AGFA HEALTHCARE
DICOM Conformance Statement

IMPAX Data Center 3.1.1

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Conformance Statement Overview

Agfa HealthCare IMPAX Data Center 3.1.1, further referred to as IDC, is comprised of a storage facility. IDC is a single Application Entity[1] that stores images sent to it by service class users, takes responsibility for storage of the images/objects, allows queries based on several standard query models, and retrieves requested images/objects. IDC can store images to an ftp archive.

IDC is a system that provides services for safe storage and retrieve of DICOM evidence objects such as Images, Key Image Notes, Presentation States, Structured Reports, and others.

IDC acts as a **service class provider (SCP)** for Verification, Storage, Storage Commitment, Query/Retrieve and Modality Performed Procedure Steps SOP Class.

IDC acts as a **service class user (SCU)** for Verification, Storage, Storage Commitment, Query/Retrieve Service Classes and Modality Performed Procedure Steps SOP Class.

IDC conforms to the DICOM 3.0 2011 standard.

IDC 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 Supplement 64, Table A.1-2. The italicized items represent SOP classes that have been retired (so no longer appear in Supplement 64) but are still supported by IDC.

Table 1.1-1: Network Services Supported

SOP Class Name	SOP Class UID	SCU	SCP
Verification			
Verification	1.2.840.10008.1.1	Yes	Yes
Transfer			
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	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
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	Yes
Enhanced MR Color Image Storage	1.2.840.10008.5.1.4.1.1.4.3	Yes	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
Enhanced US Volume Storage	1.2.840.10008.5.1.4.1.1.6.2	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes

[1]IDC can be also configured to provide Storage, Storage Commitment and Query/Retrieve by different Application Entities, addressed by different Application Entity Titles.

SOP Class Name	SOP Class UID	SCU	SCP
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	Yes
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	Yes
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	Yes
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	Yes
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	Yes
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes	Yes
General Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.2	Yes	Yes
Arterial Pulse Waveform Storage	1.2.840.10008.5.1.4.1.1.9.5.1	Yes	Yes
Respiratory Waveform Storage	1.2.840.10008.5.1.4.1.1.9.6.1	Yes	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Yes	Yes
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	Yes	Yes
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	Yes	Yes
XA / XRF Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.5	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Yes	Yes
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Yes	Yes
X-Ray 3D Craniofacial Image Storage	1.2.840.10008.5.1.4.1.1.13.1.2	Yes	Yes
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Yes	Yes
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Yes	Yes
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3	Yes	Yes
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Yes	Yes
Surface Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.5	Yes	Yes
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67	Yes	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	Yes
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	Yes
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes	Yes
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	Yes
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Yes	Yes
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Yes	Yes
Ophthalmic Tomography Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.4	Yes	Yes
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	Yes	Yes
Ophthalmic Visual Field Static Perimetry Measurements Storage	1.2.840.10008.5.1.4.1.1.80.1	Yes	Yes
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	Yes	Yes
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	Yes	Yes

SOP Class Name	SOP Class UID	SCU	SCP
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65	Yes	Yes
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes	Yes
Colon CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.69	Yes	Yes
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	Yes
Encapsulated CDA Storage	1.2.840.10008.5.1.4.1.1.104.2	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
Enhanced PET Image Storage	1.2.840.10008.5.1.4.1.1.130	Yes	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
RT Brachy Treatment Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	Yes
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	Yes
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	Yes	Yes
RT Ion Beams Plan Storage	1.2.840.10008.5.1.4.1.1.481.9	Yes	Yes
Hardcopy Grayscale Image Storage (Retired)	*1.2.840.10008.5.1.1.29*	*Yes*	*Yes*
Hardcopy Color Image Storage (Retired)	*1.2.840.10008.5.1.1.30*	*Yes*	*Yes*
Nuclear Medicine Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.5*	*Yes*	*Yes*
Ultrasound Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.6*	*Yes*	*Yes*
Ultrasound Multi-frame Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.3*	*Yes*	*Yes*
X-Ray Angiographic Bi-plane Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.12.3*	*Yes*	*Yes*
Standalone Overlay Storage (Retired)	*1.2.840.10008.5.1.4.1.1.8*	*Yes*	*Yes*
Standalone Curve Storage (Retired)	*1.2.840.10008.5.1.4.1.1.9*	*Yes*	*Yes*
Standalone Modality LUT Storage (Retired)	*1.2.840.10008.5.1.4.1.1.10*	*Yes*	*Yes*
Standalone VOI LUT Storage (Retired)	*1.2.840.10008.5.1.4.1.1.11*	*Yes*	*Yes*
Standalone PET Curve Storage (Retired)	*1.2.840.10008.5.1.4.1.1.129*	*Yes*	*Yes*
VL Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.77.1*	*Yes*	*Yes*
VL Multi-frame Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.77.2*	*Yes*	*Yes*
Agfa Attribute Presentation State	1.2.124.113532.3500.7	Yes	Yes
Siemens CSA Non-Image Storage	1.3.12.2.1107.5.9.1	Yes	Yes
Dcm4che Encapsulated Document Storage	1.2.40.0.13.1.5.1.4.1.1.104.1	Yes	Yes
Phillips 3D Presentation State Storage	1.3.46.670589.2.5.1.1	Yes	Yes
Phillips MR Spectrum Storage	1.3.46.670589.11.0.0.12.1	Yes	Yes
Phillips MR Series Data Storage	1.3.46.670589.11.0.0.12.2	Yes	Yes
Phillips MR Examcard Data Storage	1.3.46.670589.11.0.0.12.2	Yes	Yes
GE 3D Model Storage	1.2.840.113619.4.26	Yes	Yes
GE PET Raw Data Storage	1.2.840.113619.4.30	Yes	Yes
Toshiba Aplio Ultrasound Private Storage	1.2.392.200036.9116.7.8.1.1.1	Yes	Yes
Query/Retrieve			
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	Yes
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	Yes
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes
Patient/Study Only Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	Yes	Yes
Patient/Study Only Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Yes	Yes
Workflow Management			
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	Yes

SOP Class Name	SOP Class UID	SCU	SCP
Modality Performed Procedure Steps	1.2.840.10008.3.1.2.3.3	Yes	Yes

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1 INTRODUCTION

1.1 Revision Record

DICOM Conformance Statement Agfa HealthCare IMPAX Data Center 3.1.1		
Revision Number	**Date**	**Reason for Change**
1.0	July 7, 2016	Initial revision – Rebrand, new SOP Classes, new Transfer Syntaxes
1.1	July 7, 2016	Update Livelink NodeID
1.2	July 28, 2016	Updated Document No., removed comments that were added to facilitate review.

1.2 Purpose and Intended Audience of this Document

This document is a DICOM Conformance Statement for the DICOM Services of the Agfa HealthCare IMPAX Data Center 3.1.1 product, further referred to as IDC.

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 IDC and other DICOM devices, it is not sufficient to guarantee the interoperation of the two DICOM Application Entities. 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 applications requirements and developing a solution that integrates the Agfa equipment with other vendors' systems is the user's responsibility and should not be underestimated.

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

1.3.2 Future Evolution

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

1.4 Acronyms and Abbreviations

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

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

1.5 Related Documents

- ACR-NEMA Digital Imaging and Communications in Medicine (DICOM) V3.0.2008.
- IHE Radiology Technical Framework Revision 9 – Final Text, June 2008

2 NETWORKING

2.1 Implementation Model

2.1.1 Application Data Flow Diagram

The Application Data Flow Diagrams in this section depict the DICOM data flow to and from IDC Application Entities[2].

IDC is logically divided in several different DICOM Application Entities:

- Verification-SCU
- Storage-SCP
- Storage Commitment (SCP and SCU)
- Query/Retrieve-SCP and Storage-SCU
- Retrieve-SCU
- Modality Performed Procedure Steps (SCP and SCU)

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.

The Application Entities detailed in the Application Data Flow Diagram are all Java Enterprise Application and are designed to run in a J2EE compliant container (i.e. JBoss) on any Java Virtual Machine 1.5 capable Operating System.

[2]This is the default configuration. IDC is configured to act as single Application Entity providing all supported DICOM Services to remote application. But it is possible to assign different Application Entities Titles to the 4 different Service groups, which corresponds to providing/requesting these Services by logically separated Application Entities.

