Version	Date of Issue	Description of change
01	13-Feb-2023	First release for Interventional Workspot R1.8

3.2. Audience

This Conformance Statement is intended for:

- (Potential) customers
- System integrators of medical equipment
- Marketing staff interested in system functionality
- Software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

3.3. Remarks

The DICOM Conformance Statement is contained in chapter 4 through 8 and follows the contents and structuring requirements of DICOM PS 3.2.
This DICOM Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

- **Interoperability**
  Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment.
  It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

- **Validation**
  Philips equipment has been carefully tested to ensure that the actual implementation of the DICOM interface corresponds with this Conformance Statement.
  Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

- **New versions of the DICOM Standard**
  The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery. The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the

incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

3.4. Definitions, Terms and Abbreviations

Table 4: Definitions, Terms and Abbreviations

Abbreviation/Term	Explanation
AE	Application Entity
ANSI	American National Standard Institute
AP	Application Profile
BOT	Basic Offset Table
CD	Compact Disc
CD-R	CD-Recordable
CD-M	CD-Medical
CR	Computed Radiography
CT	Computed Tomography
DCR	Dynamic Cardio Review
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DX	Digital X-Ray
EBE	DICOM Explicit VR Big Endian
ELE	DICOM Explicit VR Little Endian
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
GUI	Graphic User Interface
HIS	Hospital Information System
HL7	Health Level Seven
ILE	DICOM Implicit VR Little Endian
IOD	Information Object Definition
ISIS	Information System – Imaging System
MPPS	Modality Performed Procedure Step
MR	Magnetic Resonance
PHI	Protected Health Information
NEMA	National Electrical Manufacturers Association
PDU	Protocol Data Unit
RF	X-Ray Radiofluoroscopic
RIS	Radiology Information System
RT	Radiotherapy
RWA	Real-World Activity
SC	Secondary Capture
SCM	Study Component Management

SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
US	Ultrasound
USMF	Ultrasound Multi-frame
WLM	Worklist Management
XA	X-Ray Angiographic

3.5. References

[DICOM] Digital Imaging and Communications in Medicine, Parts 1 - 22 (NEMA PS 3.1- PS 3.22),
National Electrical Manufacturers Association
1300 North 17th Street
Suite 900
Arlington, Virginia 22209
Internet: https://www.dicomstandard.org/current

4. Networking

This section contains the networking related services (vs. the media related ones).

4.1. Implementation model

The implementation model consists of three sections:

- The application data flow diagram, specifying the relationship between the Application Entities and the "external world" or Real-World Activities,
- A functional description of each Application Entity, and
- The sequencing constraints among them.

4.1.1. Application Data Flow

The Interventional Workstation implements one network application entity: The Interventional Workstation Network AE.

The following figure shows the networking application data flow as a functional overview of the application entity. On the left the local Real-World Activities are presented, whereas on the right the remote Real-World Activities are presented.

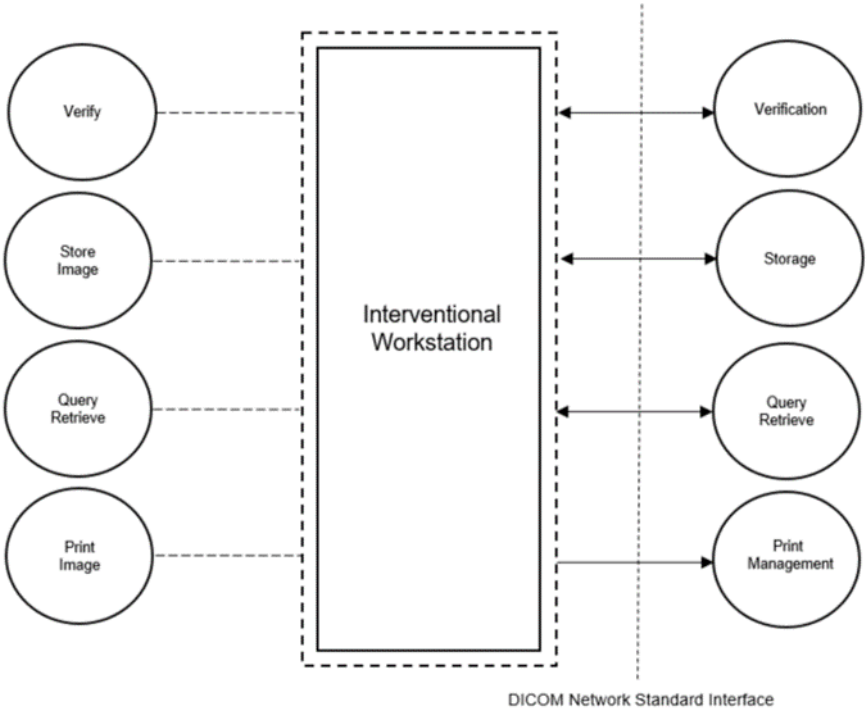


Figure 1: Application Data Flow Diagram

The Interventional Workstation incorporates the following functionality:
- Import images to a local database;
- Export images from the local database to a network DICOM node;
- Query and retrieve images from a remote DICOM node;
- Query and retrieve images from the local database;
- Print grayscale and color images from the local database on a DICOM printer.

4.1.2. Functional Definition of AE's

This section contains a functional definition for each individual local Application Entity.

4.1.2.1. Functional Definition of Interventional Workstation Network AE

Interventional Workstation incorporates the following functionality:

- The Interventional Workstation Network AE can verify application level communication by using the Verification service both as SCU and SCP (Verify).
- The Interventional Workstation Network AE can store images by using the Storage service both as SCU and SCP (Store Image).
- The Interventional Workstation Network AE can find and move images by using the Query/Retrieve service both as SCU and SCP (Query/Retrieve Image).
- The Interventional Workstation Network AE can print images by using the Print Management service as SCU (Print Image).

4.1.3. Sequencing of Real World Activities

4.1.3.1. Sequencing of Query/Retrieve Activities

The Interventional workstation can Query DICOM archives and Receive images locally. An association is established when the user initiates a query from the graphical user interface. The Interventional Workstation's Query/Retrieve SCU will establish an association to query a remote AE to obtain a list of relevant objects based on the user's inputs.

When the user retrieves the needed objects, the remote AE establishes a connection with the Interventional Workstation's Storage SCP to store the images locally.

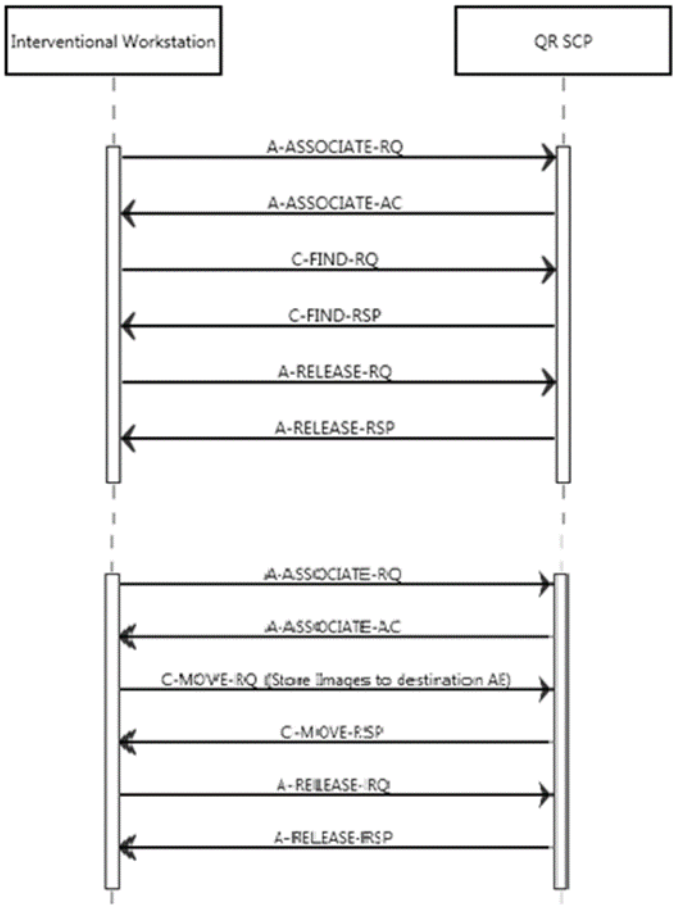


Figure 2: Sequencing of Query/Retrieve

4.2. AE Specifications

This section in the DICOM Conformance Statement is a set of Application Entity specifications. There are as many of these subsections as there are different AE's in the implementation.

4.2.1. Interventional Workstation Network AE

Detail of this specific Application Entity is specified in this section.

4.2.1.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 5: SOP Classes for interventional Workstation Network AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes
Philips Private Grayscale Softcopy Presentation State Storage SOP Class	1.3.46.670589.2.2.1.1	Yes	Yes
Philips Private X-Ray Image Storage SOP Class	1.3.46.670589.2.3.1.1	Yes	Yes
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
Positron Emission Tomography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Digital X-Ray Image Storage – For Pres. SOP Class	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes
Nuclear Medicine Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
Encapsulated PDF Storage SOP Class	1.2.840.10008.5.1.4.1.1.104.1	Yes	Yes
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes
X-Ray Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
Digital Mammography X-Ray Image Storage – Pres. SOP Class	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital X-Ray Image Storage – For Proc. SOP Class	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes
Enhanced CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes
Enhanced XA Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1.1	Yes	Yes
X-Ray Radiofluoroscopic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes
X-Ray 3D Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.13.1.1	Yes	Yes
Digital Mammography X-Ray Image Storage – Proc. SOP Class	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Ultrasound Multi-frame Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
Enhanced XRF Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.2.1	Yes	Yes
Enhanced MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4.1	Yes	Yes
RT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
MR Spectroscopy Storage SOP Class	1.2.840.10008.5.1.4.1.1.4.2	Yes	Yes
Raw Data Storage SOP Class	1.2.840.10008.5.1.4.1.1.66	Yes	Yes
RT Dose Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes

Spatial Registration Storage SOP Class	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
RT Structure Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes
Multi-frame Single Bit Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.1	Yes	Yes
RT Beams Treatment Record Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.4	Yes	Yes
Multi-frame Grayscale Byte SC Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes
RT Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
Basic Text SR SOP Class	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes
Multi-frame Grayscale Word SC Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.3	Yes	Yes
12-Lead ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	Yes
Enhanced SR SOP Class	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
General ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	Yes
Hemodynamic Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	Yes
Comprehensive SR SOP Class	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Ambulatory ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	Yes
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes
Segmentation Storage SOP Class	1.2.840.10008.5.1.4.1.1.66.4	Yes	Yes
Patient Root QR Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1.2.1.1	Yes	Yes
Patient Root QR Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1.2.1.2	Yes	Yes
Study Root QR Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes
Study Root QR Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes	No
>Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Yes	No
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No
>Printer SOP Class	1.2.840.10008.5.1.1.16	Yes	No
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No
>Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes	No
>Printer SOP Class	1.2.840.10008.5.1.1.16	Yes	No
>Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Yes	No

Note: Any SOP specific behavior is documented later in the conformance statement in the applicable SOP specific conformance section.

4.2.1.2. Association Policies

Each AE specification contains a description of the general association establishment and acceptance policies of the AE.

4.2.1.2.1 General

The DICOM standard application context is specified below.

Table 6: DICOM Application Context

Description	Value
Application Context Name	1.2.840.10008.3.1.1.1

4.2.1.2.2 Number of Associations

The number of simultaneous associations that an Application Entity may support as an Initiator or Acceptor is specified here.

Table 7: Number of associations as an Association Initiator for this AE

Description	Value
Maximum number of simultaneous associations	Configurable

Table 8: Number of associations as an Association Acceptor for this AE

Description	Value
Maximum number of simultaneous associations	10

4.2.1.2.3 Asynchronous Nature

The implementation supports negotiation of multiple outstanding transactions, along with the maximum number of outstanding transactions supported.
The Interventional Workstation Network AE does not support asynchronous operations and will not perform asynchronous window negotiation. The only exceptions are for reports from Print Management operations.

Table 9: Asynchronous nature as an Association Initiator for this AE

Description	Value
Maximum number of outstanding asynchronous transactions	Not Applicable

4.2.1.2.4 Implementation Identifying Information

The value supplied for Implementation Class UID and version name are documented here.

Table 10: DICOM Implementation Class and Version for Interventional Workstation Network AE

Implementation Class UID	1.3.46.670589.7.8.1.8
Implementation Version Name	1.8.0

4.2.1.2.5 Communication Failure Handling

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

Table 11: Communication Failure Behavior

Exception	Behavior
ARTIM Timeout	The association setup fails; the reason is logged and reported to the user.

4.2.1.3. Association Initiation Policy

The Application Entity will respond to a received Association rejection as shown in the below table:

Table 12: Association Rejection response

Result	Source	Reason/Diagnosis	Behavior
1 – rejected-permanent	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent,1: REJECT_SOURCE_dul_user,1: REJECT_REASON_no_reason_given)
		2 – application-context-name-not supported	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 1: REJECT_SOURCE_dul_user, 2: REJECT_REASON_application_context_not_support)
		3 – calling-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 1: REJECT_SOURCE_dul_user, 3: REJECT_REASON_calling_aetitle_not_recognized)
		7 – called-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 1: REJECT_SOURCE_dul_user, 7: REJECT_REASON_called_aetitle_not_recognized)
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The following error is logged. Error: UserRecoverable: impl.dicom.access.PEER: Associationrejected by peer (1: REJECT_RESULT_permanent, 2: REJECT_SOURCE_dul_provider (acse), 1: REJECT_REASON_no_reason_given)
		2 – protocol-version-not-supported	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 2: REJECT_SOURCE_dul_provider (acse), 2: REJECT_REASON_ protocol-version-not-supported)
	3 – DICOM UL service-provider (Presentation related function)	1 – temporary-congestion	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 3: REJECT_SOURCE_dul_provider (presentation), 1: REJECT_REASON_ temporary-congestion)
		2 – local-limit-exceeded	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 3: REJECT_SOURCE_dul_provider (presentation), 2: REJECT_REASON_ local-limit-exceeded)
2 – rejected-transient	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 1: REJECT_REASON_no_reason_given)
		2 – application-context-name-not-supported	Association is not established. The following error is logged. Association rejected by peer (2:

			REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 2: REJECT_REASON_application_context_not_support)
		3 – calling-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 3: REJECT_REASON_calling_aetitle_not_recognized)
		7 – called-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 7: REJECT_REASON_called_aetitle_not_recognized)
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 2: REJECT_SOURCE_dul_provider (acse), 1: REJECT_REASON_no_reason_given)
		2 – protocol-version-not-supported	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 2: REJECT_SOURCE_dul_provider (acse), 2: REJECT_REASON_ protocol-version-not-supported)
	3 – DICOM UL service-provider (Presentation related function)	1 – temporary-congestion	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 3: REJECT_SOURCE_dul_provider (presentation), 1: REJECT_REASON_ temporary-congestion)
		2 – local-limit-exceeded	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 3: REJECT_SOURCE_dul_provider (presentation), 2: REJECT_REASON_application_context_not_support)

The behavior of the AE on receiving an Association abort is summarized in the below table.

Table 13: Association Abort Handling

Source	Reason/Diagnosis	Behavior When Received	Behavior When Sent
0 – DICOM UL service-user (initiated abort)	0- reason-not-specified	When received, the Interventional Workstation terminates the connection with the following log: Association ABORTED by peer (0: ABORT_SOURCE_dul_user, 0: ABORT_REASON_not_specified).	N-EVENT-REPORT for printing received with status FAILURE. Abort is issued to an executing job that utilizes this network connection (ExportNetwork/ ArchiveNetwork/DICOMCopy/DICOMMove) Any other problem than ones specified for Interventional Workstation Network AE SCU in the rows below. (Examples: Problem while decoding the DICOM stream, SCU was unable to send the Response to SCP, Error writing to SCU stream).

2 – DICOM UL service-provider (initiated abort)	0 – reason-not-specified	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 0: ABORT_REASON_not_specified)	There are problems in SCU/SCP role negotiation. Any other problem than ones specified for Interventional Workstation Network AE SCU in the rows below. (Example: Problem while decoding the DICOM stream).
	1 – unrecognized-PDU	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 1: ABORT_REASON_unrecognized_pdu).	An unrecognized PDU type is received[4].
	2 – unexpected-PDU	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 2: ABORT_REASON_unexpected_pdu).	The received PDU type is not expected in the current state of connection[5].
	4 – unrecognized-PDU-parameter	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 4: ABORT_REASON_unrecognized_pdu_parameter).	An unrecognized Associate PDU item is received[1].
	5 – unexpected-PDU-parameter	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 5: ABORT_REASON_unexpected_pdu_parameter).	One of the Associate PDU items is received more than once[2]. One of the Associate PDU items is received unexpectedly[2].
	6 – invalid-PDU-parameter-value	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 6: ABORT_REASON_invalid_pdu_parameter).	One of the Associate PDU items is received more than once[3]. One of the Associate PDU items is not received[3]. There is mismatch in the application context names between the SCU and the SCP. Illegal Asynchronous Operations Window invoke value is received. Illegal Asynchronous Operations Window perform value is received. Unknown presentation context id is received. Unknown abstract syntax is received. The length or the format of a received PDU item is invalid.

