CD-in

DICOM Conformance Statement

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1. Conformance Statement Overview

CD-in is a XP/7/8/10 application that reads DICOM CDs or other media and store the content to a PACS system or a DICOM Store SCP application. It acts as a DICOM File Set Reader (FSR).

CD-in can use the DICOM Worklist Management service to reconcile patient information in DICOM datasets with patient information in the RIS or HIS.

CD-in implements the necessary services to:

■Supports the Echo (Verification) service as SCU

■Supports Image Storage as SCU

■Supports Modality Worklist Service as SCU

This document is intended to describe CD-in's conformance to DICOM.

Table 1-1: Network Services for CD-in

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Communication		
Verification (ECHO)	Yes	No
Transfer		
Stored Print Storage (RET)	Yes	No
Hardcopy Grayscale Image Storage (RET)	Yes	No
Hardcopy Color Image Storage (RET)	Yes	No
Computed Radiography Image Storage	Yes	No
Digital X-Ray Image Storage For Presentation	Yes	No
Digital X-Ray Image Storage For Processing	Yes	No
Digital Mammography X-Ray Image Storage For Presentation	Yes	No
Digital Mammography X-Ray Image Storage For Processing	Yes	No

Digital Intra Oral X-Ray Image Storage For Presentation	Yes	No
Digital Intra Oral X-Ray Image Storage For Processing	Yes	No
CT Image Storage	Yes	No
Enhanced CT Image Storage	Yes	No
Legacy Converted Enhanced CT Image Storage	No	No
Ultrasound Multi-frame Image Storage (RET)	Yes	No
Ultrasound Multi-frame Image Storage	Yes	No
MR Image Storage	Yes	No
Enhanced MR Image Storage	Yes	No
MR Spectroscopy Storage	Yes	No
Enhanced MR Color Image Storage	Yes	No
Legacy Converted Enhanced MR Image Storage	No	No
Nuclear Medicine Image Storage (RET)	Yes	No
Ultrasound Image Storage (RET)	Yes	No
Ultrasound Image Storage	Yes	No
Enhanced US Volume Storage	No	No
Secondary Capture Image Storage	Yes	No
Multiframe Secondary Capture Single Bit Image Storage	Yes	No
Multiframe Secondary Capture Grayscale Byte Image Storage	Yes	No
Multiframe Secondary Capture Grayscale Word Image Storage	Yes	No
Multiframe Secondary Capture True Color Image Storage	Yes	No
Standalone Overlay Storage (RET)	Yes	No

Standalone Curve Storage (RET)	Yes	No
Twelve Lead ECG Waveform Storage	Yes	No
General ECG Waveform Storage	Yes	No
Ambulatory ECG Waveform Storage	Yes	No
Hemodynamic Waveform Storage	Yes	No
Cardiac Electrophysiology Waveform Storage	Yes	No
Basic Voice Audio Waveform Storage	Yes	No
General Audio Waveform Storage	Yes	No
Arterial Pulse Waveform Storage	Yes	No
Respiratory Waveform Storage	Yes	No
Standalone Modality LUT Storage (RET)	Yes	No
Standalone VOI LUT Storage (RET)	Yes	No
Grayscale Softcopy Presentation State Storage	Yes	No
Color Softcopy Presentation State Storage	Yes	No
Pseudocolor Softcopy Presentation State Storage	Yes	No
Blending Softcopy Presentation State Storage	Yes	No
XA/XRF Grayscale Softcopy Presentation State Storage	Yes	No
X-Ray Angiographic Image Storage	Yes	No
Enhanced XA Image Storage	Yes	No
X-Ray Radiofluoroscopic Image Storage	Yes	No
Enhanced XRF Image Storage	Yes	No

X-Ray Angiographic Bi-Plane Image Storage (RET)	Yes	No
X-Ray 3D Angiographic Image Storage	Yes	No
X-Ray 3D Craniofacial Image Storage	Yes	No
Breast Tomosynthesis Image Storage	Yes	No
Breast Projection X-Ray Image Storage For Presentation	No	No
Breast Projection X-Ray Image Storage For Processing	No	No
Intravascular Optical Coherence Tomography Image Storage For Presentation	Yes	No
Intravascular Optical Coherence Tomography Image Storage For Processing	Yes	No
Nuclear Medicine Image Storage	Yes	No
Parametric Map Storage	No	No
Raw Data Storage	Yes	No
Spatial Registration Storage	Yes	No
Spatial Fiducials Storage	Yes	No
Deformable Spatial Registration Storage	Yes	No
Segmentation Storage	Yes	No
Surface Segmentation Storage	Yes	No
Real World Value Mapping Storage	Yes	No
Surface Scan Mesh Storage	No	No
Surface Scan Point Cloud Storage	No	No
VL Image Storage (RET)	Yes	No
VL Endoscopic Image Storage	Yes	No
Video Endoscopic Image Storage	Yes	No
VL Microscopic Image Storage	Yes	No

Video Microscopic Image Storage	Yes	No
VL Slide-Coordinates Microscopic Image Storage	Yes	No
VL Photographic Image Storage	Yes	No
Video Photographic Image Storage	Yes	No
Ophthalmic Photography 8 Bit Image Storage	Yes	No
Ophthalmic Photography 16 Bit Image Storage	Yes	No
Stereometric Relationship Storage	Yes	No
Ophthalmic Tomography Image Storage	Yes	No
VL Whole Slide Microscopy Image Storage	Yes	No
VL Multi-frame Image Storage (RET)	Yes	No
Lensometry Measurements Storage	Yes	No
Autorefraction Measurements Storage	Yes	No
Keratometry Measurements Storage	Yes	No
Subjective Refraction Measurements Storage	Yes	No
Visual Acuity Measurements Storage	Yes	No
Spectacle Prescription Report Storage	Yes	No
Ophthalmic Axial Measurements Storage	Yes	No
Intraocular Lens Calculations Storage	Yes	No
Macular Grid Thickness And Volume Report Storage	Yes	No
Ophthalmic Visual Field Static Perimetry Measurements Storage	Yes	No

