

The background of the page is white with various grey icons scattered throughout. These include a padlock, a globe, a circular arrow, a double-headed arrow, a star, and a database cylinder. A large, thick grey arrow points from the top left towards the right side of the page.

# DICOM Conformance Statement

## Dicom Systems Unifier Enterprise Imaging Platform

Version 1.2 | (August 15, 2019)

## F.1 CONFORMANCE STATEMENT OVERVIEW

The DCMSYS ROUTER is a self-contained networked computer system used for archiving diagnostic medical images. It allows external systems to send images to it for permanent storage, retrieve information about such images, and retrieve the images themselves. The system conforms to the DICOM standard 2014B to allow the sharing of medical information with other digital imaging systems.

Table F.1-1  
NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)	UID
Verification			
Verification – ECHO	Yes	Yes	1.2.840.10008.1.1
Transfer			
Ambulatory ECG Waveform Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.9.1.3
Arterial Pulse Waveform Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.9.5.1
Autorefraction Measurements Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.78.2
Basic Structured Display Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.131
Basic Text SR Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.11
Basic Voice Audio Waveform Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.9.4.1
Blending Softcopy Presentation State Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.11.4
Breast Projection XRay Image Storage For Presentation	Yes	Yes	1.2.840.10008.5.1.4.1.1.13.1.4
Breast Projection XRay Image Storage For Processing	Yes	Yes	1.2.840.10008.5.1.4.1.1.13.1.5
Breast Tomosynthesis Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.13.1.3
CT Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.2
CT Image Storage (DICOS)	Yes	Yes	1.2.840.10008.5.1.4.1.1.501.1
Cardiac Electrophysiology Waveform Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.9.3.1
Chest CAD SR Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.65
Colon CAD SR Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.69
Color Softcopy Presentation State Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.11.2
Comprehensive SR Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.33
Comprehensive 3D SR Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.34

Computed Radiography Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.1
Corneal Topography Map Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.82.1
Deformable Spatial Registration Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.66.3
Digital Intra Oral XRay Image Storage For Presentation	Yes	Yes	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra Oral XRay Image Storage For Processing	Yes	Yes	1.2.840.10008.5.1.4.1.1.1.3.1
Digital Mammography XRay Image Storage For Presentation	Yes	Yes	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography XRay Image Storage For Processing	Yes	Yes	1.2.840.10008.5.1.4.1.1.1.2.1
Digital XRay Image Storage For Presentation	Yes	Yes	1.2.840.10008.5.1.4.1.1.1.1
Digital XRay Image Storage For Presentation (DICOS)	Yes	Yes	1.2.840.10008.5.1.4.1.1.501.2.1
Digital XRay Image Storage For Processing	Yes	Yes	1.2.840.10008.5.1.4.1.1.1.1.1
Digital XRay Image Storage For Processing (DICOS)	Yes	Yes	1.2.840.10008.5.1.4.1.1.501.2.2
Eddy Current Image Storage (DICONDE)	Yes	Yes	1.2.840.10008.5.1.4.1.1.601.1
Eddy Current Multiframe Image Storage (DICONDE)	Yes	Yes	1.2.840.10008.5.1.4.1.1.601.2
Encapsulated CDA Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.104.2
Encapsulated PDF Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.104.1
Enhanced CT Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.2.1
Enhanced MR Color Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.4.3
Enhanced MR Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.4.1
Enhanced PET Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.130
Enhanced SR Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.22
Enhanced US Volume Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.6.2
Enhanced XA Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.12.1.1
Enhanced XRF Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.12.2.1
General Audio Waveform Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.9.4.2
General ECG Waveform Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.9.1.2
Generic Implant Template Storage	Yes	Yes	1.2.840.10008.5.1.4.43.1
Grayscale Softcopy Presentation State Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.11.1

Hardcopy Color Image Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.1.1.30
Hardcopy Grayscale Image Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.1.1.29
Hemodynamic Waveform Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.9.2.1
Implant Assembly Template Storage	Yes	Yes	1.2.840.10008.5.1.4.44.1
Implant Template Group Storage	Yes	Yes	1.2.840.10008.5.1.4.45.1
Implantation Plan SR Document Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.70
Intraocular Lens Calculations Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.78.8
Intravascular Optical Coherence Tomography Image Storage For Presentation	Yes	Yes	1.2.840.10008.5.1.4.1.1.14.1
Intravascular Optical Coherence Tomography Image Storage For Processing	Yes	Yes	1.2.840.10008.5.1.4.1.1.14.2
Keratometry Measurements Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.78.3
Key Object Selection Document Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.59
Legacy Converted Enhanced CT Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.2.2
Legacy Converted Enhanced MR Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.4.4
Legacy Converted Enhanced PET Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.128.1
Lensometry Measurements Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.78.1
MR Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.4
MR Spectroscopy Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.4.2
Macular Grid Thickness And Volume Report Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.79.1
Mammography CAD SR Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.50
Multiframe Grayscale Byte Secondary Capture Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.7.2
Multiframe Grayscale Word Secondary Capture Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.7.3
Multiframe Single Bit Secondary Capture Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.7.1
Multiframe True Color Secondary Capture Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.7.4
Nuclear Medicine Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.20
Nuclear Medicine Image Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.4.1.1.5
Ophthalmic Axial Measurements Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.78.7
Ophthalmic Photography 16Bit Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.5.2

Ophthalmic Photography 8Bit Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.5.1
Ophthalmic Thickness Map Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.81.1
Ophthalmic Tomography Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.5.4
Ophthalmic Visual Field Static Perimetry Measurements Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.80.1
Positron Emission Tomography Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.128
Procedure Log Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.40
Pseudo Color Softcopy Presentation State Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.11.3
RT Beams Delivery Instruction Storage	Yes	Yes	1.2.840.10008.5.1.4.34.7
RT Beams Delivery Instruction Storage (Draft)	Yes	Yes	1.2.840.10008.5.1.4.34.1
RT Beams Treatment Record Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.481.4
RT Brachy Treatment Record Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.481.6
RT Dose Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.481.2
RT Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.481.1
RT Ion Beams Treatment Record Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.481.9
RT Ion Plan Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.481.8
RT Plan Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.481.5
RT Structure Set Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.481.3
RT Treatment Summary Record Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.481.7
Radiopharmaceutical Radiation Dose SR Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.68
Raw Data Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.66
Real World Value Mapping Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.67
Respiratory Waveform Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.9.6.1
SR Audio Storage (Draft)	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.2
SR Comprehensive Storage (Draft)	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.4
SR Detail Storage (Draft)	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.3
SR Text Storage (Draft)	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.1
Secondary Capture Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.7
Segmentation Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.66.4
Spatial Fiducials Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.66.2
Spatial Registration Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.66.1

Spectacle Prescription Report Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.78.6
Standalone Curve Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.4.1.1.9
Standalone Modality LUT Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.4.1.1.10
Standalone Overlay Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.4.1.1.8
Standalone PET Curve Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.4.1.1.129
Standalone VOI LUT Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.4.1.1.11
Stereometric Relationship Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.5.3
Stored Print Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.1.27
Subjective Refraction Measurements Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.78.4
Surface Scan Mesh Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.68.1
Surface Scan Point Cloud Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.68.2
Surface Segmentation Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.66.5
Threat Detection Report Storage (DICOS)	Yes	Yes	1.2.840.10008.5.1.4.1.1.501.3
Twelve Lead ECG Waveform Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.9.1.1
Ultrasound Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Image Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.4.1.1.6
Ultrasound Multiframe Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.3.1
Ultrasound Multiframe Image Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.4.1.1.3
VL Endoscopic Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.1
VL Image Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1
VL Microscopic Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.2
VL Multi Frame Image Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.2
VL Photographic Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.4
VL Slide Coordinates Microscopic Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.3
VL Whole Slide Microscopy Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.6
Video Endoscopic Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.1.1
Video Microscopic Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.2.1
Video Photographic Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.77.1.4.1
Visual Acuity Measurements Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.78.5
Waveform Storage (Draft)	Yes	Yes	1.2.840.10008.5.1.4.1.1.9.1
XA XRF Grayscale Softcopy Presentation State	Yes	Yes	1.2.840.10008.5.1.4.1.1.11.5

Storage			
XRay Angiographic Bi Plane Image Storage (Retired)	Yes	Yes	1.2.840.10008.5.1.4.1.1.12.3
XRay Angiographic Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.12.1
XRay Radiation Dose SR Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.88.67
XRay Radiofluoroscopic Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.12.2
Xray 3D Angiographic Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.13.1.1
Xray 3D Craniofacial Image Storage	Yes	Yes	1.2.840.10008.5.1.4.1.1.13.1.2
Query/Retrieve			
Patient Root Q/R - FIND	Yes	Yes	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Q/R - MOVE	Yes	Yes	1.2.840.10008.5.1.4.1.2.1.2
Patient Root Q/R - GET	Yes	Yes	1.2.840.10008.5.1.4.1.2.1.3
Study Root Q/R - FIND	Yes	Yes	1.2.840.10008.5.1.4.1.2.2.1
Study Root Q/R - MOVE	Yes	Yes	1.2.840.10008.5.1.4.1.2.2.2
Study Root Q/R – GET	Yes	Yes	1.2.840.10008.5.1.4.1.2.2.3
Worklist			
Modality Worklist - FIND	Yes	Yes	1.2.840.10008.5.1.4.31
Modality Worklist – FIND (Retired)	No	Yes	1.2.840.10008.5.1.4.32.1
Storage Commitment			
Storage Commitment Push Model	Yes	Yes	1.2.840.10008.1.20.1

NOTE: Relational Queries are not supported either as an SCU or SCP.

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### F.3 INTRODUCTION

#### F.3.1 Revision History

Document Version	Date	Author	Description
1.2	August 15 <sup>th</sup> , 2019	DCMSYS	Fix typo and add latest DICOM and DICOMWEB references
1.1-A1	December 13, 2014	DCMSYS	Update to the latest standard requirements
1.1-A0	September 18, 2009	DCMSYS	Production release
1.0	August 01, 2008	DCMSYS	First Draft

#### F.3.2 Audience, Remarks, TERMS and Definitions, Basics of DICOM Communication, Abbreviations, REFERENCES

*See example text in Annex A.3.*

#### F.3.3 ADDITIONAL REMARKS FOR THIS DOCUMENT

This document is a Dicom Systems DICOM Conformance Statement created for DICOM PS3.2. If certain SOPs are not described Dicom Systems still accept and process those. Dicom Systems is fully compliant with DICOM PS3.2. Please see the reference <http://dicom.nema.org/medical/dicom/current/output/html/part18.html>

Dicom Systems support DICOMWEB. The term DICOMweb™ is used to designate the RESTful Web Services described below. Please refer to Dicom Systems API documentation for the specific examples including authentication.

References: <https://www.dicomstandard.org/dicomweb/>

[http://dicom.nema.org/medical/dicom/current/output/html/part18.html#sect\\_7.1.2](http://dicom.nema.org/medical/dicom/current/output/html/part18.html#sect_7.1.2)

**F.4 NETWORKING**

F.4.1 Implementation Model

F.4.1.1 Application Data Flow

The division of DCMSYS ROUTER 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.

By default all of the defined Application Entities have different AE Titles. However, DCMSYS ROUTER can be configured so that the QUERY-RETRIEVE-SCP AE and STORAGE-SCU AE share the same Application Entity Title. However, the QUERY-RETRIEVE-SCP AE and STORAGE-SCP AE must have separate Application Entity Titles.