Notes:

1. Associate PDU items that are recognized:
   - 0x10 APPLICATION CONTEXT
   - 0x20 PRESENTATION CONTEXT (RQ)
   - 0x21 PRESENTATION CONTEXT (AC)
   - 0x30 ABSTRACT SYNTAX
   - 0x40 TRANSFER SYNTAX
   - 0x50 USER INFO
   - 0x51 MAXIMUM LENGTH
   - 0x52 IMPLEMENTATION CLASS UID
   - 0x53 ASYNCHRONOUS OPERATIONS WINDOW
   - 0x54 SCP/SCU ROLE SELECTION
   - 0x55 IMPLEMENTATION VERSION NAME
   - 0x56 SOP CLASS EXTENDED NEGOTIATION
2. Associate PDU items for Unexpected-PDU parameter Received more than once:
   - 0x10 APPLICATION CONTEXT (SCU, SCP)
   - 0x30 ABSTRACT SYNTAX (SCU, SCP)
   - 0x40 TRANSFER SYNTAX (SCU)

   Received unexpectedly:
   - 0x20 PRESENTATION CONTEXT (RQ) (SCU)
3. Associate PDU items for Invalid-PDU parameter value:

   Received more than once (SCU, SCP):
   - 0x50 USER INFO
   - 0x51 MAXIMUM LENGTH
   - 0x52 IMPLEMENTATION CLASS UID
   - 0x53 ASYNCHRONOUS OPERATIONS WINDOW
   - 0x55 IMPLEMENTATION VERSION NAME

   Received illegally:
   - 0x21 PRESENTATION CONTEXT (AC) (SCP)

   PDU items not received:
   - 0x10 APPLICATION CONTEXT (SCU, SCP)
   - 0x20 PRESENTATION CONTEXT (RQ) (SCP)
   - 0x21 PRESENTATION CONTEXT (AC) (SCU)
   - 0x50 USER INFO (SCU, SCP)
   - 0x30 ABSTRACT SYNTAX (SCU)- 0x40 TRANSFER SYNTAX (SCU)
   - 0x51 MAXIMUM LENGTH (SCU, SCP)
   - 0x52 IMPLEMENTATION CLASS UID (SCU)
4. PDU types that are recognized:
   - 0x01 A-ASSOCIATE-RQ
   - 0x02 A-ASSOCIATE-AC
   - 0x03 A-ASSOCIATE-RJ
   - 0x04 P-DATA-TF
   - 0x05 A-RELEASE-RQ
   - 0x06 A-RELEASE-RP
   - 0x07 A-ABORT
5. Expected PDU's for following states:

   STATE_IDLE:
   - 0x01 A-ASSOCIATE-RQ
   - 0x02 A-ASSOCIATE-AC
   - 0x03 A-ASSOCIATE-RJ

- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP

STATE_ASSOCIATED:
- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x06 A-RELEASE-RP

STATE_ASSOCIATING (SCU):
- 0x01 A-ASSOCIATE-RQ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP

STATE_RELEASING:
- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ

STATE_WAIT_FOR_ASSOCIATE (SCP):
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP
- 0x07 A-ABORT

STATE_WAIT_FOR_FINISH:
- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP

STATE_WAIT_FOR_DISCONNECT:
- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ

STATE_TIMED_OUT:
- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP
- 0x07 A-ABORT

Table 14: DICOM Command Communication Failure Behavior

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

4.2.1.3.1 (Real-World) Activity – Verification as SCU

4.2.1.3.1.1 Description and Sequencing of Activities

The Interventional Workstation Network AE implements the Verification service class / Verification SOP class to verify application level communication.

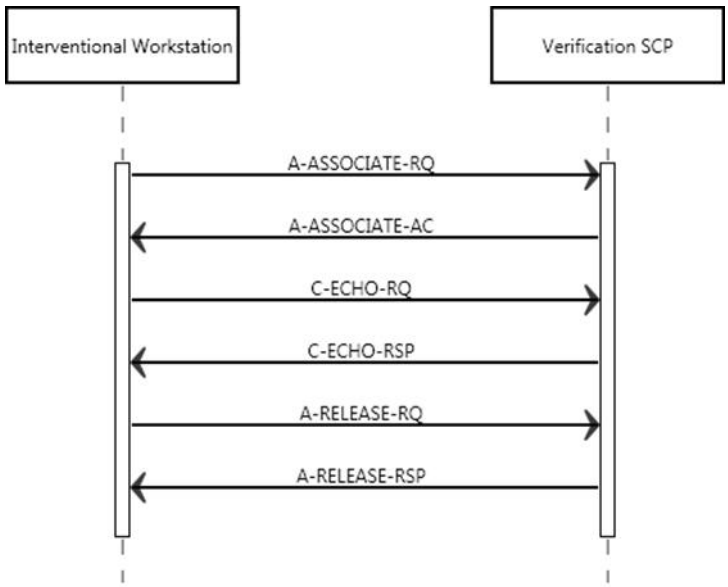


Figure 3: Data Flow Diagram – Verification as SCU

4.2.1.3.1.2 Proposed Presentation Contexts

The presentation contexts are defined in the below table.

Table 15: Proposed Presentation Contexts for (Real-World) Activity – Verification as SCU

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

4.2.1.3.1.3 SOP Specific Conformance for Verification SOP Class

The Interventional Workstation Network AE provides standard conformance to the DICOM Verification service class.

4.2.1.3.1.3.1 Dataset Specific Conformance for Verification C-ECHO SCU

Table 16: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Confirmation	The SCP has successfully returned a verification response

4.2.1.3.2 (Real-World) Activity – FIND as SCU

4.2.1.3.2.1 Description and Sequencing of Activities

The Interventional Workstation implements the Query/Retrieve service class to find selected images per Query/Retrieve SCP. When querying a remote database, the Interventional Workstation AE initiates an association to the selected peer entity, sends a C-FIND request and receives the related C-FIND responses. The association is released after specific time-out.

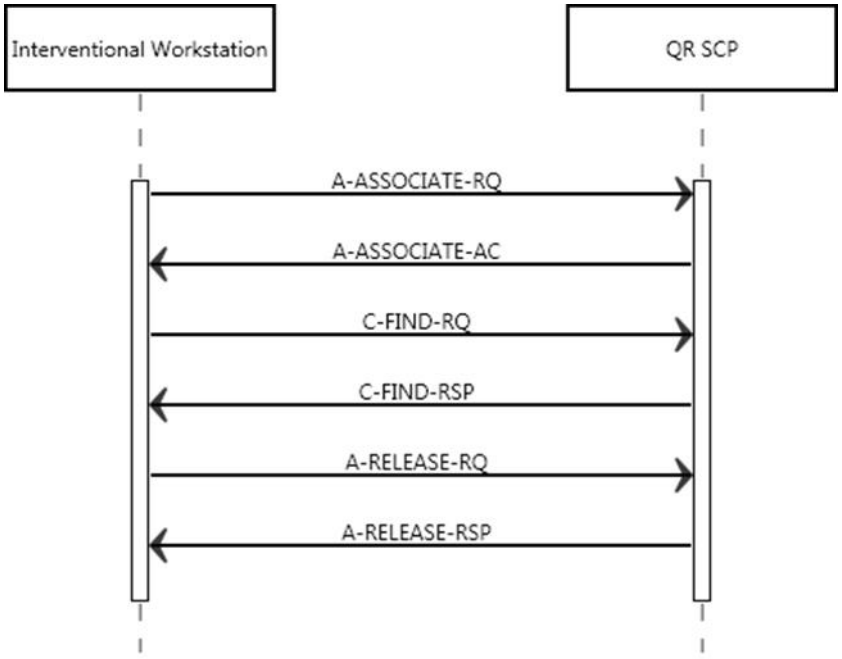


Figure 4: Data Flow Diagram – FIND as SCU

4.2.1.3.2.2 Proposed Presentation Contexts

The presentation contexts proposed by the system are defined in the below table.

Table 17: Proposed Presentation Contexts for (Real-World) Activity – FIND as SCU

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root QR Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1.2.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Study Root QR Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Patient Study Only QR Info. Model – FIND SOP Class (Retired)	1.2.840.10008.5.1.4.1.2.3.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

4.2.1.3.2.3 SOP Specific Conformance for Patient Root QR Information Model – FIND SOP Class

The Interventional Workstation Network AE provides standard conformance to the DICOM Query Retrieve service class. The system issues a C-FIND-RQ to a configured remote DIOCM node for matching studies. The received responses are displayed to the user.

The user may retrieve the images from the remote node.

4.2.1.3.2.3.1 Dataset Specific Conformance for Patient Root QR Information Model – FIND SOP Class C-FIND-SCU

Table 18: Supported Query Keys for Patient Root Information Model

Patient Root Information Model				
Attribute Name	**Tag**	**VR**	**Type of Matching**	**Comment**
Query/Retrieve Level	0008,0052	CS	Single Value	
Specific Character Set	0008,0005	CS		
Q/R Patient level				
Patient ID	0010,0020	LO	Single Value	
Patient's Name	0010,0010	PN	Single Value, Universal, Wild card	
Patient's Birth Date	0010,0030	DA	Universal	
Patient Sex	0010,0040	CS	Universal	
Q/R Study level				
Study Date	00080020	DA	Range, Single Value, Universal	
Study Time	0010,0010	TM	Universal matching	
Accession Number	0008,0050	SH	Single Value, Universal, Wild card	
Modalities in Study	0008,0061	CS	Single Value, Universal	
Referring Physician's Name	0008,0090	PN	Single Value, Universal	
Patient ID	0010,0020	LO	Single Value, Universal, Wild card	
Study Instance UID	0020,000D	UI	Single Value	
Study ID	0020,0010	SH	Single Value, Universal	
Q/R Series level				
Series Date	0008,0021	DA	Single Value	
Series Time	0008,0031	TM	Single Value	
Modality	0008,0060	CS	Single Value, Universal, Wild card	
Related Series Sequence	0008,1250	SQ		
Series Instance UID	0020,000E	UI	Single Value	
Series Number	0020,0011	IS	Single Value, Universal	
Frame of Reference UID	0020,0052	UI	Single Value	

NOTE: A configuration template is available without the private attributes.

Table 19: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete – No final identifier is supplied	Successful completion of the query.
Failure	A700	Refused – Out of resources	Out of Resources- request needs more computer resources than is available
	A900	Failed- Identifier does not match SOP Class	The Remote server could not process the query: an unknown error occurred
	C100	More than one match found	The Remote server could not process the query: an unknown error occurred
	C200	Unable to support requested template	The Remote server could not process the query: an unknown error occurred
	C000	Failed – Unable to process	The Remote server could not process the query
Cancel	FE00	Matching terminated due to Cancel request	Error opening patient/study list.
Pending	FF00	Matches are continuing – Current match is supplied and any optional keys were supported in the same manner as required keys	Optional keys supported.
	FF01	Matches are continuing – Warning that one or more optional keys were not supported for existence and/or matching for this identifier	Optional keys not supported.

4.2.1.3.2.4 SOP Specific Conformance for Study Root QR Information Model – FIND SOP Class

The Interventional Workstation Network AE provides standard conformance to the DICOM Query Retrieve service class. The system issues a C-FIND-RQ to a configured remote DIOCM node for matching studies. The received responses are displayed to the user.

The user may retrieve the images from the remote node.

4.2.1.3.2.4.1 Dataset Specific Conformance for Study Root QR Information Model – FIND SOP Class C-FIND-SCU

Table 20: Supported Query Keys for Study Root Information Model

Study Root Information Model				
Attribute Name	**Tag**	**VR**	**Type of Matching**	**Comment**
Query/Retrieve Level	0008,0052	CS	Single Value	
Q/R Study level				
Study Date	00080020	DA	Range, Single Value, Universal	“Study Date” is displayed in UI. The dropdown option contains “All”, “Today”, “Yesterday”, “Last 7 days”, “Last 4 weeks”, “Last year” and the user can choose any particular date.
Study Time	0010,0010	TM	Universal matching	

Accession Number	0008,0050	SH	Single Value, Universal, Wild card	"Accession Number" is displayed on UI. Accession Number is case sensitive query.
Modalities in Study	0008,0061	CS	Single Value, Universal	
Referring Physician's Name	0008,0090	PN	Single Value, Universal, Wild card	"Referring Physician" is displayed on UI
Patient's Name	0010,0010	PN	Single Value, Universal, Wild card	"Patient Name" is displayed on UI
Patient ID	0010,0020	LO	Single Value, Universal, Wild card	"Patient ID is displayed on UI". Patient ID is a case sensitive query.
Patient's Birth Date	0010,0030	DA	Single Value, Universal	
Patient's Sex	0010,0040	CS	Universal matching	
Study Instance UID	0020,000D	UI	Single Value	
Study ID	0020,0010	SH	Single Value, Universal	"Study ID" is displayed on UI
Q/R Series level				
Series Date	0008,0021	DA	Single Value	
Series Time	0008,0031	TM	Single Value	
Modality	0008,0060	CS	Single Value, Universal, Wild card	
Related Series Sequence	0008,1250	SQ		
Study Instance UID	0020,000D	UI	Single Value, Universal	
Series Instance UID	0020,000E	UI	Single Value	
Series Number	0020,0011	IS	Single Value, Universal	
Frame of Reference UID	0020,0052	UI	Single Value	
Series Description	0008,103E	LO	Single Value, Universal, Wildcard	Series Description is displayed on the UI.

Table 21: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete – No final identifier is supplied	Successful completion of the query.
Failure	A700	Refused – Out of resources	Out of Resources- request needs more computer resources than is available
	A900	Failed- Identifier does not match SOP Class	The Remote server could not process the query: an unknown error occurred
	C100	More than one match found	The Remote server could not process the query: an unknown error occurred
	C200	Unable to support requested template	The Remote server could not process the query: an unknown error occurred
	C000	Failed – Unable to process	The Remote server could not process the query
Cancel	FE00	Matching terminated due to Cancel request	Error opening patient/study list.

Pending	FF00	Matches are continuing – Current match is supplied and any optional keys were supported in the same manner as required keys	Optional keys supported.
	FF01	Matches are continuing – Warning that one or more optional keys were not supported for existence and/or matching for this identifier	Optional keys not supported.

4.2.1.3.2.5 SOP Specific Conformance for Patient/Study Only Root QR Information Model – FIND SOP Class

The Interventional Workstation Network AE provides standard conformance to the DICOM Query Retrieve service class. The system issues a C-FIND-RQ to a configured remote DIOCM node for matching studies. The received responses are displayed to the user.

The user may retrieve the images from the remote node.

4.2.1.3.2.5.1 Dataset Specific Conformance for Patient/Study Only Root QR Information Model – FIND SOP Class C-FIND-SCU

Table 22: Supported Query Keys for Patient/Study Only Root Information Model

Patient/Study Only Root Information Model				
Attribute Name	**Tag**	**VR**	**Type of Matching**	**Comment**
Query/Retrieve Level	0008,0052	CS	Single Value	
Q/R Patient level				
Patient ID	0010,0020	LO	Single Value	Patient ID attribute is visible on the UI.
Patient's Name	0010,0010	PN	Single Value, Universal, Wild card	Patient Name attribute is visible on the UI.
Patient's Birth Date	0010,0030	DT	Universal	
Patient Sex	0010,0040	CS	Universal	
Q/R Study level				
Specific Character Set	0008,0005	CS		
Study Date	00080020	DA	Range, Single Value, Universal	
Study Time	0010,0010	TM	Universal matching	
Accession Number	0008,0050	SH	Single Value, Universal, Wild card	
Modalities in Study	0008,0061	CS	Single Value, Universal	
Referring Physician's Name	0008,0090	PN	Single Value, Universal	
Patient ID	0010,0020	LO	Single Value, Universal, Wild card	
Study Instance UID	0020,000D	UI	Single Value	
Study ID	0020,0010	SH	Single Value, Universal	

Note: A configuration template is available without the private attributes.

Table 23: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete – No final identifier is supplied	Successful completion of the query.
Failure	A700	Refused – Out of resources	Out of Resources- request needs more computer resources than is available
	A900	Failed- Identifier does not match SOP Class	The Remote server could not process the query: an unknown error occurred
	C100	More than one match found	The Remote server could not process the query: an unknown error occurred
	C200	Unable to support requested template	The Remote server could not process the query: an unknown error occurred
	C000	Failed – Unable to process	The Remote server could not process the query
Cancel	FE00	Matching terminated due to Cancel request	Error opening patient/study list.
Pending	FF00	Matches are continuing – Current match is supplied and any optional keys were supported in the same manner as required keys	Optional keys supported.
	FF01	Matches are continuing – Warning that one or more optional keys were not supported for existence and/or matching for this identifier	Optional keys not supported.

4.2.1.3.3 (Real-World) Activity – MOVE as SCU

4.2.1.3.3.1 Description and Sequencing of Activities

The Interventional Workstation implements the Query/Retrieve service class to move selected images per Query/Retrieve SCP. After receiving a C-FIND responses one is able to copy all or selected images in a patient folder from a remote database to the local database. The Interventional Workstation initiates an association to the selected peer entity, sends a C-MOVE request and receives the related C-MOVE responses. The association is released after the final C-MOVE response (when all selected images have been transmitted).

