AGFA HEALTHCARE
DICOM Conformance Statement

IMPAX 6.5 Solution

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AGFA HealthCare

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Conformance Statement Overview

The IMPAX 6.5 Solution is comprised of a storage facility, client review workstations and connectivity to DICOM modalities and other healthcare information systems. The IMPAX 6.5 Solution is comprised of two application entities (AE), a PACS application entity and an Integration Services application entity.

The Integration Services application entity (AE) described in this document are handled by the Connectivity Manager component.

The IMPAX 6.5 Solution:

- stores images sent to it by service class users;
- takes responsibility for storage of the images;
- allows image queries based on several standard query models;
- retrieves and transmits requested images;
- displays images to a user;
- stores, creates and displays color or grayscale softcopy presentation state objects;
- prints images to a printer;
- imports and exports images from portable interchange media;
- uses patient and order information to fulfill modality worklist requests;
- and receives and forwards modality performed procedure step information.

The IMPAX 6.5 Solution 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.

The IMPAX 6.5 Solution conforms to the DICOM 3.0 2009 standard.

The IMPAX 6.5 Solution provides Standard Conformance to the SOP Classes listed in Table 1.1-1. This table lists the Network Services Supported as they appear in DICOM Part 2, 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 the PACS AE.

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 graphical user interface will display the DICOM objects. In some cases only storage of the object may be provided by the IMPAX 6.5 Solution.

Table 1.1-1 : Network Services Supported

SOP Class Name	User of Service (SCU)	Provider of Service (SCP)	Display
Verification			
Verification	Optional	Yes	N/A
Transfer			
Computed Radiography Image Storage	Yes	Yes	Yes
Digital X-Ray Image Storage – For Presentation	Yes	Yes	Yes
12 lead ECG Waveform Storage	Yes	Yes	No
Ambulatory ECG Waveform Storage	Yes	Yes	No

SOP Class Name	User of Service (SCU)	Provider of Service (SCP)	Display
Basic Text SR	Yes	Yes	Yes[1]
Basic Voice Audio Waveform Storage	Yes	Yes	No
Cardiac Electrophysiology Waveform Storage	Yes	Yes	No
Chest CAD SR Storage	Yes	Yes	No
Color Softcopy Presentation State Storage SOP Class	Yes	Yes	Yes
Comprehensive SR	Yes	Yes	No
CT Image Storage	Yes	Yes	Yes
Digital X-Ray Image Storage – For Processing	Yes	Yes	No
Digital Mammography X-Ray Image Storage – For Presentation[2]	Yes	Yes	Option[2]
Digital Mammography X-Ray Image Storage – For Processing	Yes	Yes	No
Digital Intra-oral X-Ray Image Storage – For Presentation	Yes	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	Yes	Yes	No
Encapsulated PDF Storage	Yes	Yes	No
Enhanced SR	Yes	Yes	No
Enhanced XRF Image Storage	Yes	Yes	No
Enhanced XA Image Storage	Yes	Yes	No
GE Private 3D Model Storage	Yes	Yes	No
GE Private PET Raw Data Storage	Yes	Yes	No
General ECG Waveform Storage	Yes	Yes	No
Grayscale Softcopy Presentation State Storage SOP Class	Yes	Yes	Yes
Hemodynamic Waveform Storage	Yes	Yes	No
Key Object Selection Document Storage	Yes	Yes	Yes
Mammography CAD SR	Yes	Yes	Option[3]
MR Image Storage	Yes	Yes	Yes
MR Spectroscopy Storage	Yes	Yes	No
Multi-frame Grayscale Bit SC Storage	Yes	Yes	No
Multi-frame Grayscale Byte SC Storage	Yes	Yes	Yes
Multi-frame Grayscale Word SC Storage	Yes	Yes	Yes
Multi-frame True Color SC Storage	Yes	Yes	Yes
Nuclear Medicine Image Storage	Yes	Yes	Yes
Nuclear Medicine Image Storage (Retired)	Yes	Yes	Yes
Ophthalmic Photography 8 Bit Image Storage	Yes	Yes	No
Ophthalmic Photography 16 Bit Image Storage	Yes	Yes	No
Philips 3D Private Presentation State Storage	Yes	Yes	No
Philips Private MR Examcard Data Storage	Yes	Yes	No
Philips Private MR Series Data Storage	Yes	Yes	No

[1] Display for this class is limited to those created by the Agfa Connectivity Manager.

[2] This class is only validated for viewing on The PACS AE Client workstations for which the digital mammography feature is enabled with an appropriate license key.

[3] Display of Mammography CAD SR markers available only for Hologic (R2), iCAD and Siemens structured reports.

SOP Class Name	User of Service (SCU)	Provider of Service (SCP)	Display
Philips Private MR Spectrum Storage	Yes	Yes	No
Positron Emission Tomography Image Storage	Yes	Yes	Yes
Raw Data Storage	Yes	Yes	No
RT Beams Treatment Record Storage	Yes	Yes	No
RT Brachy Treatment Storage	Yes	Yes	No
RT Dose Storage	Yes	Yes	No
RT Image Storage	Yes	Yes	No
RT Plan Storage	Yes	Yes	No
RT Structure Set Storage	Yes	Yes	No
RT Treatment Summary Record Storage	Yes	Yes	No
Siemens Private CSA Non-image Storage	Yes	Yes	No
Secondary Capture Image Storage	Yes	Yes	Yes
Spatial Registration Storage	Yes	Yes	No
Spatial Fiducials Storage	Yes	Yes	No
Standalone Curve Storage	Yes	Yes	No
Standalone Modality LUT Storage	Yes	Yes	Yes
Standalone Overlay Storage	Yes	Yes	Yes
Standalone PET Curve Storage	Yes	Yes	No
Standalone VOI LUT Storage	Yes	Yes	Yes
Stereo-metric Relationship Storage	Yes	Yes	No
Structured Report Audio Storage (Retired)	Yes	Yes	No
Structured Report Comprehensive Storage (Retired)	Yes	Yes	No
Structured Report Detail Storage (Retired)	Yes	Yes	No
Structured Report Text Storage (Retired)	Yes	Yes	No
Ultrasound Multi-frame Image Storage (Retired)	Yes	Yes	Yes
Ultrasound Multi-frame Image Storage	Yes	Yes	Yes
Ultrasound Image Storage (Retired)	Yes	Yes	Yes
Ultrasound Image Storage	Yes	Yes	Yes
Video Endoscopic Image Storage	Yes	Yes	No
Video Microscopic Image Storage	Yes	Yes	No
Video Photographic Image Storage	Yes	Yes	No
VL Endoscopic Image Storage	Yes	Yes	Yes
VL Image Storage (Retired)	Yes	Yes	Yes
VL Microscopic Image Storage	Yes	Yes	Yes
VL Multi-frame Image Storage (Retired)	Yes	Yes	Yes
VL Photographic Image Storage	Yes	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	Yes	Yes	Yes
X-Ray Angiographic Image Storage	Yes	Yes	Yes
X-Ray Radiation Dose SR Storage	Yes	Yes	No
X-Ray Radiofluoroscopic Image Storage	Yes	Yes	Yes
X-Ray Angiographic Bi-plane Image Storage (Retired)	Yes	Yes	Yes
Query/Retrieve			
Patient Root Query/Retrieve Information Model – FIND	Yes	Yes	N/A
Patient Root Query/Retrieve Information Model – MOVE	Yes	Yes	N/A
Study Root Query/Retrieve Information Model – FIND	Yes	Yes	N/A
Study Root Query/Retrieve Information Model – MOVE	Yes	Yes	N/A

SOP Class Name	User of Service (SCU)	Provider of Service (SCP)	Display
Patient/Study Only Query/Retrieve Information Model – FIND	Yes	Yes	N/A
Patient/Study Only Query/Retrieve Information Model – MOVE	Yes	Yes	N/A
Workflow Management			
Storage Commitment Push Model	Option	Yes	N/A
Modality Worklist Information Model – Find	Option	Option	N/A
Modality Performed Procedure Step SOP Class	Option	Option	N/A
Print Management			
Basic Film Session SOP Class	Yes	No	N/A
Basic Film Box SOP Class	Yes	No	N/A
Basic Grayscale Image Box SOP Class	Yes	No	N/A
Basic Color Image Box SOP Class	Yes	No	N/A
Basic Grayscale Print Management Meta SOP Class	Yes	No	N/A
Basic Annotation Box SOP Class	Yes	No	N/A
Basic Color Print Management Meta SOP Class	Yes	No	N/A
Presentation LUT SOP Class	Yes	No	N/A

Table 1.1-2 : Media Services Supported

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

Table of Contents

1 INTRODUCTION

1.1 REVISION RECORD

Revision Number	Date	Reason for Change
1.0	May 27, 2010	Added all new supported SOP classes for IMPAX 6.5. Updated table of acronyms. Update matching FIND Extended Negotiation items for SR.
1.1	June 03, 2010	Review layout and update document numbering for publication

1.2 PURPOSE AND INTENDED AUDIENCE OF THIS DOCUMENT

This document is a DICOM Conformance Statement for the DICOM Services of the IMPAX 6.5 Solution.

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

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

Although the use of this conformance statement, in conjunction with the DICOM 3.0 standard, is intended to facilitate communication between the IMPAX 6.5 Solution and other DICOM devices, it is not sufficient to guarantee the interoperation 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.

1.3.3 Storage and Display of PET/CT

IMPAX supports the storage and display of fused PET/CT series (fusion done at the modality prior to sending into IMPAX). DICOM does not stipulate a SOP Class for fused series. They will typically be labeled with modality (0008,0060) PET, CT, OT or SC. Agfa does not recommend using IMPAX to diagnose fused PET/CT series.

IMPAX supports the storage and display of PET series.

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:

ADT	HL7 Admission, Discharge, and Transfer message
AE	DICOM Application Entity
AET	Application Entity Title
ASCE	Association Control Service Element
CAD	Computer Aided Detection
CD-R	Compact Disk Recordable
CSPS	Color Softcopy Presentation State
DICOM	Digital Imaging and Communications in Medicine
DM	Detached Management
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
GSDF	Grayscale Standard Display Function
GSPS	Grayscale Softcopy Presentation State
GUI	Graphical User Interface
HL7	Health Level 7
IE	Information Entity
IHE	Integrating the Healthcare Enterprise
IOD	(DICOM) Information Object Definition
ISO	International Organization of Standardization
KIN	Key Image Notes
MF	Multi-frame
MPPS	Modality Performed Procedure Step
MSPS	Modality Scheduled Procedure Step
MWL	Modality Worklist
NEMA	National Electrical Manufacturers Association
ORM	HL7 Order Request message
ORU	HL7 Observation Results - Unsolicited message
PACS	Picture Archive and Communications System
PDU	DICOM Protocol Data Unit
RIS	Radiology Information System
SC	Secondary Capture
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair
SR	Structured Report
TCP/IP	Transmission Control Protocol / Internet Protocol

UID	Unique Identifier
UTF-8	Unicode Transformation Format - 8
VR	Value Representation

1.5 RELATED DOCUMENTS

- ACR-NEMA Digital Imaging and Communications in Medicine (DICOM) V3.0
- IHE Radiology Technical Framework Revision 9.0, June, 2008.
- Health Level Seven Standard version 2.3.1

2 NETWORKING

2.1 IMPLEMENTATION MODEL

2.1.1 Application Data Flow Diagram

The Application Data Flow Diagram in Figure 2-1 depicts the DICOM data flow to and from the individual application entities that are included in the IMPAX 6.5 Solution. 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.

