

AGFA HEALTHCARE DICOM Conformance Statement

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Conformance Statement Overview

IMPAX is comprised of a storage facility and client review workstations. IMPAX is a single application entity that stores images sent to it by service class users, takes responsibility for storage of the images, allows queries based on several standard query models, retrieves requested images, and displays images to a user. IMPAX is able to validate images before they are stored internally by querying a service class provider for demographic information. Images found to be registered with the HIS/RIS are stored, while images not found to be registered are automatically corrected, where possible, or set aside for a technician to correct. IMPAX can store images to a variety of media.

IMPAX acts as a service class provider (SCP) for Verification, Storage, Storage Commitment, Query/Retrieve, and Print Management Service Classes

IMPAX acts as a service class user (SCU) for Verification, Storage, Storage Commitment, and Query/Retrieve Service Classes.

IMPAX conforms to the DICOM 3.0 standard

Table 1-1: SOP Classes for IMPAX

SOP Class Name	SOP Class UID	SCU	SCP	Display
Verification				
Verification	1.2.840.10008.1.1	Option	Yes	N/A
Transfer				
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes	Yes
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes	Yes
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes	No
Digital Mammography X-Ray Image Storage – For Presentation ¹	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes	Option
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes	No
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes	Yes
<i>Ultrasound Multi-frame Image Storage (Retired)</i>	<i>1.2.840.10008.5.1.4.1.1.3</i>	Yes	Yes	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes	Yes

¹ This class is only validated for viewing on IMPAX Client workstations for which the digital mammography feature is enabled with an appropriate license key.

SOP Class Name	SOP Class UID	SCU	SCP	Display
<i>Nuclear Medicine Image Storage (Retired)</i>	1.2.840.10008.5.1.4.1.1.5	Yes	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes	Yes
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129	Yes	Yes	No
<i>Ultrasound Image Storage (Retired)</i>	1.2.840.10008.5.1.4.1.1.6	Yes	Yes	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes	Yes
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	Yes	Yes	Yes
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Yes	Yes	No
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	Yes	Yes	Yes
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11	Yes	Yes	Yes
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	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes	Yes
<i>X-Ray Angiographic Bi-plane Image Storage (Retired)</i>	1.2.840.10008.5.1.4.1.1.12.3	Yes	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes	Yes
<i>VL Image Storage (retired)</i>	1.2.840.10008.5.1.4.1.1.77.1	Yes	Yes	Yes
<i>VL Multi-frame Image Storage (retired)</i>	1.2.840.10008.5.1.4.1.1.77.2	Yes	Yes	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	Yes	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	Yes	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	Yes	Yes
<i>Structured Report Text Storage (Retired)</i>	1.2.840.10008.5.1.4.1.1.88.1	Yes	Yes	No
<i>Structured Report Audio Storage (Retired)</i>	1.2.840.10008.5.1.4.1.1.88.2	Yes	Yes	No
<i>Structured Report Detail Storage (Retired)</i>	1.2.840.10008.5.1.4.1.1.88.3	Yes	Yes	No
<i>Structured Report Comprehensive Storage (Retired)</i>	1.2.840.10008.5.1.4.1.1.88.4	Yes	Yes	No
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes	No
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes	No
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes	No
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Yes	Yes	Option ²
Query/Retrieve				
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	Yes	N/A
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	Yes	N/A
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes	N/A

² Display of Mammography CAD SR markers available only for R2 and iCAD structured reports.

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SOP Class Name	SOP Class UID	SCU	SCP	Display
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes	N/A
Patient/Study Only Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	Yes	Yes	N/A
Patient/Study Only Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Yes	Yes	N/A
Workflow Management				
Storage Commitment Push Model	1.2.840.10008.1.20.1	Option	Yes	N/A
Print Management				
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No	N/A
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No	N/A
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes	No	N/A
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Yes	No	N/A
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No	N/A
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15	Yes	No	N/A
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes	No	N/A
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Yes	No	N/A

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1 INTRODUCTION

1.1 Revision Record

Revision Number	Date	Reason for Change
1.0	October 25, 2006	Initial Version from based on IMPAX 5.2 DCS.
1.1	October 25, 2006	Updated document number.
1.2	October 31, 2006	Added iCAD CAD SR support.
1.3	November 3, 2006	Updated conformance for printing.
1.4	November 25, 2009	General review and Update for IMPAX 5.2.x and 5.3.x Update table 2.2-8 and table 2.2-39 with ELE for store SCU/SCP

1.2 Purpose and Intended Audience of this Document

This document is a DICOM Conformance Statement for the DICOM Services of the IMPAX 5.2.x & 5.3.x product.

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

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

Although the use of this conformance statement, in conjunction with the DICOM 3.0 standard, is intended to facilitate communication between IMPAX and other DICOM devices, it is not sufficient to guarantee the interoperability of the connection. Section 1.3 outlines issues that need to be considered to ensure interoperability.

1.3 General Remarks

1.3.1 Integration and Validation Activities

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

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

1.3.2 Future Evolution

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

1.4 Acronyms and Abbreviations

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

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

1.5 Related Documents

- [ACR-NEMA Digital Imaging and Communications in Medicine \(DICOM\) V3.0. 2003.](#)
- [IHE Radiology Technical Framework Revision 6 – Final Text, May 2005](#)

1.6 SOP Class Overview

IMPAX provides Standard Conformance to the SOP Classes listed in Table 1-1. This table lists the Network Services Supported as they appear in DICOM Supplement 64, Table A.1-2. The shaded items represent SOP classes that have been retired (so no longer appear in Supplement 64) but are still supported by IMPAX.

If the **User of Service (SCU)** or the **Provider of Service (SCP)** column has the value “Option”, then the functionality is either configurable or can be purchased as an option. The **Display** column indicates whether or not the IMPAX Client will display the DICOM objects. In some cases only storage of the object may be provided by IMPAX.

2 NETWORKING

2.1 Implementation Model

IMPAX is a storage facility. IMPAX is a single application entity that stores images sent to it by service class users, takes responsibility for storage of the images, allows queries based on several standard query models, and retrieves requested images. IMPAX is able to validate images before they are stored internally by querying a service class provider for demographic information. Images found to be registered with the HIS/RIS are stored, while images not found to be registered are automatically corrected, where possible, or set aside for a technician to correct.

2.1.1 Application Data Flow Diagram

The Application Data Flow Diagram in Figure 2.1-1 depicts the DICOM data flow to and from IMPAX. The tail of the arrow between a local AE and the remote real world activity indicates the party (AE or remote real world activity) that initiates the association negotiation.

In the remote real-world activity labeled "Verify Communication", a remote application entity (AE) initiates an association and requests verification from IMPAX. Assuming IMPAX receives the request, it responds to the remote AE and communication between the two AE's has been verified. IMPAX can also initiate an association and request verification to a remote AE.