Ophthalmic Thickness Map Storage	Yes	No
Corneal Topography Map Storage	No	No
Basic Text SR Storage	Yes	No
Enhanced SR Storage	Yes	No
Comprehensive SR Storage	Yes	No
Comprehensive 3D SR Storage	No	No
Procedure Log Storage	Yes	No
Mammography CAD SR Storage	Yes	No
Key Object Selection Document Storage	Yes	No
Chest CAD SR Storage	Yes	No
X-Ray Radiation Dose SR Storage	Yes	No
Radiopharmaceutical Radiation Dose SR Storage	No	No
Colon CAD SR Storage	Yes	No
Implantation Plan SR Storage	Yes	No
Encapsulated PDF Storage	Yes	No
Encapsulated CDA Storage	Yes	No
Positron Emission Tomography Image Storage	Yes	No
Legacy Converted Enhanced PET Image Storage	No	No
Standalone PET Curve Storage (RET)	Yes	No
Enhanced PET Image Storage	Yes	No
Basic Structured Display Storage	Yes	No
RT Image Storage	Yes	No
RT Dose Storage	Yes	No
RT Structure Set Storage	Yes	No
RT Beams Treatment Record Storage	Yes	No
RT Plan Storage	Yes	No

RT Brachy Treatment Record Storage	Yes	No
RT Treatment Summary Record Storage	Yes	No
RT Ion Plan Storage	Yes	No
RT Ion Beams Treatment Record Storage	Yes	No
Private Fuji CR Image Storage	Yes	No
Private Toshiba Raw Data Storage	Yes	No
Workflow Management		
Modality Worklist (C-FIND)	Yes	No

Table 1-2: Media Services

Media Storage Application Profile	Read Files (FSR)	Write Files (FSC or FSU)
Compact Disk – Recordable		
General Purpose CD-R	Yes	No
DVD		
General Purpose DVD	Yes	No
USB and Flash memory		
General Purpose USB	Yes	No
General Purpose secure USB	No	No
General Purpose Multimedia Card	Yes	No
General Purpose secure Multimedia Card	No	No
General Purpose Compact Flash	Yes	No
General Purpose secure Compact Flash	No	No
General Purpose Digital Card (SD)	Yes	No
General Purpose secure Digital Card (SD)	No	No

Note: CD-in can read and import any media with DICOM Part 10 compliant datasets. If a DICOMDIR is present, CD-in will read the DICOMDIR and import referenced datasets.

CD-in relies on the installed hardware and operating system to read (physically) USB and Flash Memory media.

Table of Contents

2. Introduction

2.1 Revision History

Document Version	Date	Author	Description
1.0	May 2006	F. Gousset	Creation
2.02	January 2009	F. Gousset	Update
2.04	October 2009	F. Gousset	Update
2.06	December 2016	N. Le Meur	Update
2.08	October 2018	G. Mevel	Update

2.2 Audience

This document is intended for:

- Potential users
- System integrators of medical equipment
- Software designers implementing DICOM interfaces

It is assumed that the reader has a working understanding of DICOM.

Experience and familiarity with DICOM Conformance Statements is helpful but not required.

2.3 Remarks

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication between CD-in and other DICOM systems. The Conformance Statement should be read and understood in conjunction with the DICOM Standard (DICOM). However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- The comparison of different Conformance Statements is the first step towards assessing interconnectivity between CD-in and other DICOM conformant equipment.
- Test procedures should be defined to validate the desired level of connectivity.

■The DICOM standard will evolve to meet the users' future requirements. ETIAM is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

2.4 Definitions, Terms 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   Application Entity

AET   Application Entity Title

DICOM   Digital Imaging and Communications in Medicine

DIMSE   DICOM Message Service Element

DIMSE-C   DICOM Message Service Element-Composite

DIMSE-N   DICOM Message Service Element-Normalized

HIS/RIS   Hospital Information System / Radiology Information System.

IOD   Information Object Definition

ISO   International Standard Organization

NEMA   National Electrical Manufacturers Association

PACS   Picture Archiving and Communication System

PDU   Protocol Data Unit

SCP   Service Class Provider

SCU   Service Class User

SOP   Service-Object Pair

TCP/IP   Transmission Control Protocol/Internet Protocol
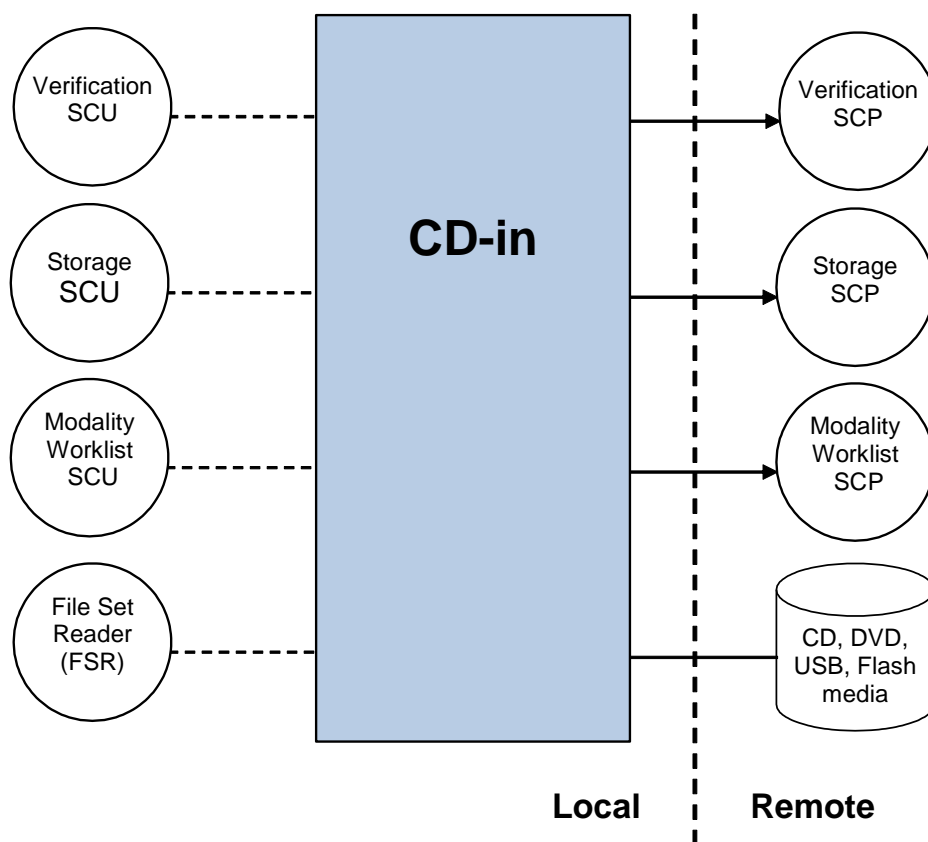
UID   Unique Identifier

3. Networking

3.1 Implementation Model

Each installed CD-in acts as a single Application Entity, maintaining at most one association per connected remote DICOM SCP.