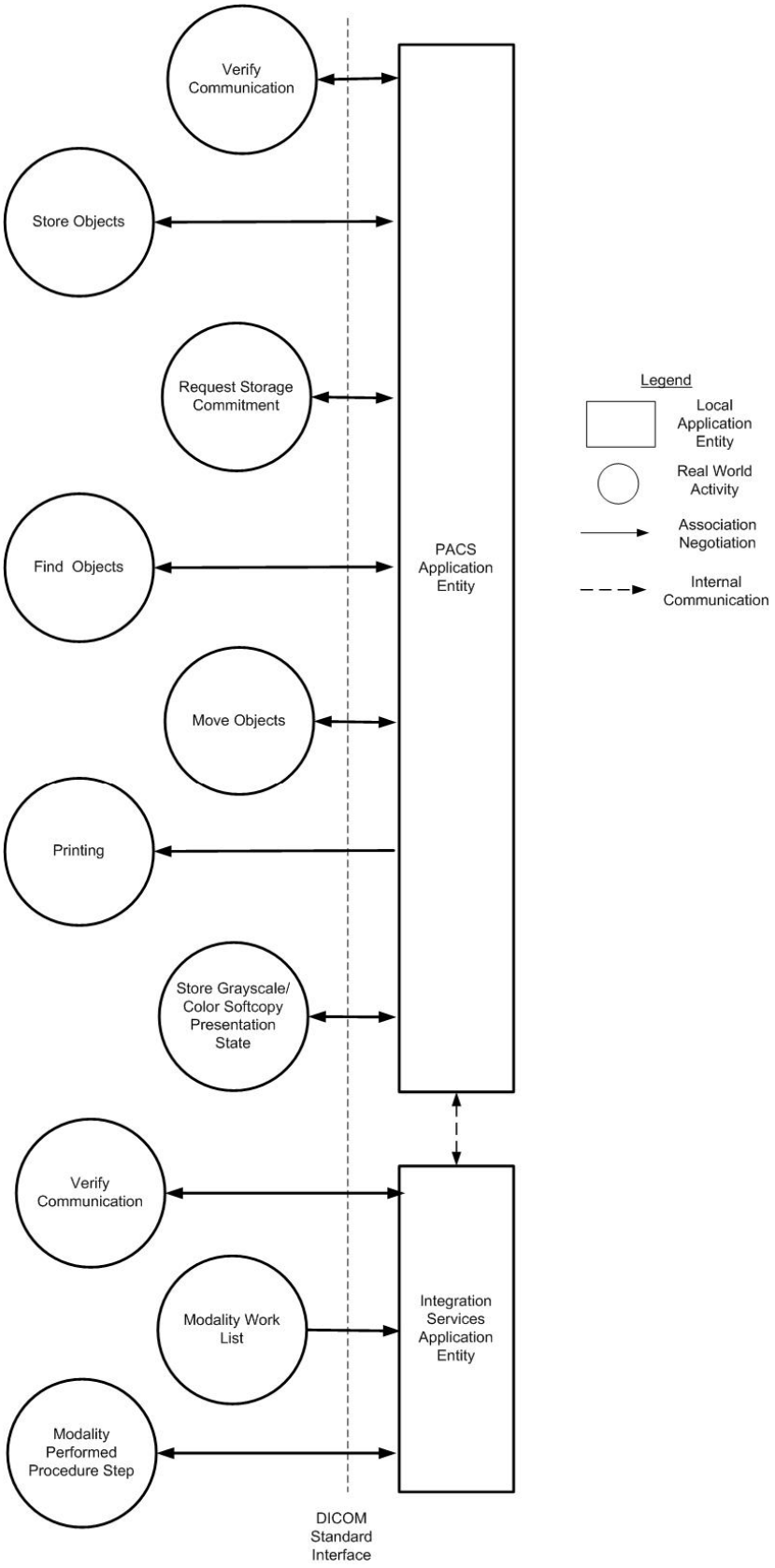

Figure 2-1: Functional Overview – Application Data Flow

The following data flows are depicted in the diagram:

- In the remote real-world activity labeled “Verify Communication”, a remote application entity (AE) can initiate an association and verify communications with the PACS AE or the Integration Services AE. Both the PACS AE and the Integration Services AE can also initiate an association and verify communications with a remote AE.

- In the remote real-world activity “Store Objects”, a remote AE initiates an association with the PACS AE and sends one or more objects. When the PACS AE receives an object, it stores the object in short term cache or long term media and registers the object in the database. The PACS AE 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 the PACS AE and requests commitment for the safekeeping of one or more composite SOP instances on the PACS AE. The PACS AE will open a new association with the remote AE to indicate success or failure. The PACS AE 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 the PACS AE and sends a query. The PACS AE 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. The PACS AE 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 the PACS AE and requests some composite SOP instances be retrieved. The PACS AE will search the database for possible matches with composite SOP instances. The resulting composite SOP instances are transferred to either the same AE that requested the retrieval or to another AE over a new association. The PACS AE can also initiate an association and request some composite SOP instances be retrieved from a remote AE.

- In the remote real-world activity “Printing”, the PACS AE initiates an association with a remote printer AE. The PACS AE constructs and sends one or more composite SOP instances to the remote AE.

- In the remote real-world activity “Store Grayscale/Color Softcopy Presentation State”, the PACS AE publishes presentation state information such as VOI LUT, Annotation, Markup, etc. to Grayscale/Color Presentation State object. The published GSPS/CSPS objects can then be sent to a remote AE using the remote real-world activity “Store Objects”. The PACS AE can also receive and display GSPS/CSPS objects.

- In the remote real-world activity “Import/Export Interchange Media”, the PACS AE exports selected exams for the given patient to interchange media. The PACS AE can also read interchange media received from outside the PACS AE. Furthermore, the PACS AE can import exams stored in the interchange media into the system.

- In the remote real-world activity “Modality Work List", a remote AE initiates an association with the Integration Services AE and requests a DICOM Modality Work List. The Integration Services AE will query its database and return to work list results to the remote AE.

- In the remote real world activity "Modality Performed Procedure Step", a remote AE initiates an association with the Integration Services AE and sends a DICOM MPPS message. The Integration Services AE receives the MPPS message and updates the status of the study in its database. The Integration Services AE can also initiate an association with a remote AE and forward an MPPS message that it has received from a remote AE.

2.1.2 Functional Definitions of AE's

The following sections contain a functional definition for each Application Entity that is part of the IMPAX 6.5 Solution. 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 Verify Communication

Both the PACS AE and the Integration Services AE will respond to a DICOM C-Echo request from a remote AE and verify communications. The PACS AE and the Integration Services AE can also initiate an association and request verification to a remote AE.

2.1.2.2 Receive Images

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

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

2.1.2.3 Commitment to Store Images Received

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

2.1.2.4 Query from Other Devices

The PACS AE responds to queries based on the records stored in its database.

2.1.2.5 Retrieve to Other Devices

The PACS AE 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.

2.1.2.6 Transmit Images

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

2.1.2.7 Print Images

The PACS AE proposes a print context, constructs a Print Meta SOP class and transfers a DICOM print object to compatible devices.

2.1.2.8 Store Grayscale/Color Softcopy Presentation State Objects

The PACS AE acts as a Service Class User for storage of Grayscale/Color Softcopy Presentation State Objects. It extracts presentation state information such as annotation, VOI LUT, markup, etc. from the database and creates the corresponding Grayscale/Color Softcopy Presentation State object. Then it acts as a Service Class User of C-Store to transmit the created GSPS/CSPS object to a compatible device.

The PACS AE also acts as a Service Class Provider for storage of Grayscale/Color Softcopy Presentation State Objects. It stores the GSPS/CSPS objects in its entirety in its internal data store. It extracts the query information with respect to the patient, study, series, and object, and stores this information within its internal database. When the client displays a study, a user can select one of the associated GSPS/CSPS objects and the corresponding presentation state information will be applied to the display objects.

2.1.2.9 Modality Worklist Requests

The Integration Services AE returns a Modality Worklist in response to a request from a compatible device. In order to return a worklist, the Integration Services AE must receive scheduling information from a scheduling system via an HL7 ORM messages. This information is cached in the Integration Services AE's local database. When a DICOM MWL request is received, the Integration Services AE converts the request into a database query. The results of the database query are then returned via DICOM to the remote AE.

2.1.2.10 Modality Performed Procedure Step Information

The Integration Services AE is capable of receiving DICOM MPPS messages. These messages are used to update the status of the procedure in the Integration Services AE's local database. Once a procedure is COMPLETED or DISCONTINUED, it is considered inactive, and can be filtered out of a modality worklist request. The Integration Services AE is also capable of sending DICOM MPPS messages. This is primarily used to forward MPPS messages to a DICOM compatible scheduling system in an IHE environment.

2.2 AE SPECIFICATIONS

This section outlines the specifications for each of the Application Entities that are part of the IMPAX 6.5 Solution.

2.2.1 The PACS AE Specification

2.2.1.1 SOP Classes supported

The PACS AE provides Standard Conformance to the SOP Classes listed in Table 2.2-1. The shaded items represent SOP classes that have been retired (so no longer appear in Supplement 64) but are still supported by the PACS AE.

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 PACS AE Client will display the DICOM objects. In some cases only storage of the object may be provided by the PACS AE.

Table 2.2-1 : SOP Classes for PACS AE

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	1.2.840.10008.5.1.4.1.1.1.2	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
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	Yes	No
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	Yes	Yes	Yes
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
12 lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	Yes	No
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	Yes	No
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	Yes	No
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	Yes	No
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	Yes	No
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	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
Color Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.2	Yes	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes	Yes
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Yes	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes	Yes
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Yes	Yes	No
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
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Yes	Yes	No

SOP Class Name	SOP Class UID	SCU	SCP	Display
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes	No
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Yes	Yes	No
Multi-frame Grayscale Bit SC Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes	Yes	Yes
Multi-frame Grayscale Byte SC Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes	Yes
Multi-frame Grayscale Word SC Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	Yes	Yes
Multi-frame True Color SC Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes	Yes
VL Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.1	Yes	Yes	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	Yes	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	Yes	No
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	Yes	Yes
VL Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.2	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
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes	Yes	No
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	Yes	No
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Yes	Yes	No
Stereo-metric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Yes	Yes	No
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes	Yes	No
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	Yes[4]
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
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes	Yes
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65	Yes	Yes	No
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes	Yes	No
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	Yes	No
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
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes	No
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes	No
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes	No
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	Yes	No
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes	No
RT Brachy Treatment Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	Yes	No
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	Yes	No
GE Private 3D Model Storage	1.2.840.113619.4.26	Yes	Yes	No

[4] Display for this class is limited to those created by the Agfa Connectivity Manager.

SOP Class Name	SOP Class UID	SCU	SCP	Display
GE Private PET Raw Data Storage	1.2.840.113619.4.30	Yes	Yes	No
Siemens Private CSA Non-image Storage[5]	1.3.12.2.1107.5.9.1	Yes	Yes	No
Philips 3D Private Presentation State Storage[5]	1.3.46.670589.2.5.1.1	Yes	Yes	No
Philips Private MR Examcard Data Storage[5]	1.3.46.670589.11.0.0.12.4	Yes	Yes	No
Philips Private MR Series Data Storage[5]	1.3.46.670589.11.0.0.12.2	Yes	Yes	No
Philips Private MR Spectrum Storage[5]	1.3.46.670589.11.0.0.12.1	Yes	Yes	No
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
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
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

2.2.1.2 Default Transfer Syntaxes Supported

The PACS AE provides Standard Conformance to the default transfer syntaxes listed in Table 2.2-2.

Table 2.2-2: Default Transfer Syntaxes

SOP Class Name	SOP Class UID
Implicit VR Little Endian	1.2.840.10008.1.2

[5] These private SOP Classes are accepted by IMPAX for storage, however, it is the responsibility of the adjacent systems to accept them as well should IMPAX be configured to store them. For example, if IMPAX Store and Remember is enabled for a source that creates objects containing these SOPs and the archive destination is not capable of accepting these objects, the archive jobs will fail and the objects will not be eligible for deletion by IMPAX.

2.2.1.3 Extended Transfer Syntaxes Supported

The PACS AE provides Standard Conformance to the extended transfer syntaxes listed in Table 2.2-3 for the purposes of **storage** and ***retrieval***.

Table 2.2-3: Extended Transfer Syntaxes

Transfer Syntax	UID
Explicit VR Little Endian[6]	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
MPEG2 Main Profile @ Main Level[7] [8]	1.2.840.10008.1.2.4.100

2.2.1.4 Association Establishment Policies

2.2.1.4.1 General

The following Application Context Name will be proposed and recognized by the PACS AE.

Table 2.2-4: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

The PACS AE contains no limitations for maximum PDU size.

2.2.1.4.2 Number of Associations

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

2.2.1.4.3 Asynchronous Nature

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

Table 2.2-5: Asynchronous Nature as an Association Initiator for the PACS AE

Maximum number of outstanding asynchronous transactions	1

[6] LEE (Explicit Little Endian) is used for all group 2 elements, including File Meta Information.

[7] Supported only for Video Endoscopic Image Storage

[8] IMPAX is unable to convert MPEG2 to any other transfer syntax.

2.2.1.4.4 Implementation Identifying Information

The PACS AE will respond with the implementation identifying parameters listed in the following table.

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

Implementation Class UID	1.2.124.113532.3510.50
Implementation Version Name	AGFAMAY2003

2.2.1.4.5 Called/Calling Titles

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

2.2.1.5 Association Initiation Policies

The PACS AE 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

The PACS AE 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, the PACS AE requests the Presentation Contexts listed in Table 2.2-7.

Table 2.2-7: Presentation Contexts Proposed by the PACS AE

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

The PACS AE 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

The PACS AE 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. The PACS AE 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

The PACS AE may request any of the Presentation Contexts listed in Table 2.2-8 for Storage. The PACS AE will propose the transfer syntax used when the object was written to cache after being accepted by the server and Implicit VR Little Endian. For certain images with a photometric interpretation of 'RGB', the PACS AE SCU will prefer Implicit VR Little Endian over a compressed transfer syntax if both are accepted by the remote Storage SCP.

Table 2.2-8: Presentation Contexts Proposed by the PACS AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
All SOP classes listed in section Transfer in Table 2.2-1.		Big Endian Explicit VR	1.2.840.10008.1.2.2	SCU	None
		Little Endian Implicit VR	1.2.840.10008.1.2	SCU	None
		Little Endian Explicit VR	1.2.840.10008.1.2.1	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	None
		JPEG Process 14, selection value 1, lossless	1.2.840.10008.1.2.4.70	SCU	None

2.2.1.5.2.3 SOP Specific Conformance – Store Objects

The PACS AE 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

The PACS AE stores images that are sent to it from an SCU. In some configurations the PACS AE may send images to another SCP, such as a PACS, for permanent storage. The request for storage commitment may then be transmitted from the PACS AE 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 the PACS AE follows to support Storage Commitment.