In the remote real-world activity "Store Objects", a remote AE initiates an association with IMPAX and sends one or more objects to IMPAX. When IMPAX receives an object, it stores the object in short term cache or long term media and registers the object in the database. IMPAX can also initiate an association and send one or more objects to a remote AE.

In the remote real-world activity "Request Storage Commitment", a remote AE initiates an association with IMPAX and requests commitment for the safekeeping of one or more composite SOP instances on IMPAX. IMPAX will open a new association with the remote AE to indicate success or failure. IMPAX can also initiate an association and request commitment for the safekeeping of one or more composite SOP instances to a remote AE.

In the remote real-world activity "Find Objects", a remote AE initiates an association with IMPAX and sends a query. IMPAX will search the database for possible matches with composite SOP instances. The results of the query are returned to the remote AE using the same association. IMPAX can also initiate an association and send a query to a remote AE.

In the remote real-world activity "Move Objects", a remote AE initiates an association with IMPAX and requests some composite SOP instances be retrieved. IMPAX will search the database for possible matches with composite SOP instances. The resulting composite SOP instances are transferred to either the same AE that requested the retrieval or to another AE over a new association. IMPAX can also initiate an association and request some composite SOP instances be retrieved from a remote AE.

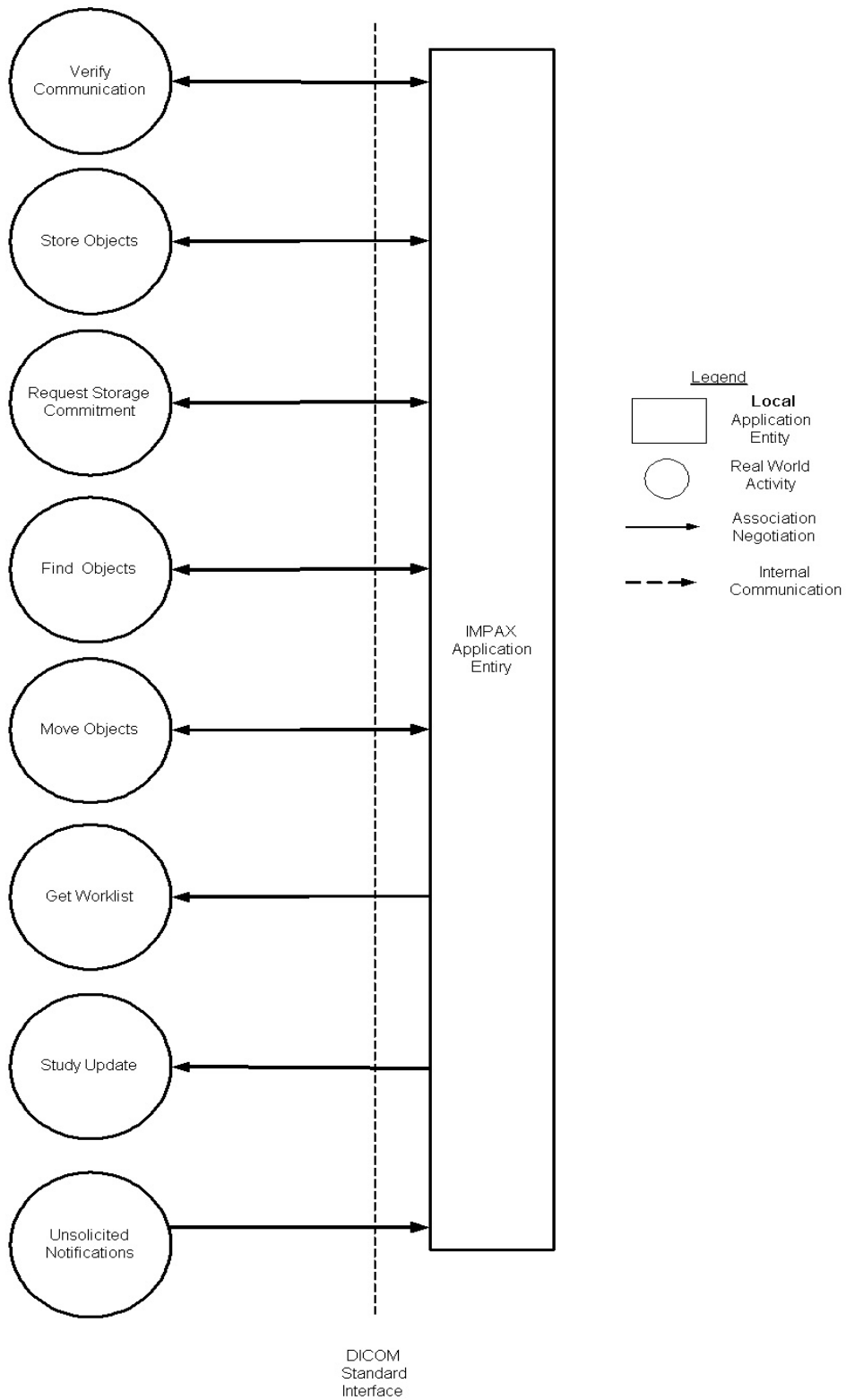


Figure 2.1-1: Functional Overview – Application Data Flow

2.1.2 Functional Definitions of AE's

The following sections contain a functional definition for each individual local Application Entity. These definitions describe the functions to be performed by the AE, and the DICOM services used to accomplish these functions (both DICOM service classes and lower level DICOM services such as Association Services).

2.1.2.1 Receive Images

IMPAX stores a received image in its entirety, compressed, in its internal data store. IMPAX stores each image with the File Meta Information attached to it.

IMPAX extracts the query information with respect to the patient, study, series, and object, and stores this information within its internal database.

2.1.2.2 Commitment to Store Images Received

IMPAX acts as a Service Class Provider of Storage Commitment to take responsibility explicitly for storing DICOM objects received.

2.1.2.3 Query from Other Devices

IMPAX responds to queries based on the records stored in its database.

2.1.2.4 Retrieve to Other Devices

IMPAX acts as a Service Class Provider of C-Move to retrieve DICOM objects. It does so by obtaining a reference from the database and then obtaining the object itself from the data store.

2.1.2.5 Transmit Images

IMPAX acts as a Service Class User of C-Store to transmit objects to other compatible devices.

2.2 AE Specifications

This section outlines the specifications for the Application Entity of IMPAX.

2.2.1 IMPAX Specification

2.2.1.1 Default Transfer Syntaxes Supported

IMPAX provides Standard Conformance to the default transfer syntaxes listed in Table 2.2-1.

Table 2.2-1: Default Transfer Syntaxes

SOP Class Name	SOP Class UID
Implicit VR Little Endian	1.2.840.10008.1.2

2.2.1.2 Extended Transfer Syntaxes Supported

IMPAX provides Standard Conformance to the extended transfer syntaxes listed in Table 2.2-2 for the purposes of storage and retrieval.