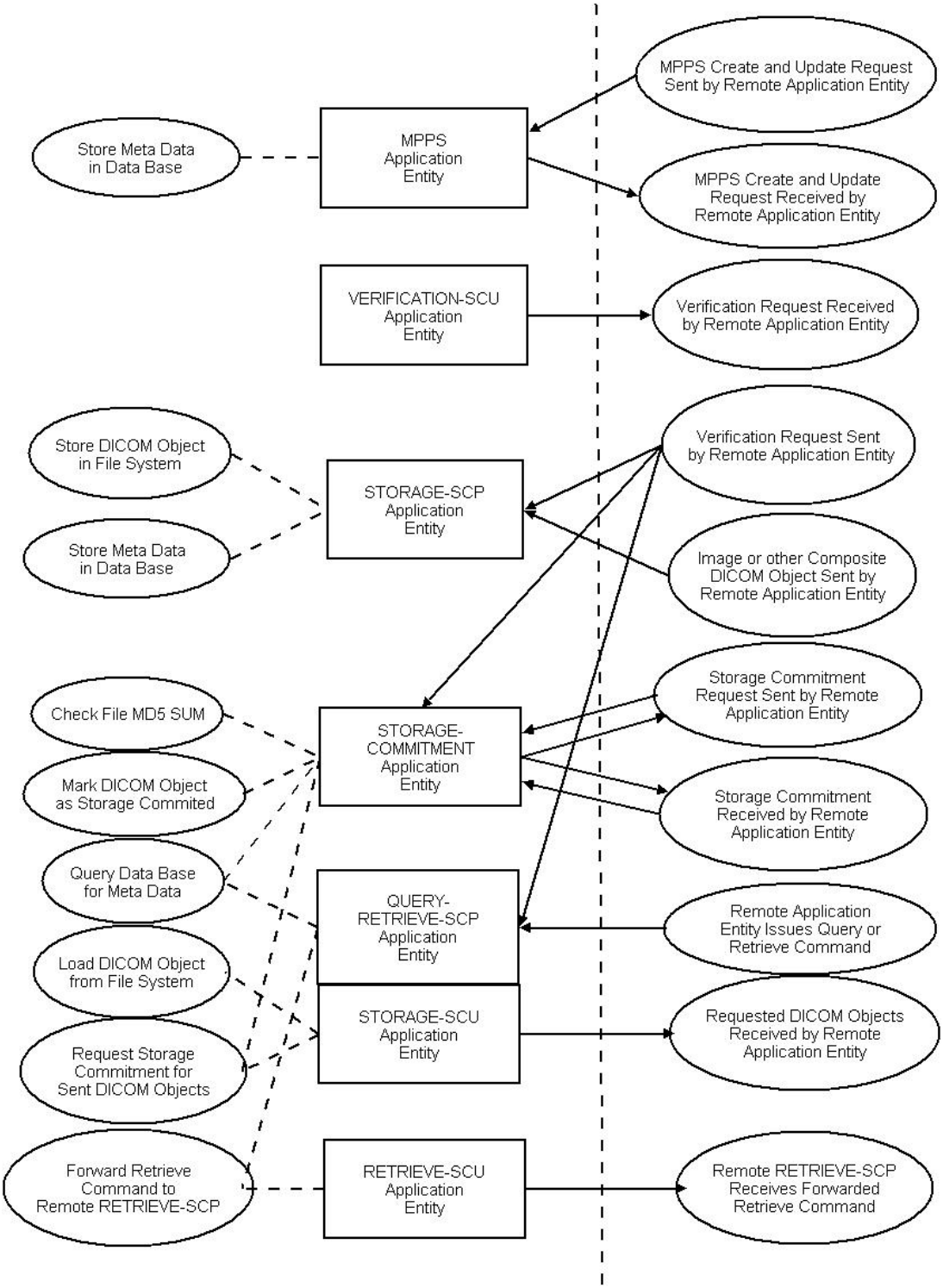

Figure 2-1: Functional Overview – Application Data Flow for MPPS, Verification-SCU, Storage-SCP, Storage Commitment, Query/Retrieve-SCP, Storage-SCU, and Retrieve-SCU AEs.

Application Entity: Verification-SCU

The Verification-SCU AE implements the DICOM Verification Service Class as an SCU.

Application Entity: Storage-SCP

The **Storage-SCP AE** implements the DICOM Storage Service Class and the Verification Service Class as an SCP.

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

Application Entity: Storage Commitment (SCP and SCU)

The **Storage Commitment AE** implements the DICOM Storage Commitment Service Class as an SCP and SCU.

Application Entity: Query/Retrieve-SCP and Storage-SCU

The **Query/Retrieve-SCP AE** implements Query/Retrieve Service Class as an SCP. The Storage-SCU AE implements the DICOM Storage Service Class as an SCU.

Application Entity: Retrieve-SCU

The **Retrieve-SCU AE** implements the DICOM Retrieve Service Class as an SCU.

Application Entity: Modality Performed Procedure Step (SCP and SCU)

The Modality Performed Procedure Step AE implements the DICOM MPPS Service Class as an SCP and SCU.

2.1.2 Functional Definitions of AE’s

2.1.2.1 Application Entity: Verification-SCU

Summary: IDC acts as a Service Class User of C-Echo to verification DICOM communication with remote application entity.

Details: The Verification-SCU Application Entity initiates a new association to a Remote Application Entity with the Verification (Echo) Service Classes.

2.1.2.2 Application Entity: Storage-SCP

Summary: IDC stores a received image in its entirety in its internal data store. IDC stores each image with the File Meta Information attached to it.

IDC extracts information about the images and stores this information within its internal database.

Details: The Storage-SCP Application Entity waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the Storage-SCP AE expects it to be a DICOM application.

The Storage-SCP AE will accept Associations with Presentation Contexts for SOP Classes of the Verification and Storage Service Classes.

DICOM Instances received in a Storage Request are filed on local (attached/mounted) file system(s). A subset of attributes from received Instances is also stored in records in local database.

2.1.2.3 Application Entity: Storage Commitment (SCP and SCU)

Summary: IDC acts a Service Class Provider of Storage Commitment to take explicit responsibility for storing DICOM objects received. Also IDC acts as a Service Class User of Storage Commitment to request explicit responsibility for storing DICOM objects sent to a Remote Storage-SCP.

Details: The Storage Commitment Application Entity waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the Storage Commitment-SCP AE expects it to be a DICOM application.

The Storage Commitment AE will accept Associations with Presentation Contexts for SOP Classes of the Verification and the Storage Commitment Service Classes.

A remote AE initiates an association with IDC and requests commitment for the safekeeping of one or more composite SOP instances on IDC. IDC will open a new association with the remote AE to indicate success or failure.

IDC can also initiate an association and request commitment for the safekeeping of one or more composite SOP instances to a remote AE.

2.1.2.4 Application Entity: Query/Retrieve-SCP and Storage-SCU

Summary: IDC responds to queries and retrieves based on the records stored in its database.

Details: The Query/Retrieve-SCP Application Entity waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the Query/Retrieve-SCP AE expects it to be a DICOM application.

The Query/Retrieve-SCP AE will accept Associations with Presentation Contexts for SOP Classes of the Verification and Query/Retrieve Service Classes.

Once it receives a Retrieve (Move) request, the Query/Retrieve-SCP AE will initiate a new association and send the requested instances to the Move Destination AE. The new association is handled by the Storage-SCU.

A remote AE initiates an association with IDC and sends a query. IDC 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.

2.1.2.5 Application Entity: Retrieve-SCU

Summary: IDC acts as a Service Class User of C-Move to retrieve DICOM objects.

Details: The Retrieve-SCU Application Entity initiates a new association to a Remote Application Entity with the Retrieve (Move) Service Classes. It specifies in the request the study, series or sop instance to be retrieved and the Move Destination AE.

2.1.2.6 Application Entity: Modality Performed Procedure Step (SCP and SCU)

Summary: IDC acts as a Service Class Provider of MPPS to receive MPPS and acts as a Service Class User of MPPS to forward the received MPPS to configured destination AEs.

Details: The MPPS SCP Application Entity waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the MPPS SCP AE expects it to be a DICOM application.

The MPPS SCP AE will accept Associations with Presentation Contexts for SOP Class of Modality Performed Procedure Step SOP Class.

Once it receives a Create (N-Create) or an Update (N-Set) request, the MPPS SCP AE will store the MPPS or update an existing MPPS locally. If one or more MPPS Forward

destinations are configured, then the MPPS SCP AE will notify the MPPS SCU AE which will initiate new association with the configured destinations and forward the MPPS.

2.2 AE Specifications

This section outlines the specifications for the Application Entities included in IDC.