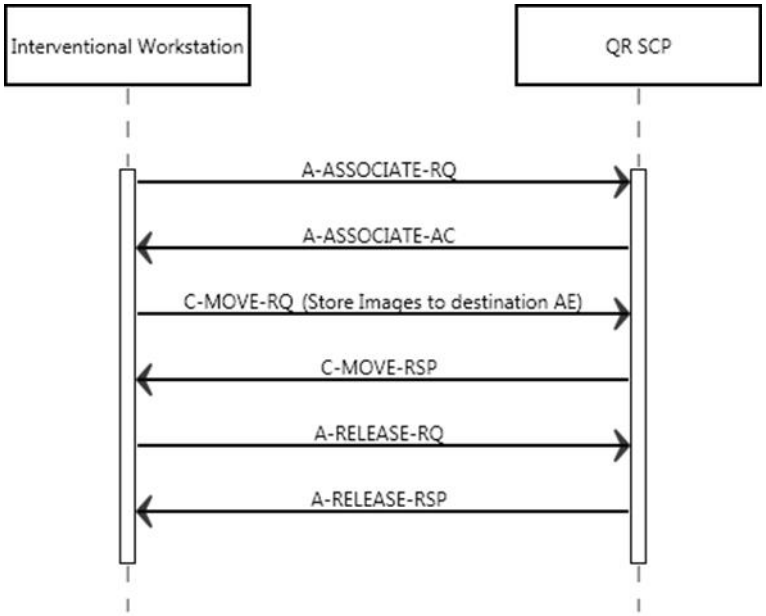


Figure 5: Data Flow Diagram – MOVE as SCU

4.2.1.3.3.2 Proposed Presentation Contexts

The presentation contexts are defined in the below table.

Table 24: Proposed Presentation Contexts for (Real-World) Activity – MOVE as SCU

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root QR Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1.2.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Study Root QR Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Patient Study Only QR Info. Model – MOVE SOP Class (Retired)	1.2.840.10008.5.1.4.1.2.3.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

4.2.1.3.3.3 SOP Specific Conformance for Patient Root QR Information Model – MOVE SOP Class

Once the queried image responses are received by the Interventional Workstation Network AE, the user may retrieve the images from the remote DICOM node. The system shall then initiate a C-MOVE-RQ to the remote DICOM node, with the destination AE. In response the remote node shall initiate a C-Store for the requested images to the destination AE.

4.2.1.3.3.1 Dataset Specific Conformance for Patient Root QR Information Model – MOVE SOP Class C-MOVE-SCU

Table 25: Identifiers for Patient Root Information Model MOVE as SCU

Patient Root Information Model			
Attribute Name	**Tag**	**VR**	**Comment**
Query/Retrieve Level	0008,0052	CS	
Q/R Patient level			
Patient ID	0010,0020	LO	
Specific Character Set	0008,0005	CS	
Q/R Study level			
Patient ID	0010,0020	LO	
Study Instance UID	0020,000D	UI	
Specific Character Set	0008,0005	CS	
Q/R Series level			
Patient ID	0010,0020	LO	
Study Instance UID	0020,000D	UI	
Series Instance UID	0020,000E	UI	
Specific Character Set	0008,0005	CS	

Table 26: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Sub-operations complete – No failures	Successful completion of the retrieve; also storage warnings may have occurred.
Failure	A701	Refused – Out of resources – Unable to calculate number of matches	Storage status Refused: Out of resources.
	A702	(Refused: Out of Resources – Unable to perform sub-operations	Insufficient system resources
	A801	Refused – Move destination unknown	Move destination is unknown.
	A900	Identifier does not match SOP Class	Moving data failed
	C000	Failed – Unable to process	Moving data failed
Warning	B000	Sub-operations complete – One or more failures	Sub operations complete – one or more warnings
Cancel	FE00	Sub-operations terminated due to Cancel indication	DICOM: Error Information: Move failed in Receive Request, DICOM protocol error
Pending	FF00	Sub-operations are continuing	Move pending.

4.2.1.3.3.4 SOP Specific Conformance for Study Root QR Information Model – MOVE SOP Class

Once the queried image responses are received by the Interventional Workstation Network AE, the user may retrieve the images from the remote DICOM node. The system shall then initiate a C-MOVE-RQ to the remote DICOM node, with the destination AE. In response the remote node shall initiate a C-Store for the requested images to the destination AE.

4.2.1.3.3.4.1 Dataset Specific Conformance for Study Root QR Information Model – MOVE SOP Class C-MOVE-SCU

Table 27: Identifiers for Study Root Information Model MOVE as SCU

Study Root Information Model			
Attribute Name	**Tag**	**VR**	**Comment**
Query/Retrieve Level	0008,0052	CS	
Q/R Study level			
Study Instance UID	0020,000D	UI	
Specific Character Set	0008,0005	CS	
Q/R Series level			
Study Instance UID	0020,000D	UI	
Series Instance UID	0020,000E	UI	
Specific Character Set	0008,0005	CS	

Table 28: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Sub-operations complete – No failures	Successful completion of the retrieve; also storage warnings may have occurred.
Failure	A701	Refused – Out of resources – Unable to calculate number of matches	Storage status Refused: Out of resources.
	A702	(Refused: Out of Resources – Unable to perform sub-operations	Insufficient system resources
	A801	Refused – Move destination unknown	Move destination is unknown.
	A900	Identifier does not match SOP Class	Moving data failed
	C000	Failed – Unable to process	Moving data failed
Warning	B000	Sub-operations complete – One or more failures	Sub operations complete – one or more warnings
Cancel	FE00	Sub-operations terminated due to Cancel indication	DICOM: Error Information: Move failed in Receive Request, DICOM protocol error
Pending	FF00	Sub-operations are continuing	Move pending.

4.2.1.3.3.5 SOP Specific Conformance for Patient/Study Only Root QR Information Model – MOVE SOP Class

Once the queried image responses are received by the Interventional Workstation Network AE, the user may retrieve the images from the remote DICOM node. The system shall then initiate a C-MOVE-RQ to the remote DICOM node, with the destination AE. In response the remote node shall initiate a C-Store for the requested images to the destination AE.

4.2.1.3.3.5.1 Dataset Specific Conformance for Patient/Study Only Root QR Information Model – MOVE SOP Class C-MOVE-SCU

Table 29: Identifiers for Patient/Study Only Root Information Model MOVE as SCU

Patient/Study Only Root Information Model			
Attribute Name	**Tag**	**VR**	**Comment**
Query/Retrieve Level	0008,0052	CS	
Q/R Patient level			
Patient ID	0010,0020	LO	
Specific Character Set	0008,0005	CS	
Q/R Study level			
Patient ID	0010,0020	LO	
Study Instance UID	0020,000D	UI	
Specific Character Set	0008,0005	CS	

Table 30: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Sub-operations complete – No failures	Successful completion of the retrieve; also storage warnings may have occurred.
Failure	A701	Refused – Out of resources – Unable to calculate number of matches	Storage status Refused: Out of resources.
	A702	(Refused: Out of Resources – Unable to perform sub-operations	Insufficient system resources
	A801	Refused – Move destination unknown	Move destination is unknown.
	A900	Identifier does not match SOP Class	Moving data failed
	C000	Failed – Unable to process	Moving data failed
Warning	B000	Sub-operations complete – One or more failures	Sub operations complete – one or more warnings
Cancel	FE00	Sub-operations terminated due to Cancel indication	DICOM: Error Information: Move failed in Receive Request, DICOM protocol error
Pending	FF00	Sub-operations are continuing	Move pending.

4.2.1.3.4 (Real-World) Activity – Image Export

4.2.1.3.4.1 Description and Sequencing of Activities

The Interventional Workstation implements the Storage service class as part of the Interventional Workstation to store selected images at an archive or other storage SCP. All actual selected images are exported using one and the same association.

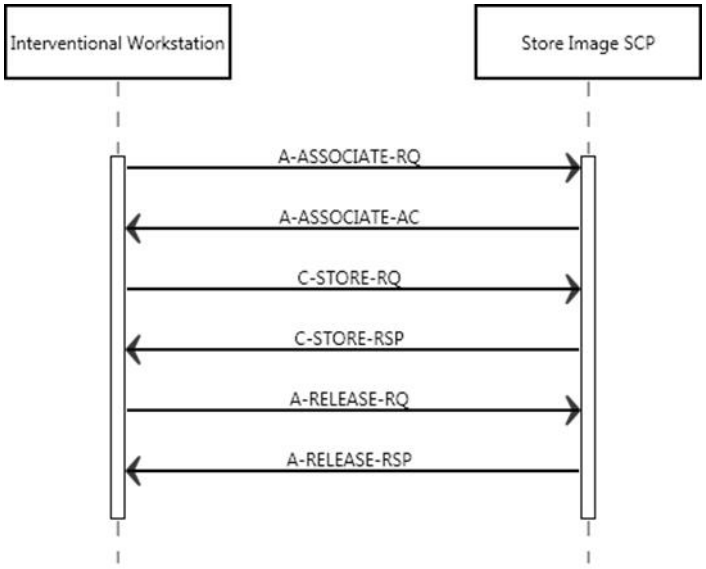


Figure 6: Data Flow Diagram – Storage Image - Storage as SCU

4.2.1.3.4.2 Proposed Presentation Contexts

The presentation contexts are defined in the below table.

Table 31: Proposed Presentation Contexts for (Real-World) Activity – Image Export

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
12-Lead ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Ambulatory ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.3	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Basic Text SR SOP Class	1.2.840.10008.5.1.4.1.1.88.11	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Comprehensive SR SOP Class	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		

		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Digital Mammography X-Ray Image Storage – Pres. SOP	1.2.840.10008.5.1.4.1.1.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Digital Mammography X-Ray Image Storage – Proc. SOP	1.2.840.10008.5.1.4.1.1.1.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Digital X-Ray Image Storage – For Pres. SOP	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

Digital X-Ray Image Storage – For Proc. SOP	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Enhanced MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Enhanced SR SOP Class	1.2.840.10008.5.1.4.1.1.88.22	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		

		RLE Lossless	1.2.840.10008.1.2.5		
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
General ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Hemodynamic Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
MR Spectroscopy Storage SOP Class	1.2.840.10008.5.1.4.1.1.4.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		

		RLE Lossless	1.2.840.10008.1.2.5		
Multi-frame Grayscale Byte SC Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Multi-frame Grayscale Word SC Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.3	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Multi-frame Single Bit Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Nuclear Medicine Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.20	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		

		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Philips Private Grayscale Softcopy Presentation State Storage	1.3.46.670589.2.2.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Philips Private X-Ray Image Storage	1.3.46.670589.2.3.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Philips Private X-Ray MF Image	1.3.46.670589.7.8.1618510091	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Philips Private Stent Boost WorkItem	1.3.46.670589.7.8.16185100912	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Philips Private Live Run WorkItems	1.3.46.670589.7.8.161851009 2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Philips Private Run WorkItems	1.3.46.670589.7.8.16185100129	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Philips Private Reco WorkItems	1.3.46.670589.7.8.16185100130	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Philips Private Three DCA WorkItem	1.3.46.670589.7.8.16185100913	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
RT Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.5	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
RT Structure Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.3	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Ultrasound Multi-frame Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

		RLE Lossless	1.2.840.10008.1.2.5		
X-Ray Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
X-Ray Radiofluoroscopic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		

Note:

1. Fluoroscopy overlay images cannot be exported and imported.

4.2.1.3.4.3 SOP Specific Conformance for Storage SOP Class

The Interventional Workstation will export all optional or private image attributes.

Note: These private attributes need to be preserved when the data is exported and imported back – failing which, the data can fail to import, or not open in the appropriate viewer. The exact attributes and their meanings are not elaborated in this document.

Choice of format to store Volumes:

3D-RA and XperCT volumes generated by the Interventional Workstation can be exported in one of two formats:

- X-Ray 3D Angiographic Image Storage (has preference).
- CT Image Storage. If the X-Ray 3D SOP class is not supported by the SCP, then the volume is sliced and exported as CT images. Once exported as CT images, the volume loses its link with the original data. Thereafter, the data can be brought back to Interventional Workstation only for viewing. Operations like performing secondary reconstructions on that data are not possible.

Choice of format to store private data (Raw Data)

The Interventional Workstation exports private attributes in Raw Data Storage IODs without pixel data. Below the attributes stored in the Raw Data Storage IOD per application are listed. In the case a PACS does not support Raw Data Storage, these attributes will be lost in an archive–retrieve operation.

3D-RA and XperCT:

- The above Meta data which is exported as Raw Data is useful only if the PACS supports X-Ray 3D Angiographic Image Storage also. For volumes sent out as CT Images this Meta Data is not relevant.

3D Roadmap, MultiModality Roadmap and XperGuide:
3D-CA:

1. 2D Image selection information
2. Delineation settings
3. Vessel names
4. Vessel/bifurcation selection information

CTTrueView:

1. Viewport arrangement
2. Visibility setting of curved reformat views
3. Visibility setting of the segmented heart
4. Visibility setting of obscured lines

Stentboost:

1. Calibration method
2. Region of Interest
3. Measurements
4. View settings: Zoom, Brightness and Contrast
5. Frame selection and marker settings Catheter lines and stent lines

Choice of format to store private data (Secondary Capture)

The Interventional Workstation also exports private data in Secondary Capture Storage IOD. These attributes are primarily the last seen settings of each application.

Choice of format to store images received from Modality

The 2D X-Ray Angiography frames received from the modality are exported using the X-Ray Angiographic Image Storage SOP class. The pixel content in the frames may be different from what was sent from the Modality. Hence a different instance UID is used while exporting them from the Interventional Workstation.

Choice of format to store Movie

Interventional Workstation exports movies as Multi-Frame Secondary Capture Images, if that SOP class is supported. It exports movies as series of Single Frame Secondary Capture Images (“Secondary Capture Image Storage” SOP class), if the Remote DICOM node doesn’t accept Multi-Frame Secondary Capture Images.

Choice of format to store Snapshots

Snapshots created in the Interventional Workstation are exported using the Secondary Capture Image Storage SOP class. Stereo Snapshots and Stack of Snapshots are exported as multiple Secondary Capture Images in a Series of their own.

4.2.1.3.4.3.1 Dataset Specific Conformance for C-STORE-RQ

Table 32: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful stored	Progress of the export job is updated and connection is retained for the next store. If the store of all the SOP instances is completed then the connection is released.
Failure	A701	Refused: Out of Resources	Error is logged and the export job fails. Connection is released.

	A9xx	Error: Data Set does not match SOP Class	Error is logged and the export job fails. Connection is released.
	C000	Error: cannot understand	Error is logged and the export job fails. Connection is released.
	0117	Invalid Object Instance	Error is logged and the export job fails. Connection is released.
	0212	Mistyped Argument	Error is logged and the export job fails. Connection is released.
Warning	B000	Coercion of Data Elements	Warning is logged and the export job continues. Connection is released.
	B007	Data Set does not match SOP Class	Warning is logged and the export job continues. Connection is released.
	B006	Elements Discarded	Warning is logged and the export job continues. Connection is released.
	0107	Attribute List Error	Warning is logged and the export job continues. Connection is released.

4.2.1.3.5 (Real-World) Activity – Print Management as SCU

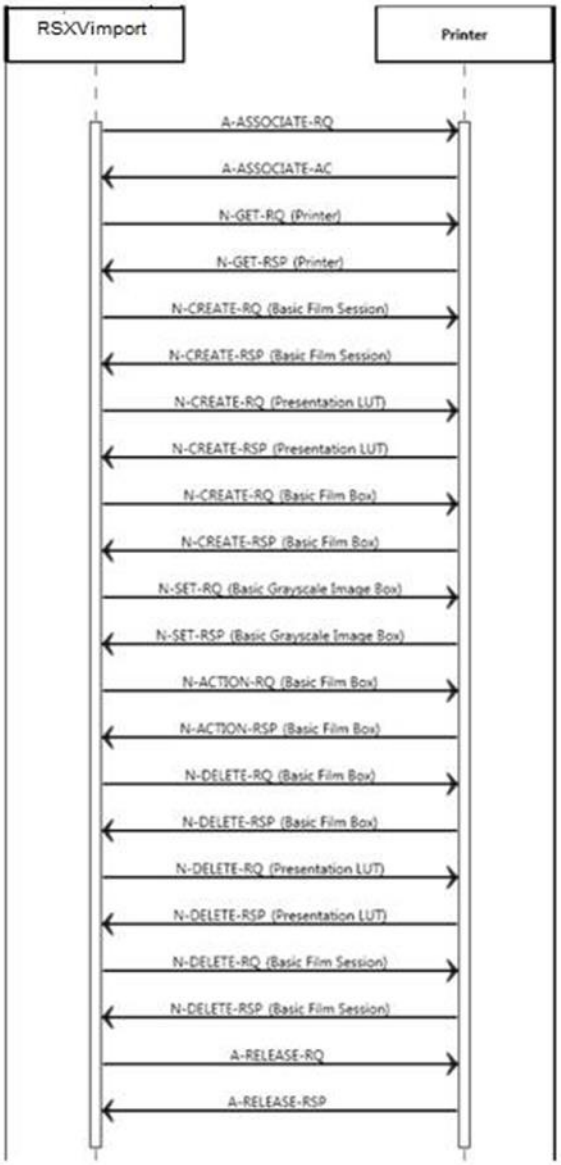


Figure 7: (Real Word) Activity – Print Management as SCU

4.2.1.3.5.1 Description and Sequencing of Activities

The Interventional Workstation Network AE implements the Print Management service class as part of the Print component to send selected images to a printer (SCP).