Table 2.2-2: Extended Transfer Syntaxes

Transfer Syntax	UID
Explicit VR Little Endian ³	1.2.840.10008.1.2.1
Explicit VR Big Endian	1.2.840.10008.1.2.2
RLE Lossless, PackBits	1.2.840.10008.1.2.5
JPEG Process 1, baseline, lossy (8 bit)	1.2.840.10008.1.2.4.50
JPEG Process 2,4, extended lossy (12 bit)	1.2.840.10008.1.2.4.51
JPEG Process 14, lossless	1.2.840.10008.1.2.4.57
JPEG Process 14, selection value 1, lossless	1.2.840.10008.1.2.4.70

2.2.1.3 Storage SOP Classes Supported

IMPAX provides Standard Conformance to the SOP Classes listed in Table 2.2-3. This table lists the Network Services Supported as they appear in DICOM Supplement 64, Table A.1-2. The shaded items represent SOP classes that have been retired (so no longer appear in Supplement 64) but are still supported by IMPAX.

If the **Provider of Service (SCP)** column has the value "Option", then the functionality is either configurable or can be purchased as an option. The **Display** column indicates whether or not the IMPAX Client will display the DICOM objects. In some cases only storage of the object may be provided by IMPAX.

³ LEE (Explicit Little Endian) is used for all group 2 elements including File Meta Information.

Table 2.2-3: SOP Classes for IMPAX Storage

SOP Class Name	SOP Class UID	SCU	SCP	Display
Transfer				
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes	Yes
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes	Yes
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes	No
Digital Mammography X-Ray Image Storage – For Presentation ⁴	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes	Option
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes	No
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes	Yes
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	Yes	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes	Yes
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	Yes	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes	Yes
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129	Yes	Yes	No
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	Yes	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes	Yes
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	Yes	Yes	Yes
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Yes	Yes	No
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	Yes	Yes	Yes
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11	Yes	Yes	Yes
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	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes	Yes
X-Ray Angiographic Bi-plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Yes	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes	Yes
VL Image Storage (retired)	1.2.840.10008.5.1.4.1.1.77.1	Yes	Yes	Yes

⁴ This class is only validated for viewing on IMPAX Client workstations for which the digital mammography feature is enabled with an appropriate license key.

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SOP Class Name	SOP Class UID	SCU	SCP	Display
VL Multi-frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.77.2	Yes	Yes	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	Yes	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	Yes	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	Yes	Yes
Structured Report Text Storage (Retired)	1.2.840.10008.5.1.4.1.1.88.1	Yes	Yes	No
Structured Report Audio Storage (Retired)	1.2.840.10008.5.1.4.1.1.88.2	Yes	Yes	No
Structured Report Detail Storage (Retired)	1.2.840.10008.5.1.4.1.1.88.3	Yes	Yes	No
Structured Report Comprehensive Storage (Retired)	1.2.840.10008.5.1.4.1.1.88.4	Yes	Yes	No
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes	No
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes	No
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes	No
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Yes	Yes	Option ⁵

2.2.1.4 Association Establishment Policies

2.2.1.4.1 General

The following Application Context Name will be proposed and recognized by IMPAX.

Table 2.2-4: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

IMPAX contains no limitations for maximum PDU size.

2.2.1.4.2 Number of Associations

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

2.2.1.4.3 Asynchronous Nature

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

⁵ Display of Mammography CAD SR markers available only for R2 and iCAD structured reports.

Table 2.2-5: Asynchronous Nature as an Association Initiator for IMPAX

Maximum number of outstanding asynchronous transactions	1
---	---

2.2.1.4.4 Implementation Identifying Information

IMPAX will respond with the implementation identifying parameters listed in the following table.

Table 2.2-6: DICOM implementation Class and Version for IMPAX

Implementation Class UID	1.2.124.113532.3510
Implementation Version Name	MITRAJUNE1997

2.2.1.4.5 Called/Calling Titles

The default calling title that IMPAX will use is the host name of the computer. This parameter can be configured via the IMPAX GUI. IMPAX is configured to validate the Called Title of the requesting SCU during association negotiation.

2.2.1.5 Association Initiation Policies

IMPAX initiates associations for the following real-world activities:

- Verify Communication
- Store Objects
- Request Storage Commitment
- Find Object
- Move Object
- Printing

2.2.1.5.1 Real World Activity – Verify Communication (SCU)

2.2.1.5.1.1 Description and Sequencing of Activity

IMPAX will issue Verification requests in response to UI mediated requests from the user to test the validity of a DICOM connection.

2.2.1.5.1.2 Proposed Presentation Contexts

For the real world activity of Verification, IMPAX requests the Presentation Contexts listed in Table 2.2-7.

Table 2.2-7: Presentation Contexts Proposed by IMPAX

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

2.2.1.5.1.3 SOP Specific Conformance – Verify Communication

IMPAX provides standard conformance to the DICOM Verification Service Class as an SCU.

2.2.1.5.2 Real World Activity – Store Objects (SCU)

2.2.1.5.2.1 Description and Sequencing of Activity

IMPAX will transmit images that have been sent to it previously, driven by user requests. An association is established when the user initiates a transmit request. IMPAX will establish an association automatically in response to a C-MOVE request, archive to PACS autopilot notification, or configured study routing rules.

2.2.1.5.2.2 Proposed Presentation Contexts

IMPAX may request any of the Presentation Contexts listed in Table 2.2-8 for Storage. IMPAX will propose the transfer syntax used when the object was initially accepted by the server and Implicit VR Little Endian.

Table 2.2-8: Presentation Contexts Proposed by IMPAX

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
All Table 2.2-3		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		RLE Lossless, PackBits	1.2.840.10008.1.2.5	SCU	None
		JPEG Process 1, baseline, lossy (8 bit)	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Process 2,4, extended lossy (12 bit)	1.2.840.10008.1.2.4.51	SCU	None
		JPEG Process 14, lossless	1.2.840.10008.1.2.4.57	SCU	See Note 1
		JPEG Process 14, selection value 1, lossless	1.2.840.10008.1.2.4.70	SCU	See Note 1

Note 1: IMPAX will not accept SOP Classes that could contain RGB data (Ultrasound, Visible Light, and Secondary Capture) if they are compressed using the lossless jpeg algorithm.

2.2.1.5.2.3 SOP Specific Conformance – Store Objects

IMPAX provides Standard conformance to the DICOM Storage Service Class as an SCU.

A successful C-Store response status will not generate any actions.

An unsuccessful C-Store response will generate a warning and the operation will remain in the Job Queue. The number of automated retry attempts and the time interval between each is

configurable for each remote AE. A warning status received in response to a C-Store operation will be treated in the same manner as an unsuccessful C-Store response.