2.2.1 AE Specification: Storage-SCP, Storage Commitment (SCP and SCU), Query/Retrieve-SCP and Storage-SCU, Retrieve-SCU

2.2.1.1 Default Transfer Syntaxes Supported

Storage-SCP provides Standard Conformance to the default transfer syntaxes listed in the following table:

Table 2-1: Default Transfer Syntaxes

Transfer Syntax	UID	SOP Class
Implicit VR Little Endian	1.2.840.10008.1.2	not Video

2.2.1.2 Extended Syntaxes Supported

Storage-SCP provides Standard Conformance to the extended transfer syntaxes listed in the following table for the purposes of storage and retrieval:

Table 2-2: Extended Transfer Syntaxes

Transfer Syntax	UID	SOP Class
Explicit VR Little Endian[3]	1.2.840.10008.1.2.1	not Video
JPEG Process 1, baseline, lossy (8 bit)	1.2.840.10008.1.2.4.50	only Image
JPEG Process 2,4, extended lossy (12 bit)	1.2.840.10008.1.2.4.51	only Image
JPEG Process 14, lossless, Non-Hierarchical	1.2.840.10008.1.2.4.57	only Image
JPEG Process 14, selection value 1, lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70	only Image
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90	only Image
JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	only Image
RLE Lossless	1.2.840.10008.1.2.5	only Image
MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100	only Video
MPEG2 Main Profile @ High level	1.2.840.10008.1.2.4.101	only Video
MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102	only Video
MPEG-4 AVC/H.264 BD compatible High Profile / Level 4.1	1.2.840.10008.1.2.4.103	only Video
MPEG-4 AVC/H.264 High Profile / Level 4.2	1.2.840.10008.1.2.4.104	only Video
MPEG-4 AVC/H.264 High Profile / Level 4.2	1.2.840.10008.1.2.4.105	only Video
MPEG-4 AVC/H.264 Stereo High Profile / Level 4.2	1.2.840.10008.1.2.4.106	only Video

2.2.1.3 Storage SOP Classes Supported

The Storage-SCP AE provides Standard Conformance to the following SOP Classes:

Notes

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

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

Table 2-3: SOP Classes for Storage-SCP

SOP Class Name	SOP Class UID	SCU	SCP
Verification			
Verification	1.2.840.10008.1.1	Yes	Yes
Transfer			
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	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
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	Yes
Enhanced MR Color Image Storage	1.2.840.10008.5.1.4.1.1.4.3	Yes	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
Enhanced US Volume Storage	1.2.840.10008.5.1.4.1.1.6.2	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	Yes
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	Yes
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	Yes
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	Yes
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	Yes
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes	Yes
General Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.2	Yes	Yes
Arterial Pulse Waveform Storage	1.2.840.10008.5.1.4.1.1.9.5.1	Yes	Yes
Respiratory Waveform Storage	1.2.840.10008.5.1.4.1.1.9.6.1	Yes	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Yes	Yes
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	Yes	Yes
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	Yes	Yes
XA / XRF Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.5	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Yes	Yes
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Yes	Yes
X-Ray 3D Craniofacial Image Storage	1.2.840.10008.5.1.4.1.1.13.1.2	Yes	Yes
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Yes	Yes

SOP Class Name	SOP Class UID	SCU	SCP
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Yes	Yes
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Yes	Yes
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3	Yes	Yes
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Yes	Yes
Surface Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.5	Yes	Yes
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67	Yes	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	Yes
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	Yes
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes	Yes
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	Yes
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Yes	Yes
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Yes	Yes
Ophthalmic Tomography Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.4	Yes	Yes
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	Yes	Yes
Ophthalmic Visual Field Static Perimetry Measurements Storage	1.2.840.10008.5.1.4.1.1.80.1	Yes	Yes
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	Yes	Yes
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	Yes	Yes
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65	Yes	Yes
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes	Yes
Colon CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.69	Yes	Yes
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	Yes
Encapsulated CDA Storage	1.2.840.10008.5.1.4.1.1.104.2	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
Enhanced PET Image Storage	1.2.840.10008.5.1.4.1.1.130	Yes	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
RT Brachy Treatment Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	Yes
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	Yes
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	Yes	Yes
RT Ion Beams Plan Storage	1.2.840.10008.5.1.4.1.1.481.9	Yes	Yes
Hardcopy Grayscale Image Storage (Retired)	*1.2.840.10008.5.1.1.29*	*Yes*	*Yes*
Hardcopy Color Image Storage (Retired)	*1.2.840.10008.5.1.1.30*	*Yes*	*Yes*
Nuclear Medicine Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.5*	*Yes*	*Yes*
Ultrasound Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.6*	*Yes*	*Yes*
Ultrasound Multi-frame Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.3*	*Yes*	*Yes*
X-Ray Angiographic Bi-plane Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.12.3*	*Yes*	*Yes*
Standalone Overlay Storage (Retired)	*1.2.840.10008.5.1.4.1.1.8*	*Yes*	*Yes*

SOP Class Name	SOP Class UID	SCU	SCP
Standalone Curve Storage (Retired)	*1.2.840.10008.5.1.4.1.1.9*	*Yes*	*Yes*
Standalone Modality LUT Storage (Retired)	*1.2.840.10008.5.1.4.1.1.10*	*Yes*	*Yes*
Standalone VOI LUT Storage (Retired)	*1.2.840.10008.5.1.4.1.1.11*	*Yes*	*Yes*
Standalone PET Curve Storage (Retired)	*1.2.840.10008.5.1.4.1.1.129*	*Yes*	*Yes*
VL Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.77.1*	*Yes*	*Yes*
VL Multi-frame Image Storage (Retired)	*1.2.840.10008.5.1.4.1.1.77.2*	*Yes*	*Yes*
Agfa Attribute Presentation State	1.2.124.113532.3500.7	Yes	Yes
Siemens CSA Non-Image Storage	1.3.12.2.1107.5.9.1	Yes	Yes
Dcm4che Encapsulated Document Storage	1.2.40.0.13.1.5.1.4.1.1.104.1	Yes	Yes
Phillips 3D Presentation State Storage	1.3.46.670589.2.5.1.1	Yes	Yes
Phillips MR Spectrum Storage	1.3.46.670589.11.0.0.12.1	Yes	Yes
Phillips MR Series Data Storage	1.3.46.670589.11.0.0.12.2	Yes	Yes
Phillips MR Examcard Data Storage	1.3.46.670589.11.0.0.12.2	Yes	Yes
GE 3D Model Storage	1.2.840.113619.4.26	Yes	Yes
GE PET Raw Data Storage	1.2.840.113619.4.30	Yes	Yes
Toshiba Aplio Ultrasound Private Storage	1.2.392.200036.9116.7.8.1.1.1	Yes	Yes

2.2.1.4 Association Establishment Policies

2.2.1.4.1 General

The Storage-SCP AE can both accept and propose Association Requests. The Storage-SCP AE will accept Association Requests for the Verification and Storage Services.

The DICOM standard application context name for DICOM 3.0 is always accepted.

Table 2-4: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

IDC contains no limitations for maximum PDU size.

2.2.1.4.2 Number of Associations

The Storage-SCP AE can support multiple simultaneous Associations requested by peer AEs. The default is 512. This value can be configured through the attribute "MaximumDICOMClients" in the Application Server DcmServer service.

Table 2-5: Number of Associations as an Association Acceptor for Storage-SCP

Maximum number of simultaneous associations	512 (Configurable)

2.2.1.4.3 Asynchronous Nature

The Storage-SCP AE supports asynchronous communication. Multiple outstanding transactions are supported. It allows more than one invoked and more than one performed operation on an Association. Asynchronous mode of operation is supported.

Table 2-6: Asynchronous Nature as an Association Acceptor for Storage-SCP

Maximum number of outstanding asynchronous transactions	1 (Configurable)

2.2.1.4.4 Implementation Identifying Information

The Storage-SCP AE will respond with the implementation identifying parameters listed in the following table.

Table 2-7: DICOM implementation Class and Version for Storage-SCP

Implementation Class UID	1.2.40.0.13.1.1
Implementation Version Name	dcm4che-1.1

2.2.1.4.5 Called/Calling Titles

The AE Title of IDC can be configured at installation or initial configuration time. Multiple hosts within a single IDC installation can use the same AE Title.

IDC validates the Called AE Title of the requesting SCU during association negotiation. Validation of the Calling AE Title is configurable. It is enabled by default.

2.2.1.5 Association Initiation Policies

2.2.1.5.1 Real World Activity – Verification Request Sent by IDC

2.2.1.5.1.1 Description and Sequencing of Activity

IDC issues Verification requests in response to UI mediated requests from the user to test the validity of a DICOM connection.

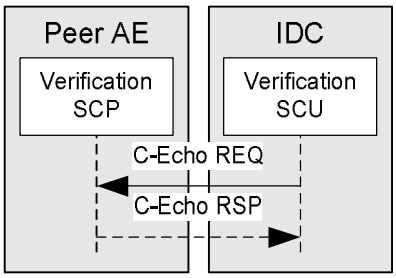

Figure 2-2 C-Echo Sequencing of Activity

2.2.1.5.1.2 Proposed Presentation Contexts

For the real world activity of Verification, the IDC requests the Presentation Contexts listed in Table 2-8.

Table 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**		
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

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

2.2.1.5.2 Real World Activity – Storage Commitment Request Sent by IDC

2.2.1.5.2.1 Description and Sequencing of Activity

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

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

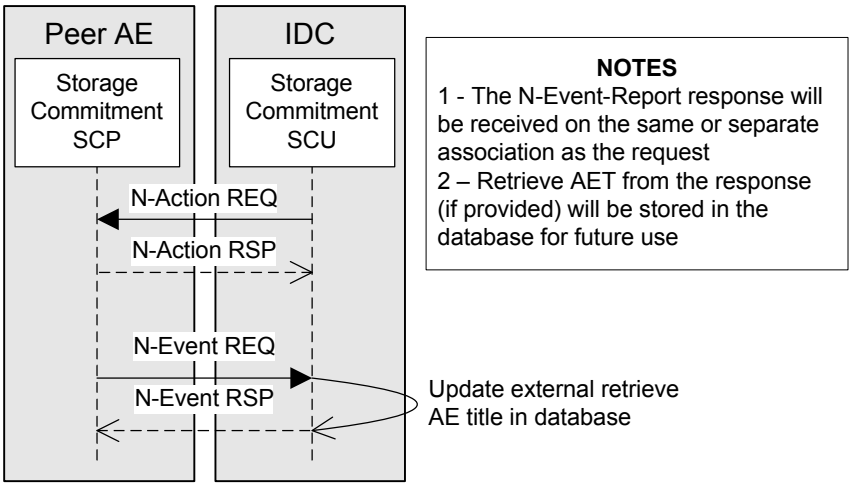

Figure-2-3: Send Storage Commitment Sequencing of Activity

2.2.1.5.2.2 Proposed Presentation Contexts

IDC may request any of the Presentation Contexts listed in Table 2-9 for Storage Commitment.

