

EBMJ Server for SoliPACS

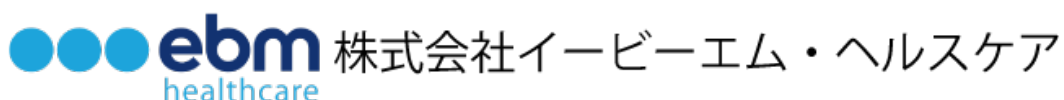
DICOM Conformance Statement

<Storage and Query/Retrieve Server>

Revision [2.1](#)
Software Version [2.0](#) and after

Date: [April 15, 2025](#)

Prepared for



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1. Conformance Statement Overview

This conformance statement is re-compiled in accordance with DICOM PS 3.2-2004 (Supplement 64 "Revised Part 2 (Conformance)").

The EBMJ Server is a self-contained networked computer system used for archiving diagnostic medical images. It allows external systems to send images to it for long-term storage, retrieve information about such images, and retrieve the images themselves. The system conforms to the DICOM 3.0 standard to allow the sharing of medical information with other digital imaging systems.

Table 1-1
SUPPORTED NETWORKING DICOM SERVICE (SOP) CLASSES

Networking Service Class	Initiator or User of Service	Provider of Service
Image Transfer and Verification		
Verification	Yes	Yes
Computed Radiography Image Storage	Yes	Yes
Digital X-Ray Image Storage – For Presentation	Yes	Yes
Digital X-Ray Image Storage - For Processing	Yes (Note3)	Yes (Note3)
Digital Mammography X-Ray Image Storage – For Presentation	Yes	Yes
Digital Mammography X-Ray Image Storage – For Processing	Yes (Note3)	Yes (Note3)
Breast Tomosynthesis Image Storage	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	Yes (Note3)	Yes (Note3)
CT Image Storage	Yes	Yes
Enhanced CT Image Storage	Yes	Yes
US Multi-frame Storage	Yes	Yes
MR Image Storage	Yes	Yes
Enhanced MR Image Storage	Yes	Yes
MR Spectroscopy Storage	Yes	Yes
US Image Storage	Yes	Yes
Secondary Capture Image Storage	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	Yes	Yes

12-lead ECG Waveform Storage	Yes	Yes
General ECG Waveform Storage	Yes	Yes
Ambulatory ECG Waveform Storage	Yes	Yes
Basic Voice Audio Waveform Storage	Yes	Yes
Grayscale Softcopy Presentation State Storage	Yes	Yes
Color Softcopy Presentation State Storage	Yes	Yes
X-Ray Angiographic Image Storage	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	Yes	Yes
Nuclear Medicine Image Storage	Yes	Yes
Raw Data Storage	Yes (Note3)	Yes (Note3)
VL Endoscopic Image Storage	Yes	Yes
Video Endoscopic Image Storage	Yes	Yes
VL Microscopic Image Storage	Yes	Yes
Video Microscopic Image Storage	Yes	Yes
VL Photographic Image Storage	Yes	Yes
Video Photometric Image Storage	Yes	Yes
Ophthalmic Photography 8 Bit Image Storage	Yes	Yes
Basic Text SR	Yes	Yes
Enhanced SR	Yes	Yes
Comprehensive SR	Yes	Yes
Mammography CAD SR	Yes	Yes
Key Object Selection Document	Yes	Yes
Chest CAD SR	Yes	Yes
X-Ray Radiation Dose SR	Yes	Yes
Encapsulated PDF Storage	Yes	Yes
Positron Emission Tomography Image Storage	Yes	Yes
RT Image Storage	Yes	Yes
RT Dose Storage	Yes (Note3)	Yes (Note3)
RT Structure Set Storage	Yes (Note3)	Yes (Note3)
RT Beams Treatment Record Storage	Yes (Note3)	Yes (Note3)
RT Plan Storage	Yes (Note3)	Yes (Note3)
RT Brachy Treatment Record Storage	Yes (Note3)	Yes (Note3)
RT Treatment Summary Record Storage	Yes (Note3)	Yes (Note3)
RT Ion Plan Storage	Yes (Note3)	Yes (Note3)
RT Icon Beams Treatment Record Storage	Yes (Note3)	Yes (Note3)
Query/Retrieve		
Study Root Q/R – FIND	Yes	Yes (Note1)
Study Root Q/R – MOVE	Yes	Yes (Note 2)

Note 1: Relational Queries and Retrieval are supported as an SCU and SCP.

Note 2: Retrieve (Q/R-MOVE) SCP is optional. If the option is not installed, Presentation Contexts for Patient Root Q/R – MOVE and Study Root Q/R – MOVE will be rejected during Association establishment.

Note 3: Requires "Retrieve Option" license.

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3. Introduction

3.1 Revision History

Document Revision	Date	Author	Description
1.0	April 14, 2020	T. Takamura	Initial
2.0	June 19, 2024	M.Kobayashi	Supported SOP Classes expanded
2.1	April 15, 2025	M.Kobayashi	Storage SCP Max Associations changed from "8" to "4 or 64"

3.2 Audience

This document is intended for hospital staff, health system integrators, software designers, or implementers. It is assumed that the reader has a working understanding of DICOM.

3.3 Remarks

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

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

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

The user should be aware of the following important issues:

- The comparison of different Conformance Statements is the first step towards assessing interconnectivity between EBMJ Server and other DICOM conformant equipment.
- Test procedures should be defined to validate the desired level of connectivity.
- The DICOM standard will evolve to meet the users' future requirements. EBM is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

3.4 Abbreviations and Acronyms:

AE	Application Entity
CR	Computerized radiography
CT	Computerized Tomography
DICOM	Digital Imaging and Communications in Medicine
IE	Information Entity
IOD	Information Object Definition
ISO	International Standards Organization
MR	Magnetic Resonance
PDF	Portable Document Format
PDU	Protocol Data Unit
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SR	Structured Reporting
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
US	Ultrasound
VM	Value Multiplicity
VL	Visible Light
VR	Value Representation

4. Networking

4.1 Implementation Model

4.1.1 Application Data Flow

The division of EBMJ Server into the separate DICOM Application Entities represents a somewhat arbitrary partitioning of functionality. For the purpose of this document they are organized in this manner so as to detail their independent logical functionality.

EBMJ Server is configured so that the QUERY-RETRIEVE-SCP AE, STORAGE-SCU AE and QUERY-RETRIEVE-SCP AE share the same Application Entity Title.

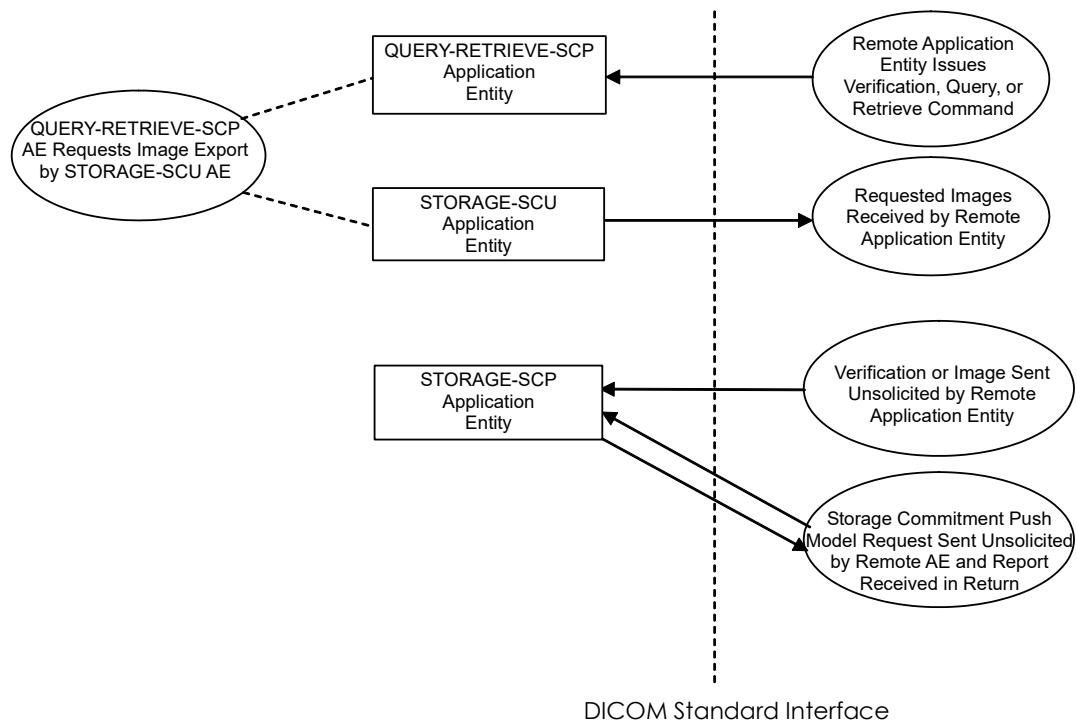


Figure 4.1-1
EBMJ SERVER DICOM DATA FLOW DIAGRAM

The Application Entities detailed in the Application Data Flow Diagram are all Windows applications.

- The STORAGE-SCU AE can send Composite SOP Instances. It handles requests from the QUERY-RETRIEVE-SCP AE to transmit Images to a specific DICOM destination. The STORAGE-SCU AE functions as a C-STORE SCU. Local User can request to send Composite SOP Instances to a Remote AE.
- The QUERY-RETRIEVE-SCP AE can handle incoming query and retrieve requests. It can handle external queries for Patient, Study, Series, and Image data, and also handle Image retrieval requests. The QUERY-RETRIEVE-SCP AE handles retrieval requests by issuing a command to the STORAGE-SCU AE to send the requested Images to the destination specified by the Remote AE. The QUERY-RETRIEVE-SCP AE functions as an SCP for C-FIND and C-MOVE requests.
- The STORAGE-SCP AE can receive incoming DICOM images and add them to the EBMJ Server database. It can respond to external Storage Requests as a Service Class Provider (SCP) for solicited C-STORE requests.

4.1.2 Functional Definition of AEs

4.1.2.1 Functional Definition of STORAGE-SCU Application Entity

The STORAGE-SCU AE can be invoked by the QUERY-RETRIEVE-SCP AE to trigger the transfer of specific images to a remote destination AE. The STORAGE-SCU AE must be correctly configured with the IP address and port number of any external DICOM AE's that are to be C-MOVE retrieval destinations. The Presentation Contexts to use are determined from the headers of the DICOM files to be transferred. Some conversion of the DICOM image objects is possible if the original Presentation Context is not supported by the remote destination AE or if decompression is preferred.