2.2.1.5.3 Real World Activity – Request Storage Commitment (SCU)

2.2.1.5.3.1 Description and Sequencing of Activity

IMPAX stores images that are sent to it from an SCU. In some configurations IMPAX may send images to another SCP, such as a PACS, for permanent storage. The request for storage commitment may then be transmitted from IMPAX together with a list of references to one or more SOP instances. This action is invoked through the DIMSE N-ACTION primitive. The following message is supported:

- Request Storage Commitment - to request the safekeeping of a set of SOP instances

The following sequence diagram outlines the sequencing that IMPAX follows to support Storage Commitment.

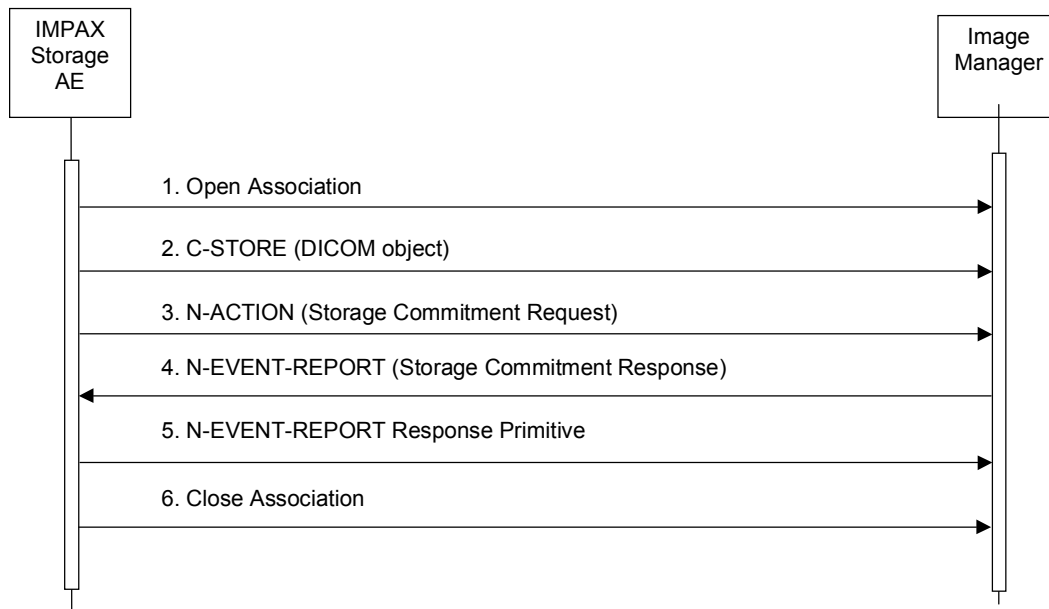


Figure 2.2-1: Storage Commitment Sequencing Diagram

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

2.2.1.5.3.2 Proposed Presentation Contexts

IMPAX may request any of the Presentation Contexts listed in Table 2.2-9 for Storage Commitment.

Table 2.2-9: Presentation Contexts Proposed by IMPAX

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

2.2.1.5.3.3 SOP Specific Conformance – Request Storage Commitment

IMPAX provides partial conformance to the DICOM Storage Commitment Service Class as an SCU. The Action Type and Action Information specified in Table 2.2-10 are supported. IMPAX does not support explicit role negotiation.

Table 2.2-10: Storage Commitment Request – Action Information

Action Type Name	Action Type ID	Attribute Name	Tag
Request Storage Commitment	1	Transaction UID	(0008,1195)
		Referenced SOP Sequence	(0008,1199)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
		Referenced Study Component Sequence	(0008,1111)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)

- IMPAX will generate an N-ACTION primitive if the local configuration setting for the remote AE is enabled for storage commitment. IMPAX only supports the Storage AE as the destination for the storage commitment N-Action.
- IMPAX may request storage commitment for all the SOP Class UIDs listed in Table 2.2-3.
- IMPAX supports the Referenced Study Component Sequence Attribute.
- IMPAX will keep the Transaction ID applicable indefinitely.
- IMPAX does not support the optional Storage Media File-Set ID and UID Attributes in the N-Action.
- IMPAX only sends the storage commitment request to the same remote AE as the storage request was sent.
- IMPAX will respond to an N-EVENT-REPORT with an N-EVENT-REPORT response primitive using one of the status codes listed in Table 2.2-11:

Table 2.2-11: Storage Commitment Status Codes

Service Status	Further Meaning	Protocol Codes	Related Fields	Description
Success	Success	0000		Successful notification

2.2.1.5.4 Real World Activity – Find Object (SCU)

2.2.1.5.4.1 Description and Sequencing of Activity

IMPAX will negotiate Find requests to an SCP. IMPAX can query a remote AE for composite objects to the Study Level. An association is established when the user initiates a query from the graphical user interface. IMPAX will establish an association automatically to query a remote AE to obtain a list of relevant objects based on the configured prefetching rules.

2.2.1.5.4.2 Proposed Presentation Contexts

IMPAX will initiate any of the Presentation Contexts listed in Table 2.2-12 for Query. IMPAX will initiate one Find Presentation Context per association request. Any one Abstract Syntax may be specified more than once in an association request, if the Transfer Syntaxes differ between the Presentation Contexts.

Table 2.2-12: Presentation Contexts Proposed by IMPAX

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root Query/Retrieve IM Find	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	See Note 1
Study Root Query/Retrieve IM Find	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	See Note 1
Patient/Study Only Query/Retrieve IM Find	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	See Note 1

Note 1: C-Find Extended Negotiation will be supported. IMPAX will respond with the information in Table 2.2-13:

Table 2.2-13: FIND Extended Negotiation

Field Name	Value	Description of Field
Relational-queries	1	Relational queries supported.

2.2.1.5.4.3 SOP Specific Conformance – Find Object

IMPAX provides standard conformance to the DICOM Query/Retrieve Service Class as an SCU. The Query/Retrieve Information Model used depends on the attributes used to constrain the query.

IMPAX supports the Relational-queries extended SCU behavior for the Patient Root Query, Study Root Query, and Patient/Study Only Query/Retrieve.

IMPAX may request any mandatory search keys during a relational query. Tables 2.2-14 to 2.2-17 describe the search keys for the four levels of query that IMPAX requests.

Table 2.2-14: Patient Level Attributes

Description	Tag
Patient Name	(0x0010, 0x0010)
Patient ID	(0x0010, 0x0020)

Table 2.2-15: Study Level Attributes

Description	Tag
Study Instance UID	(0x0020, 0x000D)
Study ID	(0x0020, 0x0010)
Study Date	(0x0008, 0x0020)
Study Time	(0x0008, 0x0010)
Accession Number	(0x0008, 0x0050)

Table 2.2-16: Series Level Attributes

Description	Tag
Series Instance UID	(0x0020, 0x000E)
Series Number	(0x0020, 0x0011)
Modality	(0x0008, 0x0060)
Station Name	(0x0008, 0x1010)

Table 2.2-17: Image Level Attributes

Description	Tag
SOP Instance UID	(0x0008, 0x0018)
Image Number	(0x0020, 0x0013)

IMPAX automatically adds a wildcard "*" to matching keys with a VR of PN. The user is not required to add one manually.