Table 2-9: Presentation Contexts Proposed for Request Storage Commitment (SCU)

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

2.2.1.5.2.3 SOP Specific Conformance – Request Storage Commitment (SCU)

IDC provides standard conformance to the DICOM Storage Commitment Service Class as an SCU. The Action Type and Action Information specified in Table 2-10 are supported.

Table 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)

IDC will generate an N-ACTION primitive if the local configuration setting for the remote AE is enabled for storage commitment.

IDC may request storage commitment for all the SOP Class UIDs listed in Table 2-3.

IDC supports the Referenced Study Component Sequence Attribute.

IDC will keep the Transaction ID applicable indefinitely.

IDC will respond to an N-EVENT-REPORT with an N-EVENT-REPORT response primitive using one of the status codes listed in Table 2-11.

IDC can configure the destination AE Title for the Storage Commit. By default, this is the AE Title where the storage request is sent.

Table 2-11: Storage Commitment Status Codes

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

2.2.1.5.3 Real World Activity – Transmit DICOM Objects Requested by IDC

2.2.1.5.3.1 Description and Sequencing of Activity

IDC will transmit images to a remote Storage-SCP. An association is established when the IDC initiates a transmit request. IDC will establish an association automatically in response to a C-MOVE request, archive to PACS notification, or configured forwarding rules.

Figure 2-4 illustrates the sequencing of activity when IDC initiates a C-Store request to a Storage-SCP.

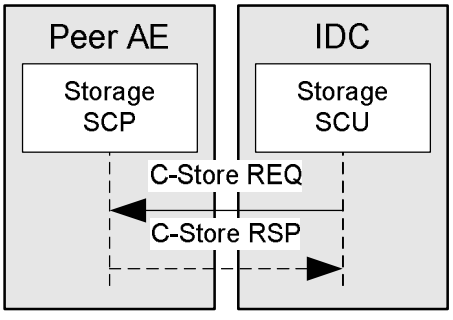

Figure 2-4: C-Store Sequencing of Activity

2.2.1.5.3.2 Proposed Presentation Contexts

IDC may request any of the Presentation Contexts listed in Table 2-12 for Storage. IDC will propose the transfer syntax used when the object was initially accepted by the server, Explicit VR Little Endian and Implicit VR Little Endian.

Table 2-12: Presentation Contexts Proposed for Requested DICOM Objects Received by Remote AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		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
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90	SCU	None
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	SCU	None

2.2.1.5.3.3 SOP Specific Conformance

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

IDC supports sending the objects in their native transfer syntax. If native compressed transfer syntax is not supported by the destination Calling AET, then IDC can decompress the object using the default Implicit VR Little Endian transfer syntax. If the transfer syntax Explicit VR Little Endian is accepted during the association negotiation, then IDC prefers sending the objects using the Explicit VR Little Endian transfer syntax over the Implicit VR Little Endian transfer syntax.

IDC will not convert the objects into any other compressed transfer syntax.

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

An unsuccessful C-Store response will cause the warning status B000: Sub-operations Complete – One or more Failures, in the final C-MOVE response to the C-MOVE request which triggers this C-Store sub-operation. The SOP Instance UID of the object, which storage to the Move Destination failed, will be listed in the Failed SOP Instance UID List (0008,0058) of the C_MOVE RSP Identifier and the value of Number of Failed Sub-operations (0000,1022) in the C-MOVE response will be incremented.

A warning status received in response to a C-Store operation will increment the value of Number of Warning Sub-operations (0000,1023) in the C-MOVE response.

2.2.1.6 Association Acceptance Policies

2.2.1.6.1 Real World Activity – Image or other Composite DICOM Object Sent by Remote AE (SCP)

2.2.1.6.1.1 Description and Sequencing of Activity

IDC will store images that are sent to it from a Storage SCU. All images received by IDC can be retrieved at a later time from IDC; 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 2-13.

Table 2-13: Image States for Image or other Composite DICOM Object Sent by Remote AE (SCP)

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.

Figure 2-5 illustrates the sequencing of activity when new DICOM objects are stored to IDC. IDC may be configured to apply lossless compression to received DICOM image objects. If this configuration option has been set, only images that arrived uncompressed are affected.

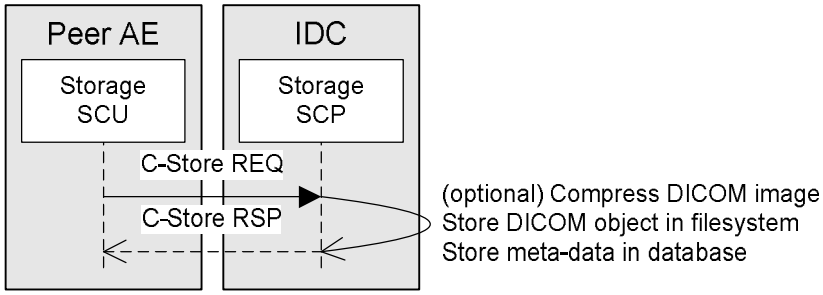

Figure 2-5: C-Store Sequencing of Activity

2.2.1.6.1.2 Accepted Presentation Contexts

IDC will accept any of the Presentation Contexts listed in Table 2-14 for Storage.

Table 2-14: Presentation Contexts Accepted by IDC for Image DICOM Object Sent by Remote AE (SCP)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	-
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	-
		RLE Lossless, PackBits	1.2.840.10008.1.2.5	SCP	-
		JPEG Process 1, baseline, lossy (8 bit)	1.2.840.10008.1.2.4.50	SCP	-
		JPEG Process 2,4, extended lossy (12 bit)	1.2.840.10008.1.2.4.51	SCP	-
		JPEG Process 14, lossless	1.2.840.10008.1.2.4.57	SCP	-
		JPEG Process 14, selection value 1, lossless	1.2.840.10008.1.2.4.70	SCP	-
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90	SCP	-
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	SCP	-

Table 2-15: Presentation Contexts Accepted by IDC for Video DICOM Object Sent by Remote AE (SCP)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
		MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100	SCP	-
		MPEG2 Main Profile @ High level	1.2.840.10008.1.2.4.101	SCP	-
		MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102	SCP	
		MPEG-4 AVC/H.264 BD compatible High Profile / Level 4.1	1.2.840.10008.1.2.4.103	SCP	-
		MPEG-4 AVC/H.264 High Profile / Level 4.2	1.2.840.10008.1.2.4.104	SCP	-
		MPEG-4 AVC/H.264 High Profile / Level 4.2	1.2.840.10008.1.2.4.105	SCP	-
		MPEG-4 AVC/H.264 Stereo High Profile / Level 4.2	1.2.840.10008.1.2.4.106	SCP	-

Table 2-16: Presentation Contexts Accepted by IDC for SR DICOM Object Sent by Remote AE (SCP)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	-
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	-

Table 2-17: Presentation Contexts Accepted by IDC for Other Composite DICOM Object Sent by Remote AE (SCP)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	-
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	-

2.2.1.6.1.3 SOP Specific Conformance – Image or other Composite DICOM Object Sent by Remote AE (SCP)

IDC conforms to the DICOM Storage Service Class as a Level 2 (Full) SCP. No elements are discarded or coerced by IDC. 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. IDC can decompress lossy compressed images and send them in uncompressed format. The Attribute Lossy Image Compression (0028,2110) remains “01”.

Upon receiving an object from a Storage SCU, IDC can be configured to extract other linked patient IDs associated to the same patient by one of the following mechanisms:

- Query an external Patient Identity Cross-referencing Manager using HL7 QBP^Q23 message using the Patient ID (0010,0020) and Issuer of Patient ID (0010,0021)
- Extract from the DICOM header. The other linked patient IDs can be stored in any DICOM attributes, public or private. For example, Other Patient IDs (0010,1000), Other Patient ID Sequence (0010,1002), etc.

Note that other linked patient IDs can also be conveyed to IDC outside of DICOM, for example, via HL7 ADT messages.

All patient IDs, including the primary patient ID (0010,0020) and all linked patient IDs, if present, must be uniquely qualified to a specific patient ID domain. For example, each patient ID is qualified by a corresponding Issuer of Patient ID attribute (0010,0021).

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. IDC 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.