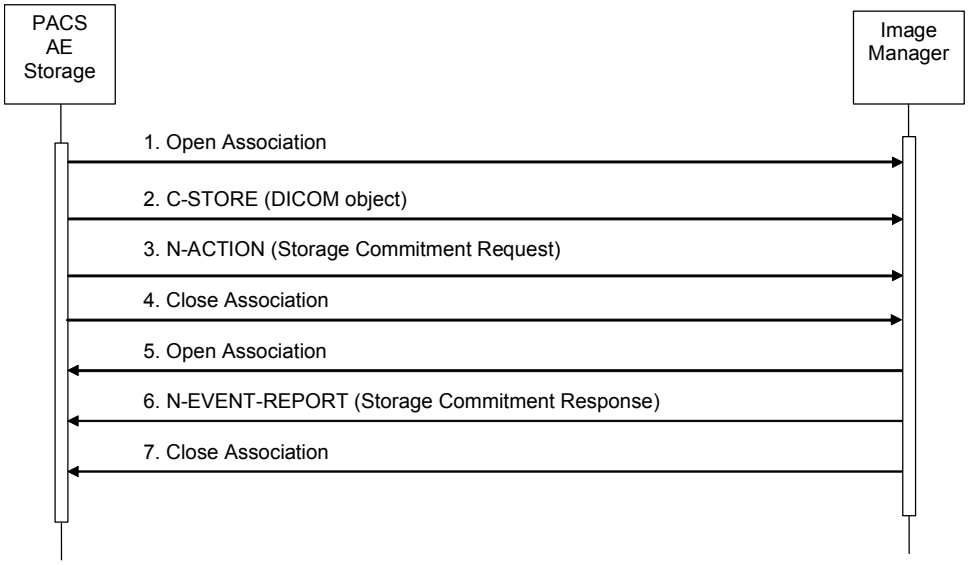

Figure 2-2: Storage Commitment Sequencing Diagram

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

2.2.1.5.3.2 Proposed Presentation Contexts

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

Table 2.2-9: Presentation Contexts Proposed by the PACS AE

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

The PACS AE 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. The PACS AE 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)

- The PACS AE will generate an N-ACTION primitive if the local configuration setting for the remote AE is enabled for storage commitment.
- The PACS AE may request storage commitment for all the SOP Class UIDs listed in Table 2.2-10.
- The PACS AE supports the Referenced Study Component Sequence Attribute.
- The PACS AE will keep the Transaction ID applicable indefinitely.
- The PACS AE does not support the optional Storage Media File-Set ID and UID Attributes in the N-Action.
- The PACS AE 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.
- The PACS AE can be configured with the destination AE Title for the Storage Commit. By default, this is the AE Title where the storage request is sent.

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

The PACS AE will negotiate Find requests to an SCP. The PACS AE 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. The PACS AE 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

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

Table 2.2-12: Presentation Contexts Proposed by the PACS AE

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. The PACS AE 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

The PACS AE 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.

The PACS AE supports the Relational-queries extended SCU behaviour for the Patient Root Query, Study Root Query, and Patient/Study Only Query/Retrieve.

The PACS AE 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 the PACS AE requests.

Table 2.2-14: Patient Level Attributes

Description	Tag	Types of Matching
Patient Name	(0010,0010)	S, *, U
Patient ID	(0010,0020)	UNIQUE (for Patient Root Model) S, *, U (for Study Root Model)

Table 2.2-15: Study Level Attributes

Description	Tag	Types of Matching
Study Instance UID	(0020,000D)	UNIQUE
Study ID	(0020,0010)	*, U
Station Name	(0008,1010)	S, *, U
Study Date	(0008,0020)	S, *, U, R
Study Time	(0008,0010)	S, *, U, R
Accession Number	(0008,0050)	S, *, U
Modalities in Study	(0008,0061)	S, *, U
Referring Physician Name	(0008,0090)	S, *, U

Table 2.2-16: Series Level Attributes

Description	Tag	Types of Matching
Series Instance UID	(0020,000E)	UNIQUE
Modality	(0008,0060)	S, *, U

Table 2.2-17: Image Level Attributes

Description	Tag	Types of Matching
SOP Instance UID	(0008,0018)	UNIQUE
Image Number	(0020,0013)	S, *, U
Concept Name Code Sequence	(0040,A043)	SEQUENCE
>Code Value	(0008,0100)	S, *, U
>Coding Scheme Designator [9]	(0008,0102)	S, *, U
>Code Meaning	(0008,0104)	U, *
Content Date	(0008,0023)	S, *, U, R
Content Time	(0008,0033)	S, *, U, R
Observation Date Time	(0040,A032)	S, *, U, R
Referenced Request Sequence	(0040,A370)	SEQUENCE
>Study Instance UID	(0020,000D)	UNIQUE
>Accession Number	(0008,0050)	S, *, U
>Requested Procedure ID	(0040,1000)	S, *, U
>Requested Procedure Code Sequence	(0032,1064)	SEQUENCE
>>Code Value	(0008,0100)	S, *, U
>>Coding Scheme Designator	(0008,0102)	U, *
>>Coding Scheme Version	(0008,0103)	U, *
>>Code Meaning	(0008,0104)	U, *

[9] The IMPAX Client always identifies the Coding Scheme Designator to be “DCM” while Code Value is user selected from a list of configurable enumerated values.

Types of Matching:

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

The PACS AE automatically adds a wildcard “*” to matching keys with a VR of PN. The user is not required to add one manually.

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 PACS AE 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

The PACS AE can retrieve composite objects from a remote AE. An association is established when the user initiates a query from the graphical user interface. The PACS AE 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

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

Table 2.2-18: Presentation Contexts Proposed by the PACS AE

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

The PACS AE provides standard conformance to the DICOM Query/Retrieve Service Class as an SCU. The PACS AE supports the Relational-retrieve extended SCU behaviour.

The PACS AE 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

The PACS AE 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. The indicator should appear at the left for portrait and at the top for landscape mode prints.

2.2.1.5.6.2 Proposed Presentation Contexts

The PACS AE may request any of the Presentation Contexts listed in Table 2.2-19 for Print Management.

Table 2.2-19: Presentation Contexts Proposed by the PACS AE

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

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

The PACS AE supports the Presentation LUT for printing to a DICOM printer. This SOP Class is only negotiated if the user set the TASTE LUT to the value CPI.

2.2.1.5.6.3.1 SOP Specific Conformance – Presentation LUT SOP Class

The PACS AE supports the following DIMSE operations for the Presentation LUT SOP Class:

- N-Create

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

2.2.1.5.6.3.1.1 Presentation LUT SOP Class Operations (N-Create)

The attributes supplied in an N-Create Request are listed in the Table below:

Table 2.2-20: Presentation LUT SOP Class N-Create Request Attributes

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

The behaviour of the PACS AE when encountering status code in a N-Create response is summarized in the Table below:

Table 2.2-21: Presentation LUT SOP Class N-Create Response Status Handling Behaviour

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Operation performed properly.
*	*	Any other status code	If CPI is enabled and Presentation LUT SOP Class cannot be negotiated, then the print job will be marked as failed. The status and error comment are recorded in the log file. If N-Create failed, the status and error comment will be recorded in the log file. The print job continues to proceed.

2.2.1.5.6.3.2 SOP Specific Conformance – Basic Film Session

The PACS AE 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 2.2-22: 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)	

2.2.1.5.6.3.3 SOP Specific Conformance – Basic Film Box

The PACS AE 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, the PACS AE will ignore these empty film boxes and print them immediately beside one another.

Table 2.2-23: 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)	
Referenced Presentation LUT sequence	(2050,0500)	Only if CPI taste LUT is selected

2.2.1.5.6.3.4 SOP Specific Conformance – Basic Grayscale Image Box

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

Table 2.2-24: 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: **- 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)	

2.2.1.5.6.3.5 SOP Specific Conformance – Basic Color Image Box

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

Table 2.2-25: Attributes for a Basic Color Image Box

Attribute Name	Tag	Comments
Magnification Type	(2010,0060)	
Smoothing Type	(2010,0080)	
Image Position	(2020,0010)	

Attribute Name	Tag	Comments
Requested Image Size	(2020,0030)	This tag is only sent if: **- 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)	

2.2.1.5.6.3.6 SOP Specific Conformance – Basic Annotation Box

The PACS AE requests the following attributes of the Basic Annotation Box SOP Class.

Table 2.2-26: Attributes for a Basic Annotation Box

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

2.2.1.5.6.3.7 SOP Specific Conformance – Printer

The PACS AE requests the following attributes of the Printer SOP Class.

Table 2.2-27: 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)

2.2.1.5.7 Real World Activity – Grayscale/Color Softcopy Presentation State Storage (SCU)

2.2.1.5.7.1 Description and Sequencing of Activity

A user selects a study to display. When the study objects are displayed at the PACS client workstation, a user can use the available tools to modify presentation state of the displayed objects. The tools include add markup, add annotation, modify window width and window centre, etc. When the user saves the changes, he/she has the option to publish the presentation state changes into Grayscale/Color Softcopy Presentation State objects in addition to just saving the changes to the PACS database. If the user chooses to publish the changes, then all the presentation state changes will be encapsulated in new Grayscale/Color Softcopy Presentation State objects at the PACS client workstation. The GSPS/CSPS object can reference one or more of the objects in the study. The PACS client workstation will then send the generated GSPS/CSPS object to the PACS AE for storage and registration.

2.2.1.5.7.2 Proposed Presentation Context

The PACS AE provides standard conformance to the Presentation Contexts listed in Table 2.2-28 for Grayscale/Color Softcopy Presentation State Storage.

Table 2.2-28: Presentation Contexts Proposed by the PACS AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Color Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.1.5.7.3 SOP Specific Conformance – Grayscale/Color Softcopy Presentation State Storage

The PACS AE provides standard conformance to Grayscale/Color Softcopy Presentation State Storage as a Service Class User.

The PACS AE supports using the Specific Character Set to save the Series Description (0008,103E) and Content Description (0070,0081) into the GSPS/CSPS instance.

The PACS AE supports both the deprecated colour specification tags and the new Lab tags, using a default Lab to sRGB conversion.

The PACS AE supports all displayable SOP classes specified in the Transfer section of Table 2.2-28 to be referenced by the created Grayscale/Color Softcopy Presentation State object.

2.2.1.6 Association Acceptance Policies

The PACS AE 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 the PACS AE.

2.2.1.6.1 Real World Activity – Verify Communication (SCP)

2.2.1.6.1.1 Description and Sequencing of Activity

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

2.2.1.6.1.2 Accepted Presentation Contexts

The PACS AE will accept any of the Presentation Contexts listed in Table 2.2-29 for Verification.

Table 2.2-29: Presentation Contexts Proposed by the PACS AE

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

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

Table 2.2-30: 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

The PACS AE will always accept a Presentation Context for the Verification SOP Class with the default DICOM transfer syntax listed in Table 2.2-29.

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

The PACS AE will store images that are sent to it from an SCU. All images received by the PACS AE can be retrieved at a later time from the PACS AE; 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 2.2-31.

Table 2.2-31: 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

The PACS AE will accept any of the Presentation Contexts listed in Table 2.2-32 for Storage.

Table 2.2-32: Presentation Contexts Accepted by the PACS AE

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

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

Table 2.2-33: 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: The PACS AE will only accept SOP Classes sent from previously released IMPAX PACS AEs that could contain RGB data (e.g. Ultrasound, Visible Light, and Secondary Capture) using the Implicit VR Little Endian Transfer Syntax. The PACS AE will accept these SOP Classes using any transfer syntax listed in the table from all other DICOM devices.

Note 3: The PACS AE will only support Little Endian Implicit, Little Endian Explicit and Big Endian Explicit for non-imaging objects.

2.2.1.6.2.3 SOP Specific Conformance - Store Object

The PACS AE conforms to the DICOM Storage Service Class as a Level 2 (Full) SCP. No elements are discarded or coerced by the PACS AE. 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. The PACS AE 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. The PACS AE 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) of an object that is already present on the PACS AE the object will not be accepted. When an object is received that has a SOP Instance UID but different Study Instance UID of an object that is already present on the PACS AE, the new object will be assigned a new SOP Instance UID by the PACS AE. In addition to assigning new sop instance UID, if the SERIES INSTANCE UID of the incoming object belongs to a different known study (STUDY INSTANCE UID), then the PACS AE will assign a new series instance UID to the new object.

In addition, the PACS AE can be configured to (1) silently ignore the duplicate object or (2) silently overwriting the object by returning success (i.e. return status of 0000H).

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

The PACS AE will return the C-STORE status codes shown in Table 2.2-34.

Table 2.2-34: Storage 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.

Service Status	Further Meaning	Error Code	Reason
	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	0111	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, the PACS AE may issue a Modality Worklist Query and modify the values of certain Attributes to match the values maintained by the HIS/RIS. The PACS AE will issue a Modality Worklist Query and modify the values.