As a result, the Interventional Workstation Network AE will initiate an association to the selected printer and use it to send the Print Service Elements of the Print SOP Classes. If the association could not be established, the Interventional Workstation Network AE will retry to establish an association every 20 seconds during the next hour.

Interventional Workstation allows having a print preview first.

In case of a print job the printer status is requested in that association. The received printer status is displayed in the Printer Status Tool. On a failure printer status, the Interventional Workstation Network AE will retry and request the printer status every 20 seconds during the next hour.

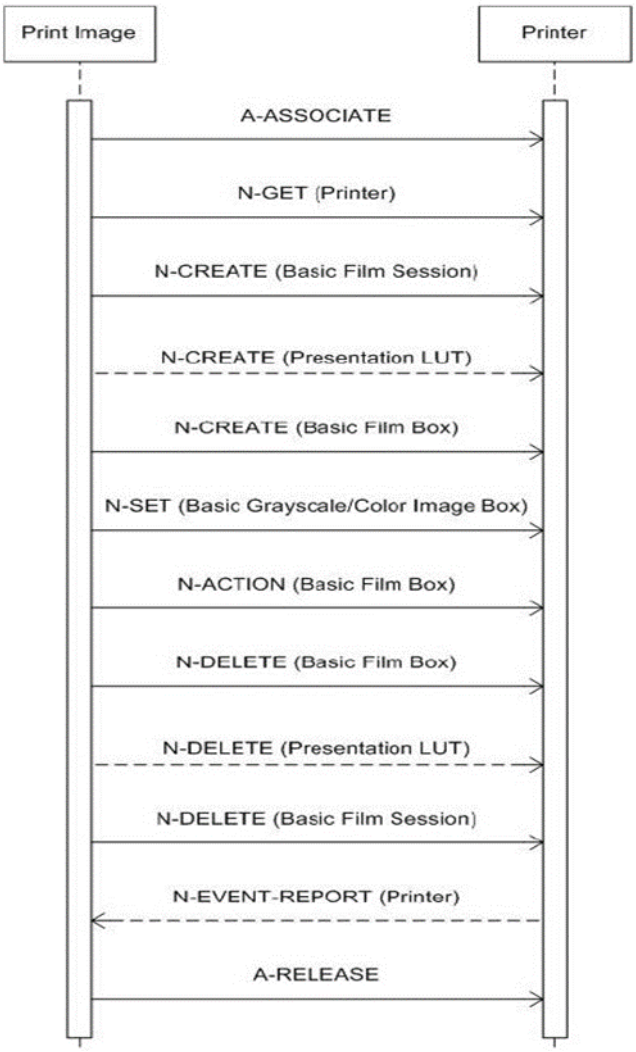


Figure 8: Data Flow Diagram – Print Management as SCU

Associations are proposed for either color or grayscale printing, not for both. The following optional SOP classes from these Meta SOP classes are not supported:

- Print Job SOP class (can be used to get a notification that a job is ready);
- Basic Annotations Box SOP class;
- Reference Image Box SOP class.

The grayscale standard display function adjusts the brightness such that equal changes in P-Values will result in the same level of perceptibility. DICOM color print is supported as Planar Interleaved method as well as Pixel Interleaved. The Planar Interleaved method is mandatory according to DICOM standard and means that each color plane (R, G, B) is rendered separately. So each image must be rendered three times. This means that Planar Interleaved will be time consuming. For this reason, the default method for DICOM color print will be set to Pixel Interleaved, whereas the printer supports this.

The applied order of Print Service Elements (DIMSE's) is specified in Figure 7. Refer to the following sections for a description of the applied optional attributes in these Service Elements (i.e. non-mandatory attributes

as Print SCU). Note that the Service Elements order is not specified by the DICOM standard. Overlay Annotation (showing the values of some major identifying attributes) and Shutter information is processed in the images sent to the printer (i.e. burnt-in into the image).

The Status Codes of DIMSE Responses (Success, Warning, and Failure) as returned by the printer will also be logged (for service purposes) and are mapped onto general print job status messages towards the operator. These User Interface messages indicate:

- "Job Completed" indicating that the print job is accepted by the printer; the actual printing will be done afterwards.
- "Print Error" indicating that a failure occurred during the DICOM Print. Also, most warning cases (like default printer values applied on optional print attributes) are interpreted as a print error because this will mostly result in a different print quality or print layout than expected.

The following implementation remarks are important to achieve successful printing:

- The number of Film Boxes per Film Session is one.
- The number of images per Film Box is one.
- The images to be printed on one film are rendered by Interventional Workstation Network AE into one logical image. This logical image is very large, depending on the pixel matrix size (pixels per line, lines per image), use of color or not. A rough indication is 20 Mbytes for grayscale and 80 Mbytes for color. One should take this into account when selecting the DICOM printer and the printer configuration (e.g. the amount of memory).

The Interventional Workstation Network AE does not send an attribute list to the printer. Therefore, the mandatory attributes listed in the following sections are the only attributes that are required to be supported by the printer.

4.2.1.3.5.2 Proposed Presentation Contexts

The presentation contexts are defined in the below table.

Table 33: Proposed Presentation Contexts for (Real-World) Activity – Print Management as SCU

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18			SCU	None
>Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
>Printer SOP Class		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

	1.2.840.10008.5.1.1.16	Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9			SCU	None
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
>Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
>Printer SOP Class	1.2.840.10008.5.1.1.16	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Presentation LUT	1.2.840.10008.5.1.1.23	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

This section specifies each IOD created (including private IOD's).

Abbreviations used in the Module table for the column "Presence of Value" are:

ALWAYS	The attribute is always present with a value
EMPTY	The attribute is always present without any value (attribute sent zero length)
VNAP	The attribute is always present and its Value is Not Always Present (attribute sent zero length if no value is present)
ANAP	The attribute is present under specified condition – if present then it will always have a value

The abbreviations used in the Module table for the column "Source" are:

AUTO	The attribute value is generated automatically
CONFIG	The attribute value source is a configurable parameter
COPY	The attribute value source is another SOP instance
FIXED	The attribute value is hard-coded in the application
IMPLICIT	The attribute value source is a user-implicit setting
MPPS	The attribute value is the same as that use for Modality Performed Procedure Step
MWL	The attribute value source is a Modality Worklist
USER	The attribute value source is explicit user input

4.2.1.3.5.3 SOP Specific Conformance for Basic Color Image Box SOP Class of the Basic Color Print Management Meta SOP Class

4.2.1.3.5.3.1 Dataset Specific Conformance for Basic Color Image Box SOP Class N-SET-SCU

Table 34: Image Box Pixel Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Box Position	2020,0010	US		ALWAYS	AUTO	
Polarity	2020,0020	CS		ALWAYS	AUTO	
Basic Color Image Sequence	2020,0111	SQ		ALWAYS	AUTO	
>Samples per Pixel	0028,0002	US	3	ALWAYS	FIXED	
>Photometric Interpretation	0028,0004	CS		ALWAYS	IMPLICIT	
>Rows	0028,0010	US		ALWAYS	IMPLICIT	
>Columns	0028,0011	US		ALWAYS	IMPLICIT	
>Bits Allocated	0028,0100	US		ALWAYS	AUTO	
>Bits Stored	0028,0101	US		ALWAYS	IMPLICIT	
>High Bit	0028,0102	US		ALWAYS	AUTO	
>Pixel Representation	0028,0103	US		ALWAYS	AUTO	
>Pixel Data	7FE0,0010	OW/OB		ALWAYS	AUTO	

Table 35: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Image successfully stored in image box.	The print job continues and completes.
Failure	0106.	Not defined	Print job did not conclude gracefully and did not receive release request from SUT after receiving error in N-CREATE-RSP scenarios
	0105	Not defined	Print job did not conclude gracefully and did not receive release request from SUT after receiving error in N-CREATE-RSP scenarios
	0119	Not defined	Print job did not conclude gracefully and did not receive release request from SUT after receiving error in N-CREATE-RSP scenarios
Warning	B604	Image size is larger than image box size, the image has been de magnified.	The print job continues and the warning is logged.
	B605	Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.	The print job continues and the warning is logged.
	B609	Image size is larger than the image box size. The image has been cropped to fit.	The print job continues and the warning is logged.
	B60A	Image size or combined print image size is larger than the image box size. Image or combined print image has been decimated to fit.	The print job continues and the warning is logged.

	0107	Attribute List Error	The print job continues and the warning is logged.
	0116	Attribute Value Out of Range	The print job continues and the warning is logged.
	B600	Memory allocation not supported	The print job continues and the warning is logged.
	B602	Empty film page	The print job continues and the warning is logged.
	B603	Empty film page	The print job continues and the warning is logged.

4.2.1.3.5.4 SOP Specific Conformance for Basic Film Box SOP Class of the Basic Color Print Management Meta SOP Class

4.2.1.3.5.4.1 Dataset Specific Conformance for Basic Film Box SOP Class N-CREATE-SCU

Table 36: Basic Film Box Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Display Format	2010,0010	ST		ALWAYS	AUTO	
Film Orientation	2010,0040	CS		ALWAYS	CONFIG, IMPLICIT	
Film Size ID	2010,0050	CS		ALWAYS	CONFIG, IMPLICIT	
Magnification Type	2010,0060	CS		ALWAYS	AUTO	
Max Density	2010,0130	US		ALWAYS	AUTO	
Trim	2010,0140	CS		ALWAYS	AUTO	
Configuration Information	2010,0150	ST		ALWAYS	AUTO	

Table 37: Basic Film Box Relationship Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Referenced Film Session Sequence	2010,0500	SQ		ALWAYS	AUTO	
>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	

Table 38: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Film accepted for printing.	The print job continues and completes.
Failure	XXXX	(Any failure)	Print job fails, the error is logged, and the association is released.
Warning	0107	Attribute List Error	Print job fails, the error is logged, and the association is released.
	0116	Attribute Value Out of Range	Print job fails, the error is logged, and the association is released.
	XXXX	(Any other warning)	Print job fails, the warning is logged, and the association is released.

4.2.1.3.5.4.2 Dataset Specific Conformance for Basic Film Box SOP Class N-ACTION-SCU

Table 39: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Film Box successfully created.	The print job continues and completes.
Failure	XXXX	(Any failure)	Print job fails, the error is logged, and the association is released.
Warning	B605	Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.	The print job continues and the warning is logged.
	0107	Attribute List Error	The print job continues and the warning is logged.
	0116	Attribute value out of range	The print job continues and the warning is logged.
	B600	(not defined)	The print job continues and the warning is logged.
	B601	(not defined)	The print job continues and the warning is logged.
	B602	(not defined)	The print job continues and the warning is logged.
	B603	(not defined)	The print job continues and the warning is logged.
	B604	(not defined)	The print job continues and the warning is logged.
	B606	(not defined)	The print job continues and the warning is logged.
	B608	(not defined)	The print job continues and the warning is logged.
	B609	(not defined)	The print job continues and the warning is logged.
	XXXX	(Any other warning)	Print job fails, the warning is logged, and the association is released.

4.2.1.3.5.4.3 Dataset Specific Conformance for Basic Film Box SOP Class N-DELETE-SCU

Table 40: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful command	Print job continues.
Failure	XXXX	(Any failure)	Print job fails, the error is logged and the association is released.
Warning	XXXX	(Any warning)	Print job fails, the warning is logged and the association is released.

4.2.1.3.5.5 SOP Specific Conformance for Basic Film Session SOP Class of the Basic Color Print Management Meta SOP Class

4.2.1.3.5.5.1 Dataset Specific Conformance for Basic Film Session SOP Class N-CREATE-SCU

Table 41: Basic Film Session Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Number of Copies	2000,0010	IS		ALWAYS	IMPLICIT	
Print Priority	2000,0020	CS		ALWAYS	AUTO	

Medium Type	2000,0030	CS		ALWAYS	IMPLICIT	
Film Destination	2000,0040	CS		ALWAYS	AUTO	
Film Session Label	2000,0050	LO		ALWAYS	AUTO	

Table 42: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Film session successfully created.	The print job continues and completes.
Failure	XXXX	(Any failure)	Print job fails, the error is logged, and the association is not released.
Warning	0116	Attribute Value Out of Range	The print job continues and the warning is logged.
	XXXX	(Any other warning)	Print job fails, the warning is logged, and the association is released.

4.2.1.3.5.5.2 Dataset Specific Conformance for Basic Film Session SOP Class N-DELETE-SCU

Table 43: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful command	Print job continues.
Failure	XXXX	(Any failure)	Print job fails, the error is logged and the association is released.
Warning	XXXX	(Any warning)	Print job fails, the warning is logged and the association is released.

4.2.1.3.5.6 SOP Specific Conformance for Printer SOP Class of the Basic Color Print Management Meta SOP Class

4.2.1.3.5.6.1 Dataset Specific Conformance for Printer SOP Class N-EVENT-REPORT-SCP

Table 44: N-EVENT-REPORT Status Handling Behavior

Event Type Name	Event Type ID	Behavior
Normal	1	The N-EVENT-REPORT-RSP is sent with: Status = 0, Event Type ID = 1
		Information is logged: N-EVENT-REPORT received, type: NORMAL
Warning	2	The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0, Event Type ID = 2
		Warning is logged: N-EVENT-REPORT received, type: WARNING Status info: <Status info>
Failure	3	The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0, Event Type ID = 3
		Error is Logged: N-EVENT-REPORT received, type: FAILURE Status info: <Status info>
		Printer status is set to DICOM_PRINTER_STATUS_FAILURE. The print job retries the print operation.

All possible status responses are provided in the following table.

Table 45: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful command	The result is logged.

4.2.1.3.5.6.2 Dataset Specific Conformance for Printer SOP Class N-GET-SCU

Table 46: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful command	The print job continues and completes.
Failure	XXXX	(Any failure)	Print job fails, the error is logged, and the association is released.
Warning	0001	Requested optional attributes are not supported	The print job continues and the warning is logged.
	XXXX	(Any warning)	Print job fails, the warning is logged and the association is released.

4.2.1.3.5.7 SOP Specific Conformance for Presentation LUT SOP Class

4.2.1.3.5.7.1 Dataset Specific Conformance for Presentation LUT SOP Class N-CREATE-SCU

Table 47: Presentation LUT Module

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

4.2.1.3.5.8 SOP Specific Conformance for Basic Film Box SOP Class of the Basic Grayscale Print Management Meta SOP Class

4.2.1.3.5.8.1 Dataset Specific Conformance for Basic Film Box SOP Class N-CREATE-SCU

Table 48: Basic Film Box Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Display Format	2010,0010	ST		ALWAYS	AUTO	
Film Orientation	2010,0040	CS		ALWAYS	CONFIG, IMPLICIT	
Film Size ID	2010,0050	CS		ALWAYS	CONFIG, IMPLICIT	
Magnification Type	2010,0060	CS		ALWAYS	AUTO	
Max Density	2010,0130	US		ALWAYS	AUTO	
Trim	2010,0140	CS		ALWAYS	AUTO	
Configuration Information	2010,0150	ST		ALWAYS	AUTO	
Illumination	2010,015E	US		ALWAYS	AUTO	
Reflected Ambient Light	2010,0160	US		ALWAYS	AUTO	

Table 49: Basic Film Box Relationship Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Referenced Film Session Sequence	2010,0500	SQ		ALWAYS	AUTO	
>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	
Referenced Presentation LUT Sequence	2010,0500	SQ		ALWAYS	AUTO	
>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	

Table 50: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Film Box successfully created.	The print job continues and completes.
Failure	XXXX	(Any Failure)	Print job fails, the error is logged, and the association is released.
Warning	0107	Attribute List Error	The print job continues and the warning is logged.
	0116	Attribute value out of range	The print job continues and the warning is logged.
	B603	(Not Defined)	The print job continues and the warning is logged.
	XXXX	(Any Warning)	Print job fails, the warning is logged, and the association is released.

4.2.1.3.5.8.2 Dataset Specific Conformance for Basic Film Box SOP Class N-ACTION-SCU

Table 51: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Film accepted for printing	The print job continues and completes.
Failure	XXXX	(Any failure)	Print job fails, the error is logged, and the association is released.
Warning	B603	Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page).	The print job continues and the warning is logged.

4.2.1.3.5.8.3 Dataset Specific Conformance for Basic Film Box SOP Class N-DELETE-SCU

Table 52: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful command	The print job continues and completes.
Failure	XXXX	(Any failure)	Print job fails, the error is logged and the association is released.
Warning	XXXX	(Any warning)	Print job fails, the warning is logged and the association is released.