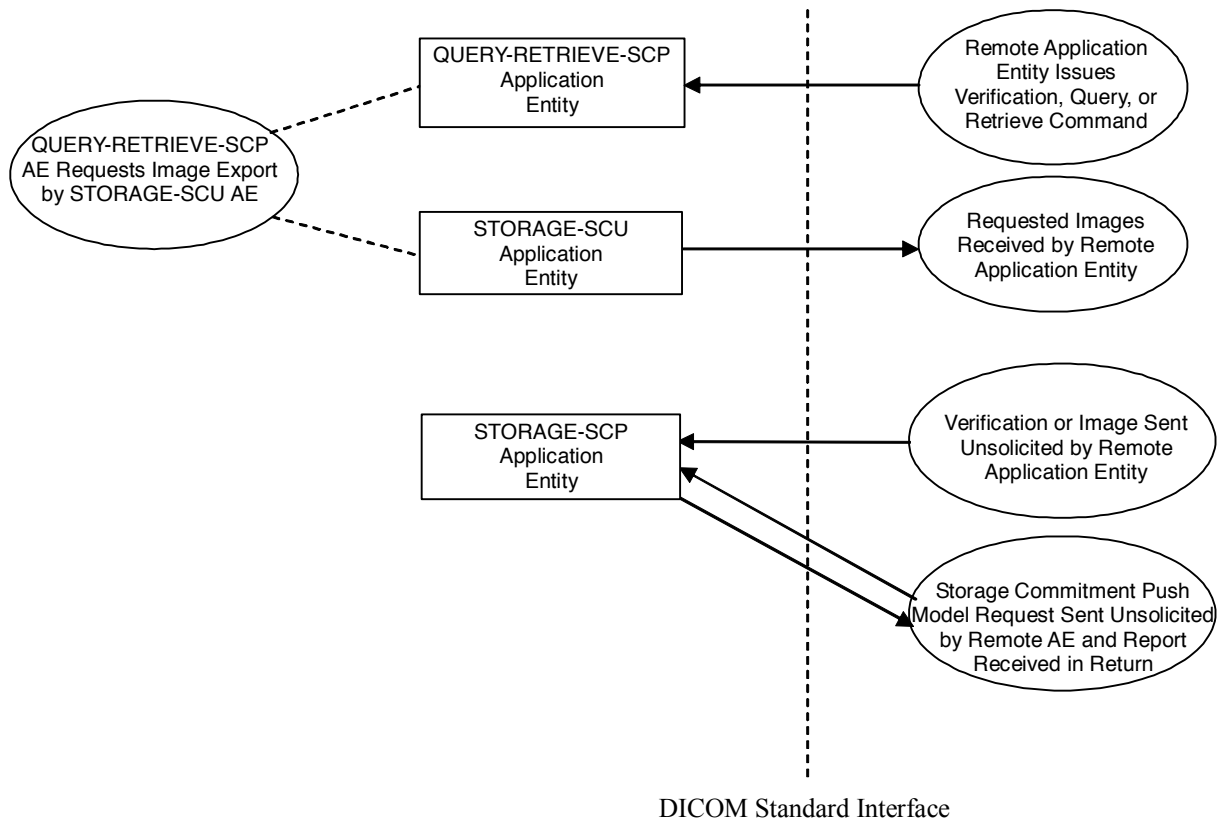


Figure F.4.1-1  
DCMSYS ROUTER DICOM DATA FLOW DIAGRAM

The Application Entities detailed in the Application Data Flow Diagram are all Windows NT 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. (Note that in this example Conformance Statement this STORAGE-SCU AE does not allow a Local User to request that images be sent to a Remote AE. If a 'real' AE does allow this then this should be mentioned here and in the other appropriate areas of the Conformance Statement).
- 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 DCMSYS ROUTER database. It can respond to external Storage and Verification Requests as a Service Class Provider (SCP) for C-STORE and C-ECHO requests. The STORAGE-SCP AE can also handle Storage Commitment Push Model Requests. It can thus be used to query whether the DCMSYS ROUTER will confirm ownership and responsibility for specific Composite SOP Instances. The STORAGE-SCP AE currently only supports image type Composite SOP Instances.

#### F.4.1.2 Functional Definition of AEs

##### F.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 host 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 compression is preferred.

##### F.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 DCMSYS ROUTER 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.

##### F.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, Storage, and Storage Commitment Service Classes. Any images received on such Presentation Contexts will be added to the DCMSYS ROUTER database. If a Storage Commitment Push Model N-ACTION Request is received then the STORAGE-COMMITMENT-SCP AE will immediately check if the referenced Composite SOP Instances are in the DCMSYS ROUTER database and return an N-EVENT-REPORT Notification. It will never 'cache' Storage Commitment Push Model Requests and wait for Composite SOP Instances to be received at a later time.

F.4.1.3 Sequencing of Real-World Activities

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

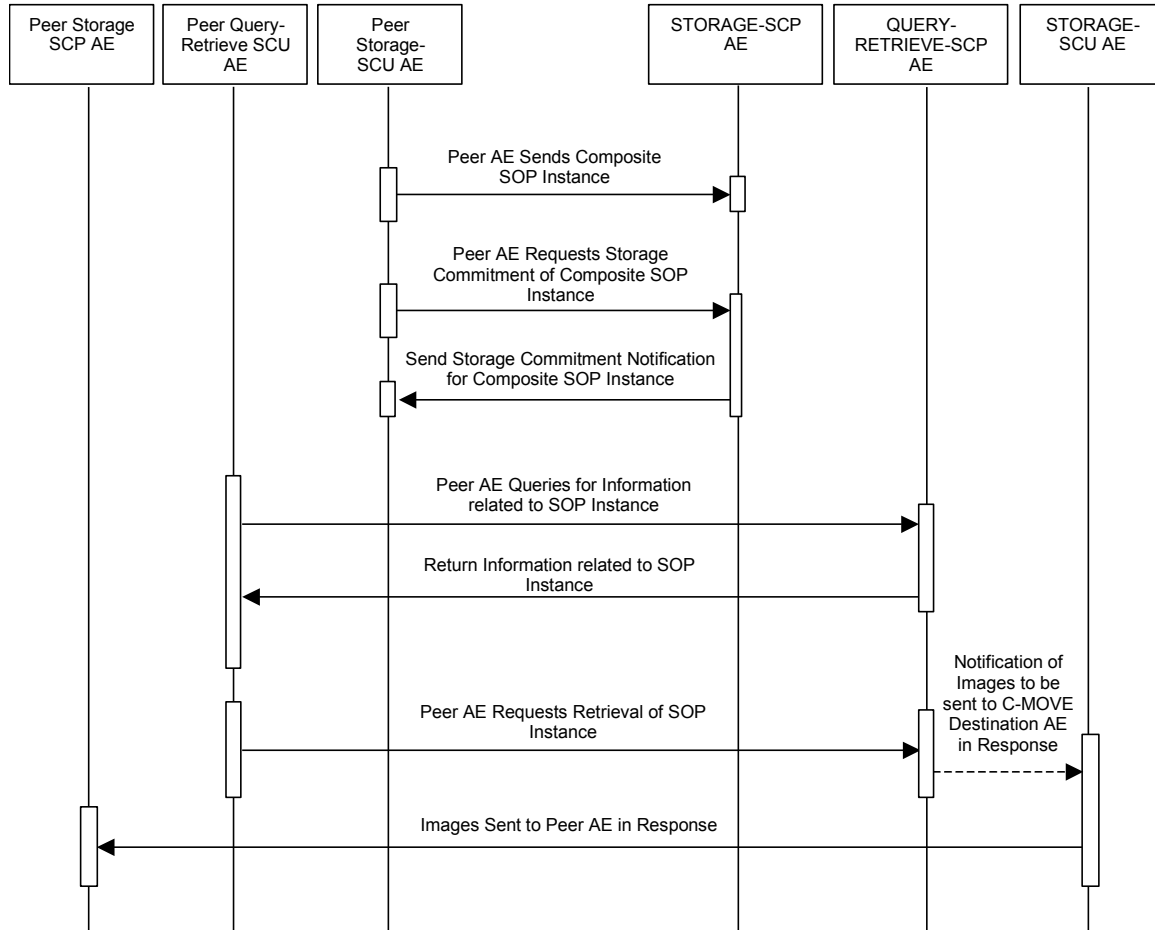


Figure F.4.1-2 SEQUENCING CONSTRAINTS

Note that the only constraint is for the Composite SOP Instance to be received prior to the other events. For example, it is not necessary for the Storage Commitment Push Model Request to be received prior to receiving Query or Retrieval Requests related to the SOP Instance.

F.4.2 AE Specifications

F.4.2.1 STORAGE-SCU Application Entity Specification

F.4.2.1.1 SOP Classes

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

Table F.4.2-1 SOP CLASSES FOR STORAGE-SCU AE

SOP Class Name	SOP Class UID	SCU
Verification	1.2.840.10008.1.1	Yes

Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes
Arterial Pulse Waveform Storage	1.2.840.10008.5.1.4.1.1.9.5.1	Yes
Autorefractometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.2	Yes
Basic Structured Display Storage	1.2.840.10008.5.1.4.1.1.131	Yes
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	Yes
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	Yes
Breast Projection XRay Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.13.1.4	Yes
Breast Projection XRay Image Storage For Processing	1.2.840.10008.5.1.4.1.1.13.1.5	Yes
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes
CT Image Storage (DICOS)	1.2.840.10008.5.1.4.1.1.501.1	Yes
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65	Yes
Colon CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.69	Yes
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Yes
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes
Comprehensive 3D SR Storage	1.2.840.10008.5.1.4.1.1.88.34	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes
Corneal Topography Map Storage	1.2.840.10008.5.1.4.1.1.82.1	Yes
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3	Yes
Digital Intra Oral XRay Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes
Digital Intra Oral XRay Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes
Digital Mammography XRay Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes
Digital Mammography XRay Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes
Digital XRay Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes
Digital XRay Image Storage For Presentation (DICOS)	1.2.840.10008.5.1.4.1.1.501.2.1	Yes

Digital XRay Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes
Digital XRay Image Storage For Processing (DICOS)	1.2.840.10008.5.1.4.1.1.501.2.2	Yes
Eddy Current Image Storage (DICONDE)	1.2.840.10008.5.1.4.1.1.601.1	Yes
Eddy Current Multiframe Image Storage (DICONDE)	1.2.840.10008.5.1.4.1.1.601.2	Yes
Encapsulated CDA Storage	1.2.840.10008.5.1.4.1.1.104.2	Yes
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes
Enhanced MR Color Image Storage	1.2.840.10008.5.1.4.1.1.4.3	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes
Enhanced PET Image Storage	1.2.840.10008.5.1.4.1.1.130	Yes
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes
Enhanced US Volume Storage	1.2.840.10008.5.1.4.1.1.6.2	Yes
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Yes
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Yes
General Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.2	Yes
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes
Generic Implant Template Storage	1.2.840.10008.5.1.4.43.1	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes
Hardcopy Color Image Storage (Retired)	1.2.840.10008.5.1.1.30	Yes
Hardcopy Grayscale Image Storage (Retired)	1.2.840.10008.5.1.1.29	Yes
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes
Implant Assembly Template Storage	1.2.840.10008.5.1.4.44.1	Yes
Implant Template Group Storage	1.2.840.10008.5.1.4.45.1	Yes
Implantation Plan SR Document Storage	1.2.840.10008.5.1.4.1.1.88.70	Yes
Intraocular Lens Calculations Storage	1.2.840.10008.5.1.4.1.1.78.8	Yes
Intravascular Optical Coherence Tomography Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.14.1	Yes
Intravascular Optical Coherence Tomography Image Storage For Processing	1.2.840.10008.5.1.4.1.1.14.2	Yes
Keratometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.3	Yes
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	Yes

Legacy Converted Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.2	Yes
Legacy Converted Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.4	Yes
Legacy Converted Enhanced PET Image Storage	1.2.840.10008.5.1.4.1.1.128.1	Yes
Lensometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.1	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes
Macular Grid Thickness And Volume Report Storage	1.2.840.10008.5.1.4.1.1.79.1	Yes
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	Yes
Multiframe Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes
Multiframe Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes
Multiframe Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes
Multiframe True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	Yes
Ophthalmic Axial Measurements Storage	1.2.840.10008.5.1.4.1.1.78.7	Yes
Ophthalmic Photography16Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Yes
Ophthalmic Photography8Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes
Ophthalmic Thickness Map Storage	1.2.840.10008.5.1.4.1.1.81.1	Yes
Ophthalmic Tomography Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.4	Yes
Ophthalmic Visual Field Static Perimetry Measurements Storage	1.2.840.10008.5.1.4.1.1.80.1	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	Yes
Pseudo Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	Yes
RT Beams Delivery Instruction Storage	1.2.840.10008.5.1.4.34.7	Yes
RT Beams Delivery Instruction Storage (Draft)	1.2.840.10008.5.1.4.34.1	Yes
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes

RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	Yes
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes
Radiopharmaceutical Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.68	Yes
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Yes
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67	Yes
Respiratory Waveform Storage	1.2.840.10008.5.1.4.1.1.9.6.1	Yes
SR Audio Storage (Draft)	1.2.840.10008.5.1.4.1.1.88.2	Yes
SR Comprehensive Storage (Draft)	1.2.840.10008.5.1.4.1.1.88.4	Yes
SR Detail Storage (Draft)	1.2.840.10008.5.1.4.1.1.88.3	Yes
SR Text Storage (Draft)	1.2.840.10008.5.1.4.1.1.88.1	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Yes
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Yes
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes
Spectacle Prescription Report Storage	1.2.840.10008.5.1.4.1.1.78.6	Yes
Standalone Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.9	Yes
Standalone Modality LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.10	Yes
Standalone Overlay Storage (Retired)	1.2.840.10008.5.1.4.1.1.8	Yes
Standalone PET Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.129	Yes
Standalone VOI LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.11	Yes
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Yes
Stored Print Storage (Retired)	1.2.840.10008.5.1.1.27	Yes
Subjective Refraction Measurements Storage	1.2.840.10008.5.1.4.1.1.78.4	Yes
Surface Scan Mesh Storage	1.2.840.10008.5.1.4.1.1.68.1	Yes
Surface Scan Point Cloud Storage	1.2.840.10008.5.1.4.1.1.68.2	Yes
Surface Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.5	Yes



Threat Detection Report Storage (DICOS)	1.2.840.10008.5.1.4.1.1.501.3	Yes
Twelve Lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes
Ultrasound Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes
Ultrasound Multiframe Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes
VL Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.1	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes
VL Multi Frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.2	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes
VL Slide Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes
Visual Acuity Measurements Storage	1.2.840.10008.5.1.4.1.1.78.5	Yes
Waveform Storage (Draft)	1.2.840.10008.5.1.4.1.1.9.1	Yes
XA XRF Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.5	Yes
XRy Angiographic Bi Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Yes
XRy Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes
XRy Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes
XRy Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes
XRy 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Yes
XRy 3D Craniofacial Image Storage	1.2.840.10008.5.1.4.1.1.13.1.2	Yes

STORAGE-SCU AE can be configured to use the retired US Image objects (US Image Storage, 1.2.840.10008.5.1.4.1.1.6, and US Multi-frame Storage, 1.2.840.10008.5.1.4.1.1.3) rather than the current US SOP Classes for ultrasound images or vice-versa, making any necessary changes to make the transformed image objects conformant to the corresponding SOP Class. This is only done if the external Storage SCP AE does not support the SOP Instance's original SOP Class.