2.2.1.6.2.4 Presentation Context Acceptance Criterion – Store Object

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

2.2.1.6.2.5 Transfer Syntax Selection Policies - Store Object

The PACS AE supports all transfer syntaxes listed in Table 2.2-32. By default, the PACS AE will choose a transfer syntax other than Implicit VR Little Endian if more than one is requested in a single Presentation Context. The PACS AE 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.

The PACS AE 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

The PACS AE stores images that are sent to it from an SCU. The request for storage commitment may then be transmitted to the PACS AE together with a list of references to one or more SOP instances. The PACS AE 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

The PACS AE will accept any of the Presentation Contexts listed in Table 2.2-35 for Verification.

Table 2.2-35: Presentation Contexts Accepted by the PACS AE

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

The PACS AE provides partial conformance to the DICOM Storage Commitment Service Class as an SCP. The PACS AE supports the elements listed in Table 2.2-36 for this SOP class. The PACS AE does not support explicit role negotiation.

Table 2.2-36: 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)

The PACS AE 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. The PACS AE will stop accepting new objects for storage to ensure the availability of objects for which a successful storage commitment response has been sent.

The PACS AE can be configured to not 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 the PACS AE and disk management configuration settings of the system.

The PACS AE does not support the optional Storage Media and File-Set ID and UID Attributes in the N-ACTION. The PACS AE supports the Action Type and Action Information shown in Table 2.2-37.

Table 2.2-37: 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 the PACS AE determines that it has successfully completed storage commitment, the PACS AE 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 the PACS AE cannot commit to storing SOP Instances, the PACS AE 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.

The PACS AE supports the Event Information as specified in Table 2.2-38. The PACS AE 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 2.2-38: 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 the PACS AE commits to permanently storing a SOP Instance, unless it is manually deleted from the PACS AE. Offline storage capacity varies based on how the individual PACS AE is configured.

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

SOP Instances can be retrieved from the PACS AE 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

The PACS AE 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 2.2-39.

Table 2.2-39: 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.

The PACS AE 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

The PACS AE will accept any of the Presentation Contexts listed in Table 2.2-40 for Query.

Table 2.2-40: Presentation Contexts Accepted by the PACS AE

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. The PACS AE will respond with the information in Table 2.2-41.

Table 2.2-41: 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

The PACS AE provides standard conformance to the DICOM Query/Retrieve Service Class as an SCP.

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

The PACS AE provides support for the Instance Availability (0008,0056) Data Element.

The PACS AE supports hierarchical queries. The PACS AE supports relational queries. The tables below contain detailed information on matching and returned keys:

Table 2.2-42: Patient Level Attributes

Description	Tag	Types of Matching
Patient Name	(0010,0010)	S, *, U
Patient ID	(0010,0020)	UNIQUE (for Patient Root Model) S, *, U (for Study Root Model)
Patient Birth Date	(0010,1005)	S, *, U, R
Patient Sex	(0010,0040)	S, *, U

Table 2.2-43: Study Level Attributes

Description	Tag	Types of Matching
Study Instance UID	(0020,000D)	UNIQUE
Study ID	(0020,0010)	S, *, U
Study Date	(0008,0020)	S, *, U, R
Study Time	(0008,0010)	S, *, U, R
Accession Number	(0008,0050)	S, *, U
Modalities in Study	(0008,0061)	S, *, U
Referring Physician's Name	(0008,0090)	S, *, U
Number of Study Related Series	(0020,1000)	NONE
Number of Study Related Instances	(0020,1208)	NONE

Table 2.2-44: Series Level Attributes

Description	Tag	Types of Matching
Series Instance UID	(0020,000E)	UNIQUE
Series Number	(0020,0011)	S, *, U
Modality	(0008,0060)	S, *, U
Series Description	(0008,103E)	U
Station Name	(0008,1010)	S, *, U
Number of Series Related Instances	(0020,1209)	NONE
Request Attribute Sequence	(0040,0275)	SEQUENCE
>> Requested Procedure ID	(0040,1001)	S, *, U
>> Scheduled Procedure Step ID	(0040,0009)	S, *, U
Performed Procedure Step Start Date	(0040,0244)	S, *, U, R
Performed Procedure Step Start Time	(0040,0245)	S, *, U, R

Table 2.2-45: Instance Level Attributes

Description	Tag	Types of Matching
Image Number	(0020,0013)	S, *, U
SOP Instance UID	(0008,0018)	UNIQUE
SOP Class UID	(0008,0016)	S, *, U
Number of Frames	(0028,0008)	U
Referenced Request Sequence	(0040,A370)	SEQUENCE
>Study Instance UID	(0020,000D)	U, *
>Accession Number	(0008,0050)	U, *
> Requested Procedure ID	(0040,1000)	U, *
Concept Name Code Sequence	(0040,A043)	SEQUENCE
>Code Value	(0008,0100)	S, *, U
>Coding Scheme Designator	(0008,0102)	S, *, U
>Code Meaning	(0008,0104)	U, *

Types of Matching:

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

The PACS AE returns one of the following status codes to a C-FIND request.

Table 2.2-46: C-FIND Status Codes

Service Status	Further Meaning	Protocol Codes	Description
Refused	Out of Resources	A700	Out of resources.
Failed	Identifier does not match SOP Class	A900	The specified identifier contains a request that does not match the specified SOP Class.
	Unable to process	C001	For some reason (such as the database being off-line) this request cannot be processed at this time.
Cancel	Matching terminated due to Cancel Request	FE00	The original requester canceled this operation.
Pending	Pending	FF00	All Optional Keys are supported in the same manner as Required Keys.
	Pending	FF01	The matching operation is continuing. Warning that one or more Optional Keys were not supported in the same manner as Required Keys.
Success	Success	0000	Operation performed properly.

2.2.1.6.4.4 Presentation Context Acceptance Criterion – Find Object

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

2.2.1.6.4.5 Transfer Syntax Selection Policies – Find Object

The PACS AE 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

The PACS AE will respond to retrieve requests that are sent to it by an SCU.

The PACS AE will establish a new Association with the Remote AE specified in the Move Destination for the C_STORE sub-operations. The PACS AE 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

The PACS AE will accept any of the Presentation Contexts listed in Table 2.2-47 for Move.

Table 2.2-47: Presentation Contexts Accepted by the PACS AE

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

The PACS AE 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.

The PACS AE returns one of the following status codes to a C-MOVE request.

Table 2.2-48: C-MOVE Status Codes

Service Status	Further Meaning	Protocol Codes	Description
Refused	Out of Resources	A701	Unable to calculate number of matches.
	Out of Resources	A702	Unable to perform storage of images to move destination.
Failed	Move destination unknown	A801	The destination of this move request is unknown.
	Identifier does not match SOP Class	A900	The specified identifier contains a request that does not match the specified SOP Class.
	Unable to process	C002	Indicates that the *PACS AE* cannot process this request at this time.
Cancel	Storage terminated due to Cancel Request	FE00	The original requester canceled this operation.
Warning	Warning	B000	Storage complete with one or more failures.

Service Status	Further Meaning	Protocol Codes	Description
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

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

2.2.1.6.5.5 Transfer Syntax Selection Policies - Move Object

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

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

2.2.1.6.6 Real World Activity - Grayscale/Color Softcopy Presentation State Storage (SCP)

2.2.1.6.6.1 Description and Sequencing of Activity

This Real World Activity is an extension to the Real World Activity - Store Object (SCP) specified in Section 2.2.1.6.2 above. In addition to the sequencing of activity described, the PACS AE also extracts the presentation state information included in the GSPS/CSPS instance and stores a reference in the PACS AE database.

When the current study being viewed by a user at the PACS Client Workstation contains one or more GSPS/CSPS objects, a dropdown list will contain all these GSPS/CSPS objects, grouped by the Content Label (0070,0080) of the instances. The user can select any one GSPS/CSPS instance from the dropdown list. The PACS client workstation will then apply the presentation state information specified by the GSPS/CSPS instance on the referenced objects.

The PACS AE supports applying only one GSPS/CSPS instance at any time. Simultaneously applying multiple GSPS/CSPS instances is not supported.

2.2.1.6.6.2 Accepted Presentation Contexts

The PACS AE will accept any of the Presentation Contexts listed in Table 2.2-49 for Grayscale/Color Softcopy Presentation State Storage:

Table 2.2-49: Presentation Contexts Accepted by the PACS AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Color Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

2.2.1.6.6.3 SOP Specific Conformance - Grayscale/Color Softcopy Presentation State Storage

The PACS AE provides standard conformance to Grayscale/Color Softcopy Presentation State Storage as a Service Class Provider.

The PACS AE supports using the Specific Character Set to interpret the Series Description (0008,103E) and Content Description (0070,0081) stored in the GSPS/CSPS instance.

The PACS AE supports both the deprecated colour specification tags and the new Lab tags, using a default Lab to sRGB conversion.

The PACS AE ignores the ICC colour profile for Color Softcopy Presentation State objects.

The PACS AE supports all displayable SOP classes specified in the Transfer section of Table 2.2-49 to be referenced by the created Grayscale/Color Softcopy Presentation State object.

The PACS AE groups related Grayscale/Color Softcopy Presentation State Storage by content label.

2.2.1.6.6.4 Presentation Context Acceptance Criterion - Grayscale/Color Softcopy Presentation State Storage

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

2.2.1.6.6.5 Transfer Syntax Selection Policies - Grayscale/Color Softcopy Presentation State Storage

The PACS AE currently only supports the default transfer syntax of Implicit VR Little Endian.

2.2.2 The Integration Services AE Specification

2.2.2.1 SOP Classes Supported

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

Table 2.2-50: SOP Classes for the Integration Services AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	Yes
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	No	Yes
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Yes	Yes
Detached Study Management	1.2.840.10008.3.1.2.3.1	Yes	Yes

2.2.2.2 Association Establishment Policies

2.2.2.2.1 General

The DICOM standard Application context shall be specified.

Table 2.2-51: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

The Integration Services AE sets the PDU size to 100,000 bytes. This is not configurable.

2.2.2.2.2 Number of Associations

The maximum number of simultaneous associations accepted by the Integration Services AE is not constrained. There is no inherent limit to the number of associations other than limits imposed by the computer operating system.

2.2.2.2.3 Asynchronous Nature

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

2.2.2.2.4 Implementation Identifying Information

The Integration Services AE will respond with the following implementation identifying parameters:

Table 2.2-52: DICOM implementation Class and Version for Verification

SCP Identification Parameters	
Implementation Class UID	1.2.124.113532.3320
Implementation Version Name	BROKER992.0
SCU Identification Parameters	
Implementation Class UID	1.2.124.113532.1.1
Implementation Version Name	MITRA22JAN97

2.2.2.3 Association Initiation Policies

2.2.2.3.1 Real World Activity – Verify Communications (SCU)

2.2.2.3.1.1 Description and Sequencing of Activity

The Integration Services AE uses the verification service class to test communication with a remote entity. Verification is initiated via the Integration Services AE's Service Tools interface.

2.2.2.3.1.2 Proposed Presentation Contexts

Table 2.2-53: Presentation Contexts Proposed by Verification SCU

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 Transfer Syntax	1.2.840.10008.1.2	SCU	None

2.2.2.3.1.3 SOP Specific Conformance

The Integration Services AE provides standard conformance to the DICOM Verification Service Class.

2.2.2.3.2 Real World Activity – Modality Performed Procedure Step (SCU)

2.2.2.3.2.1 Description and Sequencing of Activity

The Integration Services AE acts as an SCU only when it is configured to route DICOM N-CREATE or N-SET Modality Performed Procedure Step messages to one or more destinations in response to receiving N-CREATE or N-SET MPPS from an acquisition device. The Integration Services AE sends the attribute values as received from the originator of the Modality Performed Procedure Step.

