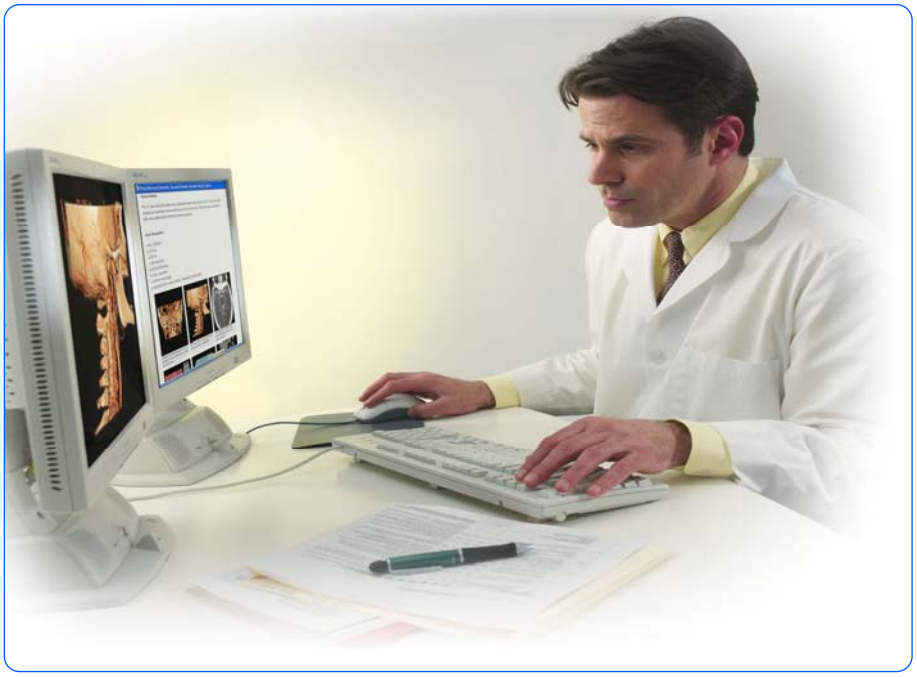
DICOM

Conformance Statement

Extended Brilliance Workspace V4



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1. DICOM CONFORMANCE STATEMENT OVERVIEW

This Conformance Statement refers to the Brilliance™ Workspace, Philips user environment for CT scanning and visualization. All Brilliance Workspace users enjoy the same easy to use interface and access to advanced applications. This version of the DICOM Conformance Statement applies to Extended Brilliance Workspace (EBW) workstation, versions 4.x.

The Extended Brilliance Workspace (EBW) workstation provides the following DICOM data exchange features:

- It receives images sent from remote systems (e.g. workstations or imaging modalities) and stores them in a database.
- It allows the operator to copy images from the database to remote databases and vice versa. For this purpose the operator is able to query remote databases.
- It allows the operator to print images (Grayscale and Color) stored in the database on a DICOM printer.
- It is able to read and write DICOM media CD, CD-RW disks
- It is able to read and write DICOM media DVD+/-R, DVD+/-RW disks.

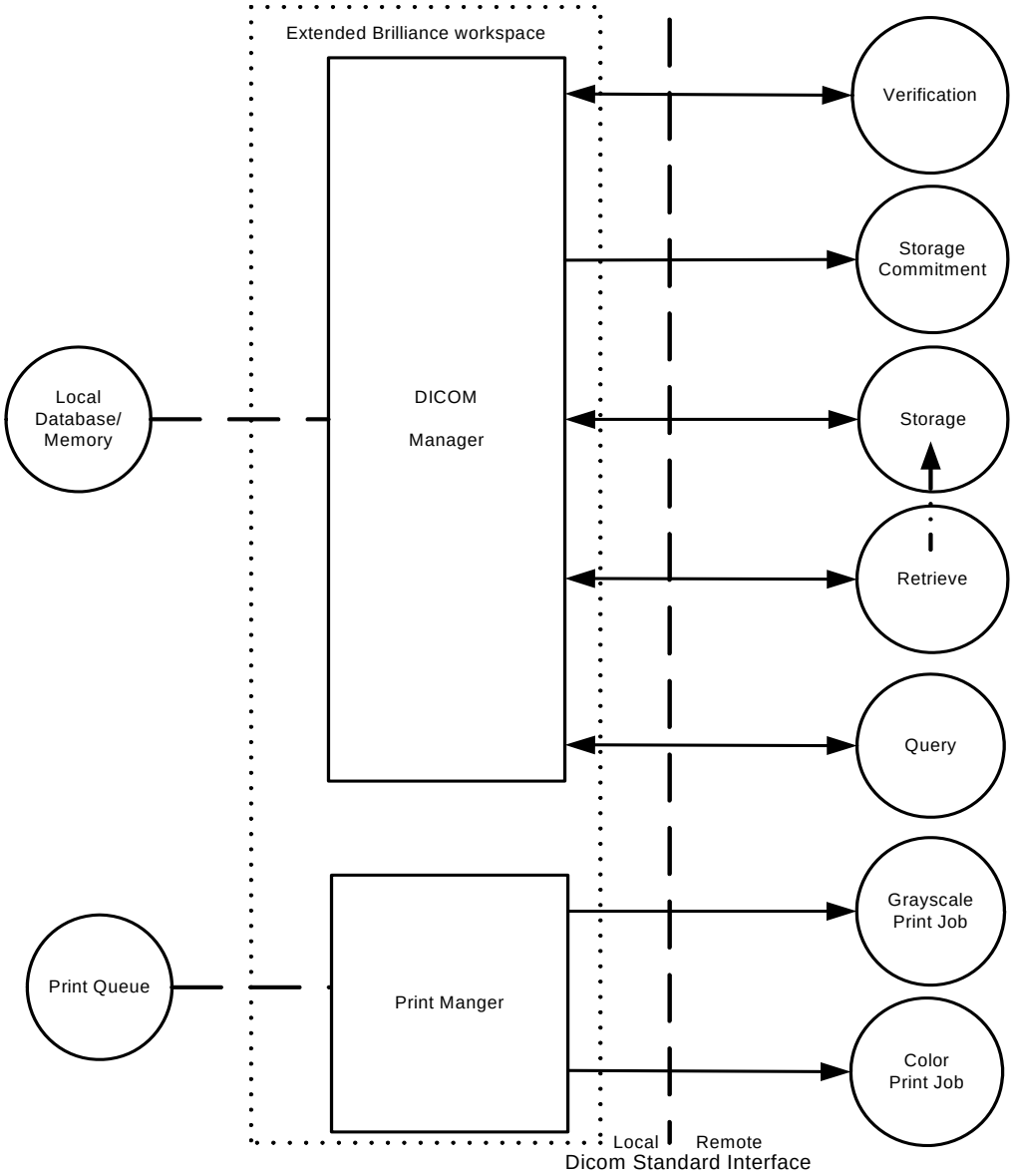

Figure 1: Extended Brilliance Workspace in a DICOM Network

The following Table presents an overview of all network services and the applicable SOP Classes as provided by the Extended Brilliance Workspace (EBW) workstation.

The first column specifies the used SOP classes exactly as named in PS 3.6. (Ref. PS 3.2 Annex A.) of the current DICOM Standard.

Table 1: All Supported Network Services

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	**UID**		
Storage			
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 Mammography X-Ray Image Storage - Pres.	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital Mammography X-Ray Image Storage - Proc.	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
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
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	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 SC 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
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	Yes
Grayscale Softcopy Presentation State Storage (PR)	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
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	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 (REG)	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes
Encapsulated PDF	1.2.840.10008.5.1.4.1.1.104.1	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	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 Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
Verification			
Verification	1.2.840.10008.1.1	Yes	Yes
Query/Retrieve			
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	**UID**		
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes
Print Management			
Basic Film Session	1.2.840.10008.5.1.1.1	Yes	No
Basic Film Box	1.2.840.10008.5.1.1.2	Yes	No
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	Yes	No
Basic Color Image Box	1.2.840.10008.5.1.1.4.1	Yes	No
Basic Grayscale Print Management (Meta)	1.2.840.10008.5.1.1.9	Yes	No
Basic Color Print Management (Meta)	1.2.840.10008.5.1.1.18	Yes	No

Note that normally the system (SCU) requests only supported DICOM objects.
All SOP Classes support as default Transfer Syntaxes ILE. All other transfer Syntaxes are configurable in LAN Config.
Not supported is JPEG transfer syntax for all SOP classes if the images have no pixel data.

All supported Network Services which can be blocked by the Blocking Filter (configurable in LAN Config by FSE) are shown below.

Table 2: Supported Network Services which can blocked by Blocking Filter

SOP Classes		User of Service (SCU)	Provider of Service (SCP)
Name	**UID**		
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

All supported Media Services by EBW are shown in the next table.

Table 3: Supported Media Services

Media Storage Application Profile	Write Files (FSC)	Update Files (FSU)	Read Files (FSR)
Compact Disk – Recordable			
CT/MR Studies on CD-R	Yes	NO	Yes
STD-GEN-CD	Yes	NO	Yes
DVD disk			
General Purpose DVD Interchange with JPEG	Yes	NO	Yes

Note: *After data is written to DVD, the DVD is finalized; the finalized DVD can now be read on mostly every DVD reader.*
Currently the EBW supports:
FSC service for CD-R, CD-RW, DVD + R, DVD – R, DVD + RW, DVD – RW media; and the
FSR service for CD-R, CD-RW, DVD + R, DVD – R, DVD + RW, DVD – RW.

2. TABLE OF CONTENTS

3. INTRODUCTION

3.1. Revision History

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

Table 4: Revision History

Document Version	Date of Issue	Author	Description
0.0	2 June 2008	HI / PII / IOCC	Proposal version Extended Brilliance Workspace V4.0
0.1	18 July 2008	HI / PII / IOCC	Update version Extended Brilliance Workspace V4.0
0.2	07 October 2008	HI / PII / IOCC	Update final Version Extended Brilliance Workspace V4.0
0.3	15 October 2008	HI / PII / IOCC	Update final Version Extended Brilliance Workspace V4.0
0.4	16 December 2008	HI / PII / IOCC	Final

3.2. Audience

This Conformance Statement is intended for:

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

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

3.3. Remarks

The DICOM Conformance Statement is contained in chapter 4 through 8 and follows the contents and structuring requirements of [DICOM] PS 3.2.

This DICOM Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) must be aware of the following issues:

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

- **Validation**
  Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement.
  Where Philips equipment is linked to non-Philips equipment, the first step is to

compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange must be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

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

3.4. Definitions, Terms and Abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see [DICOM] PS 3.3 and PS 3.4.
The word Philips in this document refers to Philips Medical Systems.

The following acronyms and abbreviations are used in this document.

AE	Application Entity
ANSI	American National Standard Institute
AP	Application Profile
BOT	Basic Offset Table
CD	Compact Disc
CD-R	CD-Recordable
CD-M	CD-Medical
CR	Computed Radiography
CT	Computed Tomography
DCR	Dynamic Cardio Review
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DIMSE-Composite
DIMSE-N	DIMSE-Normalized
DVD	Digital Versatile Disc
DX	Digital X-Ray
EBE	DICOM Explicit VR Big Endian
EBW	Extended Brilliance Workspace
ELE	DICOM Explicit VR Little Endian
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
GUI	Graphic User Interface
HIS	Hospital Information System
HL7	Health Level Seven
ILE	DICOM Implicit VR Little Endian
IOD	Information Object Definition
ISIS	Information System – Imaging System
JPEG	JPEG Lossless, Non-Hierarchical, FOP (Process 14)
MOD	Magneto-Optical Disk

MPPS	Modality Performed Procedure Step
MR	Magnetic Resonance
NEMA	National Electrical Manufacturers Association
NM	Nuclear Medicine
P-ELE	Private CT Transfer Syntax – Explicit VR Little Endian
PDU	Protocol Data Unit
PET	Positron Emission Tomography
RF	X-Ray Radiofluoroscopic
RIS	Radiology Information System
RT	Radiotherapy
RWA	Real-World Activity
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
US	Ultrasound
USMF	Ultrasound Multi-frame
WLM	Worklist Management
XA	X-Ray Angiographic

3.5. References

[DICOM] Digital Imaging and Communications in Medicine (DICOM), Part 1 – 18 (NEMA PS 3.1 – PS 3.18), National Electrical Manufacturers Association (NEMA) Publication Sales 1300 N. 17th Street, Suite 1847. Rosslyn, Virginia. 22209, United States of America.
Internet: http://medical nema.org/
Note that at any point in time the official standard consists of the most recent yearly edition of the base standard (currently 2008) plus all the supplements and correction items that have been approved as Final Text.

4. NETWORKING

4.1. Implementation model

The implementation model consists of three sections:

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

4.1.1. Application Data Flow

The Extended Brilliance Workspace (EBW) system implements and provides DICOM services using the following Application Entities:

- DICOM-Manager
- Print-Manager

The Extended Brilliance Workspace (EBW) workstation system consists of one single Application Entity.
Figure below shows the Networking application data flow as a functional overview of the Extended Brilliance Workspace (EBW) workstation. As depicted in the Figure, the Extended Brilliance Workspace (EBW) workstation incorporates the following functionality.

- After RWA Request Verification, the Extended Brilliance Workspace (EBW) workstation as SCP provides standard Verification Service Class functionality to the requesting SCU.
- After RWA Import Images, the Extended Brilliance Workspace (EBW) workstation as SCP provides standard Storage Service Class functionality to the requesting SCU.
- After RWA Query Local Images/Retrieve Local Images, the Extended Brilliance Workspace (EBW) workstation as SCP provides standard Query/Retrieve Service Class functionality to the requesting SCU.
- After RWA Export Images (triggered by either the operator or RWA Retrieve Local Images), the Extended Brilliance Workspace (EBW) workstation as SCU uses the Remote SCP Storage Service Class functionality to store Local Images on a Remote Database.
- After operator RWA Find Remote Images, the Extended Brilliance Workspace (EBW) workstation as SCU uses the remote SCP Query/Retrieve Service Class functionality to query remote images.
- After operator RWA Move Remote Images, the Extended Brilliance Workspace (EBW) workstation as SCU uses the remote SCP Query/Retrieve Service Class functionality to retrieve remote images.
- After operator RWA Request Storage Commitment, the Extended Brilliance Workspace (EBW) workstation as SCU uses the remote SCP Storage Commitment Service Class functionality to commit remote images.
- After operator RWA Print Images, the Extended Brilliance Workspace (EBW) workstation as SCU uses the remote Print Management Service Class to print local images.
- After operator RWA Request Printer Status, the Extended Brilliance Workspace (EBW) workstation as SCU uses the remote Print Management Service Class to request the printer status.