By altering the configuration it is possible to support additional or fewer SOP Classes.

F.4.2.1.2 Association Establishment Policies

F.4.2.1.2.1 General

The STORAGE-SCU AE can only form Associations when requested to do so by the QUERY-RETRIEVE-SCP AE. 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 is always proposed:

Table F.4.2-2  
DICOM APPLICATION CONTEXT FOR STORAGE-SCU AE

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

F.4.2.1.2.2 Number of Associations

The maximum number of simultaneous Associations is configurable, but is usually limited to a maximum of 10. This configuration largely depends on whether relatively quick response to multiple simultaneous C-MOVE Destination AE's is required or maximum throughput performance is required. If the latter is the case, then no simultaneous Associations are permitted, in order to reduce disk thrashing and thus maximize throughput. The STORAGE-SCU AE can initiate simultaneous Associations to a given external C-MOVE Destination AE up to the maximum number configured. There is no separate limit on the maximum number permitted to the same C-MOVE Destination 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 F.4.2-3  
NUMBER OF ASSOCIATIONS AS A SCU FOR STORAGE-SCU AE

Maximum number of simultaneous Associations	10 (Configurable)
---	-------------------

F.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 F.4.2-4  
ASYNCHRONOUS NATURE AS A SCU FOR STORAGE-SCU AE

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

F.4.2.1.2.4 Implementation Identifying Information

Table F.4.2-5  
DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGE-SCU AE

Implementation Class UID	1.3.6.1.4.1.29565.0.1.1.8
Implementation Version Name	DCMSYS_RTR_118

Note that the STORAGE-SCU AE and QUERY-RETRIEVE-SCP AE use the same Implementation Class UID. All DCMSYS ROUTER AE's use the same Implementation Version Name. This Version Name is updated with each

new release of the product software, as the different AE versions are never released independently.

F.4.2.1.3 Association Initiation Policy

F.4.2.1.3.1 Activity – Send Images Requested by an External Peer AE

F.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.

Note that the STORAGE-SCU AE does not support the unsolicited sending of SOP Instances using the DICOM Storage Service Class. It will only send SOP Instances in response to a C-MOVE Request from a peer AE.

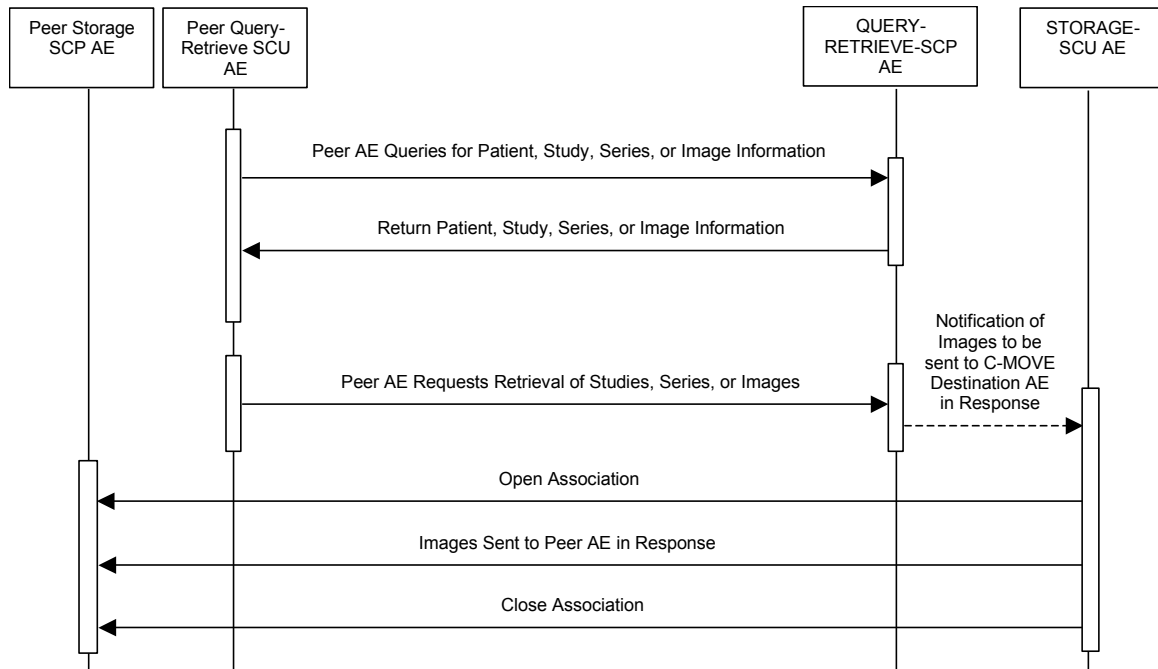


Figure F.4.2-1  
SEQUENCING OF ACTIVITY - SEND IMAGES REQUESTED BY AN EXTERNAL PEER AE

The following sequencing constraints illustrated in Figure F.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.

F.4.2.1.3.1.2 Proposed Presentation Contexts

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

Table F.4.2-6  
PROPOSED PRESENTATION CONTEXTS BY THE STORAGE-SCU AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCU	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCU	None
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCU	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCU	None
Computer Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Computer Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCU	None

Note: The SOP Classes and Transfer Syntaxes that the STORAGE-SCU AE proposes, as listed above, represent the default behavior. The STORAGE-SCU AE can be configured to propose a subset of these contexts or additional Presentation Contexts. Also, the default Behavior is to propose just a single Transfer Syntax per Presentation Context. However, this can be altered so that every proposed Presentation Context has a unique SOP Class and one or more Transfer Syntaxes. That is, the default behavior is to determine the Transfer Syntaxes the SCP can accept as opposed to which it prefers.

F.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.

F.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 DCMSYS ROUTER database. The entire set of tags received with the image will be saved in DCMSYS ROUTER; this includes all Private and SOP Extended Elements. When a SOP Instance is selected for export from DCMSYS ROUTER, 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

DCMSYS ROUTER 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, or from HL7 messaging. The replacement behavior depends on which specific DICOM and HL7 services are supported. Also, this behavior is configurable. Values can be altered without changing the SOP Instance UID unless otherwise noted. Refer to the Annex for the specific details of which Elements can have their values altered at time of export.

The DCMSYS ROUTER creates files called Service 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 Service Logs. In addition, error messages may be output as alerts to the User Interface in certain cases.

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 F.4.2-7  
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 the appropriate PENDING or SUCCESS Status in the C-MOVE Response.  Success indication message is output to the Service Logs.  No message is posted to the User Interface.
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 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 Service Logs.  No message is posted to the User Interface.
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 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 Service Logs.  No message is posted to the User Interface.
Error	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 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 Service Logs.  No message is posted to the User Interface.
Warning	Coercion of Data Elements	B000	Image transmission is considered successful. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response.  Warning indication message is output to the Service Logs.  No message is posted to the User Interface.

Warning	Data Set does not match SOP Class	B007	Image transmission is considered successful. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response. Warning indication message is output to the Service Logs. No message is posted to the User Interface.
Warning	Elements Discarded	B006	Image transmission is considered successful. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response. Warning indication message is output to the Service Logs. No message is posted to the User Interface.
Warning	Attribute List Error	0107	Image transmission is considered successful. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response. Warning indication message is output to the Service Logs. No message is posted to the User Interface.
Warning	Attribute Value Out of Range	0116	Image transmission is considered successful. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response. Warning indication message is output to the Service Logs. No message is posted to the User Interface.
*	*	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 Service Logs. No message is posted to the User Interface.

All Status Codes indicating an error or refusal are treated as a permanent failure. The STORAGE-SCU AE never automatically resends images 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 F.4.2-8  
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

	<p>appropriate Status in the C-MOVE Response.</p> <p>Error indication message is output to the Service Logs.</p> <p>No message is posted to the User Interface.</p>
<p>Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout).</p>	<p>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.</p> <p>Error indication message is output to the Service Logs.</p> <p>No message is posted to the User Interface.</p>
<p>Association A-ABORTed by the SCP or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)</p>	<p>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.</p> <p>Error indication message is output to the Service Logs.</p> <p>No message is posted to the User Interface.</p>

F.4.2.1.4 Association Acceptance Policy

The STORAGE-SCU AE does not accept Associations.

F.4.2.2 QUERY-RETRIEVE-SCP Application Entity Specification

F.4.2.2.1 SOP Classes

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

Table F.4.2-9  
SOP CLASSES FOR QUERY-RETRIEVE-SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Patient Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	No	Yes
Patient Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	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

F.4.2.2.2 Association Policies

F.4.2.2.2.1 General

The QUERY-RETRIEVE-SCP AE will never initiate Associations; it only accepts Association Requests from external DICOM AEs. 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 F.4.2-10  
DICOM APPLICATION CONTEXT FOR QUERY-RETRIEVE-SCP AE

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



F.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 set by configuration. The default maximum is 10 in total. The maximum number of simultaneous Associations can be either an absolute number or a maximum number for each requesting external Application Entity. The latter flexibility can be useful if communication with one external AE is unreliable and one does not wish ‘hung’ connections with this AE to prevent Associations with other client AEs.

Table F.4.2-11  
NUMBER OF SIMULTANEOUS ASSOCIATIONS AS A SCP FOR QUERY-RETRIEVE-SCP AE

Maximum number of simultaneous Associations	10 (Configurable)
---	-------------------

F.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 F.4.2-12  
ASYNCHRONOUS NATURE AS A SCP FOR QUERY-RETRIEVE-SCP AE

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

F.4.2.2.2.4 Implementation Identifying Information

The implementation information for the Application Entity is:

Table F.4.2-13  
DICOM IMPLEMENTATION CLASS AND VERSION FOR QUERY-RETRIEVE-SCP AE

Implementation Class UID	1.840.xxxxxxx.yyy.etc...
Implementation Version Name	EX_VERS_01

Note that the STORAGE-SCU AE, and QUERY-RETRIEVE-SCP AE use the same Implementation Class UID. All DCMSYS ROUTER AE’s use the same Implementation Version Name. This Version Name is updated with each new release of the product software, as the different AE versions are never released independently.

F.4.2.2.3 Association Initiation Policy

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

F.4.2.2.4 Association Acceptance Policy

F.4.2.2.4.1 Activity – Handling Query and Retrieval Requests

F.4.2.2.4.1.1 Description and Sequencing of 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 hosts (using TCP/IP address) and/or 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 a 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.