If the received object is a DICOM SR with document title equal to (11528-7, LN, "Radiology Report"), then IDC will automatically update the study_status_id to READ.

In addition, IDC can be configured to silently ignore the duplicate object by returning success (i.e. return status of 0000H).

IDC calculates a hash code for each object received using the industry standard MD5 hashing algorithm. If IDC receives the same object (i.e. same SOP Instance UID) at a later time but the MD5 hash is different from the previous instance, IDC can be configured to overwrite the former received object.

IDC will return the C-STORE status codes shown in Table 2-18.

Table 2-18: Verification Response Status for Image or other Composite DICOM Object Sent by IDC Storage SCP

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.
Error	Data set does not match SOP Class	A900	Indicates that the Data Set does not encode an instance of the SOP Class specified.
	Processing Failure	110	The operation was not successful.
	Coercion of Data Elements	B000	Values of attributes were modified by the SCP to ensure consistency with former received objects belonging to the same Patient/Study/Series entity.
Success	Success	0000	Operation performed properly.

2.2.1.6.1.4 Presentation Context Acceptance Criterion

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

2.2.1.6.1.5 Transfer Syntax Selection Policies

IDC supports all transfer syntaxes listed in Table 2-9. By default, IDC will choose a transfer syntax other than Implicit VR Little Endian if more than one is requested in a single Presentation Context. IDC 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.

2.2.1.6.2 Real World Activity – Storage Commitment Request Sent by Remote AE

2.2.1.6.2.1 Description and Sequencing of Activity

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

When IDC is ready to commit successful recipient of the requested objects, an Association Request is sent to the peer AE that sent the Storage Commitment Push Model request. Upon successful negotiation of the required Presentation Context the outstanding N-EVENT-REPORT is sent.

Figure 2-6 illustrates the sequencing of activities when IDC receives a storage commitment request (N-Action) and send a storage commitment response (N-Event).

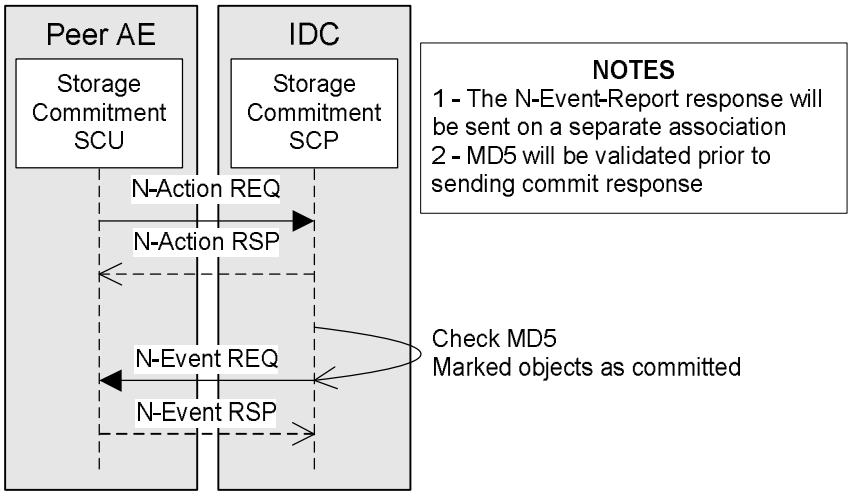

Figure 2-6: Storage Commitment Request Sequencing of Activity

2.2.1.6.2.2 Accepted Presentation Contexts

IDC will accept any of the Presentation Contexts listed in Table 2-19 for Storage Commitment.

Table 2-19: Presentation Contexts Accepted for Storage Commitment Request Sent by Remote 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
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

2.2.1.6.2.3 SOP Specific Conformance

IDC provides standard conformance to the DICOM **Storage Commitment** Service Class as an SCP. IDC supports the elements listed in Table 2-20 for this SOP class.

The associated Activity with the Storage Commitment Push Model service is the communication by the Storage Commitment AE to peer AEs that it has committed to permanently store Composite SOP Instances that have been sent to it.

It thus allows peer AEs to determine whether the Storage-SCP AE has taken responsibility for the archiving of specific SOP Instances so that they can be flushed from the peer AE system.

The Storage Commitment SCP AE will initiate a new Association to a peer AE that sent a Storage Commitment Push Model request if the original Association over which this was sent is no longer open.

Table 2-20: 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)

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

2.2.1.6.2.4 Storage Commitment Result

If IDC determines that it has successfully completed storage commitment, IDC 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 IDC cannot commit to storing SOP Instances, IDC 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.

IDC supports the Event Information as specified in Table 2-21. IDC supports the optional Retrieve AE Title (0008,0054) Attributes in the N-EVENT-REPORT.

Table 2-21: 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)
		>Retrieve AE Title	(0008,0054)
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)
		>Retrieve AE Title	(0008,0054)

Action Type Name	Event Type ID	Attribute Name	Tag
		Failed SOP Sequence	(0008,1198)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
		>Failure Reason	(0008,1197)

2.2.1.6.2.5 Operations – Storage Commitment

IDC will never delete SOP Instances for which Storage Commitment was requested – except deletion is forced manually by authorized user.

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

2.2.1.6.2.6 Presentation Context Acceptance Criterion

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

2.2.1.6.2.7 Transfer Syntax Selection Policies

Explicit VR Little Endian is preferred over Implicit VR Little Endian.

2.2.1.6.3 Real World Activity – Find Object (SCP)

2.2.1.6.3.1 Description and Sequencing of Activity – Find Object (SCP)

IDC will respond to query requests that are sent to it by a Query/Retrieve SCU. The latency for retrieval of SOP Instances is dependent on the object state, as specified in Table 2-22.

Figure 2-7 illustrates the sequencing of activity when IDC receives a DICOM query from a peer AE.

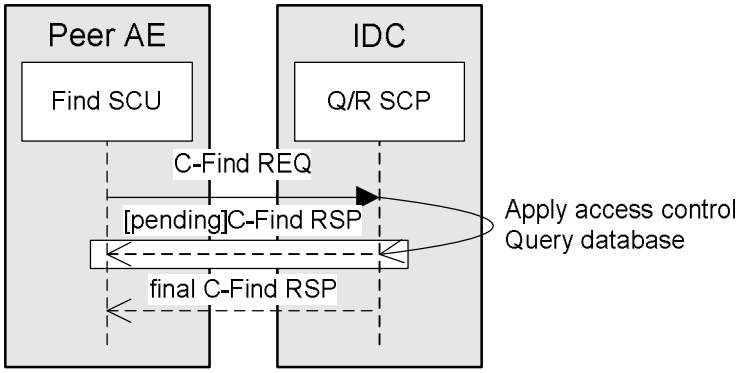

Figure 2-7: Query Sequencing of Activity

Table 2-22: Image States for Find Object (SCP)

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.

IDC can be configured to return a longitudinal record for the patient upon receiving a query request by a Query/Retrieve SCU.

2.2.1.6.3.2 Accepted Presentation Contexts – Find Object (SCP)

IDC will accept any of the Presentation Contexts listed in Table 2-23 for Find.

Table 2-23: Presentation Contexts Accepted by IDC for Find Object (SCP)

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. IDC will respond with the information in Table 2-24.

Table 2-24: FIND Extended Negotiation

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

2.2.1.6.3.3 SOP Specific Conformance – Find Object (SCP)

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

IDC supports the Relational-queries extended SCP behavior. IDC supports all mandatory Unique and Required Matching Keys. Matching for all PN VR attributes, but also for Study Description (0008,1030), Institution Name (0008,0080) and Institutional Department Name (0008,1040) is case-insensitive. Supported Return Keys are configurable. There is a trade-off between the extent of supported Return Keys and the size of the database.

IDC supports matching multiple Patient IDs in the same query using the Other Patient ID Sequence (0010,1002). If Other Patient ID Sequence is specified, then all items within the

sequence as well as the root level Patient ID and Issuer of Patient ID must be specified and cannot have wildcard.

IDC provides support for the Instance Availability (0008,0056) Data Element on Study, Series and Instance Level, but not on Patient Level.