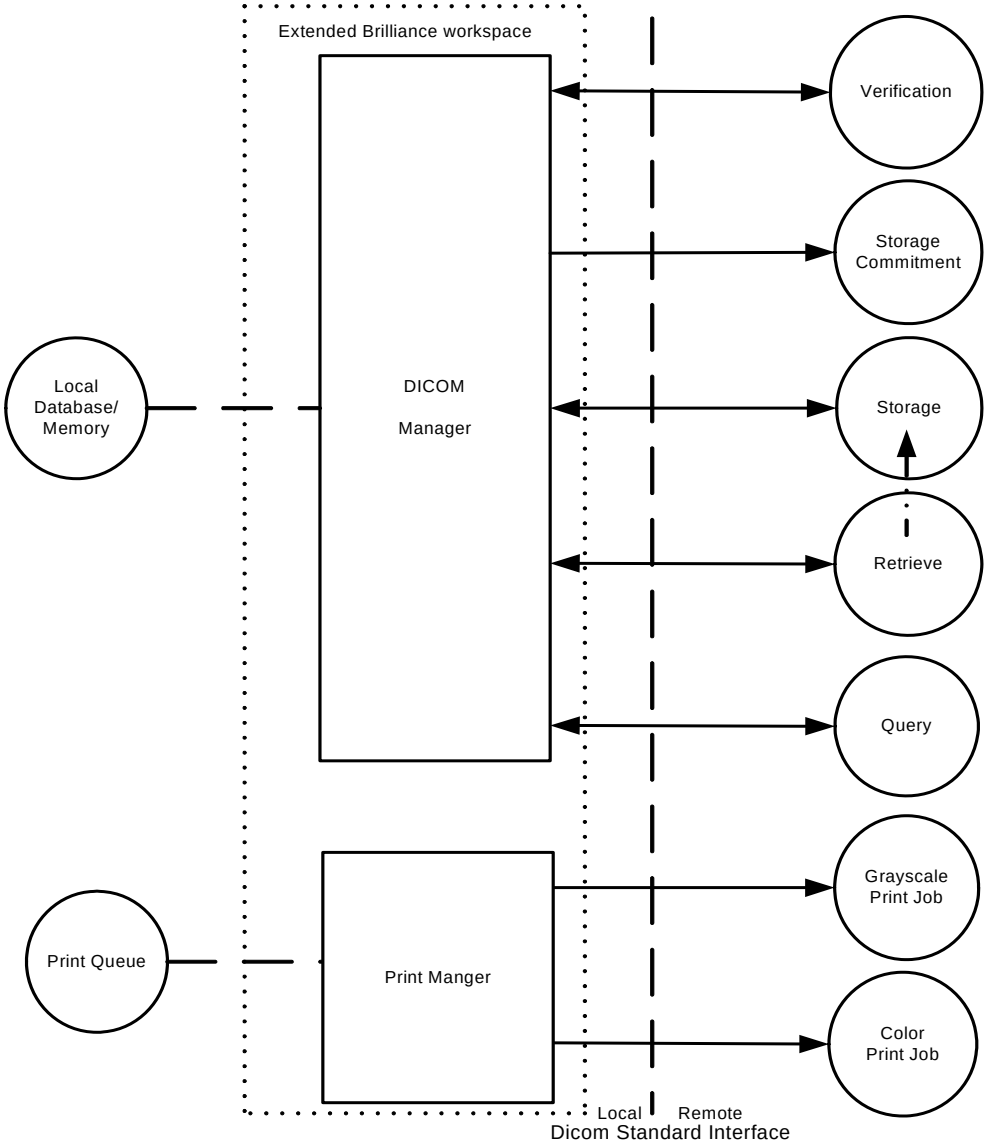

Figure 2: Network Application Data Flow Diagram

4.1.2. Functional Definition of AE's

This part contains a functional definition for each individual local Application Entity. It describes in general terms the functions to be performed by the AE, and the DICOM services used to accomplish these functions. In this sense, "DICOM services" refers not only to DICOM Service Classes, but also to lower level DICOM services, such as Association Services.

4.1.2.1. Functional Definition of DICOM Manager

The Figure below shows the Network Application Data Flow Diagram of the DICOM Manager.

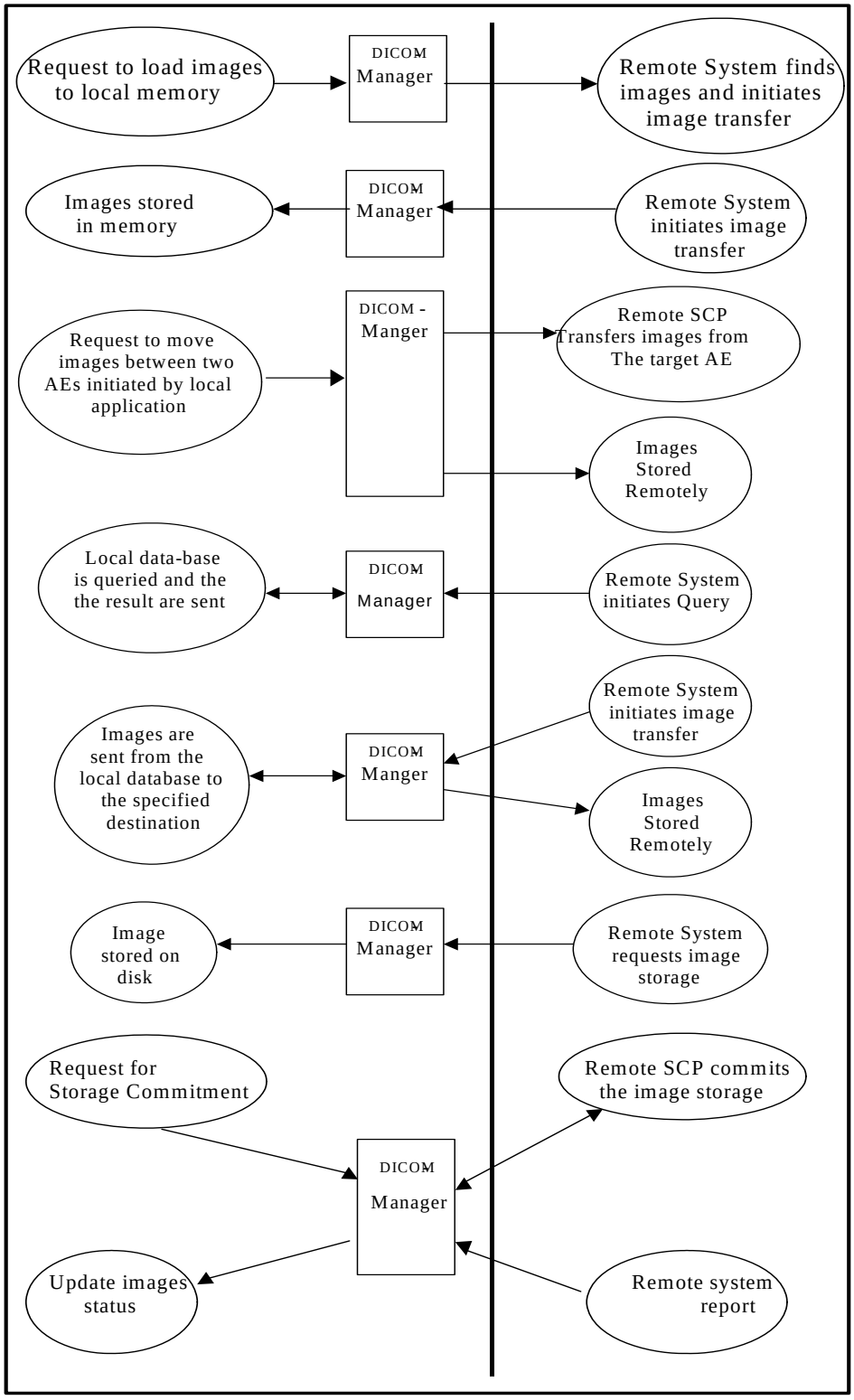

Figure 3: Network Application Data Flow Diagram of the DICOM Manager

The DICOM-Manager includes the following service classes:

- The DICOM-Manager is responsible for loading images into memory.
- The DICOM- Manager gets requests from local image processing and display applications to load images to the memory. It performs these requests using the Query-Retrieve Service Class (C-MOVE only).
- The DICOM-Manager waits for another application to connect at the presentation address configured for its AE title. Memory-Server will accept associations with Presentation Contexts for SOP classes of the Storage and Verification Service Classes. It will receive images on these Presentation Contexts and load them into the system's memory.

Storage Service

- When performing a Storage Service Class (SCP), the DICOM Manager will receive images and store them into the system's local database. The same AE may be used (with a configurable different AE title) to access the local MOD or different local hard disk folders.

Storage Commitment Service

- The DICOM Manager is responsible to issue and support the storage commitment service as SCU. When some remote storage device server is configured to support this service.
- The DICOM Manager establishes association with the specified AE title and sends storage commitment (N-ACTION) request using push the model. After that, it may accept storage commitment (N-EVENT-REPORT) requests on the same association or by establishing another association.

Query-Retrieve Service

- The DICOM Manager waits for another application to connect at the presentation address configured for its AE title. The DICOM Manager will accept associations with Presentation Contexts for Service Object Pair (SOP) classes of the Storage, Query-Retrieve (C-MOVE and C-FIND only) and Verification Service Classes.
- When performing Query-Retrieve Service Class (C-FIND SCP), the DICOM Manager will query its local database according to the request's parameters, and will send the results to the issuer.
- When performing Query-Retrieve Service Class (C-MOVE SCP), the DICOM Manager will issue a C-STORE (SCU) to the target AE for every image found according to the request.

Import Service

- Imported data object received from an external system will be inserted into the local data base with all the original attributes (including private), except those that jeopardize database integrity or further processing by applications.

Export Service

- When an object is exported from the local database to an external device, the attributes will be preserved unless an Export Converter is applied.

4.1.2.2. Functional Definition of Print Manager

The Print-Manager is a Graphical User Interface (GUI) based application. It enables the user to print predefined images using the DICOM protocol. The user can specify as a printing destination one of several predefined printers. The user can also modify some of the printing parameters such as the film size and format. The following figure provides an illustration of Print-Manager activities:

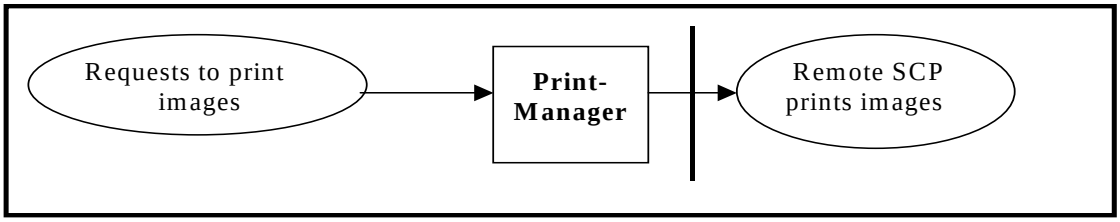

Figure 4: Illustration of Print Manager

4.1.3. Sequencing of Real World Activities

This section contains description of specific sequencing as well as potential constraints of Real-World Activities, including any applicable user interactions, as performed by the DICOM Manager.

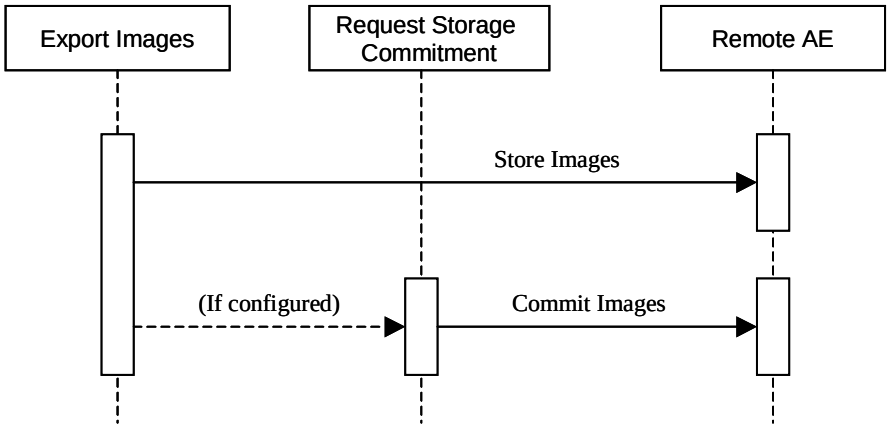

Figure 5: RWA Sequencing for Export Images

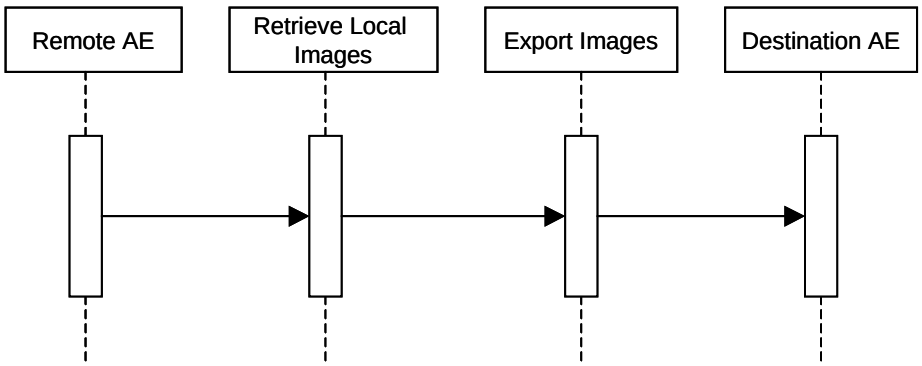

Figure 6: RWA Sequencing for Retrieve Local Images

4.2. AE Specifications

The next section in the DICOM Conformance Statement is a set of application entity specifications. There are as many of these subsections as there are different AE's in the implementation.
The Extended Brilliance Workspace V4.x consists of 2 AE, The DICOM Manager and Print Manager. These two AE's will be described in the subsections 4.2.1 and 4.2.2.

4.2.1. DICOM Manager

Every detail of this specific Application Entity will be completely specified in this section.

4.2.1.1. SOP Classes

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

Table 5: SOP Classes for DICOM Manager

SOP Class Name	SOP Class UID	SCU	SCP
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 - Pres.	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital Mammography X-Ray Image Storage - Proc.	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
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	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 SC 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
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	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
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	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

SOP Class Name	SOP Class UID	SCU	SCP
Key Object Selection Document (*)	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes
Encapsulated PDF (*)	1.2.840.10008.5.1.4.1.1.104.1	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	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 Plan Storage (*)	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
Query/Retrieve			
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
Verification			
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes

Notes:
(*) These SOP Classes are only supported for storage (not for viewing/processing).

Table 6: Supported Network Services for DICOM Manager who can be blocked by the Blocking Filter.

The next IODs (as configured in LAN Config by FSE) can be blocked with the Blocking Filter in EBW.

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	UID		
Transfer			
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
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes

4.2.1.2. Association Policies

Each AE specification contains a description of the general association establishment and acceptance policies of the AE.
With incoming association requests the system allows acceptance of a range of defined IP addresses which is configurable in the LAN Config application. The system will not be IP or AE title sensitive.

4.2.1.2.1. General

The DICOM standard application context will be specified as

Table 7: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.1.2.2. Number of Associations

The number of simultaneous associations that will be accepted by DICOM Manager is limited on 50.