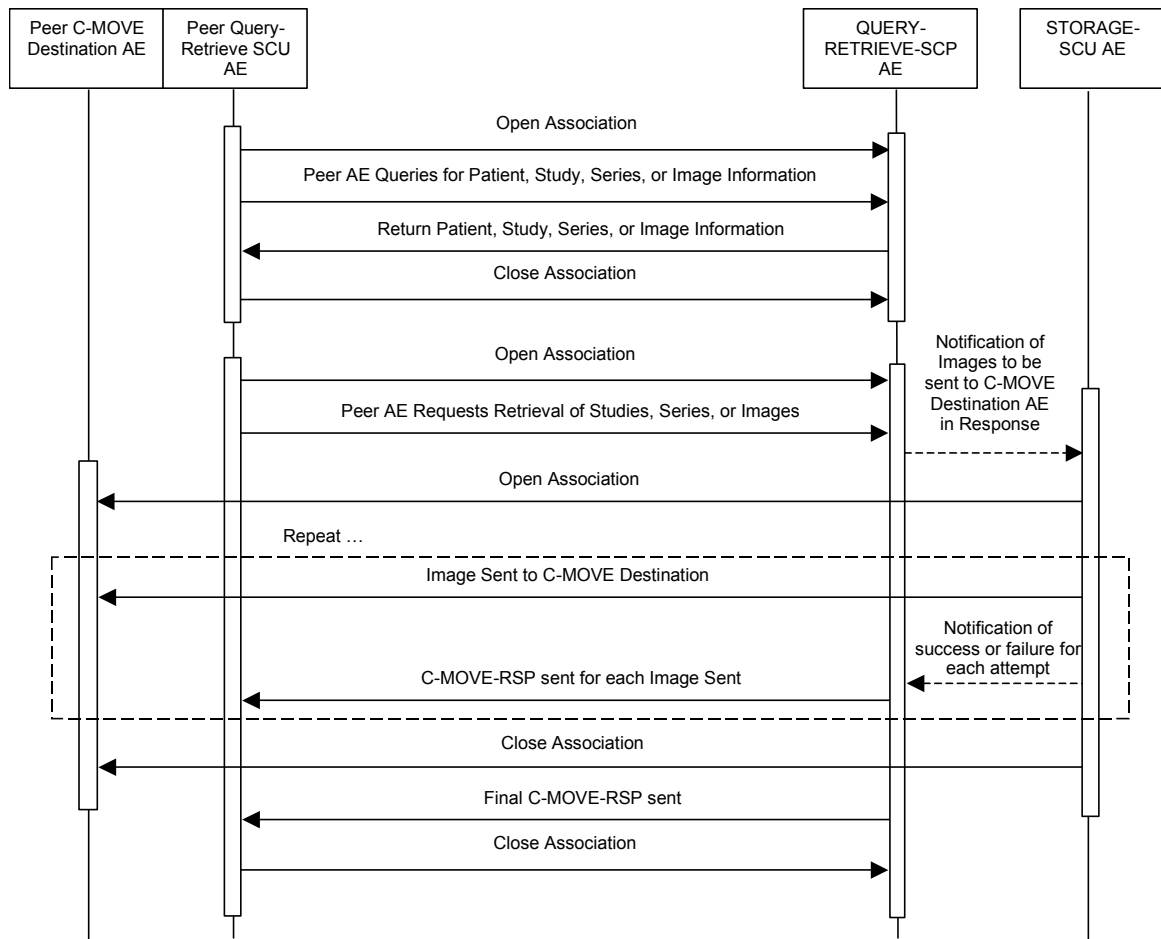


Figure F.4.2-2  
 SEQUENCING OF ACTIVITY – HANDLING QUERY AND RETRIEVAL REQUESTS

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

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

3. QUERY-RETRIEVE-SCP AE 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 F.4.2-2 apply to the QUERY-RETRIEVE-SCP AE for handling retrievals (C-MOVE-Requests):

1. Peer AE opens an Association with the QUERY-RETRIEVE-SCP AE.
2. Peer AE sends a C-MOVE-RQ Message
3. QUERY-RETRIEVE-SCP AE 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 the table below. 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 F.4.2-14  
ASSOCIATION REJECTION REASONS

Result	Source	Reason/Diag	Explanation
2 – rejected-transient	c	2 – local-limit-exceeded	The (configurable) 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	1 – temporary-congestion	No Associations can be accepted at this time due to the real-time requirements of higher priority activities (e.g. during image acquisition no Associations will be accepted) or because insufficient resources are available (e.g. memory, processes, threads). An Association request with the same parameters may succeed at a later time.
1 – rejected-permanent	a	2 – application-context-name-not-	The Association request contained an unsupported Application Context Name. An association request with the same parameters

		supported	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.

F.4.2.2.4.1.2 Accepted Presentation Contexts

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

Table F.4.2-15  
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	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Patient Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Patient Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

F.4.2.2.4.1.3 SOP Specific Conformance for Query SOP Classes

The QUERY-RETRIEVE-SCP AE supports hierarchical queries and not relational queries. There are no attributes always returned by default. Only those attributes requested in the query identifier are returned. Query responses always return values from the DCMSYS ROUTER 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.

Patient Root Information Model

All required search keys on each of the four levels (Patient, Study, Series, and Image) are supported. However, the Patient ID (0010,0020) key must have at least a partial value if the Patient's Name (0010,0010) is not present in a Patient Level query.

Study Root Information Model

All the required search keys on each of the three levels (Study, Series, and Image) are supported. If no partial values are specified for Study attributes then either the Patient ID (0010,0020) key or the Patient's Name (0010,0010) must have at least a partial value specified.

Table F.4.2-16  
PATIENT ROOT C-FIND SCP SUPPORTED ELEMENTS

Level Name Attribute Name	Tag	VR	Types of Matching
SOP Common Specific Character Set	0008,0005	CS	NONE
Patient 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
Other Patient IDs	0010,1000	LO	NONE
Other Patient Names	0010,1001	PN	NONE
Study Level			
Study Date	0008,0020	DA	S,R,U
Study Time	0008,0030	TM	R,U
Accession Number	0008,0050	SH	S,*,U
Study ID	0020,0010	SH	S,*,U
Study Instance UID	0020,000D	UI	S,U,L
Referring Physician's Name	0008,0090	PN	S,*,U
Study Description	0008,1030	LO	S,*,U
Series Level			
Modality	0008,0060	CS	S,U
Series Number	0020,0011	IS	S,*,U
Series Instance UID	0020,000E	UI	S,U,L
Operator's Name	0008,1070	PN	NONE
Image Level			
Instance Number	0020,0013	IS	S,*,U
SOP Instance UID	0008,0018	UI	S,U,L

Table F.4.2-17  
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
Other Patient IDs	0010,1000	LO	NONE
Other Patient Names	0010,1001	PN	NONE
Study Date	0008,0020	DA	S,R,U
Study Time	0008,0030	TM	R,U
Accession Number	0008,0050	SH	S,*,U
Study ID	0020,0010	SH	S,*,U
Study Instance UID	0020,000D	UI	S,U,L
Referring Physician's Name	0008,0090	PN	S,*,U
Study Description	0008,1030	LO	S,*,U
Series Level			
Modality	0008,0060	CS	S,U
Series Number	0020,0011	IS	S,*,U
Series Instance UID	0020,000E	UI	S,U,L
Operator's Name	0008,1070	PN	NONE
Image Level			
Instance Number	0020,0013	IS	S,*,U
SOP Instance UID	0008,0018	UI	S,U,L

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. A "S" indicates the identifier attribute can specify Single Value Matching, a "R" will indicate Range Matching, a "*" will denote wildcard matching, an '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 F.4.2-19  
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 disk space or memory usage. Error message is output to as an alert to the User Interface, and to the Service 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 Service Log.
	Unable to process	C001	The C-FIND query identifier is valid for the specified SOP Class but cannot be used to query the database. For example, this can occur if a Patient Level query is issued but the identifier has only empty values for both the Patient ID and the Patient Name. Error message is output to the Service Log.
Cancel	Matching terminated due to Cancel Request	FE00	The C-FIND SCU sent a Cancel Request. This has been acknowledged and the search for matches has been halted.
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.

#### F.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 C-MOVE 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 C-MOVE SCU. One or more of the Image Storage Presentation Contexts listed in table F.4.2-6 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 C-MOVE 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. If the Composite SOP Instances must be retrieved from long-term archive prior to export there may be quite a long delay between the first C-MOVE Response and the next one after the attempt to export the first image. The maximum length of time for this delay will depend on the particular type of archive used but typically varies between 3 and 10 minutes.

Table F.4.2-20  
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 as an alert on the User Interface, and to the Service 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. For example, this Status will be returned if the required SOP Instances are determined to be off-line (i.e. the MO media has been removed from the archive jukebox). Error message is output as an alert on the User Interface, and to the Service 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 Service Log.
Failed	Identifier does not match SOP Class	A900	The C-MOVE identifier contains invalid Elements or values, or is missing mandatory Elements or values for the specified SOP Class or retrieval level. Error message is output to the Service Log.
Cancel	Matching terminated due to Cancel Request	FE00	The C-MOVE 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.

Note that the Warning Status, B000 (Sub-operations complete – One or more Failures) is never returned. If a failure occurs during export to the C-MOVE Destination AE by the STORAGE-SCU AE then the entire task is aborted. Thus any remaining matches are not exported.

Table F.4.2-21  
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 Service 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	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log. If the STORAGE-SCU AE is still exporting Composite SOP Instances as a result of



timer expires.	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 Service 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.

F.4.2.3 STORAGE-SCP Application Entity Specification

F.4.2.3.1 SOP Classes

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

Table F.4.2-22  
SOP CLASSES FOR STORAGE-SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	Yes
Storage Commitment Push Model	1.2.840.10008.1.20.1	No	Yes
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	No	Yes
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	No	Yes
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes

These are the default SOP Classes supported. By altering the configuration it is possible to support additional or fewer SOP Classes.

F.4.2.3.2 Association Policies

F.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, Storage, and Storage Commitment Push Model Services. It will propose Associations only for the Storage Commitment Push Model Service.

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

Table F.4.2-23  
DICOM APPLICATION CONTEXT FOR STORAGE-SCP AE

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

F.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, Storage, or Storage Commitment Push Model Service requests. The maximum number of child processes, and thus the maximum number of simultaneous Associations that can be processed, is set by configuration. The default maximum number is 10 in total. This maximum number of simultaneous Associations can be either an absolute

number or a maximum number for each requesting external Application Entity. The latter flexibility can be useful if communication with one external AE is unreliable and one does not wish ‘hung’ connections with this AE to prevent Associations with other client AEs.

The STORAGE-SCP AE initiates one Association at a time for sending Storage Commitment Push Model N-EVENT-REPORTs to peer AEs.

Table F.4.2-24  
NUMBER OF SIMULTANEOUS ASSOCIATIONS AS AN SCP FOR STORAGE-SCP AE

Maximum number of simultaneous Associations requested by peer AEs	10 (Configurable)
Maximum number of simultaneous Associations proposed by STORAGE-SCP AE	1

F.4.2.3.2.3 Asynchronous Nature

The STORAGE-SCP AE does not support asynchronous communication (multiple outstanding transactions over a single Association). The STORAGE-SCP AE does permit an SCU to send multiple Storage Commitment Push Model Requests before it has sent back any N-EVENT-REPORT Notifications. However, the STORAGE-SCP AE must send an N-ACTION Response before permitting another N-ACTION Request to be received so the DICOM communication itself is not truly asynchronous.

Table F.4.2-25  
ASYNCHRONOUS NATURE AS A SCP FOR STORAGE-SCP AE

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

There is no limit on the number of outstanding Storage Commitment Push Model Requests that can be received and acknowledged before the STORAGE-SCP AE has responded with the corresponding N-EVENT-REPORT Notifications.

Table F.4.2-26  
OUTSTANDING STORAGE COMMITMENT PUSH MODEL REQUESTS FOR STORAGE-SCP AE

Maximum number of outstanding Storage Commitment Requests for which no N-EVENT Notification has been sent	No Maximum Limit
---	------------------

F.4.2.3.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table F.4.2-27  
DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGE-SCP AE

Implementation Class UID	1.3.6.1.4.1.29565.0.1.1.8
Implementation Version Name	DCMSYS_RTR_118

Note that the STORAGE-SCP AE specifies a different Implementation Class UID than that used by the other Application Entities. All DCMSYS ROUTER AEs use the same Implementation Version Name. This Version Name is updated with each new release of the product software, as the different AE versions are never released independently.