3.1.1 Application Data flow

Figure 3.1-1: Application Data Flow

After installing the CD-in, the software administrator will use CD-in settings window to declare the DICOM peers that CD-in will communicate with. These peers may include a DICOM Worklist provider, and PACS (DICOM Store). At installation or whenever a problem occurs, the network communication between CD-in and other DICOM peers can be checked within the Verification service from the CD-in.

To update patient's information in the DICOM datasets, CD-in may send a request to a Worklist Provider in order to get the patient's information defined on the local HIS system. The reconciliation process updates the DICOM datasets according to the DICOM CP 526.

CD-in will read the DICOMDIR from the DICOM media or it can eventually browse the media for DICOM datasets. Then, the DICOM datasets will be stored to a remote DICOM peer that offers DICOM Store service as SCP such as a PACS.

3.1.2 Functional Definitions of Application Entities

As a SCU, CD-in connects to other DICOM applications

3.1.2.1   Verification Service as SCU

On user demand, CD-in can initiate an association with Presentation Contexts for the Verification service SOP class. It will send a C-ECHO request to another DICOM application and wait for a response to complete the verification.

Additionally, CD-in may initiate a negotiation with other DICOM applications to ensure that they indeed accept the services declared by the user (Image Storage Service as SCP or Basic Worklist Management as SCP).

3.1.2.2   Basic Modality Worklist Management Service as SCU

CD-in uses the Basic Worklist Management service to get required information to reconcile patient's information in DICOM datasets read from a CD.

It establishes one association with the remote Worklist SCP, performs a Find request, waits for responses, and then releases the association.

3.1.2.3   Image Storage Service as SCU

To store images, CD-in establishes an association with a remote Storage SCP, negotiates its presentation contexts, and sends the images according to their related Image Storage SOP Class. It then releases the association.

According to the CD-in settings, images can be stored either all at once on a single association, a set on "n" images on a single association, or one image per association. Store operations can be performed in background in a separate thread. However, only one store session may be issued at the same time.

3.1.2.4   File Set Reader (FSR)

According to the application settings, CD-in will detect media insertion and try to read CD, DVD or USB media containing a DICOM Part 10 compliant DICOMDIR structure or will browse for DICOM Part 10 compliant datasets. Then CD-in will proceed to import and reconcile the found items. Additionally, the user may choose a directory to import.

3.1.3 Sequencing of Real-Word Activities

Real-World Activity for Verification operation is independent of other operations.

Real-World Activity for Storage operation is independent of other operations.

Real-World Activity for Basic Worklist Management query is independent of other operations.
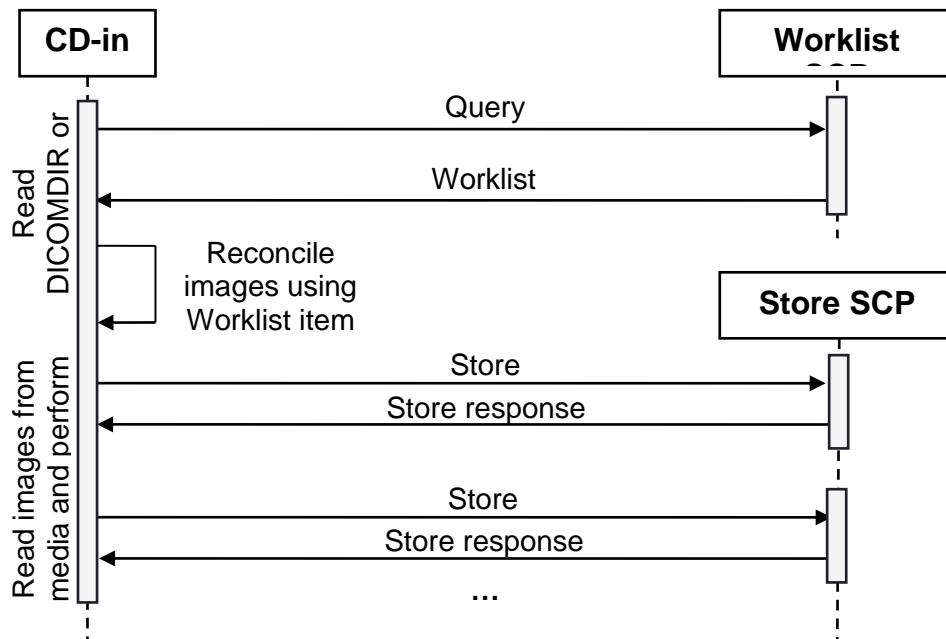
3.2 Application Entity Specifications

3.2.1 SOP Classes

The CD-in AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

Table 3.2-1: SOP Classes for CD-in AE

SOP Class Name	SOP Class UID	SCU	SCP
Supported SOP Classes for Verification			
Verification	1.2.840.10008.1.1	Yes	No
Supported SOP Classes for Storage			
Stored Print Storage (RET)	1.2.840.10008.5.1.1.27	Yes	No
Hardcopy Grayscale Image Storage (RET)	1.2.840.10008.5.1.1.29	Yes	No
Hardcopy Color Image Storage (RET)	1.2.840.10008.5.1.1.30	Yes	No
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
Digital X-Ray Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	No
Digital X-Ray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	No
Digital Mammography X-Ray Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	No
Digital Mammography X-Ray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	No
Digital Intra Oral X-Ray Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	No
Digital Intra Oral X-Ray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	No
Legacy Converted Enhanced CT Image Storage	*1.2.840.10008.5.1.4.1.1.2.2*	*No*	*No*

