



ClearCanvas Workstation DICOM Conformance Statement

Document Version: 2.1

Product Name(s): ClearCanvas RIS/PACS

Component Name(s): ClearCanvas Workstation

Edition(s): Chiropractic

Version: 3.7

Date: July 27, 2011

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1 CONFORMANCE STATEMENT OVERVIEW

1.1 OVERVIEW

The application supports querying a remote system for a list of DICOM objects that may then be retrieved to the local system and displayed, in the case of images. It also supports sending locally loaded objects across the network to another system. Only hierarchical study root query and retrieval is supported for both SCP and SCU query operations.

For the purposes of display, the application supports:

- Most image storage SOP Classes defined as of DICOM 2009.
- Images of any photometric interpretation.
- Images compressed with the following Transfer Syntaxes:
 - RLE Lossless
 - JPEG Baseline (Process 1)
 - JPEG Extended (Process 2 & 4)
 - JPEG Lossless, Non-Hierarchical (Process 14)
 - JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])
 - JPEG 2000 Image Compression
 - JPEG 2000 Image Compression (Lossless Only)
- Key object selection documents containing image entries.
- Grayscale softcopy presentation states and color softcopy presentation states for images in a key object selection document.

All other storage SOP Classes can be retrieved and stored locally, and sent to other DICOM devices, but are otherwise completely ignored by the application. Table 1.1-1 provides a detailed summary.

**Table 1.1-1
NETWORK SERVICES**

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Image Transfer		
Computed Radiography Image Storage	Stored and Viewed	Yes
CT Image Storage	Stored and Viewed	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	Stored and Viewed	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	Stored and Viewed	Yes
Digital Mammography X-Ray Image Storage – For Presentation	Stored and Viewed	Yes
Digital Mammography X-Ray Image Storage – For Processing	Stored and Viewed	Yes
Digital X-Ray Image Storage – For Presentation	Stored and Viewed	Yes
Digital X-Ray Image Storage – For Processing	Stored and Viewed	Yes
Enhanced CT Image Storage	Stored and Limited Viewing	Yes

Enhanced MR Image Storage	Stored and Limited Viewing	Yes
Enhanced XA Image Storage	Stored and Limited Viewing	Yes
Enhanced XRF Image Storage	Stored and Limited Viewing	Yes
MR Image Storage	Stored and Viewed	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	Stored only	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	Stored only	Yes
Multi-frame Single Bit Secondary Capture Image Storage	Stored only	Yes
Multi-frame True Color Secondary Capture Image Storage	Stored only	Yes
Nuclear Medicine Image Storage (Retired)	Stored and Viewed	Yes
Nuclear Medicine Image Storage	Stored and Viewed	Yes
Ophthalmic Photography 16 Bit Image Storage	Stored and Viewed	Yes
Ophthalmic Photography 8 Bit Image Storage	Stored and Viewed	Yes
Ophthalmic Tomography Image Storage	Stored only	Yes
Positron Emission Tomography Image Storage	Stored and Viewed	Yes
RT Image Storage	Stored and Viewed	Yes
Secondary Capture Image Storage	Stored and Viewed	Yes
Ultrasound Image Storage	Stored and Viewed	Yes
Ultrasound Image Storage (Retired)	Stored and Viewed	Yes
Ultrasound Multi-frame Image Storage	Stored and Viewed	Yes
Ultrasound Multi-frame Image Storage (Retired)	Stored and Viewed	Yes
Video Endoscopic Image Storage	Stored only	Yes
Video Microscopic Image Storage	Stored only	Yes
Video Photographic Image Storage	Stored only	Yes
VL Endoscopic Image Storage	Stored only	Yes
VL Microscopic Image Storage	Stored only	Yes
VL Photographic Image Storage	Stored only	Yes
VL Slide-Coordinates Microscopic Image Storage	Stored only	Yes
X-Ray 3D Angiographic Image Storage	Stored only	Yes
X-Ray 3D Craniofacial Image Storage	Stored only	Yes
X-Ray Angiographic Bi-Plane Image Storage (Retired)	Stored and Viewed	Yes
X-Ray Angiographic Image Storage	Stored and Viewed	Yes
X-Ray Radiofluoroscopic Image Storage	Stored and Viewed	Yes
Waveforms, Notes, Reports, Measurements Transfer		
12-lead ECG Waveform Storage	Stored only	Yes
Ambulatory ECG Waveform Storage	Stored only	Yes

Basic Text SR Storage	Stored only	Yes
Basic Voice Audio Waveform Storage	Stored only	Yes
Blending Softcopy Presentation State Storage	Stored only	Yes
Cardiac Electrophysiology Waveform Storage	Stored only	Yes
Chest CAD SR Storage	Stored only	Yes
Colon CAD SR Storage	Stored only	Yes
Color Softcopy Presentation State Storage	Yes – Key Object Selections only	Yes
Comprehensive SR Storage	Stored only	Yes
Deformable Spatial Registration Storage	Stored only	Yes
Encapsulated CDA Storage	Stored only	Yes
Encapsulated PDF Storage	Stored only	Yes
Enhanced SR Storage	Stored only	Yes
General ECG Waveform Storage	Stored only	Yes
Grayscale Softcopy Presentation State Storage	Yes – Key Object Selections only	Yes
Hemodynamic Waveform Storage	Stored only	Yes
Key Object Selection Document Storage	Yes – Images only	Yes
Macular Grid Thickness and Volume Report Storage	Stored only	Yes
Mammography CAD SR Storage	Stored only	Yes
MR Spectroscopy Storage	Stored only	Yes
Procedure Log Storage	Stored only	Yes
Pseudo-Color Softcopy Presentation State Storage	Stored only	Yes
Raw Data Storage	Stored only	Yes
Real World Value Mapping Storage	Stored only	Yes
RT Beams Treatment Record Storage	Stored only	Yes
RT Brachy Treatment Record Storage	Stored only	Yes
RT Dose Storage	Stored only	Yes
RT Ion Beams Treatment Record Storage	Stored only	Yes
RT Ion Plan Storage	Stored only	Yes
RT Plan Storage	Stored only	Yes
RT Structure Set Storage	Stored only	Yes
RT Treatment Summary Record Storage	Stored only	Yes
Segmentation Storage	Stored only	Yes
Spatial Fiducials Storage	Stored only	Yes
Spatial Registration Storage	Stored only	Yes
Spectacle Prescription Reports Storage	Stored only	Yes
Standalone Curve Storage (Retired)	Stored only	Yes
Standalone Modality LUT Storage (Retired)	Stored only	Yes
Standalone Overlay Storage (Retired)	Stored only	Yes
Standalone PET Curve Storage (Retired)	Stored only	Yes

Standalone VOI LUT Storage (Retired)	Stored only	Yes
Stereometric Relationship Storage	Stored only	Yes
Stored Print Storage (Retired)	Stored only	Yes
X-Ray Radiation Dose SR Storage	Stored only	Yes
Query/Retrieve		
Study Root Information Model FIND	Yes – Hierarchical only	Yes
Study Root Information Model MOVE	Yes – Hierarchical only	Yes

**Table 1.1-2
MEDIA SERVICES**

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk - Recordable		
General Purpose CD-R	Yes	Yes – Not DICOMDIR
DVD		
General Purpose DVD-RAM	Yes	Yes – Not DICOMDIR
General Purpose DVD	Yes	Yes – Not DICOMDIR
BD		
General Purpose BD	Yes	Yes – Not DICOMDIR

Note: Support for General Purpose BD is based on the public comment version of DICOM Supplement 153.

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3 INTRODUCTION

3.1 REVISION HISTORY

Document Version	Date of Issue	Author	Description
1.0	July 25, 2008	Henry Hernaez	Version for Final Review
1.1	December 11, 2008	Stewart Bright	Version for Final Review
1.2	July 22, 2009	Jasper Yeh, Stewart Bright	Version for Final Review
1.3	September 18, 2009	Jasper Yeh	Version for Final Review
1.4	December 17, 2009	Jasper Yeh, Stewart Bright	Version for Final Review
1.5	February 22, 2010	Stewart Bright	Version for Final Review
1.6	September 16, 2010	Jasper Yeh, Stewart Bright	Version for Final Review
1.7	September 21, 2010	Jasper Yeh, Stewart Bright	Version for Final Review
1.8	February 16, 2011	Jasper Yeh, Stewart Bright	Version for Final Review
1.9	March 31, 2011	Jasper Yeh, Stewart Bright	Version for Final Review
2.0	June 14, 2011	Jasper Yeh	Version for Final Review
2.1	July 27, 2011	Jasper Yeh	Version for Final Review

3.2 AUDIENCE

This document is written for the people who need to understand how ClearCanvas Workstation will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators and developers who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators and developers are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

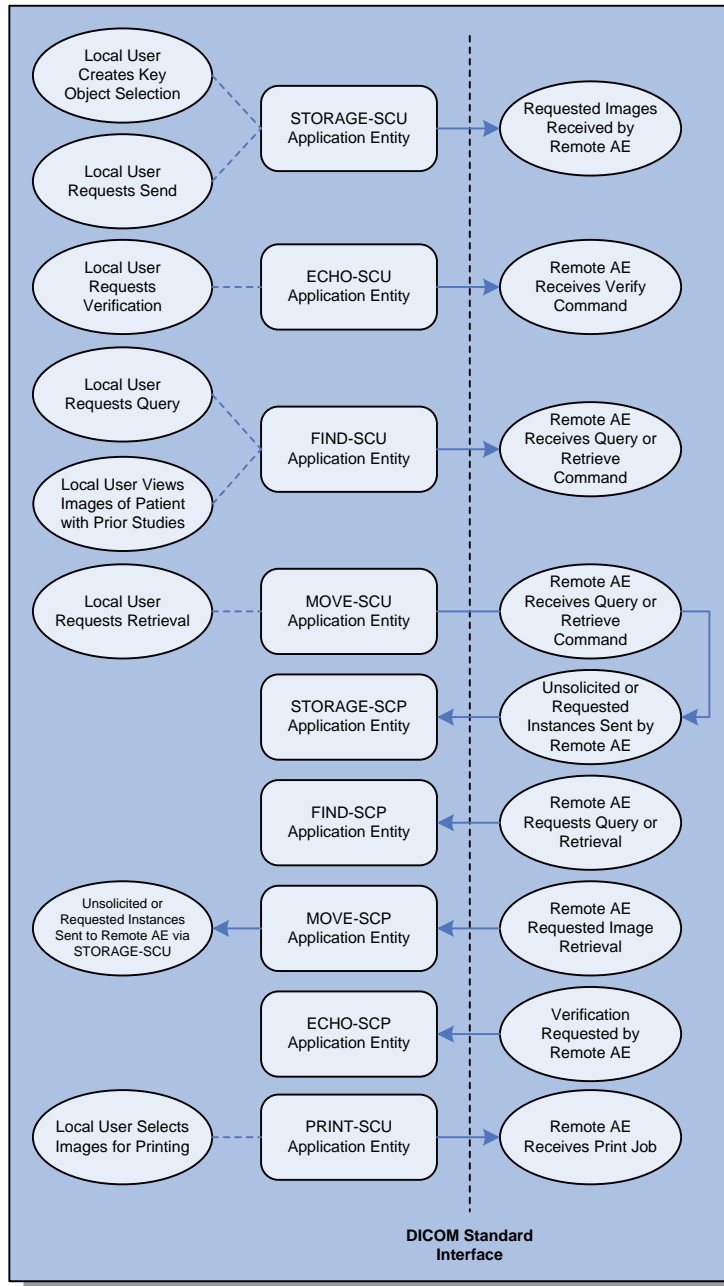
3.3 REMARKS

This application has been approved for clinical use in the United States and Canada.

4 NETWORKING

4.1 IMPLEMENTATION MODEL

4.1.1 Application Data Flow



**Figure 4.1-1
IMPLEMENTATION MODEL**

The application is a .NET application that provides a user interface, internal database and network listener that spawns additional threads as necessary to handle incoming connections, as well as limited media support.

Conceptually, the network services may be modeled as the following separate AEs, though in fact all the AEs share a single (configurable) AE Title:

- ECHO-SCP, which responds to verification requests
- ECHO-SCU, which sends a verification request
- STORAGE-SCP, which receives incoming composite instances
- STORAGE-SCU, which sends outbound composite instances
- FIND-SCP, which receives incoming queries for lists of studies
- FIND-SCU, which queries remote AEs for lists of studies
- MOVE-SCP, which responds to requests for studies
- MOVE-SCU, which retrieves selected studies
- PRINT-SCU, which sends print jobs

4.1.2 Functional Definitions of AEs

4.1.2.1 ECHO-SCP

ECHO-SCP waits in the background for connections, will accept associations with Presentation Contexts for the SOP Class of the Verification Service Class, and will respond successfully to echo requests.

4.1.2.2 ECHO-SCU

ECHO-SCU is activated through the user interface when a user selects a remote AE to verify (from a pre-configured list), then initiates a verification.

4.1.2.3 STORAGE-SCP

STORAGE-SCP waits in the background for connections, will accept associations with Presentation Contexts for SOP Classes of the Storage Service Class, and will store the received instances to the internal database where they may subsequently be listed and viewed through the user interface.

4.1.2.4 STORAGE-SCU

STORAGE-SCU is typically activated through the user interface when a user selects studies from the local store and requests that they be sent to a remote AE (selected from a pre-configured list). STORAGE-SCU can also be activated internally when a user closes a viewer window and there are images that were marked as key objects by the user. Softcopy presentation states created at the time the images were marked as key objects are referenced alongside the source images to create a key object selection document.

4.1.2.5 FIND-SCP

FIND-SCP waits in the background for connections, will accept associations with Presentation Contexts for the SOP Class of the Study Root Query/Retrieve Information Model – FIND Service Class, and will respond successfully to query requests.

4.1.2.6 FIND-SCU

FIND-SCU is typically activated through the user interface when a user selects a remote AE to query (from a pre-configured list), then initiates a query for studies. For a single study at a time, the user can also elect to view details of the series in it, which also utilizes FIND-SCU.

FIND-SCU can also be activated internally when a user opens one or more studies for viewing and there is at least one remote AE marked as a “Default Server” in the configuration. A query is initiated to list prior studies related to the current patient(s) being viewed.

4.1.2.7 MOVE-SCP

MOVE-SCP waits in the background for connections, will accept associations with Presentation Contexts for the SOP Class of the Study Root Query/Retrieve Information Model – MOVE Service Class, and will respond successfully to move requests by initiating storage of instances to the remote AE.

4.1.2.8 MOVE-SCU

MOVE-SCU is activated through the user interface when a user selects a study for retrieval. A connection to the remote AE is established to initiate the retrieval and the STORAGE-SCP AE receives the retrieved instances.

4.1.2.9 PRINT-SCU

PRINT-SCU is activated through the user interface when a user selects one or more previously-identified images for printing. A connection to the remote AE is established to transfer the selected images for printing.

4.1.3 Sequencing of Real-World Activities

All SCP activities are performed asynchronously in the background and are not dependent on any sequencing. All SCU activities are initiated through the user interface with the following exceptions:

- STORAGE-SCU is also initiated internally by both MOVE-SCP and a Send Key Object Selections operation.
- FIND-SCU is also initiated internally by a Query for Prior Studies operation.

ECHO-SCU and FIND-SCU activities are typically synchronous and blocking except when FIND-SCU is invoked as a Query for Prior Studies operation, in which case it is asynchronous and non-blocking. STORAGE-SCU and MOVE-SCU activities are asynchronous and non-blocking.

4.2 AE SPECIFICATIONS

4.2.1 ECHO-SCP

4.2.1.1 SOP Classes

ECHO-SCP provides Standard Conformance to the following SOP classes:

**Table 4.2-1
SOP CLASSES SUPPORTED BY ECHO SCP**

SOP Class Name	SOP Class UID
Verification SOP Class	1.2.840.10008.1.1

4.2.1.2 Association Policies

4.2.1.2.1 General

ECHO-SCP accepts but never initiates associations.

**Table 4.2-2
MAXIMUM PDU SIZE RECEIVED FOR ECHO-SCP**

Maximum PDU size received	114kB (approximate)
---------------------------	---------------------

4.2.1.2.2 Number of Associations

**Table 4.2-3
NUMBER OF ASSOCIATIONS FOR ECHO-SCP**

Maximum number of simultaneous associations	Unlimited
---	-----------

4.2.1.2.3 Asynchronous Nature

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

4.2.1.2.4 Implementation Identifying Information

**Table 4.2-4
DICOM IMPLEMENTATION CLASS AND VERSION FOR ECHO SCP**

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

4.2.1.3 Association Initiation Policy

ECHO-SCP does not initiate associations.

4.2.1.4 Association Acceptance Policy

When ECHO-SCP accepts an association, it will respond to echo requests. The association will be rejected if:

- The Called AE Title does not match the AE Title shared by all the SCPs of the application.

4.2.1.4.1 Activity – Receive Echo Request

4.2.1.4.1.1 Description and Sequencing of Activities

As requests are received, they are responded to immediately.

4.2.1.4.1.2 Accepted Presentation Contexts

**Table 4.2-5
ACCEPTABLE PRESENTATION CONTEXTS FOR ECHO-SCP AND RECEIVE ECHO REQUEST**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

4.2.1.4.1.2.1 Extended Negotiation

No extended negotiation is performed.