F.4.2.3.3 Association Initiation Policy

F.4.2.3.3.1 Activity – Send Storage Commitment Notification over new Association

F.4.2.3.3.1.1 Description and Sequencing of Activity

The STORAGE-SCP AE will initiate a new Association if a Storage Commitment Push Model Notification (N-EVENT-REPORT) cannot be sent back over the original Association used to send the corresponding request. A new Association will always be requested by the STORAGE-SCP AE in such cases even if the peer AE requests another Association after the original has been closed (i.e. A peer AE opens an Association and sends some Storage requests and a Storage Commitment Push Model request. Before the STORAGE-SCP AE can send the Storage Commitment Push Model N-EVEN-REPORT the Association is closed. The peer AE then opens another Association and begins to send Storage requests. In such a case the STORAGE-SCP AE will always initiate a new Association to send the N-EVENT-REPORT even though it could send the N-EVENT-REPORT over the new Association opened by the peer AE).

An Association Request is sent to the peer AE that sent the Storage Commitment Push Model request and upon successful negotiation of the required Presentation Context the outstanding N-EVENT-REPORT is sent. If there are multiple outstanding N-EVENT-REPORTs to be sent to a single peer AE then the STORAGE-SCP AE will attempt to send them all over a single Association rather than requesting a new Association for each one. The Association will be released when all the N-EVENT-REPORTs for the peer AE have been sent. If any type of error occurs during transmission (either a communication failure or indicated by a Status Code returned by the peer AE) over an open Association then the transfer of N-EVENT-REPORTs is halted. A new Association will be opened to retry sending outstanding N-EVENT-REPORTs. The maximum number of times the STORAGE-SCP AE will attempt to resend an N-EVENT-REPORT is configurable, along with the amount of time to wait between attempts to resend.

If the STORAGE-SCP AE sends a Notification request (N-EVENT-REPORT-RQ) over the original Association opened by the peer AE but receives a request to close the Association rather than a response to the Notification (N-EVENT-REPORT-RSP) then this is handled in the same way as if the request to close the Association had been received before trying to send the Notification request. Thus, the STORAGE-SCP AE will then open a new Association to resend the Notification request.

The STORAGE-SCP AE can be configured to always open a new Association before sending a Storage Commitment Push Model Notifications (N-EVENT-REPORT), in which case the sequencing illustrated in Figure 4.2-3 will always be followed.

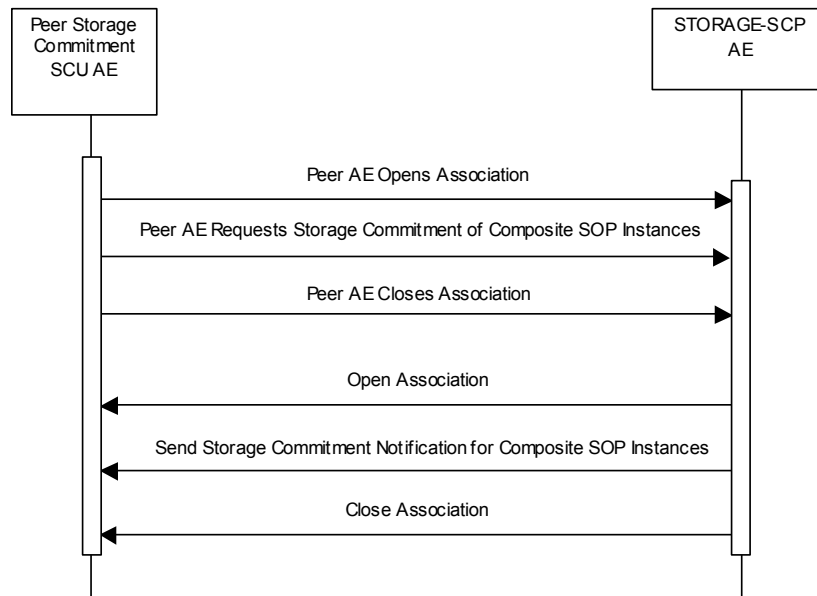


Figure F.4.2-3  
**SEQUENCING OF ACTIVITY – SEND STORAGE  
 COMMITMENT NOTIFICATION OVER NEW ASSOCIATION**

The following sequencing constraints illustrated in Figure F.4.2-3 apply to the STORAGE-SCP AE for handling Storage Commitment Push Model Requests using a new Association:

1. Peer AE opens an Association with the STORAGE-SCP AE.
2. Peer AE requests Storage Commitment of Composite SOP Instance(s) (peer sends N-ACTION-RQ and STORAGE-SCP AE responds with N-ACTION-RSP to indicate that it received the request).
3. Peer AE closes the Association before the STORAGE-SCP AE can successfully send the Storage Commitment Push Model Notification (N-EVENT-REPORT-RQ).
4. STORAGE-SCP AE opens an Association with the peer AE.
5. STORAGE-SCP AE sends Storage Commitment Push Model Notification (N-EVENT-REPORT). More than one can be sent over a single Association if multiple Notifications are outstanding.
6. STORAGE-SCP AE closes the Association with the peer AE.

The Verification Service as an SCU is only supported as a utility function for Service staff. It is used only as a diagnostic tool when the STORAGE-SCP AE is failing to open new Associations to send N-EVENT-REPORTs to peer AEs.

F.4.2.3.3.1.2 Proposed Presentation Contexts

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

Table F.4.2-28  
**PROPOSED PRESENTATION CONTEXTS BY THE STORAGE-SCP AE**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Storage Commitment Push Model	1.2.840.10008.1.20.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Storage Commitment Push Model	1.2.840.10008.1.20.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

F.4.2.3.3.1.3 SOP Specific Conformance for Storage SOP Classes

The associated Activity with the Storage Commitment Push Model service is the communication by the STORAGE-SCP AE to peer AEs that it has committed to permanently store Composite SOP Instances that have been sent to it. It thus allows peer AEs to determine whether the DCMSYS ROUTER has taken responsibility for the archiving of specific SOP Instances so that they can be flushed from the peer AE system.

The STORAGE-SCP AE will initiate a new Association to a peer AE that sent a Storage Commitment Push Model request if the original Association over which this was sent is no longer open. For a detailed explanation of the SOP specific Behavior of the STORAGE-SCP AE in this case please refer to 4.2.4.4.1.3.3, Storage Commitment Push Model as an SCP.

#### F.4.2.3.3.1.4 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. It can be used to test whether Associations can actually be opened with a peer AE that is issuing Storage Commitment Push Model requests (i.e. to test whether the indicated TCP/IP port and AE Title for sending N-EVENT-REPORT Requests to the peer AE are truly functional).

#### F.4.2.3.4 Association Acceptance Policy

##### F.4.2.3.4.1 Activity – Receive Images and Storage Commitment Requests

###### F.4.2.3.4.1.1 Description and Sequencing of 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 hosts (using TCP/IP address) and/or Application Entity Titles.

The default behavior of the STORAGE-SCP AE is to always attempt to send a Storage Commitment Push Model Notification (N-EVENT-REPORT) over the same Association opened by the peer AE to send the request (N-ACTION). If the STORAGE-SCP AE receives a request to close the Association either before sending the Notification or before receiving the corresponding N-EVENT-REPORT-RSP then it will open a new Association to send the Notification. Refer to section F.4.2.3.4.1.5 for the details.

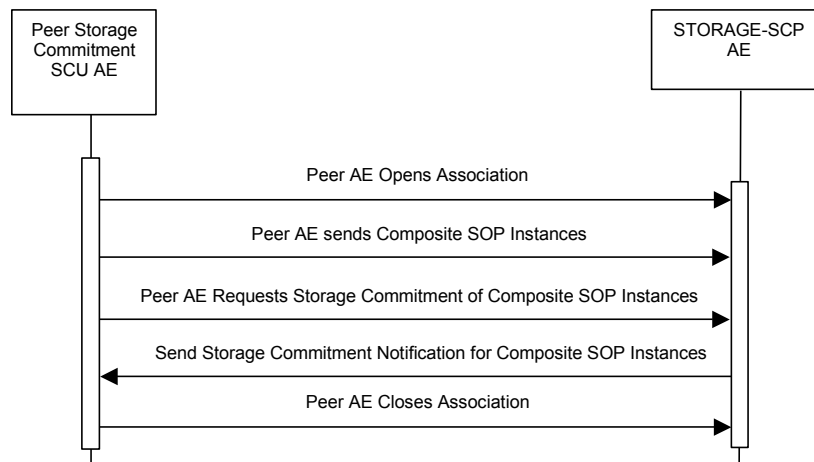


Figure F.4.2-4

#### SEQUENCING OF ACTIVITY – RECEIVE IMAGES AND STORAGE COMMITMENT REQUESTS

The following sequencing constraints illustrated in Figure F.4.2-4 apply to the STORAGE-SCP AE for handling Storage Commitment Push Model Requests over the original Association:

1. Peer AE opens an Association with the STORAGE-SCP AE.
2. Peer AE sends zero or more Composite SOP Instances.
3. Peer AE requests Storage Commitment of Composite SOP Instance(s) (peer sends N-ACTION-RQ and STORAGE-SCP AE responds with N-ACTION-RSP to indicate that it received the request).

4. STORAGE-SCP AE sends Storage Commitment Push Model Notification request (N-EVENT-REPORT-RQ) and successfully receives Notification response (N-EVENT-REPORT-RSP) from peer AE.
5. Peer AE closes the Association.

If the STORAGE-SCP AE receives a request to close the Association from the peer AE before sending the Notification request (N-EVENT-REPORT-RQ) or when expecting to receive a Notification response (N-EVENT-REPORT-RSP) then it will open a new Association to send (or resend) the Notification. Refer to 0 for the details. The STORAGE-SCP AE has a configurable timeout value for the maximum amount of time that it will wait on an open Association for a new request from a peer AE. A peer AE can reset this timer by sending a Verification request (C-ECHO-RQ). This can act as a useful mechanism for a peer AE to maintain an active Association if the length of time between sending Storage or Storage Commitment requests can be long (such as when using a single Association to send images as they are acquired during an ultrasound exam).

The STORAGE-SCP AE may reject Association attempts as shown in the Table below. 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 F.4.2-29  
ASSOCIATION REJECTION REASONS

Result	Source	Reason/Diag	Explanation
2 – rejected-transient	c	2 – local-limit-exceeded	The (configurable) 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	1 – temporary-congestion	No Associations can be accepted at this time due to the real-time requirements of higher priority activities (e.g. during image acquisition no Associations will be accepted) or because insufficient resources are available (e.g. memory, processes, threads). 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.

F.4.2.3.4.1.2 Accepted Presentation Contexts

The default Behavior of the STORAGE-SCP AE supports the Implicit VR Little Endian and Explicit VR Little Endian Transfer Syntaxes for all Associations. In addition, explicit JPEG (baseline lossy) compression syntax is supported for the following SOP Classes: US Image, US Multi-frame Image, US Image (retired), US Multi-frame Image (retired), VL Image, VL Multi-frame and Secondary Capture Image Storage.

The STORAGE-SCP AE can be configured to accept a subset of these Transfer Syntaxes, with the inclusion of Implicit VR Little Endian being mandatory.

If multiple Transfer Syntaxes are proposed per Presentation Context then only the most preferable Transfer Syntax is accepted. The order of Transfer Syntax preference for the STORAGE-SCP AE is configurable. The default preference order if multiple Transfer Syntaxes are proposed in a single Presentation Context is: JPEG Baseline1, Little Endian Explicit, Little Endian Implicit (if all these are proposed for a single Presentation Context). This means that if the Implicit VR Little Endian and Explicit VR Little Endian Transfer Syntaxes are proposed in a single Presentation Context then the accepted Transfer Syntax will be Explicit VR Little Endian. This order of preference is configurable.

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

Table F.4.2-30  
ACCEPTED PRESENTATION CONTEXTS BY STORAGE-SCP AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Storage Commitment Push Model	1.2.840.10008.1.20.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Storage Commitment Push Model	1.2.840.10008.1.20.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCP	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Implicit VR Little Endian (uncompressed)	1.2.840.10008.1.2	SCP	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Explicit VR Little Endian (uncompressed)	1.2.840.10008.1.2.1	SCP	None
US Image	1.2.840.10008.5.1.4.1.1.6.1	DICOM Explicit	1.2.840.10008.1.2.4.50	SCP	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Storage		JPEG baseline lossy compression			
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCP	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Implicit VR Little Endian (uncompressed)	1.2.840.10008.1.2	SCP	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Explicit VR Little Endian (uncompressed)	1.2.840.10008.1.2.1	SCP	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCP	None
Computer Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Computer Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
NM Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Explicit JPEG lossy compression	1.2.840.10008.1.2.4.50	SCP	None



F.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.