SOP Class Name	SOP Class UID	SCU	SCP
Ultrasound Multi-frame Image Storage (RET)	1.2.840.10008.5.1.4.1.1.3	Yes	No
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	No
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	No
Enhanced MR Color Image Storage	1.2.840.10008.5.1.4.1.1.4.3	Yes	No
Legacy Converted Enhanced MR Image Storage	*1.2.840.10008.5.1.4.1.1.2.4*	*No*	*No*
Nuclear Medicine Image Storage (RET)	1.2.840.10008.5.1.4.1.1.5	Yes	No
Ultrasound Image Storage (RET)	1.2.840.10008.5.1.4.1.1.6	Yes	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
Enhanced US Volume Storage	*1.2.840.10008.5.1.4.1.1.6.2*	*No*	*No*
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
Multiframe Secondary Capture Single Bit Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes	No
Multiframe Secondary Capture Grayscale Byte Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	No
Multiframe Secondary Capture Grayscale Word Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	No
Multiframe Secondary Capture True Color Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	No
Standalone Overlay Storage (RET)	1.2.840.10008.5.1.4.1.1.8	Yes	No
Standalone Curve Storage (RET)	1.2.840.10008.5.1.4.1.1.9	Yes	No
Twelve Lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	No

SOP Class Name	SOP Class UID	SCU	SCP
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	No
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	No
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	No
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	No
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes	No
General Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.2	Yes	No
Arterial Pulse Waveform Storage	1.2.840.10008.5.1.4.1.1.9.5.1	Yes	No
Respiratory Waveform Storage	1.2.840.10008.5.1.4.1.1.9.6.1	Yes	No
Standalone Modality LUT Storage (RET)	1.2.840.10008.5.1.4.1.1.10	Yes	No
Standalone VOI LUT Storage (RET)	1.2.840.10008.5.1.4.1.1.11	Yes	No
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	No
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Yes	No
Pseudocolor Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	Yes	No
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	Yes	No
XA/XRF Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.5	Yes	No
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	No
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Yes	No

SOP Class Name	SOP Class UID	SCU	SCP
X-Ray Angiographic Bi-Plane Image Storage (RET)	1.2.840.10008.5.1.4.1.1.12.3	Yes	No
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Yes	No
X-Ray 3D Craniofacial Image Storage	1.2.840.10008.5.1.4.1.1.13.1.2	Yes	No
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Yes	No
Breast Projection X-Ray Image Storage For Presentation	*1.2.840.10008.5.1.4.1.1.13.1.4*	*No*	*No*
Breast Projection X-Ray Image Storage For Processing	*1.2.840.10008.5.1.4.1.1.13.1.5*	*No*	*No*
Intravascular Optical Coherence Tomography Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.14.1	Yes	No
Intravascular Optical Coherence Tomography Image Storage For Processing	1.2.840.10008.5.1.4.1.1.14.2	Yes	No
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	No
Parametric Map Storage	*1.2.840.10008.5.1.4.1.1.30*	*No*	*No*
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Yes	No
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	No
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Yes	No
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3	Yes	No
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Yes	No
Surface Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.5	Yes	No
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67	Yes	No
Surface Scan Mesh Storage	*1.2.840.10008.5.1.4.1.1.68.1*	*No*	*No*
Surface Scan Point Cloud Storage	*1.2.840.10008.5.1.4.1.1.68.2*	*No*	*No*

SOP Class Name	SOP Class UID	SCU	SCP
VL Image Storage (RET)	1.2.840.10008.5.1.4.1.1.77.1	Yes	No
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	No
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	No
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	No
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes	No
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	No
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	No
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes	No
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	No
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Yes	No
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Yes	No
Ophthalmic Tomography Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.4	Yes	No
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	Yes	No
VL Multi-frame Image Storage (RET)	1.2.840.10008.5.1.4.1.1.77.2	Yes	No
Lensometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.1	Yes	No
Autorefraction Measurements Storage	1.2.840.10008.5.1.4.1.1.78.2	Yes	No
Keratometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.3	Yes	No
Subjective Refraction Measurements Storage	1.2.840.10008.5.1.4.1.1.78.4	Yes	No
Visual Acuity Measurements Storage	1.2.840.10008.5.1.4.1.1.78.5	Yes	No

SOP Class Name	SOP Class UID	SCU	SCP
Spectacle Prescription Report Storage	1.2.840.10008.5.1.4.1.1.78.6	Yes	No
Ophthalmic Axial Measurements Storage	1.2.840.10008.5.1.4.1.1.78.7	Yes	No
Intraocular Lens Calculations Storage	1.2.840.10008.5.1.4.1.1.78.8	Yes	No
Macular Grid Thickness And Volume Report Storage	1.2.840.10008.5.1.4.1.1.79.1	Yes	No
Ophthalmic Visual Field Static Perimetry Measurements Storage	1.2.840.10008.5.1.4.1.1.80.1	Yes	No
Ophthalmic Thickness Map Storage	1.2.840.10008.5.1.4.1.1.81.1	Yes	No
Corneal Topography Map Storage	*1.2.840.10008.5.1.4.1.1.82.1*	*No*	*No*
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	Yes	No
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes	No
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	No
Comprehensive 3D SR Storage	*1.2.840.10008.5.1.4.1.1.88.34*	*No*	*No*
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	Yes	No
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	Yes	No
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	Yes	No
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65	Yes	No
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes	No
Radiopharmaceutical Radiation Dose SR Storage	*1.2.840.10008.5.1.4.1.1.88.68*	*No*	*No*
Colon CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.69	Yes	No
Implantation Plan SR Storage	1.2.840.10008.5.1.4.1.1.88.70	Yes	No
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	No
Encapsulated CDA Storage	1.2.840.10008.5.1.4.1.1.104.2	Yes	No
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	No

SOP Class Name	SOP Class UID	SCU	SCP
Legacy Converted Enhanced PET Image Storage	*1.2.840.10008.5.1.4.1.1.128.1*	*No*	*No*
Standalone PET Curve Storage (RET)	1.2.840.10008.5.1.4.1.1.129	Yes	No
Enhanced PET Image Storage	1.2.840.10008.5.1.4.1.1.130	Yes	No
Basic Structured Display Storage	1.2.840.10008.5.1.4.1.1.131	Yes	No
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	No
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	No
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	No
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	No
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	No
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	No
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	No
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	Yes	No
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	Yes	No
Private Fuji CR Image Storage	1.2.392.200036.9125.1.1.2	Yes	No
Private Toshiba Raw Data Storage	1.2.392.200036.9116.7.8.1.1.1	Yes	No
Supported SOP Class For Modality Worklist			
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	No

3.2.2 Association Policies

3.2.2.1   General

Before any SOP classes can be exchanged between CD-in (SCU) and a SCP Application Entity, an association stage takes place to negotiate and exchange the capabilities of the SCU and SCP.