Table 8: Number of Associations as an Association Initiator for DICOM-Manager

Maximum number of simultaneous associations	Unlimited

Table 9: Number of Associations as an Association Acceptor for DICOM-Manager

Maximum number of simultaneous associations	50

4.2.1.2.3. Asynchronous Nature

If the implementation supports negotiation of multiple outstanding transactions this is stated here, along with the maximum number of outstanding transactions supported.

Table 10: Asynchronous Nature as an Association Initiator for DICOM-Manager

Maximum number of outstanding asynchronous transactions	1

4.2.1.2.4. Implementation Identifying Information

The value supplied for Implementation Class UID is documented here. If a version name is supplied, this fact is documented here. Policies defining the values supplied for version name may be stated here.

Table 11: DICOM Implementation Class and Version for DICOM-Manager

Implementation Class UID	1.3.46.670589.33.1.1
Implementation Version Name	BRCONN_4.0

4.2.1.2.5. Communication Failure Handling

The behavior of the AE during communication failure is summarized in Table 12.

Table 12: Communication Failure Behavior

Exception	Behavior	Comment
ARTIM Timeout	The system stops the ARTIM timer and close the transport connection	Configurable , minimum value=1
Association Timeout	A release request is sent in order to close the association	Configurable, minimum value=1

4.2.1.3. Association Initiation Policy

This describes the conditions under which the AE will initiate an association.

The behavior of the AE during association rejection is summarized in Table 13.

Table 13: DICOM Association Rejection Handling

Result	Source	Reason/Diagnosis	Behavior
1 – rejected-permanent	1 – DICOM UL service-user	1 – no-reason-given	The connection is closed
		2 – application-context-name-not-supported	The connection is closed
		3 – calling-AE-title-not-recognized	The connection is closed
		7 – called-AE-title-not-recognized	The connection is closed
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	The connection is closed
		2 – protocol-version-not-supported	The connection is closed
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	The connection is closed
		2 – local-limit-exceeded	The connection is closed
2 – rejected-transient	1 – DICOM UL service-user	1 – no-reason-given	The connection is closed
		2 – application-context-name-not-supported	The connection is closed
		3 – calling-AE-title-not-recognized	The connection is closed
		7 – called-AE-title-not-recognized	The connection is closed
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	The connection is closed
		2 – protocol-version-not-supported	The connection is closed
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	The connection is closed
		2 – local-limit-exceeded	The connection is closed

The behavior of the AE on receiving an association abort is summarized in Table 14.

Table 14: DICOM Association Abort Handling

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	The connection is closed
2 – DICOM UL service-provider	0 – reason-not-specified	The connection is closed
	1 – unrecognized-PDU	The connection is closed
	2 – unexpected-PDU	The connection is closed
	4 – unrecognized-PDU parameter	The connection is closed
	5 – unexpected-PDU parameter	The connection is closed
	6 – invalid-PDU-parameter value	The connection is closed

The behavior of the AE for sending an association abort is summarized in Table 15.

Table 15: DICOM Association Abort Policies

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	When the system tries to disconnect before receiving an association accept but after sending association request When receiving association accept with no presentation context item When receiving association accept where all items in the presentation context item list are not accepted by remote system When an association timeout (configurable per remote device) expired (timeout which determines how long to keep an idle association). When receiving a PDU whose size is bigger then the agreed max PDU size
2 – DICOM UL service-provider	1 – unrecognized-PDU	Whenever the system receives unexpected or unrecognized PDU (according to the DICOM UPPER LAYER PROTOCOL STATE TRANSITION TABLE in chapter 8 of the DICOM standard).

4.2.1.3.1. (Real-World) Activity – Verification (C-ECHO)

Description and Sequencing of Activities

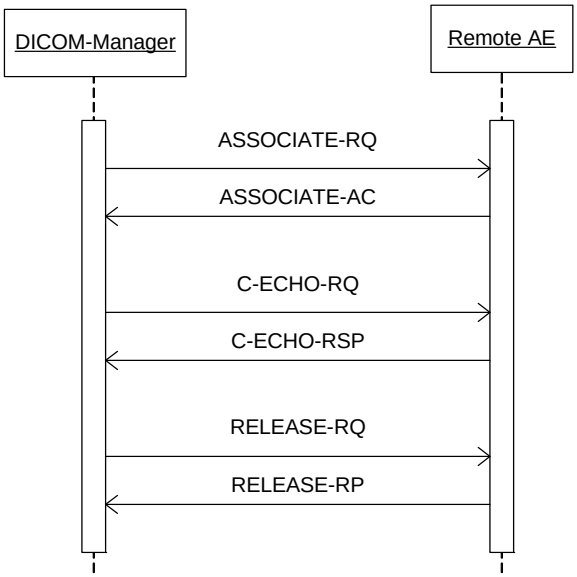

Figure 7: (Real World) Activity – DICOM Manager (C-ECHO SCU)

DICOM Manager initiates an association when the user points to one of the icons in the devices tool-bar, clicks the right mouse button and selects “Verify Connection” operation. A DICOM ping (C-ECHO) is available from the EBW application UI.

Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. The association will be closed immediately upon receiving the response.

The presentation contexts proposed by DICOM Manager for (Real-World) Activity – Verification (C-ECHO) are defined in Table 16

Table 16: Proposed Presentation Contexts for (Real-World) Activity – DICOM Manager – C-ECHO SCU

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List (*)**		
Verification SOP Class	1.2.840.10008.1.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	S C U	None

Note: the default supported Transfer Syntaxes is ILE, configurable are all Transfer Syntaxes in the order as shown in the Table above in LAN Config. JPEG has preference over ELE and ILE.

SOP Specific Conformance for SOP Classes

DICOM Manager provides standard conformance to the DICOM V3.0.
All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in next table.

Table 17: DICOM C-ECHO Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Success	The SCU has successfully send C-ECHO
Other than Success	<>0000	Problems with sending the C-ECHO	The SCU failed to send the C-ECHO; user is notified

4.2.1.3.2. (Real-World) Activity – Storage (C_STORE)

Description and Sequencing of Activities

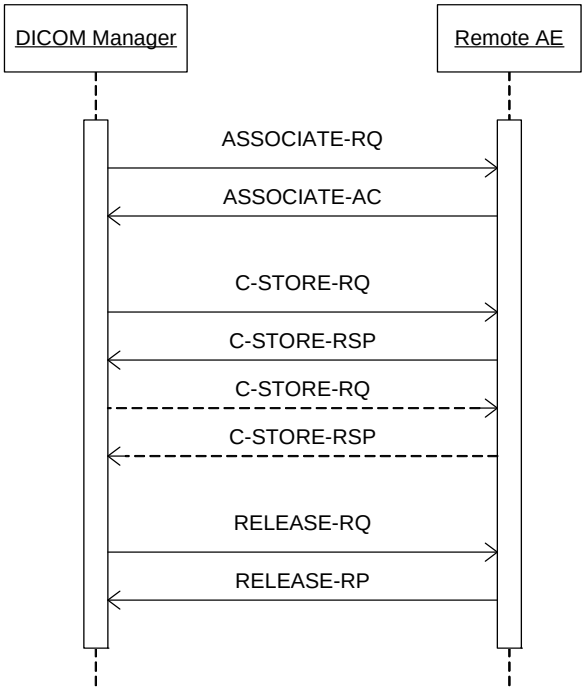

Figure 8: (Real World) Activity – DICOM Manager (C-STORE SCU)

The associated Real-World Activity is a request for retrieval of images from the disk/memory and storage of the images to a remote system using a C-STORE command.

Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association.

If, per configuration all DICOM objects are requested, than there is no corrections on import for those objects and can be saved “as is” (except ILE/ELE conversion or compression)

The system configuration (by FSE in LAN Config) allows disabling individually each of the supported syntaxes per remote device when establishing and accepting associations. At least one of the syntaxes will be enabled.

When establishing association to a remote device, all the enabled (for that device) syntaxes will be proposed. If more than one Transfer Syntax is accepted by the SCP, the order of selecting the syntax to use is: P-ELE, JPEG, ELE and ILE.

When accepting association from the remote device, only the enabled (for that device) transfer syntaxes will be accepted. If more than one transfer syntax fits this, the order of selecting the syntax to use is: P-ELE, JPEG, ELE and ILE.

The default enabled configuration setting in LAN Config, for transfer syntaxes are ILE and ELE. By default the Private ELE and JPEG transfer syntaxes are disabled.

During data export the EBW preserves the Date and Time format of the original data.

The presentation contexts proposed by the DICOM Manager for (Real-World) Activity (C-STORE SCU) are defined in Table 18.
Explicit VR Transfer Syntaxes for a specific AE target may be restricted using the configuration utility.

Table 18: Proposed Presentation Contexts for (Real-World) Activity – DICOM Manager – C-STORE SCU

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Digital X-Ray Image Storage – for Presentation	1.2.840.10008.5.1.4.1.1.1.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Digital Mammography X-Ray Image Storage - Pres.	1.2.840.10008.5.1.4.1.1.1.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Digital Mammography X-Ray Image Storage - Proc.	1.2.840.10008.5.1.4.1.1.1.2.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Digital Intra-oral X-Ray Image Storage – for Presentation	1.2.840.10008.5.1.4.1.1.1.3	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Digital Intra-oral X-Ray Image Storage – for Processing	1.2.840.10008.5.1.4.1.1.1.3.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Digital X-Ray Image Storage – for Processing	1.2.840.10008.5.1.4.1.1.1.1.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Grayscale Softcopy Presentation State Storage (PR)	1.2.840.10008.5.1.4.1.1.11.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Spatial Registration Storage (REG)	1.2.840.10008.5.1.4.1.1.66.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Encapsulated PDF	1.2.840.10008.5.1.4.1.1.104.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Verification	1.2.840.10008.1.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None

Note that the default supported Transfer Syntax is ILE.
Configurable are all other Transfer Syntaxes in order as shown in the table above in LAN Config Tool.
JPEG has preferences over ELE and ILE.

“JPEG” here refers to JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression.

DICOM Manager prefers an explicit Transfer Syntax encoding. If offered a choice of Transfer Syntax's in a Presentation Context, it will apply the following priorities to the choice of Transfer Syntax which can be configure in LAN Config Tool:

Table 19: Transfer Syntax Priorities.

Transfer Syntax	**Name List**	**UID List**	Comment
1. Private DICOM Explicit VR Little Endian	P-ELE	1.3.46.670589.33.1.4.1	LAN Config.
2. DICOM JPEG Lossless, Non-Hierarchical, FOP (Process 14)	JPEG	1.2.840.10008.1.2.4.70	LAN Config, Transfer Syntax for Lossless JPEG Image Compression (JPEG)
3. DICOM Explicit VR Little Endian	ELE	1.2.840.10008.1.2.1	Default, LAN Config.
4. DICOM Explicit VR Little Endian	ILE	1.2.840.10008.1.2	Default, LAN Config.

Note 1: The d*efault Transfer Syntax is ILE.*
The Transfer Syntaxes can be configured in the order as shown in the table above.
Note 2: *No support of JPEG transfer syntax for all SOP classes without pixel data.*

The system configuration of EBW (by FSE in LAN Config) allows the FSE to disable individually each of the supported Transfer Syntaxes per remote device when

establishing and accepting associations. At least one of the Transfer Syntaxes will be enabled.

During association negotiation, the system offers all the transfer syntaxes in one presentation context. The SCP will determine which transfer syntax is going to select, not the SCU.

SOP Specific Conformance for SOP Classes

DICOM Manager provides standard conformance to the DICOM V3.0 Storage Service Class as an SCU for SOP Classes mentioned in the previous section.

Multiple C-STORE operations can be performed over a single association.
Upon receiving a C-STORE Response containing a successful status, this implementation will perform the next C-STORE operation (if this operation is the result of the Series Level Move request). The association will be kept open if possible.

Any unsuccessful status (error or warning), returned in the C-STORE Response results in termination of sending further C-STORE requests (if any in the queue) and reporting of the error to the system log file.

There are two timeouts for the association. One timeout, “Association Timeout” is used to close an idle association. For C-STORE the default is 120 sec and can be configured per remote DICOM node. The other timeout is “Service Timeout” which detects that no data is transmitted over the association and closes it. The default “Service Timeout” for C- STORE is 5 minutes.

The system creates CT, PET, NM, Single and Multi-Frame Secondary Capture Images and RT Structure Sets. Section 8.1.1 will give an overview of the created objects.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in the next table.

Table 20: DICOM C-STORE Command Response Status Handling Behavior

Response Status Handling Behavior			
Service Status	**Code**	**Further Meaning**	**Behavior**
Success	0000	Success	Storage successful.
Failure	0122	Refused – SOP Class not supported	Message by transfer result – Unknown reason
	A700	Refused – Out of Resources	Message by transfer result – Out of Resources
	A900	Error - Data Set does not match SOP	Message by transfer result – Unknown reason
	C000	Error – Cannot understand	Message by transfer result – Store failed
Warning	B000	Coercion of Data Elements	Warning status is treated as success
	B006	Elements Discarded	Warning status is treated as success
	B007	Data Set does not match	Warning status is treated as success

4.2.1.3.3. (Real-World) Activity – Storage Commitment

Description and Sequencing of Activities

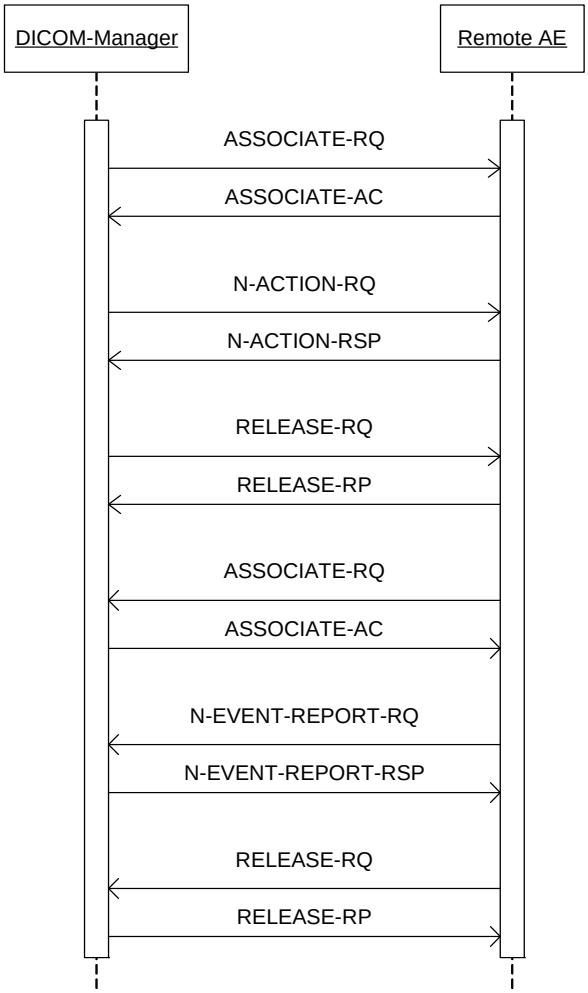

Figure 9: (Real World) Activity – DICOM Manager (Storage Commitment)

DICOM-Manager will attempt to initiate a new association when requested to commit the images that were stored on a remote device, which supports the storage Commitment Service.