F.4.2.3.4.1.4 SOP Specific Conformance for Storage SOP Classes

The associated 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 DCMSYS ROUTER 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. Refer to the Annex for the list of Elements that are checked and/or processed upon receiving a Composite SOP Instance.

The Behavior for handling duplicate SOP Instances is configurable. The default Behavior is to assign a new SOP Instance UID to a received SOP Instance if it conflicts with an existing SOP Instance UID. An alternative configuration is possible that causes the original object with the conflicting SOP Instance UID to be replaced by the new SOP Instance. This Behavior is most commonly enabled if a Storage SCU re-sends entire Studies or Series if a single failure occurs when sending a group of SOP Instances.

For the purposes of image display the system supports the following photometric interpretations: MONOCHROME1, MONOCHROME2, RGB, PALETTE COLOR, YBR FULL 422, and YBR FULL.

It is expected that optimal Window Center and Width values are specified in the DICOM Image Objects if they have greater than 8 bits of image data stored per sample. If optimal Window Center and Width values are not provided, then the DCMSYS ROUTER is capable of estimating values using histogram analysis.

For multi-frame image SOP Instances sent using JPEG compression Transfer Syntax, sending a fully specified offset table increases performance, because the entire file does not have to be parsed to find the individual frame offsets. However, the inclusion of an offset table is not required for archiving or viewing of such SOP Instances.

Display of information conveyed using the DICOM Curve Module is not supported. Graphic overlay data sent either embedded in the unused image pixel data bits or in the separate Overlay Data Element is supported for display. Region of Interest overlays are not yet supported.

If an image SOP Instance specifies an aspect ratio that is not one-to-one then the image data will be automatically resized when displayed on the system monitor so that they are always displayed in a one-to-one aspect ratio.

The average throughput performance has been determined to be between 2 and 6 Mega Bytes per second on a 100 Megabit Ethernet network. Actual performance will depend greatly on the performance of the C-STORE SCU, the number of simultaneous active Associations, and the underlying network performance.

Table F.4.2-31  
STORAGE-SCP AE C-STORE RESPONSE STATUS RETURN REASONS

Service Status	Further Meaning	Error Code	Reason
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. Error message is output to the Service 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. In addition, if the SOP Class is for a type of image but the SOP Instance does not contain values necessary for its display then this status is returned. Error message is output to the Service Log. The system can be configured to temporarily save such Data Sets in order to aid problem diagnosis.
	Cannot understand	C000	Indicates that the STORAGE-SCP AE cannot parse the Data Set into Elements. Error message is output to the Service Log. The system can be configured to temporarily save such Data Sets in order to aid problem diagnosis.
Warning	Coercion of Data Elements	B000	Indicates that one or more Element values were coerced. Refer to the Attributes defined in Annex for a list of those that can be coerced. Note that return of this status is disabled by default, as some SCUs treat it as an Error code rather than a Warning.

NOTE: If a failure condition does occur when handling an Association then all images previously received successfully over the Association are maintained in the DCMSYS ROUTER 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.

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

Table F.4.2-32  
STORAGE-SCP AE STORAGE SERVICE COMMUNICATION FAILURE REASONS

Exception	Reason
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 Service 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 Service 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	Error message is output to the Service Log. If some Composite

network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	SOP Instances have already been successfully received then they are maintained in the database. They are not automatically discarded because of a later failure.
---	--

F.4.2.3.4.1.5 SOP Specific Conformance for Storage Commitment SOP Class

The associated Activity with the Storage Commitment Push Model service is the communication by the STORAGE-SCP AE to peer AEs that it has committed to permanently store Composite SOP Instances that have been sent to it. It thus allows peer AEs to determine whether the DCMSYS ROUTER has taken responsibility for the archiving of specific SOP Instances so that they can be flushed from the peer AE system.

The STORAGE-SCP AE takes the list of Composite SOP Instance UIDs specified in a Storage Commitment Push Model N-ACTION Request and checks if they are present in the DCMSYS ROUTER database. As long as the Composite SOP Instance UIDs are present in the database, the STORAGE-SCP AE will consider those Composite SOP Instance UIDs to be successfully archived. The STORAGE-SCP AE does not require the Composite SOP Instances to actually be successfully written to archive media in order to commit to responsibility for maintaining these SOP Instances.

Once the STORAGE-SCP AE has checked for the existence of the specified Composite SOP Instances, it will then attempt to send the Notification request (N-EVENT-REPORT-RQ). The default behavior is to attempt to send this Notification over the same Association that was used by the peer AE to send the original N-ACTION Request. If the Association has already been released or Message transfer fails for some reason then the STORAGE-SCP AE will attempt to send the N-EVENT-REPORT-RQ over a new Association. The STORAGE-SCP AE will request a new Association with the peer AE that made the original N-ACTION Request. The STORAGE-SCP AE can be configured to always open a new Association in order to send the Notification request.

The STORAGE-SCP AE will not cache Storage Commitment Push Model N-ACTION Requests that specify Composite SOP Instances that have not yet been transferred to the DCMSYS ROUTER. If a peer AE sends a Storage Commitment Push Model N-ACTION Request before the specified Composite SOP Instances are later sent over the same Association, the STORAGE-SCP AE will not commit to responsibility for such SOP Instances.

The STORAGE-SCP AE does not support the optional Storage Media File-Set ID & UID attributes in the N-ACTION.

The DCMSYS ROUTER never automatically deletes Composite SOP Instances from the archive. The absolute persistence of SOP Instances and the maximum archiving capacity for such SOP Instances is dependent on the archiving media and capacity used by the DCMSYS ROUTER and is dependent on the actual specifications of the purchased system. It is necessary to check the actual system specifications to determine these characteristics.

The STORAGE-SCP AE will support Storage Commitment Push Model requests for SOP Instances of any of the Storage SOP Classes that are also supported by the STORAGE-SCP AE:

Table F.4.2-33  
SUPPORTED REFERENCED SOP CLASSES IN STORAGE  
COMMITMENT PUSH MODEL N-ACTION REQUESTS

Supported Referenced SOP Classes
Ambulatory ECG Waveform Storage
Arterial Pulse Waveform Storage
Autorefracton Measurements Storage
Basic Structured Display Storage
Basic Text SR Storage
Basic Voice Audio Waveform Storage
Blending Softcopy Presentation State Storage

Breast Projection XRay Image Storage For Presentation
Breast Projection XRay Image Storage For Processing
Breast Tomosynthesis Image Storage
CT Image Storage
CT Image Storage (DICOS)
Cardiac Electrophysiology Waveform Storage
Chest CAD SR Storage
Colon CAD SR Storage
Color Softcopy Presentation State Storage
Comprehensive SR Storage
Comprehensive 3D SR Storage
Computed Radiography Image Storage
Corneal Topography Map Storage
Deformable Spatial Registration Storage
Digital Intra Oral XRay Image Storage For Presentation
Digital Intra Oral XRay Image Storage For Processing
Digital Mammography XRay Image Storage For Presentation
Digital Mammography XRay Image Storage For Processing
Digital XRay Image Storage For Presentation
Digital XRay Image Storage For Presentation (DICOS)
Digital XRay Image Storage For Processing
Digital XRay Image Storage For Processing (DICOS)
Eddy Current Image Storage (DICONDE)
Eddy Current Multiframe Image Storage (DICONDE)
Encapsulated CDA Storage
Encapsulated PDF Storage
Enhanced CT Image Storage
Enhanced MR Color Image Storage
Enhanced MR Image Storage
Enhanced PET Image Storage
Enhanced SR Storage
Enhanced US Volume Storage
Enhanced XA Image Storage
Enhanced XRF Image Storage
General Audio Waveform Storage
General ECG Waveform Storage
Generic Implant Template Storage
Grayscale Softcopy Presentation State Storage

Hardcopy Color Image Storage (Retired)
Hardcopy Grayscale Image Storage (Retired)
Hemodynamic Waveform Storage
Implant Assembly Template Storage
Implant Template Group Storage
Implantation Plan SR Document Storage
Intraocular Lens Calculations Storage
Intravascular Optical Coherence Tomography Image Storage For Presentation
Intravascular Optical Coherence Tomography Image Storage For Processing
Keratometry Measurements Storage
Key Object Selection Document Storage
Legacy Converted Enhanced CT Image Storage
Legacy Converted Enhanced MR Image Storage
Legacy Converted Enhanced PET Image Storage
Lensometry Measurements Storage
MR Image Storage
MR Spectroscopy Storage
Macular Grid Thickness And Volume Report Storage
Mammography CAD SR Storage
Multiframe Grayscale Byte Secondary Capture Image Storage
Multiframe Grayscale Word Secondary Capture Image Storage
Multiframe Single Bit Secondary Capture Image Storage
Multiframe True Color Secondary Capture Image Storage
Nuclear Medicine Image Storage
Nuclear Medicine Image Storage (Retired)
Ophthalmic Axial Measurements Storage
Ophthalmic Photography16Bit Image Storage
Ophthalmic Photography8Bit Image Storage
Ophthalmic Thickness Map Storage
Ophthalmic Tomography Image Storage
Ophthalmic Visual Field Static Perimetry Measurements Storage
Positron Emission Tomography Image Storage
Procedure Log Storage
Pseudo Color Softcopy Presentation State Storage
RT Beams Delivery Instruction Storage
RT Beams Delivery Instruction Storage (Draft)
RT Beams Treatment Record Storage
RT Brachy Treatment Record Storage

RT Dose Storage
RT Image Storage
RT Ion Beams Treatment Record Storage
RT Ion Plan Storage
RT Plan Storage
RT Structure Set Storage
RT Treatment Summary Record Storage
Radiopharmaceutical Radiation Dose SR Storage
Raw Data Storage
Real World Value Mapping Storage
Respiratory Waveform Storage
SR Audio Storage (Draft)
SR Comprehensive Storage (Draft)
SR Detail Storage (Draft)
SR Text Storage (Draft)
Secondary Capture Image Storage
Segmentation Storage
Spatial Fiducials Storage
Spatial Registration Storage
Spectacle Prescription Report Storage
Standalone Curve Storage (Retired)
Standalone Modality LUT Storage (Retired)
Standalone Overlay Storage (Retired)
Standalone PET Curve Storage (Retired)
Standalone VOI LUT Storage (Retired)
Stereometric Relationship Storage
Stored Print Storage (Retired)
Subjective Refraction Measurements Storage
Surface Scan Mesh Storage
Surface Scan Point Cloud Storage
Surface Segmentation Storage
Threat Detection Report Storage (DICOS)
Twelve Lead ECG Waveform Storage
Ultrasound Image Storage
Ultrasound Image Storage (Retired)
Ultrasound Multiframe Image Storage
Ultrasound Multiframe Image Storage (Retired)
VL Endoscopic Image Storage

VL Image Storage (Retired)
VL Microscopic Image Storage
VL Multi Frame Image Storage (Retired)
VL Photographic Image Storage
VL Slide Coordinates Microscopic Image Storage
VL Whole Slide Microscopy Image Storage
Video Endoscopic Image Storage
Video Microscopic Image Storage
Video Photographic Image Storage
Visual Acuity Measurements Storage
Waveform Storage (Draft)
XA XRF Grayscale Softcopy Presentation State Storage
XRay Angiographic Bi Plane Image Storage (Retired)
XRay Angiographic Image Storage
XRay Radiation Dose SR Storage
XRay Radiofluoroscopic Image Storage
Xray 3D Angiographic Image Storage
Xray 3D Craniofacial Image Storage

The STORAGE-SCP AE will return the following Status Code values in N-ACTION Responses:

Table F.4.2-34  
 STORAGE-SCP AE STORAGE COMMITMENT PUSH  
 MODEL N-ACTION RESPONSE STATUS RETURN BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully received the Storage Commitment Push Model N-ACTION Request and can process the commitment request for the indicated SOP Instances.
Error	Processing Failure	0110	Indicates that the Storage Commitment Push Model N-ACTION Request cannot be parsed or fully processed due to a database or system failure.
Error	Missing Attribute	0120	Indicates that the Storage Commitment Push Model N-ACTION Request cannot be processed because a required attribute is missing from the N-ACTION Request Data Set.
Error	Missing Attribute Value	0121	Indicates that the Storage Commitment Push Model N-ACTION Request cannot be processed because a Type 1 attribute in the N-ACTION Request Data Set does not specify a value.