4.2.1.4.1.3 SOP Specific Conformance

4.2.1.4.1.3.1 SOP Specific Conformance to Verification SOP Class

ECHO-SCP provides standard conformance to the Verification Service Class.

4.2.1.4.1.3.2 Presentation Context Acceptance Criterion

ECHO-SCP will only accept a Presentation Context compatible with the one listed in Table 4.2-5.

4.2.1.4.1.3.3 Transfer Syntax Selection Policies

ECHO-SCP will select the first Transfer Syntax proposed by the client that is supported by the SCP, per Presentation Context.

ECHO-SCP will accept duplicate Presentation Contexts; that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same method for selecting a Transfer Syntax for each.

4.2.2 ECHO-SCU

4.2.2.1 SOP Classes

ECHO-SCU provides Standard Conformance to the following SOP classes:

**Table 4.2-6
SOP CLASSES SUPPORTED BY ECHO-SCU**

SOP Class Name	SOP Class UID
Verification SOP Class	1.2.840.10008.1.1

4.2.2.2 Association Policies

4.2.2.2.1 General

ECHO-SCU initiates but never accepts associations.

**Table 4.2-7
MAXIMUM PDU SIZE RECEIVED FOR ECHO-SCU**

Maximum PDU size received	114kB (approx.)
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4.2.2.2.2 Number of Associations

**Table 4.2-8
NUMBER OF ASSOCIATIONS FOR ECHO-SCU**

Maximum number of simultaneous associations	1
---	---

4.2.2.2.3 Asynchronous Nature

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

4.2.2.2.4 Implementation Identifying Information

**Table 4.2-9
DICOM IMPLEMENTATION CLASS AND VERSION FOR ECHO-SCU**

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

4.2.2.3 Association Initiation Policy

ECHO-SCU attempts to initiate a new association when the user performs the verify action from the user interface to either a single remote AE or a group of remote AEs.

4.2.2.3.1 Activity – Send Echo Request

4.2.2.3.1.1 Description and Sequencing of Activities

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

4.2.2.3.1.2 Proposed Presentation Contexts

**Table 4.2-10
PROPOSED PRESENTATION CONTEXTS FOR ECHO-SCU AND SEND ECHO REQUEST**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.2.2.3.1.2.1 Extended Negotiation

No extended negotiation is performed.

4.2.2.3.1.3 SOP Specific Conformance

4.2.2.3.1.3.1 SOP Specific Conformance to Verification SOP Class

ECHO-SCU provides standard conformance to the Verification Service Class.

4.2.2.3.1.3.2 Presentation Context Acceptance Criterion

ECHO-SCU does not accept associations.

4.2.2.3.1.3.3 Transfer Syntax Selection Policies

ECHO-SCU prefers Explicit VR Little Endian Transfer Syntax, which is always first in the proposed Presentation Context.

4.2.2.4 Association Acceptance Policy

ECHO-SCU does not accept associations.

4.2.3 STORAGE-SCP

4.2.3.1 SOP Classes

STORAGE-SCP provides Standard Conformance to the following SOP classes:

**Table 4.2-11
SOP CLASSES SUPPORTED BY STORAGE-SCP**

SOP Class Name	SOP Class UID
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4

Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65
Colon CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.69
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Encapsulated CDA Storage	1.2.840.10008.5.1.4.1.1.104.2
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59
Macular Grid Thickness and Volume Report Storage	1.2.840.10008.5.1.4.1.1.79.1
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1
Ophthalmic Tomography Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.4
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128

Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1
Spectacle Prescription Reports Storage	1.2.840.10008.5.1.4.1.1.78.6
Standalone Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.9
Standalone Modality LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.10
Standalone Overlay Storage (Retired)	1.2.840.10008.5.1.4.1.1.8
Standalone PET Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.129
Standalone VOI LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.11
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3
Stored Print Storage (Retired)	1.2.840.10008.5.1.1.27
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1
X-Ray 3D Craniofacial Image Storage	1.2.840.10008.5.1.4.1.1.13.1.2
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3

X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2

4.2.3.2 Association Policies

4.2.3.2.1 General

STORAGE-SCP accepts but never initiates associations.

**Table 4.2-12
MAXIMUM PDU SIZE RECEIVED FOR STORAGE-SCP**

Maximum PDU size received	114kB (approx.)
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4.2.3.2.2 Number of Associations

**Table 4.2-13
NUMBER OF ASSOCIATIONS FOR STORAGE-SCP**

Maximum number of simultaneous associations	Unlimited
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4.2.3.2.3 Asynchronous Nature

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

4.2.3.2.4 Implementation Identifying Information

**Table 4.2-14
DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGE-SCP**

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

4.2.3.3 Association Initiation Policy

STORAGE-SCP does not initiate associations.

4.2.3.4 Association Acceptance Policy

When STORAGE-SCP accepts an association, it will respond to storage requests. The association will be rejected if:

- The Called AE Title does not match the AE Title shared by all the SCPs of the application.

4.2.3.4.1 Activity – Receive Storage Request

4.2.3.4.1.1 Description and Sequencing of Activities

As instances are received, they are copied to the local file system and a record inserted into the internal database. If the received instance is a duplicate of a previously received instance, the old file and database record will be overwritten with the new one.

4.2.3.4.1.2 Accepted Presentation Contexts

**Table 4.2-15
ACCEPTABLE PRESENTATION CONTEXTS FOR
STORAGE-SCP AND RECEIVE STORAGE REQUEST**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 4.2-11	See Table 4.2-11	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		RLE Lossless	1.2.840.10008.1.2.5	SCP	None
		JPEG Baseline (Process 1):	1.2.840.10008.1.2.4.50	SCP	None
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51	SCP	None
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCP	None
		JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])	1.2.840.10008.1.2.4.70	SCP	None
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90	SCP	None
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	SCP	None

4.2.3.4.1.2.1 Extended Negotiation

No extended negotiation is performed, though STORAGE-SCP:

- is a Level 2 Storage SCP (Full – does not discard any data elements)
- does not support digital signatures
- does not coerce any received data elements

4.2.3.4.1.3 SOP Specific Conformance

4.2.3.4.1.3.1 SOP Specific Conformance to Storage SOP Classes

STORAGE-SCP provides standard conformance to the Storage Service Class.

4.2.3.4.1.3.2 Presentation Context Acceptance Criterion

STORAGE-SCP will always accept any Presentation Context for the supported SOP Classes with the supported Transfer Syntaxes. More than one proposed Presentation Context will be accepted for the same Abstract Syntax if the Transfer Syntax is supported, whether or not it is the same as another Presentation Context.

4.2.3.4.1.3.3 Transfer Syntax Selection Policies

STORAGE-SCP will always select the first Transfer Syntax proposed by the client that is supported by the SCP, per Presentation Context.

STORAGE-SCP will accept duplicate Presentation Contexts; that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same method for selecting a Transfer Syntax for each.

4.2.3.4.1.3.4 Response Status

STORAGE-SCP will behave as described in the Table below when generating the C-STORE response command message.

**Table 4.2-16
RESPONSE STATUS FOR STORAGE-SCP AND RECEIVE STORAGE REQUEST**

Service Status	Further Meaning	Status Codes	Reason
Failure	Processing Failure	0110	Sent when an error occurs trying to save the stored SOP instance to disk
Success		0000	Sent as each SOP is stored

4.2.4 STORAGE-SCU

4.2.4.1 SOP Classes

STORAGE-SCU provides Standard Conformance to the following SOP classes:

**Table 4.2-17
SOP CLASSES SUPPORTED BY STORAGE-SCU**

SOP Class Name	SOP Class UID
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65
Colon CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.69
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2

Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Encapsulated CDA Storage	1.2.840.10008.5.1.4.1.1.104.2
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59
Macular Grid Thickness and Volume Report Storage	1.2.840.10008.5.1.4.1.1.79.1
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1
Ophthalmic Tomography Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.4
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5

RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1
Spectacle Prescription Reports Storage	1.2.840.10008.5.1.4.1.1.78.6
Standalone Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.9
Standalone Modality LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.10
Standalone Overlay Storage (Retired)	1.2.840.10008.5.1.4.1.1.8
Standalone PET Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.129
Standalone VOI LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.11
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3
Stored Print Storage (Retired)	1.2.840.10008.5.1.1.27
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1
X-Ray 3D Craniofacial Image Storage	1.2.840.10008.5.1.4.1.1.13.1.2
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2

4.2.4.2 Association Policies

4.2.4.2.1 General

STORAGE-SCU initiates but never accepts associations.

**Table 4.2-18
MAXIMUM PDU SIZE RECEIVED FOR STORAGE-SCU**

Maximum PDU size received	114kB (approx.)
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4.2.4.2.2 Number of Associations

**Table 4.2-19
NUMBER OF ASSOCIATIONS FOR STORAGE-SCU**

Maximum number of simultaneous associations	Unlimited
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4.2.4.2.3 Asynchronous Nature

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

4.2.4.2.4 Implementation Identifying Information

**Table 4.2-20
DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGE-SCU**

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

4.2.4.3 Association Initiation Policy

When initiated by the user, STORAGE-SCU attempts to initiate a new association for the study, or group of studies, selected (e.g. one association per user-initiated send operation). When initiated by MOVE-SCP, one association is initiated per move request. When initiated internally in response to the user closing a viewer window where key object selection documents and softcopy presentation states have been created, one association is initiated for all the instances per remote AE.

4.2.4.3.1 Activity – Send Storage Request

4.2.4.3.1.1 Description and Sequencing of Activities

For each instance selected from the user interface to be transferred, a single attempt will be made to transmit it to the selected remote AE. If the send fails, for whatever reason, no retry will be performed, and an attempt will be made to send the next instance.

4.2.4.3.1.2 Proposed Presentation Contexts

**Table 4.2-21
PROPOSED PRESENTATION CONTEXTS FOR STORAGE-SCU AND SEND STORAGE REQUEST**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 4.2-17	See Table 4.2-17	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		RLE Lossless	1.2.840.10008.1.2.5	SCU	None
		JPEG Baseline (Process 1):	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51	SCU	None
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCU	None

	JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])	1.2.840.10008.1.2.4.70	SCU	None
	JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90	SCU	None
	JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	SCU	None

STORAGE-SCU examines all the Abstract Syntax/Transfer Syntax pairs in the instances to be stored, and applies the following algorithm when determining the Presentation Contexts to propose:

- For each Abstract Syntax/Transfer Syntax pair where the Transfer Syntax is uncompressed, a Presentation Context will be defined for the Abstract Syntax with both Explicit and Implicit Little Endian Transfer Syntaxes only.
- For those Abstract Syntax/Transfer Syntax pairs where the Transfer Syntax is encapsulated (e.g. compressed), a Presentation Context is defined for the Abstract Syntax with only the encapsulated Transfer Syntax.
- For those Abstract Syntax/Transfer Syntax pairs where the Transfer Syntax is encapsulated and STORAGE-SCU is able to convert to an uncompressed Transfer Syntax (e.g. Explicit or Implicit Little Endian), an additional Presentation Context is defined for each such Abstract Syntax, with only Explicit and Implicit Little Endian Transfer Syntaxes.

The implications of this algorithm are:

- STORAGE-SCU will never compress an instance in order to store it.
- Compressed instances will be stored as-is whenever possible, or failing that, in either Explicit or Implicit Little Endian format. When STORAGE-SCU is incapable of decompressing an instance, it simply will not be stored and STORAGE-SCU will continue sending the remaining instances.

4.2.4.3.1.2.1 Extended Negotiation

No extended negotiation is performed.

4.2.4.3.1.3 SOP Specific Conformance

4.2.4.3.1.3.1 SOP Specific Conformance to Storage SOP Classes

STORAGE-SCU provides standard conformance to the Storage Service Class.

4.2.4.3.1.3.2 Presentation Context Acceptance Criterion

STORAGE-SCU does not accept associations.

4.2.4.3.1.3.3 Transfer Syntax Selection Policies

For encapsulated Transfer Syntaxes, STORAGE-SCU prefers to send each instance using its current Transfer Syntax, and will find the first Presentation Context where the Transfer Syntax was accepted. In the case where the Transfer Syntax was not accepted by the remote STORAGE-SCP, STORAGE-SCU will check for the acceptance of Explicit VR Little Endian and Implicit VR Little Endian, in that order. If STORAGE-SCU cannot change the Transfer Syntax, the sub-operation will fail and it will not store the instance.

In the case of uncompressed Transfer Syntaxes, STORAGE-SCU has no real preference. It will store the instances in either Explicit VR Little Endian or Implicit VR Little Endian, depending on what was accepted by the SCP.

4.2.4.3.1.3.4 Response Status

STORAGE-SCU will behave as described in the Table below in response to the status returned in the C-STORE response command message.

**Table 4.2-22
RESPONSE STATUS FOR STORAGE-SCU AND SEND STORAGE REQUEST**

Service Status	Further Meaning	Status Codes	Behavior
Failure	N/A	Any	Message shown in Send Queue UI, continues storing remaining instances
Warning	N/A	Any	Message shown in Send Queue UI, continues storing remaining instances

4.2.4.3.2 Activity – Send Key Object Selections

4.2.4.3.2.1 Description and Sequencing of Activities

For each key object selection document created, a single attempt will be made to transmit it and the softcopy presentation states of each image in the selection to remote AE(s) according to the following rules:

- If configured to do so, the created instances will be sent to the user’s “Default Servers”, if any have been defined. This will be done regardless of whether or not the source images exist on the “Default Servers”.
- If configured to do so, the created instances will be sent to the AE from which the source images were received, based on the value in each source image’s meta header for “(0002,0016) Source Application Entity Title”. The AE must be in the application’s pre-configured list in order for this to succeed.
- If the source images were loaded directly (streamed) from a ClearCanvas ImageServer, the created instances will be sent to it. This is not configurable.

Additionally, if the source images were loaded from the local store, the created instances will be imported into it. This is not configurable.

For each remote AE, a single association will be established to send all the created instances. If an instance cannot be sent, for whatever reason, no retry will be performed, and an attempt will be made to send the next instance. An error message will be shown in the workstation’s UI.

4.2.4.3.2.2 Proposed Presentation Contexts

**Table 4.2-23
PROPOSED PRESENTATION CONTEXTS FOR STORAGE-SCU
AND SEND KEY OBJECT SELECTIONS**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 4.2-17	See Table 4.2-17	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Key object selection documents and softcopy presentation states cannot be compressed. In all instances, a single Presentation Context will be defined for the Abstract Syntax with both Explicit and Implicit Little Endian Transfer Syntaxes only.

4.2.4.3.2.2.1 Extended Negotiation

No extended negotiation is performed.

4.2.4.3.2.3 SOP Specific Conformance

4.2.4.3.2.3.1 SOP Specific Conformance to Storage SOP Classes

STORAGE-SCU provides standard conformance to the Storage Service Class.

4.2.4.3.2.3.2 Presentation Context Acceptance Criterion

STORAGE-SCU does not accept associations.

4.2.4.3.2.3.3 Transfer Syntax Selection Policies

STORAGE-SCU always stores key object selection documents and softcopy presentation states in either Explicit VR Little Endian or Implicit VR Little Endian, depending on what was accepted by the SCP.

4.2.4.3.2.3.4 Response Status

See Table 4.2-22.

4.2.4.4 Association Acceptance Policy

STORAGE-SCU does not accept associations.

4.2.5 FIND-SCP

4.2.5.1 SOP Classes

FIND-SCP provides Standard Conformance to the following SOP classes:

**Table 4.2-24
SOP CLASSES SUPPORTED BY FIND-SCP**

SOP Class Name	SOP Class UID
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1

4.2.5.2 Association Policies

4.2.5.2.1 General

FIND-SCP accepts but never initiates associations.

**Table 4.2-25
MAXIMUM PDU SIZE RECEIVED FOR FIND-SCP**

Maximum PDU size received	114kB (approx.)
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4.2.5.2.2 Number of Associations

**Table 4.2-26
NUMBER OF ASSOCIATIONS FOR FIND-SCP**

Maximum number of simultaneous associations	Unlimited
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4.2.5.2.3 Asynchronous Nature

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

4.2.5.2.4 Implementation Identifying Information

**Table 4.2-27
DICOM IMPLEMENTATION CLASS AND VERSION FOR FIND-SCP**

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

4.2.5.3 Association Initiation Policy

FIND-SCP does not initiate associations.

4.2.5.4 Association Acceptance Policy

When FIND-SCP accepts an association, it will respond to query requests. The association will be rejected if:

- The Called AE Title does not match the AE Title shared by all the SCPs of the application.

4.2.5.4.1 Activity – Receive Query Request

4.2.5.4.1.1 Description and Sequencing of Activities

When a query is received, the internal database is queried for the result set.

4.2.5.4.1.2 Accepted Presentation Contexts

**Table 4.2-28
ACCEPTABLE PRESENTATION CONTEXTS FOR FIND-SCP AND RECEIVE QUERY REQUEST**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 4.2-24	See Table 4.2-24	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

4.2.5.4.1.2.1 Extended Negotiation

No extended negotiation is performed.

In particular, relational queries are not supported.