Only CD-in shall release an association. CD-in or SCP may however abort the association.

The calling AE Title of CD-in is configurable in its user interface.

CD-in contains the following limitations for PDU size:

Minimum PDU size	8,192 bytes
Maximum PDU size	16,384 bytes

3.2.2.2   Number of Associations

Table 3.2-2: Number of Associations as an Association Initiator SCU for CD-in AE

Maximum number of simultaneous Associations	Up to 6 store and 3 worklist requests

Image storage is performed in background. It's possible to perform a Worklist request while transferring data for storage.

3.2.2.3   Asynchronous Nature

CD-in does not support asynchronous communication (multiple outstanding transactions over a single association).

3.2.2.4   Implementation Identifying Information

The implementation information for the Application Entity is:

Table 3.2-3: DICOM Implementation Class and Version for CD-in AE

Implementation class UID	1.2.250.1.59.3.0.3.5.3
Application Context Name	1.2.840.10008.3.1.1.1
Implementation version name	ETIAM_DCMTK_353

3.2.2.5   Association Initiation Policy

CD-in AE initiates association for implementation of the Verification service Class, Basic Worklist Management, and Storage as SCU.

3.2.2.6   Association Acceptance Policy

CD-in will not accept any association as acting only as SCU for Basic Worklist Management, for Storage and for verification.

3.2.2.6.1 Activity – Verification SCU

3.2.2.6.1.1   Description and Sequencing of Activities

CD-in will initiate an association with a Verification SCP within the Configuration panel to check SCP availability. Association is then opened, negotiated and closed synchronously.

Figure 3.2-4: Sequencing of Activity – Verification
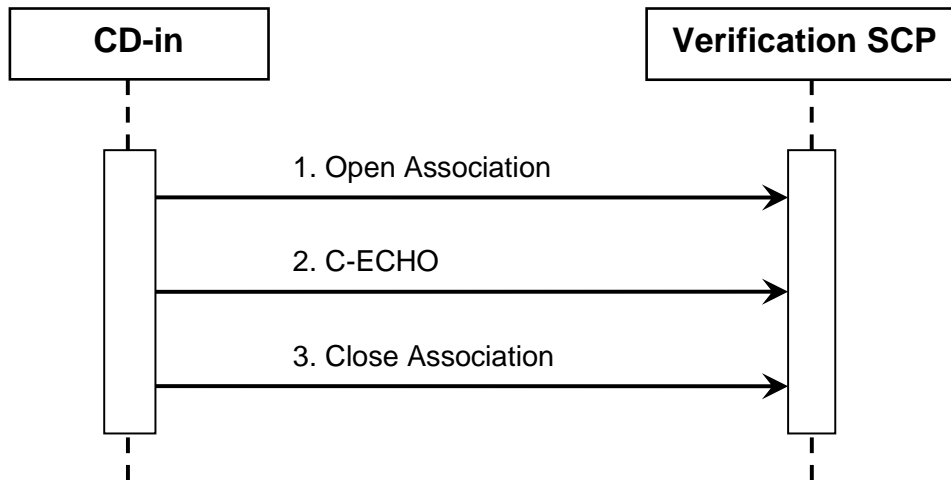
3.2.2.6.1.2   Proposed Presentation Contexts

Table 3.2-5: Proposed Presentation Contexts for CD-in AE and Verification Activity

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

3.2.2.6.1.3   SOP Specific Conformance to the Verification SOP Class

CD-in provides standard conformance to the DICOM Verification Service Class as a SCU. The status code for the C-ECHO is shown in the following table:

Table 3.2-6: C-ECHO Response Status Handling Behaviour

Code	Status	Meaning
0000	Success	The C-ECHO request is accepted.

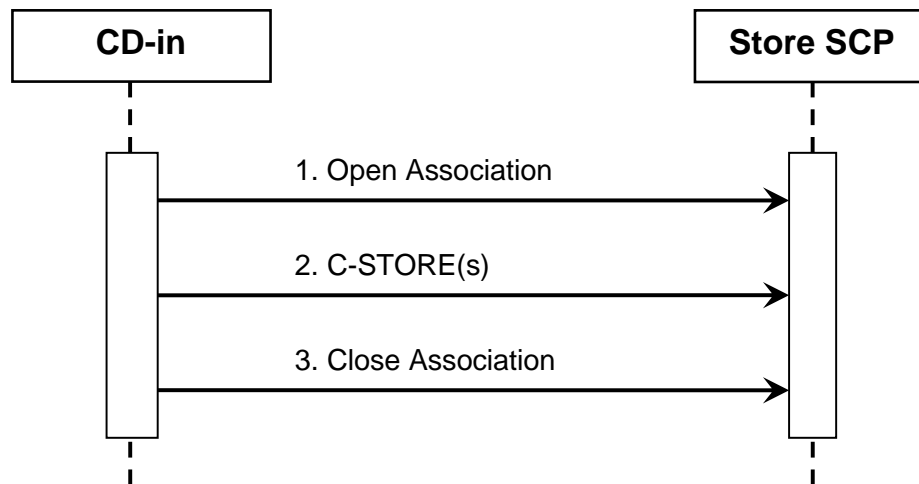**Table 3.2-7: C-ECHO Communication Failure Behaviour**

Exception	Behaviour
Timeout	The Association is aborted using A-ABORT.

3.2.2.6.2 Activity – Storage SCU

3.2.2.6.2.1 Description and Sequencing of Activities

CD-in will initiate an association with a Storage SCP to store all images. All images will be stored on an association.