4.1.2.2 Functional Definition of QUERY-RETRIEVE-SCP Application Entity

The QUERY-RETRIEVE-SCP AE waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, QUERY-RETRIEVE-SCP AE expects it to be a DICOM application. QUERY-RETRIEVE-SCP AE will accept Associations with Presentation Contexts for SOP Classes of the DICOM Query-Retrieve Service Class, and Verification Service Class. It will handle query and retrieve requests on these Presentation Contexts and respond with data objects with values corresponding to the contents of the EBMJ Server database. For C-MOVE requests the destination for

the image objects is determined from the Destination AE Title contained in the C-MOVE request. When a retrieval request is received, the QUERY-RETRIEVE-SCP AE issues a command to the STORAGE-SCU AE to send the specified images to the C-MOVE Destination AE.

4.1.2.3 Functional Definition of STORAGE-SCP Application Entity

The STORAGE-SCP AE waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the STORAGE-SCP AE expects it to be a DICOM application. The STORAGE-SCP AE will accept Associations with Presentation Contexts for SOP Classes of the Verification and Storage Service Classes. Any images received on such Presentation Contexts will be added to the EBMJ Server database.

4.1.3 Sequencing of Real-World Activities

The only sequencing constraint that exists across all the EBMJ Server Application Entities is the fact that a Composite SOP Instance must be received by the STORAGE-SCP AE before Query-Retrieve Requests related to this SOP Instance can be successfully handled:

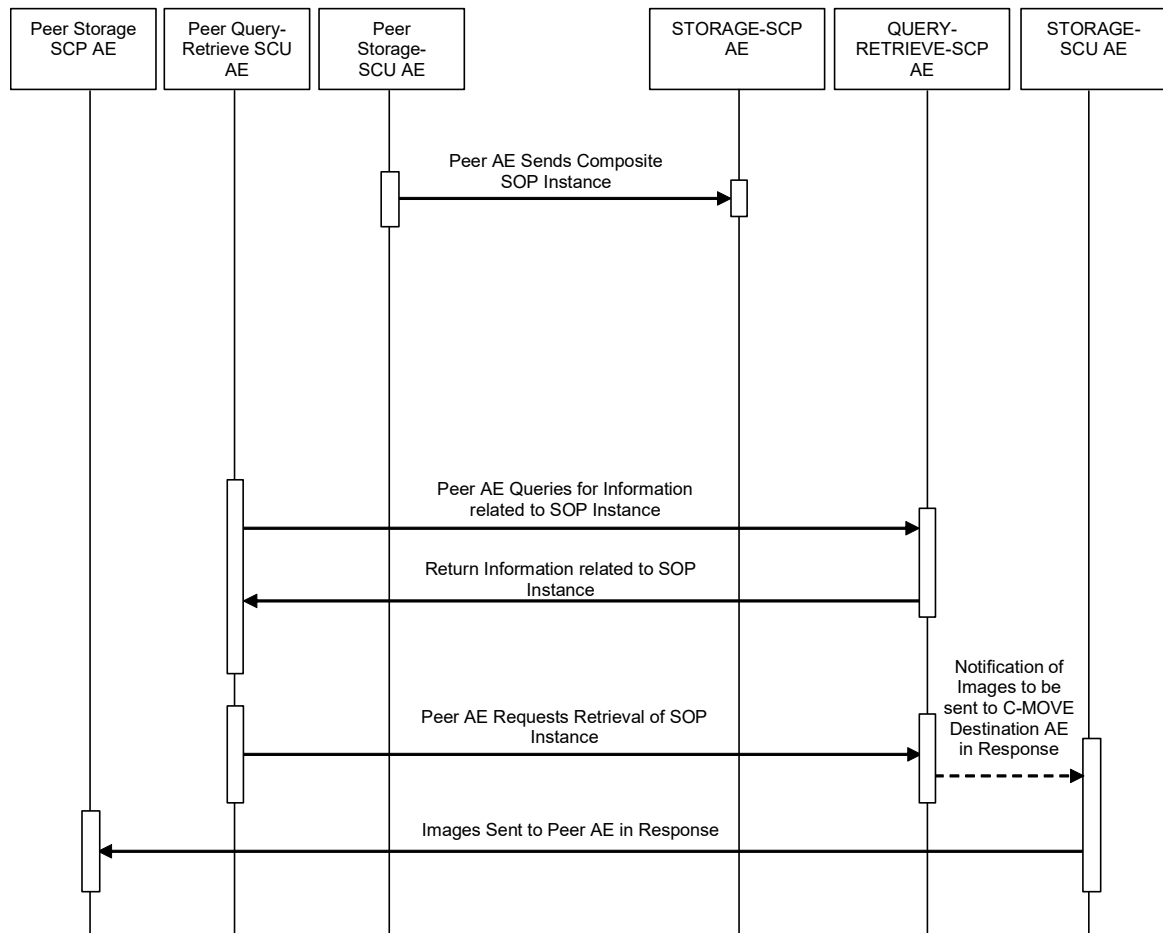


Figure 4.1-2
SEQUENCING CONSTRAINTS

Note that the only constraint is for the Composite SOP Instance to be received prior to the other events.

4.2 AE Specifications

4.2.1 STORAGE-SCU Application Entity Specification

4.2.1.1 SOP Classes

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

Table 4.2-1 SOP CLASSES FOR STORAGE-SCU AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	No
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Note	No
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	No
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Note	No
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Yes	No
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	No
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Note	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	No
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	No
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	No
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	No
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	No
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	No
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	No
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	No
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes	No
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	No

Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Yes	No
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	No
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Note	No
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	No
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	No
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	No
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes	No
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	No
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	No
Video Photometric Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes	No
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	No
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Yes	No
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Yes	No
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes	No
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Yes	No
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Yes	No
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	Yes	No
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Yes	No
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	No
Positron Emission Tomography Image	1.2.840.10008.5.1.4.1.1.128	Yes	No
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	No
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Note	No
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Note	No
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Note	No
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Note	No
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Note	No
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Note	No
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	Note	No
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	Note	No

Note: Requires "Retrieve Option" license.

4.2.1.2 Association Establishment Policies

4.2.1.2.1 General

The STORAGE-SCU AE can form Associations when requested to do so by the QUERY-RETRIEVE-SCP AE in conjunction with C-MOVE request or STORAGE-SCP for auto-routing. It can also form Associations when requested by Local User for manual transmission of images. The STORAGE-SCU AE can only request the opening of an Association. It cannot accept requests to open Associations from external Application Entities.

The DICOM standard Application Context Name for DICOM 3.0 is always proposed:

Table 4.2-2

DICOM APPLICATION CONTEXT FOR STORAGE-SCU AE

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

4.2.1.2.2 Number of Associations

The maximum number of simultaneous Associations is 8. The STORAGE-SCU AE can initiate simultaneous Associations to a given external C-MOVE Destination AE up to the maximum number. There is no separate limit on the maximum number permitted to the same C-MOVE Destination AE.

In case of auto-routing (transmit SOP instance received by STORAGE-SCP to a remove AE), if the first attempt to open an Association fails then the STORAGE-SCU AE will reschedule the task to attempt it again after a configurable time delay. The number of times to reattempt Association establishment is configurable, with the default being zero.

Table 4.2-3

NUMBER OF ASSOCIATIONS AS A SCU FOR STORAGE-SCU AE

Maximum number of simultaneous Associations	64
---	----

4.2.1.2.3 Asynchronous Nature

The STORAGE-SCU AE does not support asynchronous communication (multiple outstanding transactions over a single Association). All Association requests must be completed and acknowledged before a new operation can be initiated.

Table 4.2-4

ASYNCHRONOUS NATURE AS A SCU FOR STORAGE-SCU AE

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

4.2.1.2.4 Implementation Identifying Information

Table 4.2-5

DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGE-SCU AE

Implementation Class UID	1.2.840.113820.81.101
Implementation Version Name	EBM_DICOM_81_101

Note that All EBMJ Server AE's use the same Implementation Class UID and the same Implementation Version Name.

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity – Send Images Requested by an External Peer AE

4.2.1.3.1.1 Description and Sequencing of Activity

The STORAGE-SCU AE will initiate a new Association when the QUERY-RETRIEVE-SCP AE invokes the STORAGE-SCU AE to transmit images. The QUERY-RETRIEVE-SCP AE will issue such a command whenever it receives a valid C-MOVE Request. An Association Request is sent to the specified C-MOVE Destination AE and upon successful negotiation of the required Presentation Context the image transfer is started. In all cases an attempt will be made to transmit all the indicated images in a single Association, but this may not always be possible. The Association will be released when all the images have been sent. If an error occurs during transmission over an open Association then the image transfer is halted. The STORAGE-SCU AE will not attempt to independently retry the image export.

In addition to transmissions in response to a C-MOVE Request from a peer AE, STORAGE-SCU initiates a new Association, when Local User requests to transmit images to a peer AE. This user action is referred to as "manual transmission". Behavior of STORAGE-SCU for manual transmission is identical to the transmission invoked by QUERY-RETRIEVE-SCP AE.

STORAGE-SCU also initiates a new Association, when configured to transmit copy of SOP instances to another AE. This transmission activity is referred to as "auto-route".