The STORAGE-SCP AE will exhibit the following Behavior according to the Status Code value returned in an N-EVENT-REPORT Response from a destination Storage Commitment Push Model SCU:

Table F.4.2-35  
 STORAGE-SCP AE N-EVENT-REPORT RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCU has successfully received the Storage Commitment Push Model N-EVENT-REPORT Request. Success indication message is output to the Service Logs. No message is posted to the User Interface.
Warning	Attribute List Error	0107	Transmission of Storage Commitment Push Model N-EVENT-REPORT Request is considered successful. Warning indication message is output to the Service Logs. No message is posted to the User Interface.
*	*	Any other status code.	This is treated as a permanent Failure. Error indication message is output to the Service Logs. No message is posted to the User Interface.

All Status Codes indicating an error or refusal are treated as a permanent failure. The STORAGE-SCP AE can be configured to automatically reattempt the sending of Storage Commitment Push Model N-EVENT-REPORT Requests if an error Status Code is returned or a communication failure occurs. The maximum number of times to attempt sending as well as the time to wait between attempts is configurable.

Table F.4.2-36  
STORAGE-SCP AE STORAGE COMMITMENT PUSH MODEL  
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 N-ACTION Request on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. If some Composite SOP Instances have been successfully received over the same Association via the Storage Service then they are maintained in the database. They are not automatically discarded because of a later Storage Commitment messaging failure. Any previously received Storage Commitment Push Model N-ACTION Requests will still be fully processed. Error indication message is output to the Service Logs. No message is posted to the User Interface.
Timeout expiry for an expected DICOM Message Response (DIMSE level timeout). I.e. The STORAGE-SCP AE is waiting for the next N-EVENT-REPORT Response on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. If some Composite SOP Instances have been successfully received over the same Association via the Storage Service then they are maintained in the database. They are not automatically discarded because of a later Storage Commitment messaging failure. Any previously received Storage Commitment Push Model N-ACTION Requests will still be fully processed. Error indication message is output to the Service Logs. No message is posted to the User Interface.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout).	The Association is aborted by issuing a DICOM A-ABORT. If some Composite SOP Instances have been successfully received over the same Association via the Storage Service then they are maintained in the database. They are not automatically discarded because of a later Storage Commitment messaging failure. Any previously received Storage Commitment Push Model N-



	<p>ACTION Requests will still be fully processed.</p> <p>Error indication message is output to the Service Logs.</p> <p>No message is posted to the User Interface.</p>
<p>Association A-ABORTed by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)</p>	<p>The TCP/IP socket is closed.</p> <p>If some Composite SOP Instances have been successfully received over the same Association via the Storage Service then they are maintained in the database. They are not automatically discarded because of a later Storage Commitment messaging failure.</p> <p>Any previously received Storage Commitment Push Model N-ACTION Requests will still be fully processed.</p> <p>Error indication message is output to the Service Logs.</p> <p>No message is posted to the User Interface.</p>

F.4.3 Network Interfaces

F.4.3.1 Physical Network Interface

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

Table F.4.3-1  
SUPPORTED PHYSICAL NETWORK INTERFACES

Ethernet 100baseT
Ethernet 10baseT

F.4.3.2 Additional Protocols

DCMSYS ROUTER conforms to the System Management Profiles listed in Table F.4.3-2. All requested transactions for the listed profiles and actors are supported. It does not support any optional transactions.

Table F.4.3-2  
SUPPORTED SYSTEM MANAGEMENT PROFILES

Profile Name	Actor	Protocols Used	Optional Transactions	Security Support
Network Address Management	DHCP Client	DHCP	N/A	
	DNS Client	DNS	N/A	

F.4.3.2.1 DHCP

DHCP can be used to obtain TCP/IP network configuration information. The network parameters obtainable via DHCP are shown in Table F.4.3-3. The Default Value column of the table shows the default used if the DHCP server does not provide a value. Values for network parameters set in the Service/Installation tool take precedence over values obtained from the DHCP server. Support for DHCP can be configured via the Service/Installation Tool. The Service/Installation tool can be used to configure the machine name. If DHCP is not in use, TCP/IP network configuration information can be manually configured via the Service/Installation Tool.

Table F.4.3-3  
SUPPORTED DHCP PARAMETERS

DHCP Parameter	Default Value
IP Address	None
Hostname	Requested machine name
List of NTP servers	Empty list
List of DNS servers	Empty list
Routers	Empty list
Static routes	None
Domain name	None
Subnet mask	Derived from IP Address (see service manual)
Broadcast address	Derived from IP Address (see service manual)
Default router	None
Time offset	Site configurable (from Time zone)
MTU	Network Hardware Dependent
Auto-IP permission	No permission

If the DHCP server refuses to renew a lease on the assigned IP address all active DICOM Associations will be aborted.

F.4.3.2.2 DNS

DNS can be used for address resolution. If DHCP is not in use or the DHCP server does not return any DNS server addresses, the identity of a DNS server can be configured via the Service/Installation Tool. If a DNS server is not in use, local mapping between hostname and IP address can be manually configured via the Service/Installation Tool.

F.4.3.3 IPv4 and IPv6 Support

This product supports both IPv4 and IPv6. It does not utilize any of the optional configuration identification or security features of IPv6.

F.4.4 Configuration

F.4.4.1 AE Title/Presentation Address Mapping

F.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 F.4.4-1  
 DEFAULT APPLICATION ENTITY CHARACTERISTICS

Application Entity	Role	Default AE Title	Default TCP/IP Port
STORAGE-SCU	SCU	EX_STORE_SCU	None
STORAGE-SCP	SCP	EX_STORE_SCP	4000
QUERY-RETRIEVE-SCP	SCP	EX_QUERY_SCP	5000

The STORAGE-SCU and QUERY-RETRIEVE-SCP Application Entities can be configured to have the same AE Title. The STORAGE-SCP Application Entity must not have the same AE Title as the other two.

## F.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.

## F.4.4.2 Parameters

Table F.4.4-2  
CONFIGURATION PARAMETERS

Parameter	Configurable	Default Value
<b>General Parameters</b>		
Maximum PDU size I can receive	Yes	128kbytes
Maximum PDU size I can send	Yes	128kbytes
Time-out waiting for response to TCP/IP connect() request. (Low-level timeout)	Yes	10 s
Time-out waiting for A-ASSOCIATE RQ PDU on open TCP/IP connection. (ARTIM timeout)	Yes	30 s
Time-out waiting for acceptance or rejection response to an Association Open Request. (Application Level timeout)	Yes	30s
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	Yes	30 s
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	Yes	30 s
The Windows NT TCP/IP socket buffer size is set to 1,342,177 bytes in order to improve image data throughput performance.	No	1,342,177 bytes
<b>STORAGE-SCU AE Parameters</b>		
Maximum number of simultaneous Associations.	Yes	10
STORAGE-SCU AE time-out waiting for a Response to a C-STORE-RQ. (DIMSE timeout)	Yes	5 minutes
STORAGE-SCU AE number of times a failed send job to a C-MOVE Destination is automatically retried.	No	0
<b>STORAGE-SCP AE Parameters</b>		
Maximum PDU Size	Yes	16384
Maximum number of simultaneous Associations (Can be configured to be a maximum total number or a maximum per external SCU AE)	Yes	10
STORAGE-SCP AE time-out waiting on an open Association for the next Request message (C-STORE-RQ, Association Close Request. etc.) (DIMSE timeout)	Yes	15 minutes
STORAGE-SCP AE maximum number of simultaneous Associations	Yes (NOTE: Can be configured with a maximum per external AE)	10
Permanent archival of SOP Instances sent by a peer AE to the STORAGE-SCP AE in response to a retrieval request from QUERY-RETRIEVE AE.	Yes	FALSE (Such received SOP Instances are not archived.)

Permanent archival of SOP Instances sent unsolicited by a peer AE to the STORAGE-SCP AE. I.e. Not in response to a retrieval request from QUERY-RETRIEVE AE.	Yes	TRUE (Such received SOP Instances are archived.)
Always open a new Association to send a Storage Commitment Push Model Notification request (N-EVENT-REPORT-RQ).	Yes	FALSE (Default is to try and send Notifications over original Association opened by peer AE).
Maximum number of times to attempt sending a Storage Commitment Push Model N-EVENT-REPORT Request when an error status is returned or communication failure occurs.	Yes	5
Time to wait between attempts to send a Storage Commitment Push Model N-EVENT-REPORT Request when an error status is returned or communication failure occurs.	Yes	5 minutes
QUERY-RETRIEVE-SCP AE Parameters		
Maximum PDU Size	Yes	16384
Maximum number of simultaneous Associations (Can be configured to be a maximum total number or a maximum per external SCU AE)	Yes	10
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)	Yes	3 minutes
QUERY-RETRIEVE-SCP AE maximum number of simultaneous Associations	Yes (NOTE: Can be configured with a maximum per external AE)	10

## **F.5 MEDIA INTERCHANGE**

DCMSYS ROUTER does not support Media Storage.

## **F.6 SUPPORT OF EXTENDED CHARACTER SETS**

All DCMSYS ROUTER DICOM applications support the following:

ISO\_IR 100 (ISO 8859-1:1987 Latin Alphabet No. 1 supplementary set)

As well as supporting this Extended Character Set for DICOM messaging, the Query-Server system database and user interface can support the expected display of this character set.

## **F.7 SECURITY**

### **F.7.1 Security Profiles**

The DCMSYS ROUTER conforms to the bit preserving Digital Signatures Security Profile, if the STORAGE SCP AE receives a SOP Instance in an Explicit Transfer Syntax and the STORAGE SCU AE can export such SOP Instances using an Explicit Transfer Syntax.

### **F.7.2 Association Level Security**

The QUERY-RETRIEVE-SCP AE and the STORAGE-SCP AE can both be configured to check the following DICOM values when determining whether to accept Association Open Requests:

Calling AE Title

Called AE Title

Application Context

Each SCP AE can be configured to accept Association Requests from only a limited list of Calling AE Titles. They SCP AEs can have different lists. Each SCP AE can be configured to check that the Association requestor specifies the correct Called AE Title for the SCP.

In addition the IP address of the requestor can be checked. The SCP AEs can be constrained to only accept Association Requests from a configured list of IP addresses. The SCP AE's can have different lists.

**F.8 ANNEXES**

F.8.1 IOD Contents

F.8.1.1 Storage-SCP AE Element Use

The following Elements of Composite SOP Instances received by the STORAGE-SCP AE are either stored to the permanent DCMSYS ROUTER database or of particular importance in the received images.

SOP Instances conforming to the following Composite Image SOP Classes are fully supported for display on the system workstations.

Table F.8.1-1  
SUPPORTED COMPOSITE IMAGE SOP CLASSES FOR DISPLAY

US Image Storage (Retired)
US Image Storage
US Multi-frame Storage (Retired)
US Multi-frame Storage
Computed Radiography Image Storage
CT Image Storage
MR Image Storage
Secondary Capture Image Storage

Table F.8.1-2  
SIGNIFICANT ELEMENTS IN RECEIVED COMPOSITE SOP INSTANCES

Module	Attribute Name	Tag ID	Type	Significance
Patient	Patient Name	(0010,0010)	Opt	STORAGE-SCP AE can be configured to apply a default value if there is no value specified. Value is saved to database as separate first and last names. Only first and last names are entered in the DCMSYS ROUTER database. Both first and last names can be a maximum of 64 characters each. Names will be parsed correctly if they are in the format of 'lname^fname' or 'lname, fname'. If space separation is used (i.e. 'lname fname') then the entire name will be treated as the last name.
	Patient ID	(0010,0020)	Opt	STORAGE-SCP AE can be configured to apply a default value if there is no value specified. Verification on incoming Patient IDs is performed. If an ID already exists but the existing name does not match, then the ID is coerced because different Patient records in the DCMSYS ROUTER database cannot have identical Patient IDs. Value is saved to database.
	Patient's Birth Date	(0010,0030)	Opt	STORAGE-SCP AE can be configured to apply a default value if there is no value specified. Value is saved to database.