4.2.1.3.5.9 SOP Specific Conformance for Basic Film Session SOP Class of the Basic Grayscale Print Management Meta SOP Class

4.2.1.3.5.9.1 Dataset Specific Conformance for Basic Film Session SOP Class N-CREATE-SCU

Table 53: Basic Film Session Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Number of Copies	2000,0010	IS		ALWAYS	IMPLICIT	
Print Priority	2000,0020	CS		ALWAYS	AUTO	
Medium Type	2000,0030	CS		ALWAYS	IMPLICIT	
Film Destination	2000,0040	CS		ALWAYS	AUTO	
Film Session Label	2000,0050	LO		ALWAYS	AUTO	

Table 54: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Film session successfully created.	The print job continues and completes.
Failure	XXXX	(Any failure)	Print job fails, the error is logged, and the association is not released.
Warning	0116	Attribute Value Out of Range	The print job continues and the warning is logged.
	XXXX	(Any other warning)	Print job fails, the warning is logged, and the association is released.

4.2.1.3.5.9.2 Dataset Specific Conformance for Basic Film Session SOP Class N-DELETE-SCU

Table 55: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful command	Print job continues.
Failure	XXXX	(Any failure)	Print job fails, the error is logged and the association is released.
Warning	XXXX	(Any warning)	Print job fails, the warning is logged and the association is released.

4.2.1.3.5.10 SOP Specific Conformance for Basic Grayscale Image Box SOP Class of the Basic Grayscale Print Management Meta SOP Class

4.2.1.3.5.10.1 Dataset Specific Conformance for Basic Grayscale Image Box SOP Class N-SET-SCU

Table 56: Image Box Pixel Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Box Position	2020,0010	US		ALWAYS	AUTO	
Polarity	2020,0020	CS		ALWAYS	AUTO	
Basic Grayscale Image Sequence	2020,0111	SQ		ALWAYS	AUTO	
>Samples per Pixel	0028,0002	US	MONOCHROME2	ALWAYS	FIXED	

>Photometric Interpretation	0028,0004	CS		ALWAYS	IMPLICIT	
>Rows	0028,0010	US		ALWAYS	IMPLICIT	
>Columns	0028,0011	US		ALWAYS	IMPLICIT	
>Bits Allocated	0028,0100	US		ALWAYS	AUTO	
>Bits Stored	0028,0101	US		ALWAYS	IMPLICIT	
>High Bit	0028,0102	US		ALWAYS	AUTO	
>Pixel Representation	0028,0103	US		ALWAYS	AUTO	
>Pixel Data	7FE0,0010	OW/OB		ALWAYS	AUTO	

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 57: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful command	The print job continues and completes.
Failure	XXXX	(Any failure)	Print job fails, the error is logged, and the association is not released.
Warning	0107	Attribute List Error	The print job continues and the warning is logged.
	XXXX	(Any other warning)	Print job fails, the warning is logged, and the association is released.

4.2.1.3.5.11 SOP Specific Conformance for Printer SOP Class of the Basic Grayscale Print Management Meta SOP Class

4.2.1.3.5.11.1 Dataset Specific Conformance for Printer SOP Class N-EVENT-REPORT-SCP

Table 58: N-EVENT-REPORT Status Handling Behavior

Event Type Name	Event Type ID	Behavior
Normal	1	The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0, Event Type ID = 1
		Information is logged: N-EVENT-REPORT received, type: NORMAL
Warning	2	The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0, Event Type ID = 2
		Warning is logged: N-EVENT-REPORT received, type: WARNING Status info: <Status info>
Failure	3	The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0, Event Type ID = 3
		Error is Logged: N-EVENT-REPORT received, type: FAILURE Status info: <Status info>
		Printer status is set to DICOM_PRINTER_STATUS_FAILURE. The print job retries the print operation.

All possible status responses are provided in the following table.

Table 59: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful command	The result is logged.

4.2.1.3.5.11.2 Dataset Specific Conformance for Printer SOP Class N-GET-SCU

Table 60: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful command	The print job continues and completes.
Failure	XXXX	(Any failure)	Print job fails, the error is logged, and the association is released.
Warning	XXXX	(Any warning)	Print job fails, the warning is logged and the association is released.

4.2.1.4. Association Acceptance Policy

The Interventional Workstation Network AE accepts associations for the following purposes:

- To allow remote applications to verify application level communication.
- To allow remote applications to store images in the Interventional Workstation database.
- To allow remote applications to query the Interventional Workstation database.
- To allow remote applications to retrieve images from the Interventional Workstation database.

The Interventional Workstation Network AE rejects association requests from unknown applications, i.e. applications that offer an unknown “calling AE title”. An application is known if and only if it is defined per configuration of the Interventional Workstation system. The Interventional Workstation Network AE also rejects association requests from applications that do not address the Interventional Workstation Network AE, i.e. that offer a wrong “called AE title”. The Interventional Workstation AE title is defined during configuration of Interventional Workstation.

The Application Entity may reject Association attempts as shown in the table below.

Table 61: Association Reject Reasons

Result	Source	Reason/Diagnosis	Behavior
1 – rejected-permanent	1 – DICOM UL service-user	1 – no-reason-given	Association is not established due to any problem other than that specified for Interventional Workstation SCP in the rows below. (Example: Problem while decoding the DICOM stream).
		2 – application-context-name-not supported	An application context name other than 1.2.840.10008.3.1.1.1 is requested by the SCU during association.
		3 – calling-AE-title-not-recognized	The configuration does not contain a repository having the Calling AE Title as per the association request; There is a problem in configuration (related to composing the configuration from the SCU and the SCP configuration).

		7 – called-AE-title-not-recognized	The called AE Title in the association request does not match the AE Title as per the configuration.
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Not used.
		2 – protocol-version-not-supported	Not used.
	3 – DICOM UL service-provider (Presentation related function)	1 – temporary-congestion	Not used.
		2 – local-limit-exceeded	Not used.
2 – rejected-transient	1 – DICOM UL service-user	1 – no-reason-given	Not used.
		2 – application-context-name-not-supported	Not used.
		3 – calling-AE-title-not-recognized	Not used.
		7 – called-AE-title-not-recognized	Not used.
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Maximum number of associations is exceeded and an association request is received.
		2 – protocol-version-not-supported	Not used.
	3 – DICOM UL service-provider (Presentation related function)	1 – temporary-congestion	Not used.
		2 – local-limit-exceeded	Not used.

Table 62: Association Abort Policies

Source	Reason/Diagnosis	Behavior When Received	Behavior When Sent
0 – DICOM UL service-user (initiated abort)	0- reason-not-specified	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (0: ABORT_SOURCE_dul_user, 0: ABORT_REASON_not_specified).	Association times out due to inactivity; Any other problem than ones specified for Interventional Workstation SCP in the rows below. (Examples: Problem while decoding the DICOM stream, Invalid request, Echo/Find/Move/N-Action SCP was unable to send the Response to SCU, Error writing to SCU stream).
2 – DICOM UL service-provider (initiated abort)	0 – reason-not-specified	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 0: ABORT_REASON_not_specified)	Import fails (Import SCP Performer returns fail status)
	1 – unrecognized-PDU	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2:	An unrecognized PDU type is received[4].

		ABORT_SOURCE_dul_provider, 1: ABORT_REASON_unrecognized_pdu).	
	2 – unexpected-PDU	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 2: ABORT_REASON_unexpected_pdu).	The received PDU type is not expected in the current state of connection[5].
	4 – unrecognized-PDU-parameter	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 4: ABORT_REASON _unrecognized_pdu_parameter).	An unrecognized Associate PDU item is received[1].
	5 – unexpected-PDU-parameter	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 5: ABORT_REASON _unexpected_pdu_parameter).	One of the Associate PDU items is received more than once[2]. One of the Associate PDU items is received unexpectedly[2].
	6 – invalid-PDU-parameter-value	When received, the Interventional Workstation Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 6: ABORT_REASON _invalid_pdu_parameter).	One of the Associate PDU items is received more than once[3]. One of the Associate PDU items is not received[3]. There is mismatch in the application context names between the SCU and the SCP. Illegal Asynchronous Operations Window invoke value is received. Illegal Asynchronous Operations Window perform value is received. Unknown presentation context id is received. Unknown abstract syntax is received. The length or the format of a received PDU item is invalid.

Notes:

1. Associate PDU items that are recognized:
   - 0x10 APPLICATION CONTEXT
   - 0x20 PRESENTATION CONTEXT (RQ)
   - 0x21 PRESENTATION CONTEXT (AC)
   - 0x30 ABSTRACT SYNTAX
   - 0x40 TRANSFER SYNTAX
   - 0x50 USER INFO
   - 0x51 MAXIMUM LENGTH
   - 0x52 IMPLEMENTATION CLASS UID

- 0x53 ASYNCHRONOUS OPERATIONS WINDOW
- 0x54 SCP/SCU ROLE SELECTION
- 0x55 IMPLEMENTATION VERSION NAME
- 0x56 SOP CLASS EXTENDED NEGOTIATION

2. Associate PDU items for Unexpected-PDU parameter Received more than once:
   - 0x10 APPLICATION CONTEXT (SCU, SCP)
   - 0x30 ABSTRACT SYNTAX (SCU, SCP)
   - 0x40 TRANSFER SYNTAX (SCU)

   Received unexpectedly:
   - 0x20 PRESENTATION CONTEXT (RQ) (SCU)
3. Associate PDU items for Invalid-PDU parameter value:

   Received more than once (SCU, SCP):
   - 0x50 USER INFO
   - 0x51 MAXIMUM LENGTH
   - 0x52 IMPLEMENTATION CLASS UID
   - 0x53 ASYNCHRONOUS OPERATIONS WINDOW
   - 0x55 IMPLEMENTATION VERSION NAME

   Received illegally:
   - 0x21 PRESENTATION CONTEXT (AC) (SCP)

   PDU items not received:
   - 0x10 APPLICATION CONTEXT (SCU, SCP)
   - 0x20 PRESENTATION CONTEXT (RQ) (SCP)
   - 0x21 PRESENTATION CONTEXT (AC) (SCU)
   - 0x50 USER INFO (SCU, SCP)
   - 0x30 ABSTRACT SYNTAX (SCU)- 0x40 TRANSFER SYNTAX (SCU)
   - 0x51 MAXIMUM LENGTH (SCU, SCP)
   - 0x52 IMPLEMENTATION CLASS UID (SCU)
4. PDU types that are recognized:
   - 0x01 A-ASSOCIATE-RQ
   - 0x02 A-ASSOCIATE-AC
   - 0x03 A-ASSOCIATE-RJ
   - 0x04 P-DATA-TF
   - 0x05 A-RELEASE-RQ
   - 0x06 A-RELEASE-RP
   - 0x07 A-ABORT
5. Expected PDU's for following states:

   STATE_IDLE:
   - 0x01 A-ASSOCIATE-RQ
   - 0x02 A-ASSOCIATE-AC
   - 0x03 A-ASSOCIATE-RJ
   - 0x05 A-RELEASE-RQ
   - 0x06 A-RELEASE-RP

   STATE_ASSOCIATED:
   - 0x01 A-ASSOCIATE-RQ
   - 0x02 A-ASSOCIATE-AC
   - 0x03 A-ASSOCIATE-RJ
   - 0x06 A-RELEASE-RP

   STATE_ASSOCIATING (SCU):
   - 0x01 A-ASSOCIATE-RQ
   - 0x04 P-DATA-TF

- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP

STATE_RELEASING:
- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ

STATE_WAIT_FOR_ASSOCIATE (SCP):
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP
- 0x07 A-ABORT

STATE_WAIT_FOR_FINISH:
- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP

STATE_WAIT_FOR_DISCONNECT:
- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ

STATE_TIMED_OUT:
- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP
- 0x07 A-ABORT

4.2.1.4.1 (Real-World) Activity – Verification as SCP

4.2.1.4.1.1 Description and Sequencing of Activities

The Interventional Workstation accepts Associations from configured systems that wish to verify application level communication using the C-ECHO command.

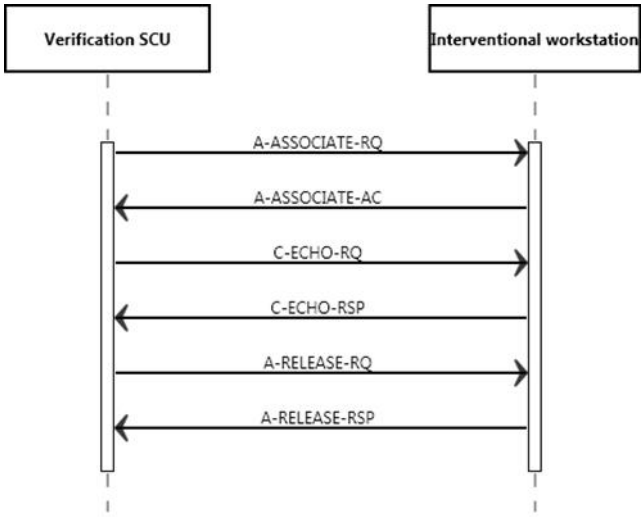


Figure 9: Data Flow Diagram – Verification as SCP

4.2.1.4.1.2 Accepted Presentation Contexts

The presentation contexts are defined in the below table.

Table 63: Accepted Presentation Contexts for (Real-World) Activity – Verification as SCP

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

The Interventional Workstation accepts all contexts in the intersection of the proposed and acceptable Presentation Contexts. This means that multiple proposed presentation contexts with the same SOP class but different transfer syntaxes are accepted by the Interventional Workstation as far as those transfer syntaxes are part of the acceptable transfer syntaxes. There is no check for duplicate contexts and these are therefore accepted.

4.2.1.4.1.3 SOP Specific Conformance for Verification SOP Class

4.2.1.4.1.3.1 Dataset Specific Conformance for Verification C-ECHO SCP

Table 64: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Confirmation	Confirm the verification request.

4.2.1.4.2 (Real-World) Activity – FIND as SCP

4.2.1.4.2.1 Description and Sequencing of Activities

The Interventional Workstation Network AE provides standard conformance to the DICOM Query/Retrieve service class. Optional keys are supported, depending on the data repository table that the remote system respectively the system integrator proposes. Relational queries are not supported. The Interventional Workstation Network AE generates a C-FIND response for each match with an identifier containing the

values of all known attributes identified by the requested key fields. All such responses will have a status of Pending, indicating that the process of matching is not complete. When the process of matching is complete a C-FIND response is sent with a status of success and no identifier. A Refused or Failed response to a C-FIND request indicates that the Interventional Workstation is unable to process the request.

The SCU may cancel the C-FIND service by issuing a C-FIND-CANCEL request at any time during the processing of the C-FIND service. The Interventional Workstation will interrupt all matching and return a status of Cancelled

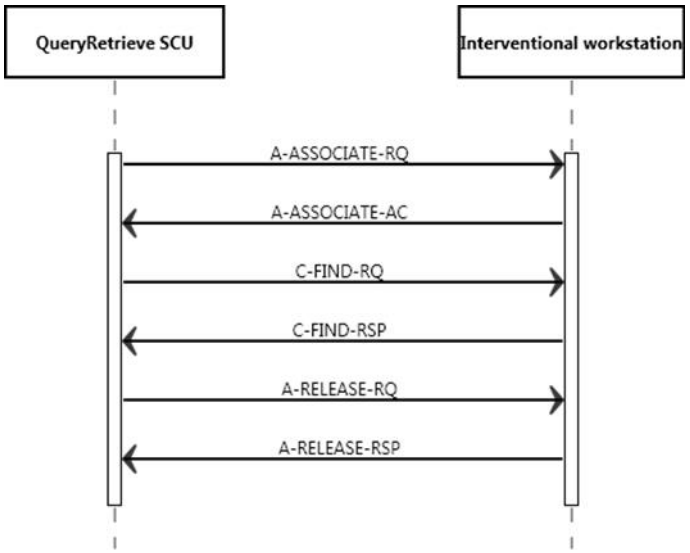


Figure 10: Data Flow Diagram – FIND as SCP

4.2.1.4.2.2 Accepted Presentation Contexts

The presentation contexts are defined in the below table.