4.2.5.4.1.3 SOP Specific Conformance

4.2.5.4.1.3.1 SOP Specific Conformance to C-FIND SOP Classes

FIND-SCP provides standard conformance to the supported C-FIND SOP Classes with one exception: all matching is case-insensitive, which is not in strict compliance with DICOM 2009 PS 3.4. This was a conscious decision, as case-sensitive matching is not intuitive and most users would be completely unaware of the fact that it even matters, causing many expected query matches to not be returned.

Only a single information model, Study Root, is supported.

Only those attributes that are requested are returned in a C-FIND response. Some optional requested attributes will be returned as per Table 4.2-29.

**Table 4.2-29
STUDY ROOT RESPONSE IDENTIFIER FOR FIND-SCP**

Name	Tag	Types of Matching
STUDY Level		
Study Instance UID	(0020,000D)	UNIQUE
Patient's ID	(0010,0020)	S,*,U
Patient's Name	(0010,0010)	S,*,U
Patient's Birth Date	(0010,0030)	NONE
Patient's Sex	(0010,0040)	S,*,U
Study ID	(0020,0010)	S,*,U
Study Description	(0008,1030)	S,*,U
Modalities In Study	(0008,0061)	S,*,U
Study Date	(0008,0020)	S,U,R
Study Time	(0008,0030)	NONE
Accession Number	(0008,0050)	S,*,U
Referring Physician's Name	(0008,0090)	S,*,U
Procedure Code Sequence	(0008,1032)	NONE
>Code Value	(0008,0100)	S,*,U
>Coding Scheme Designator	(0008,0102)	S,*,U
Number Of Study Related Series	(0020,1206)	S,*,U
Number Of Study Related Instances	(0020,1208)	S,*,U
SERIES Level		
Series Instance UID	(0020,000E)	UNIQUE
Modality	(0008,0060)	S,*,U
Series Description	(0008,103E)	S,*,U
Series Number	(0020,0011)	S,*,U
Number Of Series Related Instances	(0020,1209)	S,*,U

IMAGE Level		
SOP Instance UID	(0008,0018)	UNIQUE
Instance Number	(0020,0013)	S,*,U
SOP Class UID	(0008,0016)	L,U
Common to all query levels		
Specific Character Set	(0008,0005)	N/A

Types of Matching:

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

Note that, in the case of wildcard matching, the question mark (?) operator is currently not supported.

4.2.5.4.1.3.2 Presentation Context Acceptance Criterion

FIND-SCP will always accept any Presentation Context for the supported SOP Classes with the supported Transfer Syntaxes. More than one proposed Presentation Context will be accepted for the same Abstract Syntax if the Transfer Syntax is supported, whether or not it is the same as another Presentation Context.

4.2.5.4.1.3.3 Transfer Syntax Selection Policies

FIND-SCP will always select the first Transfer Syntax proposed by the client that is supported by the SCP, per Presentation Context.

FIND-SCP will accept duplicate Presentation Contexts; that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same method for selecting a Transfer Syntax for each.

4.2.5.4.1.3.4 Response Status

FIND-SCP will behave as described in Table 4.2-30 when constructing the C-FIND response command message(s).

**Table 4.2-30
RESPONSE STATUS FOR FIND-SCP AND RECEIVE QUERY REQUEST**

Service Status	Further Meaning	Status Codes	Behavior
Failure	Identifier does not match SOP Class	A900	Sent when the Query/Retrieve Level in the C-FIND request is not present or valid
	Unable to process	Cxxx	Sent if internal database query is unsuccessful
Pending	Matches are continuing - Current Match is	FF00	Sent

	supplied and any Optional Keys were supported in the same manner as Required Keys		
Success	Matching is complete	0000	Sent

4.2.6 FIND-SCU

4.2.6.1 SOP Classes

FIND-SCU provides Standard Conformance to the following SOP classes:

**Table 4.2-31
SOP CLASSES SUPPORTED BY FIND-SCU**

SOP Class Name	SOP Class UID
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1

4.2.6.2 Association Policies

4.2.6.2.1 General

FIND-SCU initiates but never accepts associations.

**Table 4.2-32
MAXIMUM PDU SIZE RECEIVED FOR FIND-SCU**

Maximum PDU size received	114kB (approx.)
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4.2.6.2.2 Number of Associations

**Table 4.2-33
NUMBER OF ASSOCIATIONS FOR FIND-SCU**

Maximum number of simultaneous associations	1
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4.2.6.2.3 Asynchronous Nature

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

4.2.6.2.4 Implementation Identifying Information

**Table 4.2-34
DICOM IMPLEMENTATION CLASS AND VERSION FOR FIND-SCU**

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

4.2.6.3 Association Initiation Policy

FIND-SCU attempts to initiate a new association when the user performs the query action from the user interface. Furthermore, FIND-SCU attempts to initiate new associations for the purpose of locating prior studies when the user opens one or more studies for viewing.

4.2.6.3.1 Activity – Query Remote AE

4.2.6.3.1.1 Description and Sequencing of Activities

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

4.2.6.3.1.2 Proposed Presentation Contexts

**Table 4.2-35
PROPOSED PRESENTATION CONTEXTS FOR FIND-SCU AND QUERY REMOTE AE**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 4.2-31	See Table 4.2-31	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.2.6.3.1.2.1 Extended Negotiation

No extended negotiation is performed.

In particular, relational queries are not supported.

4.2.6.3.1.3 SOP Specific Conformance

4.2.6.3.1.3.1 SOP Specific Conformance to C-FIND SOP Classes

FIND-SCU provides standard conformance to the supported C-FIND SOP Classes.

Only a single information model, Study Root, is supported and is only used at the STUDY and SERIES levels. IMAGE level queries are never performed.

No CANCEL requests are ever issued.

Unexpected attributes returned in a C-FIND response (those not requested) are discarded. Requested return attributes not returned by the SCP are ignored. In general, non-matching responses returned by the SCP due to unsupported (hopefully optional) matching keys are not filtered locally by the FIND-SCU and thus will still be presented in the browser, with the exception of *Modalities in Study*, which is filtered by the SCU.

Specific Character Set is not included in the C-FIND request at any level. If present in the response, Specific Character Set will be used to identify character sets other than the default character set for display of strings in the browser.

Instance Availability is incorrectly included (but empty) in the C-FIND request at the STUDY level only; it is not included in SERIES level requests. For STUDY level queries initiated by the user, the value is shown in the results table if it was returned in the response.

Retrieve AE Title is not included in the C-FIND request at any level. If present in the response, it is ignored. The application currently assumes that the AE queried is also the AE from which to retrieve; normally, this is a reasonable assumption.

**Table 4.2-36
STUDY ROOT REQUEST IDENTIFIER FOR FIND-SCU**

Name	Tag	Types of Matching
STUDY Level		
Study Instance UID	(0020,000D)	UNIQUE
Patient's ID	(0010,0020)	S,*,U
Patient's Name	(0010,0010)	S,*,U
Patient's Birth Date	(0010,0030)	U
Referring Physician's Name	(0008,0090)	S,*,U
Study Description	(0008,1030)	S,*,U
Modalities In Study	(0008,0061)	S,U
Study Date	(0008,0020)	S,U,R
Study Time	(0008,0030)	U
Accession Number	(0008,0050)	S,*,U
Number Of Study Related Instances	(0020, 1208)	U
SERIES Level		
Study Instance UID	(0020,000D)	UNIQUE
Series Instance UID	(0020, 000E)	UNIQUE
Modality	(0008, 0060)	U
Series Description	(0008, 103E)	U
Series Number	(0020, 0011)	U
Number of Series Related Instances	(0020, 1209)	U
IMAGE Level		
N/A		
Common to all query levels		
Specific Character Set	(0008,0005)	N/A
Instance Availability	(0008,0056)	N/A
Retrieve AE Title	(0008,0054)	N/A

Types of Matching:

An "S" indicates the identifier attribute uses Single Value Matching, an "R" indicates Range Matching, a "*" indicates wildcard matching, a 'U' indicates Universal Matching, an 'L' indicates that a UID list is sent, and "UNIQUE" indicates that this is the Unique Key for that query level.

4.2.6.3.1.3.2 Presentation Context Acceptance Criterion

FIND-SCU does not accept associations.

4.2.6.3.1.3.3 Transfer Syntax Selection Policies

FIND-SCU prefers Explicit VR Little Endian Transfer Syntax, which is always first in the proposed Presentation Context.

4.2.6.3.1.3.4 Response Status

FIND-SCU will behave as described in Table 4.2-37 in response to the status returned in the C-FIND response command message(s).

**Table 4.2-37
RESPONSE STATUS FOR FIND-SCU AND QUERY REMOTE AE REQUEST**

Service Status	Further Meaning	Status Codes	Behavior
Failure	N/A	Any	Association closed, message shown to user
Cancel	Matching terminated due to Cancel request	FE00	Association closed, message shown to user
Success	Matching is complete - No final Identifier is supplied	0000	Association closed

4.2.6.3.2 Activity – Query for Prior Studies

4.2.6.3.2.1 Description and Sequencing of Activities

When one or more studies are opened for viewing by the user, an attempt is made to query the local store and each remote AE defined as a “Default Server” in the configuration for each unique patient ID in the opened studies. If a query fails for whatever reason, the remaining queries will not be performed, and the user will be notified of the failure.

Studies discovered this way which were not specifically selected by the user are considered “prior studies” and are listed by the application to inform the user of their presence. In some configurations (namely, when the source AE of the prior study is a ClearCanvas ImageServer), the application also supports viewing the prior study as if it had been selected by the user initially via the Streaming mechanism (see Section 4.3.2.1).

The only parameter used in each query is the patient ID, with a wildcard character (asterisk) appended by default. A configurable algorithm exists that allows the patient ID query parameter to be modified before the query is executed, in order to maximize the number of studies returned in the results.

Similarly, because not all the results returned will belong to the patient, there is another configurable algorithm used to reconcile the patient ID in the returned study identifiers against those of the loaded studies. By default, the algorithm specifies that each patient ID in the results must match one of the patient IDs in the loaded studies exactly in order to be considered a true match. Studies returned in the results that cannot be reconciled are filtered out.

These algorithms are very flexible, but would typically only be used to trim whitespace and suffixes rather than making sweeping modifications. For obvious reasons, configuration of the algorithms should be done with great care, as it could result in false matches or in true matches being missed, which could adversely impact patient care.

4.2.6.3.2.2 Proposed Presentation Contexts

See Table 4.2-35.

4.2.6.3.2.2.1 Extended Negotiation

No extended negotiation is performed.

In particular, relational queries are not supported.

4.2.6.3.2.3 SOP Specific Conformance

4.2.6.3.2.3.1 SOP Specific Conformance to C-FIND SOP Classes

FIND-SCU provides standard conformance to the supported C-FIND SOP Classes.

Only a single information model, Study Root, is supported and is only used at the highest level (STUDY).

No CANCEL requests are ever issued.

Unexpected attributes returned in a C-FIND response (those not requested) are discarded. Requested return attributes not returned by the SCP are ignored.

Specific Character Set is not included in the C-FIND request. If present in the response, Specific Character Set will be used to identify character sets other than the default character set for display of strings in the viewer.

For each “prior study” found, Retrieve AE Title is used to determine if the study can be streamed, and if so, the study will be loaded into the viewer in the same way as one(s) selected by the user.

**Table 4.2-38
STUDY ROOT REQUEST IDENTIFIER FOR FIND-SCU FOR QUERY FOR PRIOR STUDIES**

Name	Tag	Types of Matching
STUDY Level		
Study Instance UID	(0020,000D)	UNIQUE
Patient's ID	(0010,0020)	*
Patient's Name	(0010,0010)	U
Patient's Birth Date	(0010,0030)	U
Patient's Birth Time	(0010,0032)	U
Patient's Sex	(0010,0040)	U
Study Description	(0008,1030)	U
Modalities In Study	(0008,0061)	U
Study ID	(0020,0010)	U
Study Description	(0008,1030)	U
Study Date	(0008,0020)	U
Study Time	(0008,0030)	U
Accession Number	(0008,0050)	U
Referring Physician's Name	(0008,0090)	U
Number of Study Related Instances	(0020,1208)	U
Number of Study Related Series	(0020,1206)	U
SERIES Level		
N/A		
IMAGE Level		
N/A		

Common to all query levels		
Specific Character Set	(0008,0005)	N/A
Instance Availability	(0008,0056)	N/A
Retrieve AE Title	(0008,0054)	N/A

Types of Matching:

An "S" indicates the identifier attribute uses Single Value Matching, an "R" indicates Range Matching, a "*" indicates wildcard matching, a 'U' indicates Universal Matching, an 'L' indicates that a UID list is sent, and "UNIQUE" indicates that this is the Unique Key for that query level.

4.2.6.3.2.3.2 Presentation Context Acceptance Criterion

FIND-SCU does not accept associations.

4.2.6.3.2.3.3 Transfer Syntax Selection Policies

FIND-SCU prefers Explicit VR Little Endian Transfer Syntax, which is always first in the proposed Presentation Context.

4.2.6.3.2.3.4 Response Status

See Table 4.2-37.

4.2.6.4 Association Acceptance Policy

FIND-SCU does not accept associations.

4.2.7 MOVE-SCP

4.2.7.1 SOP Classes

MOVE-SCP provides Standard Conformance to the following SOP classes:

**Table 4.2-39
SOP CLASSES SUPPORTED BY MOVE-SCP**

SOP Class Name	SOP Class UID
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2

4.2.7.2 Association Policies

4.2.7.2.1 General

MOVE-SCP accepts but never initiates associations.

**Table 4.2-40
MAXIMUM PDU SIZE RECEIVED FOR MOVE-SCP**

Maximum PDU size received	114kB (approx.)
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4.2.7.2.2 Number of Associations

**Table 4.2-41
NUMBER OF ASSOCIATIONS FOR MOVE-SCP**

Maximum number of simultaneous associations	Unlimited
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4.2.7.2.3 Asynchronous Nature

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

4.2.7.2.4 Implementation Identifying Information

**Table 4.2-42
DICOM IMPLEMENTATION CLASS AND VERSION FOR MOVE-SCP**

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

4.2.7.3 Association Initiation Policy

MOVE-SCP initiates an association with the AE specified as the Move Destination in the MOVE request, in order to store the requested instances. The remote AE must be in the application's pre-configured AE list.

4.2.7.4 Association Acceptance Policy

When MOVE-SCP accepts an association, it will respond to move requests. The association will be rejected if:

- The Called AE Title does not match the AE Title shared by all the SCPs of the application.

4.2.7.4.1 Activity – Receive Move Request

4.2.7.4.1.1 Description and Sequencing of Activities

As requests are received, a STORAGE-SCU operation is initiated to send the requested instances to the specified remote AE.

4.2.7.4.1.2 Proposed Presentation Contexts

**Table 4.2-43
ACCEPTABLE PRESENTATION CONTEXTS FOR MOVE-SCP AND RECEIVE MOVE REQUEST**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 4.2-39	See Table 4.2-39	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

4.2.7.4.1.2.1 Extended Negotiation

No extended negotiation is performed through MOVE-SCP.

In particular, relational retrievals are not supported.

4.2.7.4.1.3 SOP Specific Conformance

4.2.7.4.1.3.1 SOP Specific Conformance to C-MOVE SOP Classes

MOVE-SCP provides standard conformance to the supported C-MOVE SOP Classes.

Only a single information model, Study Root, is supported.

The move is performed to the destination AE Title specified in the original request. . If the destination AE does not exist in the application's pre-configured list, the store operations are not performed.

**Table 4.2-44
STUDY ROOT REQUEST IDENTIFIER FOR MOVE-SCP**

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

4.2.7.4.1.3.2 Presentation Context Acceptance Criterion

MOVE-SCP will only accept a Presentation Context compatible with the one listed in Table 4.2-43.

4.2.7.4.1.3.3 Transfer Syntax Selection Policies

MOVE-SCP will always select the first Transfer Syntax proposed by the client that is supported by the SCP, per Presentation Context.

MOVE-SCP will accept duplicate Presentation Contexts; that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same method for selecting a Transfer Syntax for each.

4.2.7.4.1.3.4 Response Status

MOVE-SCP will behave as described in the Table below when generating the C-MOVE response command message.

**Table 4.2-45
RESPONSE STATUS FOR MOVE-SCP AND SEND TO REMOTE AE REQUEST**

Service Status	Further Meaning	Status Codes	Behavior
Failure	Refused: Move Destination unknown	A801	Sent if the destination AE Title has not been preconfigured
	Identifier does not match SOP Class	A900	Sent when the Query/Retrieve Level is not present or is invalid
	Unable to process	Cxxx	Sent if the internal database query fails
Warning	Sub-operations	B000	Sent when at least one

	Complete - One or more Failures		storage sub-operation has failed
Success	Sub-operations Complete - No Failures	0000	Sent when storage sub-operations have completed with no failures
Pending	Sub-operations are continuing	FF00	Sent as sub-operations progress

4.2.7.4.1.3.5 Sub-operation Dependent Behavior

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

MOVE-SCP initiates a C-STORE sub-operation for each SOP instance that matches the information supplied in the C-MOVE request (for example, all SOP instances in a study). The responses from the MOVE-SCP are purely dependent on the success or failure of the C-STORE sub-operations, not on any explicit action by MOVE-SCP.