The following diagram shows the sequence of real world activities when the Integration Services AE receives a DICOM MPPS:

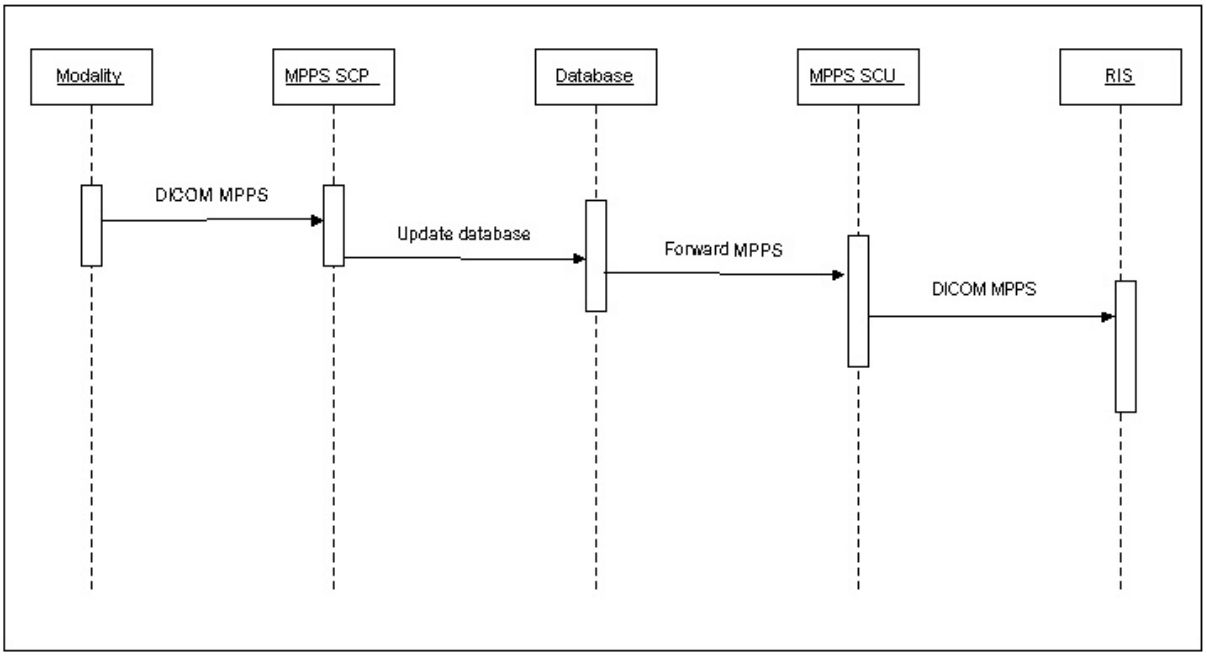

Figure 2-3: DICOM Performed Procedure Step Sequence Diagram

2.2.2.3.2.2 Proposed Presentation Contexts

Table 2.2-54: Presentation Contexts Proposed by MPPS SCU

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

2.2.2.3.2.3 SOP Specific Conformance

The Integration Services AE supports the following N-CREATE Modality Performed Procedure Step attributes:

Table 2.2-55: Modality Performed Procedure Step SOP Class N-CREATE Attributes

Module	Attribute Name	Tag
SOP Common	Specific Character Set	(0008,0005)
Performed Procedure Step Relationship	Referenced Patient Sequence	(0008,1120)
	>Referenced SOP Class UID	(0008,1150)
	>Referenced Instance UID	(0008,1155)
	Patient Name	(0010,0010)
	Patient ID	(0010,0020)
	Patient's Birth Date	(0010,0030)
	Patient's Sex	(0010,0040)

Module	Attribute Name	Tag
	Scheduled Step Attribute Sequence	(0040,0270)
	>Accession Number	(0008,0050)
	>Reference Study Sequence	(0008,1110)
	>>Referenced SOP Class UID	(0008,1150)
	>>Referenced SOP Instance UID	(0008,1155)
	>Study Instance UID	(0020,000D)
	>Requested Procedure Description	(0032,1060)
	>Scheduled Procedure Step Description	(0040,0007)
	>Scheduled Action Item Code Seq.	(0040,0008)
	>>Code Value	(0008,0100)
	>>Coding Scheme Designator	(0008,0102)
	>>Code Meaning	(0008,0104)
	>Scheduled Procedure Step ID	(0040,0009)
	>Requested Procedure ID	(0040,1001)
	>Placer Order Number	(0040,2016)
	>Filler Order Number	(0040,2017)
Performed Procedure Step Information	Procedure Code Sequence	(0008,1032)
	>Code Value	(0008,0100)
	>Coding Scheme Designator	(0008,0102)
	>Code Meaning	(0008,0104)
	Performed Station AE Title	(0040,0241)
	Performed Station Name	(0040,0242)
	Performed Location	(0040,0243)
	Performed Procedure Step Start Date	(0040,0244)
	Performed Procedure Step Start Time	(0040,0245)
	Performed Procedure Step End Date	(0040,0250)
	Performed Procedure Step End Time	(0040,0251)
	Performed Procedure Step Status	(0040,0252)
	Performed Procedure Step ID	(0040,0253)
	Performed Procedure Step Description	(0040,0254)
	Performed Procedure Type Description	(0040,0255)
Image Acquisition Results	Modality	(0008,0060)
	Study ID	(0020,0010)
	Performed Action Item Code Sequence	(0040,0260)
	>Code Value	(0008,0100)
	>Coding Scheme Designator	(0008,0102)
	>Code Meaning	(0008,0104)
	Performed Series Sequence	(0040,0340)
	>Retrieve AE Title	(0008,0054)
	>Series Description	(0008,103E)
	>Performing Physician's Name	(0008,1050)
	>Operator's Name	(0008,1070)
	>Referenced Image Sequence	(0008,1140)
	>>Referenced SOP Class UID	(0008,1150)
	>>Referenced SOP Instance UID	(0008,1155)
	>Protocol Name	(0018,1030)
	>Series Instance UID	(0020,000E)

Module	Attribute Name	Tag
	>Referenced Standalone SOP Instance Sequence	(0040,0220)
	>>Referenced SOP Class UID	(0008,1150)
	>>Referenced SOP Instance UID	(0008,1155)

The Integration Services AE supports the following elements for N-SET Modality Performed Procedure Step attributes:

Table 2.2-56: Modality Performed Procedure Step SOP Class N-SET Attributes

Module	Attribute Name	Tag
Performed Procedure Step Information	Procedure Code Sequence	(0008,1032)
	>Code Value	(0008,0100)
	>Coding Scheme Designator	(0008,0102)
	>Code Meaning	(0008,0104)
	Performed Procedure Step End Date	(0040,0250)
	Performed Procedure Step End Time	(0040,0251)
	Performed Procedure Step Status	(0040,0252)
	Performed Procedure Step Description	(0040,0254)
	Performed Procedure Type Description	(0040,0255)
Image Acquisition Results	Performed Action Item Code Sequence	(0040,0260)
	>Code Value	(0008,0100)
	>Coding Scheme Designator	(0008,0102)
	>Code Meaning	(0008,0104)
	Performed Series Sequence	(0040,0340)
	>Retrieve AE Title	(0008,0054)
	>Series Description	(0008,103E)
	>Performing Physician's Name	(0008,1050)
	>Operator's Name	(0008,1070)
	>Referenced Image Sequence	(0008,1140)
	>>Referenced SOP Class UID	(0008,1150)
	>>Referenced SOP Instance UID	(0008,1155)
	>Protocol Name	(0018,1030)
	>Series Instance UID	(0020,000E)
	>Referenced Standalone SOP Instance Sequence	(0040,0220)
	>>Referenced SOP Class UID	(0008,1150)
	>>Referenced SOP Instance UID	(0008,1155)

2.2.2.4 Association Acceptance Policies

2.2.2.4.1 Real World Activity –Verify Communications (SCP)

2.2.2.4.1.1 Description and Sequencing of Activity

The Integration Services AE will respond to Verification requests to provide a SCU with the ability to determine if the Integration Services AE is receiving DICOM requests.

2.2.2.4.1.2 Accepted Presentation Contexts

Table 2.2-57: Presentation Contexts Accepted by Verification SCP

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 Transfer Syntax	1.2.840.10008.1.2	SCP	None

2.2.2.4.1.3 SOP Specific Conformance – Verification SCP

The Integration Services AE provides standard conformance to the DICOM Verification Service Class. The Integration Services AE returns one of the following status codes:

Table 2.2-58: Verification SCP Response Status

Service Status	Error Code	Reason
Success	0000	Operation performed properly

2.2.2.4.2 Real World Activity – Modality Worklist (SCP)

2.2.2.4.2.1 Description and Sequencing of Activity

The Integration Services AE can be configured to respond to DICOM C-FIND requests in response to an external device querying the Integration Services AE for Worklist.

Before the Integration Services AE can respond to a DICOM Modality Worklist query, it must be populated with data via HL7 messages. The following diagram shows the sequence of events involved in a DICOM Modality Worklist query:

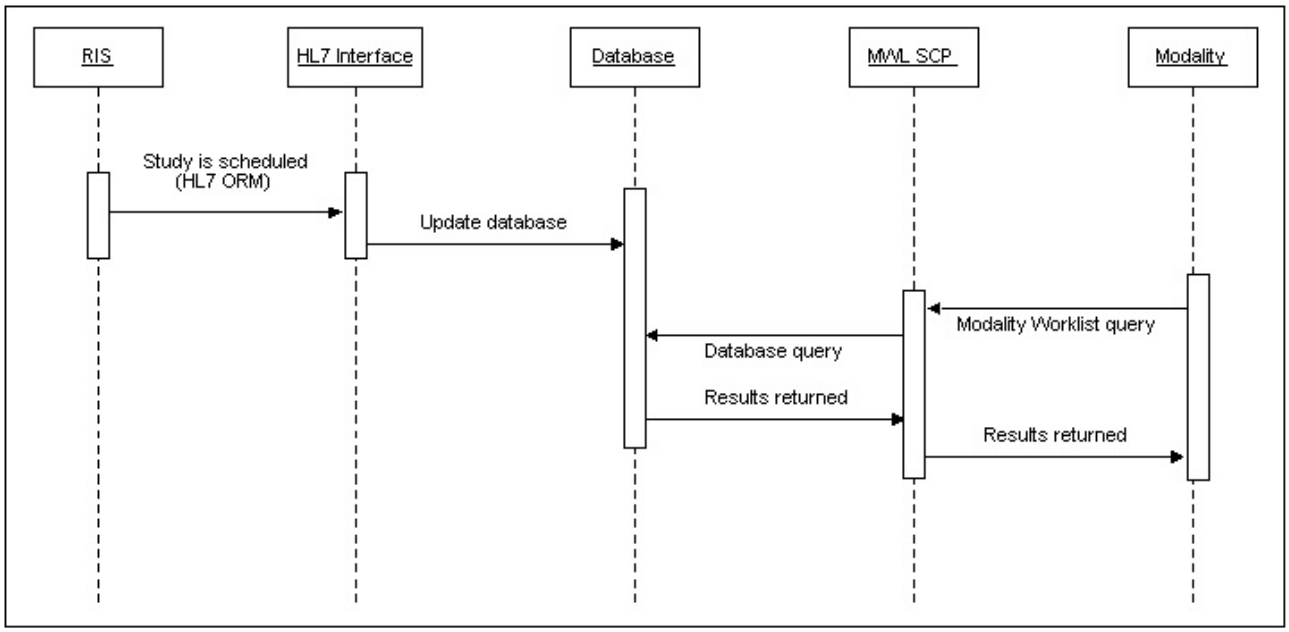

Figure 2-4: DICOM Modality Worklist Sequence Diagram

2.2.2.4.2.2 Accepted Presentation Contexts

Table 2.2-59: Presentation Contexts Accepted by Modality Worklist SCP

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

2.2.2.4.2.3 SOP Specific Conformance

The Integration Services AE provides standard conformance to the DICOM Basic Worklist Management Service Class.

The Integration Services AE supports all required matching key types:

Table 2.2-60: Matching Key Types

Matching Key Types	
SV	single valued match
WC	wild card match
UI	List of UID matching
SQ	sequence match
DR	date range match

The Integration Services AE supports all required return keys as long as the data was available from the RIS.

The Integration Services AE supports a 'NOT' operator (!) for all attributes with a single valued match (SV) type.