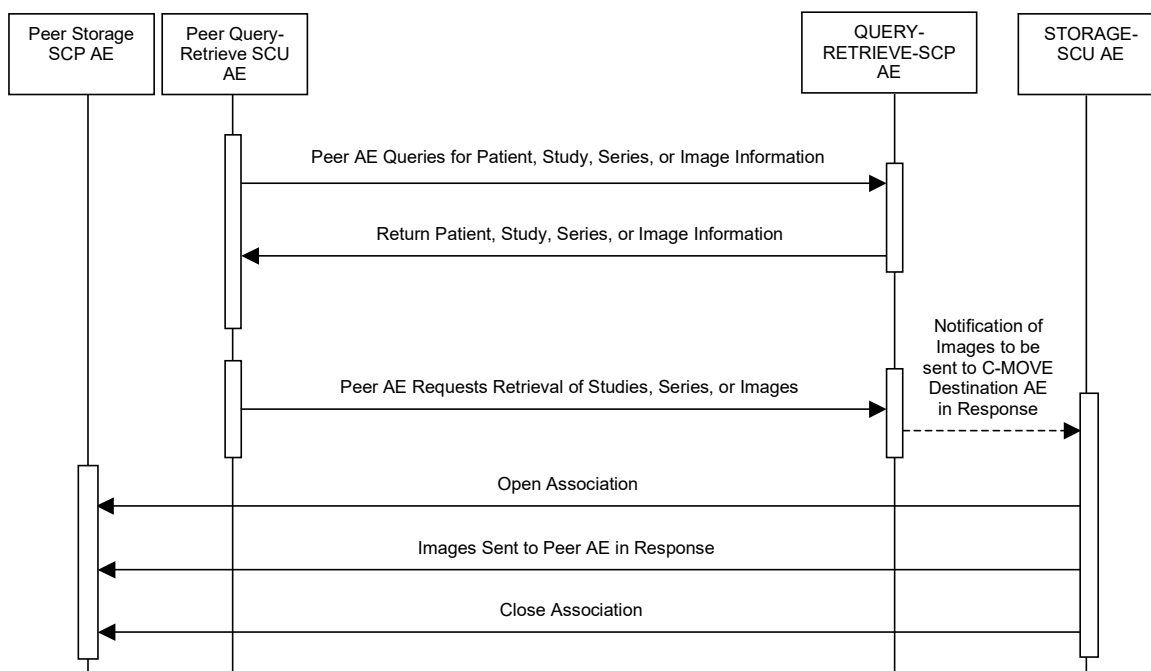


Figure 4.2-1

SEQUENCING OF ACTIVITY - SEND IMAGES REQUESTED BY AN EXTERNAL PEER AE

The following sequencing constraints illustrated in Figure 4.2-1 apply to the STORAGE-SCU AE:

1. Peer AE requests retrieval of Study, Series, or Images from QUERY-RETRIEVE-SCP AE (C-MOVE-RQ).
2. QUERY-RETRIEVE-SCP AE signals STORAGE-SCU AE to send the image Composite SOP Instances indicated in the C-MOVE-RQ to the C-MOVE Destination AE.
3. STORAGE-SCU AE opens a new Association with the indicated C-MOVE Destination AE.
4. STORAGE-SCU AE sends the indicated Composite SOP Instances.
5. STORAGE-SCU AE closes the Association.
6. The Verification Service is only supported as a utility function for Service staff. It is used only as a diagnostic tool.

4.2.1.3.1.2 Proposed Presentation Contexts

STORAGE-SCU AE will propose Presentation Contexts as shown in the following table:

Table 4.2-5
PROPOSED PRESENTATION CONTEXTS BY THE STORAGE-SCU AE

Presentation Context Table				
Abstract Syntax		Transfer Syntax	Role	Ext. Neg.
Name	UID	Table		
Verification	1.2.840.10008.1.1	4.2-5.1	SCU	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	4.2-5.2	SCU	None
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	4.2-5.2	SCU	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	4.2-5.2	SCU	None
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	4.2-5.2	SCU	None
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	4.2-5.2	SCU	None
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	4.2-5.2	SCU	None
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	4.2-5.2	SCU	None
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	4.2-5.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	4.2-5.2	SCU	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	4.2-5.2	SCU	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	4.2-5.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	4.2-5.2	SCU	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	4.2-5.2	SCU	None
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	4.2-5.2	SCU	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	4.2-5.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	4.2-5.2	SCU	None
Multi-frame Grayscale Byte Secondary Capture Image	1.2.840.10008.5.1.4.1.1.7.2	4.2-5.2	SCU	None

Presentation Context Table				
Abstract Syntax		Transfer Syntax	Role	Ext. Neg.
Storage				
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	4.2-5.2	SCU	None
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	4.2-5.1	SCU	None
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	4.2-5.1	SCU	None
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	4.2-5.1	SCU	None
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	4.2-5.1	SCU	None
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	4.2-5.1	SCU	None
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	4.2-5.1	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	4.2-5.2	SCU	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	4.2-5.2	SCU	None
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	4.2-5.2	SCU	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	4.2-5.2	SCU	None
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	4.2-5.1	SCU	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	4.2-5.2	SCU	None
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	4.2-5.2	SCU	None
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	4.2-5.2	SCU	None
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	4.2-5.2	SCU	None
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	4.2-5.2	SCU	None
Video Photometric Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	4.2-5.2	SCU	None
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	4.2-5.2	SCU	None
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	4.2-5.1	SCU	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax	Role	Ext. Neg.	
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	4.2-5.1	SCU	None	
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	4.2-5.1	SCU	None	
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	4.2-5.1	SCU	None	
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	4.2-5.1	SCU	None	
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	4.2-5.1	SCU	None	
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	4.2-5.1	SCU	None	
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	4.2-5.1	SCU	None	
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	4.2-5.2	SCU	None	
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	4.2-5.2	SCU	None	
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	4.2-5.2	SCU	None	
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	4.2-5.2	SCU	None	
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	4.2-5.2	SCU	None	
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	4.2-5.2	SCU	None	
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	4.2-5.2	SCU	None	
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	4.2-5.2	SCU	None	
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	4.2-5.2	SCU	None	
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	4.2-5.2	SCU	None	

Table 4.2-5.1**TRANSFER SYNTAX COMBINATION FOR NON-IMAGE STORAGE SOP CLASSES**

Transfer Syntax	
Name	UID
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1

Table 4.2-5.2**TRANSFER SYNTAX COMBINATION FOR IMAGE STORAGE SOP CLASSES**

Transfer Syntax	
Name	UID
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1
JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
JPEG 12 Bit Image Compression	1.2.840.10008.1.2.4.51
JPEG Lossless Image Compression	1.2.840.10008.1.2.4.70
RLE Lossless	1.2.840.10008.1.2.5

4.2.1.3.1.3 SOP Specific Conformance for Verification SOP Class

Standard conformance is provided to the DICOM Verification Service Class as an SCU. The Verification Service as an SCU is actually only supported as a diagnostic service tool for network communication issues.

4.2.1.3.1.4 SOP Specific Conformance for Image SOP Classes

Composite DICOM SOP Instances are maintained as DICOM Part 10 compliant files in the EBMJ Server database. The entire set of tags received with the image will be saved in EBMJ Server; this includes all Private and SOP Extended Elements. When a SOP Instance is selected for export from EBMJ Server, its content will be exported as it was originally received except for a few possible exceptions. Some of the Patient demographic and Study information Elements whose values can have been altered due to changes administered on EBMJ Server or changes to the state of the image data due to compression can be altered when the SOP Instance is exported.

The Patient demographic and Study information can be entered or altered by several means: manually, from HL7 messaging, or from DICOM Modality Worklist information.

The EBMJ Server creates files called Communication Logs that can be used to monitor their status and diagnose any problems that may arise. If any error occurs

during DICOM communication, then appropriate messages are always output to these Communication Logs. The STORAGE-SCU AE will exhibit the following Behavior according to the Status Code value returned in a C-STORE Response from a destination C-STORE SCP:

Table 4.2-6

STORAGE-SCU AE C-STORE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully stored the exported SOP Instance. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send an appropriate status in the C-MOVE Response. Success indication message is output to the Communication Logs.
Refused	Out of Resources	A700 – A7FF	This is treated as a permanent Failure. A message is sent to the QUERY-RETRIEVE-SCP AE indicating an export failure. The QUERY-RETRIEVE-SCP AE will send an appropriate Status in the C-MOVE Response. Error indication message is output to the Communication Logs.
Error	Data Set does not match SOP Class	A900 – A9FF	This is treated as a permanent Failure. A message is sent to the QUERY-RETRIEVE-SCP AE indicating an export failure. The QUERY-RETRIEVE-SCP AE will send an appropriate Status in the C-MOVE Response. Error indication message is output to the Communication Logs.
	Cannot Understand	C000 - CFFF	This is treated as a permanent Failure. A message is sent to the QUERY-RETRIEVE-SCP AE indicating an export failure. The QUERY-RETRIEVE-SCP AE will send an appropriate Status in the C-MOVE Response. Error indication message is output to the Communication Logs.
Warning	Coercion of Data Elements	B000	Image transmission is considered successful with warning. A message is sent to the QUERY-RETRIEVE-SCP AE indicating export with warning. The QUERY-RETRIEVE-SCP AE will send an appropriate status in the C-MOVE Response. Warning indication message is output to the Communication Logs.
	Data Set	B007	Image transmission is considered successful

	does not match SOP Class		with warning. A message is sent to the QUERY-RETRIEVE-SCP AE indicating export with warning. The QUERY-RETRIEVE-SCP AE will send an appropriate status in the C-MOVE Response. Warning indication message is output to the Communication Logs.
	Elements Discarded	B006	Image transmission is considered successful with warning. A message is sent to the QUERY-RETRIEVE-SCP AE indicating export with warning. The QUERY-RETRIEVE-SCP AE will send an appropriate status in the C-MOVE Response. Warning indication message is output to the Communication Logs.
	Attribute List Error	0107	Image transmission is considered successful with warning. A message is sent to the QUERY-RETRIEVE-SCP AE indicating export with warning. The QUERY-RETRIEVE-SCP AE will send an appropriate status in the C-MOVE Response. Warning indication message is output to the Communication Logs.
	Attribute Value Out of Range	0116	Image transmission is considered successful with warning. A message is sent to the QUERY-RETRIEVE-SCP AE indicating export with warning. The QUERY-RETRIEVE-SCP AE will send an appropriate status in the C-MOVE Response. Warning indication message is output to the Communication Logs.
*	*	Any other status code.	This is treated as a permanent Failure. A message is sent to the QUERY-RETRIEVE-SCP AE indicating an export failure and the Association is released. The QUERY-RETRIEVE-SCP AE will send an appropriate Status in the C-MOVE Response. Error indication message is output to the Communication Logs.

The STORAGE-SCU AE does not resend images, when image is transmitted in conjunction with C-MOVE request and when an error Status Code is returned in a C-STORE Response. For specific behavior regarding Status Code values returned in C-MOVE Responses, refer to the Services Supported as an SCP by the QUERY-RETRIEVE-SCP AE.