Table 2-25: Patient Level Attributes for Find Object (SCP)

Description	Tag	Support
Patient Name	(0010,0010)	Wild Card Matching / Returned
Patient ID	(0010,0020)	Wild Card Matching / Returned
Issuer of Patient ID	(0010,0021)	Single Value Matching / Returned
Patient Birth Date	(0010,1005)	Range Matching / Returned
Patient Sex	(0010,0040)	Wild Card Matching / Returned
Other Patient ID Sequence	(0010,1002)	Sequence Matching / Returned
> Patient ID	(0010,0020)	Single Value Matching / Returned
> Issuer of Patient ID	(0010,0021)	Single Value Matching / Returned
All additional configured Patient Level Return Keys		Returned Only

Table 2-26: Study Level Attributes for Find Object (SCP)

Description	Tag	Support
Study Instance UID	(0020,000D)	List of UID Matching / Returned
Study ID	(0020,0010)	Wild Card Matching / Returned
Study Date	(0008,0020)	Range Matching[4] / Returned
Study Time	(0008,0010)	Range Matching[4] / Returned
Accession Number	(0008,0050)	Wild Card Matching / Returned
Modalities in Study	(0008,0061)	Single Value Matching / Returned
Referring Physician's Name	(0008,0090)	Wild Card Matching / Returned
Study Description	(0008,1030)	Wild Card Matching / Returned
Study Status ID	(0032,000A)	Single Value Matching / Returned
Number of Study Related Series	(0020,1000)	Returned Only
Number of Study Related Instances	(0020,1208)	Returned Only
All additional configured Study Level Return Keys		Returned Only

Table 2-27: Series Level Attributes for Find Object (SCP)

Description	Tag	Support
Series Instance UID	(0020,000E)	List of UID Matching / Returned
Series Number	(0020,0011)	Wild Card Matching / Returned

[4]Matching keys for Date and Time are combined. For example, a Study Date of "20060705-20060707" and a Study Time of "1000-1800" will match the time period of July 5, 10am until July 7, 6pm, rather than the three time periods of 10am until 6pm on each of July 5, July 6 and July 7.

Description	Tag	Support
Modality	(0008,0060)	Wild Card Matching / Returned
Institution Name	(0008,0080)	Wild Card Matching / Returned
Institutional Department Name	(0008,1040)	Wild Card Matching / Returned
Request Attribute Sequence	(0040,0275)	
>Requested Procedure ID	(0040,1001)	Wild Card Matching / Returned
>Reason for the Requested Procedure	(0040,1002)	Returned Only
>Reason for Requested Procedure Code Sequence	(0040,100A)	
>>Code Value	(0008,0100)	Returned Only
>>Coding Scheme Designator	(0008,0102)	Returned Only
>>Coding Scheme Version	(0008,0103)	Returned Only
>>Code Meaning	(0008,0104)	Returned Only
>Scheduled Procedure Step ID	(0040,0009)	Wild Card Matching / Returned
>Scheduled Procedure Step Description	(0040,0007)	Returned Only
>Scheduled Protocol Code Sequence	(0040,0008)	
>>Code Value	(0008,0100)	Returned Only
>>Coding Scheme Designator	(0008,0102)	Returned Only
>>Coding Scheme Version	(0008,0103)	Returned Only
>>Code Meaning	(0008,0104)	Returned Only
Performed Procedure Step Start Date	(0040,0244)	Range Matching[4] / Returned
Performed Procedure Step Start Time	(0040,0245)	Range Matching[4] / Returned
Number of Series Related Instances	(0020,1209)	Returned Only
All additional configured Series Level Return Keys		Returned Only

Table 2-28: Instance Level Attributes for Find Object (SCP)

Description	Tag	Support
Instance Number	(0020,0013)	Wild Card Matching / Returned
SOP Instance UID	(0008,0018)	List of UID Matching / Returned
SOP Class UID	(0008,0016)	List of UID Matching / Returned
Content Date	(0008,0023)	Range Matching[4] / Returned
Content Time	(0008,0033)	Range Matching[4] / Returned
Concept Name Code Sequence	(0040,A043)	
>>Code Value	(0008,0100)	Single Value Matching / Returned
>>Coding Scheme Designator	(0008,0102)	Single Value Matching / Returned
>>Coding Scheme Version	(0008,0103)	Returned Only
>>Code Meaning	(0008,0104)	Returned Only
Completion Flag	(0040,A491)	Single Value Matching / Returned
Verification Flag	(0040,A493)	Single Value Matching / Returned

Description	Tag	Support
All additional configured Instance Level Return Keys		Returned Only

For IDC to return the longitudinal record for the patient, the query must be constrained with at least Patient ID (0010,0020) and Issuer of Patient ID (0010,0021). Other query constraints can also be specified.

Since the longitudinal record may consist of records from different originating sources, especially from different patient ID domains, IDC may return query responses that consist of Patient ID (0010,0020) and Issuer of Patient ID (0010,0021) other than the pair specified in the query. It is the responsibility of the Query/Retrieve SCU to handle the responses appropriately.

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

Table 2-29: C-FIND Status Codes for Find Object (SCP)

Service Status	Further Meaning	Protocol Codes	Description
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	C000	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.
Success	Success	0000	Operation performed properly.

2.2.1.6.3.4 Presentation Context Acceptance Criterion – Find Object (SCP)

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

2.2.1.6.3.5 Transfer Syntax Selection Policies – Find Object (SCP)

Explicit VR Little Endian is preferred over Implicit VR Little Endian.

2.2.1.6.4 Real World Activity – Received DICOM Objects Retrieve Requested by Remote AE

2.2.1.6.4.1 Description and Sequencing of Activity

IDC 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. IDC will establish an association automatically in response to a C-MOVE request.

Figure 2-8 illustrates the sequencing of activity when IDC received a C-Move request from a Move-SCU. Pending C-Move responses are, by default, sent on a periodic basis to keep the inbound DICOM association alive. The pending response interval is configurable.

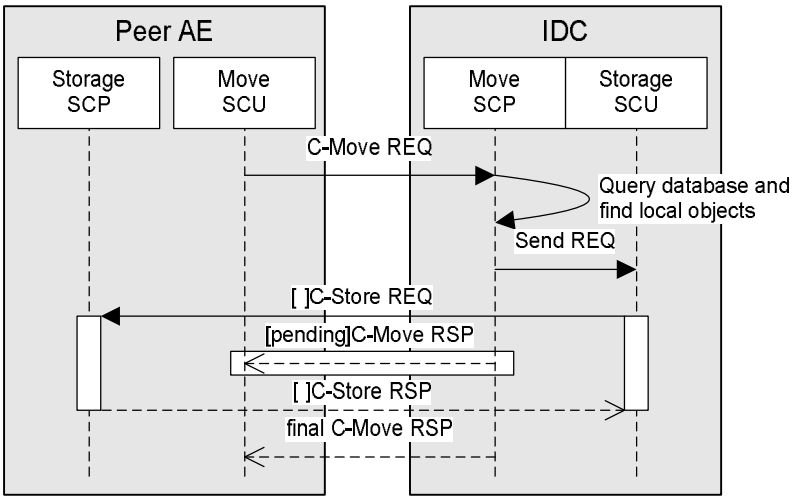

Figure 2-8: Retrieve Sequencing of Activity

2.2.1.6.4.2 Accepted Presentation Contexts – Move Object (SCP)

IDC will accept any of the Presentation Contexts listed in Table 2-30 for Move.

Table 2-30: Presentation Contexts Accepted by IDC for Move Object (SCP)

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	See Note 2
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	See Note 2
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	See Note 2

Note 2: C-Move Extended Negotiation will be supported. IDC will respond with the information in Table 2-31: MOVE Extended Negotiation.

Table 2-31: MOVE Extended Negotiation

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

2.2.1.6.4.3 SOP Specific Conformance – Move Object (SCP)

IDC 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.

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

Table 2-32: C-MOVE Status Codes for Move Object (SCP)

Service Status	Further Meaning	Protocol Codes	Description
Refused	Out of Resources	A702	Unable to perform storage of images to move destination.
	Move destination unknown	A801	The destination of this move request is unknown.
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	C000	For some reason (such as the database being off-line) this request cannot be processed at this time.
Cancel	Storage terminated due to Cancel Request	FE00	The original requester canceled this operation.
Warning	Warning	B000	Storage complete with one or more failures.
Pending	Pending	FF00	The storage operation is continuing.
Success	Success	0000	Operation performed properly.

When IDC returns an object to the move destination, it will include all known linked patient IDs other than the primary patient ID in the Other Patient IDs Sequence (0010,1002). Each item in the sequence specifies one linked patient identifier. Each item includes the Patient ID (0010,0020) and Issuer of Patient ID (0010,0021).

Furthermore, IDC will always attempt to localize the primary Patient ID (0010,0020) and primary Issuer of Patient ID (0010,0021) based on a predefined list of local issuers for the move destination. One or more local issuers can be defined for each move destination. If the primary Issuer of Patient ID does not match the predefined list of local issuers for the move destination but one or more of the other linked patient IDs does, then IDC will substitute the primary Patient ID and Issuer of Patient ID with the first match. Moreover, the original primary Patient ID and primary Issuer of Patient ID will be added as an item to the Original Attribute Sequence (0400,0561).

The following table shows the key attributes related to patient identification in an object returned by IDC.

Table 2-33: Key attributes related to patient identification

Attribute Name	Attribute Tag	Description
Patient ID	(0010,0020)	Localized Patient ID (as per section 3.2)
Issuer of Patient ID	(0010,0021)	Localized Patient Domain (as per section 3.2)
Other Patient IDs Sequence	(0010,1002)	This sequence includes all known linked patient identities
>Patient ID	(0010,0020)	Each item in the sequence conveys corresponding patient id and patient domain pairs
>Issuer of Patient ID	(0010,0021)	
Original Attribute Sequence	(0400,0561)	This sequence includes the original primary patient identity that was localized
>Modified Attribute Sequence	(0400,0550)	Single item in the sequence conveys original patient id and patient domain pair
>>Patient ID	(0010,0020)	
>>Issuer of Patient ID	(0010,0021)	

2.2.1.6.4.4 Presentation Context Acceptance Criterion – Move Object (SCP)

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

2.2.1.6.4.5 Transfer Syntax Selection Policies – Move Object (SCP)

By default, IDC sends the IOD using the transfer syntax that was used when the image was originally stored. It will convert the IOD to a transfer syntax with native (uncompressed) pixel data (=Explicit or Implicit VR Little Endian) if the original transfer syntax is not supported by the destination.