Figure 3.2-8: Sequencing of Activity – Storage

3.2.2.6.2.2 Proposed Presentation Contexts

Table 3.2-9: Proposed Presentation Contexts for CD-in AE and Storage Activity

Presentation Context Table				
Abstract Syntax	**Transfer Syntax**		**Role**	**Extended Negotiation**
See note below	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
	JPEG Baseline : Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50	SCU	None
	JPEG Extended (Process 2 & 4): Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression	1.2.840.10008.1.2.4.51	SCU	None
	JPEG Lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70	SCU	None

Presentation Context Table

Abstract Syntax	Transfer Syntax		Role	Extended Negotiation
	JPEG 2000 Lossless	1.2.840.10008.1.2.4.90	SCU	None
	JPEG 2000	1.2.840.10008.1.2.4.91	SCU	None
	MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100	SCU	None
	MPEG2 Main Profile @ High Level	1.2.840.10008.1.2.4.101	SCU	None
	MPEG-4 AVC/H.264 High Profile @ Level 4.1	1.2.840.10008.1.2.4.102	SCU	None
	MPEG-4 AVC/H.264 BD-compatible High Profile @ Level 4.1	1.2.840.10008.1.2.4.103	SCU	None
	RLE Lossless	1.2.840.10008.1.2.5	SCU	None

Note: Transfer syntaxes referenced in the above table applies to a very large number of Storage Abstract Syntax. The abstract syntaxes names and UIDs are listed in Table 3.2-1.

CD-in applies the following rules for its proposed presentation contexts:

■All uncompressed transfer syntaxes are proposed for Storage operations excepted for MPEG2, MPEG-4 or JPEG2000 encoded datasets.

■If an image is encoded, its corresponding native transfer syntax is proposed also, and will be preferred by SCU if both compressed and uncompressed transfer syntaxes are accepted by SCP.

■If SCP does not accept encoded transfer syntaxes, CD-in will uncompress the related images on the fly. Note that this doesn't apply to MPEG2, MPEG-4 or JPEG2000 encoded data.

3.2.2.6.2.3 SOP Specific Conformance to the Storage SOP Class

Images sent by CD-in using Storage SCU operation contain their native information. CD-in never attempts to modify local stored datasets.

However, if a patient reconciliation process has been involved, the related information is replaced on the fly in the stored datasets by values provided by the Basic Worklist SCP. Additionally, if CD-in has been configured to keep the previous values, they are kept in the dataset according to DICOM 2004 - CP 526.

Table 3.2-10: Additional Reconciliation Attributes (CP 526)

| Attribute Name	Tag	Type	Attribute Value
Original Attribute Sequence	(0400, 0561)	3	
> Source of Previous Values	(0400, 0564)	2	Empty Value
> Attribute Modification Datetime	(0400, 0562)	1	Date and time the reconciliation occurred
> Modifying System	(0400, 0563)	1	Etiam/CD-in <version>
> Reason for the attribute modification	(0400, 0565)	1	COERCE
> Modified Attribute Sequence	(0400, 0550)	1	
>> Any attribute from the main dataset that was modified or removed			

If a patient reconciliation has not been involved, some dataset values may be altered according to CD-in configuration. The same behavior is applied in that case.

3.2.2.6.3 Activity – Worklist Management SCU

3.2.2.6.3.1   Description and Sequencing of Activities

CD-in will initiate a separate association for each Find request.

Figure 3.2-11: Sequencing of Activity – Storage
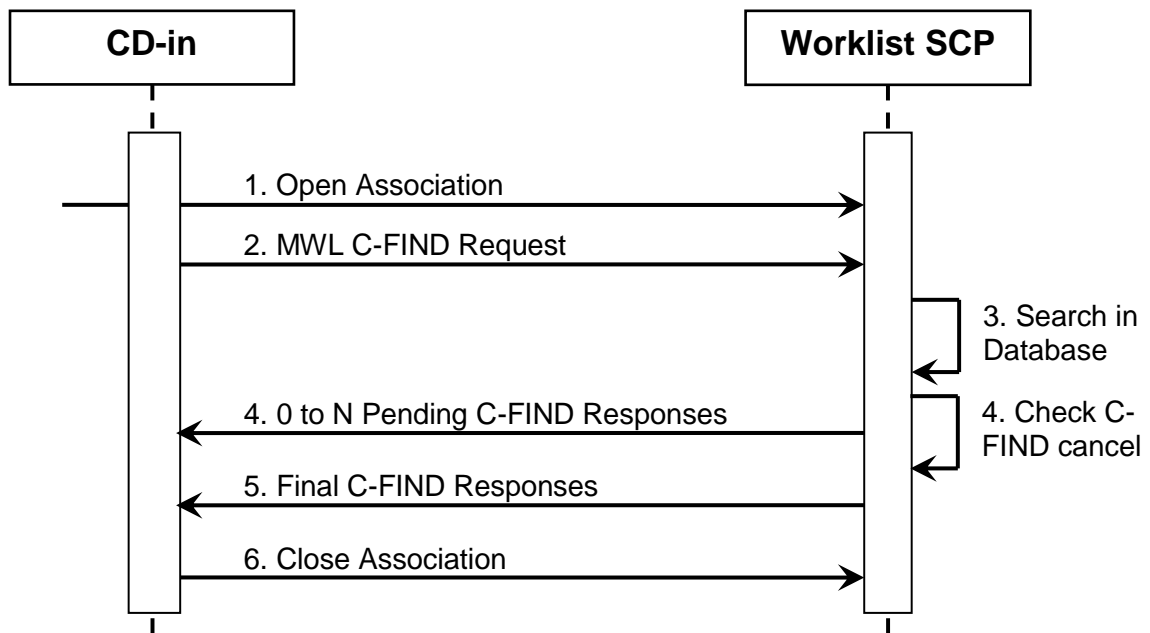
3.2.2.6.3.2   Proposed Presentation Contexts

Table 3.2-12: Proposed Presentation Contexts for CD-in AE and Worklist Management Activity

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Worklist Information Model	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

3.2.2.6.3.3   SOP Specific Conformance to the Worklist Management SOP Class

CD-in provides standard conformance to the DICOM Basic Worklist Management Service Class. CD-in requests the following matching key types:

Table 3.2-13: Modality Worklist Matching Key Type

Key Type Matching	
SV	Single Value matching
WC	Wild Card matching
RM	Range matching
	No matching Returns value when available

Table 3.2-14: Modality Worklist Supported Attributes

Module	Attribute Name	Tag	Match
SOP Common	Specific Character Set	(0008,0005)	
Scheduled Procedure Step	Scheduled Procedure Step Sequence	(0040,0100)	
	> Scheduled Station AETitle	(0040,0001)	SV
	> Scheduled Procedure Step Start Date	(0040,0002)	RM
	> Scheduled Procedure Step Start Time	(0040,0003)	
	> Scheduled Procedure Step End Date	(0040,0004)	
	> Scheduled Procedure Step End Time	(0040,0005)	
	> Modality	(0008,0060)	
	> Scheduled Performing Physician's Name	(0040,0006)	
	> Scheduled Station Name	(0040,0010)	
	> Scheduled Procedure Step Location	(0040,0011)	
	> Scheduled Procedure Step Description	(0040,0070)	
	> Pre Medication	(0040,0012)	
	> Scheduled Procedure Step ID	(0040,0009)	
	> Scheduled Procedure Step Status	(0040,0020)	
	> Comments On Scheduled Procedure Step Status	(0040,0400)	
	> Requested Contrast Agent	(0032,1070)	
	> Scheduled Protocol Code Sequence	(0040,0008)	
	>> Code Value	(0008,0100)	
	>> Coding Scheme Designator	(0008,0102)	
	>> Coding Scheme Version	(0008,0103)	
	>> Code Meaning	(0008,0104)	

Module	Attribute Name	Tag	Match
Requested Procedure	Requested Procedure ID	(0040,1001)	
	Study Instance UID	(0020,000D)	
	Reason For The Requested Procedure	(0020,1002)	
	Requested Procedure Description	(0032,1060)	
	Requested Procedure Priority	(0040,1003)	
	Patient Transport Arrangements	(0040,1004)	
	Names Of Intended Recipients Of Results	(0040,1010)	
	Requested Procedure Comments	(0040,1400)	
	Requested Procedure Code Sequence	(0032,1064)	
	> Code Value	(0008,0100)	
	> Coding Scheme Designator	(0008,0102)	
	> Coding Scheme Version	(0008,0103)	
	> Code Meaning	(0008,0104)	
Imaging Service Request	Accession Number	(0008,0050)	SV
	Requesting Physician	(0032,1032)	
	Referring Physician's Name	(0008,0090)	
	Requesting Service	(0032,1033)	
	Reason For The Imaging Service Request	(0040,2001)	
	Imaging Service Request Comments	(0040,2400)	
	Placer Order Number / Imaging Service Request	(0040,2016)	
Visit Identification	Admission ID	(0038,0010)	
Visit Status	Current Patient Location	(0038,0300)	
Patient Identification	Patient's Name	(0010,0010)	SV / WC
	Patient ID	(0010,0020)	SV
	Issuer of Patient ID	(0010,0021)	
	Other Patient IDs	(0010,1000)	
Patient Demographic	Patient's Birth Date	(0010,0030)	*RM*
	Patient's Birth Time	(0010,0032)	
	Patient's Sex	(0010,0040)	*SV*

Module	Attribute Name	Tag	Match
	Patient's Size	(0010,1020)	
	Patient's Weight	(0010,1030)	
	Confidentiality Constraint On Patient Data Description	(0010, 3001)	
	Ethnic Group	(0010, 2160)	
	Patient Comments	(0010, 4000)	
Patient Medical	Patient State	(0038,0500)	
	Medical Alerts	(0010,2000)	
	Contrast Allergies	(0010,2110)	
	Special Needs	(0038,0050)	
	Additional Patient History	(0010, 21B0)	
	Last Patient Menstrual Date	(0010, 21D0)	

3.3 Network Interfaces

3.3.1 Physical Network Interface

CD-in provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

CD-in inherits its TCP/IP stack from the Windows system where it runs. Default Windows TCP/IP stack is supported.

3.3.2 Additional Protocols

None.

3.4 Configuration

CD-in configuration is detailed in CD-in User's Guide.

3.4.1 AE Titles / Presentation Address Mapping

AE Titles, host names and port numbers for remote applications are configured using the **DICOM Network** tab of the CD-in settings panel. Multiple Worklists and Store SCPs can be defined.

3.4.2 Parameters

CD-in configurable parameters can be defined in the **Settings** panels. They are the following:

- ◼ AE Title: default is "CDIN".
- ◼ Debug and Verbose modes: to get or not detailed information about connections.

4. Media Interchange

4.1 Implementation Model

The CD-in product can read CD or DVD media. It can read DICOM part 10 compliant datasets.

CD-in can also import DICOM part 10 compliant datasets from other media, such as USB flash drives, memory cards, external drives, or from a folder on a drive.

4.1.1 Application Data flow

The DICOM interface for the CD-in supports Media Storage implementation of the 120mm CD-R media, 120 mm DVD-R media and 120 mm DVD+R media.

It also supports USB removable device and Flash memory cards (cf. PS-3.12), but it can also read DICOM part 10 files from other physical sources or file systems providing that the operating system can read the medium.

Figure 4.1-1: Application Data Flow
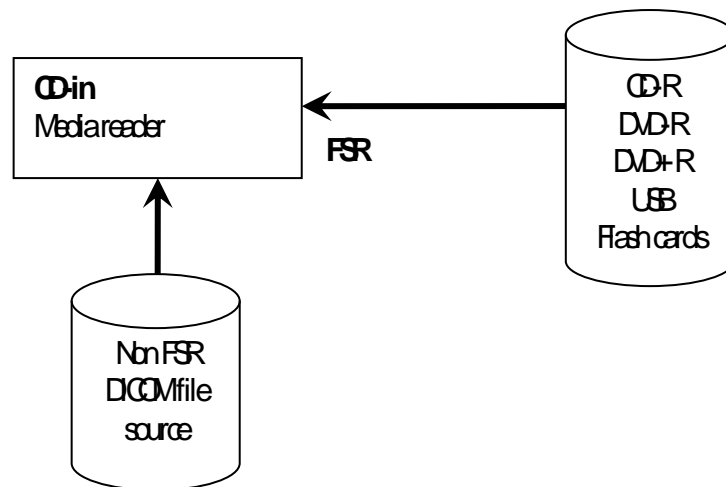
4.1.2 Functional Definitions of Application Entities

4.1.2.1 Functional Definition of Media Reading Application Entity

The Entity searches for a Media Storage Directory IOD (DICOMDIR) then reads images and videos stored on the DICOM media.