The Integration Services AE supports the following elements for this SOP class:

Table 2.2-61: Modality Worklist Information Model Attributes

Module	Attribute Name	Tag	Match	Return
SOP Common	Specific Character Set	(0008,0005)		1C
Scheduled Procedure Step	Scheduled Procedure Step Sequence	(0040,0100)	SQ	1
	>Modality	(0008,0060)	SV	1
	>Requested Contrast Agent	(0032,1070)		2C
	>Scheduled Station AE Title	(0040,0001)	SV	1
	>Scheduled Procedure Step Start Date	(0040,0002)	DR	1
	>Scheduled Procedure Step Start Time	(0040,0003)	DR	1
	>Scheduled Procedure Step End Date	(0040,0004)		3
	>Scheduled Procedure Step End Time	(0040,0005)		3
	>Scheduled Performing Physician	(0040,0006)	WC	2
	>Scheduled Procedure Step Description	(0040,0007)		1C
	>Scheduled Protocol Code Sequence.	(0040,0008)		1C
	>>Code Value	(0008,0100)		1C
	>>Code Schema Designator	(0008,0102)		1C
	>>Code Meaning	(0008,1004)		3
	>Scheduled Procedure Step ID	(0040,0009)		1
	>Scheduled Station Name	(0040,0010)	SV	2
	>Scheduled Procedure Step Location	(0040,0011)		2
	>Pre-Medication	(0040,0012)		2C
	>Scheduled Procedure Step Status	(0040,0020)	SV	3
	>Comments on Scheduled Procedure Step	(0040,0400)		3
Requested Procedure	Study Date	(0008,0020)		3
	Study Time	(0008,0030)		3
	Referenced Study Sequence	(0008,1110)		2
	>Referenced SOP Class UID	(0008,1150)		1C
	>Referenced SOP Instance UID	(0008,1155)	SV	1C
	Study Instance UID	(0020,000D)	SV	1
	Study Status ID	(0032,000A)		3
	Study Priority ID	(0032,000C)		3
	Study Verified Date	(0032,0032)		3
	Study Verified Time	(0032,0033)		3
	Study Read Date	(0032,0034)		3
	Study Read Time	(0032,0035)		3
	Study Arrival Date	(0032,1040)		3
	Study Arrival Time	(0032,1041)		3
	Study Completion Date	(0032,1050)		3
	Study Completion Time	(0032,1051)		3
	Requested Procedure Description	(0032,1060)		1C
	Requested Procedure Code Sequence	(0032,1064)		1C
	>Code Value	(0008,0100)		1C
	>Coding Scheme Designator	(0008,0102)		1C
	>Code Meaning	(0008,0104)		3

Module	Attribute Name	Tag	Match	Return
	Requested Contrast Agent	(0032,1070)		3
	Requested Procedure ID	(0040,1001)		1
	Reason for Requested Procedure	(0040,1002)		3
	Requested Procedure Priority	(0040,1003)		2
	Patient Transport Arrangements	(0040,1004)		2
	Requested Procedure Location	(0040,1005)		3
	Confidentiality Code	(0040,1008)		3
	Requested Procedure Comments	(0040,0400)		3
Imaging Service Request	Accession Number	(0008,0050)	SV	2
	Referring Physician Name	(0008,0090)		2
	Requesting Physician	(0032,1032)		2
	Requesting Service	(0032,1033)		3
	Reason for Imaging Service Request	(0040,2001)		3
	Service Request Issue Date	(0040,2004)		3
	Service Request Issue Time	(0040,2005)		3
	Service Request Comments	(0040,2400)		3
Visit Identification	Institution Name	(0008,0080)		3
	Admission ID	(0038,0010)	SV	2
	Issuer of Admission ID	(0038,0011)		3
Visit Status	Visit Status ID	(0038,0008)		3
	Current Patient Location	(0038,0300)		2
Visit Relationship	Referenced Patient Sequence	(0008,1120)		2
	>Referenced SOP Class UID	(0008,1150)		2
	>Referenced SOP Instance UID	(0008,1155)		2
Visit Admission	Referring Physician's Name	(0008,0090)		3
	Referring Physician's Address	(0008,0092)		3
	Admitting Diagnosis Description	(0008,1080)		3
	Route of Admission	(0038,0016)		3
	Admitting Date	(0038,0020)		3
	Admitting Time	(0038,0021)		3
Visit Discharge	Discharge Date	(0038,0030)		3
	Discharge Time	(0038,0032)		3
	Discharge Diagnosis Description	(0038,0040)		3
Visit Scheduling	Scheduled Admission Date	(0038,001A)		3
	Scheduled Admission Time	(0038,001B)		3
	Scheduled Discharge Date	(0038,001C)		3
	Scheduled Discharge Time	(0038,001D)		3
Patient Identification	Patient Name	(0010,0010)	WC	1
	Patient ID	(0010,0020)	SV	1
	Issuer of Patient ID	(0010,0021)		3
	Other Patient IDs	(0010,1000)		3
	Other Patient Names	(0010,1001)		3
Patient Demographic	Patient Birth Date	(0010,0030)		2
	Patient Birth Time	(0010,0032)		2
	Patient Sex	(0010,0040)		2
	Patient Size	(0010,1020)		3
	Patient Weight	(0010,1030)		2
	Patient Address	(0010,1040)		3

Module	Attribute Name	Tag	Match	Return
	Patient's Telephone Numbers	(0010,2154)		3
	Ethnic Group	(0010,2160)		3
	Occupation	(0010,2180)		3
	Patient's Religious Preference	(0010,21F0)		3
	Patient Comments	(0010,4000)		3
	Confidentiality Constraint	(0040,3001)		2
Patient Medical	Medical Alerts	(0010,2000)		2
	Contrast Allergies	(0010,2110)		2
	Smoking Status	(0010,21A0)		3
	Additional Patient History	(0010,21B0)		3
	Pregnancy Status	(0010,21C0)		2
	Last Menstrual Date	(0010,21D0)		3
	Special Needs	(0038,0050)		2
	Patient State	(0038,0500)		2

The Integration Services AE returns one of the following status codes in the C-FIND response:

Table 2.2-62: Modality Worklist SCP Response Status

Service Status	Error Code	Reason
Success	0000	Operation performed properly
Fail	A900	Sent when an SCU attempts to request an Identifier that doesn't match SOP Class attributes.
	Cxxx	Sent when the SCP is Unable to Process the SCU request.
Cancel	FE00	It is terminated due to Cancel request.
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional keys were supported in the same manner as Required keys.
	FF01	Matches are continuing – Warning that one or more Optional keys were not supported for existence for this identifier.

2.2.2.4.3 Real World Activity – Modality Performed Procedure Step (SCP)

2.2.2.4.3.1 Description and Sequencing of Activity

The Integration Services AE acts as an SCP to DIMSE N-CREATE or N-SET Modality Performed Procedure Steps. Attributes values for the performed procedure step are stored within the Integration Services AE's data repository. A common application for MPPS is to trim the modality worklist of completed or discontinued procedures.

2.2.2.4.3.2 Accepted Presentation Contexts

Table 2.2-63: Presentation Contexts Accepted by Modality Performed Procedure Step SCP

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

2.2.2.4.3.3 SOP Specific Conformance

The Integration Services AE supports the following N-CREATE Modality Performed Procedure Step attributes.

Table 2.2-64: Modality Performed Procedure Step SOP Class N-CREATE Attributes

Module	Attribute Name	Tag
SOP Common	Specific Character Set	(0008,0005)
Performed Procedure Step	Patient's Name	(0010,0010)
Relationship	Patient ID	(0010,0020)
	Patient Birth Date	(0010,0030)
	Patient's Sex	(0010,0040)
	Referenced Patient Sequence	(0008,1120)
	>Referenced SOP Instance UID	(0008,1155)
	Scheduled Step Attribute Sequence	(0040,0270)
	>Accession Number	(0008,0050)
	>Referenced Study Sequence	(0008,1110)
	>>Referenced SOP Instance UID	(0008,1155)
	>Performing Physician's Name	(0008,1050)
	>Study Instance UID	(0020,000D)
	>Requested Procedure Description	(0032,1060)
	>Scheduled Procedure Step Description	(0040,0007)
	>Scheduled Action Item Code Seq.	(0040,0008)
	>>Code Value	(0008,0100)
	>>Coding Scheme Designator	(0008,0102)
	>>Code Meaning	(0008,0104)
	>Scheduled Procedure Step ID	(0040,0009)
	>Requested Procedure ID	(0040,1001)
Performed Procedure Step	Procedure Code Sequence	(0008,1032)
Information	>Code Value	(0008,0100)
	>Coding Scheme Designator	(0008,0102)
	>Code Meaning	(0008,0104)
	Performed Station AE Title	(0040,0241)
	Performed Station Name	(0040,0242)
	Performed Location	(0040,0243)
	Performed Procedure Step Start Date	(0040,0244)
	Performed Procedure Step Start Time	(0040,0245)
	Performed Procedure Step End Date	(0040,0250)

Module	Attribute Name	Tag
	Performed Procedure Step End Time	(0040,0251)
	Performed Procedure Step Status	(0040,0252)
	Performed Procedure Step ID	(0040,0253)
	Performed Procedure Step Description	(0040,0254)
	Performed Procedure Type Description	(0040,0255)
Image Acquisition Results	Modality	(0008,0060)
	Study ID	(0020,0010)
	Performed Protocol Code Sequence	(0040,0260)
	>Code Value	(0008,0100)
	>Coding Scheme Designator	(0008,0102)
	>Code Meaning	(0008,0104)
	Performed Series Sequence	(0040,0340)
	>Retrieve AE Title	(0008,0054)
	>Series Description	(0008,103E)
	>Performing Physician's Name	(0008,1050)
	>Operator's Name	(0008,1070)
	>Referenced Image Sequence	(0008,1140)
	>>Referenced SOP Class UID	(0008,1150)
	>>Referenced SOP Instance UID	(0008,1155)
	>Protocol Name	(0018,1030)
	>Series Instance UID	(0020,000E)
	> Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)
	>>Referenced SOP Class UID	(0008,1150)
	>>Referenced SOP Instance UID	(0008,1155)

All attributes in the following table may be updated by the SCU using the N-SET Service.

Table 2.2-65: Modality Performed Procedure Step SOP Class N-SET Attributes

Module	Attribute Name	Tag
Performed Procedure Step Information	Procedure Code Sequence	(0008,1032)
	>Code Value	(0008,0100)
	>Coding Scheme Designator	(0008,0102)
	>Code Meaning	(0008,0104)
	Performed Procedure Step End Date	(0040,0250)
	Performed Procedure Step End Time	(0040,0251)
	Performed Procedure Step Status	(0040,0252)
	Performed Procedure Step Description	(0040,0254)
	Performed Procedure Type Description	(0040,0255)
Image Acquisition Results	Performed Protocol Code Sequence	(0040,0260)
	>Code Value	(0008,0100)
	>Coding Scheme Designator	(0008,0102)
	>Code Meaning	(0008,0104)
	Performed Series Sequence	(0040,0340)
	>Retrieve AE Title	(0008,0054)
	>Series Description	(0008,103E)
	>Performing Physician's Name	(0008,1050)

Module	Attribute Name	Tag
	>Operator's Name	(0008,1070)
	>Referenced Image Sequence	(0008,1140)
	>>Referenced SOP Class UID	(0008,1150)
	>>Referenced SOP Instance UID	(0008,1155)
	>Protocol Name	(0018,1030)
	>Series Instance UID	(0020,000E)
	> Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)
	>>Referenced SOP Class UID	(0008,1150)
	>>Referenced SOP Instance UID	(0008,1155)

The Integration Services AE returns one of the following status codes in the N-SET-RSP:

Table 2.2-66: Modality Performed Procedure Step SCP Response Status

Service Status	Error Code	Reason
Success	0000	Operation performed properly
Performed Procedure Step may no longer be updated	0110	Sent when an SCU attempts to update a performed procedure step which is COMPLETED or DISCONTINUED

2.3 NETWORK INTERFACES

The IMPAX 6.5 Solution provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8 of the DICOM Standard. The IMPAX 6.5 Solution inherits its TCP/IP stack from the computer system upon which it executes.

2.3.1 Physical Medium Support

The IMPAX 6.5 Solution 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 configuration of the IMPAX 6.5 Solution that affects DICOM conformance is described in this section.

2.4.1 PACS AE Configuration

This sub-section describes any configuration of the PACS AE that affects DICOM conformance.

2.4.1.1 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 the PACS AE.

2.4.1.2 Configuration Parameters

Table 2.4-1: PACS AE Configuration Parameter Table

Parameter	Description	Configurable (Yes/No)	Default Value
AE Specific Parameters			
Number of Simultaneous Associations	Maximum number of simultaneous associations accepted by the PACS AE.	Yes	32
Calling Title	Calling title that the PACS AE 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 the PACS AE waits for a response when trying to establish communication with a remote AE.	Yes	

2.4.2 Integration Services AE Configuration

This sub-section describes any configuration of the Integration Services AE that affects DICOM conformance.

2.4.2.1 AE Title/ Presentation Mapping

AE titles can be configured in the Integration Services AE via the Service Tools. The Service Tools provide a Web-based GUI for configuring the Integration Services AE.

2.4.2.1.1 Local AE Titles

The Integration Services AE uses local AE titles when it initiates a DICOM association. These parameters can be configured to be unique for each remote AE that the Integration Services AE communicates with.

Table 2.4-2: AE Title Configuration Table

Application Entity	Default AE Title	Default TCP/IP Port
Modality Performed Procedure Step SCU	PPS_OUT_MGR	2350

2.4.2.1.2 Remote AE Titles

The Integration Services AE uses remote AE titles when it accepts a DICOM association. The Integration Services AE can be configured to communicate with multiple remote AEs. Remote AE titles are configured using the Device Manager Service Tool. The Integration Services AE requires a separate real world device to be created for each remote AE that is communicating with. The Integration Services AE uses the name of the real world device as the remote AE title.

The Integration Services AE also uses remote AE titles when it initiates a DICOM association as a MPPS SCU. In this case the device name is not used as the remote AE title. The remote AE title is a configurable parameter of the MPPS SCU. Refer to section 2.4.2.2 for more details.

2.4.2.2 Configuration Parameters

The following table lists all of the DICOM parameters that can be configured via the Service Tools of the Integration Services AE. These parameters can be configured for each real world device that the Integration Services AE communicates with.