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

2.2.1.6.5 Real World Activity – Remote Retrieve-SCP Receives Forwarded Retrieve Command

2.2.1.6.5.1 Description and Sequencing of Activity

IDC may both receive and initiate forwarded C-Move requests. C-Move requests will be forwarded to another Move-SCP when the requested sop instance(s) are no longer stored by the local AE. Figure 2-9 and Figure 2-10 illustrate the sequencing of activity when IDC forwards a C-Move request to another AE. The difference is that the first option let the external Move-SCP directly send the objects to the requesting Move-SCU via C-Store while with the second option, IDC acts as the proxy to intercept the C-Store requests and then forward them to the requesting Move-SCU. C-Move responses from the forward destination are echoed back to the original C-Move SCU by IDC.

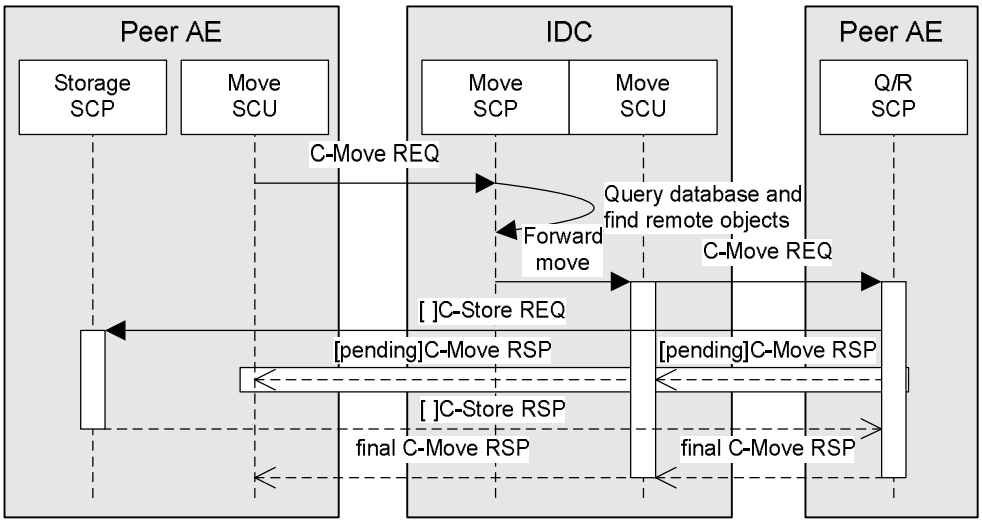

Figure 2-9: Direct C-Move Forward Sequencing of Activity

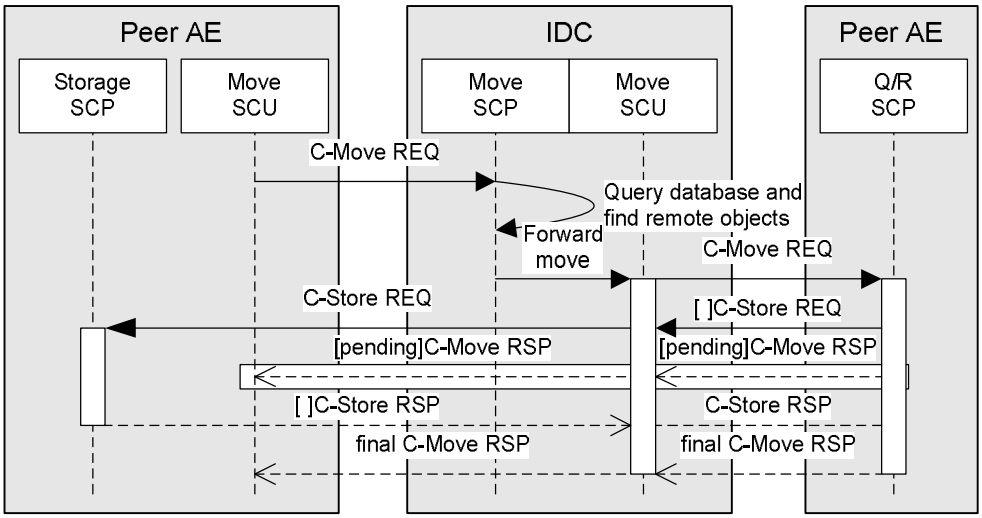

Figure 2-10: Proxy C-Move Forward Sequencing of Activity

Section 2.2.1.6.4 describes the conformance of IDC Move-SCP. The following sub-sections describe the conformance of IDC Move-SCU in the context of this real world activity.

2.2.1.6.5.2 Proposed Presentation Contexts

Move-SCU will initiate any of the Presentation Contexts listed in Table 2-34 for Move. Move-SCU will accept any number of Move Presentation Contexts per association request.

Table 2-34: Presentation Contexts Proposed for Move Object (SCU)

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	Relational-retrieve
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
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	Relational-retrieve
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
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	Relational-retrieve
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

2.2.1.6.5.3 SOP Specific Conformance

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

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

2.2.1.6.6.1 Description and Sequencing of Activity

IDC 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 IDC's data repository. If configured, IDC can act as an MPPS SCU forward the received Modality Performed Procedure Steps SOP Instance to another MPPS SCP.

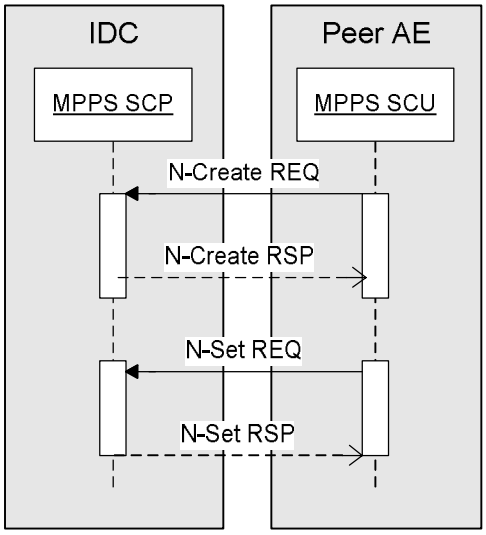

Figure 2-11: MPPS SCP N-Create and N-Set Sequence of Activity

2.2.1.6.6.2 Accepted Presentation Contexts

Table 2.2-35: 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

2.2.1.6.6.3 SOP Specific Conformance

When IDC receives an N-CREATE or N-SET MPPS from a MPPS SCU, if there are any configured forward destinations, IDC will forward the MPPS.

IDC supports the following N-CREATE Modality Performed Procedure Step attributes.

Table 2.2-36: Modality Performed Procedure Step SOP Class N-CREATE Attributes

Module	Attribute Name	Tag	Remarks
SOP Common	Specific Character Set	(0008,0005)	
Performed Procedure Step	Patient's Name	(0010,0010)	
Relationship	Patient ID	(0010,0020)	

Module	Attribute Name	Tag	Remarks
	Patient Birth Date	(0010,0030)	
	Patient's Sex	(0010,0040)	
	Scheduled Step Attribute Sequence	(0040,0270)	See Note 1
	>Accession Number	(0008,0050)	
	>Referenced Study Sequence	(0008,1110)	
	>>Referenced SOP Instance UID	(0008,1155)	
	>Referenced Patient Sequence	(0008,1120)	
	>>Referenced SOP Instance UID	(0008,1155)	
	>Performing Physician's Name	(0008,1050)	
	>Study Instance UID	(0020,000D)	See Note 1
	>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)	See Note 1
	Performed Station Name	(0040,0242)	
	Performed Location	(0040,0243)	
	Performed Procedure Step Start Date	(0040,0244)	See Note 1
	Performed Procedure Step Start Time	(0040,0245)	See Note 1
	Performed Procedure Step End Date	(0040,0250)	
	Performed Procedure Step End Time	(0040,0251)	
	Performed Procedure Step Status	(0040,0252)	See Note 1 Must have status 'In Progress'. Any other status will result in an error.
	Performed Procedure Step ID	(0040,0253)	See Note 1
	Performed Procedure Step Description	(0040,0254)	
	Performed Procedure Type Description	(0040,0255)	
Image Acquisition Results	Modality	(0008,0060)	See Note 1
	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)	

Module	Attribute Name	Tag	Remarks
	>>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)	

Note 1: These attributes must be present and not empty.