The associated real world activity for the N-ACTION is a storage commitment request to the remote storage device.

The associated real world activity for the N-EVENT-REPORT operation is the completion of the storage commitment by the remote device. DICOM-Manager will issue a failure status if it is unable to properly handle the storage commitment report event.

Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association.

The presentation contexts proposed by DICOM Manager for (Real-World) Activity – Storage Commitment are defined in Table 21.

Table 21: Proposed Presentation Contexts for (Real-World) Activity – DICOM Manager – Storage Commitment

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None

SOP Specific Conformance for SOP Classes

DICOM-Manager provides standard conformance to the DICOM V3.0 Storage Commitment Service Class using Push Model as an SCU.

Multiple N-ACTION requests can be performed over a single association. Multiple N-EVENT-REPORT requests can be accepted over a single association.
After all N-ACTION requests that are waiting in the stack are issued, association will be closed with the timeout of 60 seconds.

A remote system reports about storage commitment completion using N-EVENT-REPORT command. The system can also accept the N-EVENT-REPORT commands over a separate association initiated by the remote system, using reverse role negotiation.

Storage Commitment for individual images are grouped into large "chunks" and issued as a singe Storage Commitment request.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 22 for N-ACTION and in Table 25 for N-EVENT-REPORT
.

Table 22: DICOM N-ACTION Command Response Status Handling Behavior

Response Status Handling Behavior			
Service Status	**Code**	**Further Meaning**	**Behavior**
Success	0000	Success	The request for storage commitment is considered successfully stored
Other than Success	<> 0000	Problems with sending the N-ACTION	The association is aborted and the request for storage commitment is marked as failed

Table 23: DICOM Command Communication Failure Behavior

Communication Failure Behavior	
Exception	**Behavior**
ARTIM Time-out	The reason is logged.
Reply Time-out	The association is released. Continues with waiting for storage commitment.
Association Time-out SCU	The association is released. Continues with waiting for storage commitment
Association aborted	Continues with waiting for storage commitment.

Table 24: Storage Commitment N-EVENT-REPORT Behavior

Storage Commitment N-EVENT-REPORT Behavior		
Event Type Name	**Event Type**	**Behavior**
Storage Commitment Request Successful	1	Successfully committed instances are marked as “transferred”
Storage Commitment Request Complete – Failures Exist	2	

Table 25: DICOM N-EVENT-REPORT Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Success	The storage commitment result has been successfully received.
Failure	0211	Unrecognized Operation	The transaction UID in the N-EVENT-REPORT request is not recognized..
	0213	Resource Limitation	The Transaction UID in the N-EVENT-REPORT request has expired.
	0113	No Such Event Type	An invalid Event Type ID was supplied in the N-EVENT-REPORT.
	0110	Processing Failure	An internal error occurred during processing
	0115	Invalid Argument Value	One of more SOP Instance UID’s with the Referenced SOP Sequence (0008.1199) or Failed SOP Sequence (0008,1198) was not included in the Storage Commitment Request associated with this Transaction UID.

4.2.1.3.4. (Real-World) Activity – DICOM-Manager C-FIND (SCU)

Description and Sequencing of Activities

DICOM-Manager initiates an association when the user clicks on one of the icons in the devices tool-bar.
The DICOM-Manager searches (C-FIND) by Study Level following by Series level and, optionally (configurable), by Image Level.

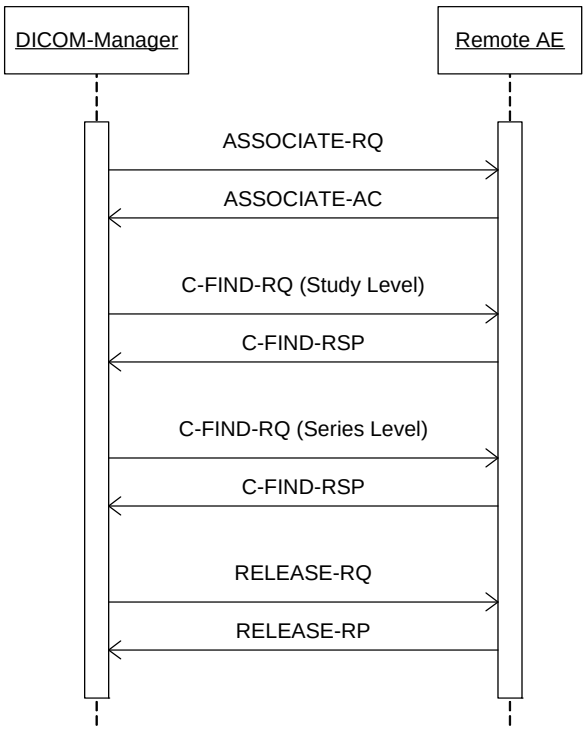

Figure 10: (Real World) Activity – DICOM-Manager C-FIND (SCU)

Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by Archive-Manager for (Real-World) Activity – DICOM-Manager C-FIND (SCU) are defined in the Table below.

Table 26: Proposed Presentation Contexts for (Real-World) Activity – Archive-Manager C-FIND (SCU)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Study Root Query /Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None

SOP Specific Conformance for SOP Classes

The DICOM-Manager provides standard conformance to the DICOM V3.0.
The DICOM-Manager supports the following Study and Series level attributes Sub-selection on the received list of patients after query will be done on the local memory.

Table 27: Supported Study and Series Query Level Attributes

Query Level	Query Key			Value	Type of matching
	Name	Tag	VR		
STUDY	Specific Character Set	0008,0005	CS	None	None
	Study Date	0008,0020	DA	User Input	S, U, R
	Study Time	0008,0030	TM	None	None
	Accession Number	0008,0050	SH	User Input	S
	Query/Retrieve Level	0008,0052	CS	STUDY	S
	Modalities in Study	0008,0061	CS	System	S
	Referring Physician's Name *, 1)	0008,0090	PN	User Input	S, U, R
	Study Description	0008,1030	LO	System	U
	Patient's Name *, 1)	0010,0010	PN	User Input	S
	Patient ID	0010,0020	LO	STUDY	S
	Patient's Birth Date	0010,0030	DA	User Input	S
	Patient's Birth Time	0010,0032	TM	User Input	S, U, *
	Patient's Sex	0010,0040	CS	User Input	S, U, *
	Study Instance UID	0020,000D	UI	User Input	S, U, *
	Study ID	0020,0010	SH	User Input	S, U, *
	Number of Study Related Series	0020,1206	IS	System	U
	Number of Study Related Images	0020,1208	IS	System	U
	Performed Procedure Step Description	0040,0254	LO	User Input	U,S
SERIES	Specific Character Set	0008,0005	CS	System	U
	Series Date	0008,0021	DA	User Input	U, S
	Series Time	0008,0031	TM	System	U
	Query/Retrieve Level	0008,0052	CS	System	U
	Modality	0008,0060	CS	System	U
	Manufacturer	0008,0070	LO	System	U
	Series Description	0008,103E	LO	System	U
	Body Part Examined	0018,0015	CS	System	U
	Protocol Name	0018,1030	LO	SERIES	S
	Study Instance UID	0020,000D	UI	System	U, S
	Series Instance UID	0020,000E	UI	System	U
	Series Number	0020,0011	IS	System	U
	Number of Series Related Instances	0020,1209	IS	System	U
	Performed Procedure Step Start Date	0040,0244	DA	System	U
	Performed Procedure Step Start Time	0040,0245	TM	System	S

Query Level	Query Key			Value	Type of matching
	Name	Tag	VR		
	Request Attributes Sequence	0040,0275	SQ	System	U
	>Requested Procedure ID	0040,1001	SH	System	U
	>Scheduled Procedure Step ID	0040,0009	SH	System	U
IMAGE	Specific Character Set	0008,0005	CS	System	U
	Image Type	0008,0008	CS	System	U
	Instance Creation Date	0008,0012	DA	System	U
	Instance Creation Time	0008,0013	TM	System	U
	SOP Class UID	0008,0016	UI	System	U
	SOP Instance UID	0008,0018	UI	System	U
	Query/Retrieve Level	0008,0052	CS	System	U
	Contrast Bolus Agent	0018,0010	LO	System	U
	Slice Thickness	0018,0050	DS	System	U
	KVP	0018,0060	DS	System	U
	Series Instance UID	0020,000E	UI	System	U
	Instance Number	0020,0013	IS	IMAGE	S
	Patient Orientation	0020,0020	CS	System	U
	Image Orientation Patient	0020,0037	DS	System	U
	Slice Location	0020,1041	DS	System	U
	Sample per Pixel	0028,0002	US	System	S
	Photometric Interpretation	0028,0004	CS	System	S
	Rows	0028,0010	US	System	U
	Columns	0028,0011	US	System	U
	Pixel Spacing	0028,0030	DS	System	U

Note that the column Type of Matching of the table above must be read as follows:
The types of Matching supported by the C-FIND SCP:
“S” indicates the identifier attribute can specify Single Value Matching,
“R” will indicate Range Matching,
“*” will denote wildcard matching,
“U” will indicate universal matching,
“L” will indicate that UID lists are supported for matching.
“NONE” indicates that no matching is supported, but that values for this element in the database can be returned.

1) Note that for Matching Values equal to Patient’s Name, the leading spaces into the Patient’s Name will be treated as insignificant for matching purposes.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 28

Table 28: DICOM C-FIND Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Success	Matching successful.
Failure	A700	Refused	Out of Resources
	A900	Failed	Unknown reason
	C000	Failed	Unknown reason

4.2.1.3.5. (Real-World) Activity – DICOM-Manager C-MOVE (SCU)

Description and Sequencing of Activities

The RWA Move Remote Images involves the retrieve of images on a remote system by moving matching images from the remote database to another database.

The operator is able to copy the selected images in a patient folder from a remote database to another, local or remote, database by means of the copy tool in the DICOM Manager data handling facility. The DICOM Manager initiates for each copy request an association to the selected peer entity (Remote AE) and uses it to send the Retrieve (C-MOVE) request (and receive the associated responses). An examination may contain both images and presentation states. The association is released after the final Retrieve (C-MOVE) response for the related request has been received (no more pending).

DICOM-Manager initiates an association when an image processing application asks for image loading from a specified source device using a proprietary IPC protocol.

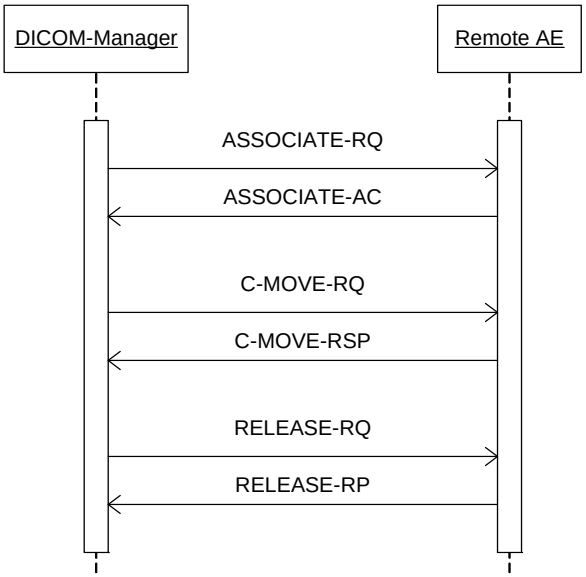

Figure 11: (Real World) Activity – DICOM-Manager C-MOVE as SCU

Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by DICOM-Manager for (Real-World) Activity – DICOM-Manager C-MOVE (SCU) are defined in Table 29.

Table 29: Proposed Presentation Contexts for (Real-World) Activity – DICOM-Manager C-MOVE as SCU

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None

SOP Specific Conformance for SOP Classes

DICOM-Manager provides standard conformance to the DICOM V3.0 Query/Retrieve Service Class as an SCU for the SOP Class Study Root Query/Retrieve Information Model – Move.
All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 30.

Table 30: DICOM C-MOVE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Success	Storage successful.
Failure	A701	Refused – Out of Resources	Message by transfer result – Refused Unknown reason
	A702	Refused – Out of Resources	Message by transfer result – Refused Store Failed
	A801	Refused – Move Destination Unknown	Message by transfer result – Refused Unknown target
	A900	Error – Identifier Does Not Match SOP Class	Message by transfer result – Failed Unknown reason
	C000	Error – Unable to Process	Message by transfer result – Failed Store Failed
Warning	B000	Sub-operations complete – One or more failures	Whenever one of the store operations failed
Cancel	FE00	Cancel	Message by transfer result – Refused Connection closed on timeout.

4.2.1.4. Association Acceptance Policy

Each AE specification contains a description of the association acceptance policies of the AE. This describes the conditions under which the AE will accept an association.

The AE association rejection policies are summarized in Table 31.

Table 31: DICOM Association Rejection Policies

Result	Source	Reason/Diagnosis	Explanation
1 – rejected-permanent	1 – DICOM UL service-user	2 – application-context-name-not-supported	When receiving association request and the application context name is not supported
		3 – calling-AE-title-not-recognized	When receiving association request and the calling AE title is not supported
		7 – called-AE-title-not-recognized	When receiving association request and the called AE title is not supported
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	When receiving association request and all of the items in the presentation context item list are not supported by the system
		2 – protocol-version-not-supported	When receiving an association request and the protocol version received is not supported

The behavior of the AE on DICOM receiving Association Abort Handling `is summarized in table below:

Table 32: DICOM receiving Association Abort Handling

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	The connection is closed
2 – DICOM UL service-provider	0 – reason-not-specified	The connection is closed
	1 – unrecognized-PDU	The connection is closed
	2 – unexpected-PDU	The connection is closed
	4 – unrecognized-PDU parameter	The connection is closed
	5 – unexpected-PDU parameter	The connection is closed
	6 – invalid-PDU-parameter value	The connection is closed

The behavior of the AE for DICOM sending Association Abort Policies is summarized in table below:

Table 33: DICOM sending Association Abort Policies

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	When an association timeout (configurable per remote device) expired (timeout which determines how long to keep an idle association). When receiving a PDU whose size is bigger then the agreed max PDU size
2 – DICOM UL service-provider	1 – unrecognized-PDU	Whenever the system receives unexpected or unrecognized PDU (according to the DICOM UPPER LAYER PROTOCOL STATE TRANSITION TABLE in chapter 8 of the DICOM standard).

4.2.1.4.1. (Real-World) Activity – DICOM Manager (C-ECHO SCP)

Description and Sequencing of Activities

A remote system requests verification from DICOM Manager using the C-ECHO command.

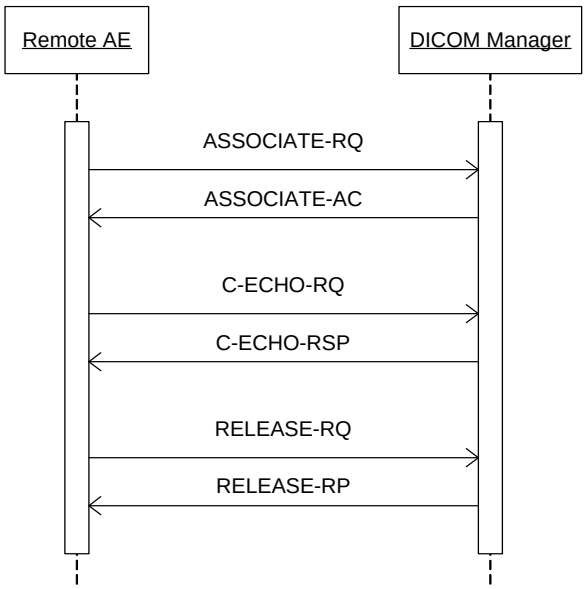

Figure 12: (Real World) Activity – DICOM Manager (C-ECHO SCP)

Accepted Presentation Contexts

Any of the presentation contexts shown in Table 34 is acceptable to DICOM Manager (C-ECHO SCP).

Table 34: Acceptable Presentation Contexts for < (Real-World) Activity – DICOM Manager (C-ECHO SCP)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification SOP Class	1.2.840.10008.1.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None

Note: The d*efault Transfer Syntax is ILE. Configurable are all other Transfer Syntaxes.*

SOP Specific Conformance for SOP Classes

DICOM Manager (C-ECHO SCP) provides standard conformance to the DICOM V3.0 verification SOP Class.

The behavior of an Application Entity SOP class is summarized as shown in Table 35. The standard as well as the manufacturer specific status codes and their corresponding behavior is specified.

Table 35: DICOM Manager (C-ECHO SCP) Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Success	C-ECHO command was successful received
Other than Success	<> 0000	Problems with receiving the C-ECHO	Problems with receiving the C-ECHO

4.2.1.4.2. (Real-World) Activity – DICOM Manager (C-STORE SCP)

Description and Sequencing of Activities

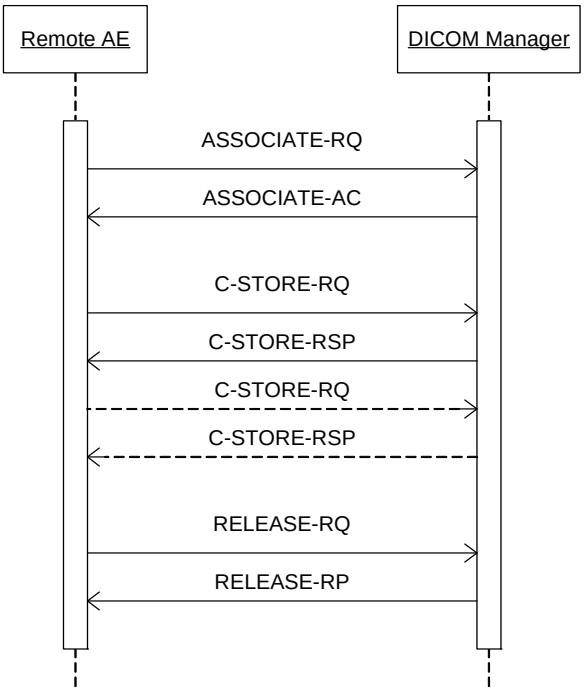

Figure 13: (Real World) Activity – DICOM Manager C-STORE (SCP)

The real world activity associated with the C-STORE operation is the storage of the image in the memory of the system upon which DICOM Manager is running in order to make it available for immediate processing by applications. DICOM Manager will issue a failure status if it is unable to store the image in the memory.

Accepted Presentation Contexts

Any of the Presentation Contexts shown in Table 36 is acceptable to the DICOM Manager C-STORE as SCP.

Table 36: Acceptable Presentation Contexts for (Real-World) Activity – DICOM Manager (C-STORE SCP)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Digital X-Ray Image Storage – for Presentation	1.2.840.10008.5.1.4.1.1.1.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Digital Mammography X-Ray Image Storage - Pres.	1.2.840.10008.5.1.4.1.1.1.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Digital Mammography X-Ray Image Storage - Proc.	1.2.840.10008.5.1.4.1.1.1.2.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Digital Intra-oral X-Ray Image Storage – for Presentation	1.2.840.10008.5.1.4.1.1.1.3	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Digital Intra-oral X-Ray Image Storage – for Processing	1.2.840.10008.5.1.4.1.1.1.3.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Digital X-Ray Image Storage – for Processing	1.2.840.10008.5.1.4.1.1.1.1.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Multi-frame Grayscale Word SC Image Storage	1.2.840.10008.5.1.4.1.1.7.3	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Grayscale Softcopy Presentation State Storage (PR)	1.2.840.10008.5.1.4.1.1.11.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Spatial Registration Storage (REG)	1.2.840.10008.5.1.4.1.1.66.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Encapsulated PDF	1.2.840.10008.5.1.4.1.1.104.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None
Verification	1.2.840.10008.1.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None

Note that the default Transfer Syntax is ILE. Configurable are all other transfer Syntaxes in order as shown in Table 37, by LAN Config tool.

Transfer Syntaxes JPEG has preference over Transfer Syntaxes ILE.

For all SOP classes without pixel data the JPEG transfer syntax will not supported.

SOP Specific Conformance for SOP Classes

DICOM Manager provides standard conformance to the DICOM V3.0 Storage Service Class as a SCP.
DICOM Manager conforms to the SOPs of the Storage Service Class at Level 2 (Full).
In case of a successful C-STORE, the stored image may be accessed by the processing applications

If the DICOM Manager returns one of the following status codes,

Table 38: DICOM-Manager C-STORE (SCP) Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Successful	Whenever the store operation succeeded
Failure	C000	Failed	Whenever the store operation failed

4.2.1.4.3. (Real-World) Activity – DICOM Manager (C-FIND SCP)

Description and Sequencing of Activities

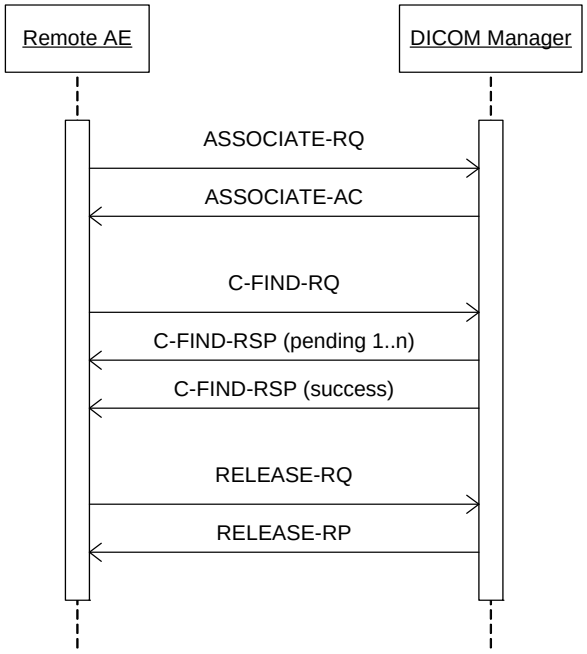

Figure 14: (Real World) Activity – C-FIND SCP

The Real World activity associated with the C-FIND-SCP is querying of the local disk based on C-FIND-RQ from the remote DICOM node. DICOM Manager will issue a failure status if it is unable to process the query request.

Proposed Presentation Contexts

Any of the Presentation Contexts show in Table 39 is acceptable to the DICOM Manager (C-FIND SCP).

Table 39: Proposed Presentation Contexts for (Real-World) Activity – DICOM Manager (C-FIND SCP)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None

SOP Specific Conformance for SOP Classes

DICOM Manager provides standard conformance to the DICOM V3.0 Query/Retrieve Service Class as an SCP for the following SOP Class: Study Root Query/Retrieve Information Model - FIND, UID=1.2.840.10008.5.1.4.1.2.2.1.

EBW does not support Relational Search, a query that may contain any combination of keys at any level in the hierarchy. Starting at the top level in the Query/Retrieve Information Model, continuing until the Query/Retrieve level specified in the C-FIND request is reached.

All Required (R) and Unique (U) Study, Series and Image level keys for the Study Root Query/Retrieve Information Model are supported.

Unsupported fields will not be returned in the C-FIND response.

Table 40: Supported Matching Keys – DICOM Manager (C-FIND SCP)

Query Level	Matching Keys			Value	Type of matching
	Name	Tag	VR		
STUDIES					
	Study Date	0008,0020	DA	User Input	S, U, R
	Study Time	0008,0030	TM	System	None
	Accession Number	0008,0050	SH	User Input	S
	Query/Retrieve Level	0008,0052	CS	STUDY	S
	Modalities in Study	0008,0061	CS	System	S
	Referring Physician’s Name *, 1)	0008,0090	PN	User Input	S, U, R
	Study Description	0008,1030	LO	System	U
	Patient’s Name *, 1)	0010,0010	PN	User Input	S
	Patient ID	0010,0020	LO	STUDY	S
	Patient’s Birth Date	0010,0030	DA	User Input	S
	Patient’s Birth Time	0010,0032	TM	User Input	S, U, *
	Study Instance UID	0020,000D	UI	User Input	S, U, *
	Study ID	0020,0010	SH	User Input	S, U, *
	Number of Study Related Series	0020,1206	IS	System	U
	Number of Study Related Images	0020,1208	IS	System	U
	Performed Procedure Step Description	0040,0254	LO	User Input	U,S
SERIES					
	Query/Retrieve Level	0008,0052	CS	System	U
	Modality	0008,0060	CS	System	U
	Series Date	0008,0021	DA	User Input	U, S
	Series Time	0008,0031	TM	System	U
	Manufacturer	0008,0070	LO	System	U
	Body Part Examined	0018,0015	CS	System	U
	Protocol Name	0018,1030	LO	SERIES	S
	Study Instance UID	0020,000D	UI	System	U, S
	Series Instance UID	0020,000E	UI	System	U
	Series Number	0020,0011	IS	System	U

Query Level	Matching Keys			Value	Type of matching
	Name	Tag	VR		
	Number of Series Related Instances	0020,1209	IS	System	U
	Performed Procedure Step Start Date	0040,0244	DA	System	U
	Performed Procedure Step Start Time	0040,0245	TM	System	S
	Request Attributes Sequence	0040,0275	SQ	System	U
IMAGE					
	SOP Instance UID	0008,0018	UI	System	U
	Query/Retrieve Level	0008,0052	CS	Image	U
	Contrast Bolus Agent	0018,0010	LO	User	U
	Slice Thickness	0018,0050	DS	System	U
	KVP	0018,0060	DS	System	U
	Series Instance UID	0020,000E	UI	System	U
	Instance Number	0020,0013	IS	IMAGE	S
	Patient Orientation	0020,0020	CS	System	U
	Image Orientation Patient	0020,0037	DS	System	U
	Slice Location	0020,1041	DS	System	U
	Sample per Pixel	0028,0002	US	System	S
	Photometric Interpretation	0028,0004	CS	System	S
	Rows	0028,0010	US	System	U
	Columns	0028,0011	US	System	U
	Pixel Spacing	0028,0030	DS	System	U
	Image Type	0008,0008	CS	System	S
	Instance Creation date	0008,0012	DA	System	S
	Instance Creation time	0008,0013	TM	System	S
	SOP class UID	0008,0016	UI	System	S
	Frame of Reference UID	0020:0052	UI	System	S
	Study Instance UID	0008,0018	UI	System	S

C-FIND-CANCEL is supported. However, some C-FIND responses may be forwarded before the C-FIND-CANCEL takes effect.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 41

Table 41: DICOM C-Find Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Matching complete	Matching successful
Failure	C000	General failure status	Whenever the find operation failed

4.2.1.4.4. (Real-World) Activity – DICOM Manager (C-MOVE SCP)

Description and Sequencing of Activities

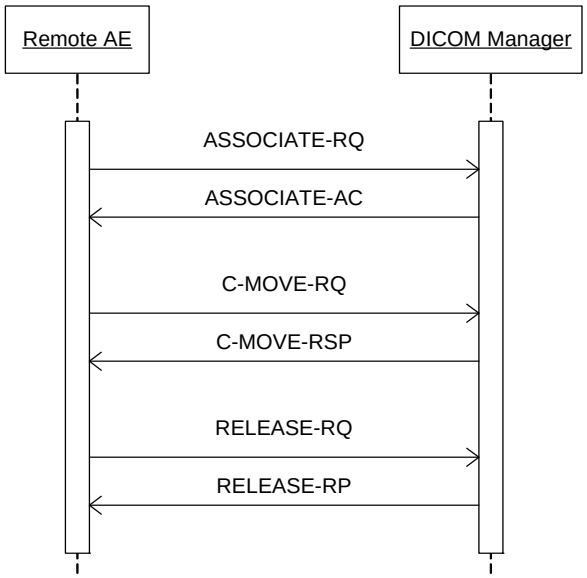

Figure 15: (Real World) Activity – DICOM Manager (C-MOVE SCP)

The Real World activity associated with the C-MOVE command is retrieval of images from the disk and storage of the images to a remote system using a C-STORE command.
DICOM Manager will issue a failure status if it is unable to process the transfer request

Proposed Presentation Contexts

Any of the Presentation Contexts show in Table 42 is acceptable to the DICOM Manager (C-MOVE SCP).

Table 42: Proposed Presentation Contexts for (Real-World) Activity – DICOM Manager (C-MOVE SCP)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None

SOP Specific Conformance for SOP Classes

DICOM Manager provides standard conformance to the DICOM V3.0 Query/Retrieve Service Class as an SCP for the following SOP Class: Study Root Query/Retrieve Information Model - MOVE, UID=1.2.840.10008.5.1.4.1.2.2.2.
Prioritization of C-MOVE requests is not supported.

DICOM Manager does not support relational C-MOVE requests.
All images requested in the C-MOVE will be sent over a single association.

All details regarding the specific conformance, including response behavior of all status codes, both from an application level and communication errors are provided in Table 43

Table 43: DICOM C-MOVE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Matching complete	Whenever the move operation succeeded.
Failure	A801	Refused – Move Destination Unknown	Whenever the move destination is unknown to the system.
	C000	Error – Unable to Process	Whenever the move operation failed.
Warning	B000	Sub-operations Complete – One or more Failures	Whenever one of the store operations failed.
Pending	FF00	Pending	For every store response received.
Cancel	FE00	Cancel	When receiving a cancel move request.

4.2.2. Print-Manager Specifications

4.2.2.1. SOP Classes

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

Table 44: SOP Classes for Print-Manager

SOP Class Name	SOP Class UID	SCU	SCP
Basic Grayscale Print Management (Meta)	1.2.840.10008.5.1.1.9	Yes	No
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No
>Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes	No
>Printer SOP Class	1.2.840.10008.5.1.1.16	No	No
Basic Color Print Management (Meta)	1.2.840.10008.5.1.1.18	Yes	No
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No
>Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Yes	No
>Printer SOP Class	1.2.840.10008.5.1.1.16	No	No

4.2.2.2. Association Policies

4.2.2.2.1. General

The maximum PDU Size that the Print-Manager will use is configurable, with a minimum of 2 Kbytes.

Table 45: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.2.2.2. Number of Associations

Print-Manager can have only one open connection at a given time.