Table 4.2-6.1

STORAGE-SCU AE COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout expiry for an expected DICOM Message Response (DIMSE level timeout).	The Association is aborted using a DICOM A-ABORT and a message is sent to the QUERY-RETRIEVE-SCP AE indicating an export failure. The QUERY-RETRIEVE-SCP AE will send an appropriate Status in the C-MOVE Response. Error indication message is output to the Communication Logs.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout).	The Association is aborted using a DICOM A-ABORT and a message is sent to the QUERY-RETRIEVE-SCP AE indicating an export failure. The QUERY-RETRIEVE-SCP AE will send an appropriate Status in the C-MOVE Response. Error indication message is output to the Communication Logs.
Association A-ABORTed by the SCP or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	A message is sent to the QUERY-RETRIEVE-SCP AE indicating an export failure. The QUERY-RETRIEVE-SCP AE will send an appropriate Status in the C-MOVE Response. Error indication message is output to the Communication Logs.

4.2.1.4 Association Acceptance Policy

The STORAGE-SCU AE does not accept Associations.

4.2.2 QUERY-RETRIEVE-SCP Application Entity Specification

4.2.2.1 SOP Classes

The QUERY-RETRIEVE-SCP AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

Table 4.2-7
SOP CLASSES FOR QUERY-RETRIEVE-SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	No	Yes
Study Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	No	Yes
Study Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	No	Yes

4.2.2.2 Association Establishment Policies

4.2.2.2.1 General

The QUERY-RETRIEVE-SCP AE will accept Associations for Verification, C-FIND, and C-MOVE requests. In the case of a C-MOVE request, the QUERY-RETRIEVE-SCP AE will issue a command to the STORAGE-SCU AE to initiate an Association with the Destination DICOM AE to send images as specified by the originator of the C-MOVE Request.

The DICOM standard Application Context Name for DICOM 3.0 is always accepted:

Table 4.2-8
DICOM APPLICATION CONTEXT FOR QUERY-RETRIEVE-SCP AE

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

4.2.2.2.2 Number of Associations

The QUERY-RETRIEVE-SCP AE can support multiple simultaneous Associations. Each time the QUERY-RETRIEVE-SCP AE receives an Association, a child process will be spawned to process the Verification, Query, or Retrieval request. The maximum number of child processes, and thus the maximum number of simultaneous Associations that can be processed, is 8.

Table 4.2-9
NUMBER OF SIMULTANEOUS ASSOCIATIONS AS A SCP FOR QUERY-RETRIEVE-SCP AE

Maximum number of simultaneous Associations	4 or 64
---	---------

4.2.2.2.3 Asynchronous Nature

The QUERY-RETRIEVE-SCP AE does not support asynchronous communication

(multiple outstanding transactions over a single Association). All Association requests must be completed and acknowledged before a new operation can be initiated.

Table 4.2-10
ASYNCHRONOUS NATURE AS A SCP FOR QUERY-RETRIEVE-SCP AE

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

4.2.2.2.4 Implementation Identifying Information

The implementation information for the Application Entity is:

Table 4.2-11
DICOM IMPLEMENTATION CLASS AND VERSION FOR QUERY-RETRIEVE-SCP AE

Implementation Class UID	1.2.840.113820.81.101
Implementation Version Name	EBM_DICOM_81_101

Note that All EBMJ Server AE's use the same Implementation Class UID and the same Implementation Version Name.

4.2.2.3 Association Initiation Policy

The QUERY-RETRIEVE-SCP AE does not initiate Associations.

4.2.2.4 Association Acceptance Policy

4.2.2.4.1 Real-World Activity – Handling Query and Retrieval Requests

4.2.2.4.1.1 Associated Real World Activity

The QUERY-RETRIEVE-SCP AE accepts Associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted then the Association Request itself is rejected. It can be configured to only accept Associations with certain Application Entity Titles.

If QUERY-RETRIEVE-SCP AE receives a query (C-FIND) request then the response(s) will be sent over the same Association used to send the C-FIND-Request.

If QUERY-RETRIEVE-SCP AE receives retrieval (C-MOVE) request then the responses will be sent over the same Association used to send the C-MOVE-Request. The QUERY-RETRIEVE-SCP AE will notify the STORAGE-SCU to send the requested SOP Instances to the C-MOVE Destination. The STORAGE-SCU AE notifies the QUERY-RETRIEVE-SCP AE of the success or failure of each attempt to send a

Composite SOP Instance to the peer C-MOVE Destination AE. The QUERY-RETRIEVE-SCP AE then sends a C-MOVE Response indicating this status after each attempt. Once the STORAGE-SCU AE has finished attempting to transfer all the requested SOP Instances, the QUERY-RETRIEVE-SCP AE sends a final C-MOVE Response indicating the overall status of the attempted retrieval.

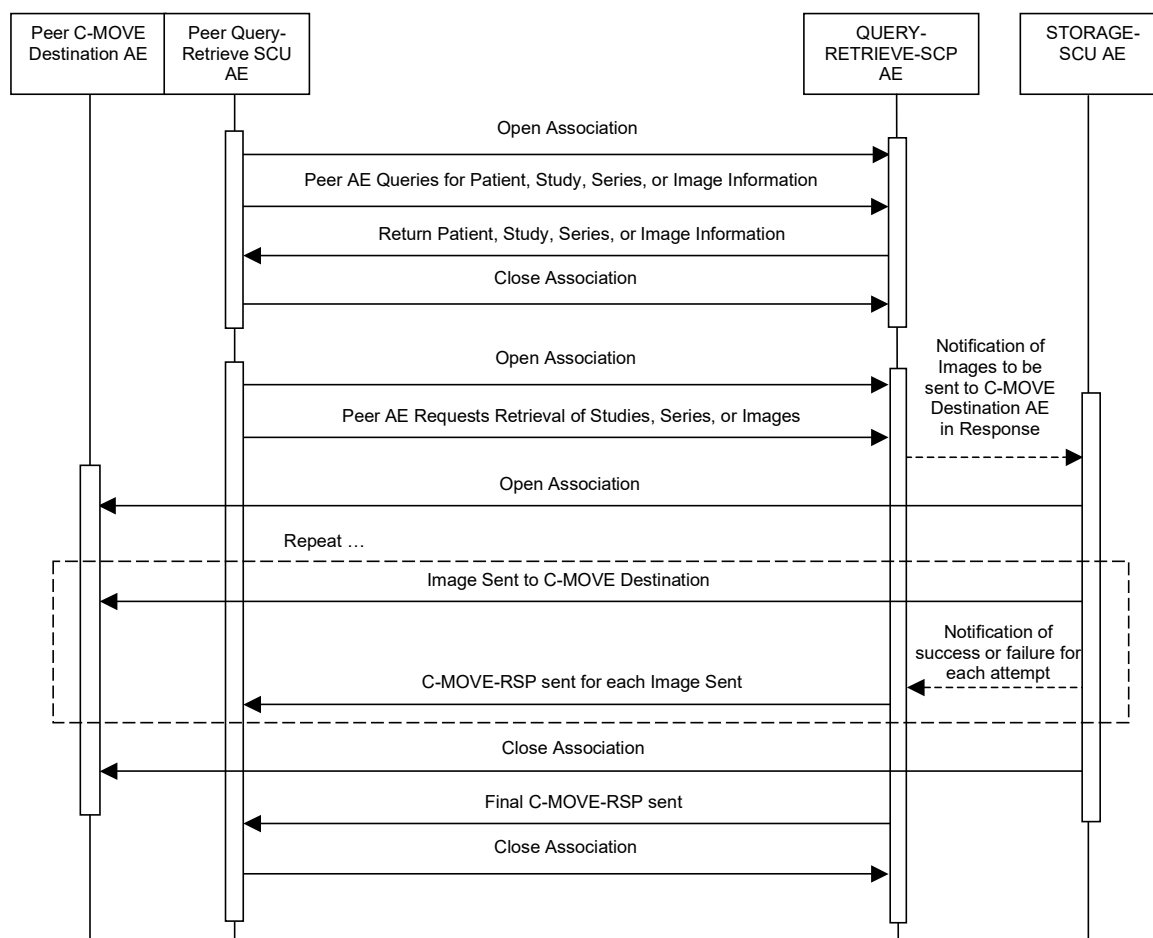


Figure 4.2-2
SEQUENCING OF ACTIVITY – HANDLING QUERY AND RETRIEVAL REQUESTS

The following sequencing constraints illustrated in Figure 4.2-2 apply to the QUERY-RETRIEVE-SCP AE for handling queries (C-FIND-Requests):

1. Peer AE opens an Association with QUERY-RETRIEVE-SCP.
2. Peer AE sends a C-FIND-RQ Message

3. QUERY-RETRIEVE-SCP returns a C-FIND-RSP Message to the peer AE with matching information. A C-FIND-RSP is sent for each entity matching the identifier specified in the C-FIND-RQ. A final C-FIND-RSP is sent indicating that the matching is complete.
4. Peer AE closes the Association. Note that the peer AE does not have to close the Association immediately. Further C-FIND or C-MOVE Requests can be sent over the Association before it is closed.

The following sequencing constraints illustrated in Figure 4.2-2 apply to the QUERY-RETRIEVE-SCP AE for handling retrievals (C-MOVE-Requests):

1. Peer AE opens an Association with QUERY-RETRIEVE-SCP.
2. Peer AE sends a C-MOVE-RQ Message
3. QUERY-RETRIEVE-SCP notifies the STORAGE-SCU AE to send the Composite SOP Instances to the peer C-MOVE Destination AE as indicated in the C-MOVE-RQ.
4. After attempting to send a SOP Instance, the STORAGE-SCU AE indicates to the QUERY-RETRIEVE-SCP AE whether the transfer succeeded or failed. The QUERY-RETRIEVE-SCP AE then returns a C-MOVE-RSP indicating this success or failure.
5. Once the STORAGE-SCU AE has completed all attempts to transfer the SOP Instances to the C-MOVE Destination AE, or the first failure occurred, the QUERY-RETRIEVE-SCP AE sends a final C-MOVE-RSP indicating the overall success or failure of the retrieval.
6. Peer AE closes the Association. Note that the peer AE does not have to close the Association immediately. Further C-FIND or C-MOVE Requests can be sent over the Association before it is closed.

The QUERY-RETRIEVE-SCP AE may reject Association attempts as shown in Table 4.2-12. The Result, Source and Reason/Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8, Section 9.3.4). The following abbreviations are used in the Source column:

- a. 1 – DICOM UL service-user
- b. 2 – DICOM UL service-provider (ASCE related function)
- c. 3 – DICOM UL service-provider (Presentation related function)

Table 4.2-12

ASSOCIATION REJECTION REASONS

Result	Source	Reason/Diag	Explanation
2 – rejected- transient	c	1 – temporary- congestion	The maximum number of simultaneous Associations has been reached. An Association request with the same parameters may succeed at a later time.
2 – rejected- transient	c	2 – local-limit- exceeded	No Associations can be accepted at this time due to insufficient resources. An Association request with the same parameters may succeed at a later time.
1 – rejected- permanent	a	2 – application- context-name- not-supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will not succeed at a later time.
1 – rejected- permanent	a	7 – called- AE-title-not- Recognized	The Association request contained an unrecognized Called AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association initiator is incorrectly configured and attempts to address the Association acceptor using the wrong AE Title.
1 – rejected- permanent	a	3 – calling-AE-title- not-recognized	The Association request contained an unrecognized Calling AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association acceptor has not been configured to recognize the AE Title of the Association initiator.
1 – rejected -permanent	b	1 – no-reason- given	The Association request could not be parsed. An Association request with the same format will not succeed at a later time.

4.2.2.4.1.2 Accepted Presentation Contexts

QUERY-RETRIEVE-SCP AE will accept Presentation Contexts as shown in the following table:

Table 4.2-13
ACCEPTED PRESENTATION CONTEXTS BY THE QUERY-RETRIEVE-SCP AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Verification	1.2.840.10008.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Study Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	See Note 1
Study Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	See Note 1
Study Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	See Note 2
Study Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	See Note 2

Note 1: Accepts Extended Negotiation for Relational-Queries.

Note 2: Retrieve SCP is optional.

4.2.2.4.1.3 SOP Specific Conformance for Query SOP Classes

The QUERY-RETRIEVE-SCP AE supports hierarchical queries and relational queries. Two attributes, (0008, 0052) Query/Retrieve Level and (0008,0054) Retrieve AE Title, are always returned by default. (0008, 0005) Specific Character Set may be returned conditionally, without being requested. Other attributes are returned only when requested in the query identifier. Query responses always return values from the EBMJ Server database. Exported SOP Instances are always updated with the latest values in the database prior to export. Thus, a change in Patient demographic information will be contained in both the C-FIND Responses and any Composite SOP Instances exported to a C-MOVE Destination AE.

Study Root Information Model

All the required search keys on each of the three levels (Study, Series, and Image) are supported.

Table 4.2-15
STUDY ROOT C-FIND SCP SUPPORTED ELEMENTS

Level Name Attribute Name	Tag	VR	Types of Matching
SOP Common			
Specific Character Set	0008,0005	CS	NONE
Study Level			
Patient's Name	0010,0010	PN	S,*,U
Patient ID	0010,0020	LO	S,*,U
Patient's Birth Date	0010,0030	DA	S,U
Patient's Sex	0010,0040	CS	S,U
Study Date	0008,0020	DA	S,R,U
Study Time	0008,0030	TM	R,U
Accession Number	0008,0050	SH	S,*,U
Modalities in Study	0008,0061	CS	S,U,L
Referring Physician's Name	0008,0090	PN	S,*,U
Study Description	0008,1030	LO	S,*,U
Study ID	0020,0010	SH	S,*,U
Study Instance UID	0020,000D	UI	S,U,L
Number of Study Related Series	0020,1206	IS	NONE
Number of Study Related Instances	0020,1208	IS	NONE
Series Level			
Modality	0008,0060	CS	S,U
Series Description	0008,103E	LO	S,*,U
Operator's Name	0008,1070	PN	NONE
Manufacturer's Model Name	0008,1090	LO	NONE
Body Part Examined	0018,0015	CS	S,U
Protocol Name	0018,1030	LO	NONE
Series Instance UID	0020,000E	UI	S,U,L
Series Number	0020,0011	IS	S,*,U
Number of Series Related Instances	0020,1209	IS	NONE
Requesting Physician	0032,1032	PN	NONE
Requesting Service	0032,1033	LO	NONE
Requested Attribute Sequence	0040,0275	SQ	NONE
> Scheduled Procedure Step ID	0040,0009	SH	S,*,U

> Requested Procedure ID	0040,1001	SH	S,*,U
Performed Procedure Step Start Date	0040,0244	DA	S,R,U
Performed Procedure Step Start Time	0040,0245	TM	R,U
Image Level			
SOP Class UID	0008,0016	UI	S,U,L
SOP Instance UID	0008,0018	UI	S,U,L
Content Date	0008,0023	DA	NONE
Content Time	0008,0033	TM	NONE
Referenced Series Sequence	0008,1115	SQ	NONE
> Referenced Image Sequence	0008,1140	SQ	NONE
>> Referenced SOP Class UID	0008,1150	UI	NONE
>> Referenced SOP Instance UID	0008,1155	UI	NONE
> Series Instance UID	0020,000E	UI	NONE
Instance Number	0020,0013	IS	S,*,U
Number of Frames	0028,0008	US	NONE
Rows	0028,0010	US	NONE
Columns	0028,0011	US	NONE
Bits Allocated	0028,0100	US	NONE
Observation DateTime	0040,A032	DT	NONE
Concept Name Code Sequence	0040,A043	SQ	NONE
> Code Value	0008,0100	SH	S,*,U
> Coding Scheme Designator	0008,0102	SH	S,*,U
> Coding Scheme Version	0008,0103	SH	S,*,U
> Code Meaning	0008,0104	LO	S,*,U
Verifying Observer Identification Code Sequence	0040,A073	SQ	NONE
> Verifying Organization	0040,A027	LO	NONE
> Verifying DateTime	0040,A030	DT	R,U
> Verifying Observer Name	0040,A075	PN	S,*,U
> Verifying Observer Identification Code Sequence	0040,A088	SQ	NONE
Referenced Request Sequence	0040,A370	SQ	NONE
> Accession Number	0008,0050	SH	NONE
> Study Instance UID	0020,000D	UI	NONE
> Requested Procedure Code Sequence	0032,1064	SQ	NONE
> Requested Procedure ID	0040,1001	SH	NONE
Current Requested Procedure Evidence Sequence	0040,A375	SQ	NONE
> Referenced Series Sequence	0008,1115	SQ	NONE
>> Referenced SOP Sequence	0008,1199	SQ	NONE
>>> Referenced SOP Class UID	0008,1150	UI	NONE
>>> Referenced SOP Instance UID	0008,1155	UI	NONE
>> Series Instance UID	0020,000E	UI	NONE

> Study Instance UID	0020,000D	UI	NONE
Completion Flag	0040,A491	CS	S,U
Verification Flag	0040,A493	CS	S,U
Content Template Sequence	0040,A504	SQ	NONE
> Template Identifier	0040,DB00	CS	S,U
Content Label	0070,0080	CS	NONE
Content Description	0070,0081	LO	NONE
Presentation Creation Date	0070,0082	DA	NONE
Presentation Creation Time	0070,0083	TM	NONE
Presentation Creator's Name	0070,0084	PN	NONE

NOTE: Patient's Name (0010,0010) matching is case insensitive.

The tables should be read as follows:

Attribute Name: Attributes supported for returned C-FIND Responses.

Tag: Appropriate DICOM tag for this attribute.

VR: Appropriate DICOM VR for this attribute.

Types of Matching: The types of Matching supported by the C-FIND SCP. An "S" indicates the identifier attribute can specify Single Value Matching, an "R" will indicate Range Matching, a "*" will denote wildcard matching, a 'U' will indicate universal matching, and '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.

Table 4.2-16**QUERY-RETRIEVE-SCP AE C-FIND Response Status Return Behavior**

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Matching is complete. No final identifier is supplied.
Refused	Out of Resources	A700	System reached the limit in resource usage. Error message is output to the Communication Log.
Failed	Identifier does not match SOP Class	A900	The C-FIND query identifier contains invalid Elements or values, or is missing mandatory Elements or values for the specified SOP Class. Error message is output to the Communication Log.
	Unable to process	C000	The C-FIND query identifier is valid for the specified SOP Class but cannot be used to query the database. Error message is output to the Communication Log.
Pending	Matches are continuing and current match is supplied.	FF00	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming. This status code is returned if all Optional keys in the query identifier are actually supported.
	Matches are continuing but one or more Optional Keys were not supported.	FF01	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming. This status code is returned if there are Optional keys in the query identifier that are not supported.

4.2.2.4.1.4 SOP Specific Conformance for Retrieval SOP Classes

The QUERY-RETRIEVE-SCP AE will convey to the STORAGE-SCU AE that an Association with a DICOM Application Entity named by the external RETRIEVE-SCU (through a MOVE Destination AE Title) should be established. It will also convey to the STORAGE-SCU AE to perform C-STORE operations on specific images requested by the external RETRIEVE-SCU. One or more of the Image Storage Presentation Contexts listed in Table 4.2-5 will be negotiated.

The QUERY-RETRIEVE-SCP AE can support lists of UIDs in the C-MOVE Request at the Study, Series, and Image Levels. The list of UIDs must be at the Level of the C-MOVE Request however. For example, if the C-MOVE Request is for Series Level retrieval but the identifier contains a list of Study UIDs then the C-MOVE Request will be rejected, and the A900 Failed Status Code will be returned in the C-MOVE Response.

An initial C-MOVE Response is always sent after confirming that the C-MOVE Request itself can be processed. After this, the QUERY-RETRIEVE-SCP AE will return a response to the RETRIEVE-SCU after the STORAGE-SCU AE has attempted to send each image. This response reports the number of remaining SOP Instances to transfer, and the number transferred having a successful, failed, or warning status.

Table 4.2-17

QUERY-RETRIEVE-SCP AE C-MOVE Response Status Return Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Sub-operations complete – No Failures	0000	All the Composite SOP Instances have been successfully sent to the C-MOVE Destination AE.
Refused	Out of Resources – Unable to calculate number of matches	A701	Number of matches cannot be determined due to system failure. Returned if the server's database is not functioning so the search for matches to the C-MOVE Request cannot be found. Error message is output to the Communication Log.
	Out of Resources – Unable to perform sub-operations	A702	C-STORE sub-operations cannot be performed due to failure to access Composite SOP Instances in archive, or failure of a C-STORE Request. Error message is output to the Communication Log.
	Move destination unknown	A801	The Destination Application Entity named in the C-MOVE Request is unknown to Query-Retrieve SCP AE. Error message is output to the Communication Log.
Failed	Unable to Process	C000	The C-MOVE identifier is valid for the specified SOP Class but cannot be used to query the database. Error message is output to the Communication Log.
Warning	Sub-operations Complete – One or more Failures	B000	Some but not all the Composite SOP Instances have been successfully sent to the C-MOVE Destination AE.
Cancel	Matching terminated due to Cancel Request	FE00	The RETRIEVE-SCU sent a Cancel Request. This has been acknowledged and the export of Composite SOP Instances to the C-MOVE Destination AE has been halted.
Pending	Sub-operations are continuing	FF00	A Response with this Status Code is sent every time a Composite SOP Instance has been successfully sent to the C-MOVE Destination AE.

Table 4.2-18**QUERY-RETRIEVE-SCP AE Communication Failure Behavior**

Exception	Behavior
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout). I.e. The QUERY-RETRIEVE-SCP AE is waiting for the next C-FIND or C-MOVE Request on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Communication Log. If the STORAGE-SCU AE is still exporting Composite SOP Instances as a result of an earlier C-MOVE Request received on this Association, it will continue attempting to complete the entire C-MOVE Request.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout). I.e. The QUERY-RETRIEVE-SCP AE is waiting for the next message PDU but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Communication Log. If the STORAGE-SCU AE is still exporting Composite SOP Instances as a result of an earlier C-MOVE Request received on this Association, it will continue attempting to complete the entire C-MOVE Request.
Association aborted by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	Error message is output to the Communication Log. If the STORAGE-SCU AE is still exporting Composite SOP Instances as a result of an earlier C-MOVE Request received on this Association, it will continue attempting to complete the entire C-MOVE Request.

4.2.3 STORAGE-SCP Application Entity Specification

4.2.3.1 SOP Classes

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

Table 4.2-19 SOP CLASSES FOR STORAGE-SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	No	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	No	Yes
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	No	Note
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	No	Yes
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	No	Note
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	No	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	No	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	No	Note
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	No	Yes
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	No	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	No	Yes
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	No	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	No	Yes
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	No	Yes
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	No	Yes
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	No	Yes
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	No	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	No	Yes

Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	No	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	No	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	No	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	No	Yes
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	No	Note
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	No	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	No	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	No	Yes
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	No	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	No	Yes
Video Photometric Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	No	Yes
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	No	Yes
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	No	Yes
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	No	Yes
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	No	Yes
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	No	Yes
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	No	Yes
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	No	Yes
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	No	Yes
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	No	Yes
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	No	Yes
Positron Emission Tomography Image	1.2.840.10008.5.1.4.1.1.128	No	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	No	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	No	Note
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	No	Note
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	No	Note
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	No	Note
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	No	Note
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	No	Note
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	No	Note
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	No	Note

Note: Requires "Retrieve Option" license.

4.2.3.2 Association Establishment Policies

4.2.3.2.1 General

The STORAGE-SCP AE can both accept and propose Association Requests. The STORAGE-SCP AE will accept Association Requests for the Verification and Storage. The DICOM standard Application Context Name for DICOM 3.0 is always accepted and proposed:

Table 4.2-20
DICOM APPLICATION CONTEXT FOR STORAGE-SCP AE

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

4.2.3.2.2 Number of Associations

The STORAGE-SCP AE can support multiple simultaneous Associations requested by peer AEs. Each time the STORAGE-SCP AE receives an Association, a child process will be spawned to process the Verification or Storage requests. The maximum number of child processes, and thus the maximum number of simultaneous Associations that can be processed, is **8 or optionally 64** in total.

Table 4.2-21
NUMBER OF SIMULTANEOUS ASSOCIATIONS AS AN SCP FOR STORAGE-SCP AE

Maximum number of simultaneous Associations requested by peer AEs	8 or 64
Maximum number of simultaneous Associations proposed by STORAGE-SCP AE	1

4.2.3.2.3 Asynchronous Nature

The STORAGE-SCP AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4.2-22
ASYNCHRONOUS NATURE AS A SCP FOR STORAGE-SCP AE

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

4.2.3.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 4.2-24

DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGE-SCP AE

Implementation Class UID	1.2.840.113820.81.101
Implementation Version Name	EBM_DICOM_81_101

Note that All EBMJ Server AE's use the same Implementation Class UID and the same Implementation Version Name.

4.2.3.3 Association Initiation Policy

The STORAGE-SCP AE does not initiate Associations.

4.2.3.4 Association Acceptance Policy

4.2.3.4.1 Real-World Activity – Receive Images Requests

4.2.3.4.1.1 Associated Real World Activity

The STORAGE-SCP AE accepts Associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted then the Association Request itself is rejected. It can be configured to only accept Associations with certain Application Entity Titles.

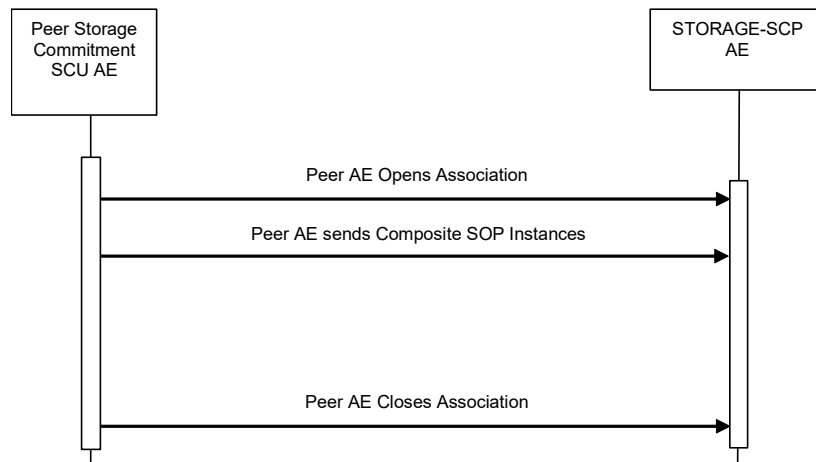


Figure 4.2-4
SEQUENCING OF ACTIVITY – RECEIVE IMAGES

The following sequencing constraints illustrated in Figure 4.2-4 apply to the STORAGE-SCP AE:

1. Peer AE opens an Association with STORAGE-SCP.
2. Peer AE sends zero or more Composite SOP Instances.
3. Peer AE closes the Association.

The STORAGE-SCP AE may reject Association attempts as shown in Table 4.2-26. The Result, Source and Reason/Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8, Section 9.3.4). The following abbreviations are used in the Source column:

- 1 – DICOM UL service-user
- 2 – DICOM UL service-provider (ASCE related function)
- 3 – DICOM UL service-provider (Presentation related function)

Table 4.2-26
ASSOCIATION REJECTION REASONS

Result	Source	Reason/Diag	Explanation
2 – rejected-transient	c	1 – temporary-congestion	The maximum number of simultaneous Associations has been reached. An Association request with the same parameters may succeed at a later

			time.
2 – rejected-transient	c	2 – local-limit-exceeded	No Associations can be accepted at this time due to insufficient resources. An Association request with the same parameters may succeed at a later time.
1 – rejected-permanent	a	2 – application-context-name-not-supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will not succeed at a later time.
1 – rejected-permanent	a	7 – called-AE-title-not-Recognized	The Association request contained an unrecognized Called AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association initiator is incorrectly configured and attempts to address the Association acceptor using the wrong AE Title.
1 – rejected-permanent	a	3 – calling-AE-title-not-recognized	The Association request contained an unrecognized Calling AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association acceptor has not been configured to recognize the AE Title of the Association initiator.
1 – rejected-permanent	b	1 – no-reason-given	The Association request could not be parsed. An Association request with the same format will not succeed at a later time.

4.2.3.4.1.2 Accepted Presentation Contexts

The STORAGE-SCP AE supports the Implicit VR Little Endian and Explicit VR Little Endian Transfer Syntaxes for all Abstract Syntaxes. In addition, various compression syntaxes are supported for all Image Object Storage.

The STORAGE-SCP AE can be configured to accept only Little Endian Transfer Syntaxes from certain Application Entity Titles.

If multiple Transfer Syntaxes are proposed per Presentation Context, then only the first supported Transfer Syntax is accepted.

Any of the Presentation Contexts shown in the following table are acceptable to the STORAGE-SCP AE for receiving images.

Table 4.2-27
ACCEPTED PRESENTATION CONTEXTS BY STORAGE-SCP AE

Presentation Context Table				
Abstract Syntax		Transfer Syntax	Role	Ext. Neg.
Name	UID	Table		
Verification	1.2.840.10008.1.1	4.2-27.1	SCP	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	4.2-27.2	SCP	None
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	4.2-27.2	SCP	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	4.2-27.2	SCP	None
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	4.2-27.2	SCP	None
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	4.2-27.2	SCP	None
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	4.2-27.2	SCP	None
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	4.2-27.2	SCP	None
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	4.2-27.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	4.2-27.2	SCP	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	4.2-27.2	SCP	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	4.2-27.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	4.2-27.2	SCP	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	4.2-27.2	SCP	None
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	4.2-27.2	SCP	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	4.2-27.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	4.2-27.2	SCP	None
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	4.2-27.2	SCP	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	4.2-27.2	SCP	None

Presentation Context Table				
Abstract Syntax		Transfer Syntax	Role	Ext. Neg.
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	4.2-27.1	SCP	None
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	4.2-27.1	SCP	None
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	4.2-27.1	SCP	None
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	4.2-27.1	SCP	None
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	4.2-27.1	SCP	None
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	4.2-27.1	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	4.2-27.2	SCP	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	4.2-27.2	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	4.2-27.2	SCP	None
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	4.2-27.1	SCP	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	4.2-27.2	SCP	None
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	4.2-27.2	SCP	None
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	4.2-27.2	SCP	None
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	4.2-27.2	SCP	None
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	4.2-27.2	SCP	None
Video Photometric Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	4.2-27.2	SCP	None
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	4.2-27.2	SCP	None
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	4.2-27.1	SCP	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	4.2-27.1	SCP	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	4.2-27.1	SCP	None
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	4.2-27.1	SCP	None
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	4.2-27.1	SCP	None
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	4.2-27.1	SCP	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax	Role	Ext. Neg.	
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	4.2-27.1	SCP	None	
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	4.2-27.1	SCP	None	
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	4.2-27.1	SCP	None	
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	4.2-27.2	SCP	None	
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	4.2-27.2	SCP	None	
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	4.2-27.2	SCP	None	
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	4.2-27.2	SCP	None	
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	4.2-27.2	SCP	None	
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	4.2-27.2	SCP	None	
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	4.2-27.2	SCP	None	
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	4.2-27.2	SCP	None	
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	4.2-27.2	SCP	None	
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	4.2-27.2	SCP	None	

Table 4.2-27.1

TRANSFER SYNTAX COMBINATION FOR NON-IMAGE STORAGE SOP CLASSES

Transfer Syntax	
Name	UID
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1

Table 4.2-27.2

TRANSFER SYNTAX COMBINATION FOR IMAGE STORAGE SOP CLASSES

Transfer Syntax	
Name	UID
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1
JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
JPEG 12 Bit Image Compression	1.2.840.10008.1.2.4.51
JPEG Lossless Image Compression	1.2.840.10008.1.2.4.70
RLE Lossless	1.2.840.10008.1.2.5

4.2.3.4.1.3 SOP Specific Conformance for Verification SOP Class

The STORAGE-SCP AE provides standard conformance to the Verification SOP Class as an SCP.