Table 2.4-3: Configuration Parameter Table

Parameter	Configurable (Yes/No)	Default Value
General Parameters		
Default character encoding	Yes	Latin 1 (ISO-8859-1)
Device name (remote AE title)	Yes	n/a
Modality Worklist SCP Specific Parameters		
Local DICOM port	Yes	104
Modality Performed Procedure Step SCP Specific Parameters		
Local DICOM port	Yes	104
Default assigning authority	Yes	UNKNOWN
Study SOP Instance UID is Study Instance UID	Yes	false
Modality Performed Procedure Step SCU Specific Parameters		
Remote host	Yes	127.0.0.1
Remote port	Yes	2350
Remote called title	Yes	PPS_OUT_MGR
Local calling title	Yes	PPS_OUT_MGR

3 MEDIA INTERCHANGE

3.1 IMPLEMENTATION MODEL

3.1.1 Application Data Flow

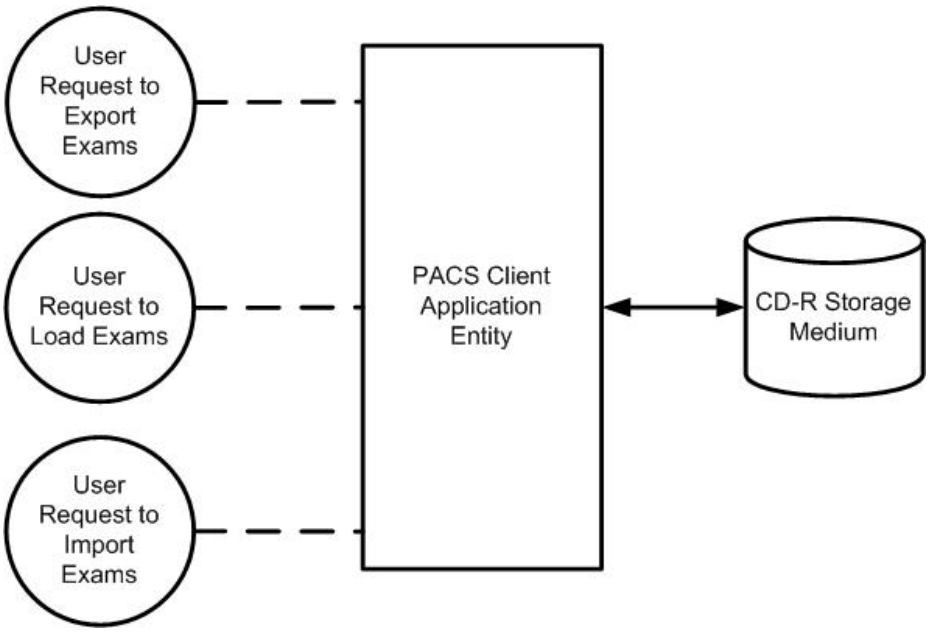

Figure 3-1: Application Data Flow Diagram for Interchange Media

The following data flows are depicted in the diagram:

- The PACS Client Application Entity exports exams to CD-R storage medium. It is associated with the local real-world activity “Export Exams”. It is optional to export a DICOM viewer along with the exams. “Export Exams” is performed upon user request for selected patients, studies, series and instances (images, presentation states and other non-image objects).
- The PACS Client Application Entity loads exams from the CD-R storage medium. It is associated with the local real-world activity “Load Exams”. It is performed upon user request to browse the content of the CD-R storage medium and then display selected patients, studies, series or instances (images, presentation states and other non-image objects).
- The PACS Client Application Entity imports exams from the CD-R storage medium to its associated PACS AE. It is associated with the real-world activity “Import Exams”. It is performed upon user request to import selected patients, studies, series or instances (images, presentation states and other non-image objects).

3.1.2 Functional Definitions of AE's

3.1.2.1 Functional Definition of PACS Client Application Entity

Activation of the "Export to CD" or "Export to CD with Viewer" icon or menu entry will create an export job. Each export job has references to one or more studies selected by the user. The contents referenced in each export job will be written to a single CD-R media or multiple CD-R media if the total size of the selection is larger than the capacity of a single CD-R media.

Selecting the CD as the search constraint will read the DICOMDIR on the media and present all the patients and studies available on the CD to the user. The user can then select one or more patients and studies to be displayed at the PACS Client Application Entity.

Activation of the "Import Study" icon or menu entry will import the selected patients and studies to the PACS AE associated with the PACS Client AE. Import is performed by transmitting the instances of the selected patients and studies to the PACS AE.

3.1.3 Sequencing of Real-World Activities

One or more studies must be selected before the "Export to CD" or "Export to CD with Viewer" can be invoked. An export job is created at the associated PACS AE. The job contains references to which studies are selected. The PACS AE collects all the instances for the referenced studies, packages them in a zip file and sends it to the PACS Client AE. The PACS Client AE unzips the file to extract the study instances. Then it writes the instances to a CD-R storage medium if a blank media is available and inserted in the CD-R writer device, or the write process will wait until a blank media is available. Optionally if a DICOM viewer is requested, then the PACS Client AE also adds a DICOM viewer to the CD-R storage medium.

When the PACS Client AE imports one or more patients and studies from the CD-R media, the instances are loaded based on the location references set in the DICOMDIR. Also the PACS Client AE will use the information stored in the Patient Module in the DICOMDIR to update the loaded instance before transmitting to the associated PACS AE. The transmission from PACS Client AE to PACS AE is done via C-Store service as a Service Class User.

3.1.4 File Meta Information for Implementation Class and Version

Table 3.1-1: File Meta Information for Implementation Class and Version

File Meta Information Version	0x00 0x01
Implementation Class UID	1.2.124.113532.1.1
Implementation Version Name	MITRA22JAN97

3.2 AE SPECIFICATION

3.2.1 PACS Client AE

PACS AE provides standard conformance to DICOM Interchange Option of the Media Storage Device Class.

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

Application Profiles Supported	Real World Activity	Role	SC Option
STD-GEN-CD	Export Exams	FSC	Interchange
STD-GEN-CD	Load Exams	FSR	Interchange
STD-GEN-CD	Import Exams	FSR	Interchange

3.2.1.1 File Meta Information for the PACS Client AE

Table 3.2-2: File Meta Information for PACS Client AE

Source Application Entity Title	CREATOR_impax.cu

3.2.1.2 Real World Activities

3.2.1.2.1 Activity – Export Exams

The PACS Client AE acts as a File-Set Creator when export patient exams to an interchange media. It creates the DICOM Directory structure with references to the exam objects. If the content of the current selection exceeds the capacity of a single CD-R medium, then it will automatically export to multiple CD-R medium.

The user will be prompted to insert an empty CD-R for each export job. The contents of the export job will be written together with a corresponding DICOMDIR and optionally a DICOM viewer to a single-session CDR. Writing in multi-session mode is not supported. The user can cancel an export job in the job queue.

3.2.1.2.1.1 Application Profile Specific Conformance

The PACS Client AE supports the STD-GEN-CD Application Profile. It supports all SOP classes defined in Table 1.1-1. All exported instances have transfer syntax set to Explicit VR Little Endian (transfer syntax UID 1.2.840.10008.1.2.1). If an instance stored in the PACS AE associated with the PACS Client AE does not have transfer syntax of Explicit VR Little Endian, then the PACS AE will convert the object into Explicit VR Little Endian.

The following attributes are defined as Type 1 for the DICOM directory record but are defined as Type 2 in the corresponding Information Object Definition:

- (0010,0020) Patient ID
- (0008,0020) Study Date
- (0008,0030) Study Time
- (0020,0010) Study ID
- (0020,0011) Series Number
- (0020,0013) Instance Number

If the values of these attributes are empty in the PACS AE database, then the PACS AE will not automatically generate a value for them. In other words, If one or more of these type 1 attributes are still empty after the updates from the database, the study will be exported as is and the media will not be DICOM Part 10 compliant in this case. On the other hand, it is possible for the user to configure field mappings for one or more of these attributes at the PACS AE such that if the attribute is empty, a default value will be filled in at runtime. As a result, the exported media will be DICOM Part 10 compliant.

3.2.1.2.2 Activity – Load Exams

The PACS Client AE also acts as a File-Set Reader when reading exams from an interchange media. It retrieves the references to the exam objects based on the DICOM Directory structure and then presents a list of all the available exams to the user. Then the user can select a study and display the objects using the location references retrieved from the DICOM Directory structure.

3.2.1.2.2.1 Application Profile Specific Conformance

The PACS Client AE supports the STD-GEN-CD Application Profile. It supports all SOP classes defined in Table 1.1-1 with transfer syntax set to Explicit VR Little Endian (transfer syntax UID 1.2.840.10008.1.2.1)

3.2.1.2.3 Activity – Import Exams

The PACS Client AE also acts as a File-Set Reader when it imports exams from an interchange media to its associated PACS AE. It retrieves the references to the exam objects based on the DICOM Directory structure. Then using the location references retrieved, it transmits the objects to its associated PACS AE via DICOM C-Store.

3.2.1.2.3.1 Application Profile Specific Conformance

The PACS Client AE supports the STD-GEN-CD Application Profile. It supports all SOP classes defined in Table 1.1-1 with transfer syntax set to Explicit VR Little Endian (transfer syntax UID 1.2.840.10008.1.2.1).

3.3 AUGMENTED AND PRIVATE PROFILES

3.3.1 Augmented Profiles

None

3.3.2 Private Profiles

None

3.4 MEDIA CONFIGURATION

None

4 SUPPORT FOR EXTENDED CHARACTER SETS

4.1 PACS AE EXTENDED CHARACTER SET SUPPORT

The PACS AE supports the following character sets:

Table 4.1-1: PACS AE Extended Character Sets

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

4.2 INTEGRATION SERVICES AE EXTENDED CHARACTER SET SUPPORT

The internal encoding of character data in the Integration Services AE is UTF-8. If remote AEs are sending or receiving data in a different encoding, the Integration Services AE must convert the data to/from the encoding that the remote AE is using.

For inbound data, the Integration Services AE will read the value of the Specific Character Set (0008,0005) and automatically convert the incoming character data from the specified encoding to UTF-8. If no value is specified for the Specific Character Set, the Integration Services AE will use the character encoding configuration parameter to determine what the encoding of the data should be.

For outbound data, the Integration Services AE will use the value of the character encoding configuration parameter to specify the encoding of the character data. The Integration Services AE will populate the Specific Character Set (0008,0005) with the appropriate value.

The Integration Services AE supports the following character sets:

Table 4.2-1: Integration Services AE Character Set Table

Defined Term	Character Set
• ISO-IR 6	ASCII
• ISO-IR 13	JIS X 0201: Katakana
• ISO-IR 14	JIS X 0201: Romaji
• ISO-IR 100	Latin Alphabet No. 1
• ISO-IR 101	Latin Alphabet No. 2
• ISO-IR 109	Latin Alphabet No. 3
• ISO-IR 110	Latin Alphabet No. 4
• ISO-IR 126	Greek
• ISO-IR 127	Arabic
• ISO-IR 138	Hebrew
• ISO-IR 144	Cyrillic
• ISO-IR 148	Latin Alphabet No. 5
• ISO-IR 166	Thai
• ISO-IR 192	UTF-8
• ISO 2022 IR 87	JIS X 0208: Kanji
• ISO 2022 IR 149	KS X 1001: Hangul and Hanja
• ISO 2022 IR 159	JIS X 0212: Supplementary Kanji Set
• GB18030	Chinese

5 SECURITY

5.1 SECURITY PROFILE

IMPAX 6.5 Solution does not implement any DICOM security profiles from PS 3.15.

5.2 ASSOCIATION LEVEL SECURITY

IMPAX 6.5 Solution provides association level security by restricting acceptance to association requests only from DICOM AEs configured in IMPAX 6.5 Solution. Association requests from unknown DICOM AEs will be rejected.

5.3 APPLICATION LEVEL SECURITY

Administration Tools running at PACS AE and Service Tools running at Integration Services AE requires a valid user name and password pair to login.

6 ANNEXES

6.1 IOD CONTENTS

6.1.1 Created SOP Instance

6.1.1.1 Change Context IOD

Table 6.1-1 defines the IOD of the Change Context object which is used to capture attribute changes as well as object deletion.

Table 6.1-1: IOD of Change Context Object

Attribute	DICOM Tag	Value	Type	Remarks
Patient level attributes				Current patient level values
Referenced Patient Sequence	(0008,1120)		3	Only included if patient_uid is updated
> Referenced SOP Instance UID	(0008,1155)		1C	Must be set if the Referenced Patient Sequence exists
Study Instance UID	(0020,000D)	The study_uid of the affected study	1	
study level attributes				Current study level values
Modified Attribute Sequence	(0400,0550)		3	This sequence is used to capture the original values at the patient and study level for the changed attributes of the affected study. This sequence is only required if there are attribute changes at the patient and study level. The items are recorded in reverse chronological order.
> Old values of all affected patient and study level attributes for a given change context			1C	
> Content_date	(0008,0023)	Date when the most recent change occurred	3	
> Content_time	(0008,0033)	Time when the most recent change occurred	3	
Referenced Series Sequence	(0008,1115)		3	Sequence of Items where each Item includes references to the Instances within the same Series. One or more Items shall be included in this Sequence. This sequence is only required if the Attribute Presentation State object is used to convey the information of one or more

Attribute	DICOM Tag	Value	Type	Remarks
				object deletion or any series level attribute change.
> Series Instance UID	(0020,000E)	The series_uid of the affected series.	1C	
> Any other attributes in the General Series Module				Current series level values.
> Modified Attribute Sequence	(0400,0550)		3	This sequence is used to capture the original values at the series level for the changed attributes of the affected study. This sequence is only required if there are attribute changes at the series level. The items are recorded in reverse chronological order.
>> Old values of all affected series level attributes			1C	
>> Content_date	(0008,0023)	Date when the most recent change occurred	3	
>> Content_time	(0008,0033)	Time when the most recent change occurred	3	
> Referenced SOP Sequence	(0008,1199)		3	Sequence of Items where each Item includes references to a single Instance within this series. One or more Items shall be included in this Sequence.
>> Referenced SOP Class UID	(0008,1150)		1C	
>> Referenced SOP Instance UID	(0008,1155)		1C	
>> Instance Availability	(0008,0056)	HIDDEN or UNHIDDEN	1C	This is to indicate that the object is completely deleted from the source PACS or it is undeleted. It is important to note that it is the responsibility of the recipient of this object to determine how to handle the object deletion. For example, it can choose to delete the object from the system, or it can simply hide the object from any access but keep the object in the system.
>> Any other attributes in the SOP Common Module				Current SOP instance level values
>> Modified Attribute Sequence	(0400,0550)		3	This sequence is used to capture the original values at the sop instance level for the changed attributes of the affected study. This sequence is only required if there are attribute changes at the sop instance level.