The following matching keys are available from the User Interface within IMPAX during a relational query:

- patient_id
- patient_name
- accession_number
- patient_location
- referring_physician
- modality

A user can also query using time constraints through the User Interface.

No matching keys are available during a hierarchical query.

Within the application, the exact Patient ID has to be entered in the patient_id field.

Within the application, IMPAX also has a facility to carry out extensive custom queries. These are not DICOM queries and are to be used only when querying within the cluster.

2.2.1.5.5 Real World Activity – Move Object (SCU)

2.2.1.5.5.1 Description and Sequencing of Activity

IMPAX can retrieve composite objects from a remote AE. An association is established when the user initiates a query from the graphical user interface. IMPAX will establish an association automatically to retrieve objects that were archived to the remote AE or to pre-fetch relevant objects from the remote AE based on configured prefetching rules.

2.2.1.5.5.2 Proposed Presentation Contexts

IMPAX will initiate any of the Presentation Contexts listed in Table 2.2-18 for Move. IMPAX will accept any number of Move Presentation Contexts per association request. Any one Abstract Syntax may be specified more than once in an association request, if the Transfer Syntaxes differ between the Presentation Contexts.

Table 2.2-18: Presentation Contexts Proposed by IMPAX

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root Query/Retrieve IM Move	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Study Root Query/Retrieve IM Move	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Patient/Study Only Query/Retrieve IM Move	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.1.5.5.3 SOP Specific Conformance – Move Object

IMPAX provides standard conformance to the DICOM Query/Retrieve Service Class as an SCU. IMPAX supports the Relational-retrieve extended SCU behavior.

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

2.2.1.5.6 Real World Activity – Printing (SCU)

2.2.1.5.6.1 Description and Sequencing of Activity

IMPAX issues print requests based on user interface mediated requests. When true size printing is enabled, a border-only (non-filled) white circle with 2cm diameter with the text '2 cm' centered inside is added to the printout. For Non-MG true size images, the indicator should appear at the left for portrait and at the top for landscape mode prints. For MG true size images, if the orientation is 'Posterior', then the true size indicator should appear at the left; if the orientation is 'Anterior', the true size indicator should appear at the right.

2.2.1.5.6.2 Proposed Presentation Contexts

IMPAX may request any of the Presentation Contexts listed in Table 2.2-29 for Print Management.

Table 2.2-29: Presentation Contexts Proposed by IMPAX

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.1.5.6.3 SOP Specific Conformance – Printing

IMPAX provides standard conformance to the DICOM Print Service Classes by supporting a number of distinct Service Classes described in the following subsections.

2.2.1.5.6.3.1 SOP Specific Conformance – Basic Film Session

IMPAX requests the following attributes of the Basic Film Session SOP Class. Values and ranges are configured to match the capabilities of the printer, and the preferences of the particular user.

Table 2.2-30: Attributes for a Basic Film Session

Attribute Name	Tag	Comments
Manufacturer	(0008,0070)	
Manufacturer's model name	(0008,1090)	
Number of Copies	(2000,0010)	1
Print Priority	(2000,0020)	MED
Medium Type	(2000,0030)	BLUE FILM; CLEAR FILM, PAPER
Film Destination	(2000,0040)	
Film Session Label	(2000,0050)	
Printer Name	(2110,0030)	

2.2.1.5.6.3.2 SOP Specific Conformance – Basic Film Box

IMPAX requests the following attributes of the Basic Film Box SOP Class. Values and ranges are configured to match the capabilities of the printer, and the preferences of the particular user. When images are positioned on a film box with empty boxes in between the images, IMPAX will ignore these empty film boxes and print them immediately beside one another.

Table 2.2-31: Attributes for a Basic Film Box

Attribute Name	Tag	Comments
Image Display Format	(2010,0010)	STANDARD\C,R
Annotation Display Format ID	(2010,0030)	It is not sent if file printer-config.<AETitle> containing NOFORMAT= is present in mvf/etc
Film Orientation	(2010,0040)	
Film Size ID	(2010,0050)	
Magnification Type	(2010,0060)	
Smoothing Type	(2010,0080)	
Border Density	(2010,0100)	
Empty Image Density	(2010,0110)	
Min Density	(2010,0120)	
Max Density	(2010,0130)	
Trim	(2010,0140)	
Configuration Information	(2010,0150)	Will be populated with the lookup table configured in the 'LUTs' tab of the Presets when checkbox 'Use Custom Configuration String' is flagged
Referenced Film session Sequence	(2010,0500)	

2.2.1.5.6.3.3 SOP Specific Conformance – Basic Grayscale Image Box

IMPAX requests the following attributes of the Basic Grayscale Image Box SOP Class. Values and ranges depend on the characteristics of the images stored in IMPAX.

Table 2.2-32: Attributes for a Basic Grayscale Image Box

Attribute Name	Tag	Comments
Magnification Type	(2010,0060)	
Smoothing Type	(2010,0080)	
Image Position	(2020,0010)	
Polarity	(2020,0020)	
Requested Image Size	(2020,0030)	This tag is only sent if: <ul style="list-style-type: none"> - True size is selected in the 'Magnification' tab of the Print Presets - Normal Print Mode is used. Remark: It only works when attributes Imager Pixel Spacing (0018,1164) or Pixel Spacing (0028,0030) are present in the Dicom header of the image. If above attributes are missing the film is not printed
Preformatted Grayscale Image Sequence	(2020,0110)	
> Samples Per Pixel	(0028,0002)	
> Photometric Interpretation	(0028,0004)	MONOCHROME1 MONOCHROME2
> Rows	(0028,0010)	Limited to 4096 in normal print mode
> Columns	(0028,0011)	Limited to 4096 in normal print mode
> Pixel Aspect Ratio	(0028,0034)	
> Bits Allocated	(0028,0100)	
> Bits Stored	(0028,0101)	
> High Bit	(0028,0102)	
> Pixel Representation	(0028,0103)	
> Pixel Data	(7FE0,0010)	

2.2.1.5.6.3.4 SOP Specific Conformance – Basic Color Image Box

IMPAX requests the following attributes of the Basic Color Image Box SOP Class. Values and ranges depend on the characteristics of the images stored in IMPAX.

Table 2.2-33: Attributes for a Basic Color Image Box

Attribute Name	Tag	Comments
Magnification Type	(2010,0060)	
Smoothing Type	(2010,0080)	
Image Position	(2020,0010)	
Requested Image Size	(2020,0030)	This tag is only sent if: <ul style="list-style-type: none"> - True size is selected in the 'Magnification' tab of the Presets - Normal Print Mode is used. Remark: It only works when attributes Imager Pixel Spacing (0018,1164) or Pixel Spacing (0028,0030) are present in the Dicom header of the image. If above attributes are missing the film is not printed
Preformatted Color Image Sequence	(2020,0111)	
> Samples Per Pixel	(0028,0002)	3
> Photometric Interpretation	(0028,0004)	RGB
> Planar Configuration	(0028,0006)	1
> Rows	(0028,0010)	
> Columns	(0028,0011)	
> Pixel Aspect Ratio	(0028,0034)	
> Bits Allocated	(0028,0100)	8
> Bits Stored	(0028,0101)	8
> High Bit	(0028,0102)	7
> Pixel Representation	(0028,0103)	
> Pixel Data	(7FE0,0010)	

2.2.1.5.6.3.5 SOP Specific Conformance – Basic Annotation Box

IMPAX requests the following attributes of the Basic Annotation Box SOP Class.

Table 2.2-34: Attributes for a Basic Annotation Box

Attribute Name	Tag
Annotation Position	(2030,0010)
Text String	(2030,0020)

2.2.1.5.6.3.6 SOP Specific Conformance – Printer

IMPAX requests the following attributes of the Printer SOP Class.

Table 2.2-35: Attributes for a Printer

Attribute Name	Tag
Printer Status	(2110,0010)
Printer Status Info	(2110,0020)
Printer Name	(2110,0030)
Manufacturer	(0008,0070)
Manufacturer Model Name	(0008,1090)

2.2.1.6 Association Acceptance Policies

IMPAX accepts associations for the following real world activities:

- Verify Communication
- Store Objects
- Request Storage Commitment
- Find Object
- Move Object

Association requests from unknown Application Entities will be rejected by IMPAX.

2.2.1.6.1 Real World Activity – Verify Communication (SCP)

2.2.1.6.1.1 Description and Sequencing of Activity

IMPAX will respond to Verification requests to provide an SCU with the ability to determine if IMPAX is receiving DICOM requests.

2.2.1.6.1.2 Accepted Presentation Contexts

IMPAX will accept any of the Presentation Contexts listed in Table 2.2-36 for Verification.

Table 2.2-36: Presentation Contexts Accepted by IMPAX

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

2.2.1.6.1.3 SOP Specific Conformance - Verify Communication

IMPAX provides standard conformance to the DICOM Verification Service Class as an SCU. IMPAX returns one of the following status codes.

Table 2.2-37: Verification Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Operation performed properly.

2.2.1.6.1.4 Presentation Context Acceptance Criterion – Verify Communication

IMPAX will always accept a Presentation Context for the Verification SOP Class with the default DICOM transfer syntax listed in Table 2.2-36.

2.2.1.6.1.5 Transfer Syntax Selection Policies - Verify Communication

Since no DICOM data object is associated with a Verification command, only the default DICOM transfer syntax is required / supported.

2.2.1.6.2 Real World Activity – Store Object (SCP)

2.2.1.6.2.1 Description and Sequencing of Activity

IMPAX will store images that are sent to it from an SCU. All images received by IMPAX can be retrieved at a later time from IMPAX; however, the rate of return of the images will vary depending on the state of the images. The images can be in one of three states, as listed in Table 2.2-38.

Table 2.2-38: Image States

Image State	Description
Online	The image is immediately available.
Nearline	The image is automatically available. However, there may be a small delay in retrieval time.
Offline	The image requires manual assistance to become online. The retrieval request will return a failure code.

2.2.1.6.2.2 Accepted Presentation Contexts

IMPAX will accept any of the Presentation Contexts listed in Table 2.2-39 for Storage.

Table 2.2-39: Presentation Contexts Accepted by IMPAX

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
All Table 2.2-3		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	See Note 1
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	See Note 1
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	See Note 1
		RLE Lossless, PackBits	1.2.840.10008.1.2.5	SCP	See Note 1
		JPEG Process 1, baseline, lossy (8 bit)	1.2.840.10008.1.2.4.50	SCP	See Note 1
		JPEG Process 2,4, extended lossy (12 bit)	1.2.840.10008.1.2.4.51	SCP	See Note 1
		JPEG Process 14, lossless	1.2.840.10008.1.2.4.57	SCP	See Notes 1 and 2
		JPEG Process 14, selection value 1, lossless	1.2.840.10008.1.2.4.70	SCP	See Notes 1 and 2

Note 1: IMPAX supports Extended Negotiations for the Storage Service Class. IMPAX will respond with the following information:

Table 2.2-40: Storage Extended Negotiation

Field Name	Value	Description of Field
Level of Support	2	Level 2 (FULL) SCP
Element Coercion	0	Does not coerce any element

Note 2: IMPAX will not accept SOP Classes that could contain RGB data (Ultrasound, Visible Light, and Secondary Capture) if they are compressed using the lossless jpeg algorithm.

2.2.1.6.2.3 SOP Specific Conformance - Store Object

IMPAX conforms to the DICOM Storage Service Class as a Level 2 (Full) SCP. No elements are discarded or coerced by IMPAX. All Type 1, Type 2 and Type 3 attributes will be retained. Private attributes will be stored and included when the object is sent out again. IMPAX can decompress lossy compressed images and send them in uncompressed format. The Attribute Lossy Image Compression (0028,2110) remains "01".

Upon successful storage of objects contained within a study the study can be automatically transferred to a remote AE or returned in response to a retrieval request. IMPAX can be configured to automatically archive or delete objects contained within a study. Studies may be manually transferred, archived or deleted through the graphical user interface.

When an object is received that has a SOP Instance UID (0008,0018), Study Instance UID (0020,000D) and Series Instance UID (0020,000E) of an object that is already present on IMPAX the existing object will be overwritten. When an object is received that has a SOP Instance UID but different Study Instance UID and Series Instance UID of an object that is already present on IMPAX, the new object will be assigned a new SOP Instance UID by IMPAX.

IMPAX can be configured to lock an existing study after it has been marked as READ. IMPAX will not accept new objects and return an Error status.

IMPAX will return the C-STORE status codes shown in Table 2.2-41.

Table 2.2-41: Verification Response Status

Service Status	Further Meaning	Error Code	Reason
Refused	Out of resources	A700	Indicates that there was not enough storage space to store the image. Recovery from this condition is left to the administrative functions.
	SOP Class not supported	A800	Indicates that the SOP Class of the Image in the C-STORE operation did not match the Abstract Syntax negotiated for the Presentation Context.
Error	Data set does not match SOP Class	A900	Indicates that the Data Set does not encode an instance of the SOP Class specified.
	Failed	C000	The operation was not successful.
	Unable to register object, study locked; no new objects allowed	C005	Indicates that no new objects can be added to this study because it has been locked.
	Cannot understand	C005	Indicates that the Data Set cannot be parsed into elements.
Warning	Data set does not match SOP Class	B007	Indicates that the Data Set does not match the SOP Class, but that the image was stored anyway.
	Duplicate SOP Instance UID	D000	Indicates that the SOP Instance UID of the specified image is already stored in the database.
Success	Success	0000	Operation performed properly.