Table 65: Accepted Presentation Contexts for (Real-World) Activity – FIND as SCP

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root QR Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1.2.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Study Root QR Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Patient Study Only QR Info. Model – FIND SOP Class (Retired)	1.2.840.10008.5.1.4.1.2.3.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

4.2.1.4.2.3 SOP Specific Conformance for Patient Root QR Information Model – FIND SOP Class

4.2.1.4.2.3.1 Dataset Specific Conformance for Patient Root QR Information Model – FIND SOP Class C-FIND-SCP

Table 66: Requested Query Keys for Patient Root Information Model

Patient Root Information Model				
Attribute Name	**Tag**	**VR**	**Type of Matching**	**Comment**
Query/Retrieve Level	0008,0052	CS	Single Value	
Specific Character Set	0008,0005	CS		
Q/R Patient level				
Patient ID	0010,0020	LO	Single Value, Universal, Wild card	
Patient's Name	0010,0010	PN	Single Value, Universal, Wild card	
Issuer of Patient ID	0010,0021	LO		
Patient's Birth Date	0010,0030	DT	Universal	
Patient Sex	0010,0040	CS	Universal	
Q/R Study level				
Study Date	00080020	DA	Range, Single Value	
Study Time	0010,0010	TM	Range, Single Value	
Accession Number	0008,0050	SH	Single Value, Universal, Wild card	
Modalities in Study	0008,0061	CS		
Referring Physician's Name	0008,0090	PN		
Study Description	0008,1030	LO		
Patient's Name	0010,0010	PN		
Patient ID	0010,0020	LO	Single Value	
Patient's Birth Date	0010,0030	DA		
Patient's Seks	0010,0040	CS		
Study Instance UID	0020,000D	UI	Single Value, Universal	
Study ID	0020,0010	SH	Single Value, Universal, Wild card	
Number of Study Related Series	0020,1206	IS		
Number of Study Related Instances	0020,1208	IS		
Q/R Series level				
Modality	0008,0060	CS	Single Value, Universal	
Series Description	0008,103E	LO		
Patient ID	0010,0020	LO	Single Value	
Study Instance UID	0020,000D	UI	Single Value	
Series Instance UID	0020,000E	UI	Single Value, Universal	
Series Number	0020,0011	IS	Single Value, Universal, Wild card	
Number of Series Related Instance	0020,1209	IS		
Scheduled Procedure Step ID	0040,0009	SH		
Performed Procedure Step Start Date	0040,0244	DA		

Performed Procedure Step Start Time	0040,0245	TM		
Request Attributes Sequence	0040,0275	SQ		
Requested Procedure ID	0040,1001	SH		
Q/R Instance level				
SOP Class UID	0008,0016	UI		
SOP Instance UID	0008,0018	UI		
Patient ID	0010,0020	LO	Single Value	
Study Instance UID	0020,000D	UI	Single Value	
Series Instance UID	0020,000E	UI	Single Value	
Instance Number	0020,0013	IS	Single Value, Universal	

4.2.1.4.2.4 SOP Specific Conformance for Study Root QR Information Model – FIND SOP Class

4.2.1.4.2.4.1 Dataset Specific Conformance for Study Root QR Information Model – FIND SOP Class C-FIND-SCP

Table 67: Requested Query Keys for Study Root Information Model

Study Root Information Model				
Attribute Name	**Tag**	**VR**	**Type of Matching**	**Comment**
Query/Retrieve Level	0008,0052	CS	Single Value	
Q/R Study level				
Study Date	00080020	DA	Range, Single Value	
Study Time	0010,0010	TM	Universal	
Study ID	0020,0010	SH	Single Value, Universal, Wild card	
Accession Number	0008,0050	SH	Single Value, Universal, Wild card	
Modalities in Study	0008,0061	CS		
Referring Physician's Name	0008,0090	PN	Single Value, Universal	
Study Description	0008,1030	LO		
Patient's Name	0010,0010	PN		
Patient ID	0010,0020	LO		
Issuer of Patient ID	0010,0021	LO		
Patient's Birth Date	0010,0030	DA		
Patient's Sex	0010,0040	CS		
Study Instance UID	0020,000D	UI	Single Value, Universal, List of UID	
Number of Study Related Series	0020,1206	IS		
Number of Study Related Instances	0020,1208	IS		
Q/R Series level				
Modality	0008,0060	CS	Single Value, Universal	
Series Description	0008,103E	LO		
Study Instance UID	0020,000D	UI		
Series Instance UID	0020,000E	UI		

Series Number	0020,0011	IS	Single Value, Universal	
Number of Series Related Instance	0020,1209	IS		
Scheduled Procedure Step ID	0040,0009	SH		
Performed Procedure Step Start Date	0040,0244	DA		
Performed Procedure Step Start Time	0040,0245	TM		
Request Attributes Sequence	0040,0275	SQ		
Requested Procedure ID	0040,1001	SH		
Q/R Instance level				
Modality	0008,0060	CS	Single Value, Universal	
SOP Class UID	0008,0016	UI		
SOP Instance UID	0008,0018	UI		
Patient ID	0010,0020	LO	Single Value	
Study Instance UID	0020,000D	UI	Single Value	
Series Instance UID	0020,000E	UI	Single Value	
Instance Number	0020,0013	IS	Single Value, Universal	

4.2.1.4.2.5 SOP Specific Conformance for Patient/Study Only Root QR Information Model – FIND SOP Class

4.2.1.4.2.5.1 Dataset Specific Conformance for Patient/Study Only Root QR Information Model – FIND SOP Class C-FIND-SCP

Table 68: requested Query Keys for Patient/Study Only Root Information Model

Patient/Study Only Root Information Model				
Attribute Name	**Tag**	**VR**	**Type of Matching**	**Comment**
Query/Retrieve Level	0008,0052	CS	Single Value	
Q/R Patient level				
Patient ID	0010,0020	LO	Single Value	
Patient's Name	0010,0010	PN	Single Value, Universal, Wild card	
Issuer of Patient ID	0010,0021	LO		
Patient's Birth Date	0010,0030	DT		
Patient Sex	0010,0040	CS		
Q/R Study level				
Study Date	00080020	DA	Range, Single Value	
Study Time	0010,0010	TM	Universal	
Study ID	0020,0010	SH	Single Value, Universal, Wild card	
Accession Number	0008,0050	SH	Single Value, Universal, Wild card	
Modalities in Study	0008,0061	CS	Universal	
Referring Physician's Name	0008,0090	PN	Single Value, Universal	
Study Description	0008,1030	LO		
Patient's Name	0010,0010	PN		
Patient ID	0010,0020	LO		

Issuer of Patient ID	0010,0021	LO		
Patient's Birth Date	0010,0030	DT		
Patient Sex	0010,0040	CS		
Study Instance UID	0020,000D	UI	Single Value, Universal, List of UID	
Number of Study Related Series	0020,1206	IS		
Number of Study Related Instances	0020,1208	IS		
SOP Instance UID	0008,0018	UI		
Study Instance UID	0020,000D	UI	Single Value	
Series Instance UID	0020,000E	UI		
Instance Number	0020,0013	IS		

Table 69: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	Results are displayed
Failure	A900	Identifier does not match SOP Class	
Pending	FF00	Matches are continuing and current match is supplied	

4.2.1.4.3 (Real-World) Activity – MOVE as SCP

Interventional Workstation accepts associations from systems that wish to retrieve images from the Interventional Workstation database using the C-MOVE command.

4.2.1.4.3.1 Description and Sequencing of Activities

During the processing of the C-STORE sub-operations Interventional Workstation optionally generates responses to the C-MOVE with status equal to pending. These C-MOVE responses indicate a number of remaining C-STORE sub-operations and the number of CSTORE sub-operations returning the status of Success, Warning, and Failed. When the number of remaining C-STORE sub-operations reaches zero, the Interventional Workstation generates a final response with the status of equal to Success, Warning, Failed, or Refused. This response may indicate the number of C-STORE sub-operations returning the status of Success, Warning, and Failed.

The SCU may cancel the C-MOVE service by issuing a C-MOVE-CANCEL request at any time during the processing of the C-MOVE. The Interventional Workstation terminates all incomplete CSTORE sub-operations and returns a status of Cancelled.

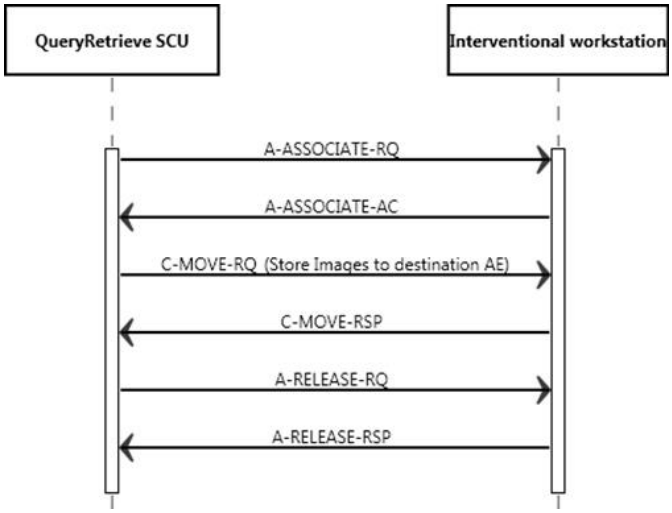


Figure 11: Data Flow Diagram – MOVE as SCP

4.2.1.4.3.2 Accepted Presentation Contexts

The presentation contexts are defined in the below table.

Table 70: Accepted Presentation Contexts for (Real-World) Activity – MOVE as SCP

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root QR Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1.2.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Study Root QR Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Patient Study Only QR Info. Model – MOVE SOP Class (Retired)	1.2.840.10008.5.1.4.1.2.3.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

4.2.1.4.3.3 SOP Specific Conformance for Patient Root QR Information Model – MOVE SOP Class

4.2.1.4.3.3.1 Dataset Specific Conformance for Patient Root QR Information Model – MOVE SOP Class C-MOVE-SCP

Table 71: Identifiers for Patient Root Information Model MOVE as SCP

Patient Root Information Model			
Attribute Name	Tag	VR	Comment
Query/Retrieve Level	0008,0052	CS	

Table 72: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Success	Success indication message is sent.
Failure	A702	Out of resource	Error is logged
	C000	All Sub-operation failure	
Warning	B000	Sub-operations complete – One or more failures	Warning indication message is sent.
	0116	Attribute Value Out of Range	

4.2.1.4.3.4 SOP Specific Conformance for Study Root QR Information Model – MOVE SOP Class

4.2.1.4.3.4.1 Dataset Specific Conformance for Study Root QR Information Model – MOVE SOP Class C-MOVE-SCP

Table 73: Identifiers for Study Root Information Model MOVE as SCP

Study Root Information Model			
Attribute Name	**Tag**	**VR**	**Comment**
Query/Retrieve Level	0008,0052	CS	

Table 74: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Success	Success indication message is sent.
Failure	A702	Out of resource	Error is logged
	C000	All Sub-operation failure	
Warning	B000	Sub-operations complete – One or more failures	Warning indication message is sent.
	0116	Attribute Value Out of Range	

4.2.1.4.3.5 SOP Specific Conformance for Patient/Study Only Root QR Information Model – MOVE SOP Class

4.2.1.4.3.5.1 Dataset Specific Conformance for Patient/Study Only Root QR Information Model – MOVE SOP Class C-MOVE-SCP

Table 75: Identifiers for Patient/Study Only Root Information Model MOVE as SCP

Patient/Study Only Root Information Model			
Attribute Name	**Tag**	**VR**	**Comment**
Query/Retrieve Level	0008,0052	CS	

Table 76: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Success	Success indication message is sent.
Failure	A702	Out of resource	Error is logged
	C000	All Sub-operation failure	

Warning	B000	Sub-operations complete – One or more failures	Warning indication message is sent.
	0116	Attribute Value Out of Range	

4.2.1.4.4 (Real-World) Activity – Image Import

4.2.1.4.4.1 Description and Sequencing of Activities

The Interventional Workstation accepts associations from configured systems that wish to store images in the Interventional Workstation database using the C-STORE command.

When patient data which contains more than 5 components in Patient's Name is imported into system: -
SUT displays the patient data in the Patient Directory with name"Comp1, Comp2Comp3
Comp2 and Comp3 are clubbed together and Comp 4, Comp5 are missing
Note: When same data is exported back from SUT to other remote note all 6 components are exported.

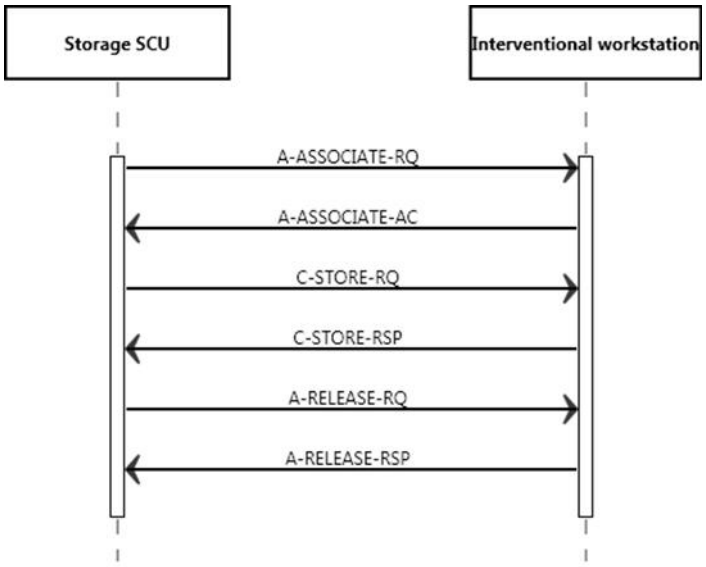


Figure 12: Data Flow Diagram – Storage Image - Storage as SCP

4.2.1.4.4.2 Accepted Presentation Contexts

The presentation contexts are defined in the below table.

Table 77: Accepted Presentation Contexts for (Real-World) Activity – Image Import

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
12-Lead ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Ambulatory ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.3	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

Basic Text SR SOP Class	1.2.840.10008.5.1.4.1.1.88.11	Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Comprehensive SR SOP Class	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Digital Mammography X-Ray Image Storage – Pres. SOP	1.2.840.10008.5.1.4.1.1.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		

		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Digital Mammography X-Ray Image Storage – Proc. SOP	1.2.840.10008.5.1.4.1.1.1.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Digital X-Ray Image Storage – For Pres. SOP	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Digital X-Ray Image Storage – For Proc. SOP	1.2.840.10008.5.1.4.1.1.1.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		

Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Enhanced MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Enhanced SR SOP Class	1.2.840.10008.5.1.4.1.1.88.22	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		

		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
General ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Hemodynamic Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		

		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
MR Spectroscopy Storage SOP Class	1.2.840.10008.5.1.4.1.1.4.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Multi-frame Grayscale Byte SC Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Multi-frame Grayscale Word SC Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.3	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		

Multi-frame Single Bit Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Nuclear Medicine Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.20	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Philips Private Grayscale Softcopy Presentation State Storage	1.3.46.670589.2.2.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Philips Private X-Ray Image Storage	1.3.46.670589.2.3.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Positron Emission Tomography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.128	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

Raw Data Storage SOP Class	1.2.840.10008.5.1.4.1.1.66	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
RT Dose Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
RT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
RT Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.5	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
RT Structure Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.3	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		RLE Lossless	1.2.840.10008.1.2.5		
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		

		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
Ultrasound Multi-frame Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		

		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
X-Ray Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		
X-Ray Radiofluoroscopic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		RLE Lossless	1.2.840.10008.1.2.5		

Note:
1. The supported transfer syntaxes can be configured to include additional syntaxes. See section 4.4.2, for details.
2. Fluoroscopy overlay images cannot be exported and imported.

4.2.1.4.4.3 SOP Specific Conformance for Storage SOP Class

The Interventional Workstation will only accept associations from configured systems. The Interventional Workstation may provide level 2 (full) conformances, depending on the implemented database.

Remarks:
- Pixel data will be stored in configurable transfer syntax. This implies that transfer syntax conversions might take place during import. Compressed pixel data is always decompressed and afterwards converted to the “configurable transfer syntax”.
- A non-empty BOT may be present in imported JPEG encoded pixel data.
- When importing an image, a default Presentation State object may be created as specified in Table 73. In case a default Presentation State object is created (also for duplicate images), the following rules apply:
  - If a private Presentation State is present in the image the default Presentation State is always created based upon the private Presentation State.
  - For multi-frame images with one frame it is configurable if a Presentation State should be created for every image in the series or only one Presentation State for the whole series.

Table 78: Conditions for creating Default Presentation State Object

Accepted association contains PR SOP class	Private PR is present in imported image	Default PR object created
Yes	Yes / No	No
No	Yes	Yes
No	No	No

- Value Representation ‘UN’ (Unknown) is supported, and shall be used for any attributes not known to Interventional Workstation and received per implicit transfer (ILE).
- Attribute values from images may be copied into related Presentation States and vice versa.
- Images must contain the minimum set of attributes prescribed by DICOM. Otherwise the default behavior is that the image is rejected and the association aborted.

4.2.1.4.4.3.1 Dataset Specific Conformance for C-STORE-RSP

Table 79: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful command	Successful completion of the store request.
Failure	A700	Refused: Out of Resources	Not enough resources available to do a store.
	C000	Error: cannot understand	Any other exception generated during the store.

4.3. Network Interfaces

4.3.1. Physical Network Interfaces

The System provides only DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8 of the standard.
TCP/IP is the only protocol stack supported.

Supported physical medium include:
IEEE 802.3-1995, 10BASE-T
IEEE 802.3-1995, 100BASE-TX (Fast Ethernet)
IEEE 802.3, 1000BASE-X (Fiber Optic Gigabit Ethernet).

The TCP/IP Stack as supported by the underlying Operating System.
The API is the WinSock 2 interface as supported by the underlying Operating System.

4.3.2. Additional Protocols
Not applicable.

4.4. Configuration
Any implementation's DICOM conformance may be dependent upon configuration, which takes place at the time of installation. Issues concerning configuration are addressed in this section.