Table 46: Number of Associations as an Association Initiator for Print-Manager

Maximum number of simultaneous associations	1

Table 47: Number of Associations as an Association Acceptor for Print-Manager

Maximum number of simultaneous associations	50

4.2.2.2.3. Asynchronous Nature

Print-Manager will only allow a single outstanding operation on an association.

Table 48: Asynchronous Nature as an Association Initiator for Print-Manager

Maximum number of outstanding asynchronous transactions	1

4.2.2.2.4. Implementation Identifying Information

The value supplied for Implementation Class UID and Version Name is documented here.

Table 49: DICOM Implementation Class and Version for Print-Manager

Implementation Class UID	1.3.46.670589.33.1.1
Implementation Version Name	BRCONN_4.0

4.2.2.3. Association Initiation Policy

4.2.2.3.1. (Real-World) Activity – Print Manager as SCU

Description and Sequencing of Activities

After selecting the print destination (out of choice list of configured printers) and some print parameters (depending on the configuration and the selected printer; these values can be configured too).
Print-Manager initiates an association when a print job is submitted to a DICOM printer (when the user click on the print button in the film view).
The association is left open after the job is completed for a configurable time-out (so that if there are other jobs to the same printer, they will be done on the same association.
Jobs to different printers are performed simultaneously.

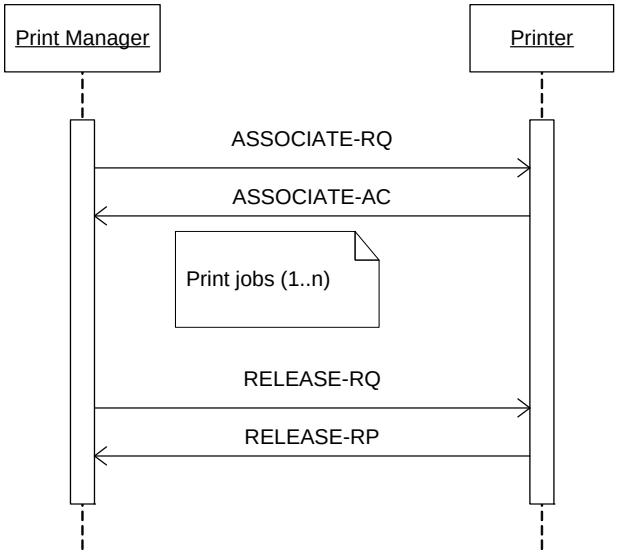

Figure 16: (Real World) Activity – Print-Manager Initiates

Normally, when the job is completed and there are no other jobs to the same printer, the Print manager does close the association with an A-RELEASE request.
If a TCP/IP connection timeout occurs, then the association is closed. In this case, a new association is set up when needed.

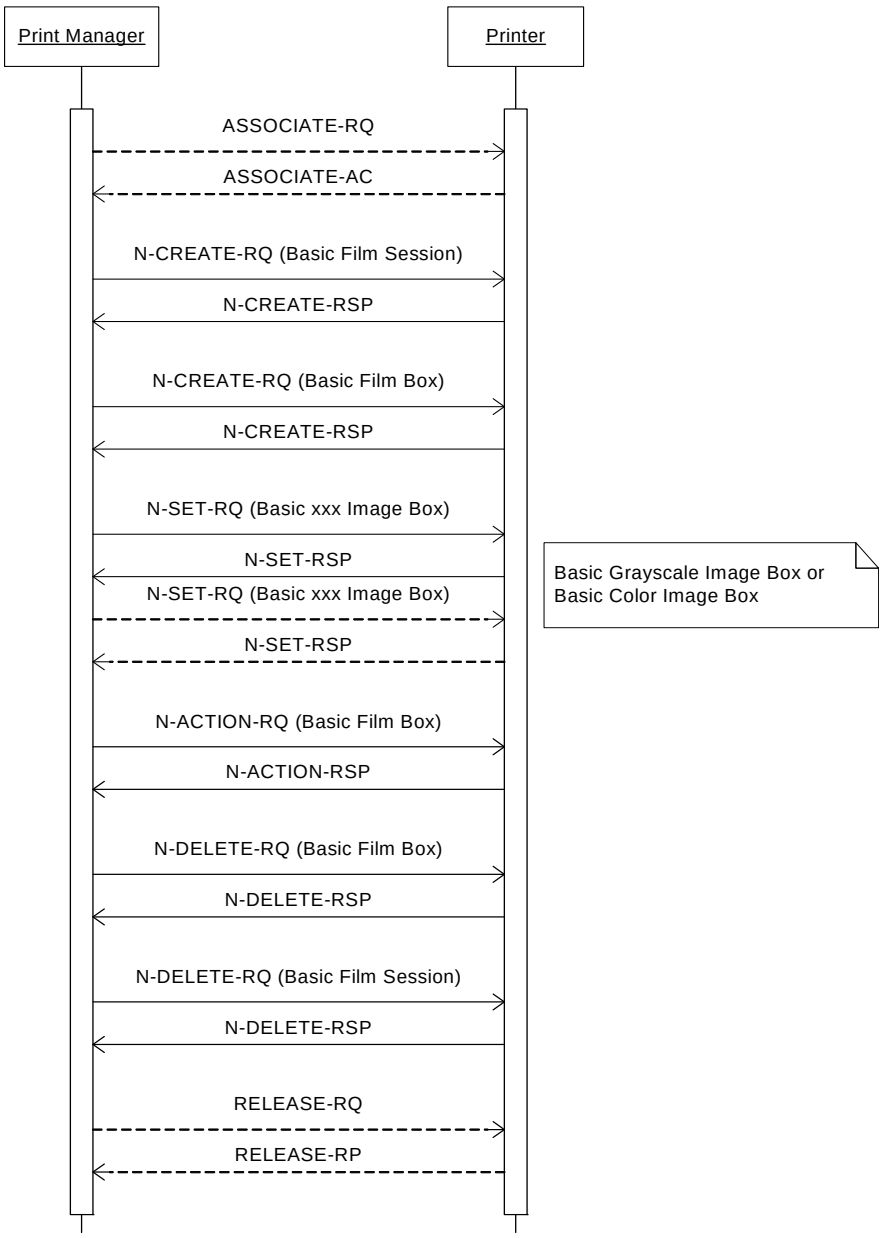

Figure 17: (Real World) Activity – Print-Manager

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Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by Print-Manager for (Real-World) Activity – Print Image are defined in Table 50

Table 50: Proposed Presentation Contexts for (Real-World) Activity – Print Image

Presentation Context Table					
Abstract Syntax		**Transfer Syntax during Association Negotiation**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Basic Grayscale Print Management (Meta)	1.2.840.10008.5.1.1.9	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Basic Color Print Management (Meta)	1.2.840.10008.5.1.1.18	P_ELE JPEG ELE ILE	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None

Note: The only supported default Transfer Syntaxes for printing are ELE and ILE.

Recommended abbreviations to be used for the module tables are:
ALWAYS the attribute is always present with a value
ANAP the Attribute is Not Always Present

Recommended abbreviations to be used for the source of the data values in the tables are:
AUTO the attribute value is generated automatically
CONFIG the attribute value source is a configurable parameter by USER or in printer configuration file.

SOP Specific Conformance Basic Film Session SOP Class

The Printer process conforms to the Basic Film Session SOP Class.
The following DIMSE service element is supported:

N-CREATE
N-DELETE

The following table lists the supported attributes for the N-CREATE DIMSE.

Table 51: Basic Film Session Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Copies	2000,0010	IS	1..100	ALWAYS	USER
Print Priority	2000,0020	CS	LOW, MED, HIGH, AUTO,	ANAP	USER
Medium Type	2000,0030	CS	BLUE FILM, CLEAR FILM, PAPER	ALWAYS	USER, CONFIG
Film Destination	2000,0040	CS	MAGAZINE, PROCESSOR	ALWAYS	USER, CONFIG

The behavior on successful and unsuccessful transfer is given in the table below.

Table 52: DICOM Command Response Status Handling Behavior for Basic Film Session N-CREATE

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Film Session successfully created	The print job continues
*	B600	Memory Allocation not supported	The print job continues and the warning is logged

Table 53: DICOM Command Response Status Handling Behavior for Basic Film Session N-DELETE

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Film Session successfully created	The SCP has completed the operation successfully
*	<> 0000	other status	On any other status then success, the job remains in the queue manager, with status failed

SOP Specific Conformance Basic Film Box SOP Class

The Printer process conforms to the Basic Film Box Sop Class.
The following DIMSE service elements are supported:

N-CREATE
N-ACTION
N-DELETE

The following table lists the supported attributes for the N-CREATE DIMSE

Table 54: Basic Film Box Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Display Format	2010,0010	ST	STANDARD\1,1	ALWAYS	CONFIG
Film Orientation	2010,0040	CS	PORTRAIT; LANDSCAPE	ALWAYS	USER, CONFIG
Film Size ID	2010,0050	CS	As In Printer Configuration File	ALWAYS	USER, CONFIG
Min Density	2010,0120	US	As In Printer Configuration File	ALWAYS	CONFIG
Max Density	2010,0130	US	As In Printer Configuration File	ALWAYS	CONFIG
Trim	2010,0140	CS	NO, YES	ALWAYS	USER, CONFIG
Configuration Information	2010,0150	ST	As In Printer Configuration File	ALWAYS	CONFIG
Magnification Type	2010,0060	CS	As In Printer Configuration File	ALWAYS	CONFIG

Table 55: Basic Film Box Relationship Module

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

The behavior on successful and unsuccessful transfer is given in the table below.

Table 56: DICOM Command Response Status Handling Behavior for Basic Film Box N-CREATE

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Film Box successfully created	The SCP has completed the operation successfully.
Warning	B605	Requested Min Density or Max Density outside of Printer's operating Range	The print job continues and the warning is logged.
Failure	C616	There is an existing Film Box that has not been printed	The print job is marked as failed and the reason is logged.

N-ACTION DIMSE does not create any Data Set Attributes.
The behavior on successful and unsuccessful transfer is given in the table below.

Table 57: DICOM Command Response Status Handling Behavior for Basic Film Box N-ACTION

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Film accepted for printing	The print job continues.
Warning	B603	Film Box SOP Instance Hierarchy does not contain Image Box SOP Instances	The print job continues and the warning is logged and reported to the user.
	B604	Image Size is larger than Image Box Size – The Image has been de-magnified	The print job continues and the warning is logged and reported to the user.
	B609	Image Size is larger than Image Box Size – The Image has been cropped to fit	The print job continues and the warning is logged and reported to the user.
	B60A	Image Size or combined Print Image Size is larger than Image Box Size – The Image or combined Print Image has been decimated to fit	The print job continues and the warning is logged and reported to the user.
Failure	C602	Unable to create Print Job SOP Instance – Print Queue is full	The print job is marked as failed and the reason is logged and reported to the user.
	C603	Image Size is larger than Image Box Size	The print job is marked as failed and the reason is logged and reported to the user.
	C613	Combined Print Image Size is larger than Image Box Size	The print job is marked as failed and the reason is logged and reported to the user.

N-DELETE DIMSE does not create any Data Set Attributes.
The behavior on successful and unsuccessful transfer is given in the table below.

Table 58: DICOM Command Response Status Handling Behavior for Basic Film Box N-DELETE

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Film Session successfully created	The SCP has completed the operation successfully
Unsuccessful	<> 0000	Any other status then success	The job remains in the queue manager, with status failed

SOP Specific Conformance Basic Grayscale Image Box SOP Class

The Printer process conforms to the Basic Grayscale Image Box Sop Class. The following DIMSE service element is supported:

N-SET

The following table lists the supported attributes for the N-SET DIMSE

Table 59: Basic Grayscale Image Box SOP Class - N-SET-RQ - Pixel Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Position	2020,0010	US	1	ALWAYS	AUTO
Basic Grayscale Image Sequence	2020,0110	SQ		ALWAYS	AUTO
>Samples per Pixel	0028,0002	US	1 , 3	ALWAYS	AUTO
>Photometric Interpretation	0028,0004	CS	MONOCHROME2 / RGB	ALWAYS	AUTO
>Rows	0028,0010	US	As in Printer Configuration File	ALWAYS	AUTO
>Columns	0028,0011	US	As in Printer Configuration File	ALWAYS	AUTO
>Pixel Aspect Ratio	0028,0034	IS	Must be present if not 1/1.	ALWAYS	AUTO
>Bits Allocated	0028,0100	US	8	ALWAYS	AUTO
>Bits Stored	0028,0101	US	8	ALWAYS	AUTO
>High Bit	0028,0102	US	7	ALWAYS	AUTO
>Pixel Representation	0028,0103	US	0	ALWAYS	AUTO
>Pixel Data	7FE0,0010	OB/ OW		ALWAYS	AUTO

The behavior on successful and unsuccessful transfer is given in the table below.

Table 60: DICOM Command Response Status Handling Behavior for Basic Grayscale Image Box N-SET

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Image successfully stored in Image Box	The print job continues.
Warning	B604	Image Size is larger than Image Box Size – The Image has been de-magnified	The print job continues and the warning is logged and reported to the user.
	B605	Requested Min Density or Max Density outside of Printer's operating Range	The print job continues and the warning is logged and reported to the user.
	B609	Image Size is larger than Image Box Size – The Image has been cropped to fit	The print job continues and the warning is logged and reported to the user.
	B60A	Image Size or combined Print Image Size is larger than Image Box Size – The Image or combined Print Image has been decimated to fit	The print job continues and the warning is logged and reported to the user.
Error	C603	Image Size is larger than Image Box Size	The print job is marked as failed and the reason is logged and reported to the user
	C605	Insufficient Memory in Printer to store the Image	The print job is marked as failed and the reason is logged and reported to the user

Service Status	Error Code	Further Meaning	Behavior
	C613	Combined Print Image Size is larger than Image Box Size	The print job is marked as failed and the reason is logged and reported to the user

SOP Specific Conformance Basic Color Image Box SOP Class

The Printer process conforms to the Color Image Box Sop Class.
The following DIMSE service element is supported:

N-SET

The following table lists the supported attributes for the N-SET DIMSE

Table 61: Basic Color Image Box SOP Class - N-SET-RQ - Pixel Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Position	2020,0010	US	1	ALWAYS	AUTO
Polarity	2020,0020	CS	As in Printer configuration File	ALWAYS	AUTO
Basic Color Image Sequence	2020,0111	SQ		ALWAYS	AUTO
>Samples per Pixel	0028,0002	US	3	ALWAYS	AUTO
>Photometric Interpretation	0028,0004	CS	RGB	ALWAYS	AUTO
>Planar Configuration	0028,0006	US	0,1	ALWAYS	AUTO
>Rows	0028,0010	US	As in Printer Configuration File	ALWAYS	AUTO
>Columns	0028,0011	US	As in Printer Configuration File	ALWAYS	AUTO
>Pixel Aspect Ratio	0028,0034	IS	Must be present if not 1/1.	ALWAYS	AUTO
>Bits Allocated	0028,0100	US	8	ALWAYS	AUTO
>Bits Stored	0028,0101	US	8	ALWAYS	AUTO
>High Bit	0028,0102	US	7	ALWAYS	AUTO
>Pixel Representation	0028,0103	US	0	ALWAYS	AUTO
>Pixel Data	7FE0,0010	OW		ALWAYS	AUTO

The behavior on successful and unsuccessful transfer is given in the Table 62

Table 62: DICOM Command Response Status Handling Behavior for Basic Color Image Box N-SET

Service Status	Further Meaning	Error Code	Behavior
Success	0000	Image successfully stored in Image Box	The print job continues.
Warning	B604	Image Size is larger than Image Box Size – The Image has been de-magnified	The print job continues and the warning is logged and reported to the user.
	B605	Requested Min Density or Max Density outside of Printer's operating Range	The print job continues and the warning is logged and reported to the user.
	B609	Image Size is larger than Image Box Size – The Image has been cropped to fit	The print job continues and the warning is logged and reported to the user.
	B60A	Image Size or combined Print Image Size is larger than Image Box Size – The Image or combined Print Image has been decimated to fit	The print job continues and the warning is logged and reported to the user.
Error	C603	Image Size is larger than Image Box Size	The print job is marked as failed and the reason is logged and reported to the user.
	C605	Insufficient Memory in Printer to store the Image	The print job is marked as failed and the reason is logged and reported to the user.
	C613	Combined Print Image Size is larger than Image Box Size	The print job is marked as failed and the reason is logged and reported to the user.

4.2.2.4. Association Acceptance Policy

Print-Manager never accepts an association.

4.3. Network Interfaces

4.3.1. Physical Network Interface

The Workspace application provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of [DICOM].

Extended Brilliance Workspace inherits its TCP/IP stack from Windows XP (i.e. the operating system platform).

Extended Brilliance Workspace supports a single network interface: Ethernet ISO.8802-3.
With standard supported physical medium include:

- IEEE 802.3 10BASE-TX
- IEEE 802.3 100BASE-TX (Fast Ethernet)
- IEEE 802.3 1000BASE-X (Fiber Optic Gigabit Ethernet).

4.3.2. Additional Protocols

Additional protocols such as used for network management are not applicable.

4.4. Configuration

The Extended Brilliance Workspace system is configured by means of a configuration program. This program is accessible at start-up of the Extended Brilliance Workspace system. It is password protected and intended to be used by the administrator onsite or Philips Customer Support Engineers only.

If, per configuration in LAN Config Tool, the system allows to accept associations from a range of IP addresses (not to check source IP or Calling AE Title). With incoming association requests the system allows acceptance of a range of defined IP addresses which is configurable in the LAN Config application. The system is not IP or AE title sensitive.

4.4.1. AE Title / Presentation Address Mapping

An important installation issue is the translation from AE title to presentation address. With incoming association requests the system allows acceptance of a range of defined IP addresses which is configurable in the LAN Config application. How this is performed is described in this section. The system is not IP or AE title sensitive.

This mapping (including IP and port numbers) is defined during the system Networking Procedure. Configurable are the following parameters:

- Calling AE Titles.
- Called AE Titles.
- Maximum PDU size.
- Manufacturer.
- Model.
- Version.
- Association timeout, the minimum configurable timeout value is “1”.
- ARTIM timer.

- Large Archive – Force Filter when querying this device.
- Archived – Mark studies as Archived when copying them to this device.
- Disable explicit transfer syntaxes are proposed at the association negotiation.
- Enable generation of DICOM overlays (“burn-in” instead).

Local AE Titles
The default AE titles are based on the system host name defined by the service engineer as part of the system configuration. The following table is used:

Table 63: AE Title Configuration Table

Application Entity	Default AE Title	Default TCP/IP Port
DICOM-Manager	<hostname> <hostname><localfolder>	104 (Configurable)
Print-Manager	<hostname>	Configurable

4.4.1.1. Remote AE Title/Presentation Address Mapping

Remote AE Title, IP-Address, Port-number and supporting Transfer Syntaxes are freely configurable.

4.4.2. Parameters

The specification of important operational parameters, their default value and range (if configurable) is specified here:

- General Parameters of Extended Brilliance Workspace system.
- Local Configurable Parameters of the Extended Brilliance Workspace system.
- Remote Configurable Parameters of the Extended Brilliance Workspace system.
- General Print Parameters.
- Printer Specific Print Parameters.

Table 64: Configuration Parameters Table

General Parameters		
Parameter	**Configurable**	**Default Value**
Release Timeout	Yes	30 seconds (LAN Config)
Port-Number	Yes	104 (Fixed)
Maximum PDU size the AE can receive	Yes	16352 (Fixed)
Maximum PDU size the AE can send	Yes	16352 (Fixed)
Transfer Syntax support, P- ELE, JPEG, ELE, ILE, There is a configuration option to turn off Explicit VR support	Yes	P- ELE, JPEG, ELE, ILE,
Storage / Retrieve Timeout	Yes	300 seconds (LAN Config)
ARTIM timeout	Yes	300 seconds (LAN Config)
Max association number	Yes	50

Printers are configurable by a selection of the default printer types. Every printer type has a fixed configuration, but can be extended with new ones. The default printer settings are defined in the printer configuration file.

5. MEDIA INTERCHANGE

5.1. Implementation Model

AE Provides Standard Conformance to the DICOM Media Storage Service and File Format (PS 3.10) and the Media Storage Application Profiles (PS 3.11)

5.1.1. Application Data Flow Diagram

As part of the implementation model, an application data flow diagram is included. The next Figure shows the media interchange application data flow as a functional overview of the Media AE for DICOM CD and DVD.

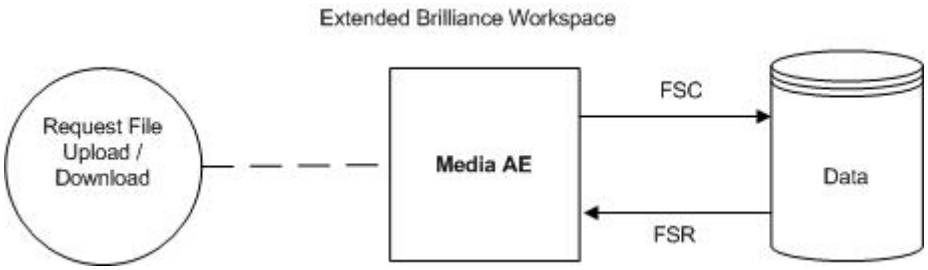


Table 65: Media Interchange Application Data Flow Diagram

The Media AE acts as a FSR when reading the directory of the medium.
The Media AE acts as a FSC when writing the selected images in a patient folder onto the CD-R / DVD medium.

The Media AE acts as a FSR, for CD-R and DVD, when reading the directory of the medium. The Media AE acts as a FSC for CD-R and DVD, when writing the selected images in a patient folder onto the medium.
Extended Brilliance Workspace supports the media profiles as shows in the Table below:

Table 66: Media Profiles supported by Extended Brilliance Workspace

Supported Application Profile	Real-World Activity	Roles	SC Option
STD-GEN-CD	Display Directory	FSR	Interchange
	Write Images	FSC	Interchange
	Read Images	FSR	Interchange
STD-GEN-DVD-JPEG	Display Directory	FSR	Interchange
	Write Images	FSC	Interchange
	Read Images	FSR	Interchange

The system proposes the transfer syntaxes mentioned in Table below.

Table 67: Transfer Syntaxes of DVD / CD supported by Extended Brilliance Workspace

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name List (note)**	**UID List**		
See Note 1	See Note 1	P-ELE JPEG ILE ELE *(Note 2)*	1.3.46.670589.33.1.4.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

Note 1: Any of the standard image storage and private SOP classes mentioned before. Note 2: The preferred transfer syntax for media is default ELE.

5.1.2. Functional Definitions of AE's

This session contains a functional definition for each local Application Entity. It's described in general terms the functions to be performed by the AE, and the DICOM services used to accomplish these functions.
The Media AE includes the following service class.

Media Storage Service Class for CD and DVD.

The Extended Brilliance Workspace can perform the CD Media Storage service as SCU, with capabilities for:
RWA Display Directory (as FSR),
RWA Write Images (as FSC), and
RWA Read Images (as FSR).

The Extended Brilliance Workspace can perform the DVD Media Storage service as SCU, with capabilities for:
RWA Display Directory (as FSR),
RWA Write Images (as FSC), and
RWA Read Images (as FSR).

The Extended Brilliance Workspace can Create and Read CD /DVD and Read CD/DVD.

5.1.2.1. Functional Definition of Extended Brilliance Workspace AE

The Media AE in an Extended Brilliance Workspace supports the following functions for CD and DVD as FSR:

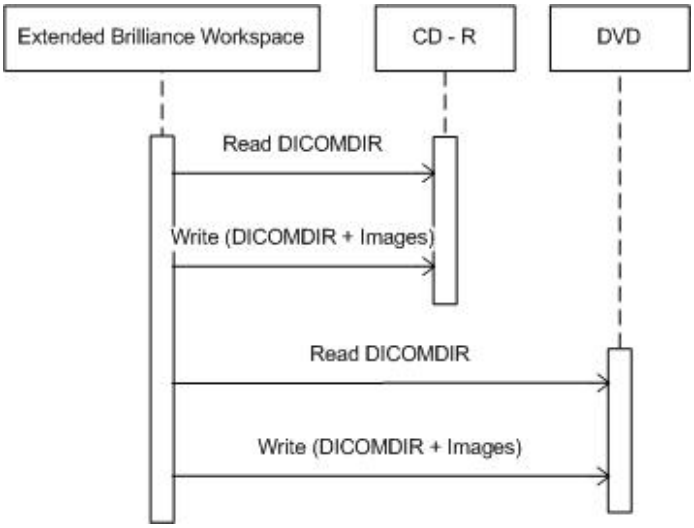
- Read the DICOMDIR File from the medium (representing the directory of the DICOM File(s) as recorded on the medium). This information may be displayed as an ordered list of icon images and, if present, with pertinent identifying information (patient name, etc.).
- Read the selected image from the medium and display it on the monitor of the View Station. This information is displayed as an ordered list of frames of the selected image or as a dynamic review of the selected image.

And for CD and DVD as FSC:

- Initialize the medium.
- Write a DICOM File-set onto the medium.
- Create a DICOMDIR File.
- Extend the DICOM File-set and update the DICOMDIR File accordingly. (DICOM Media Storage Service Class).

5.1.3. Sequencing of Real World Activities

A Real World Activity of the Media AE is:
The user selects a set of object to write these to the CD/DVD. Then the CD /DVD will be created with the selected objects. Once the CD/DVD has been created, the user can read this CD/DVD on the Extended Brilliance Workspace or for transport to another device for reading.



Another Real World Activity of the Media AE is:
A CD/DVD from another system Extended Brilliance Workspace or previously created CD/DVD can be read by the Extended Brilliance Workspace.
The Extended Brilliance Workspace cannot append (FSU) to this created CD/DVD.

After data is written to DVD, the DVD is finalized; the finalized DVD can now be read on mostly every DVD reader.

5.1.4. File Meta Information for Implementation Class and Version

This section lists the values assigned to the File Meta Information attributes (ref. [DICOM] PS 3.10) that pertain to the Implementation Class and Version.
The Application Entity title is registered in the DICOM File Meta Information header and is supported by the CD/DVD-writer (CD/DVD write option) acting as FSC.

Table 68: DICOM Implementation Class and Version for Media AE

File Meta Information Attributes	Values
File meta Information Version	00, 01
Implementation Class UID	1.2.46.670589.33.1.1
Implementation Version Name	BRCONN_4.0

5.2. AE Specifications

The next section in the DICOM Conformance Statement is a set of Application Entity specifications. There will be one such specification for each Application Entity type.

5.2.1. Media AE - Specification

The supported Application Profiles, their Roles and the Service Class options, all defined in DICOM terminology, are listed in the following table.

For reading and writing the media AE provides standard conformance to:
- DICOM media Storage Service and File Format ([DICOM] PS 3.10);
- Media Storage Application Profiles ([DICOM] PS 3.11); and
- Media Formats and Physical Media for Media Interchange ([DICOM] PS 3.12) for Reading (FSR) and Writing (FSC).

Extended Brilliance Workspace does not supports multi-patient and multi-session CD / DVD disks, both for Reading and Writing.
Supported media:
- CD: CD-R and CD-RW with the profile STD-GEN-CD.
- DVD: DVD-R, DVD+R, DVD-RW and DVD+RW with the profile: STD-GEN-DVD-JPEG.

The supported Application Profiles, their roles and the Service Class (SC) options, all defined in DICOM terminology, are listed in the next Table.

Table 69: AE Related Application Profiles, Real-World Activities, and Roles

Supported Application Profile	Identifier	Real-World Activity	Roles	SC Option
CT/MR studies on CD-R	STD-CTMR-CD	Write Images	FSC	Interchange
		Read Images	FSR	Interchange
		Display Directory	FSR	Interchange
General Purpose CD-R Interchange	STD-GEN-CD	Write Images	FSC	Interchange
		Read Images	FSR	Interchange
		Display Directory	FSR	Interchange
General Purpose DVD Interchange	STD-GEN-DVD-JPEG	Write Images	FSC	Interchange
		Read Images	FSR	Interchange
		Display Directory	FSR	Interchange

5.2.1.1. File Meta Information for the Media AE

This section contains the values of the file Meta Information that pertain to the Application Entity (see PS 3.10). These are:
- Source Application Entity Title,
- Private Information Creator UID,
- Private Information.

The Application Entity title is registered into the DICOM File Meta Information header and is supported by the CD/DVD-Writer (CD/DVD write option) acting as a FSC.

5.2.1.2. Real-World Activities

The SOP instances provided by the RWA are written to the CD/DVD media and a corresponding DICOMDIR is created.

5.2.1.2.1. Display Directory

When a database open action is initiated on the CD/DVD then the Media AE acts as an FSR using the interchange option to read the DICOMDIR of the CD/DVD media.

This will result in an overview of the patients, studies, series and images on the Extended Brilliance Workspace screen.

Media Storage Application Profile

As depicted in Table 69, the Media AE supports the RWA Display Directory for the STD-CTMR-CD and the STD-GEN-CD Application Profile and the STD-GEN-DVD-JPEG Application Profile.

Options

The mandatory DICOMDIR keys are required for the correct display of directory information. The display is structured according the DICOM Composite Information Model: Patient, Study, Series, and Image.

The DICOM standard specifies certain attributes of the DICOMDIR as mandatory. However, these attributes may not be mandatory for the related SOP class IOD. For those attributes the following default values apply.

5.2.1.2.2. Write Images

When an image transfer to CD/DVD is initiated then the Media AE acts as an FSC using the interchange option to export SOP Instances from the local database to a CD/DVD medium.

Media Storage Application Profile

As depicted in Table 69, the Media AE supports the RWA Write Images for the STD-CTMR-CD, STD-GEN-CD and the STD-GEN-DVD-JPEG Application Profile.

The DICOMDIR file will be extended when new images are written. In case some attributes are not present in an image but are specified as mandatory in the DICOMDIR definition in DICOM Media, a generated value will be filled in.

Implementation remarks and restrictions
When writing the DICOMDIR records, key values are generated when no value of the corresponding attribute is supplied, according to the following tables.