If HIS Verification is enabled, IMPAX may issue a Modality Worklist Query and modify the values of certain Attributes to match the values maintained by the HIS/RIS. IMPAX will issue a Modality Worklist Query and modify the values.

2.2.1.6.2.4 Presentation Context Acceptance Criterion – Store Object

IMPAX will accept any number of Storage Presentation Contexts per association request. Any one Abstract Syntax may be specified more than once in an association request, if the Transfer Syntaxes differ between the Presentation Contexts.

2.2.1.6.2.5 Transfer Syntax Selection Policies - Store Object

IMPAX supports all transfer syntaxes listed in Table 2.2-38. By default, IMPAX will choose a transfer syntax other than Implicit VR Little Endian if more than one is requested in a single Presentation Context. IMPAX will prefer a compressed Transfer Syntax over an uncompressed Transfer Syntax. Lossless Compression is preferred over Lossy Compression and Explicit VR Little Endian is preferred over Implicit VR Little Endian.

IMPAX can be configured on a per-source basis to accept only Implicit VR Little Endian.

2.2.1.6.3 Real World Activity – Request Storage Commitment (SCP)

2.2.1.6.3.1 Description and Sequencing of Activity

IMPAX stores images that are sent to it from an SCU. The request for storage commitment may then be transmitted to IMPAX together with a list of references to one or more SOP instances. IMPAX will receive and respond to DIMSE N-ACTION. The following message is supported:

- Request Storage Commitment - to request the safekeeping of a set of SOP instances

2.2.1.6.3.2 Accepted Presentation Contexts

IMPAX will accept any of the Presentation Contexts listed in Table 2.2-42 for Verification.

Table 2.2-42: Presentation Contexts Accepted by IMPAX

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

2.2.1.6.3.3 SOP Specific Conformance - Request Storage Commitment

IMPAX provides partial conformance to the DICOM **Storage Commitment** Service Class as an SCP. IMPAX supports the elements listed in Table 2.2-43 for this SOP class. IMPAX does not support explicit role negotiation.

Table 2.2-43: Storage Commitment Request – Action Information

Action Type Name	Action Type ID	Attribute Name	Tag
Request Storage Commitment	1	Transaction UID	(0008,1195)
		Referenced SOP Sequence	(0008,1199)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
		Referenced Study Component Sequence	(0008,1111)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)

IMPAX will store SOP Instances indefinitely unless the instances are manually deleted by a user with appropriate system permissions. The capacity is limited only by the availability of archive storage and volatility is dependent on the archive medium used. IMPAX will stop accepting new objects for storage to ensure the availability of objects for which a successful storage commitment response has been sent.

IMPAX can be configured not to archive objects received from a remote AE. A successful storage commitment request will be returned to the remote AE, however the persistence of storage will be dependent on the amount of storage capacity available on IMPAX and disk management configuration settings of the system.

IMPAX does not support the optional Storage Media and File-Set ID and UID Attributes in the N-ACTION. IMPAX supports the Action Type and Action Information shown in Table 2.2-44.

Table 2.2-44: Storage Commitment Request – Action Information

Action Type Name	Action Type ID	Attribute	Tag
Request Storage Commitment	1	Transaction UID	(0008,1195)
		Referenced SOP Sequence	(0008,1199)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
		Referenced Study Component Sequence	(0008,1111)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)

2.2.1.6.3.4 Storage Commitment Result

If IMPAX determines that it has successfully completed storage commitment, IMPAX issues an N-EVENT-REPORT to the SCU including references to the successfully stored SOP Instances contained in the N-ACTION.

In the event that IMPAX cannot commit to storing SOP Instances, IMPAX issues an N-EVENT-REPORT to the SCU including references to the failed SOP Instances contained in the N-ACTION.

The N-EVENT-REPORT contains the Transaction UID value contained in the initiating N-ACTION. The N-EVENT-REPORT is sent on a separate association from the N-ACTION operation.

IMPAX supports the Event Information as specified in Table 2.2-45. IMPAX does not support the optional Storage Media and File-Set ID and UID or Retrieve AE Title (0008,0054) Attributes in the N-EVENT-REPORT.

Table 2.2-45: Storage Commitment Result – Event Information

Action Type Name	Event Type ID	Attribute Name	Tag
Storage Commitment Request Successful	1	Transaction UID	(0008,1195)
		Referenced SOP Sequence	(0008,1199)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
		Referenced Study Component Sequence	(0008,1111)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
Storage Commitment Request Complete-Failures Exist	2	Transaction UID	(0008,1195)
		Referenced SOP Sequence	(0008,1199)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
		Failed SOP Sequence	(0008,1198)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
	>Failure Reason	(0008,1197)	

2.2.1.6.3.5 Operations – Storage Commitment

If configured with offline storage IMPAX commits to permanently storing a SOP Instance, unless it is manually deleted from IMPAX. Offline storage capacity varies based on an individual IMPAX's configuration.

In a cache-only configuration, IMPAX commits to storing a SOP Instance as long as there is available disk space. In this configuration, IMPAX may delete SOP Instances based on a user request or based on autopilot cache management rules.

SOP Instances can be retrieved from IMPAX using C-FIND and C-MOVE.

2.2.1.6.4 Real World Activity - Find Object (SCP)

2.2.1.6.4.1 Description and Sequencing of Activity

IMPAX will respond to query requests that are sent to it by an SCU. The latency for retrieval of SOP Instances is dependent on the object state, as specified in Table 2.2-46.

Table 2.2-46: Image States

Image State	Description
Online	The image is immediately available.
Nearline	The image is automatically available. However, there may be a small delay in retrieval time.
Offline	The image requires manual assistance to become online. The retrieval request will return a failure code.

IMPAX can be configured to return results for objects with an ONLINE state only or for all objects regardless of state.

2.2.1.6.4.2 Accepted Presentation Contexts

IMPAX will accept any of the Presentation Contexts listed in Table 2.2-47 for Query.

Table 2.2-47: Presentation Contexts Accepted by IMPAX

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root Query/Retrieve IM Find	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	See Note 1
Study Root Query/Retrieve IM Find	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	See Note 1
Patient/Study Only Query/Retrieve IM Find	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	See Note 1

Note 1: C-Find Extended Negotiation will be supported. IMPAX will respond with the information in Table 2.2-48.

Table 2.2-48: FIND Extended Negotiation

Field Name	Value	Description of Field
Relational-queries	1	Relational queries supported.

2.2.1.6.4.3 SOP Specific Conformance – Find Object

IMPAX provides standard conformance to the DICOM Query/Retrieve Service Class as an SCP.

IMPAX supports the Relational-queries extended SCP behavior. IMPAX supports all mandatory Unique and Required Matching Keys. Case-insensitive matching for PN VR attributes is supported.

IMPAX provides support for the Instance Availability (0008,0056) Data Element.

IMPAX supports hierarchical queries. IMPAX supports relational queries.

Table 2.2-49: Patient Level Attributes

Description	Tag
Patient Name	(0x0010, 0x0010)
Patient ID	(0x0010, 0x0020)

Table 2.2-50: Study Level Attributes

Description	Tag
Study Instance UID	(0x0020, 0x000D)
Study ID	(0x0020, 0x0010)
Study Date	(0x0008, 0x0020)
Study Time	(0x0008, 0x0010)
Accession Number	(0x0008, 0x0050)

Table 2.2-51: Series Level Attributes

Description	Tag
Series Instance UID	(0x0020, 0x000E)
Series Number	(0x0020, 0x0011)
Modality	(0x0008, 0x0060)
Station Name	(0x0008, 0x1010)

Table 2.2-52: Image Level Attributes

Description	Tag
SOP Instance UID	(0x0008, 0x0018)
Image Number	(0x0020, 0x0013)

IMPAX returns one of the following status codes to a C-FIND request.

Table 2.2-53: C-FIND Status Codes

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

Service Status	Further Meaning	Protocol Codes	Description
Pending	Pending	FF00	All Optional Keys are supported in the same manner as Required Keys.
	Pending	FF01	The matching operation is continuing. Warning that one or more Optional Keys were not supported in the same manner as Required Keys.
Success	Success	0000	Operation performed properly.

2.2.1.6.4.4 Presentation Context Acceptance Criterion – Find Object

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

2.2.1.6.4.5 Transfer Syntax Selection Policies – Find Object

IMPAX currently only supports the default transfer syntax of Implicit VR Little Endian.

2.2.1.6.5 Real World Activity - Move Object (SCP)

2.2.1.6.5.1 Description and Sequencing of Activity

IMPAX will respond to retrieve requests that are sent to it by an SCU.

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

2.2.1.6.5.2 Accepted Presentation Contexts

IMPAX will accept any of the Presentation Contexts listed in Table 2.2-54 for Query.

Table 2.2-54: Presentation Contexts Accepted by IMPAX

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root Query/Retrieve IM Move	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query/Retrieve IM Move	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Patient/Study Only Query/Retrieve IM Move	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

2.2.1.6.5.3 SOP Specific Conformance - Move Object

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

IMPAX returns one of the following status codes to a C-MOVE request.

Table 2.2-55: C-MOVE Status Codes

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

2.2.1.6.5.4 Presentation Context Acceptance Criterion – Move Object

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

2.2.1.6.5.5 Transfer Syntax Selection Policies - Move Object

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

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

2.3 Network Interfaces

IMPAX provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8 of the DICOM Standard. IMPAX inherits its TCP/IP stack from the computer system upon which it executes.

2.3.1 Physical Medium Support

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

2.4 Configuration

Any IMPAX Configuration that affects DICOM conformance is described in this section.

2.4.1 AE Title/ Presentation Mapping

The translation from Application Entity Title to Presentation Address is stored in the database. Along with this mapping, the database stores those AE titles that are allowed to communicate with IMPAX.

2.4.2 Configuration Parameters

Table 2.4-1: Configuration Parameter Table

Parameter	Description	Configurable (Yes/No)	Default Value
AE Specific Parameters			
Number of Simultaneous Associations	Maximum number of simultaneous associations accepted by IMPAX. Limited to 15 characters.	Yes	32
Calling Title	Calling title that IMPAX will use.	Yes	Hostname of computer
Port	Listening port used by the remote AE users to accept DICOM communications.	Yes	
Packet Size	The maximum size in bytes of the packet used to communicate with the remote AE.	Yes	
Read Timeout	How long a communication pause is tolerated before the connection is reset.	Yes	
Connect Timeout	How long IMPAX waits for a response when trying to establish communication with a remote AE.	Yes	

3 SUPPORT FOR EXTENDED CHARACTER SETS

IMPAX supports the following character sets:

Table 3-1: Extended Character Sets

• ISO-IR 6 (default)	Basic G0 Set
• ISO-IR 100	Latin Alphabet No. 1

4 SECURITY

4.1 Security Profile

IMPAX ES Release 5.2.x & 5.3.x does not implement any DICOM security profiles from PS 3.15.

4.2 Association Level Security

IMPAX ES Release 5.2.x & 5.3.x association level security by restricting acceptance to association requests only from DICOM AEs configured in IMPAX ES Release 5.2.x & 5.3.x. Association requests from unknown DICOM AEs will be rejected.

4.3 Application Level Security

Service Tools running at IMPAX requires a valid user name and password pair to login.

5 ANNEXES

5.1 Data dictionary of private attributes

Table 5-1 lists all the private attributes created by the IMPAX.

Disclaimer: These private attributes may be deprecated or replaced with standard DICOM SOP Classes or standard DICOM attributes in the future.

Table 5-1 Data Dictionary of Private Attributes

Attribute Name	DICOM Tag	DICOM VR	DICOM VM	DICOM Private Creator
IMPAX object document	(0029,xx00)	OB	1	Mitra Object Document 1.0
Markup1	(0029,xx00)	OB	1-n	Mitra Markup 1.0
Markup2	(0029,xx01)	OB	1-n	Mitra Markup 1.0
Markup3	(0029,xx02)	OB	1-n	Mitra Markup 1.0
Markup4	(0029,xx03)	OB	1-n	Mitra Markup 1.0
Markup5	(0029,xx04)	OB	1-n	Mitra Markup 1.0
Markup6	(0029,xx05)	OB	1-n	Mitra Markup 1.0
Markup7	(0029,xx06)	OB	1-n	Mitra Markup 1.0
Markup8	(0029,xx07)	OB	1-n	Mitra Markup 1.0
Markup9	(0029,xx08)	OB	1-n	Mitra Markup 1.0
Markup10	(0029,xx09)	OB	1-n	Mitra Markup 1.0
Markup11	(0029,xx10)	OB	1-n	Mitra Markup 1.0
Markup12	(0029,xx11)	OB	1-n	Mitra Markup 1.0
Markup13	(0029,xx12)	OB	1-n	Mitra Markup 1.0
Markup14	(0029,xx13)	OB	1-n	Mitra Markup 1.0
Markup15	(0029,xx14)	OB	1-n	Mitra Markup 1.0
Mitra Rotation	(0029,xx00)	CS	1	Mitra Presentation 1.0
Mitra Window Width	(0029,xx01)	LO	1	Mitra Presentation 1.0
Mitra Window Centre	(0029,xx02)	LO	1	Mitra Presentation 1.0
Mitra Invert	(0029,xx03)	IS	1	Mitra Presentation 1.0
Mitra Has Tabstop	(0029,xx04)	IS	1	Mitra Presentation 1.0
Mitra Smooth Rotation	(0029,xx05)	CS	1	Mitra Presentation 1.0

The supported markup types include text, arrow, caliper, region, ellipse, freeform, thick_arrow, line_arrow, profile, rectangle, angle and ratio_caliper.

5.2 Standard extended/specialized/private sop classes

None

5.3 Private Transfer Syntaxes

None



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