4.2.3.4.1.4 SOP Specific Conformance for Storage SOP Classes

The associated Real-World Activity with the Storage service is the storage of medical image data received over the network on a designated hard disk. The STORAGE-SCP AE will return a failure status if it is unable to store the images on to the hard disk.

The STORAGE-SCP AE does not have any dependencies on the number of Associations used to send images to it. Images belonging to more than one Study or Series can be sent over a single or multiple Associations. Images belonging to a single Study or Series can also be sent over different Associations. There is no limit on either the number of SOP Instances or the maximum amount of total SOP Instance data that can be transferred over a single Association.

The STORAGE-SCP AE is configured to retain the original DICOM data in DICOM Part 10 compliant file format. The STORAGE-SCP AE is Level 2 (Full) conformant as a Storage SCP. In addition, all Private and SOP Class Extended Elements are maintained in the DICOM format files. In addition to saving all Elements in files, a subset of the Elements are stored in the EBMJ Server database to support query and retrieval requests and also allow updating of Patient, Study, and Series information by user input, or demographic and Study related messages.

The Behavior for handling duplicate SOP Instances is configurable. The default Behavior is to ignore duplicated SOP Instances. An alternative configuration is possible that causes the original object with the conflicting SOP Instance UID to be replaced by the new SOP Instance.

Table 4.2-28

STORAGE-SCP AE C-STORE RESPONSE STATUS RETURN BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The Composite SOP Instance was successfully received, verified, and stored in the system database.
Refused	Out of Resources	A700	Indicates that there was not enough disk space to store the image or resource to process storage. Error message is output to the Communication Log. The SOP Instance will not be saved.

Error	Data Set does not match SOP Class	A900	Indicates that the Data Set does not encode a valid instance of the SOP Class specified. This status is returned if the DICOM Object stream can be successfully parsed but does not contain values for one or more mandatory Elements of the SOP Class. The STORAGE-SCP AE does not perform a comprehensive check, as it only checks a subset of required Elements. Error message is output to the Communication Log.
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NOTE: If a failure condition does occur when handling an Association then all images previously received successfully over the Association are maintained in the EBMJ Server database. No previously successfully received images are discarded. Even if an image is successfully received but an error occurs transmitting the C-STORE Response then this final image is maintained rather than discarded. If the loss of an Association is detected then the Association is closed.

NOTE: Warning Status, B000, B007 and B006 are never returned.

The Behavior of STORAGE-SCP AE during communication failure is summarized in the following table:

Table 4.2-29**STORAGE-SCP AE Storage Service Communication Failure Behavior**

Exception	Behavior
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout). I.e. The STORAGE-SCP AE is waiting for the next C-STORE Request on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Communication Log. If some Composite SOP Instances have already been successfully received then they are maintained in the database. They are not automatically discarded because of a later failure.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout). I.e. The STORAGE-SCP AE is waiting for the next C-STORE Data Set PDU but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Communication Log. If a C-STORE Data Set has not been fully received then the data already received is discarded. If some Composite SOP Instances have already been successfully received over the Association then they are maintained in the database.
Association aborted by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	Error message is output to the Communication Log. If some Composite SOP Instances have already been successfully received then they are maintained in the database. They are not automatically discarded because of a later failure.

4.2.4 QUERY-SCU Application Entity Specification

4.2.4.1 SOP Classes

QUERY-SCU provides Standard Conformance to the following SOP Class:

Table 4.2-34

SOP CLASSES SUPPORTED BY QUERY-SCU

SOP Class Name	SOP Class UID	SCU	SCP
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No

4.2.4.2 Association Policies

4.2.4.2.1 General

QUERY-SCU initiates but never accepts associations.

Table 4.2-35

MAXIMUM PDU SIZE RECEIVED AS A SCP FOR QUERY-SCU

Maximum PDU size received	64k bytes
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4.2.4.2.2 Number of Associations

Table 4.2-36

NUMBER OF ASSOCIATIONS AS A SCP FOR QUERY-SCU

Maximum number of simultaneous associations	1
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4.2.4.2.3 Asynchronous Nature

QUERY-SCU will only allow a single outstanding operation on an Association. Therefore, QUERY-SCU will not perform asynchronous operations window negotiation.

4.2.4.2.4 Implementation Identifying Information

Table 4.2-37

DICOM IMPLEMENTATION CLASS AND VERSION FOR QUERY-SCU

Implementation Class UID	1.2.840.113820.81.101
Implementation Version Name	EBM_DICOM_81_101

4.2.4.3 Association Initiation Policy

QUERY-SCU attempts to initiate a new association when the user performs the query action from the user interface. If this involves recursive queries for lower query

levels in the hierarchy, these will be performed on the same association.

4.2.4.3.1 Activity – Query Remote AE

4.2.4.3.1.1 Description and Sequencing of Activities

A single attempt will be made to query the remote AE. If the query fails, for whatever reason, no retry will be performed.

4.2.4.3.1.2 Proposed Presentation Contexts

Table 4.2-38

PROPOSED PRESENTATION CONTEXTS FOR QUERY-SCU AND QUERY REMOTE AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008 .5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	Relational Query
	1.2.840.10008 .5.1.4.1.2.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	Relational Query

QUERY-SCU will propose a single Presentation Context with all supported Transfer Syntaxes.

4.2.4.3.1.2.1 Extended Negotiation

Extended negotiation is performed for relational queries, if user specifies one or more query key attributes at series level.

4.2.4.3.1.3 SOP Specific Conformance

4.2.4.3.1.3.1 SOP Specific Conformance to C-FIND SOP Classes

QUERY-SCU provides standard conformance to the supported Query SOP Classes. Only a single information model, Study Root, is supported.

If user specifies one or more series level query key, QUERY-SCU negotiates for Relational Query during association establishment. If SCP accepts the Extended Negotiation, QUERY-SCU initiates SERIES level query followed by recursive query consisting of STUDY, SERIES and IMAGE level queries.

If user does not specify any series level query key or SCP rejects Extended Negotiation for Relational Query, then all queries are initiated at the highest level of the information model (the STUDY level), and then for each response received, recursively repeated at the next lower levels (the SERIES and then IMAGE levels), in

order to completely elucidate the “tree” of instances available on the remote AE (from which the user may subsequently request a retrieval at any level).

No CANCEL requests are ever issued.

Requested return attributes not returned by the SCP are ignored. Non-matching responses returned by the SCP due to unsupported (hopefully optional) matching keys are not filtered locally by the QUERY-SCU and thus will still be presented in the browser. No attempt is made to filter out duplicate responses.

Specific Character Set may be included at any query level, if identifier contains multi-byte characters. If present in the response, Specific Character Set will be used to identify character sets other than the default character set for display of strings in the browser.

Table 4.2-39
STUDY ROOT REQUEST IDENTIFIER FOR QUERY-SCU

Name	Tag	Type of Matching
STUDY level		
Patient ID	(0010,0020)	S, *, U
Patient's Name	(0010,0010)	S, *, U
Patient's Birth Date	(0010,0030)	S, *, U, R
Patient's Sex	(0010,0040)	NONE
Study ID	(0020,0010)	S, *, U
Study Description	(0008,1030)	S, *, U
Study Date	(0008,0020)	S, *, U, R
Study Time	(0008,0030)	S, *, U, R
Referring Physician's Name	(0008,0090)	S, *, U
Accession Number	(0008,0050)	S, *, U
Study Instance UID	(0020,000D)	UNIQUE
SERIES level		
Series Number	(0020,0011)	NONE
Series Description	(0008,103E)	NONE
Modality	(0008,0060)	S, *, U
Body Part Examined	(0018,0015)	S, *, U
Series Instance UID	(0020,000E)	UNIQUE
IMAGE level		
Instance Number	(0020,0013)	NONE
Content Date	(0008,0023)	NONE

Content Time	(0008,0033)	NONE
Referenced Series Sequence	(0008,1115)	NONE
Number of Frames	(0028,0008)	NONE
SOP Instance UID	(0008,0018)	UNIQUE
Observation DateTime	(0040,A032)	NONE
Concept Name Code Sequence	(0040,A043)	NONE
Verifying Observer Sequence	(0040,A073)	NONE
Completion Flag	(0040,A491)	NONE
Verification Flag	(0040,A493)	NONE
Content Template Sequence	(0040,A504)	NONE
Common to all query levels		
Specific Character Set	(0008,0005)	Note 1)

The types of Matching supported by the QUERY-SCU:

An "S" indicates the identifier attribute uses Single Value Matching, an "R" indicates Range Matching, an "*" indicates wildcard matching, a 'U' indicates Universal Matching, and an 'L' indicates that UID lists are sent. "NONE" indicates that no matching is supported, but that values for this Element are requested to be returned (i.e. universal matching), and "UNIQUE" indicates that this is the Unique Key for that query level, in which case Universal Matching or Single Value Matching is used depending on the query level.