Table 70: Generated Keys

Key	Tag	Generated Value
Study Keys		
Study Date	(0008,0020)	Date on which this Study was created.
Study Time	(0008,0030)	Time on which this Study was created.
Series Keys		
Series Number	(0020,0011)	1
Image Keys		
Instance Number	(0020,0013)	1 (if empty)

The data selected to write to the media must fit on the currently inserted media.

If it does not fit, an error is generated and it is up to the operator to re-select a smaller amount of data to be written to the media.

The system will not request additional media or write across multiple media.

5.2.1.3. DICOMDIR keys

Table 71: Supported attributes in the DICOMDIR

Dicom Tag	Description	Comment
0002,0000	Group 0002 Length	
0002,0001	File Meta Information Version	
0002,0002	UI Media Storage Sop Class UID	
0002,0003	UI Media Storage Sop Instance UID	
0002,0010	UI Transfer Syntax UID	
0002,0012	UI Implementation Class UID	
0002,0013	Implementation Version Name	
0002,0016	Source Application Entity Title	
File Set and Directory Information		
0004,1130	File Set ID	
0004,1200	First Directory Record Offset	
0004,1202	Last Directory Record Offset	
0004,1212	File Set Consistency Flag	
0004,1220	Directory Record Sequence	
Patient level		
0004,1400	Offset Of The Next Dir Record	
0004,1410	Record In Use Flag	
0004,1420	Offset of Referenced Lower-Level Directory Entity	
0004,1430	Directory Record Type	
0010,0010	Patient's Name	
0010,0020	Patient ID	
Study level		
0004,1400	Offset Of The Next Dir Record	
0004,1410	Record In Use Flag	
0004,1420	Offset Of Ref Lower Level Dir Ent	
0004,1430	Directory Record Type	
0008,0005	Specific Character Set	
0008,0020	Study Date	
0008,0030	Study Time	
0008,0050	Accession Number	
0008,0054	Retrieve AE Title	
0008,0061	Modalities in Study	
0008,0090	Referring Physician's Name	
0010,0030	Patient's Birth Date	
0010,0040	Patient's Sex	
0040,A120	DateTime	
0008,1030	Study Description	
0020,000D	Study Instance UID	
0020,0010	Study ID	
0020,1206	Number Of Study Related Series	
0020,1208	Number Of Study Related Images	
Series level		
0004,1400	Offset Of The Next Dir Record	
0004,1410	Record In Use Flag	
0004,1420	>Offset of Referenced Lower-Level Directory Entity	

Dicom Tag	Description	Comment
0004,1430	Directory Record Type	
0008,0060	Modality	
0008,0070	Manufacturer	
0020,000E	Series Instance UID	
0020,0011	Series Number	
0020,1209	Number of Series Related Instances	
Image level		
0004,1400	Offset Of The Next Dir Record	
0004,1410	Record In Use Flag	
0004,1420	Offset Of Ref Lower Level Dir Ent	
0004,1430	Directory Record Type	
0004,1500	Referenced File ID	
0004,1510	Referenced Sop Class UID In File	
0004,1511	Ref Sop Instance UID In File	
0004,1512	Referenced Transfer Syntax UID in FILE	
0008,0008	Image Type	
0018,0010	Contrast/Bolus Agent	
0008,0016	SOP Class UID	
0008,0018	SOP Instance UID	
0008,0023	Content Date	
0008,0033	Content Time	
0018,0050	Slice Thickness	
0018,0060	KVP	
0020,0013	Instance Number	
0020,0032	Image Position (Patient)	
0020,0037	Image Orientation (Patient)	
0020,0052	Frame of Reference UID	
0028,0002	Samples per Pixels	
0028,0004	Photometric Interpretation	
0028,0010	Rows	
0028,0011	Columns	
0028,0030	Pixel Spacing	
0028,0100	Bits Allocated	

5.2.1.3.1. Read Images

When an image transfer from CD or DVD is initiated then the Media AE acts as an FSR using the interchange option to import SOP Instances from the CD or DVD medium.

Media Storage Application Profile

As depicted in Table 69, the Media AE supports the RWA Read Images for the Application Profile.

The mandatory attributes of the DICOM images are required for the correct storage of the images in the Extended Brilliance Workspace internal image database.

Optional attributes and Retired/Private attributes are stored too – if present; this is equivalent with the level 2 (Full) conformance for the Storage Service Class in the Network support;

5.3. Augmented and Private Application Profiles

This section is used for the description of augmented and private Application Profiles.

5.3.1. Augmented Application Profiles

None.

5.3.2. Private Application Profiles

None.

5.4. Media Configuration

Any configuration issues may be found in the Networking Section 4.4 Configuration.

6. SUPPORT OF CHARACTER SETS

Any support for character sets beyond the default character repertoire in Network and Media services are described here.

Table 72, Supported DICOM Character Sets

Character Set Description	Defined Term	ESC Sequence	ISO Registration Number	Code Element	Character Set
Single-byte Character Sets without Code Extensions					
Default repertoire	-	-	ISO-IR 6	G0	ISO 646
Latin alphabet No. 1	ISO_IR 100	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 100	G1	Supplementary set of ISO 8859

Localization settings are configurable from the Preferences Menu, Regional Setting, and can be applied to Interface, Reports and Keyboard. The list of available languages needs to check. The default character sets supported by EBW are ISO_IR 100 and ISO_IR 6.

For Value Representation (VR) equal to Patient's Name (PN), the leading spaces into the Patient's Name will be treated as insignificant for matching purposes.

From the Patient's Name only the first 32 characters are displayed into the Quick View Viewer.

In the Patient's data with Data Time information, only the 3 Fractional digits of the Data Time Format are supported.

7. SECURITY

7.1. Security Profiles

7.1.1. The Basic Application Level Confidentiality Profile

No instances of the Encrypted Attributes Data Set are created. No Transfer Syntaxes are supported for encoding/decoding of Encrypted Attributes Data Sets.

The table below lists the protected attributes during the anonymizing of Patient's data export.

The terms used to describe the replacement value can be read as below:

Empty The attribute will have a value of zero length, is cleared by Extended Brilliance Workspace.
Copied Attribute has same value as original.

Table 73: Basic Application Level Confidentiality Profile Attributes

Attribute Name	Tag	VR	Replacement Value
Patient's Name	0010,0010	PN	LastName and FirstName can be changed by user
Patient ID	0010,0020	LO	Can be changed by user
Patient's Birth Date	0010,0030	DA	Empty
Referring Physician's Name	0008,0090	PN	Empty
Accession Number	0008,0050	SH	Empty
Institution Name	0008,0080	LO	Can be cleared by user
Station Name	0008,1010	SH	Empty
Institutional Department	0008,1040	LO	Empty
Operators Name	0008,1070	PN	Empty
Institution Address	0008,0080	LO	Empty
Patient's Sex	0010,0040	CS	Copied from original
Study ID	0020, 0010	SH	Copied from original
Station Name	0008,1010	SH	Always with unique character string generated by EBW
Media Storage SOP Class UID	0002,0002	UI	Automatically changed
Study Instance UID	0020,000D	UI	Automatically changed
Series Instance UID	0020,000E	UI	Automatically changed
SOP Instance UID	0008,0018	UI	Automatically changed

7.2. Association Level Security

None supported

7.3. Application Level Security

None supported

8. ANNEXES

8.1. IOD Contents

8.1.1. Created SOP Instances

8.1.1.1. General Rules

This section specifies the IOD's created by the Extended Brilliance Workspace.

Abbreviations used for the IOD tables are,

COPY	the module is copied from the source images
ALWAYS	the module is always present (created)
CONDITIONAL	the module exists under specified condition

8.1.1.2. List of created SOP Classes

The next Table gives an overview of the SOP classes that can be created by the Extended Brilliance Workspace in case of using the analysing applications on the Extended Brilliance Workspace.

Table 74: List of created SOP Classes

SOP Class Name	SOP Class UID
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59
Encapsulated PDF	1.2.840.10008.5.1.4.1.1.104.1
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128

The Extended Brilliance Workspace (EBW) reflects the fact that the IOD created by the workstation are always based on some source images after the viewing/processing applied and the modified images are saved. Most of the attributes or even the whole modules (Patient, General Study, etc.) are just copied from the source images.

DICOM Overlays are only created for saved Secondary Capture SOP Class images. When images with ROI, Annotations, etc. (group 50xx) are saved as DICOM Secondary Captures, the 50xx groups attributes are converted into DICOM Overlays attributes (group 60xx). In case SCP does not support group 60xx attributes - the EBW has a configurable option (in LAN Config) to burn the overlays into the pixel data thus allowing any PACS to display them.

The attribute "Burned In Annotation", for saving displays with multiple images has the value "YES". The attribute "Burned In Annotation" has the value "NO" for derived objects, if saved with “hide titles”, (only for secondary capture SOP Class objects).

A Time attribute contains a string of characters of the format “hhmmss.frac”
The Fractional part has in Extended Brilliance Workspace always 3 decimal places.

The following table lists the modules that are always copied from the source images when the created SOP Class IOD is the same as the source SOP Class IOD,

Table 75, Modules Copied to the Derived IODs Table.

Information Entity	Module Name	Reference	Presence of Module
Patient	Patient Module		COPY
	Clinical Trial Subject Module		COPY
Study	General Study Module		COPY
	Patient Study Module		COPY
	Clinical Trial Study Module		COPY
Series	General Series Module		ALWAYS CREATED
	Clinical Trial Series Module		COPY
Frame of Reference	Frame of Reference Module		COPY
Equipment	General Equipment Module		COPY

8.1.1.3. SC Image IOD Modules

Table 76, SC Image IOD Modules Table.

Information Entity	Module Name	Presence of Module
Patient	Patient Module	COPY
Study	General Study Module	COPY
	Patient Study Module	COPY
Series	General Series Module	ALWAYS
Equipment	General Equipment Module	COPY
	SC Equipment Module	ALWAYS
Image	General Image Module	ALWAYS
	Image Pixel Module	ALWAYS
	SC Image Module	ALWAYS
	Overlay Plane	CONDITIONAL - if present in the displayed image
	Modality LUT	CONDITIONAL – if Bits Stored > 8
	VOI LUT Module	CONDITIONAL – if Bits Stored > 8
	SOP Common Module	ALWAYS

8.1.1.4. Encapsulated PDF IOD Modules

Table 77, Encapsulated PDF IOD Modules Table.

Information Entity	Module Name	Reference	Presence of Module
Patient	Patient Module		COPY
	Specimen Identification		COPY
Study	General Study Module		COPY
	Patient Study Module		COPY
Series	Encapsulated Document Series		ALWAYS
Equipment	General Equipment Module		COPY

Information Entity	Module Name	Reference	Presence of Module
	SC Equipment Module		ALWAYS
Image	Encapsulated Document		ALWAYS
	SOP Common Module		ALWAYS

8.1.1.5. Derived CT Image Attributes

Image Plane Module Attributes:

- All derived CT images, except curved (panoramic) slab, contain the Image Position (0028,0032) and Image Orientation (0028,0037) attributes.
- All derived CT (including curve slab) images contain the Pixel Spacing (0028,0030) and Slice Thickness (0018,0050) attributes.
- Non-Square pixels are not supported by EBW viewers

8.1.1.6. Export Converters.

A number of configurable export convertors allow to modify certain IOD when sent to specific SCP.

8.1.1.6.1. 12-to-8-bit Converter.

An 12-bit SC image is converted to a 8-bit SC by applying Window/Level attributes.

8.1.1.6.2. Color-to-Monochrome Converter.

The Color (24-bits) SC IOD is converted to a monochrome 8-bit or 12 bit SC IOD, configurable by FSE. A new UID is generated for the converted image.

8.1.1.6.3. PET Units Convertor.

PET pixel values are converted to counts, concentration, or Standard Uptake Values (SUVs) normalized by one of several factors.

Table 78. Private Elements for PET Images.

Attribute Name	Tag	VR	Comment
Private Creator Data Element	(7053,0010)	LO	
SUV Scale Factor	(7053,1000)	DS	Only applied when Units (0054,1001) is equal to CNTS. SUV ScaleFactor used to convert pixel data from counts to SUV value. If SUV Scale Factor is 0.0, then pixel data cannot be converted from counts to SUV value.

8.1.2. Usage of Attributes from Received IOD's

The following attributes shall be present in the received IODs in order to be accepted:

For all IODs,

- SOP Class UID (0008,0016)
- Study Instance UID (0020,000D)
- Series Instance UID (0020,000E)

For Image IODs,

- Pixel Data (7FE0,0010) - Size may not 0.
- Rows (0028,0010)
- Columns (0028,0011)
- Bits Allocated (0028,0100)

8.1.3. Attribute Mapping

Not Applicable

8.1.4. Coerced/Modified fields

[Definition] The Import/Export Transparency of DICOM objects means preserving the attributes' values of the objects imported from an external system (remote or removable), optionally processed and then exported to an external system. Exception in EBW Implementation: some attributes may be coerced during the conversion from ILE.

The system complied with Level-2 requirements for Storage SCP as defined in DICOM PS 3.4 Appendix B4.1. In other words, all Type 1, Type 2, and Type 3 Attributes defined in the Information Object Definition (IOD) associated with the SOP Class, as well as any Standard Extended attributes (including Private Attributes) included in the SOP Instance, will be stored and may be accessed.

The system does not coerce any Data Elements, except those defined in the DICOM PS 3.4 Appendix B4.1. In other words, when a DICOM object is imported from another system and later exported, all the attributes values will remain unchanged.

In the received IODs, the following attributes may be modified under certain conditions.

Table 79, Modified Attributes

Attribute	Tag	When Modified
Patient's Name	0010,0010	if Empty, the Patient's Name will be set to "Unknown"
Patient ID	0010,0020	if Empty, the Patient ID will be set to "Unknown"
Rows	0028,0010	Is Fixed, if rows* columns does not match pixel data size
SOP Instance UID	0008,0018	if missing, a new SOP Instance UID will be generate by EBW.

8.2. Data Dictionary of Private Attributes

Not Applicable.

8.3. Coded Terminology and Templates

Extended Brilliance Workspace used the following Content groups and Templates.

Table 80, Content groups

Content groups Name	Content ID
Patient Orientation	CID 19
Patient Orientation Modifier	CID 20
Patient Gantry Relationship	CID 21
PET Radionuclide	CID 4020
PET Radiopharmaceuticals	CID 4021
Route of Administration	CID 11
Nuclear Medicine Projections	CID 26
NM Procedural State Values	CID 3101

Table 81, Used Templates

Template Name	Template ID
NM Acquisition Context	TID 3470

8.4. Grayscale Image Consistency

Not applicable.

8.5. Standard Extended/Specialized/Private SOPs

Not applicable.

8.6. Private Transfer Syntaxes

Supported Private Transfer Syntaxes are shown in the next Table:

Table 82, Supported Private Transfer Syntaxes

Private Transfer Syntax		
Name List	**UID List**	**Comment**
Private CT Transfer Syntax – Explicit VR Little Endian (P-ELE)	1.3.46.670589.33.1.4.1	Private ELE