Whether or not the remote AE accepts the C-STORE sub-operations is beyond the control of MOVE-SCP.

If the association on which the C-MOVE request was issued is aborted for any reason, the C-STORE sub-operations will continue.

If the C-MOVE operation is canceled by the remote AE, MOVE-SCP will also attempt to cancel the remaining C-STORE sub-operation(s) and close the association.

Because MOVE-SCP uses STORAGE-SCU to store the requested instances, the progress and status of the C-STORE sub-operations will appear in the application's "Send Queue" UI.

4.2.8 MOVE-SCU

4.2.8.1 SOP Classes

MOVE-SCU provides Standard Conformance to the following SOP classes:

**Table 4.2-46
SOP CLASSES SUPPORTED BY MOVE-SCU**

SOP Class Name	SOP Class UID
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2

4.2.8.2 Association Policies

4.2.8.2.1 General

MOVE-SCU initiates but never accepts associations.

**Table 4.2-47
MAXIMUM PDU SIZE RECEIVED FOR MOVE-SCU**

Maximum PDU size received	114kB (approx.)
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4.2.8.2.2 Number of Associations

**Table 4.2-48
NUMBER OF ASSOCIATIONS FOR MOVE-SCU**

Maximum number of simultaneous associations	Unlimited
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4.2.8.2.3 Asynchronous Nature

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

4.2.8.2.4 Implementation Identifying Information

**Table 4.2-49
DICOM IMPLEMENTATION CLASS AND VERSION FOR MOVE-SCU**

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

4.2.8.3 Association Initiation Policy

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

4.2.8.3.1 Activity – Retrieve from Remote AE

4.2.8.3.1.1 Description and Sequencing of Activities

For the studies or series selected from the user interface to be retrieved, a single attempt will be made to retrieve them from the selected remote AE. If the retrieve fails, for whatever reason, no retry will be performed.

4.2.8.3.1.2 Proposed Presentation Contexts

**Table 4.2-50
PROPOSED PRESENTATION CONTEXTS FOR MOVE-SCU AND RETRIEVE FROM REMOTE AE
REQUEST**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 4.2-46	See Table 4.2-46	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.2.8.3.1.2.1 Extended Negotiation

No extended negotiation is performed.

In particular, relational retrievals are not supported.

4.2.8.3.1.3 SOP Specific Conformance

4.2.8.3.1.3.1 SOP Specific Conformance to C-MOVE SOP Classes

MOVE-SCU provides standard conformance to the supported C-MOVE SOP Classes, with one exception: the retrieval is performed from the AE that was queried by FIND-SCU, rather than the AE specified in the Retrieve AE Title attribute of the C-FIND response.

Only a single information model, Study Root, is supported.

Retrievals can be performed at the STUDY and SERIES levels only.

No CANCEL requests are ever issued.

The instances are retrieved to the current application's local store by specifying the Move Destination as the shared AE Title of the local application. This implies that the remote C-MOVE SCP must be preconfigured to determine the presentation address corresponding to the local application's AE.

**Table 4.2-51
STUDY ROOT REQUEST IDENTIFIER FOR MOVE-SCU**

Name	Tag	Unique, Matching or Return Key
STUDY level		
Study Instance UID	(0020,000D)	UNIQUE
SERIES level		
Study Instance UID	(0020,000D)	UNIQUE
Series Instance UID	(0020,000E)	UNIQUE

4.2.8.3.1.3.2 Presentation Context Acceptance Criterion

MOVE-SCU does not accept associations.

4.2.8.3.1.3.3 Transfer Syntax Selection Policies

MOVE-SCU prefers Explicit VR Little Endian Transfer Syntax, which is always first in the proposed Presentation Context.

4.2.8.3.1.3.4 Response Status

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

**Table 4.2-52
RESPONSE STATUS FOR MOVE-SCU AND RETRIEVE FROM REMOTE AE REQUEST**

Service Status	Further Meaning	Status Codes	Behavior
Failure	N/A	Any	Association closed, message shown in Receive Queue UI
Cancel	Sub-operations terminated due to	FE00	Association closed, message shown in Receive

	Cancel Indication		Queue UI
Warning	N/A	Any	message shown in Receive Queue UI
Success	Sub-operations Complete - No Failures	0000	Association closed

4.2.8.3.1.3.5 Sub-operation Dependent Behavior

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

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

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

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

If the association on which the C-MOVE was issued is aborted for any reason, whether or not the C-STORE sub-operations continue is dependent on the remote AE; the local STORAGE-SCP will continue to accept associations and storage operations regardless. In this case, an error indicating why the MOVE-SCU association terminated before the C-MOVE operation completed should be shown in the application's "Receive Queue" UI.

4.2.8.4 Association Acceptance Policy

MOVE-SCU does not accept associations.

4.2.9 PRINT-SCU

4.2.9.1 SOP Classes

PRINT-SCU provides Standard Conformance to the following SOP classes:

**Table 4.2-53
SOP CLASSES SUPPORTED BY PRINT-SCU**

SOP Class Name	SOP Class UID
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4
Printer SOP Class	1.2.840.10008.5.1.1.16
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1

Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1
Printer SOP Class	1.2.840.10008.5.1.1.16

4.2.9.2 Association Policies

4.2.9.2.1 General

PRINT-SCU initiates but never accepts associations.

**Table 4.2-54
MAXIMUM PDU SIZE RECEIVED FOR PRINT-SCU**

Maximum PDU size received	114kB (approx.)
---------------------------	-----------------

4.2.9.2.2 Number of Associations

**Table 4.2-55
NUMBER OF ASSOCIATIONS FOR PRINT-SCU**

Maximum number of simultaneous associations	1
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4.2.9.2.3 Asynchronous Nature

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

4.2.9.2.4 Implementation Identifying Information

**Table 4.2-56
DICOM IMPLEMENTATION CLASS AND VERSION FOR PRINT-SCU**

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

4.2.9.3 Association Initiation Policy

PRINT-SCU attempts to initiate a new association when the user performs the print images action from the user interface to a single remote AE.

4.2.9.3.1 Activity – Print Images

4.2.9.3.1.1 Description and Sequencing of Activities

A single attempt will be made to send images for printing to the remote AE. If the request fails for whatever reason, no retry will be performed. The application allows the user to cancel a print job that is in progress, in which case PRINT-SCU will immediately abort the association.

4.2.9.3.1.2 Proposed Presentation Contexts

**Table 4.2-57
PROPOSED PRESENTATION CONTEXTS FOR PRINT-SCU AND PRINT IMAGES**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 4.2-53	See Table 4.2-53	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.2.9.3.1.2.1 Extended Negotiation

No extended negotiation is performed.

4.2.9.3.1.3 SOP Specific Conformance

The tables in this section use a number of abbreviations. The abbreviations used in the “Presence of Value” column are:

- ALWAYS: Attribute is always present with a non-zero-length value
- ANAP: Attribute is not always present; this is usually because the user selected “Default” for the attribute in the configuration, which means that the printer should apply its own default value.

The abbreviations used in the “Source” column are:

- AUTO: The attribute value is generated automatically, or indirectly from previous user input
- USER: The attribute value is taken directly from user input

4.2.9.3.1.3.1 SOP Specific Conformance to Basic Film Session SOP Class

PRINT-SCU provides standard conformance to the Basic Film Session SOP Class.

A single film session is created by issuing an N-CREATE request to the SCP containing the attributes listed in Table 4.2-58. Specific Character Set is not included in the N-CREATE request.

The selected images are then processed in sequence by creating the necessary film boxes that reference the film session (see 4.2.9.3.1.3.2).

After all the selected images have been processed, the film session is deleted by issuing an N-DELETE request to the SCP.

**Table 4.2-58
BASIC FILM SESSION SOP CLASS N-CREATE ATTRIBUTE SUPPORT FOR PRINT-SCU**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Copies	(2000,0010)	IS	A number between 1 and 100	ALWAYS	USER
Print Priority	(2000,0020)	CS	One of HIGH, MED or LOW	ANAP	USER
Medium Type	(2000,0030)	CS	One of PAPER, CLEAR FILM, BLUE FILM, MAMMO CLEAR FILM, MAMMO BLUE FILM	ANAP	USER

Film Destination	(2000,0040)	CS	One of MAGAZINE, PROCESSOR or BIN_i, where "i" represents a bin number between 0 and 9	ANAP	USER
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PRINT-SCU will behave as described in Table 4.2-59 in response to the status returned in a Basic Film Session N-DELETE response after all the selected images have been processed. Otherwise, PRINT-SCU behaves as described in Table 4.2-66.

**Table 4.2-59
BASIC FILM SESSION N-DELETE RESPONSE STATUS FOR PRINT-SCU AND PRINT IMAGES**

Service Status	Further Meaning	Status Codes	Behavior
Failure	N/A	Any	Association closed, message shown to user
Warning	N/A	Any	Message logged
Success	Print operation completed successfully	0000	Association closed

4.2.9.3.1.3.2 SOP Specific Conformance to Basic Film Box SOP Class

PRINT-SCU provides standard conformance to the Basic Film Box SOP Class.

During any given film session, a single film box is created initially by issuing an N-CREATE request to the SCP containing the attributes listed in Table 4.2-60.

The available image boxes that reference the film box are then set by processing the selected images in sequence. Individual image boxes are updated by issuing N-SET requests as a Basic Grayscale Image Box (see 4.2.9.3.1.3.3) or as a Basic Color Image Box (see 4.2.9.3.1.3.4) depending on a user-specified option.

When all the image boxes available on the film box have been set, the film box is printed by issuing an N-ACTION "Print" request to the SCP. If the response status is Success, PRINT-SCU proceeds by issuing an N-DELETE request to the SCP for the film box.

If there are still selected images that have not yet been processed, PRINT-SCU repeats the actions starting with creating a new film box.

**Table 4.2-60
BASIC FILM BOX SOP CLASS N-CREATE ATTRIBUTE SUPPORT FOR PRINT-SCU**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Display Format	(2010,0010)	ST	See Table 4.2-61	ALWAYS	USER
Referenced Film Session Sequence	(2010,1500)	SQ	A single item that references the parent film session	ALWAYS	AUTO
> Referenced SOP Class UID	(0008,1150)	UI	Basic Film Session SOP Class 1.2.840.10008.5.1.1.1	ALWAYS	AUTO
> Referenced SOP Instance UID	(0008,1155)	UI	The UID of the parent film session	ALWAYS	AUTO

Film Orientation	(2010,0040)	CS	One of PORTRAIT or LANDSCAPE	ALWAYS	USER
Film Size ID	(2010,0050)	CS	See Table 4.2-62	ALWAYS	USER
Magnification Type	(2010,0060)	CS	One of REPLICATE, BILINEAR or CUBIC	ANAP	USER
Configuration Information	(2010,0150)	ST	When present, a printer configuration string specified by the user	ANAP	USER
Border Density	(2010,0100)	CS	One of BLACK or WHITE	ANAP	USER
Empty Image Density	(2010,0110)	CS	One of BLACK or WHITE	ANAP	USER
Requested Resolution ID	(2020,0050)	CS	One of STANDARD or HIGH	ALWAYS	USER

**Table 4.2-61
SUPPORTED IMAGE DISPLAY FORMATS FOR PRINT-SCU**

Image Display Format	Description
STANDARD\1,1	1 single image box
STANDARD\1,2	2 rows of 1 image box
STANDARD\2,1	1 row of 2 equal sized image boxes
STANDARD\2,2	2 rows of 2 equal sized image boxes
STANDARD\2,4	4 rows of 2 equal sized image boxes
STANDARD\4,1	1 row of 4 equal sized image boxes
STANDARD\4,2	2 rows of 4 equal sized image boxes
STANDARD\4,4	4 rows of 4 equal sized image boxes
ROW\1,2	First row with 1 image box, second row with 2 equal sized image boxes
COL\1,2	First column with 1 image box, second column with 2 equal sized image boxes

**Table 4.2-62
SUPPORTED FILM SIZE IDS FOR PRINT-SCU**

Film Size ID	Description
8INX10IN	8 in x 10 in
8_5INX11IN	8.5 in x 11 in
10INX12IN	10 in x 12 in
10INX14IN	10 in x 14 in (25.7 cm x 36.4 cm)
11INX14IN	11 in x 14 in
11INX17IN	11 in x 17 in
14INX14IN	14 in x 14 in
14INX17IN	14 in x 17 in
24CMX24CM	24 cm x 24 cm
24CMX30CM	24 cm x 30 cm
A4	A4 (210 mm x 297 mm)
A3	A3 (294 mm x 420 mm)

4.2.9.3.1.3.3 SOP Specific Conformance to Basic Grayscale Image Box SOP Class

PRINT-SCU provides standard conformance to the Basic Grayscale Image Box SOP Class.

For each image box SOP instance contained in the film box N-CREATE response, PRINT-SCU will update the image box by issuing an N-SET request with the attributes listed in Table 4.2-63.

**Table 4.2-63
BASIC GRAYSCALE IMAGE BOX SOP CLASS N-SET ATTRIBUTE SUPPORT FOR PRINT-SCU**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Box Position	(2020,0010)	US	An integer indicating the sequencing of the image boxes, with the first image box having the value 1	ALWAYS	AUTO
Basic Grayscale Image Sequence	(2020,0110)	SQ	A single item containing the grayscale image box pixel data	ALWAYS	AUTO
> Samples Per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
> Photometric Interpretation	(0028,0004)	CS	MONOCHROME2	ALWAYS	AUTO
> Rows	(0028,0010)	US	Number of rows in pixel data	ALWAYS	AUTO
> Columns	(0028,0011)	US	Number of columns in pixel data	ALWAYS	AUTO
> Pixel Aspect Ratio	(0028,0034)	IS	1\1	ALWAYS	AUTO
> Bits Allocated	(0028,0100)	US	8	ALWAYS	AUTO
> Bits Stored	(0028,0101)	US	8	ALWAYS	AUTO
> High Bit	(0028,0102)	US	7	ALWAYS	AUTO
> Pixel Representation	(0028,0103)	US	0	ALWAYS	AUTO
> Pixel Data	(7FE0,0010)	OW	The pixel data of the image to be printed, complete with any visible user annotations and pre-rendered to an appropriate resolution for printing	ALWAYS	AUTO
Requested Image Size	(2020,0030)	DS	The physical width of the image if True Size printing was requested; not present otherwise	ANAP	AUTO
Requested Decimate/Crop Behavior	(2020,0040)	CS	CROP if True Size printing was requested; otherwise DECIMATE.	ALWAYS	AUTO

4.2.9.3.1.3.4 SOP Specific Conformance to Basic Color Image Box SOP Class

PRINT-SCU provides standard conformance to the Basic Color Image Box SOP Class.

For each image box SOP instance contained in the film box N-CREATE response, PRINT-SCU will update the image box by issuing an N-SET request with the attributes listed in Table 4.2-64.

**Table 4.2-64
BASIC COLOR IMAGE BOX SOP CLASS N-SET ATTRIBUTE SUPPORT FOR PRINT-SCU**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Box Position	(2020,0010)	US	An integer indicating the sequencing of the image boxes, with the first image box having the value 1	ALWAYS	AUTO
Basic Color Image Sequence	(2020,0111)	SQ	A single item containing the color image box pixel data	ALWAYS	AUTO
> Samples Per Pixel	(0028,0002)	US	3	ALWAYS	AUTO
> Photometric Interpretation	(0028,0004)	CS	RGB	ALWAYS	AUTO
> Planar Configuration	(0028,0006)	US	0		
> Rows	(0028,0010)	US	Number of rows in pixel data	ALWAYS	AUTO
> Columns	(0028,0011)	US	Number of columns in pixel data	ALWAYS	AUTO
> Pixel Aspect Ratio	(0028,0034)	IS	1\1	ALWAYS	AUTO
> Bits Allocated	(0028,0100)	US	8	ALWAYS	AUTO
> Bits Stored	(0028,0101)	US	8	ALWAYS	AUTO
> High Bit	(0028,0102)	US	7	ALWAYS	AUTO
> Pixel Representation	(0028,0103)	US	0	ALWAYS	AUTO
> Pixel Data	(7FE0,0010)	OW	The pixel data of the image to be printed, complete with any visible user annotations and pre-rendered to an appropriate resolution for printing	ALWAYS	AUTO
Requested Image Size	(2020,0030)	DS	The physical width of the image if True Size printing was requested; not present otherwise	ANAP	AUTO
Requested Decimate/Crop Behavior	(2020,0040)	CS	CROP if True Size printing was requested; otherwise DECIMATE.	ALWAYS	AUTO

4.2.9.3.1.3.5 SOP Specific Conformance to Printer SOP Class

PRINT-SCU provides standard conformance to the Printer SOP Class.

N-EVENT-REPORT requests received by PRINT-SCU from the SCP are accepted and confirmation of receipt is always supplied via an N-EVENT-REPORT response with a success status. Additionally, PRINT-SCU behaves as described in Table 4.2-65 upon receipt of the request.

**Table 4.2-65
PRINTER N-EVENT-REPORT REQUEST BEHAVIOUR FOR PRINT-SCU AND PRINT IMAGES**

Event Type Name	Event Type ID	Attribute	Tag	Behavior
Normal	1	Any	Any	Receipt logged (at debug level).
Warning	2	Any	Any	Receipt logged.

Failure	3	Any	Any	Receipt logged, association closed, message shown to user.
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4.2.9.3.1.3.6 Presentation Context Acceptance Criterion

PRINT-SCU does not accept associations.

4.2.9.3.1.3.7 Transfer Syntax Selection Policies

PRINT-SCU prefers Explicit VR Little Endian Transfer Syntax, which is always first in the proposed Presentation Context.

4.2.9.3.1.3.8 Response Status

PRINT-SCU will behave as described in Table 4.2-66 in response to the status returned in any response message other than Basic Film Session N-DELETE. See Table 4.2-59 for the response behavior to Basic Film Session N-DELETE.

**Table 4.2-66
RESPONSE STATUS FOR PRINT-SCU AND PRINT IMAGES**

Service Status	Further Meaning	Status Codes	Behavior
Failure	N/A	Any	Association closed, message shown to user
Warning	N/A	Any	Message logged
Success	N/A	0000	Operation proceeds as described in the appropriate SOP Specific Conformance section(s).

4.2.9.4 Association Acceptance Policy

PRINT-SCU does not accept associations.

4.3 NETWORK INTERFACES

4.3.1 Physical Network Interface

The application is indifferent to the physical medium over which TCP/IP executes; which is dependent on the underlying operating system and hardware.

4.3.2 Additional Protocols

When host names rather than IP addresses are used in the configuration properties to specify presentation addresses for remote AEs, the application is dependent on the name resolution mechanism of the underlying operating system.

4.3.2.1 Web Access to DICOM Persistent Objects (WADO)

The application claims partial conformance to DICOM 2009 PS 3.18 "Web Access to DICOM Persistent Objects (WADO)" in that the HTTP GET request sent to the remote server is compliant. The application is non-conformant in that, although it does include the required MIME types in the Accept field of the HTTP GET request, if the MIME type of the returned object is anything other than "application/clearcanvas" (when retrieving pixel data), the behavior is undefined and the application will be unable to render the image to the screen.

The following parameters are used in the HTTP GET Request sent to the remote server.

**Table 4.3-1
PARAMETERS OF HTTP GET REQUEST**

Parameter	Value
requestType	WADO
studyUID	The Study Instance UID of the composite object
seriesUID	The Series Instance UID of the composite object
objectUID	The SOP Instance UID of the composite object
frameNumber	Valid only when contentType is application/clearcanvas; the frame within the composite object instance to be returned
contentType	application/clearcanvas (for pixel data) – or – application/clearcanvas-header (for PS 3.10 headers)
stopTag	Valid only when contentType is application/clearcanvas-header; indicates the hexadecimal tag at which the remote AE should stop parsing the PS 3.10 DICOM file before returning it. Pixel Data (0x7FE0, 0010) is never returned regardless of this value.

When a study is loaded from a ClearCanvas ImageServer, the viewer application uses a proprietary web service to retrieve a gzip compressed XML stream containing the majority of the content of the DICOM headers for the entire study, always excluding pixel data. This is referred to as the instance XML or study XML.

The application/clearcanvas MIME type is a custom MIME type intended to speed the retrieval of DICOM image data; it allows for per-frame pixel data to be retrieved, without any header information. The application/clearcanvas-header MIME type is a custom MIME type used to retrieve the entire DICOM PS 3.10 header when the application has detected that some attributes have been excluded from the instance XML.

The following describes the motivation for the proprietary web service and custom application/clearcanvas MIME type(s) used by the application:

- DICOM queries (e.g. Hierarchical Study Root Query) at the IMAGE level are often poorly supported, providing little information. Also, the time required to perform the queries for each series down to the IMAGE level can be quite long, especially on slower networks.
- The Image Sets and Display Sets can be constructed from the XML headers without having to retrieve any DICOM PS 3.10 files. The application has all required information about the images before any have been displayed.
- Once a study is open in the viewer, the pixel data can be retrieved on demand for each image, or for each frame in a multi-frame image, without having to request the entire DICOM PS 3.10 file at once. This provides a significant time savings in the case of multi-frame images. Although PS 3.18 does allow for retrieval of individual frames, for obvious reasons, it must explicitly disallow the application/dicom MIME type, leaving only low bit-depth image types, such as JPEG.
- This approach optimizes both the 'time to first image' (after initial study load) and the time taken to load each image (or frame) the user selects.

The content of the HTTP GET response is always a byte array containing the image pixel data, normally taken directly from the DICOM PS 3.10 file on the remote server. When the returned image data is compressed, the response headers will contain enough information about the pixel data to allow it to be

decompressed. When the pixel data is not compressed, it is assumed the client has enough information from the instance XML to handle the data appropriately.

When the pixel data in the response is compressed, the following information is contained in the response headers.

**Table 4.3-2
CONTENTS OF HTTP GET RESPONSE HEADERS
FOR COMPRESSED PIXEL DATA**

Header Key	Equivalent Tag
Compressed	N/A (value = true)
TransferSyntaxUid	(0002,0010)
BitsAllocated	(0028,0100)
BitsStored	(0028,0101)
DerivationDescription	(0008,2111)
HighBit	(0028,0102)
ImageHeight	(0028,0010)
ImageWidth	(0028,0011)
LossyImageCompression	(0028,2110)
LossyImageCompressionMethod	(0028,2114)
LossyImageCompressionRatio	(0028,2112)
NumberOfFrames	(0028,0008)
PhotometricInterpretation	(0028,0004)
PixelRepresentation	(0028,0103)
PlanarConfiguration	(0028,0006)
SamplesPerPixel	(0028,0002)

As stated previously, the instance XML will normally contain all the DICOM header information for each SOP instance in the study. However, in the interest of saving space on the server, excessively long values are excluded, but the fact that they have been excluded is stored in the XML. When an attribute has been excluded, the application will operate normally without that information until one of the excluded attributes is required by the application. The attempt to access an excluded attribute is detected by the application and the full header for the SOP instance will be silently retrieved. The parameters of the HTTP GET request will be as described in Table 4.3-1 where contentType is "clearcanvas-header". The remote AE will then return the entire DICOM PS 3.10 compliant file, parsed up to the value of stopTag, if it was provided. If stopTag is not specified, the file will be parsed up to, but not including, Pixel Data (0x7FE, 00010). Regardless of the value of stopTag, the pixel data will never be returned.

4.3.3 IPv4 and IPv6 Support

By default, this product supports IPv4. When configured, it will also support IPv6. It does not utilize any of the optional configuration identification or security features of IPv6.

4.4 NETWORK CONFIGURATION

All configuration of the application is performed through the use of configuration files stored in pre-defined locations that are specific to the underlying operating system.

4.4.1 AE Title/Presentation Address Mapping

The Calling AE Title of the local application is configurable in the configuration file. The mapping of the logical name by which remote AEs are described in the user interface to Called AE Titles as well as presentation address (hostname or IP address and port number) is configurable in the configuration file.

4.4.2 Parameters

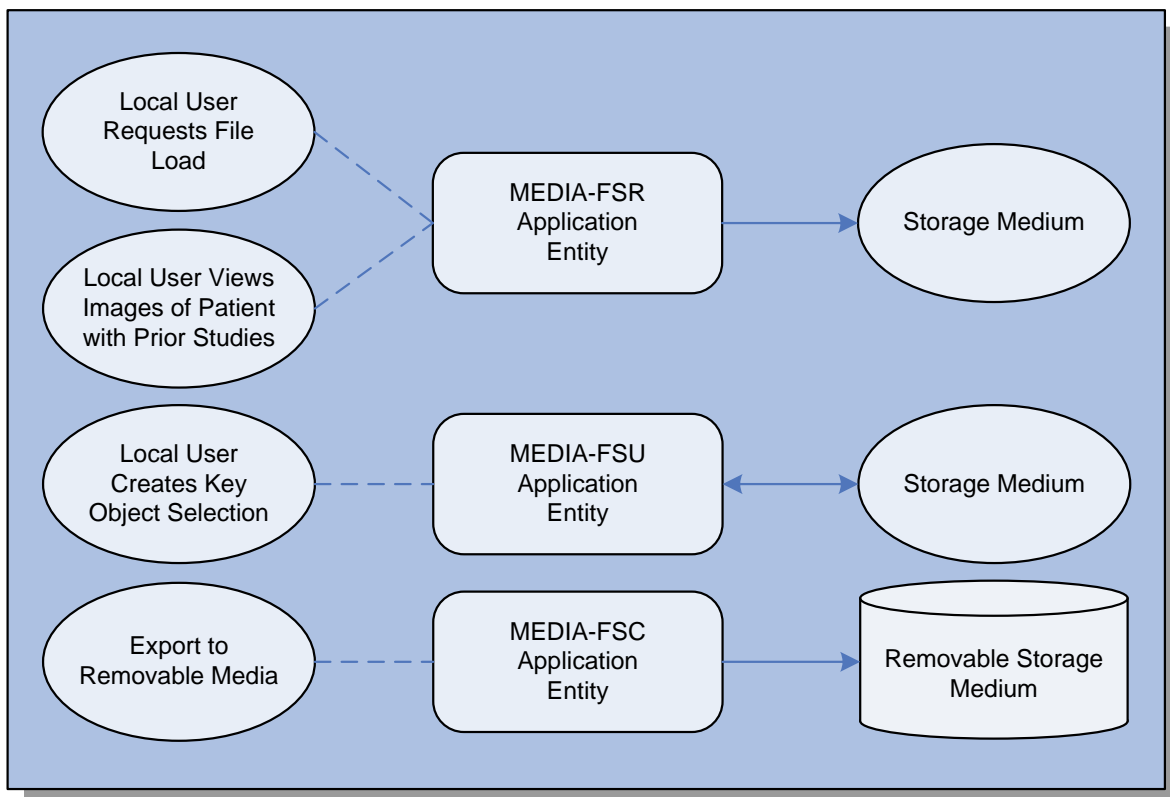
**Table 4.4-1
CONFIGURATION PARAMETERS TABLE**

Parameter	Configurable	Default Value
General Parameters		
PDU size	No	N/A
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	Yes	1 hour
General DIMSE level time-out values	No	30 seconds
Time-out waiting for response to TCP/IP connect() request. (Low-level timeout)	Yes	10 seconds
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	Yes	30 seconds
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	Yes	30 seconds
Send Buffer Size (TCP/IP socket)	Yes	118341 bytes
Receive Buffer Size (TCP/IP socket)	Yes	118341 bytes
Any changes to default TCP/IP settings, such as configurable stack parameters.	No	None
AE Specific Parameters (all AEs)		
Size constraint in maximum object size	No	None
Maximum PDU size the AE can receive	Yes	116794 bytes
Maximum PDU size the AE can send	Yes	116794 bytes
AE specific DIMSE level time-out values	No	30 seconds
Number of simultaneous Associations by Service and/or SOP Class	N/A	N/A
SOP Class support	Yes	All supported SOP Classes
Transfer Syntax support	Yes	All supported Transfer Syntaxes
Other parameters that are configurable	No	None

5 MEDIA INTERCHANGE

5.1 IMPLEMENTATION MODEL

5.1.1 Application Data Flow



**Figure 5.1-1
IMPLEMENTATION MODEL**

The application is a .NET application that provides a user interface, network support and media support as a File Set Reader (FSR), a File Set Updater (FSU), and a File Set Creator (FSC).

Conceptually, the media services may be modeled as the following separate AEs, though in fact all the AEs share the same single (configurable) AE Title as the network services:

- MEDIA-FSR, which loads a user-selected PS 3.10 compliant file (which may be an image, key object selection, or softcopy presentation state) either from the local file system or from PS 3.12 compliant media according to one of the (non-secure) General Purpose Media Storage Application Profiles of PS 3.11 (including CD-R and DVD). The application is effectively media-neutral, as the user is required to browse and locate the files and directories manually.

Any DICOM image encoded in one of the following Transfer Syntaxes may be loaded:

- Explicit VR Little Endian
- Implicit VR Little Endian
- Explicit VR Big Endian
- RLE Lossless
- JPEG Baseline (Process 1)

- JPEG Extended (Process 2 & 4)
 - JPEG Lossless, Non-Hierarchical (Process 14)
 - JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])
 - JPEG 2000 Image Compression
 - JPEG 2000 Image Compression (Lossless Only)
- MEDIA-FSU, which writes PS 3.10 compliant files containing user-created key object selection documents and associated softcopy presentation states. The key object selection document may contain only image entries, and the softcopy presentation states may be any of the following SOP classes:
 - Grayscale Softcopy Presentation State Storage
 - Color Softcopy Presentation State Storage
 - MEDIA-FSC, which writes PS 3.10 compliant file sets containing user-selected images, presentation states, and other instances to a removable storage medium. The following media storage application profiles are supported:
 - General Purpose CD-R Interchange (STD-GEN-CD)
 - General Purpose Interchange on DVD-RAM Media (STD-GEN-DVD-RAM)
 - General Purpose DVD Interchange with JPEG (STD-GEN-DVD-JPEG)

In addition to the standard media storage application profiles, the application also provides conformance to the following profiles as defined in the first public comment version of DICOM Supplement 153:

- General Purpose BD Interchange (STD-GEN-BD)

5.1.2 Functional Definitions of AE's

5.1.2.1 MEDIA-FSR

MEDIA-FSR is typically activated through the user interface to select directories and images for display or import into the internal database or to be opened for viewing. It can also be activated internally in response to the user viewing images if the patient has prior studies that are available in the internal database.

5.1.2.2 MEDIA-FSU

MEDIA-FSU is activated internally when a user closes a viewed study and there are pending images marked as key objects. Softcopy presentation states created at the time the images were marked as key objects are referenced alongside the source images to create a key object selection document. The key object selection document and any softcopy presentation states are then added to the file-set.

5.1.2.3 MEDIA-FSC

MEDIA-FSC is activated through the user interface when the user selects one or more studies for export to a removable storage medium. The application uses support built in to the operating system to create the selected file set on the destination medium.

5.1.3 Sequencing of Real-World Activities

FSR activities are sequentially initiated when activated through the user interface, and another activity may not be initiated until the prior activity has completed. When activated internally by a Load Prior Studies operation, the activity is asynchronous and non-blocking.

All current FSU activities are activated internally by a Write Key Object Selections operation, which is asynchronous and non-blocking.

The activities of MEDIA-FSC are activated through the user interface and are asynchronous and non-blocking with respect to other application entities; only one export operation may be performed at a time.

5.1.4 File Meta Information Options

**Table 5.1-1
DICOM IMPLEMENTATION CLASS AND VERSION FOR MEDIA STORAGE**

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

5.2 AE SPECIFICATIONS

5.2.1 MEDIA-FSR

MEDIA-FSR provides standard conformance to the Media Storage Service Class.

**Table 5.2-1
APPLICATION PROFILES, ACTIVITIES, AND ROLES FOR MEDIA-FSR**

Application Profiles Supported	Real World Activity	Role
STD-GEN-CD	Load Directory or File	FSR
STD-GEN-DVD-RAM	Load Directory or File	FSR
STD-GEN-DVD-JPEG	Load Directory or File	FSR
STD-GEN-BD	Load Directory or File	FSR

Note: The application is media neutral and dependent on the underlying hardware. Any (non-secure) General Purpose Profile can be supported. Support for STD-GEN-BD is based on the public comment version of DICOM Supplement 153.

DICOMDIR files are not supported.

5.2.1.1 File Meta Information for the Application Entity

Not applicable, since MEDIA-FSR is not an FSC or FSU.

5.2.1.2 Real World Activities

5.2.1.2.1 Activity – Load Directory or File

MEDIA-FSR can be activated through the user interface when a user selects the file import or open operation. Images will be imported into the internal database or loaded and displayed, respectively.

5.2.1.2.1.1 Application Profile Specific Conformance

There are no extensions or specializations.

5.2.1.2.2 Activity – Load Prior Studies

MEDIA-FSR can be activated internally in response to the user viewing images in order to identify and list studies related to the current patient. The user can navigate to these prior studies in the same viewer context as the originally selected images.

5.2.1.2.2.1 Application Profile Specific Conformance

There are no extensions or specializations.

5.2.2 MEDIA-FSU

5.2.2.1 File Meta Information for the Application Entity

The Source Application Entity Title included in the File Meta Header is configurable (see Section 5.4).

5.2.2.2 Real World Activities

5.2.2.2.1 Activity – Write Key Object Selections

MEDIA-FSU is currently only activated internally in response to the user closing images containing pending key object selections. When this occurs, a key object selection document is created along with the associated softcopy presentation states for the images (at the time they were marked as key objects) and all instances are added to the file-set.

5.2.2.2.1.1 Application Profile Specific Conformance

There are no extensions or specializations.

5.2.3 MEDIA-FSC

MEDIA-FSC provides standard conformance to the Media Storage Service Class.

**Table 5.2-2
APPLICATION PROFILES, ACTIVITIES, AND ROLES FOR MEDIA-FSC**

Application Profiles Supported	Real World Activity	Role
STD-GEN-CD	Export to removable media	FSC
STD-GEN-DVD-RAM	Export to removable media	FSC
STD-GEN-DVD-JPEG	Export to removable media	FSC
STD-GEN-BD	Export to removable media	FSC

Note: Support for STD-GEN-BD is based on the public comment version of DICOM Supplement 153.

5.2.3.1 File Meta Information for the Application Entity

The Source Application Entity Title included in the File Meta Header is configurable (see Section 5.4).

5.2.3.2 Real World Activities

5.2.3.2.1 Activity – Export to Removable Media

MEDIA-FSC acts as an FSC when requested to export SOP Instances from the internal database to a removable storage medium such as a CD-R or DVD. The application is dependent on the system hardware as well as support from the operating system. Consequently, the system must possess hardware capable of writing to one or more of the supported media types in Table 5.2-3 in order to use the MEDIA-FSC application entity.

**Table 5.2-3
SUPPORTED MEDIA TYPES FOR MEDIA-FSC**

Media Supported	Reference
CD-R	DICOM 2009 PS 3.12 Annex F
DVD-RAM	DICOM 2009 PS 3.12 Annex J
DVD-R (authoring and general), DVD-RW, DVD+R, DVD+RW	DICOM 2009 PS 3.12 Annex P
BD-R, BD-RE	DICOM Supplement 153 (Public Comment version)

An interface will be presented allowing the user to modify media creation options such as including a portable viewer application and modifying the media volume label. The interface also provides details on the available media capacity, allowing the user to adjust the contents as may be deemed necessary.

The user will be prompted to insert suitable media into the selected media creation device. The entire contents of the export job, including the corresponding DICOMDIR and any additional options such as an included portable viewer application, will be written together in one single operation. The user can cancel an export job during the procedure. Only one export job may be performed at a time.

Where applicable (optical media such as CD-R, DVD-RAM, DVD and BD):

- Only single session discs will be created.
- Writing in multi-session mode is not supported. In general, inserted media must be completely blank in order to be used, and there is no option to erase it before export; it must first be erased using an external application.
- Cancelling an export job to one of these media types may result in unusable media.

5.2.3.2.1.1 Application Profile Specific Conformance

MEDIA-FSC supports the SOP Classes and Transfer Syntaxes listed in the Table below:

**Table 5.2-4
IODS, SOP CLASSES AND TRANSFER SYNTAXES FOR MEDIA-FSC**

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Explicit VR Little Endian	1.2.840.10008.1.2.1
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	Explicit VR Little Endian	1.2.840.10008.1.2.1
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	Explicit VR Little Endian	1.2.840.10008.1.2.1
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65	Explicit VR Little Endian	1.2.840.10008.1.2.1
Colon CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.69	Explicit VR Little Endian	1.2.840.10008.1.2.1
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Little Endian	1.2.840.10008.1.2.1
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3	Explicit VR Little Endian	1.2.840.10008.1.2.1

Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Explicit VR Little Endian	1.2.840.10008.1.2.1
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Encapsulated CDA Storage	1.2.840.10008.5.1.4.1.1.104.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Explicit VR Little Endian	1.2.840.10008.1.2.1
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	Explicit VR Little Endian	1.2.840.10008.1.2.1
Macular Grid Thickness and Volume Report Storage	1.2.840.10008.5.1.4.1.1.79.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	Explicit VR Little Endian	1.2.840.10008.1.2.1
Media Storage Directory Storage	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1

MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian	1.2.840.10008.1.2.1
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Explicit VR Little Endian	1.2.840.10008.1.2.1
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Explicit VR Little Endian	1.2.840.10008.1.2.1
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	Explicit VR Little Endian	1.2.840.10008.1.2.1
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ophthalmic Tomography Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.4	Explicit VR Little Endian	1.2.840.10008.1.2.1
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Explicit VR Little Endian	1.2.840.10008.1.2.1
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	Explicit VR Little Endian	1.2.840.10008.1.2.1
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	Explicit VR Little Endian	1.2.840.10008.1.2.1
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Explicit VR Little Endian	1.2.840.10008.1.2.1
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67	Explicit VR Little Endian	1.2.840.10008.1.2.1
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Explicit VR Little Endian	1.2.840.10008.1.2.1
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Explicit VR Little Endian	1.2.840.10008.1.2.1
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Explicit VR Little Endian	1.2.840.10008.1.2.1

RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	Explicit VR Little Endian	1.2.840.10008.1.2.1
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	Explicit VR Little Endian	1.2.840.10008.1.2.1
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Explicit VR Little Endian	1.2.840.10008.1.2.1
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Explicit VR Little Endian	1.2.840.10008.1.2.1
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Explicit VR Little Endian	1.2.840.10008.1.2.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Explicit VR Little Endian	1.2.840.10008.1.2.1
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Spectacle Prescription Reports Storage	1.2.840.10008.5.1.4.1.1.78.6	Explicit VR Little Endian	1.2.840.10008.1.2.1
Standalone Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.9	Explicit VR Little Endian	1.2.840.10008.1.2.1
Standalone Modality LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Standalone Overlay Storage (Retired)	1.2.840.10008.5.1.4.1.1.8	Explicit VR Little Endian	1.2.840.10008.1.2.1
Standalone PET Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.129	Explicit VR Little Endian	1.2.840.10008.1.2.1
Standalone VOI LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.11	Explicit VR Little Endian	1.2.840.10008.1.2.1
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Explicit VR Little Endian	1.2.840.10008.1.2.1
Stored Print Storage (Retired)	1.2.840.10008.5.1.1.27	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Explicit VR Little Endian	1.2.840.10008.1.2.1
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1

Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Explicit VR Little Endian	1.2.840.10008.1.2.1
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Explicit VR Little Endian	1.2.840.10008.1.2.1
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
X-Ray 3D Craniofacial Image Storage	1.2.840.10008.5.1.4.1.1.13.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Explicit VR Little Endian	1.2.840.10008.1.2.1
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Explicit VR Little Endian	1.2.840.10008.1.2.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Explicit VR Little Endian	1.2.840.10008.1.2.1

5.2.3.2.1.1.1 Application Profile Specific Conformance to General Purpose CD-R Interchange

MEDIA-FSC provides standard conformance to the General Purpose CD-R Interchange Media Storage Application Profile.

The supported SOP Classes and Transfer Syntaxes are listed in Table 5.2-4.

5.2.3.2.1.1.2 Application Profile Specific Conformance to General Purpose Interchange on DVD-RAM Media

MEDIA-FSC provides standard conformance to the General Purpose Interchange on DVD-RAM Media Storage Application Profile.

The supported SOP Classes and Transfer Syntaxes are listed in Table 5.2-4.

5.2.3.2.1.1.3 Application Profile Specific Conformance to General Purpose DVD Interchange with JPEG

MEDIA-FSC provides standard conformance to the General Purpose DVD Interchange with JPEG Media Storage Application Profile.

Due to a technical limitation, all images are stored uncompressed for the purposes of this Media Storage Application Profile.

The supported SOP Classes and Transfer Syntaxes are listed in Table 5.2-4.

5.2.3.2.1.1.4 Application Profile Specific Conformance to General Purpose BD Interchange

MEDIA-FSC provides standard conformance to the General Purpose BD Interchange Media Storage Application Profile.

Due to a technical limitation of the operating system support for removable media creation, MEDIA-FSC uses a UDF 2.5 file system on BD-R media instead of the UDF 2.6 prescribed in the public comment version of DICOM Supplement 153.

The supported SOP Classes and Transfer Syntaxes are listed in Table 5.2-4.

5.3 AUGMENTED AND PRIVATE PROFILES

5.3.1 Augmented Profiles

No augmented profiles are used.

5.3.2 Private Profiles

No private profiles are used.

5.4 MEDIA CONFIGURATION

The media services share the same single configurable AE Title as that of the network services (see Section 4.4.1).

6 SUPPORT OF CHARACTER SETS

6.1 OVERVIEW

The application supports all extended character sets defined in the DICOM 2009 standard, including single-byte and multi-byte character sets as well as code extension techniques using ISO 2022 escapes.

Support extends to correctly decoding and displaying the correct symbol for all names and strings found in storage instances from media and received over the network, and in the internal database.

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

6.2 CHARACTER SETS

In addition to the default character repertoire, the Defined Terms for Specific Character Set in Table 6.2-1 are supported:

**Table 6.2-1
SUPPORTED SPECIFIC CHARACTER SET DEFINED TERMS**

Character Set Description	Defined Term
Latin alphabet No. 1	ISO_IR 100
Latin alphabet No. 2	ISO_IR 101
Latin alphabet No. 3	ISO_IR 109
Latin alphabet No. 4	ISO_IR 110
Cyrillic	ISO_IR 144
Arabic	ISO_IR 127
Greek	ISO_IR 126
Hebrew	ISO_IR 138
Latin alphabet No. 5	ISO_IR 148
Japanese	ISO_IR 13
Thai	ISO_IR 166
Unicode in UTF-8	ISO_IR 192
Default repertoire	ISO 2022 IR 6
Latin alphabet No. 1	ISO 2022 IR 100
Latin alphabet No. 2	ISO 2022 IR 101
Latin alphabet No. 3	ISO 2022 IR 109
Latin alphabet No. 4	ISO 2022 IR 110
Cyrillic	ISO 2022 IR 144
Arabic	ISO 2022 IR 127
Greek	ISO 2022 IR 126
Hebrew	ISO 2022 IR 138
Latin alphabet No. 5	ISO 2022 IR 148
Thai	ISO 2022 IR 166

Japanese	ISO 2022 IR 13
Japanese	ISO 2022 IR 87
Japanese	ISO 2022 IR 159
Korean	ISO 2022 IR 149
Chinese (Simplified) Extended	GB18030

6.3 CHARACTER SET CONFIGURATION

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

7 SECURITY

7.1 SECURITY PROFILES

7.1.1 Basic Application Level Confidentiality Profile

The application provides partial conformance to the Basic Application Level Confidentiality Profile for de-identification only. The following describes the application's de-identification conformance:

- Removes, re-maps, nulls (makes empty), or adjusts required attributes as specified in DICOM 2009 PS 3.15 Table E.1-1 (Basic Application Level Confidentiality Profile Attributes) with the exception of Patient's Sex (0010,0040) and Content Sequence (0040,A730).
- Explicitly removes a number of additional attributes from the Patient Identification and Patient Demographic Modules which may also contain identifying information.
- Makes adjustments to some additional tags of VR DA (Date) and DT (Date/time).
- Does NOT put original or modified attributes into the Encrypted Attributes Sequence.
- Does NOT obscure information burned into the pixel data that may identify the patient, or modify the pixel data in any way. This is of particular importance for ultrasound, as many images have the patient's information burned into the pixel data and, therefore, the application will not be able to completely de-identify the image(s).
- Does NOT add or modify the Patient Identity Removed (0012,0062) attribute. Since the application does not currently support obscuring potential patient information burned directly into the pixel data, it is impossible to determine whether or not the image has been de-identified.

The following table describes the attributes modified during de-identification:

**Table 7.1-1
ATTRIBUTES MODIFIED DURING DE-IDENTIFICATION**

Attribute	Tag	Modification Method
Instance Creator UID	(0008,0014)	R
SOP Instance UID	(0008,0018)	M
Accession Number	(0008,0050)	N,U
Institution Name	(0008,0080)	N
Institution Address	(0008,0081)	N
Referring Physician's Name	(0008,0090)	N
Referring Physician's Address	(0008,0092)	N
Referring Physician's Telephone Numbers	(0008,0094)	N
Station Name	(0008,1010)	N
Study Description	(0008,1030)	N,U
Series Description	(0008,103E)	N,U
Institutional Department Name	(0008,1040)	N
Physician(s) of Record	(0008,1048)	N
Performing Physicians' Name	(0008,1050)	N
Name of Physician(s) Reading Study	(0008,1060)	N
Operators' Name	(0008,1070)	N

Admitting Diagnoses Description	(0008,1080)	N
Referenced SOP Instance UID	(0008,1155)	M
Derivation Description	(0008,2111)	N
Patient's Name	(0010,0010)	N,U
Patient ID	(0010,0020)	N,U
Patient's Birth Date	(0010,0030)	N,U
Patient's Birth Time	(0010,0032)	N
Patient's Sex	(0010,0040)	NOT ALTERED
Other Patient Ids	(0010,1000)	N
Other Patient Names	(0010,1001)	N
Patient's Age	(0010,1010)	N
Patient's Size	(0010,1020)	N
Patient's Weight	(0010,1030)	N
Medical Record Locator	(0010,1090)	N
Ethnic Group	(0010,2160)	N
Occupation	(0010,2180)	N
Additional Patient's History	(0010,21B0)	N
Patient Comments	(0010,4000)	N
Device Serial Number	(0018,1000)	N
Protocol Name	(0018,1030)	N
Study Instance UID	(0020,000D)	M
Series Instance UID	(0020,000E)	M
Study ID	(0020,0010)	N
Frame of Reference UID	(0020,0052)	M
Synchronization Frame of Reference UID	(0020,0200)	M
Image Comments	(0020,4000)	N
Request Attributes Sequence	(0040,0275)	R
UID	(0040,A124)	M
Content Sequence	(0040,A730)	NOT ALTERED
Storage Media File-set UID	(0088,0140)	R
Referenced Frame of Reference UID	(3006,0024)	M
Related Frame of Reference UID	(3006,00C2)	M
Adjusted Dates and Times		
Study Date	(0008,0020)	G,U
Instance Creation Date	(0008,0012)	O
Series Date	(0008,0021)	O
Acquisition Date	(0008,0022)	O

Content Date	(0008,0023)	O
Acquisition DateTime	(0008,002A)	O
Date of Secondary Capture	(0018,1012)	O
Radiopharmaceutical Start DateTime	(0018,1072)	O
Radiopharmaceutical Stop DateTime	(0018,1073)	O
Frame Acquisition DateTime	(0018,9074)	O
Start Acquisition DateTime	(0018,9516)	O
End Acquisition DateTime	(0018,9517)	O
Substance Administration DateTime	(0044,0010)	O
Creation Date	(2100,0040)	O
Additional Attributes Removed		
Other Patient IDs Sequence	(0010,1002)	R
Patient's Birth Name	(0010,1005)	R
Patient's Mother's Birth Name	(0010,1060)	R
Patient's Insurance Plan Code Sequence	(0010,0050)	R
Patient's Primary Language Code Sequence	(0010,0101)	R
Patients Address	(0010,1040)	R
Military Rank	(0010,1080)	R
Branch of Service	(0010,1081)	R
Patients Telephone Numbers	(0010,2154)	R
Responsible Person	(0010,2297)	R
Responsible Person Role	(0010,2298)	R
Responsible Organization	(0010,2299)	R

In the modification method column, the following legend applies:

- N: the attribute is nulled, or set to an empty value.
- R: the attribute is removed entirely.
- M: the value is a DICOM UID that is remapped.
- U: the value is specified by the user.
- G: randomly generated date.
- O: date or date/time offset by the difference between the original and modified Study Date.

During de-identification, no attributes are added, with the exception of those specified by the user.

With the exception of UIDs, Study Date and the Date or Date/time attributes offset by the difference in Study Date (those marked with an O in Table 7.1-1), no attribute values are generated.

The integrity of UIDs for all files de-identified in the same operation will be maintained, meaning that all relationships, such as Study and Series relationships, will be maintained in the de-identified SOP Instances.

Please note that there is currently no provision for "well known UIDs" such as "well-known frames of reference" or "well-known SOP instances" during de-identification. All UID values in applicable attributes (those marked M in Table 7.1-1) are remapped.

7.1.2 Audit Trail Message Format Profile

The application provides conformance to the Audit Trail Message Format Profile defined in the final text of DICOM Supplement 95. The following describes the application’s audit message format conformance:

- Audit trail messages are generated and transmitted when the application is used in conjunction with a central enterprise application server.
- Audit trail messages are generated and stored to the local file system when the application is part of a standalone commercial installation.
- Audit trail messages are not generated otherwise.
- Audit trail messages are not received nor processed by the application.
- Audit event reporting cannot be configured through the application interface. However, in an enterprise scenario, the server to which the application transmits audit messages can be configured.

The following table describes the auditable events that are detected and reported:

**Table 7.1-2
DETECTED AND REPORTED AUDIT EVENTS**

Event	Behavior
Application Activity	Not detected or reported
Audit Log Used	Not detected or reported
Begin Transferring DICOM Instances	<p>Detected and reported when a C-STORE operation is initiated:</p> <ul style="list-style-type: none"> • manually by the user • automatically, when a “Send Key Object Selections” operation is triggered • by the local MOVE-SCP in response to a C-MOVE request
Data Export	<p>Detected and reported when instances in the internal database are exported, in any form, to a location outside the internal database. This includes:</p> <ul style="list-style-type: none"> • a local file system • an external file system, or removable media • a DICOM Printer <p>To be clear, operations that trigger “DICOM Instances Transferred” do not trigger this event. Also, this event can only be triggered directly by a user-initiated operation.</p>
Data Import	<p>Detected and reported when instances are imported into the internal database:</p> <ul style="list-style-type: none"> • manually by the user from any file system, local or remote • automatically, when the user creates Key Object Selection Documents, and associated Softcopy Presentation States • when a re-index of the internal database is performed

DICOM Instances Accessed	<p>Detected and reported when instances in the internal database are read, created, or updated. More specifically:</p> <ul style="list-style-type: none"> • When the user opens a study for viewing; this includes viewing the header information. • When the user creates Key Object Selection Documents and accompanying Softcopy Presentation States; these are also automatically imported into the internal database. • When the user edits a SOP Instance via the application's DICOM Editor. • When the user creates an anonymous copy of a study in the internal database; these are also automatically imported into the internal database.
DICOM Instances Transferred	Detected and reported when the transfer is complete regardless of origin of C-STORE operation
DICOM Study Deleted	Detected and reported when instances in the internal database are deleted
Network Entry	Not detected or reported
Order Record	Not detected or reported
Patient Record	Not detected or reported
Procedure Record	Not detected or reported
Query	Detected and reported when a C-FIND request is sent or received
Security Alert	Detected and reported when user authentication fails and when audit trail logging is suspended or resumed
User Authentication	Detected and reported when user authentication succeeds or the user signs out; user authentication capabilities only exist in commercial offerings of the software.

7.2 ASSOCIATION LEVEL SECURITY

None supported.

7.3 APPLICATION LEVEL SECURITY

None supported.

8 ANNEXES

8.1 IOD CONTENTS

8.1.1 Created SOP Instances

See Section 4.2.9.3.1.3 for a description of SOP Instances created during image print operations.

See Section 7.1.1 for a description of SOP Instances created during de-identification.

Table 8.1-1 specifies the attributes of a Grayscale Softcopy Presentation State created by the application.

Table 8.1-2 specifies the attributes of a Color Softcopy Presentation State created by the application.

Table 8.1-3 specifies the attributes of a Key Object Selection Document created by the application.

The following tables use a number of abbreviations. The abbreviations used in the “Presence of Module” column are:

- ALWAYS: Module is always present

The abbreviations used in the “Presence of Value” column are:

- ALWAYS: Attribute is always present with a non-zero-length value
- ANAP: Attribute is not always present
- EMPTY: Attribute is included without a value
- NEVER: Attribute is never included
- VNAP: Value not always present (attribute sent zero-length if no value)

The abbreviations used in the “Source” column are:

- AUTO: The attribute value is generated automatically, or indirectly from previous user input
- COPY: The attribute value is copied verbatim from the referenced SOP instances
- USER: The attribute value is taken directly from user input

8.1.1.1 Grayscale Softcopy Presentation State IOD

Masks are not supported by the application.

**Table 8.1-1
IOD OF CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES**

IE	Module	Reference	Presence of Module
Patient	Patient	Table 8.1-4	ALWAYS
	Clinical Trial Subject	Table 8.1-6	Only if module exists in referenced SOP instance(s)
Study	General Study	Table 8.1-7	ALWAYS
	Patient Study	Table 8.1-8	Only if module exists in referenced SOP instance(s)
	Clinical Trial Study	Table 8.1-9	Only if module exists in referenced SOP instance(s)
Series	General Series	Table 8.1-11	ALWAYS
	Presentation Series	Table 8.1-12	ALWAYS

Equipment	General Equipment	Table 8.1-10	ALWAYS
Presentation State	Presentation State Identification	Table 8.1-13	ALWAYS
	Presentation State Relationship	Table 8.1-14	ALWAYS
	Presentation State Shutter	Table 8.1-15	ALWAYS
	Presentation State Mask	Table 8.1-24	ALWAYS
	Display Shutter	Table 8.1-16	Only if a Display Shutter is to be applied to referenced image(s) and the Bitmap Display Shutter Module is not present
	Bitmap Display Shutter	Table 8.1-17	Only if a Bitmap Display Shutter is to be applied to referenced image(s) and the Display Shutter Module is not present
	Overlay Plane	Table 8.1-18	Only if overlays are to be applied to referenced image(s) or the Bitmap Display Shutter Module is present
	Overlay Activation	Table 8.1-19	Only if overlays are to be applied to referenced image(s)
	Displayed Area	Table 8.1-20	ALWAYS
	Graphic Annotation	Table 8.1-21	Only if graphic annotations are to be applied to referenced image(s)
	Spatial Transformation	Table 8.1-22	ALWAYS
	Graphic Layer	Table 8.1-23	Only if graphic annotations or overlays are to be applied to referenced image(s)
	Softcopy VOI LUT	Table 8.1-25	ALWAYS
	Softcopy Presentation LUT	Table 8.1-26	ALWAYS
SOP Common	Table 8.1-27	ALWAYS	

8.1.1.2 Color Softcopy Presentation State IOD

ICC Profiles and CIELab values are not supported by the application, and thus any application-generated color softcopy presentation state SOP instances *may* contain the following mandatory IOD modules which *do not fully conform* to the DICOM Standard:

- Presentation State Shutter, PS 3.3 C.11.12 (See Table 8.1-15)
- ICC Profile, PS 3.3 C.11.15 (See Table 8.1-28)

**Table 8.1-2
IOD OF CREATED COLOR SOFTCOPY PRESENTATION STATE SOP INSTANCES**

IE	Module	Reference	Presence of Module
Patient	Patient	Table 8.1-4	ALWAYS
	Clinical Trial Subject	Table 8.1-6	Only if module exists in referenced SOP instance(s)
Study	General Study	Table 8.1-7	ALWAYS

	Patient Study	Table 8.1-8	Only if module exists in referenced SOP instance(s)
	Clinical Trial Study	Table 8.1-9	Only if module exists in referenced SOP instance(s)
Series	General Series	Table 8.1-11	ALWAYS
	Presentation Series	Table 8.1-12	ALWAYS
Equipment	General Equipment	Table 8.1-10	ALWAYS
Presentation State	Presentation State Identification	Table 8.1-13	ALWAYS
	Presentation State Relationship	Table 8.1-14	ALWAYS
	Presentation State Shutter	Table 8.1-15	ALWAYS
	Display Shutter	Table 8.1-16	Only if a Display Shutter is to be applied to referenced image(s) and the Bitmap Display Shutter Module is not present
	Bitmap Display Shutter	Table 8.1-17	Only if a Bitmap Display Shutter is to be applied to referenced image(s) and the Display Shutter Module is not present
	Overlay Plane	Table 8.1-18	Only if overlays are to be applied to referenced image(s) or the Bitmap Display Shutter Module is present
	Overlay Activation	Table 8.1-19	Only if overlays are to be applied to referenced image(s)
	Displayed Area	Table 8.1-20	ALWAYS
	Graphic Annotation	Table 8.1-21	Only if graphic annotations are to be applied to referenced image(s)
	Spatial Transformation	Table 8.1-22	ALWAYS
	Graphic Layer	Table 8.1-23	Only if graphic annotations or overlays are to be applied to referenced image(s)
	ICC Profile	Table 8.1-28	NOT INCLUDED
	SOP Common	Table 8.1-29	ALWAYS

8.1.1.3 Key Object Selection Document IOD

**Table 8.1-3
IOD OF CREATED KEY OBJECT SELECTION DOCUMENT SOP INSTANCES**

IE	Module	Reference	Presence of Module
Patient	Patient	Table 8.1-4	ALWAYS
	Specimen Identification	Table 8.1-5	Only if module exists in referenced SOP instance(s)
	Clinical Trial Subject	Table 8.1-6	Only if module exists in referenced SOP instance(s)
Study	General Study	Table 8.1-7	ALWAYS

	Patient Study	Table 8.1-8	Only if module exists in referenced SOP instance(s)
	Clinical Trial Study	Table 8.1-9	Only if module exists in referenced SOP instance(s)
Series	Key Object Document Series	Table 8.1-30	ALWAYS
Equipment	General Equipment	Table 8.1-10	ALWAYS
Presentation State	Key Object Document	Table 8.1-31	ALWAYS
	SR Document Content	Table 8.1-32	ALWAYS
	SOP Common	Table 8.1-33	ALWAYS

8.1.1.4 Common Modules

**Table 8.1-4
PATIENT MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	From Referenced Image(s)	ANAP	COPY
Patient ID	(0010,0020)	LO	From Referenced Image(s)	ANAP	COPY
Issuer of Patient ID	(0010,0021)	LO	From Referenced Image(s)	ANAP	COPY
Patient's Birth Date	(0010,0030)	DA	From Referenced Image(s)	ANAP	COPY
Patient's Sex	(0010,0040)	CS	From Referenced Image(s)	ANAP	COPY
Referenced Patient Sequence	(0008,1120)	SQ	From Referenced Image(s)	ANAP	COPY
<i>> Include 'SOP Instance Reference Macro'</i>					
Patient's Birth Time	(0010,0032)	TM	From Referenced Image(s)	ANAP	COPY
Other Patient IDs	(0010,1000)	LO	From Referenced Image(s)	ANAP	COPY
Other Patient IDs Sequence	(0010,1002)	SQ	From Referenced Image(s)	ANAP	COPY
> Patient ID	(0010,0020)	LO	From Referenced Image(s)	ANAP	COPY
> Issuer of Patient ID	(0010,0021)	LO	From Referenced Image(s)	ANAP	COPY
> Type of Patient ID	(0010,0022)	CS	From Referenced Image(s)	ANAP	COPY
Other Patient Names	(0010,1001)	PN	From Referenced Image(s)	ANAP	COPY
Ethnic Group	(0010,2160)	SH	From Referenced Image(s)	ANAP	COPY
Patient Comments	(0010,4000)	LT	From Referenced Image(s)	ANAP	COPY
Patient Species Description	(0010,2201)	LO	From Referenced Image(s)	ANAP	COPY
Patient Species Code Sequence	(0010,2202)	SQ	From Referenced Image(s)	ANAP	COPY
<i>> Include 'Code Sequence Macro'</i>			<i>Defined Context ID is 7454.</i>		
Patient Breed Description	(0010,2292)	LO	From Referenced Image(s)	ANAP	COPY

Patient Breed Code Sequence	(0010,2293)	SQ	From Referenced Image(s)	ANAP	COPY
> Include 'Code Sequence Macro'			Defined Context ID is 7480.		
Breed Registration Sequence	(0010,2294)	SQ	From Referenced Image(s)	ANAP	COPY
> Breed Registration Number	(0010,2295)	LO	From Referenced Image(s)	ANAP	COPY
> Breed Registry Code Sequence	(0010,2296)	SQ	From Referenced Image(s)	ANAP	COPY
>> Include 'Code Sequence Macro'			Defined Context ID is 7481.		
Responsible Person	(0010,2297)	PN	From Referenced Image(s)	ANAP	COPY
Responsible Person Role	(0010,2298)	CS	From Referenced Image(s)	ANAP	COPY
Responsible Organization	(0010,2299)	LO	From Referenced Image(s)	ANAP	COPY
Patient Identity Removed	(0012,0062)	CS	From Referenced Image(s)	ANAP	COPY
De-identification Method	(0012,0063)	LO	From Referenced Image(s)	ANAP	COPY
De-identification Method Code Sequence	(0012,0064)	SQ	From Referenced Image(s)	ANAP	COPY
> Include 'Code Sequence Macro'			No Baseline Context ID is defined.		

**Table 8.1-5
SPECIMEN IDENTIFICATION MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specimen Accession Number	(0040,050A)	LO	From Referenced Image(s)	ANAP	COPY
Specimen Sequence	(0040,0550)	SQ	From Referenced Image(s)	ANAP	COPY
> Specimen Identifier	(0040,0551)	LO	From Referenced Image(s)	ANAP	COPY
> Specimen Type Code Sequence	(0040,059A)	SQ	From Referenced Image(s)	ANAP	COPY
>> Include 'Code Sequence Macro'			No Baseline Context ID is defined.		
> Slide Identifier	(0040,06FA)	LO	From Referenced Image(s)	ANAP	COPY

**Table 8.1-6
CLINICAL TRIAL SUBJECT MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Clinical Trial Sponsor Name	(0012,0010)	LO	From Referenced Image(s)	ANAP	COPY

Clinical Trial Protocol ID	(0012,0020)	LO	From Referenced Image(s)	ANAP	COPY
Clinical Trial Protocol Name	(0012,0021)	LO	From Referenced Image(s)	ANAP	COPY
Clinical Trial Site ID	(0012,0030)	LO	From Referenced Image(s)	ANAP	COPY
Clinical Trial Site Name	(0012,0031)	LO	From Referenced Image(s)	ANAP	COPY
Clinical Trial Subject ID	(0012,0040)	LO	From Referenced Image(s)	ANAP	COPY
Clinical Trial Subject Reading ID	(0012,0042)	LO	From Referenced Image(s)	ANAP	COPY

**Table 8.1-7
GENERAL STUDY MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	From Referenced Image(s)	ANAP	COPY
Study Date	(0008,0020)	DA	From Referenced Image(s)	ANAP	COPY
Study Time	(0008,0030)	TM	From Referenced Image(s)	ANAP	COPY
Referring Physician's Name	(0008,0090)	PN	From Referenced Image(s)	ANAP	COPY
Referring Physician Identification Sequence	(0008,0096)	SQ	From Referenced Image(s)	ANAP	COPY
<i>> Include 'Person Identification Macro'</i>					
Study ID	(0020,0010)	SH	From Referenced Image(s)	ANAP	COPY
Accession Number	(0008,0050)	SH	From Referenced Image(s)	ANAP	COPY
Study Description	(0008,1030)	LO	From Referenced Image(s)	ANAP	COPY
Physician(s) of Record	(0008,1048)	PN	From Referenced Image(s)	ANAP	COPY
Physician(s) of Record Identification Sequence	(0008,1049)	SQ	From Referenced Image(s)	ANAP	COPY
<i>> Include 'Person Identification Macro'</i>					
Name of Physician(s) Reading Study	(0008,1060)	PN	From Referenced Image(s)	ANAP	COPY
Physician(s) Reading Study Identification Sequence	(0008,1062)	SQ	From Referenced Image(s)	ANAP	COPY
<i>> Include 'Person Identification Macro'</i>					
Referenced Study Sequence	(0008,1110)	SQ	From Referenced Image(s)	ANAP	COPY
<i>> Include 'SOP Instance Reference Macro'</i>					
Procedure Code Sequence	(0008,1032)	SQ	From Referenced Image(s)	ANAP	COPY
<i>> Include 'Code Sequence Macro'</i>			<i>No Baseline Context ID is defined.</i>		

**Table 8.1-8
PATIENT STUDY MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Admitting Diagnoses Description	(0008,1080)	LO	From Referenced Image(s)	ANAP	COPY
Admitting Diagnoses Code Sequence	(0008,1084)	SQ	From Referenced Image(s)	ANAP	COPY
> Include 'Code Sequence Macro'			<i>No Baseline Context ID is defined.</i>		
Patient's Age	(0010,1010)	AS	From Referenced Image(s)	ANAP	COPY
Patient's Size	(0010,1020)	DS	From Referenced Image(s)	ANAP	COPY
Patient's Weight	(0010,1030)	DS	From Referenced Image(s)	ANAP	COPY
Occupation	(0010,2180)	SH	From Referenced Image(s)	ANAP	COPY
Additional Patient's History	(0010,21B0)	LT	From Referenced Image(s)	ANAP	COPY
Admission ID	(0038,0010)	LO	From Referenced Image(s)	ANAP	COPY
Issuer of Admission ID	(0038,0011)	LO	From Referenced Image(s)	ANAP	COPY
Service Episode ID	(0038,0060)	LO	From Referenced Image(s)	ANAP	COPY
Issuer of Service Episode ID	(0038,0061)	LO	From Referenced Image(s)	ANAP	COPY
Service Episode Description	(0038,0062)	LO	From Referenced Image(s)	ANAP	COPY
Patient's Sex Neutered	(0010,2203)	CS	From Referenced Image(s)	ANAP	COPY

**Table 8.1-9
CLINICAL TRIAL STUDY MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Clinical Trial Time Point ID	(0012,0050)	LO	From Referenced Image(s)	ANAP	COPY
Clinical Trial Time Point Description	(0012,0051)	ST	From Referenced Image(s)	ANAP	COPY

**Table 8.1-10
GENERAL EQUIPMENT MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	ClearCanvas	ALWAYS	AUTO
Manufacturer's Model Name	(0008,1090)	LO	ClearCanvas Workstation	ALWAYS	AUTO
Device Serial Number	(0018,1000)	LO	Not Included	NEVER	AUTO
Software Versions	(0018,1020)	LO	Version of ClearCanvas Workstation software	ALWAYS	AUTO

Institution Name	(0008,0080)	LO	Not Included	NEVER	AUTO
Institution Address	(0008,0081)	ST	Not Included	NEVER	AUTO
Institutional Department Name	(0008,1040)	LO	Not Included	NEVER	AUTO
Station Name	(0008,1010)	SH	Not Included	NEVER	AUTO

8.1.1.5 Common Softcopy Presentation State Modules

**Table 8.1-11
GENERAL SERIES MODULE OF CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	PR	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UJ	Automatically Generated	ALWAYS	AUTO
Series Number	(0020,0011)	IS	Zero-length	EMPTY	AUTO

**Table 8.1-12
PRESENTATION SERIES MODULE OF CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0080,0060)	CS	PR	ALWAYS	AUTO

**Table 8.1-13
PRESENTATION STATE IDENTIFICATION MODULE OF
CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Presentation Creation Date	(0070,0082)	DA	Date when presentation state was captured	ALWAYS	AUTO
Presentation Creation Time	(0070,0083)	TM	Time when presentation state was captured	ALWAYS	AUTO
Instance Number	(0020,0013)	IS	1	ALWAYS	AUTO
Content Label	(0070,0080)	CS	FOR_PRESENTATION	ALWAYS	AUTO
Content Description	(0070,0081)	LO	Zero-length	EMPTY	AUTO
Content Creator's Name	(0070,0084)	PN	Zero-length	EMPTY	AUTO

**Table 8.1-14
PRESENTATION STATE RELATIONSHIP MODULE OF CREATED PRESENTATION STATE SOP
INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
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Referenced Series Sequence	(0008,1115)	SQ	One or more items identifying the referenced image(s)	ALWAYS	AUTO
> Include 'Image SOP Instance Reference Macro'					

**Table 8.1-15
PRESENTATION STATE SHUTTER MODULE OF
CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Shutter Presentation Value	(0018,1622)	US	See Table 8.1-16 or Table 8.1-17, whichever is applicable.		
Shutter Presentation Color CIELab Value	(0018,1624)	US	See Table 8.1-16 or Table 8.1-17, whichever is applicable.		

**Table 8.1-16
DISPLAY SHUTTER MODULE OF CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Shutter Shape	(0018,1600)	CS	One or more of RECTANGULAR, CIRCULAR and POLYGONAL	ALWAYS	AUTO
Shutter Left Vertical Edge	(0018,1602)	IS	From Presentation State	ANAP	AUTO
Shutter Right Vertical Edge	(0018,1604)	IS	From Presentation State	ANAP	AUTO
Shutter Upper Horizontal Edge	(0018,1606)	IS	From Presentation State	ANAP	AUTO
Shutter Lower Horizontal Edge	(0018,1608)	IS	From Presentation State	ANAP	AUTO
Center of Circular Shutter	(0018,1610)	IS	From Presentation State	ANAP	AUTO
Radius of Circular Shutter	(0018,1612)	IS	From Presentation State	ANAP	AUTO
Vertices of the Polygonal Shutter	(0018,1620)	IS	From Presentation State	ANAP	AUTO
Shutter Presentation Value	(0018,1622)	US	0	ALWAYS	AUTO
Shutter Presentation Color CIELab Value	(0018,1624)	US	Not Included	NEVER	AUTO

**Table 8.1-17
BITMAP DISPLAY SHUTTER MODULE OF CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Shutter Shape	(0018,1600)	CS	BITMAP	ALWAYS	AUTO

Shutter Overlay Group	(0018,1623)	US	From Presentation State	ALWAYS	AUTO
Shutter Presentation Value	(0018,1622)	US	From Presentation State	ALWAYS	AUTO
Shutter Presentation Color CIELab Value	(0018,1624)	US	Not Included	NEVER	AUTO

**Table 8.1-18
OVERLAY PLANE MODULE OF CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Overlay Rows	(60xx,0010)	US	From Presentation State	ALWAYS	AUTO
Overlay Columns	(60xx,0011)	US	From Presentation State	ALWAYS	AUTO
Overlay Type	(60xx,0040)	CS	From Presentation State	ALWAYS	AUTO
Overlay Origin	(60xx,0050)	SS	From Presentation State	ALWAYS	AUTO
Overlay Bits Allocated	(60xx,0100)	US	1	ALWAYS	AUTO
Overlay Bit Position	(60xx,0102)	US	0	ALWAYS	AUTO
Overlay Data	(60xx,3000)	OB	From Presentation State	ALWAYS	AUTO
Overlay Description	(60xx,0022)	LO	From Presentation State	ANAP	AUTO
Overlay Subtype	(60xx,0045)	LO	From Presentation State	ANAP	AUTO
Overlay Label	(60xx,1500)	LO	From Presentation State	ANAP	AUTO

**Table 8.1-19
OVERLAY ACTIVATION MODULE OF CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Overlay Activation Layer	(60xx,1001)	CS	From Presentation State	VNAP	AUTO

**Table 8.1-20
DISPLAYED AREA MODULE OF CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Displayed Area Selection Sequence	(0070,005A)	SQ	One item for each image frame describing its displayed area	ALWAYS	AUTO
> Referenced Image Sequence	(0008,1140)	SQ	References exactly one image frame	ALWAYS	AUTO
<i>>> Include 'Image SOP Instance Reference Macro'</i>					
> Displayed Area Top Left Hand Corner	(0070,0052)	SL	From Presentation State	ALWAYS	AUTO
> Displayed Area Bottom Right Hand Corner	(0070,0053)	SL	From Presentation State	ALWAYS	AUTO

> Presentation Size Mode	(0070,0100)	CS	One of SCALE TO FIT, TRUE SIZE or MAGNIFY	ALWAYS	AUTO
> Presentation Pixel Spacing	(0070,0101)	DS	Included only when Presentation Size Mode is TRUE SIZE	ANAP	AUTO
> Presentation Pixel Aspect Ratio	(0070,0102)	IS	Taken from referenced frame or image if available, otherwise 1\1	ALWAYS	AUTO
> Presentation Pixel Magnification Ratio	(0070,0103)	FL	Included only when Presentation Size Mode is MAGNIFY	ANAP	AUTO

**Table 8.1-21
GRAPHIC ANNOTATION MODULE OF CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Graphic Annotation Sequence	(0070,0001)	SQ	One or more items describing user-drawn measurements and annotations. – user-drawn ROI measurements with an associated text element are described in a single item	ALWAYS	AUTO
> Referenced Image Sequence	(0008,1140)	SQ	References exactly one image frame		
<i>>> Include 'Image SOP Instance Reference Macro'</i>					
> Graphic Layer	(0070,0002)	CS	From Presentation State	ALWAYS	AUTO
> Text Object Sequence	(0070,0008)	SQ	One or more items if included	ANAP	AUTO
>> Bounding Box Annotation Units	(0070,0003)	CS	PIXEL	ALWAYS	AUTO
>> Anchor Point Annotation Units	(0070,0004)	CS	PIXEL when text is part of a callout graphic; not included otherwise	ANAP	AUTO
>> Unformatted Text Value	(0070,0006)	ST	From Presentation State	ALWAYS	AUTO
>> Bounding Box Top Left Hand Corner	(0070,0010)	FL	From Presentation State	ALWAYS	AUTO
>> Bounding Box Bottom Right Hand Corner	(0070,0011)	FL	From Presentation State	ALWAYS	AUTO
>> Bounding Box Text Horizontal Justification	(0070,0012)	CS	LEFT	ALWAYS	AUTO
>> Anchor Point	(0070,0014)	FL	Included only when text is part of a callout graphic	ANAP	AUTO
>> Anchor Point Visibility	(0070,0015)	CS	Included only when text is part of a callout graphic	ANAP	AUTO
> Graphic Object Sequence	(0070,0009)	SQ	One or more items if included	ANAP	AUTO
>> Graphic Annotation Units	(0070,0005)	CS	PIXEL	ALWAYS	AUTO

>> Graphic Dimensions	(0070,0020)	US	From Presentation State	ALWAYS	AUTO
>> Number of Graphic Points	(0070,0021)	US	From Presentation State	ALWAYS	AUTO
>> Graphic Data	(0070,0022)	FL	From Presentation State	ALWAYS	AUTO
>> Graphic Type	(0070,0023)	CS	One of POINT, POLYLINE, INTERPOLATED, CIRCLE or ELLIPSE	ALWAYS	AUTO
>> Graphic Filled	(0070,0024)	CS	N when sequence item describes a closed graphic; not included otherwise	ANAP	AUTO

**Table 8.1-22
SPATIAL TRANSFORMATION MODULE OF CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Rotation	(0070,0042)	US	One of 0, 90, 180 or 270	ALWAYS	AUTO
Image Horizontal Flip	(0070,0041)	CS	One of Y or N	ALWAYS	AUTO

**Table 8.1-23
GRAPHIC LAYER MODULE OF CREATED PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Graphic Layer Sequence	(0070,0060)	SQ	One or more items	ALWAYS	AUTO
> Graphic Layer	(0070,0002)	CS	From Presentation State	ALWAYS	AUTO
> Graphic Layer Order	(0070,0062)	IS	From Presentation State	ALWAYS	AUTO
> Graphic Layer Recommended Display Grayscale Value	(0070,0066)	US	Not Included	NEVER	AUTO
> Graphic Layer Recommended Display CIELab Value	(0070,0401)	US	Not Included	NEVER	AUTO
> Graphic Layer Description	(0070,0068)	LO	From Presentation State	ALWAYS	AUTO

8.1.1.6 Grayscale Softcopy Presentation State Modules

**Table 8.1-24
PRESENTATION STATE MASK MODULE OF
CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
<i>No conditions met to require inclusion of any attributes in this module</i>					

**Table 8.1-25
SOFTCOPY VOI LUT MODULE OF
GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Softcopy VOI LUT Sequence	(0028,3110)	SQ	One item for each frame describing the applied VOI LUT	ALWAYS	AUTO
> Referenced Image Sequence	(0008,1140)	SQ	References exactly one image frame	ALWAYS	AUTO
<i>> Include 'Image SOP Instance Reference Macro'</i>					
> VOI LUT Sequence	(0028,3010)	SQ	Included if Window Center and Window Width are not specified	ANAP	AUTO
>> LUT Descriptor	(0028,3002)	US	From Presentation State	ALWAYS	AUTO
>> LUT Explanation	(0028,3003)	LO	Not Included	NEVER	AUTO
>> LUT Data	(0028,3006)	US	From Presentation State	ALWAYS	AUTO
> Window Center	(0028,1050)	DS	From Presentation State	ANAP	AUTO
> Window Width	(0028,1051)	DS	From Presentation State	ANAP	AUTO
> Window Center & Width Explanation	(0028,1055)	LO	From Presentation State	ANAP	AUTO
> VOI LUT Function	(0028,1056)	CS	LINEAR when included	ANAP	AUTO

**Table 8.1-26
SOFTCOPY PRESENTATION LUT MODULE OF
GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Presentation LUT Sequence	(2050,0010)	SQ	Not Included	NEVER	AUTO
Presentation LUT Shape	(2050,0020)	CS	From Presentation State	ALWAYS	AUTO

**Table 8.1-27
SOP COMMON MODULE OF
CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.11.1 (Grayscale Softcopy Presentation State Storage)	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Automatically generated	ALWAYS	AUTO

8.1.1.7 Color Softcopy Presentation State Modules

**Table 8.1-28
ICC PROFILE MODULE OF CREATED COLOR SOFTCOPY PRESENTATION STATE SOP
INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
ICC Profile	(0028,2000)	OB	Not Included	NEVER	AUTO

**Table 8.1-29
SOP COMMON MODULE OF CREATED COLOR SOFTCOPY PRESENTATION STATE SOP
INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.11.2 (Color Softcopy Presentation State Storage)	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Automatically generated	ALWAYS	AUTO

8.1.1.8 Key Object Selection Document Modules

**Table 8.1-30
KEY OBJECT DOCUMENT SERIES MODULE OF
CREATED KEY OBJECT SELECTION DOCUMENT SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	KO	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Automatically generated	ALWAYS	AUTO
Series Number	(0020,0011)	IS	Automatically generated (one greater than highest series number in study)	ALWAYS	AUTO
Series Date	(0008,0021)	DA	Date when key object selection was created	ALWAYS	AUTO
Series Time	(0008,0031)	TM	Time when key object selection was created	ALWAYS	AUTO
Series Description	(0008,103E)	LO	From User Input	ALWAYS	USER
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	Zero-length	EMPTY	AUTO

**Table 8.1-31
KEY OBJECT DOCUMENT MODULE OF
CREATED KEY OBJECT SELECTION DOCUMENT SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
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Instance Number	(0020,0013)	IS	1	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Date when key object selection was created	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Time when key object selection was created	ALWAYS	AUTO
Referenced Request Sequence	(0040,A370)	SQ	Not Included	NEVER	AUTO
Current Requested Procedure Evidence Sequence	(0040,A375)	SQ	One or more items describing the referenced image(s) and associated softcopy presentation state SOP instances.	ALWAYS	AUTO
<i>> Include 'Hierarchical SOP Instance Reference Macro'</i>					
Identical Documents Sequence	(0040,A525)	SQ	One or more items describing all key object selection document SOP instances being created during the session due to referenced image(s) from one or more studies, <i>including the SOP instance in which this attribute exists.</i>	ALWAYS	AUTO
<i>> Include 'Hierarchical SOP Instance Reference Macro'</i>					

**Table 8.1-32
SR DOCUMENT CONTENT MODULE OF
CREATED KEY OBJECT SELECTION DOCUMENT SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Value Type	(0040,A040)	CS	CONTAINER	ALWAYS	AUTO
Concept Name Code Sequence	(0040,A043)	SQ	Key Object Selection Document Title	ALWAYS	USER
<i>> Include 'Code Sequence Macro'</i>			<i>Defined Context ID is 7010.</i>		
Continuity of Content	(0040,A050)	CS	SEPARATE	ALWAYS	AUTO
Content Template Sequence	(0040,A504)	SQ	Not Included	NEVER	AUTO
Content Sequence	(0040,A730)	SQ	One or more content items as described in Section 8.1.1.8.1 (such as Table 8.1-34 and Table 8.1-35)	ALWAYS	

**Table 8.1-33
SOP COMMON MODULE OF CREATED KEY OBJECT SELECTION DOCUMENT SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
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SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.88.59 (Key Object Selection Document Storage)	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Automatically generated	ALWAYS	AUTO

8.1.1.8.1 Content Items Used in Key Object Selection Documents

**Table 8.1-34
TEXT CONTENT ITEM USED IN
CREATED KEY OBJECT SELECTION DOCUMENT SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Relationship Type	(0040,A010)	CS	CONTAINS	ALWAYS	AUTO
Value Type	(0040,A040)	CS	TEXT	ALWAYS	AUTO
Concept Name Code Sequence	(0040,A043)	SQ	DCM 113012 Key Object Description	ALWAYS	AUTO
> Include 'Code Sequence Macro'			No Baseline Context ID is defined.		
Text Value	(0040,A160)	UT	Free form text describing key object selection	ALWAYS	USER
Content Sequence	(0040,A730)	SQ	Not Included	NEVER	AUTO
Referenced Content Item Identifier	(0040,DB73)	UL	1	ALWAYS	AUTO

**Table 8.1-35
IMAGE REFERENCE CONTENT ITEM USED IN
CREATED KEY OBJECT SELECTION DOCUMENT SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Relationship Type	(0040,A010)	CS	CONTAINS	ALWAYS	AUTO
Value Type	(0040,A040)	CS	IMAGE	ALWAYS	AUTO
Concept Name Code Sequence	(0040,A043)	SQ	DCM 113012 Key Object Description	ALWAYS	AUTO
> Include 'Code Sequence Macro'			No Baseline Context ID is defined.		
Content Sequence	(0040,A730)	SQ	Not Included	NEVER	AUTO
Referenced SOP Sequence	(0008,1199)	SQ	Exactly one item referencing an image	ALWAYS	AUTO
> Referenced SOP Class UID	(0008,1150)	UI	SOP Class UID of referenced image	ALWAYS	AUTO
> Referenced SOP Instance UID	(0008,1155)	UI	SOP Instance UID of referenced image	ALWAYS	AUTO
> Referenced Frame Number	(0008,1160)	IS	List of frame numbers to which this item refers, or zero-length if image is not multi-frame or item applies to all frames	ANAP	AUTO

> Referenced Segment Number	(0062,000B)	US	Not Included	NEVER	AUTO
> Referenced SOP Sequence	(0008,1199)	SQ	Exactly one item referencing an associated softcopy presentation state when included	ANAP	AUTO
>> Referenced SOP Class UID	(0008,1150)	UI	SOP Class UID of associated softcopy presentation state	ALWAYS	AUTO
>> Referenced SOP Instance UID	(0008,1155)	UI	SOP Instance UID of associated softcopy presentation state	ALWAYS	AUTO
> Referenced Real World Value Mapping Instance Sequence	(0008,114B)	SQ	Not Included	NEVER	AUTO
> Icon Image Sequence	(0088,0200)	SQ	Not Included	NEVER	AUTO
Referenced Content Item Identifier	(0040,DB73)	UL	1	ALWAYS	AUTO

8.1.2 Usage of Attributes from Received IODs

No SOP Class specific fields are required.

The internal database, remote query and directory browsers make use of the conventional identification attributes to distinguish patients, studies, series and instances. In particular, if two patients have the same value for Patient ID, they will be treated as the same in the browser and the internal database.

8.1.3 Attribute Mapping

Not applicable.

8.1.4 Coerced/Modified Fields

No coercion is performed.

8.2 DATA DICTIONARY OF PRIVATE ATTRIBUTES

No private attributes are defined.

8.3 CODED TERMINOLOGY AND TEMPLATES

Not applicable.

8.4 GRAYSCALE IMAGE CONSISTENCY

No specific support to ensure grayscale image consistency.

8.5 STANDARD EXTENDED/SPECIALIZED/PRIVATE SOP CLASSES

No standard extended, specialized or private SOP classes are used.

8.6 PRIVATE TRANSFER SYNTAXES

No private transfer syntaxes are used.