Note 1)

Specific Character Set (0008,0005) shall not be treated as matching key or return key. Query SCP shall include Specific Character Set (0008,0005) in response, when returning identifier that contains one or more character sets other than DICOM default character set.

QUERY-SCU will behave as described in Table 4.2-40 in response to the status returned in the C-FIND response command message(s).

Table 4.2-40
RESPONSE STATUS FOR QUERY-SCU AND QUERY REMOTE AE REQUEST

Service Status	Further Meaning	Status Codes	Behavior
Refused	Out of Resources	A700	Current query is terminated; remaining queries continue
Error	Identifier does not match SOP Class	A900	Current query is terminated; remaining queries continue
	Unable to process	Cxxx	Current query is terminated; remaining queries continue
Cancel	Matching terminated due to Cancel request	FE00	Ignored (should never occur, since cancels never issued)
Success	Matching is complete - No final Identifier is supplied	0000	Current query is terminated; remaining queries continue
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier used to populate browser and trigger recursive lower level queries
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	FF01	Identifier used to populate browser and trigger recursive lower level queries

4.2.4.4 Association Acceptance Policy

QUERY-SCU does not accept associations.

4.2.5 RETRIEVE-SCU

4.2.5.1 SOP Classes

RETRIEVE-SCU provides Standard Conformance to the following SOP Class:

Table 4.2-41

SOP CLASSES SUPPORTED BY RETRIEVE-SCU

SOP Class Name	SOP Class UID	SCU	SCP
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

4.2.5.2 Association Policies

4.2.5.2.1 General

RETRIEVE-SCU initiates but never accepts associations.

Table 4.2-42

MAXIMUM PDU SIZE RECEIVED AS A SCP FOR RETRIEVE-SCU

Maximum PDU size received	64k bytes
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4.2.5.2.2 Number of Associations

Table 4.2-43

NUMBER OF ASSOCIATIONS AS A SCP FOR RETRIEVE-SCU

Maximum number of simultaneous associations	1
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4.2.5.2.3 Asynchronous Nature

RETRIEVE-SCU will only allow a single outstanding operation on an Association. Therefore, RETRIEVE-SCU will not perform asynchronous operations window negotiation.

4.2.5.2.4 Implementation Identifying Information

Table 4.2-44

DICOM IMPLEMENTATION CLASS AND VERSION FOR RETRIEVE-SCU

Implementation Class UID	1.2.840.113820.81.101
Implementation Version Name	EBM_DICOM_81_101

4.2.5.3 Association Initiation Policy

RETRIEVE-SCU attempts to initiate a new association when the user performs the retrieve action from the user interface.

4.2.5.3.1 Activity – Retrieve From Remote AE

4.2.5.3.1.1 Description and Sequencing of Activities

For the entity (study, series or instance) selected from the user interface to be retrieved, a single attempt will be made to retrieve it from the selected remote AE. If the retrieve fails, for whatever reason, no retry will be performed.

4.2.5.3.1.2 Proposed Presentation Contexts

Table 4.2-45
PROPOSED PRESENTATION CONTEXTS FOR RETRIEVE-SCU
AND RETRIEVE FROM REMOTE AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

RETRIEVE-SCU will propose a single Presentation Contexts with all of the supported Transfer Syntaxes.

4.2.5.3.1.2.1 Extended Negotiation

No extended negotiation is performed.

4.2.5.3.1.3 SOP Specific Conformance

4.2.5.3.1.3.1 SOP Specific Conformance to C-MOVE SOP Classes

RETRIEVE-SCU provides standard conformance to the supported Retrieve SOP Classes. Only a single information model, Study Root, is supported.

Retrieval will be performed at the STUDY, SERIES or IMAGE level depending on what level of entity has been selected by the user in the browser.

No CANCEL requests are ever issued.

The retrieval is performed from the AE that was specified in the Retrieve AE attribute returned from the query performed by QUERY-SCU. The instances are retrieved to the local database by specifying the destination as the AE Title of the STORE-SCP AE. This implies that the remote Retrieve SCP must be preconfigured to determine the presentation address corresponding to the STORE-SCP AE. The STORE-SCP AE will accept storage requests addressed to it from anywhere, so no pre-configuration of

the local application to accept from the remote AE is necessary (except in so far as it was necessary to configure QUERY-SCU).

Table 4.2-46
STUDY ROOT REQUEST IDENTIFIER FOR RETRIEVE-SCU

Name	Tag	Unique, Matching or Return Key
STUDY level		
Study Instance UID	(0020,000D)	U, L
SERIES level		
Series Instance UID	(0020,000E)	U, L
IMAGE level		
SOP Instance UID	(0008,0018)	U, L

The types of Matching supported by the RETRIEVE-SCU:

A 'U' indicates Universal Matching and an 'L' indicates that UID lists are sent.

RETRIEVE-SCU will behave as described in Table 4.2.5.4.1.3.3-2 in response to the status returned in the C-MOVE response command message(s).

Table 4.2-47
RESPONSE STATUS FOR RETRIEVE-SCU AND RETRIEVE FROM REMOTE AE REQUEST

Service Status	Further Meaning	Status Codes	Behavior
Refused	Out of Resources - Unable to calculate number of matches	A701	Retrieval is terminated
	Out of Resources - Unable to perform sub-operations	A702	Retrieval is terminated
	Move Destination unknown	A801	Retrieval is terminated
Failed	Identifier does not match SOP Class	A900	Retrieval is terminated
	Unable to process	Cxxx	Retrieval is terminated
Cancel	Sub-operations terminated due to Cancel Indication	FE00	Retrieval is terminated (should never occur, since cancels never issued)
Warning	Sub-operations Complete - One or more Failures	B000	Retrieval is terminated

Success	Sub-operations Complete - No Failures	0000	Retrieval is terminated
Pending	Sub-operations are continuing	FF00	Retrieval continues

Since the C-MOVE operation is dependent on completion of C-STORE sub-operations that are occurring on a separate association, the question of failure of operations on the other association(s) must be considered.

RETRIEVE-SCU completely ignores whatever activities are taking place in relation to the STORAGE-SCP AE that is receiving the retrieved instances. Once the C-MOVE has been initiated it runs to completion (or failure) as described in the C-MOVE response command message(s). There is no attempt by RETRIEVE-SCU to confirm that instances have actually been successfully received or locally stored.

Whether or not completely or partially successfully retrievals are made available in the local database to the user is purely dependent on the success or failure of the C-STORE sub-operations, not on any explicit action by RETRIEVE-SCU.

Whether or not the remote AE attempts to retry any failed C-STORE sub-operations is beyond the control of RETRIEVE-SCU.

If the association on which the C-MOVE was issued is aborted for any reason, whether or not the C-STORE sub-operations continue is dependent on the remote AE; the local STORAGE-SCP will continue to accept associations and storage operations regardless.

4.2.5.4 Association Acceptance Policy

RETRIEVE-SCU does not accept associations.

4.3 Physical Network Interfaces

4.3.1 Supported Communication Stacks

EBMJ Server DICOM AEs provide DICOM 3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.3.1.1 TCP/IP Stack

EBMJ Server DICOM AEs inherit their TCP/IP stack from the Windows Operating System upon which they execute.

4.3.2 PHYSICAL NETWORK SUPPORT Physical Network Interface

The EBMJ Server supports a single network interface. One of the following physical network interfaces will be available depending on installed hardware options:

Table 4.3-1

SUPPORTED PHYSICAL NETWORK INTERFACES

Ethernet 1000baseT
Ethernet 100baseTX

4.3.3 Additional Protocols

EBMJ Server does not support additional protocols.

4.4 Configuration

4.4.1 AE Title/Presentation Address Mapping

4.4.1.1 Local AE Titles

The mapping from AE Title to TCP/IP addresses and ports is configurable and set at the time of installation by Installation Personnel.

Table 4.4-1

DEFAULT APPLICATION ENTITY CHARACTERISTICS

Application Entity	Role	Default AE Title	Default TCP/IP Port
STORAGE-SCU	SCU	EBMJ Server	None
STORAGE-SCP	SCP		104
QUERY-RETRIEVE-SCP	SCP		

4.4.1.2 Remote AE Title/Presentation Address Mapping

The mapping of external AE Titles to TCP/IP addresses and ports is configurable and

set at the time of installation by Installation Personnel. This mapping is necessary for resolving the IP address and port of C-MOVE Destination Application Entities and must be correctly configured for the QUERY-RETRIEVE-SCP AE to correctly function as a C-MOVE SCP.

4.4.2 Default Parameters

Table 4.4-2
DEFAULT PARAMETERS

Parameter	Configurable	Default Value
General Parameters		
Maximum PDU size I can receive	Yes	64kbytes
Maximum PDU size I can send	Yes	64kbytes
Time-out waiting for A-ASSOCIATE RQ PDU on open TCP/IP connection. (ARTIM timeout)	No	5 minutes
Time-out waiting for acceptance or rejection response to an Association Open Request. (Application Level timeout)	No	5 minutes
STORAGE-SCU AE Parameters		
STORAGE-SCU AE time-out waiting for a Response to a C-STORE-RQ. (DIMSE timeout)	No	5 minutes
STORAGE-SCU AE number of times a failed send job to a C-MOVE Destination is automatically retried.	No	0
STORAGE-SCP AE Parameters		
STORAGE-SCP AE time-out waiting on an open Association for the next Request message (C-STORE-RQ, Association Close Request. etc.) (DIMSE timeout)	No	5 minutes
QUERY-RETRIEVE-SCP AE Parameters		
QUERY-RETRIEVE-SCP AE time-out waiting on an open Association for the next message (C-FIND-RQ, C-MOVE-RQ, Association Close Request. etc.) (DIMSE timeout)	No	5 minutes

5. Media Storage

EBMJ Server does not support Media Storage.

6. Support for Extended Character Sets

In addition to DICOM default character set ISO 2022 IR 6, EBMJ Server supports the following Japanese character sets for all SOP Classes and both SCU and SCP roles:
ISO 2022 IR 13 Japanese katakana (phonetic) characters (94 characters)

ISO 2022 IR 87	Japanese kanji (ideographic), hiragana (phonetic), and katakana (phonetic) characters (942 characters, 2-byte)
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7. Security

The EBMJ Server does not support any of the DICOM Security profiles.