IDC returns one of the following status codes in the N-CREATE-RSP:

Table 2.2-37: Modality Performed Procedure Step SCP Response Status

Service Status	Error Code	Reason
Success	0000	Operation performed properly
Invalid attribute value	0106	If the Performed Procedure Step Status has a value other than In Progress.
Processing failure	0110	Sent when an SCU attempts to create a MPPS which SOP Instance UID has already existed, or when IDC failed to create the MPPS record in the system.
Missing attribute value	0121	One or more Type 1 attributes are either not available or are empty.

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

Table 2.2-38: Modality Performed Procedure Step SOP Class N-SET Attributes

Module	Attribute Name	Tag	Remarks
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)	See Note 2
	Performed Procedure Step End Time	(0040,0251)	See Note 2
	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)	See Note 2
	>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)	

Module	Attribute Name	Tag	Remarks
	>>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)	

Note 2: These attributes must be present and not empty.

IDC returns one of the following status codes in the N-SET-RSP:

Table 2.2-39: Modality Performed Procedure Step SCP Response Status

Service Status	Error Code	Reason
Success	0000	Operation performed properly
Invalid attribute value	0106	If the Performed Procedure Step Status is neither In Progress, Completed nor Discontinued.
Processing failure	0110	Sent when an SCU attempts to update a performed procedure step which is COMPLETED or DISCONTINUED, or when it attempts to update an attribute that cannot be updated.
Missing attribute values	0121	One or more Type 1 attributes are either not present or are empty.

If configured to forward the received MPPS SOP Instance, IDC will propose the following presentation context to the configured MPPS SCP. Upon successful association negotiation, IDC will forward the received MPPS SOP Instance *as is* to the configured MPPS 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	1.2.840.10008.1.2	SCU	None

2.3 Network Interfaces

2.3.1 Supported Communication Stacks

DICOM Upper Layer over TCP/IP is supported.

2.3.1.1 TCP/IP Stack

IDC inherits the TCP/IP stack from the installed Java Runtime Environment.

2.3.2 Physical Network Interface

IDC is indifferent to the physical medium over which TCP/IP executes; it inherits this from the Java Runtime Environment.

2.4 Configuration

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

2.4.1 AE Title/Presentation Address 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 IDC.

2.4.1.1 Local AE Titles

The local AE Titles and TCP ports are configurable through web interface and command line tools.

2.4.1.2 Remote AE Title

Remote AE Titles, TCP/IP Addresses and ports can be configured through web interface.

In the default configuration, Association Requests with configured Calling AE TITLE will be accepted. Association Requests from unknown Calling AE TITLE will be rejected.

2.4.2 Parameters

The following table shows the IDC configuration parameters relevant to DICOM communication. Refer to the IDC Documentation for details on general configuration capabilities.

Table 2-40: Parameters

Parameter	Configurable	Default Value
General Parameters		
PDU Size	Yes	16352 bytes
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	Yes	10 s
General DIMSE level time-out values	Yes	600 s
Time-out waiting for response to TCP/IP connect() request. (Low-level timeout)	No	None
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	No	None
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	No	None
Any changes to default TCP/IP settings, such as configurable stack parameters.	No	None
AE Specific Parameters (all AEs)		
Size constraint in maximum object size	No	None
Maximum PDU size the AE can receive (see note 1)	Yes	16352 bytes
Maximum PDU size the AE can send	No	1048576 bytes
AE specific DIMSE level time-out values	No	None
Number of simultaneous Associations by Service and/or SOP Class	No	Unlimited
SOP Class support	No	All supported SOP Classes always proposed and accepted
Transfer Syntax support	No	All supported Transfer Syntaxes always proposed and accepted
Other parameters that are configurable	No	None

General Parameters		
Listening Port	Yes	11112
Maximum number of simultaneous Associations	Yes	128
Time-out waiting for A-ASSOCIATE RQ on open TCP/IP connection (ARTIM timeout)	Yes	5s
Time-out waiting on an open association for the next message (DIMSE timeout)	Yes	600 s
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	Yes	10 s
Time-out waiting on an open association for the next message after sending A-RELEASE RSP or A-ABORT RQ (Closing timeout)	Yes	50 ms
Parameter	**Configurable**	**Default Value**
Maximum PDU size the AE can receive	Yes	16352 bytes
Maximum PDU size the AE can send	No	1048576 bytes
Pack Command and Data PDVs in one PDU	Yes	false

Support for the Basic TLS Secure Transport Connection Profile	Yes	Off
Accepted TLS Ciphers	Yes	-
Storage Server AE		
Accepted Called AE Titles	Yes	
Accepted Calling AE Titles	Yes	Configured
List of DICOM AE Titles that identify the location from which composite object instance(s) received by this Storage Server may be retrieved on the network	Yes	
Storage Directory Path Prefix	Yes	
Time-out waiting for the A-ASSOCIATE-AC PDU after transmission of the A-ASSOCIATE-RQ to open an association to the Storage Commitment SCU	Yes	10 s
Query/Retrieve Server AE		
Accepted Called AE Titles	Yes	
Accepted Calling AE Titles	Yes	Configured
Send optional C-MOVE RSPs with Pending Status to the C-MOVE SCU during the retrieve process	Yes	true
Time-out waiting for the A-ASSOCIATE-AC PDU after transmission of the A-ASSOCIATE-RQ to open an association to the Move Destination AE	Yes	10 s

3 MEDIA INTERCHANGE

IDC does not support Media Storage.

4 SUPPORT FOR EXTENDED CHARACTER SETS

4.1 Overview

Support extends to correctly decoding and displaying the correct symbol in the supported character sets for all names and strings received over the network, and in the local database.

No specific support for sorting of strings other than in the default character set is provided in the browsers.

4.2 Support for Extended Character Sets

IDC supports the following extended character set:

Table 4-1: Extended Character Sets

Character Set Description	Defined Term
Basic G0 Set	ISO-IR 6 (default)
JIS X 0201: Katakana	ISO 2022 IR 13
JIS X 0208: Kanji	ISO 2022 IR 87
ISO 8859-1 Latin Alphabet No. 1	ISO-IR 100
Greek	ISO-IR 126
Arabic	ISO-IR 127
Cyrillic	ISO-IR 144
KS X 1001: Hangul and Hanja	ISO 2022 IR 149
UTF-8	ISO-IR 192
Simplified Chinese	GB18030

5 SECURITY

5.1 Security Profiles

IDC supports secure DICOM communication in conformance with the Basic TLS Secure Transport Connection Profile. At default configuration, the TLS option is deactivated.

5.2 Association Level Security

IDC can be configured to accept Association Requests from only a limited list of Calling AE Titles.

In the default configuration, Association requests with configured Calling AE Title and configured Called AE Title will be accepted. However, if the Called AE Title is not correspondent to any of the actual Storage Server AE Titles, only acceptance of the Presentation Context for Verification SOP Class will be returned in the Association Acceptance Response (A-ASSOCIATE AC). Also by default, IDC only returns composite SOP instances to the original source in which IDC receives the objects.

5.3 User Interface Security

IDC Admin Interface can be configured to require user authentication in order to have access to the user interface functionalities.

6 SUPPORT OF WEB ACCESS TO DICOM PERSISTENT OBJECTS (WADO)

IDC supports receiving web access to DICOM persistent objects requests according to DICOM Part 18. It supports the following mandatory parameters:

Table 6-1: Supported Parameters for WADO

Parameter Name	Description
requestType	Must be set to WADO
studyUID	The requested Study Instance UID of the object to be retrieved
seriesUID	The requested Series Instance UID of the object to be retrieved
objectUID	The requested SOP Instance UID of the object to be retrieved
contentType	mimeType of the returned object. IDC supports the value of **application/dicom** for full-fidelity DICOM object.

IDC ignores the Accept field in the HTTP request. It responds according to the contentType value set in the Request-URI. The supported value is listed in Table 6-1. IDC will return the DICOM object in its native transfer syntax.

The URL to access the WADO service on IDC is structured as follows:

http://<host>:8080/wado?requestType=WADO

7 ANNEXES

7.1 IOD Contents

7.2 Created SOP Instances

Not applicable.

7.3 Usage of Attributes from Received IOD's

No SOP Class specific fields for images are required.

7.4 Attribute Mapping

Not applicable.

7.5 Coerced/Modified fields

Attribute coercion is configurable for IOD's received by the Storage Server. Attributes can either be mapped or may be filled with "fixed values" depending on the existence or the content(s) of one or more other Attributes.

Patient Information, Patient Demographics and Study Information could either be modified manually using the web based system management tool or updated automatically by information received from HIS/RIS.

The coerced/modified Attribute values are provided when a remote Query/Retrieve SCU queries information or when SOP Instances are sent to a remote Storage SCP. Attribute Coercion will be indicated in the appropriate Service Response Status.

7.6 Data Dictionary of Private Attributes

No private attributes are defined.

7.7 Coded Terminology and Templates

The value for Code Meaning will be displayed for all code sequences. No local lexicon is provided to look up alternative code meanings.

7.8 Grayscale Image Consistency

The high resolution display monitor attached to the product can be calibrated according to the Grayscale Standard Display Function (GSDF).

7.9 Standard Extended/Specialized/Private SOP Classes

None.

7.10 Private Transfer Syntaxes

None.