4.4.1. AE Title/Presentation Address Mapping
An important installation issue is the translation from AE title to presentation address. How this is to be performed is described here.

4.4.1.1. Local AE Titles
The Field Service User Interface only allows one AE to be configured.

The following AE specific information must be available to configure a local AE:
- AE title.
- Port number (note that normally all local Interventional Workstation AE's will have a different port number).

4.4.1.2. Remote AE Title/Presentation Address Mapping
One or more remote AE's may be configured.

The following AE specific information must be available to configure a remote AE:
- AE title.
- Hostname or IP address.
- Port number.

4.4.2. Parameters
The specification of important operational parameters, their default value and range (if configurable) are specified here.

Table 80: Configuration Parameters Table

Parameter	Configurable	Default Value
General Parameter		
Time-out waiting for acceptance or rejection Response to an Association Open Request (Application Level timeout)	Yes	60 [s] (set 0 for no time-out)
General DIMSE level time-out values (Verification, Storage)	No	-
Time-out for response to TCP/IP connect request. (Low-level timeout)	OS	-
Time-out waiting for acceptance of a TCP/IP message over the network (Low-level timeout)	OS	-

Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	OS	-
Any changes to default TCP/IP settings, such as configurable stack parameters.	OS	-
AE Specific Parameters		
Size constraint in maximum object size	No	-
Maximum PDU size the AE can send and receive	Yes	0
Association time-out SCP	Yes	0 (no time-out)
Association time-out SCU	Yes	0 (no time-out; set –1 for immediate time-out, or else value in [s])
AE specific DIMSE level time-out values	Yes	300 [s] (set 0 for no time-out)
Number of simultaneous associations by service and/or SOP class	No	1 per service/SOP class
SOP Class support	Yes	All supported SOP classes
Transfer Syntax support*	Yes	ELE – 1.2.840.10008.1.2.1
		EBE – 1.2.840.10008.1.2.2
		ILE – 1.2.840.10008.1.2
		JPEG Lossless (NH-FOP) – 1.2.840.10008.1.2.4.70
		JPEG Baseline – 1.2.840.10008.1.2.4.50
		JPEG Extended – 1.2.840.10008.1.2.4.51
		JPEG 2000 (Lossless Only) – 1.2.840.10008.1.2.4.90
		JPEG 2000 – 1.2.840.10008.1.2.4.91
		RLE – 1.2.840.10008.1.2.5
Port Number	Yes	Supported port numbers are between 0 to 49151

Notes:

1. Although it is possible to configure encapsulation transfer syntax for every SOP class, encapsulation transfer syntax is practically not applicable for SOP classes that contain no data to be encoded and such transfer syntax should therefore be omitted.
2. Also note that the order of the specified transfer syntaxes for a SOP class or AE in the configuration determines the preference order of proposed transfer syntaxes. Per default all transfer syntaxes are enabled.
3. A number of presentation contexts are not practical. Some transfer syntaxes may only be used on certain datasets, and should not be proposed for other datasets. E.g., never propose lossy JPEG compression for 16 bits images as this is not applicable.
4. Currently JPEG Extended is applicable to 12 bits images only (process 4).

5. Media Interchange

5.1. Implementation model

The implementation model identifies the DICOM Application Entities for Media in specific implementation and relates the Application Entities to Real-World Activities.

5.1.1. Application Data Flow Diagram

The Interventional Workstation implements one media application entity:

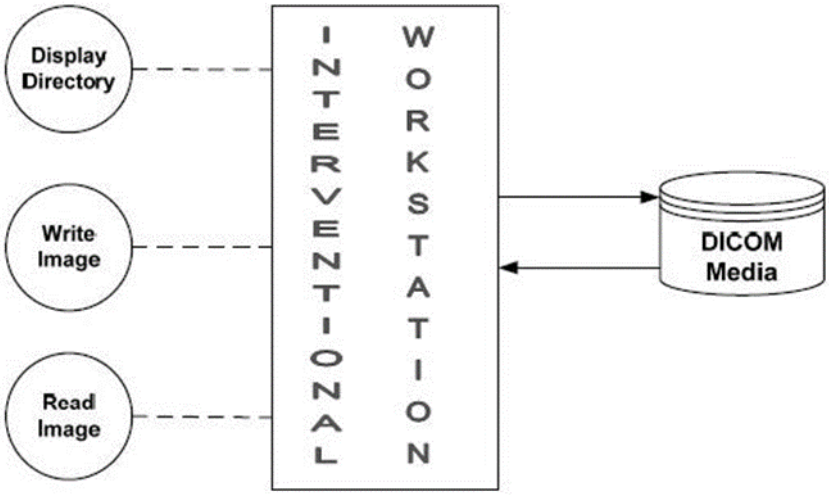


Figure 13: Application Data Flow Diagram

5.1.2. Functional Definitions of AE's

The Interventional Workstation implements the following functions for DICOM media.

- Write a DICOM file-set onto the medium.
- Create a DICOMDIR file.
- Read the DICOMDIR file from the medium.
- Read selected images from the medium.

5.1.3. Sequencing of Real World Activities

Not applicable.

5.2. AE Specifications

This section in the DICOM Conformance Statement specifies a set of Media Application Entities.

5.2.1. Interventional Workstation Media AE - Specification

The Interventional Workstation provides standard conformance to the DICOM interchange option of the media storage service class, and follows the specifications as defined in the DICOM standard – Media Storage and File Format for Data Interchange (PS 3.10) and Media Storage Application Profiles (PS 3.11).

The Interventional Workstation supports multi-patient and multi-session for CD-R media (both reading and writing). For one or more Application Profiles, the following table shows the Real-World Activities and the roles of each of these Real-World Activities.

The Interventional Workstation supports FSC and FSR onto Media for all supported export storage SOP classes and the private storage SOP classes supported by the Interventional workstation.

Note:
Read File-set = Display Directory and Read Image
Create File-set = Write Image

Table 81: AE Interventional Workstation Media AE Related Application Profiles, RWA Activities and Roles

Supported Application Profile	Identifier	Real-World Activities	Roles
General Purpose CD-R Interchange	STD-GEN-CD	Create File-set	FSC
		Read File-set	FSR
General Purpose DVD Interchange with JPEG	STD-GEN-DVD-JPEG	Create File-set	FSC
		Read File-set	FSR
General Purpose DVD Interchange with JPEG 2000	STD-GEN-DVD-J2K	Create File-set	FSC
		Read File-set	FSR

5.2.1.1. File Meta Information for the Interventional Workspot Media AE

Table 82: File Meta Information for the Interventional Workspot Media AE

Implementation Class UID	1.3.46.670589.7.8.1.8
Implementation Version Name	1.8.0

5.2.1.2. Real-World Activities

The AE specification contains a description of the Real-World Activities, which invoke the particular AE.

5.2.1.2.1 RWA - Read File-set

This Media Application Entity has a File-set Reader functionality which is described here.

Display Directory

The Interventional Workstation will act as a FSR when reading the directory of the medium. This allows the System Integrator to see the results in an overview of the patients, studies, series presentation states and images.

The Interventional Workstation will not access DICOM media when either:
- Patient ID is absent; or
- Study Instance UID has no value; or
- Series Instance UID has no value.

Read Images

The Interventional Workstation will act as a FSR when reading all/selected images from DICOM media. User will be able to see Image thumbnail and will not be able to view the image from CD/DVD.

5.2.1.2.1.1 Media Storage Application Profile

Refer to the table in section 5.2.1.

5.2.1.2.1.1.1 Options

Not applicable.

5.2.1.2.2 RWA - Create File-set

This Media Application Entity has a File-set Creator functionality which is described here.

Write Images

The Interventional Workstation acts as an FSC when writing DICOM objects onto DICOM media. The Interventional Workstation can also store private attributes.

When the Interventional Workstation has to write objects to DICOM media, it can encounter the following situation.

The objects were previously received via C-STORE operations. Some attributes in the received images have a zero-length value (type 2 attributes). However, the Application Profile specifies some of these attributes as type 1: they must have a value. In such
cases the Interventional Workstation supplies a value for the following attributes (if necessary):

- Patient ID;
- Study ID;
- Series Number;
- Instance number;
- Study Date;
- Study Time.

The mechanism of generating a value for Patient ID is to create a new value (i.e. Study Instance UID) for each new study written to the medium, even if this study belongs to a patient recorded earlier.

Study ID is assigned the value of the first Requested Procedure ID (0040,1001) encountered in the Request Attributes Sequence (0040,0275).

Table 83: DICOMDIR Attributes

Attribute Name	Tag	Notes
File Set ID	0004,1130	
Offset of the First Directory Record of the Root Directory Entity	0004,1200	
Offset of the Last Directory Record of the Root Directory Entity	0004,1202	
File Set Consistency Flag	0004,1212	
Directory Record Sequence	0004,1220	
>Offset of the Next Directory Record	0004,1400	
>Record In-use Flag	0004,1410	
>Offset of Referenced Lower-Level Directory Entity	0004,1420	
>Directory Record Type	0004,1430	
> Specific Character Set	0008,0005	
>Referenced File ID	0004,1500	
>Referenced SOP Class UID in File	0004,1510	
>Referenced Transfer Syntax UID in File	0004,1512	
Patient level		
Offset Of The Next Dir Record	0004,1400	
Record In Use Flag	0004,1410	
Offset of Referenced Lower-Level Directory Entity	0004,1420	
Directory Record Type	0004,1430	
Specific Character Set	0008,0005	

Patient's Name	0010,0010	
Patient ID	0010,0020	
Patient's Birth Date	0010,0030	
Patient's Birth Time	0010,0032	
Patient's Sex	0010,0040	
Study Level		
Offset Of The Next Dir Record	0004,1400	
Record In Use Flag	0004,1410	
Offset Of Ref Lower Level Dir Entity	0004,1420	
Directory Record Type	0004,1430	
Specific Character Set	0008,0005	
Study Date	0008,0020	
Study Time	0008,0030	
Accession Number	0008,0050	
Study Description	0008,1030	
Study Instance UID	0020,000D	
Study ID	0020,0010	
Modalities in Study	0008,0061	
Series Level		
Offset Of The Next Directory Record	0004,1400	
Record In-Use Flag	0004,1410	
Offset of Referenced Lower-Level Directory Entity	0004,1420	
Directory Record Type	0004,1430	
Specific Character Set	0008,0005	
Series Date	0008,0021	
Series Time	0008,0031	
Content Time	0008,0033	
Modality	0008,0060	
Manufacturer	0008,0070	
Series Instance UID	0020,000E	
Series Number	0020,0011	
Series Description	0008,103E	
Body Part Examined	0018,0015	
Protocol Name	0018,1030	
Icon Image Sequence	0088,0200	
>Samples per Pixel	0028,0002	
>Photometric Interpretation	0028,0004	
>Rows	0028,0010	
>Columns	0028,0011	
>Pixel Spacing	0028,0030	
>Bits Allocated	0028,0100	

>Bits Stored	0028,0101	
>High Bit	0028,0102	
>Pixel Representation	0028,0103	
>Pixel Data	7FE0,0010	
Image Level		
Offset Of The Next Directory Record	0004,1400	
Record In-Use Flag	0004,1410	
Offset Of Referenced Lower-Level Directory Entity	0004,1420	
Directory Record Type	0004,1430	
Referenced File ID	0004,1500	
Referenced SOP Class UID In File	0004,1510	
Referenced SOP Instance UID In File	0004,1511	
Referenced Transfer Syntax UID In File	0004,1512	
Specific Character Set	0008,0005	
Instance Number	0020,0013	
Image Type	0008,0008	
Instance Creation Date	0008,0012	
Instance Creation Time	0008,0013	
SOP Class UID	0008,0016	
SOP Instance UID	0008,0018	
Acquisition Date	0008,0022	
Acquisition DateTime	0008,002A	
Acquisition Time	0008,0032	
Protocol Name	0018,1030	
Patient Orientation	0020,0020	
Number of Frames	0028,0008	
Rows	0028,0010	
Columns	0028,0011	
Icon Image Sequence	0088,0200	
>Samples per Pixel	0028,0002	
>Photometric Interpretation	0028,0004	
>Rows	0028,0010	
>Columns	0028,0011	
>Pixel Spacing	0028,0030	
>Bits Allocated	0028,0100	
>High Bit	0028,0102	
>Pixel Representation	0028,0103	
>Pixel Data	7FE0,0010	

5.2.1.2.2.1 Media Storage Application Profile

Refers to the table in section 5.2.1.

5.2.1.2.2.1.1 Options
Not applicable.

5.3. Augmented and Private Application Profiles
This section is used for the description of Augmented and Private Application Profiles.

5.3.1. Augmented Application Profiles
Any Augmented Application Profiles used by the Application Entity are described in this section. The rules governing the structure of an Augmented Application Profile are also described.

5.3.1.1. Augmented Application Profile Descriptions
Each Augmented Application Profile has a section that describes the specific features of the Application Profile that make it augmented.

5.3.1.1.1 SOP Class Augmentations
The addition of Grayscale Softcopy Presentation State SOP class objects implies augmentation of the standard AP.

5.3.1.1.2 Directory Augmentations
Instances of the private SOP classes may be written on the media. This requires a Directory Record Type (0004,1430) with the value “PRIVATE” and configuration of the required Private Record UID. This UID is used to define a non-standard type of Directory Record by reference to its position in a private extension to the DICOM Basic Directory IOD Information Model.

5.3.1.1.3 Other Augmentations
Not applicable.

5.3.2. Private Application Profiles
Not applicable.

5.4. Media Configuration
Not applicable.

6. Support of Character Sets

Any support for character sets in Network and Media services is described here.

Table 84: Supported DICOM Character Sets

Character Set Description	Defined Term	ESC Sequence	ISO Registration Number	Code Element	Character Set
Latin alphabet No. 1	ISO 2022 IR 100	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/01	ISO-IR 100	G1	Supplementary set of ISO 8859
Latin alphabet No. 2	ISO 2022 IR 101	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/02	ISO-IR 101	G1	Supplementary set of ISO 8859
Latin alphabet No. 3	ISO 2022 IR 109	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/03	ISO-IR 109	G1	Supplementary set of ISO 8859
Latin alphabet No. 4	ISO 2022 IR 110	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/04	ISO-IR 110	G1	Supplementary set of ISO 8859
Greek	ISO 2022 IR 126	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/06	ISO-IR 126	G1	Supplementary set of ISO 8859
Arabic	ISO 2022 IR 127	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/07	ISO-IR 127	G1	Supplementary set of ISO 8859
Japanese	ISO 2022 IR 13	ESC 02/08 04/10	ISO-IR 14	G0	JIS X 0201: Romaji
		ESC 02/09 04/09	ISO-IR 13	G1	JIS X 0201: Katakana
	ISO 2022 IR 87	ESC 02/04 04/02	ISO-IR 87	G0	JIS X 0208:Kanji
	ISO 2022 IR 159	ESC 02/04 02/08 04/04	ISO-IR 159	G0	JIS X 0212: Supplementary Kanji set
Hebrew	ISO 2022 IR 138	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/08	ISO-IR 138	G1	Supplementary set of ISO 8859
Cyrillic	ISO 2022 IR 144	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/12	ISO-IR 144	G1	Supplementary set of ISO 8859
Latin alphabet No. 5	ISO 2022 IR 148	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/13	ISO-IR 148	G1	Supplementary set of ISO 8859
Thai	ISO 2022 IR 166	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 05/04	ISO-IR 166	G1	TIS 620-2533 (1990)
Default repertoire	ISO 2022 IR 6	-	ISO-IR 6	G0	ISO 646
		-	-	-	-
Latin alphabet No. 1	ISO_IR 100	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 100	G1	Supplementary set of ISO 8859
Latin alphabet No. 2	ISO_IR 101	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 101	G1	Supplementary set of ISO 8859
Latin alphabet No. 3	ISO_IR 109	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 109	G1	Supplementary set of ISO 8859
	ISO_IR 110	-	ISO-IR 6	G0	ISO 646

Latin alphabet No. 4		-	ISO-IR 110	G1	Supplementary set of ISO 8859
Greek	ISO_IR 126	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 126	G1	Supplementary set of ISO 8859
Arabic	ISO_IR 127	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 127	G1	Supplementary set of ISO 8859
Japanese	ISO_IR 13	-	ISO-IR 14	G0	JIS X 0201: Romaji
		-	ISO-IR 13	G1	JIS X 0201: Katakana
Hebrew	ISO_IR 138	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 138	G1	Supplementary set of ISO 8859
Cyrillic	ISO_IR 144	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 144	G1	Supplementary set of ISO 8859
Latin alphabet No. 5	ISO_IR 148	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 148	G1	Supplementary set of ISO 8859
Chinese	GB18030	-	GB18030	-	-
Thai	ISO_IR 166	-			
		-	ISO-IR 166	G1	TIS 620-2533 (1990)

As can be seen in the table above, Interventional Workspot R1.8 supports all character sets currently defined by DICOM except for the multi-byte character sets without code extensions.

The preferred character set can be configured. If not configured, the default character set shall be ISO-IR 100.