Attribute	DICOM Tag	Value	Type	Remarks
				The items are recorded in reverse chronological order.
>>> Old values of all affected sop instance level attributes			1C	
>>> Content_date	(0008,0023)	Date when the most recent change occurred	3	
>>> Content_time	(0008,0033)	Time when the most recent change occurred	3	
Series_instance_uid	(0020,000E)	If there is an existing series for Attribute Presentation State object, then use it. If there is more than one such series, then choose any one. If no such series exist yet, then generate a new series_uid to create a new series.	1	The Attribute Presentation State object cannot reside in any existing image object sequence. To minimize the number of series with just one Attribute Presentation State object, any existing CC series can be reused.
Modality	(0008,0060)	CC	1	CC = Change Context
Sop_class_uid	(0008,0016)	See Table 6.3-1	1	The private sop class for the Attribute Presentation State object.
Sop_instance_uid	(0008,0018)	Generate a new sop_instance_uid for each new attribute presentation state object created	1	

Note that the grey out attributes are defined in the IOD but not currently used in IMPAX 6.5.

6.1.1.2 Transaction IOD

Table 6.1-2 defines the IOD of the Transaction object which captures the context of a transaction occurred at the application entity.

Table 6.1-2: IOD of Transaction Object

Attribute	DICOM Tag	Value	Type	Remarks
All required Patient level attributes				Include all Type 1 and 2 attributes defined in the Patient Module.
Study Instance UID	(0020,000D)	The study_uid of the affected study	1	
Name of Physician(s) Reading Study	(0008,1060)		2C	Highly recommended for Dictated Transaction object.
All required Study level attributes				Include all Type 1 and 2 attributes defined in the General Study Module
Series Instance UID	(0020,000E)	Generate a new series_uid	1	Generate a new series_uid when the New Transaction object is created. Then all other Transaction objects will use the same series_uid. In other words, there is only Transaction object series for a given study.

Attribute	DICOM Tag	Value	Type	Remarks
Modality	(0008,0056)	TX	1	TX = Transaction
All required Series level attributes				Include all Type 1 and 2 attributes defined in the General Series Module.
SOP Class UID	(0008,0016)		1	The private sop class for the Transaction object.
SOP Instance UID	(0008,0018)	Generate a new sop_instance_uid for each new Transaction object created	1	
Content Date	(0008,0023)	Date when the transaction occurred	3	
Content Time	(0008,0033)	Time when the transaction occurred	3	

6.1.2 Usage of Attributes from received IOD's

The PACS AE expects the attribute Requesting Service (0032,1033) in the Modality Worklist Query response to be the unique identifier of the report repository that maintains the report for the corresponding service request. The PACS AE uses this information to determine where and how to fetch the report for the service request.

6.1.3 Attribute Mappings

6.1.3.1 HL7 to DICOM Modality Worklist Attribute Mappings

The Integration Services AE mapping between attributes received via HL7 and attributes returned via DICOM MWL is configurable. The default mapping is contained in the table below:

Table 6.1-3: HL7 to DICOM Mapping

DICOM Attribute Name	DICOM Tag	HL7 Attribute Name	HL7 Segment	Notes
Patient Module				
Patient's Name	(0010,0010)	Patient Name	PID 5,1 + PID 5,2 + PID 5,3	Required
Patient ID	(0010,0020)	Patient Identifier List	PID 3,1	Required
Issuer of Patient ID	(0010,0021)	Patient Identifier List	PID 3,4	Uses configurable parameter if attribute is not present.
Other Patient IDs	(0010,1000)	Alternate Patient ID	PID 4	
Other Patient Names	(0010,1001)	Patient Alias	PID 9,1 + PID 9,2 + PID 9,3	
Patient's Birth Date	(0010,0030)	Date/Time of Birth	PID 7	First 8 characters
Patient's Birth Time	(0010,0032)	Date/Time of Birth	PID 7	Last 6 characters
Patient's Sex	(0010,0040)	Sex	PID 8	
Patient's Address	(0010,1040)	Patient Address	PID 11	

DICOM Attribute Name	DICOM Tag	HL7 Attribute Name	HL7 Segment	Notes
Patient's Telephone Numbers	(0010,2154)	Phone Number – Home Phone Number – Business	PID 13,1 PID 14,1	PID 13,1 = Home PID 14,1 = Work
Ethnic Group	(0010,2160)	Race or Ethnic Group	PID 10 or PID 22	
Patient's Religious Preference	(0010,21F0)	Religion	PID 17	
Medical Alerts	(0010,2000)	Relevant Clinical Info	OBR 13	
Contrast Allergies	(0010,2110)	Allergy Code / Mnemonic / Description	AL1 3,2	
Pregnancy Status	(0010,21C0)	Ambulatory Status	PV1 15	
Patient State	(0038,0500)		OBR 12	
Visit Module				
Institution Name	(0008,0080)	Servicing Facility	PV1 39	
Admission ID	(0038,0010)	Visit Number	PV1 19,1	Required
Issuer of Admission ID	(0038,0011)	Visit Number	PV1 19,4	Uses configurable parameter if attribute is not present.
Visit Status ID	(0038,0008)	Message Type or Event Type Code	MSH 9,2 or EVN 1,1	Uses lookup table to convert to DICOM value.
Current Patient Location	(0038,0300)	Assigned Patient Location or Temporary Location	PV1 3 or PV1 11	
Referring Physician's Name	(0008,0090)	Referring Doctor	PV1 8,2 + PV1 8,3 + PV1 8,4	
Admitting Date	(0038,0020)	Admit Date/Time	PV1 44	First 8 characters
Admitting Time	(0038,0021)	Admit Date/Time	PV1 44	Last 6 characters
Discharge Date	(0038,0030)	Discharge Date/Time	PV1 45	First 8 characters
Discharge Time	(0038,0032)	Discharge Date/Time	PV1 45	Last 6 characters
Scheduled Admission Date	(0038,001A)	Admit Date/Time	PV1 44	First 8 characters
Scheduled Admission Time	(0038,001B)	Admit Date/Time	PV1 44	Last 6 characters
Scheduled Discharge Date	(0038,001C)	Discharge Date/Time	PV1 45	First 8 characters
Scheduled Discharge Time	(0038,001D)	Discharge Date/Time	PV1 45	Last 6 characters
Imaging Service Request Module				
Reason for the Imaging Service Request	(0040,2001)	Reason for Study	OBR 31,1	
Imaging Service Request Comments	(0040,2400)	Relevant Clinical Info	OBR 13	
Requesting Physician	(0032,1032)	Ordering Provider	OBR 16,2 + OBR 16,3 + OBR 16,4	
Requesting Service	(0032,1033)	Entering Organization	ORC 17	
Accession Number	(0008,0050)	Filler Order Number	ORC 3,1	Required
Issue Date of Imaging Service Request	(0040,2004)	n/a	n/a	Date HL7 message is received.
Issue Time of Imaging Service Request	(0040,2005)	n/a	n/a	Time HL7 message is received.

DICOM Attribute Name	DICOM Tag	HL7 Attribute Name	HL7 Segment	Notes
Placer Order Number / Imaging Service Request	(0040,2016)	Placer Order Number	ORC 2,1 or OBR 2,1	Required
Filler Order Number / Imaging Service Request	(0040,2017)	Filler Order Number	ORC 3,1 or OBR 3,1	
Order Entered By	(0040,2008)	Entered By	ORC 10,2 + ORC 10,3 + ORC 10,4	
Order Enterer's Location	(0040,2009)	Enterer's Location	ORC 13	
Order Callback Phone Number	(0040,2010)	Call Back Phone Number	ORC 14,1	
Requested Procedure Module				
Requested Procedure ID	(0040,1001)	Filler Order Number	ORC 3,1 or OBR 3,1	
Reason for the Requested Procedure	(0040,1002)	Reason for Study	OBR 31,1	
Requested Procedure Code Sequence	(0032,1064)	n/a	n/a	
>Code Value	(0008,0100)	Universal Service ID	OBR 4,1	
>Coding Scheme Designator	(0008,0102)	Universal Service ID	OBR 4,3	
>Code Meaning	(0008,0104)	Universal Service ID	OBR 4,2	
Requested Procedure Description	(0032,1060)	Universal Service ID	OBR 4,2	
Requested Procedure Priority	(0040,1003)	Quantity / Timing or Priority	OBR 27,6 or OBR 5	Uses lookup table to convert to DICOM value.
Patient Transport Arrangements	(0040,1004)	Transportation Mode	OBR 30	
Study Module				
Study Status ID	(0032,000A)	Order Control or Order Status	ORC 1 or ORC 5	Uses lookup table to convert to DICOM value.
Study Priority ID	(0032,000C)	Quantity / Timing	OBR 27,6	Uses lookup table to convert to DICOM value.
Reason for Study	(0032,1030)	Reason for Study	OBR 31,1	
Study Date	(0008,0020)	Results Rpt/Status Chng – Date/Time	OBR 22,1	First 8 characters
Study Time	(0008,0030)	Results Rpt/Status Chng – Date/Time	OBR 22,1	Last 6 characters
Scheduled Procedure Step Module				
Scheduled Station Name	(0040,0010)	Diagnostic Serv Sect ID or Placer Field 2	OBR 24 or OBR 19	
Scheduled Procedure Step Location	(0040,0011)	Diagnostic Serv Sect ID or Placer Field 2	OBR 24 or OBR 19	
Scheduled Procedure Step Start Date	(0040,0002)	Quantity / Timing or Scheduled Date / Time	OBR 27,4 or OBR 36	First 8 characters
Scheduled Procedure Step Start Time	(0040,0003)	Quantity / Timing or Scheduled Date / Time	OBR 27,4 or OBR 36	Last 6 characters

DICOM Attribute Name	DICOM Tag	HL7 Attribute Name	HL7 Segment	Notes
Scheduled Procedure Step End Date	(0040,0004)	Quantity / Timing	OBR 27,5	First 8 characters
Scheduled Procedure Step End Time	(0040,0005)	Quantity / Timing	OBR 27,5	Last 6 characters
Scheduled Performing Physician's Name	(0040,0006)	Technician	OBR 34,2 + OBR 34,3 + OBR 34,4	
Scheduled Procedure Step Description	(0040,0007)	Universal Service ID	OBR 4,2	
Scheduled Protocol Code Sequence	(0040,0008)	n/a	n/a	
>Code Value	(0008,0100)	Universal Service ID	OBR 4,1	
>Coding Scheme Designator	(0008,0102)	Universal Service ID	OBR 4,3	
>Code Meaning	(0008,0104)	Universal Service ID	OBR 4,2	
Scheduled Procedure Step ID	(0040,0009)	Filler Order Number	ORC 3,1 or OBR 3,1	
Scheduled Procedure Step Status	(0040,0020)	Order Control or Order Status	ORC 1 or ORC 5	Uses lookup table to convert to DICOM value.

6.2 DATA DICTIONARY OF PRIVATE ATTRIBUTES

Table 6.2-1 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 6.2-1 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
IMPAX markup XML stored	(0029,xx10)	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	Mitra Markup 1.0
Markup14	(0029,xx13)	OB	1	Mitra Markup 1.0
Markup15	(0029,xx14)	OB	1	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
study_status	(0031,xx00)	CS	1	AGFA PACS Archive Mirroring 1.0
date_time_verified	(0031,xx01)	CS	1	AGFA PACS Archive Mirroring 1.0

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

6.3 STANDARD EXTENDED/SPECIALIZED/PRIVATE SOP CLASSES

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

6.3.1 Attribute Presentation State SOP Class

Table 6.3-1: Private SOP Class for Attribute Presentation State Object

SOP Class Identifier	SOP Class UID	Remarks
Basic Attribute Presentation State	1.2.124.113532.3500.7	This is used for basic attribute changes. The recipient can accept the change and update its record.

The Basic Attribute Presentation State SOP Class uses the Change Context IOD as defined in Section 6.1.1.1.

AGFA

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