	Patient's Sex	(0010,0040)	Opt	First character must be 'M', 'm', 'F', 'f', 'O', or 'o'. If a different value, or not specified, then will be entered in the database as 'U', unknown. Value is saved to database. 'U' is never exported in DICOM images; instead, the Element value will be left empty for export.
General Study	Study Instance UID	(0020,000D)	Mand	Must be provided. Value is saved to database.
	Study Date	(0008,0020)	Opt	STORAGE-SCP AE can be configured to apply a default value if there is no value specified. Value is saved to database.
	Referring Physician's Name	(0008,0090)	Opt	Value is saved to database.
	Accession Number	(0008,0050)	Opt	STORAGE-SCP AE can be configured to apply a default value if there is no value specified. Matching used to determine which Accession number to apply is configurable (i.e. HIS/RIS provided Accession Number may be used if the Patient ID, Patient Name, Study Date, and Modality provided in the HIS/RIS and SOP Instance match). Value is saved to database.
	Study Description	(0008,1030)	Opt	If matched value(s) in the DCMSYS ROUTER exam type database, then it will be saved to the database as an exam type.
General Series	Modality	(0008,0060)	Opt	STORAGE-SCP AE can be configured to apply a default value if there is no value specified. Value is saved to database but must be two characters in length.
	Series Description	(0008,103E)	Opt	If matched value(s) in the DCMSYS ROUTER exam type database then it will be saved to the database as an exam type.
	Operator's Name	(0008,1070)	Opt	Value is saved to database.
	Body Part Examined	(0018,0015)	Opt	If matched value(s) in the DCMSYS ROUTER exam type database then it will be saved to the database as an exam type.
General Image	Image Type	(0008,0008)	Opt	If the third value, the modality specific value, matches value(s) in the DCMSYS ROUTER exam type database then it will be saved to the database as an exam type.
Image Plane	Pixel Spacing	(0028,0030)	Opt	Used for automatic scaling of measurement tool if specified in an image SOP Instance.
US Region Calibration	Sequence of Ultrasound Regions	(0018,6011)	Opt	Used for automatic scaling of measurement tool if specified in an Ultrasound or Ultrasound Multiframe Image SOP Instance.
Image Pixel	Photometric Interpretation	(0028,0004)	Cond	The following photometric interpretations are supported for image display purposes: MONOCHROME1, MONOCHROME2, RGB,

				<p>PALETTE COLOR, YBR FULL 422, and YBR FULL.</p> <p>Required if SOP Instance is an Image.</p>
	Bits Allocated	(0028,0100)	Cond	<p>Must be 8 or 16 bits for image display purposes.</p> <p>Required if SOP Instance is an Image.</p>
	Bits Stored	(0028,0101)	Cond	<p>All values of 16 or fewer are supported for image display purposes.</p> <p>Required if SOP Instance is an Image.</p>
Overlay Plane Module see Note 1	Overlay Rows	(6000,0010)	Cond	<p>Number of Rows in Overlay.</p> <p>Required in order to display an Overlay.</p>
	Overlay Columns	(6000,0011)	Cond	<p>Number of Columns in Overlay.</p> <p>Required in order to display an Overlay.</p>
	Overlay Type	(6000,0040)	Cond	<p>Overlay data is used only if the value is “G”, Graphics. Graphic overlay data can be automatically displayed if the system is configured to do so. “ROI”, Region Of Interest, overlay data is not displayed to the user of the system.</p> <p>Required in order to display an Overlay.</p>
	Overlay Origin	(6000,0050)	Cond	<p>Value must be 1\1 or greater. If either Overlay Origin coordinate is less than 1 then the overlay is not displayed.</p> <p>Required in order to display an Overlay.</p>
	Overlay Bits Allocated	(6000,0100)	Cond	<p>Must be 8 or 16 if the overlay data are embedded.</p> <p>Required in order to display an Overlay.</p>
	Overlay Bit Position	(6000,0102)	Cond	<p>Used if the overlay data is embedded. If the data is embedded then this position must indicate a bit not used by each image pixel sample.</p> <p>Required in order to display an Overlay.</p>
	Overlay Data	(6000,3000)	Cond	<p>Overlay data present in this Element or embedded in the pixel data is supported for display.</p> <p>Required in order to display a non-embedded Overlay.</p>
VOI LUT	Window Center	(0028,1050)	Opt	<p>It is recommended that this value be defined for images that have greater than 8 bits stored per pixel sample for image display</p>
	Window Width	(0028,1051)	Opt	<p>It is recommended that this value be defined for images that have greater than 8 bits stored per pixel sample for image display</p>
SOP Common	SOP Instance UID	(0008,0018)	Mand	<p>Must be provided. If a duplicate SOP Instance UID is received, the system can be configured to either coerce the duplicate value with a new UID or replace the original UID with the newly received one. The system can also be configured to either preserve the original UID or assign a new UID if the received image data is lossy compressed by the QUERY-RETRIEVE-SERVER prior to archival.</p>



Note 1: Note that only overlay information contained in the 6000 Group will be used for display. Overlay information contained in the other possible Groups (6002, 6004, etc.) will be ignored for display purposes. Such information will still be archived however.

F.8.1.2 Storage-SCU AE Element modification

The following table contains a list of all Elements that can have a value modified by the STORAGE-SCU at the time of export using the Storage Service depending on the capabilities of the receiver:

Table F.8.1-3  
SIGNIFICANT ELEMENTS IN EXPORTED COMPOSITE SOP INSTANCES

Module	Attribute Name	Tag ID	Value
Image Pixel	Photometric Interpretation	(0028,0004)	STORAGE-SCU AE can convert all images to MONOCHROME2 or RGB based on the configuration for the destination AE.  If the photometric interpretation of the image data is altered in a lossy manner, which could occur when converting from color to grayscale, then the SOP Instance UID is altered.
VOI LUT	Window Center	(0028,1050)	Default Window Center value can be configured for a specific destination AE.
	Window Width	(0028,1051)	Default Window Width value can be configured for a specific external destination AE.
SOP Common	SOP Instance UID	(0008,0018)	System assigns a new UID if the image data is lossy compressed by the STORAGE-SCU AE at the time of export. Unless the pixel data is lossy compressed or there is a conflict between duplicate SOP Instance UID's the original value received is not altered.

F.8.1.3 Attribute Mapping

The mapping between attributes received via HL7 from the HIS and those supplied in Modality Worklist is configurable. The default mapping is contained in the table below. Empty cells indicate that there is no mapping for the specific attribute

Table F.8.1-4  
HL7/MODALITY WORKLIST ATTRIBUTE MAPPING

DICOM Attribute	DICOM Tag	HL7 Attribute Name	HL7 Segment	Notes
Scheduled Procedure Step				
Scheduled Procedure Step Sequence	(0040,0100)			
> Scheduled Station AET	(0040,0002)			DCMSYS generated
> Scheduled Procedure Step Start Date	(0040,0003)	Quantity/Timing	ORM OBR:27	DCMSYS generated
> Scheduled Procedure Step Start Time	(0040,0006)	Quantity/Timing	ORM OBR:27	DCMSYS generated
> Modality	(0008,0060)			DCMSYS generated
> Scheduled Performing Physician's Name	(0040,0006)	Technician	ORM OBR:34	
> Scheduled Procedure Step	(0040,0007)			DCMSYS generated

Description				
>Scheduled Station Name	(0040,0010)			DCMSYS generated
>Scheduled Procedure Step Location	(0040,0011)			DCMSYS generated
>Scheduled Protocol Code Sequence	(0040, 0008)			
>>Code Value	(0008, 0100)			DCMSYS generated
>>Coding Scheme Designator	(0008, 0102)			DCMSYS generated
>>Code Meaning	(0008, 0104)			DCMSYS generated
> Pre-Medication	(0040,0012)			DCMSYS generated
> Scheduled Procedure Step ID	(0040,0009)			DCMSYS generated
> Requested Contrast Agent	(0032,1070)			DCMSYS generated
>Scheduled Procedure Step Status	(0040,0020)			DCMSYS generated
>Comments on the Scheduled Procedure Step	(0040, 0400)			DCMSYS generated
Requested Procedure				
Requested Procedure ID	(0040,1001)			DCMSYS generated
Requested Procedure Description	(0032,1060)			DCMSYS generated
Requested Procedure Code Sequence	(0032,1064)			
>Code Value	(0008, 0100)	Universal Service Id	ORM OBR:4	The value in the HL7 attribute is mapped to one or more procedure codes in the DCMSYS database. The mapping is configurable
>Coding Scheme Designator	(0008, 0102)	Universal Service Id	ORM OBR:4	Maps to a site-defined Coding Scheme, the CPT Coding Scheme or the DCMSYS internal Coding Scheme
>Code Meaning	(0008, 0104)			DCMSYS generated
Study Instance UID	(0020,000D)			DCMSYS generated
Referenced Study Sequence	(0008,1110)			
>Referenced SOP Class UID	(0008,1150)			DCMSYS generated
>Referenced SOP Instance UID	(0008,1155)			DCMSYS generated
Requested Procedure Priority	(0040,1003)		ORM OBR:27	
Patient Transport Arrangements	(0040,1004)		ORM OBR:30	
Reason for the Requested	(0040, 1002)			DCMSYS generated

Procedure				
Imaging Service Request				
Accession Number	(0008,0050)			DCMSYS generated
Requesting Physician	(0032,1032)		ORM OBR:16	
Referring Physician's Name	(0008,0090)		ORM PV1:8	
Reason for the Imaging Service Request	(0040,2001)	Reason for Study	ORM OBR:31	
Order Entered By	(0040,2008)	Entered By	ORM ORC:10	
Order Enterer's Location	(0040,2009)	Entering Organization	ORM ORC:17	
Visit Identification				
Admission ID	(0038,0010)		ADT PID:3	
Admitting Diagnosis Description	(0008,1080)		ADT DG1:4	
Admitting Diagnoses Code Sequence	(0008,1084)			
>Code Value	(0008, 0100)		ADT DG1:3	
>Coding Scheme Designator	(0008, 0102)		ADT DG1:2	
>Code Meaning	(0008, 0104)			
Patient Identification				
Patient's Name	(0010,0010)		ADT PID:5	
Patient ID	(0010,0020)		ADT PID:3	
Patient Demographics				
Patients Birth Date	(0010,0030)		ADT PID:7	
Patient's Sex	(0010,0040)		ADT PID:8	
Patient's Weight	(0010,1030)		ADT OBX:5	
Ethnic Group	(0010,2160)		ADT PID:10	
Patient Comment	(0010,4000)		ORM NTE:3	
Patient Medical				
Patient State	(0038,0500)	Danger Code	ORM OBR:12	

Pregnancy Status	(0010,21C0)	Filler Field 1	ORM OBR:20	
Medical Alerts	(0010,2000)	Relevant Clinical Information	ORM OBR:13	
Allergies	(0010,2110)		ADT AL1:3	
Last Menstrual Date	(0010,21D0)	Filler Field 1	ORM OBR:20	

F.8.2 Data Dictionary of private attributes

DCMSYS ROUTER does not use any private attributes.

F.8.3 Coded Terminology and templates

DCMSYS ROUTER’s usage of Coding Schemes is specified in the table below. This table lists the Coding Schemes used by DCMSYS ROUTER for attributes it originates. Usage of Controlled Terminology by Applications sending IODs to DCMSYS ROUTER is discussed in the relevant SOP Specific Conformance sections above. The Procedure and Protocol Codes in the DCMSYS ROUTER database can be exported to files and transferred across the network using the Configuration Utility. This allows Modalities to access and incorporate these codes if so desired.

Table F.8.1-5  
DCMSYS ROUTER CONTROLLED TERMINOLOGY USAGE

SOP Class/Service	Attribute Name	Tag	Baseline Context Id	Coding Scheme	Remarks
Scheduled Procedure Step Module					
MWL/ C-FIND	>Scheduled Protocol Code Sequence	(0040,0008)	None	CPT-4, DCMSYS ROUTER Procedure, site-supplied procedure codes or site-supplied protocol codes	At the option of the site, DCMSYS ROUTER may be configured to associate CPT-4, DCMSYS ROUTER Internal codes or site-supplied procedure codes with the various procedures represented in their Item master file. The configured procedure code will be passed in this attribute unless the site has supplied and configured protocol codes to be associated with the respective procedures in addition to procedure codes. In this case the configured protocol code will be passed
Requested Procedure Module					
	Requested Procedure Code Sequence	(0032,1064)	None	CPT-4, DCMSYS ROUTER Procedure, site-supplied procedure codes	See remarks for Scheduled Protocol Code Sequence (0040, 0008). The difference is that a procedure code is always passed in this attribute rather than a protocol code

F.8.4 Greyscale image consistency

DCMSYS ROUTER does not support the Greyscale Standard Display Function

F.8.5 Standard Extended/Specialized/Private SOP classes

DCMSYS ROUTER does not claim conformance to any Extended, Specialized or Private SOP Classes.

C.8.6 Private Transfer Syntaxes

DCMSYS ROUTER does not employ any Private Transfer Syntaxes.