When an unsupported character set is received it shall be tried and decoded according the preferred character set.

Unsupported characters shall be displayed as “?”.

7. Security

7.1. Security Profiles

The Interventional Workstation does not fully support DICOM security profiles. However, it does support security measures that will be used for secure authentication of a node and for the generation of audit records. The Interventional Workstation allows the use of a secure DICOM communication and creation of audit trails.

7.1.1. Security use Profiles

Not Applicable.

7.1.2. Security Transport Connection Profiles

The Secure communication mode is a “mode of operation” of Interventional workstation and will be used for nodes that can authenticate each other before they communicate over sockets. TLS 1.2 can only be used using TCP. Node authentication and encryption are only possible when the node has:

- a “private and public key”;
- a self-signed certificate or certificate signed by a Certificate Authority.
- Furthermore, the Interventional Workstation may communicate using the following Cipher Suites:
- TLS_RSA_WITH_NULL_SHA; (Node authentication without encryption)
- TLS_RSA_WITH_3DES_SHA. (Node authentication with encryption)

In case no encryption is used the data is signed and hashed: integrity is present and confidentiality is not present.

Certificates

If two systems communicate with each other, one system will be listening on a port (server node) while the other system sets up a connection (client node). The certificate this server node will send to the other client node is the server certificate. The client node initiates the communication and the certificate that the client node is sending to the server is the client certificate. (Server Client Authentication) The following TLS Certification checks will be done (TLS Handshake). The machine (either server or client) that will send its certificate will choose the certificate according to Common Name (CN) value in the Subject-field. This name is case-sensitive. All present certificates should have unique CN names.

The server verifies:

- that the client certificate is a valid X.509 certificate;
- that the client certificate is either signed by a CA or is self-signed;
- that the client certificate is in the list of trusted certificates;
- that the client certificate is valid (present time is between “Valid From” and “Valid To” fields of the X.509 certificate);
- that the client certificate has the correct purpose (at least the Client Authenticate purpose).

The client verifies:

- that the server certificate is a valid X.509 certificate;
- that the server certificate either is signed by a CA or is self-signed;
- that the server certificate is in the list of trusted certificates;
- that the server certificate is valid (present time is between “Valid From” and “Valid To” fields of the X.509 certificate);
- that the server certificate has the correct purpose (at least Server Authenticate purpose).

In the Interventional Workstation no verification is done on:
- revocation of certificates;
- limiting the connection to a limited set of IP-addresses.

Additional information:
The value in the Subject-field is determined in the certificate request. The CA will sign the request in case it accepts the values that are present in the request. The CN value can be: IP-number, hostname or hostname.domain. The value in the CN-field must be equal to the value that is used in making a connection to the server. In case the name is specified as hostname.domain that same value should be specified during connect. In the ideal situation the name-IP-number translation will be dealt with by the DNS in the hospital. This check is case-insensitive.

7.1.3. Digital Signature Profiles
Not Applicable.

7.1.4. Media Storage Security Profiles
Not Applicable.

7.1.5. Attribute Confidentiality Profiles

Table 85: De-Identified Attributes

Attribute Name	Tag	Replacement Value
Instance Creator UID	0008,0014	No values
Accession Number	0008,0050	No values
Institution Name	0008,0080	No values
Institution Address	0008,0081	No values
Referring Physicians Name	0008,0090	No values
Referring Physician Address	0008,0092	No values
Referring Physician Telephone Numbers	0008,0094	No values
Station Name	0008,1010	No values
Study Description	0008,1030	No values
Series Description	0008,103E	No values
Institutional Department Name	0008,1040	No values
Physicians Of Record	0008,1048	No values
Performing Physician Name	0008,1050	No values
Name Of Physicians Reading Study	0008,1060	No values
Operators Name	0008,1070	No values
Admitting Diagnoses Description	0008,1080	No values
Derivation Description	0008,2111	No values
Patient Name	0010,0010	Value configurable by user.
Patient Birth Date	0010,0030	No values
Patient Birth Time	0010,0032	No values
Patient Sex	0010,0040	No values
Other Patient Ids	0010,1000	No values

Other Patient Names	0010,1001	No values
Patients Age	0010,1010	No values
Patients Size	0010,1020	No values
Patients Weight	0010,1030	No values
Medical Record Locator	0010,1090	No values
Ethnic Group	0010,2160	No values
Occupation	0010,2180	No values
Additional Patient History	0010,21B0	No values
Patient Comments	0010,4000	No values
Device Serial Number	0018,1000	No values
Protocol Name	0018,1030	No values
Study ID	0020,0010	No values
Frame Of Reference UID	0020,0052	New Unique Random value
Synchronization Frame Of Reference UID	0020,0200	New Unique Random value
Image Comments	0020,4000	No values
Request Attributes Sequence	0040,0275	No values
Storage Media File Set ID	0088,0130	No values
Patient ID	0010,0020	New Unique Random value
Study Instance UID	0020,000D	New Unique Random value
Series Instance UID	0020,000E	New Unique Random value
Patient Address	0010,1040	No values
Patient Telephone Numbers	0010,2154	No values

7.1.6. Network Address Management Profiles

Not Applicable.

7.1.7. Time Synchronization Profiles

The Time Synchronization component of the Interventional Workstation can be configured via Service. The implementation of the component conforms to the basic time synchronization profile of an NTP Client. The NTP Timeserver with which the client synchronizes its time is configured via Service. The NTP Timeserver is an element of Hospital Infrastructure.

7.1.8. Application Configuration Management Profiles

Not Applicable.

7.1.9. Audit Trail Profiles

Interventional Workstation can create audit messages according to IHE Audit Trail and Node Authentication profile. Created audit records allow security officers in an institution to audit activities, to detect non-compliant behavior in the enterprise, and to facilitate detection of improper creation, access, modification and deletion of Protected Health Information (PHI), where PHI data is considered as information records (Registration, Order, Study/Procedure, Reports and to a lesser degree Images/Presentation States), and not the flow of information between the systems. This includes information exported to and imported from every secured node in the “secured domain”.

The messages will be created and sent to a syslog server according to the syslog protocol. The time that is used will be the local time of the system. This time should be maintained by implementing a NTP Timeserver daemon on the system. The timeserver and syslog server are elements of the Hospital infrastructure. The following messages will be created and sent to a central Audit Record Repository.

Audit Event Trigger	Description	Message DICOM PS 3.15 A.5.3
Actor-start-stop	When Interventional Workspot or a clinical applications (Interventional Tool) has started or is closed.	Application Activity
Begin-storing-instances	Begin storing SOP Instances for a study to an external repository.	Begin Transferring DICOM Instances
Instances-Stored	Storage of SOP instances to a remote repository has been completed.	DICOM Instances Transferred
Node-Authentication-failure	A secure node authentication failure has occurred during TLS negotiation, e.g., invalid certificate.	Security Alert
PHI-export	Any export of PHI to media.	Export
PHI-import	Any import of PHI from media.	Import
Query Information	A query has been initiated from Interventional Workspot to a remote node.	Query
Security Alert	When software, security or networking configuration of the system is changed via the field service functionality.	Security Alert
User Authentication	A user log on or log off, whether successful or not.	User Authentication.
Instances-deleted	When a study is deleted from a specific study. One event covers all instances deleted for the particular study.	DICOM Instances Accessed" or "DICOM Study Deleted
Patient record	Patient is created/Updated/Merged/deleted	Patient record
Study-used	SOP Instances from a specific study are created or accessed / Deleted. One event covers all instances used for the particular study.	DICOM Instances Accessed

7.2. Association Level Security

Interventional Workstation accepts associations only from known applications or an application whose "calling AE Title" is defined in its configuration file. Interventional Workstation will reject association requests from unknown applications, i.e. applications that offer an unknown "calling AE title". An application entity (AE) is known if – and only if – it is defined during configuration of Interventional Workstation, which is done via the configuration application.

7.3. Application Level Security

Interventional Workstation allows the use of either conventional (non-secure) communication or secure communication based on the Transport Layer Security (TLS 1.2) protocol. If configured, Interventional Workstation supports security measures for:

- secure authentication of a node;
- integrity and confidentiality of transmitted data;
- generation of audit trail records;
- access control and user authentication.

8. Annexes of Clinical Application "Interventional Workspot R1.8"

Interventional Workspot R1.8 is a hosting platform for clinical applications (which are separate products). It provides common infrastructure for clinical application hosting and end user workstation functionality to support the user workflow.

The general IOD information shared across all clinical applications (supported by Interventional Workspot R1.8 infrastructure) is described in Section 8.1. Details of a specific IOD content are clinical application specific and they are described in dedicated annexes for each clinical application.

8.1. IOD Contents

8.1.1. Created SOP Instance

For information about this section, refer to below listed documents:

1. DICOM Conformance Statement 3D-CA R3.0 on Interventional Workspot R1.8 (HSDP-1068552)
2. DICOM Conformance Statement 3D-RA R6.8 on Interventional Workspot R1.8 (HSDP-1068554)
3. DICOM Conformance Statement 3D-Roadmap R1.5 on Interventional Workspot R1.8 (HSDP-1068556)
4. DICOM Conformance Statement AneurysmFlow R1.4 on Interventional Workspot R1.8 (HSDP-1068559)
5. DICOM Conformance Statement CT TrueView R2.0 on Interventional Workspot_R1.8 (HSDP-1068561)
6. DICOM Conformance Statement EmboGuide R1.4 on Interventional Workspot R1.8 (HSDP-1068572)
7. DICOM Conformance Statement EP navigator R5.6 on Interventional Workspot R1.8 (HSDP-1068575)
8. DICOM Conformance Statement HeartNavigator R3.4 on Interventional Workspot R1.8 (HSDP-1068577)
9. DICOM Conformance Statement MR-CT Roadmap R1.5 on Interventional Workspot R1.8 (HSDP-1068579)
10. DICOM Conformance Statement SmartCT R1.3 on Interventional Workspot R1.8 (HSDP-1068586)
11. DICOM Conformance Statement SmartCT R3.0 on Interventional Workspot R1.8 (HSDP-1068489)
12. DICOM Conformance Statement SmartPerfusion R1.1 on Interventional Workspot R1.8 (HSDP-1068591)
13. DICOM Conformance Statement StentBoost R4.4 on Interventional Workspot R1.8 (HSDP-1068593)
14. DICOM Conformance Statement VesselNavigator R1.4 on Interventional Workspot R1.8 (HSDP-1068595)
15. DICOM Conformance Statement XperCT Dual R3.7 on Interventional Workspot R1.8 (HSDP-1068600)
16. DICOM Conformance Statement XperGuide R1.5 on Interventional Workspot R1.8 (HSDP-1068602)

8.1.2. Usage of Attributes from Received IOD

The Interventional Workstation only accepts all valid DICOM IOD's specified in this document. Some SOP Classes will not be viewable because they are application dependent.

8.1.3. Attribute Mapping

For the case of a DICOM image export without PR, the Presentation State information is applied to the image(s) and its attributes are sent out as DICOM composite images as described in Table 80. Three different export modes are possible.

Table 86: Mapping Rules for Exporting Interventional Workstation Images

Interventional Workstation Presentation State	DICOM without PR Standard Composite Image	DICOM without PR Standard Extended Composite Image	DICOM without PR Secondary Capture Image
Presentation State (Identification)	Discard	Add attributes as part of private sequence	Discard
Spatial Transformation	Do not apply; Discard	Do not apply; Add attributes as part of private sequence	Apply on Image

Displayed Area	Do not apply; Discard	Do not apply; Add attributes as part of private sequence	Apply on Image
Modality LUT	Modality LUT Module	Modality LUT Module; Add attributes as part of private sequence	Apply on Image
Presentation LUT	If linear into Presentation shape	If linear into Presentation shape; Add as part of private sequence	Apply on Image
VOI LUT	Into VOI LUT	Into VOI LUT; Add attributes as part of private sequence	VOI LUT Module
Display Shutter	Display Shutter Module	Display Shutter Module; Add attributes as part of private sequence	Not implemented
Overlay Plane	Overlay Plane Module	Overlay Plane Module	Apply on Image
Curve	Curve Module	Curve Module	Discard
Graphic Layer	Discard	Discard; Add attributes as part of private sequence	Apply on Image
Graphic Annotation	Converted into one, separate overlay; Graphic Layer is discarded	Converted into one, separate overlay; Add as part of private sequence	Apply on Image
Other additional or private attributes	Discard	Add as part of private sequence	Discard

8.1.4. Coerced/Modified fields

Upon export of composite instances, a de-normalization can take place by assembling data from the various entities in the hierarchy. The selection of the attributes takes place based upon what is present in the Interventional Workstation at the initiation of the export. A description is given in the following subsections per instance level.

Patient

If the patient ID attribute is absent during instance import (has no value – zero-length) the following mapping will take place.

1. When a Patient ID is absent and one of Patient's Name/Patient's Birth Date is absent then a new UID is generated for Patient ID. Otherwise Patient ID is generated by appending "EMPTYPatientID_" + <Patient's Name> + "_" + <Patient's Birth Date>. It will be ensured that all instances belonging to a particular study will get the same Patient ID.
2. For Storage SCP, when two or more SOP Instances have the same Patient ID and different values for Patient's Name/Patient's Birth Date, then a new Patient ID is created by appending "!" + <UID> to the Patient ID. The original Patient ID is added to the Other Patient IDs.

Study

During import, the value of Study ID attribute is determined as follows:

1. Retrieved from the composite image.
2. If not present in the composite image, Study ID is assigned the value of the first Requested Procedure ID (0040,1001) encountered in the Request Attributes Sequence (0040,0275) in the composite image.
3. Otherwise Study ID remains empty.

During Export, in the absence of Study attribute values, the Performed Procedure Step attributes will be taken as a best guess for the following Study attributes.

Table 87: Mapping of Study Attributes

Examination Attribute	Value	DICOM Attribute
Study Date (0008,0020)	Has value	Study date (0008,0020) is sent out
	Not present or has no value	Study date (0008,0020) is filled with Performed Procedure Step Start Date (0040,0244)
Study Time (0008,0030)	Has value	Study Time (0008,0030) is sent out
	Not present or has no value	Study Time (0008,0030) is filled with Performed Procedure Step Start Time (0040,0245)

This implies that upon export of each Examination, within the same Study, different values for these attributes may be sent out. The receiving station, e.g. a PACS system, will apply its own rules for guaranteeing consistency of its own database.

Examination

If all of the Performed Procedure Step attributes in the following table are missing from the composite image, then the mapping is as specified.

Table 88: Mapping of Study Attributes

Performed Procedure Step Attribute	Tag	Composite Image Attribute	Tag
Performed Procedure Step Start Date	0040,0244	Study Date	0008,0020
Performed Procedure Step Start Time	0040,0245	Study Time	0008,0030
Performed Procedure Step ID	0040,0253	Study ID	0020,0010
Performed Procedure Step Description	0040,0254	Study Description	0008,1030

Presentation State Handling

For backward compatibility between Interventional Workstation and DICOM without presentation states, upon export from an Interventional Workstation to DICOM without presentation states, a merge of image definition and image presentation data is required. In the Interventional Workstation model, for one single image multiple presentation states may exist. During export Interventional Workstation ensures that only one image is sent out by merging the most preferred presentation state data with the image. The most preferred presentation state is selected based on the presentation state label and the time of creation.

8.2. Data Dictionary of Private Attributes

Not applicable.

8.3. Coded Terminology and Templates

Interventional Workstation does not implement any specific support for coded terminology and templates.

8.3.1. Context Groups

Not applicable.

8.3.2. Template Specifications

Not applicable.

8.3.3. Private code definitions

Not applicable.

8.4. Grayscale Image consistency

Interventional Workstation does not implement any specific support for grayscale image consistency.

8.5. Standard Extended/Specialized/Private SOPs

Interventional Workstation supports the following specialized SOP classes.

Table 89: Interventional Workspot R1.8 Supported Specialized SOP Classes

SOP Class Name	UID
Philips Private Grayscale Softcopy Presentation State Storage	1.3.46.670589.2.2.1.1
Philips Private X-Ray Image Storage	1.3.46.670589.2.3.1.1
Philips Private X-Ray MF Image	1.3.46.670589.7.8.1618510091
Philips Private Stent Boost WorkItem	1.3.46.670589.7.8.16185100912
Philips Private Live Run WorkItems	1.3.46.670589.7.8.1618510092
Philips Private Run WorkItems	1.3.46.670589.7.8.16185100129
Philips Private Reco WorkItems	1.3.46.670589.7.8.16185100130
Philips Private Three DCA WorkItem	1.3.46.670589.7.8.16185100913
PMS Volume	1.3.46.670589.2.7.1.1
Embedded Document	1.3.46.670589.2.8.1.1

8.6. Private Transfer Syntaxes

Interventional Workstation does not support any private transfer syntaxes.

- This part of the page is left intentionally empty -

Issued by:
Philips Medical Systems Nederland BV, a Philips Healthcare company,
P.O. Box 10.000
5680 DA Best
The Netherlands

Internet: https://www.philips.com/DICOM
Doc Id: HSDP-1068450
Date: 13-Feb-2023