4.1.3 Sequencing of Real-Word Activities

The operator inserts a DICOM media into a drive or select a directory, then CD-in searches for a DICOMDIR. If the DICOMDIR is not found, CD-in will search the media for DICOM part 10 compliant files.

4.2 Application Entity Specifications

4.2.1 CD/DVD Reading Application Entity Specification

CD/DVD Reader AE provides Standard Conformance to the DICOM Interchange Option of the Media Storage Service Class.

Table 4.2-1: Application Entity related Application Profiles, Real-World activities, and Roles

Supported Application Profile	Real-World Activity	Roles	SC Option
See note below	Read Media	FSR	Interchange

CD-in is not restricted to any Application Profile.

Instead, it can handle the following objects with the associated Transfer Syntax:

Table 4.2-2: File Set Reader Supported Objects

Abstract Syntax	Transfer Syntax		Role
	Name	UID	
All relevant image objects of Table 3.2-1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	FSR
All relevant image objects of Table 3.2-1	JPEG Baseline : Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50	FSR
All relevant image objects of Table 3.2-1	JPEG Extended (Process 2 & 4): Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression	1.2.840.10008.1.2.4.51	FSR
All relevant image objects of Table 3.2-1	JPEG Lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70	FSR
All relevant image objects of Table 3.2-1	JPEG 2000 Lossless	1.2.840.10008.1.2.4.90	FSR
All relevant image objects of Table 3.2-1	JPEG 2000	1.2.840.10008.1.2.4.91	FSR
All relevant image objects of Table 3.2-1	MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100	FSR
All relevant image objects of Table 3.2-1	MPEG2 Main Profile @ High Level	1.2.840.10008.1.2.4.101	FSR
All relevant image objects of Table 3.2-1	MPEG-4 AVC/H.264 High Profile @ Level 4.1	1.2.840.10008.1.2.4.102	FSR

Abstract Syntax	Transfer Syntax		Role
	Name	UID	
All relevant image objects of Table 3.2-1	MPEG-4 AVC/H.264 BD-compatible High Profile @ Level 4.1	1.2.840.10008.1.2.4.103	FSR
All relevant image objects of Table 3.2-1	RLE Lossless	1.2.840.10008.1.2.5	FSR
All SR objects of Table 3.2-1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	FSR
Key Object Selection Document (1.2.840.10008.5.1.4.1.1.88.59)	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	FSR

4.2.2 USB removable and Flash cards Reading Application Entity Specification

USB removable, Compact Flash, Multimedia card and Secure Digital Reader AE provides Standard Conformance to the DICOM Interchange Option of corresponding Media Storage Service Class.

The options, restrictions and supported objects of the CD/DVD Reading AE apply for the USB Removable and Flash cards Reading AE. See 4.2.1 for specification.

Furthermore, as CD-in relies on the installed hardware and operating system to read those media, it may also successfully process media (micro SD ...) or file systems (FAT32, NTFS ...) that are not part of the DICOM standard (see PS-3.12).

4.2.3 Non FSR source Reading Application Entity Specification

CD-in can read and import DICOM Part 10 compliant datasets from a user specified volume or directory. If a DICOMDIR is present at the specified location, it is used to define the File Set to process. If no DICOMDIR is present, CD-in may recursively browse from the specified location for DICOM Part 10 compliant files and build a File Set referencing those files in memory.

See Table 4.2-2: File Set Reader Supported Objects.

5. Support of Extended Character Sets

CD-in supports all character sets defined by the DICOM Standard.

Whether or not characters are displayed correctly depends on the presence of font support in the underlying operating system. It may be necessary for the user to add additional Unicode fonts to their system configuration in order to correctly display characters that would not typically be used in the default locale.

Table 5-1: Supported specific character set defined terms

Character Set Description	Defined Term	Supported
Single-byte character sets without code extensions		
Default Repertoire	None	YES
Latin alphabet No. 1	ISO_IR 100	YES
Latin alphabet No. 2	ISO_IR 101	YES
Latin alphabet No. 3	ISO_IR 109	YES
Latin alphabet No. 4	ISO_IR 110	YES
Cyrillic	ISO_IR 144	YES
Arabic	ISO_IR 127	YES
Greek	ISO_IR 126	YES
Hebrew	ISO_IR 138	YES
Latin alphabet No. 5	ISO_IR 148	YES
Japanese	ISO_IR 13	YES
Thai	ISO_IR 166	YES
Single-byte character sets with code extensions		
Default Repertoire	ISO 2022 IR 6	YES
Latin alphabet No. 1	ISO 2022 IR 100	YES
Latin alphabet No. 2	ISO 2022 IR 101	YES
Latin alphabet No. 3	ISO 2022 IR 109	YES
Latin alphabet No. 4	ISO 2022 IR 110	YES
Cyrillic	ISO 2022 IR 144	YES
Arabic	ISO 2022 IR 127	YES
Greek	ISO 2022 IR 126	YES
Hebrew	ISO 2022 IR 138	YES
Latin alphabet No. 5	ISO 2022 IR 148	YES
Japanese	ISO 2022 IR 13	YES

Character Set Description	Defined Term	Supported
Thai	ISO 2022 IR 166	YES
Multi-byte character sets with code extensions		
Japanese	ISO 2022 IR 87	YES
Japanese	ISO 2022 IR 159	YES
Korean	ISO 2022 IR 149	YES
Multi-byte character sets without code extensions		
Unicode in UTF-8	ISO_IR 192	YES
Chinese GB18030	GB18030	YES

6. Security

CD-in does not support any specific security measures.

It is assumed that CD-in is used within a secured environment, including:

■　　　　Router protections to ensure that only approved external hosts have network access to CD-in

■　　　　Router protections to ensure that CD-in only has network access to approved external hosts and services

Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels