DICOM 3.0 Conformance Statement

for

Compass

LAUREL BRIDGE

Providing DICOM Connectivity for the Medical Community

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1. Conformance Statement Overview

Compass is a software application which receives and optionally sends medical instances. It implements the necessary DICOM services to receive those instances from other DICOM entities, and then send those instances to other DICOM entities.

Table 1-1 provides an overview of the DICOM network services supported by Compass.

Table 1-1

Network Services

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Computed Radiography Image Storage	Yes	Yes
Digital X-Ray Image Storage - For Presentation	Yes	Yes
Digital X-Ray Image Storage - For Processing	Yes	Yes
Digital Mammography X-Ray Image Storage - For Presentation	Yes	Yes
Digital Mammography X-Ray Image Storage - For Processing	Yes	Yes
Digital Intra-oral X-Ray Image Storage - For Presentation	Yes	Yes
Digital Intra-oral X-Ray Image Storage - For Processing	Yes	Yes
CT Image Storage	Yes	Yes
Enhanced CT Image Storage	Yes	Yes
Ultrasound Multi-frame Image Storage	Yes	Yes
MR Image Storage	Yes	Yes
Enhanced MR Image Storage	Yes	Yes
MR Spectroscopy Storage	Yes	Yes
Nuclear Medicine Image Storage	Yes	Yes
Ultrasound Image Storage	Yes	Yes
Secondary Capture Image Storage	Yes	Yes
Multi-frame Single Bit Secondary Capture Image Storage	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	Yes	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	Yes	Yes
Standalone Overlay Storage (Retired)	Yes	Yes
Standalone Curve Storage (Retired)	Yes	Yes
Standalone Modality LUT Storage (Retired)	Yes	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Standalone VOI LUT Storage (Retired)	Yes	Yes
Grayscale Softcopy Presentation State Storage SOP Class	Yes	Yes
Color Softcopy Presentation State Storage SOP Class	Yes	Yes
Pseudo-Color Softcopy Presentation State Storage SOP Class	Yes	Yes
Blending Softcopy Presentation State Storage SOP Class	Yes	Yes
X-Ray Angiographic Image Storage	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	Yes	Yes
Raw Data Storage	Yes	Yes
Spatial Registration Storage	Yes	Yes
Spatial Fiducials Storage	Yes	Yes
Twelve Lead ECG Waveform Storage	Yes	Yes
General ECG Waveform Storage	Yes	Yes
Ambulatory ECG Waveform Storage	Yes	Yes
Hemodynamic Waveform Storage	Yes	Yes
Cardiac Electrophysiology Waveform Storage	Yes	Yes
Basic Voice Audio Waveform Storage	Yes	Yes
VL Endoscopic Image Storage	Yes	Yes
Video Endoscopic Image Storage	Yes	Yes
VL Microscopic Image Storage	Yes	Yes
Video Microscopic Image Storage	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	Yes	Yes
VL Photographic Image Storage	Yes	Yes
Video Photographic Image Storage	Yes	Yes
Ophthalmic Photography 8 Bit Image Storage	Yes	Yes
Ophthalmic Photography 16 Bit Image Storage	Yes	Yes
Stereometric Relationship Storage	Yes	Yes
Basic Text SR Storage	Yes	Yes
Enhanced SR Storage	Yes	Yes
Comprehensive SR Storage	Yes	Yes
Procedure Log Storage	Yes	Yes
Mammography CAD SR Storage	Yes	Yes
Key Object Selection Document Storage	Yes	Yes
Chest CAD SR Storage	Yes	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
X-Ray Radiation Dose SR Storage	Yes	Yes
Positron Emission Tomography Image Storage	Yes	Yes
Standalone PET Curve Storage (Retired)	Yes	Yes
RT Image Storage	Yes	Yes
RT Dose Storage	Yes	Yes
RT Structure Set Storage	Yes	Yes
RT Beams Treatment Record Storage	Yes	Yes
RT Plan Storage	Yes	Yes
RT Brachy Treatment Record Storage	Yes	Yes
RT Treatment Summary Record Storage	Yes	Yes
Enhanced XA Image Storage	Yes	Yes
Enhanced XRF Image Storage	Yes	Yes
Encapsulated PDF Storage	Yes	Yes
Workflow Management		
Storage Commitment	No	Yes
Other		
Verification	Yes	Yes

2. Table of Contents

3. Introduction

3.1. Revision History

Document Version	Date of Issue	Author	Description
1.0	13 Dec 2010	JTB	Initial creation
1.1	10 Jan 2011	EMG	Updated Table 4.2.2.3.1.2-1
1.2	12 Apr 2011	BRH	Updated tables, version, titles, formatting.

3.2. Audience

This document is written for the people that need to understand how Compass will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators 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 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

The scope of this DICOM Conformance Statement is to facilitate integration between Compass and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality. This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

— The comparison of different Conformance Statements is just the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.

— Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

3.4. Terms and Definitions

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

Application Entity (AE) – an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title – the externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.

Application Context – the specification of the type of communication used between Application Entities. Example: DICOM network protocol.

Association – a network communication channel set up between Application Entities.

Attribute – a unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Information Object Definition (IOD) – the specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Joint Photographic Experts Group (JPEG) – a set of standardized image compression techniques, available for use by DICOM applications.

Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)

Module – a set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – first phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context – the set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.

Protocol Data Unit (PDU) – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data

Service Class Provider (SCP) – role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) – role of an Application Entity that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management. Service/Object Pair (SOP) Instance – an information object; a specific occurrence of information exchanged in a SOP Class. Examples: a specific x-ray image.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), little endian explicit value representation.

Unique Identifier (UID) – a globally unique “dotted decimal” string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person’s name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

3.5. Basics of DICOM Communication

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in italics below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two Application Entities (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network “handshake”. One of the two devices must initiate an

Association (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (Negotiation).

DICOM specifies a number of network services and types of information objects, each of which is called an Abstract Syntax for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted Transfer Syntaxes. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the Association; these combinations are called Presentation Contexts. The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on Roles – which one is the Service Class User (SCU - client) and which is the Service Class Provider (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (PDU) size, security information, and network service options (called Extended Negotiation information).

The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports), and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate Information Object Definition, and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most efficient for some use cases. Each transfer is explicitly acknowledged by the receiver with a Response Status indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a CD-R). Since there is no Association Negotiation possible, they both use a Media Application Profile that specifies “pre-negotiated” exchange media format, Abstract Syntax, and Transfer Syntax.

3.6. Abbreviations

AE	Application Entity
AET	Application Entity Title
CSE	Customer Service Engineer
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DNS	Domain Name System
GSDF	Grayscale Standard Display Function
GSPS	Grayscale Softcopy Presentation State
HIS	Hospital Information System
HL7	Health Level 7 Standard
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISO	International Organization for Standards
JPEG	Joint Photographic Experts Group
LDAP	Lightweight Directory Access Protocol
LUT	Look-up Table
MPEG	Moving Picture Experts Group
MPPS	Modality Performed Procedure Step
MR	Magnetic Resonance Imaging
MSPS	Modality Scheduled Procedure Step

MTU	Maximum Transmission Unit (IP)
MWL	Modality Worklist
NTP	Network Time Protocol
O	Optional (Key Attribute)
OSI	Open Systems Interconnection
PACS	Picture Archiving and Communication System
PDU	Protocol Data Unit
R	Required (Key Attribute)
RIS	Radiology Information System.
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SPS	Scheduled Procedure Step
TCP/IP	Transmission Control Protocol/Internet Protocol
U	Unique (Key Attribute)
UL	Upper Layer
VL	Visible Light
VR	Value Representation

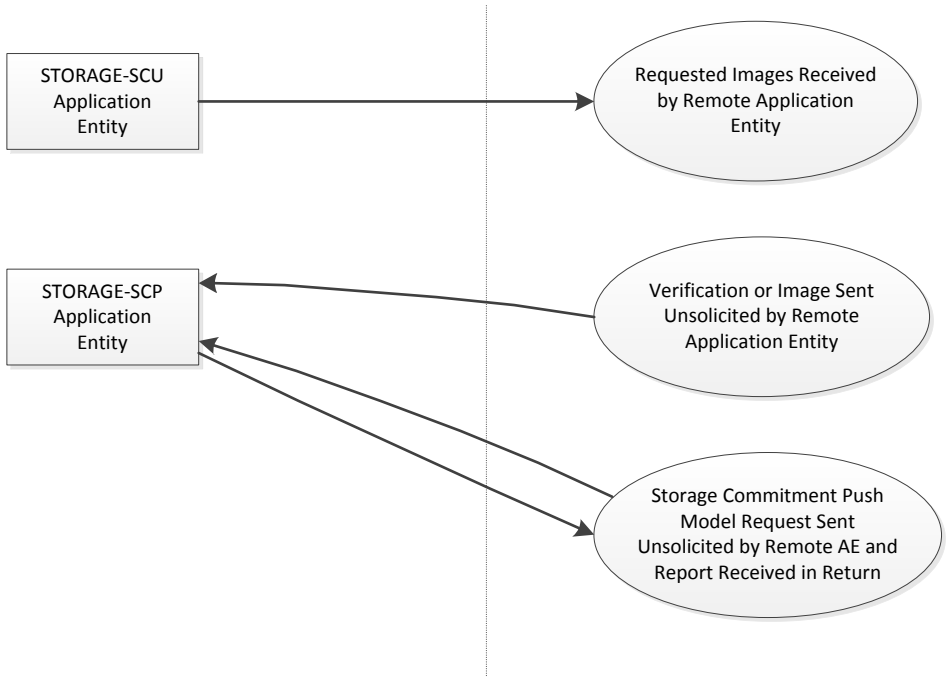
3.7. References

NEMA PS3 Digital Imaging and Communications in Medicine (DICOM) Standard, available for free at http://medical.nema.org/dicom

4. Networking

4.1. Implementation Model

4.1.1. Application Data Flow



4.1.2. Functional Definition of AE's

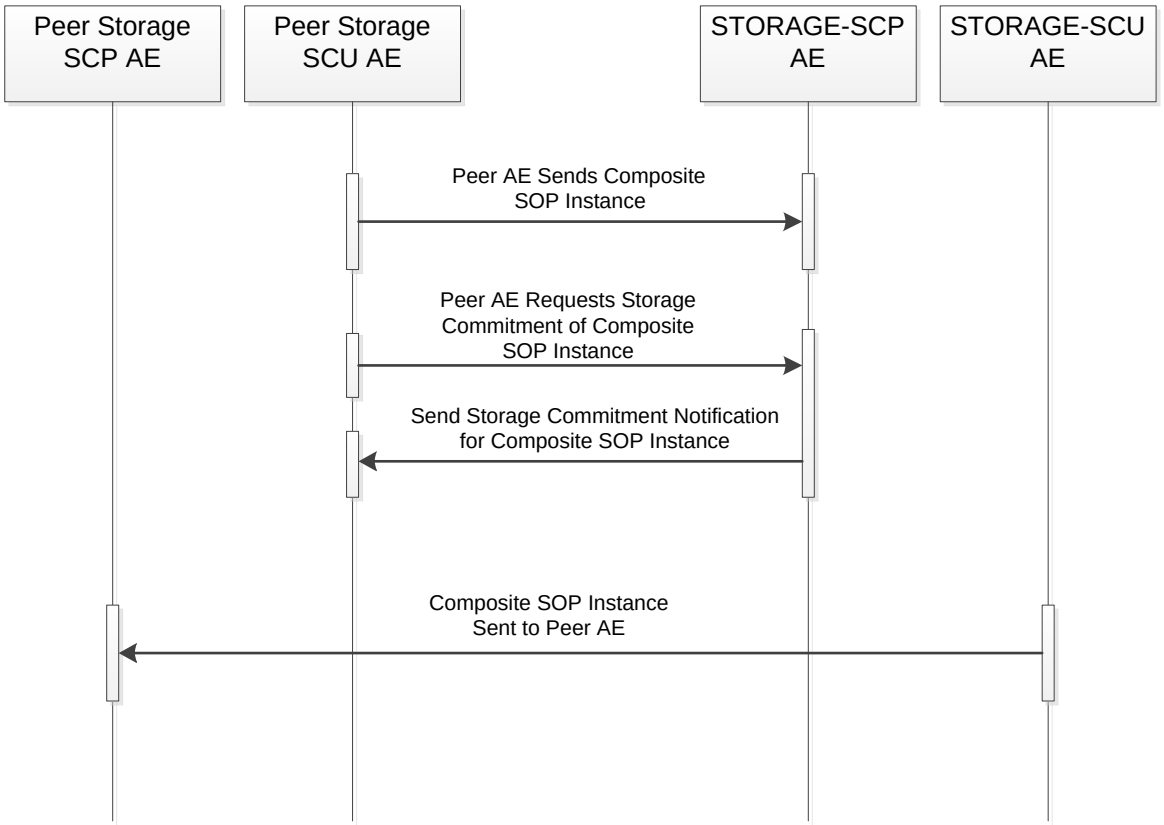
4.1.2.1. Functional Definition of STORAGE-SCU Application Entity

The STORAGE-SCU AE can be invoked by the STORAGE SCP AE's receipt of images, triggering the transfer of specific images to a remote destination AE. The STORAGE-SCU AE must be correctly configured with the host and port number of any external DICOM AE's that are to be C-STORE retrieval destinations. The Presentation Contexts to use are determined from the headers of the DICOM files to be transferred, as well as the configuration in Compass. Some conversion of the DICOM image objects is possible if the original Presentation Context is not supported by the remote destination AE or if compression is preferred.

4.1.2.2. Functional Definition of STORAGE-SCP Application Entity

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

4.1.3. Sequencing of Real-World Activities



4.2. AE Specifications

4.2.1. Storage-SCP Application Entity Specification

4.2.1.1. SOP Classes

Compass provides Standard Conformance to the following DICOM V3.0 SOP Classes:

Table 4.2.1.1-1
SOP Classes for AE Storage

SOP Classes	SOP Class UID	SCU	SCP
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	No	Yes
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	No	Yes
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	No	Yes
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	No	Yes
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	No	Yes
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	No	Yes

SOP Classes	SOP Class UID	SCU	SCP
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	No	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	No	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	No	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	No	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	No	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	No	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	No	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	No	Yes
Standalone Overlay Storage (Retired)	1.2.840.10008.5.1.4.1.1.8	No	Yes
Standalone Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.9	No	Yes
Standalone Modality LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.10	No	Yes
Standalone VOI LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.11	No	Yes
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	No	Yes
Color Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.2	No	Yes
Pseudo-Color Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.3	No	Yes
Blending Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.4	No	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	No	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	No	Yes
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	No	Yes
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	No	Yes
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	No	Yes
Twelve Lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	No	Yes
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	No	Yes

SOP Classes	SOP Class UID	SCU	SCP
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	No	Yes
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	No	Yes
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	No	Yes
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	No	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	No	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	No	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	No	Yes
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	No	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	No	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	No	Yes
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	No	Yes
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	No	Yes
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	No	Yes
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	No	Yes
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	No	Yes
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	No	Yes
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	No	Yes
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	No	Yes
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	No	Yes
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	No	Yes
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65	No	Yes
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	No	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	No	Yes
Standalone PET Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.129	No	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	No	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	No	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	No	Yes
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	No	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	No	Yes
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	No	Yes

SOP Classes	SOP Class UID	SCU	SCP
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	No	Yes
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.	No	Yes
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	No	Yes
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	No	Yes
Verification	1.2.840.10008.1.1	No	Yes

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

4.2.1.1.1. Proposed Presentation Contexts

Compass is capable of proposing or receiving a presentation context consisting of any SOP class listed in Table 4.2.1.1-1 and any transfer syntax listed in Table 4.2.1.1.1-1 below:

Table 4.2.1.1.1-1

Abstract Syntax Name	Transfer Syntax Name	Transfer Syntax UID	SCU	SCP	Ext. Neg.
*	Explicit VR Little Endian	1.2.840.10008.1.2.1	No	Yes	None
*	Implicit VR Little Endian	1.2.840.10008.1.2	No	Yes	None
*	Explicit VR Big Endian	1.2.840.10008.1.2.2	No	Yes	None
*	RLE Lossless	1.2.840.10008.1.2.5	No	Yes	None
*	JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])	1.2.840.10008.1.2.4.70	No	Yes	None
*	JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90	No	Yes	None
*	JPEG 2000	1.2.840.10008.1.2.4.91	No	Yes	None
*	JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	No	Yes	None
*	JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	No	Yes	None
*	JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51	No	Yes	None
*	JPEG-LS Lossless	1.2.840.10008.1.2.4.80	No	Yes	None
*	JPEG-LS Lossy (Near-Lossless)	1.2.840.10008.1.2.4.81	No	Yes	None

Abstract Syntax Name	Transfer Syntax Name	Transfer Syntax UID	SCU	SCP	Ext. Neg.
*	MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100	No	Yes	None
*	MPEG2 Main Profile @ High Level	1.2.840.10008.1.2.4.101	No	Yes	None
*	JPEG 2000 Part 2 Multi-component (Lossless Only)	1.2.840.10008.1.2.4.92	No	Yes	None
*	JPEG 2000 Part 2 Multi-component	1.2.840.10008.1.2.4.93	No	Yes	None

* Indicates any SOP class from Table 4.2.1.1-1.

NOTE: A SOP Class can be accepted in the following transfer syntaxes, so long as it is sent out in that same transfer syntax; i.e., Compass cannot decompress it and recompress it into a different transfer syntax.

Transfer Syntax Name	Transfer Syntax UID
JPEG-LS Lossless	1.2.840.10008.1.2.4.80
JPEG-LS Lossy (Near-Lossless)	1.2.840.10008.1.2.4.81
JPEG 2000 Part 2 Multi-component (Lossless Only)	1.2.840.10008.1.2.4.92
JPEG 2000 Part 2 Multi-component	1.2.840.10008.1.2.4.93
MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100
MPEG2 Main Profile @ High Level	1.2.840.10008.1.2.4.101

4.2.1.2. Association Policies

4.2.1.2.1. General

The STORAGE-SCP AE can both accept and propose Association Requests. The STORAGE-SCP AE will accept Association Requests for the Verification, Storage, and Storage Commitment Push Model Services. It will propose Associations only for the Storage Commitment Push Model Service. The DICOM standard Application Context Name for DICOM 3.0 is always accepted and proposed:

Table 4.2.1.2.1-1

DICOM Application Context For STORAGE-SCP AE

Application Context Name	1.2.840.10008.3.1.1.1

4.2.1.2.2. Number of Associations

The STORAGE-SCP AE can support multiple simultaneous Associations requested by peer AEs. Each time the STORAGE-SCP AE receives an Association, a child process will be spawned to process the Verification, Storage, or Storage Commitment Push Model Service requests. The maximum number of child processes, and thus the maximum number of simultaneous Associations that can be processed, is set by configuration. The default maximum number is 25 in total. This maximum number of simultaneous Associations can be either an absolute number or a maximum number for each requesting external Application Entity. The latter flexibility can be useful if communication with one external AE is unreliable and one does not wish 'hung' connections with this AE to prevent Associations with other client AEs.

Table 4.2.1.2.1-2
Number Of Simultaneous Associations As An SCP For STORAGE-SCP AE

Maximum number of simultaneous Associations requested by peer AEs	25 (Configurable)

4.2.1.2.3. Asynchronous Nature

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

Table 4.2.1.2.1-3
Asynchronous Nature As A SCP For STORAGE-SCP AE

Maximum number of outstanding asynchronous transactions	1 (Not configurable)

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

Table 4.2.1.2.1-4
Outstanding Storage Commitment Push Model Requests for STORAGE-SCP AE

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

4.2.1.2.4. Implementation Identifying Information

The implementation information for this Application Entity is:

Table 4.2.1.2.1-5
DICOM Implementation Class and Version for STORAGE-SCP AE

Implementation Class UID	1.2.840.114089.1.0.0.3.3.18
Implementation Version Name	DCF 3.3.18c

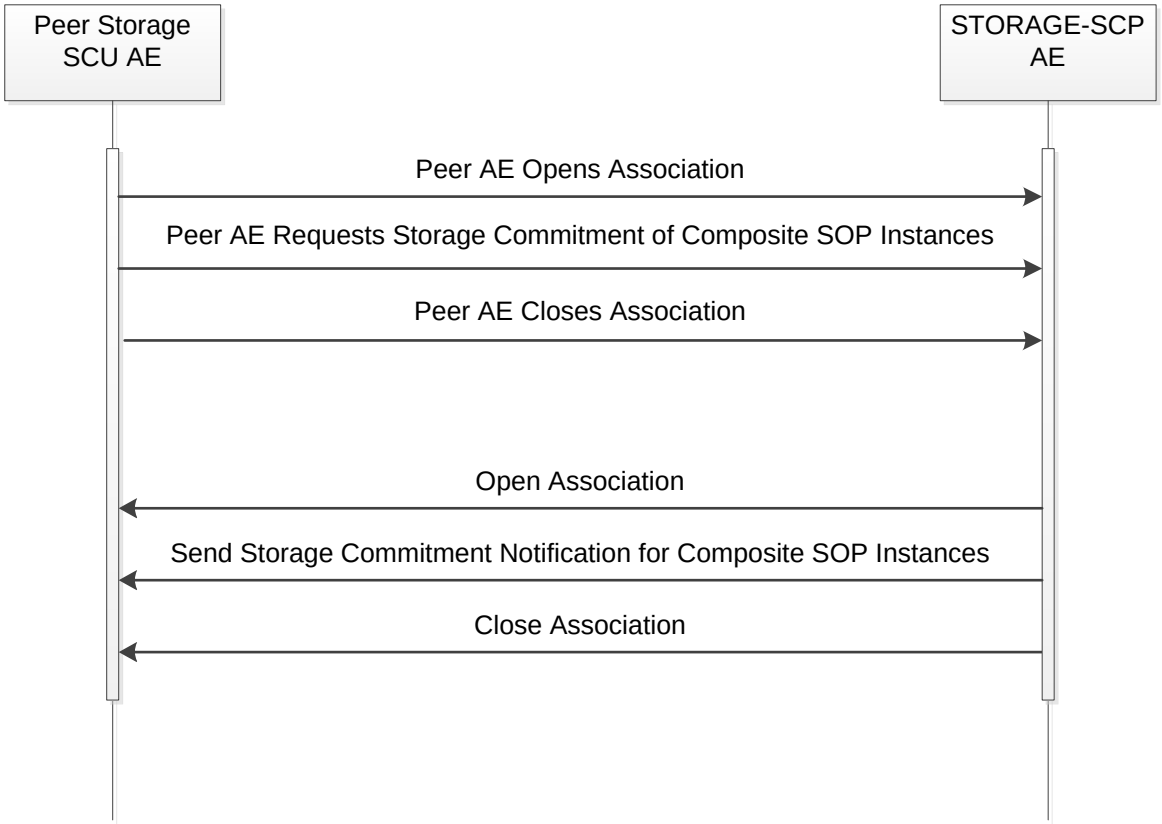
4.2.1.3. Association Initiation Policy

4.2.1.3.1. Activity – Send Storage Commitment Notification Over New Association

- 4.2.1.3.1.1 Description and Sequencing of Activity

The STORAGE-SCP AE will always initiate a new Association when a Peer AE requests Storage Commitment of Composite SOP Instances.

Figure 4.2.1.3.1.1-1
Sequencing Of Activity – Send Storage Commitment Notification Over New Association



The following sequencing constraints illustrated in Figure 4.2.1.3.1.1-1 apply to the STORAGE-SCP AE for handling Storage Commitment Push Model Requests using a new Association:

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

- 4.2.1.3.1.2 Proposed Presentation Contexts

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

Table 4.2.1.3.1.2-1
Proposed Presentation Contexts By The STORAGE-SCP AE

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

4.2.1.4. Association Acceptance Policy

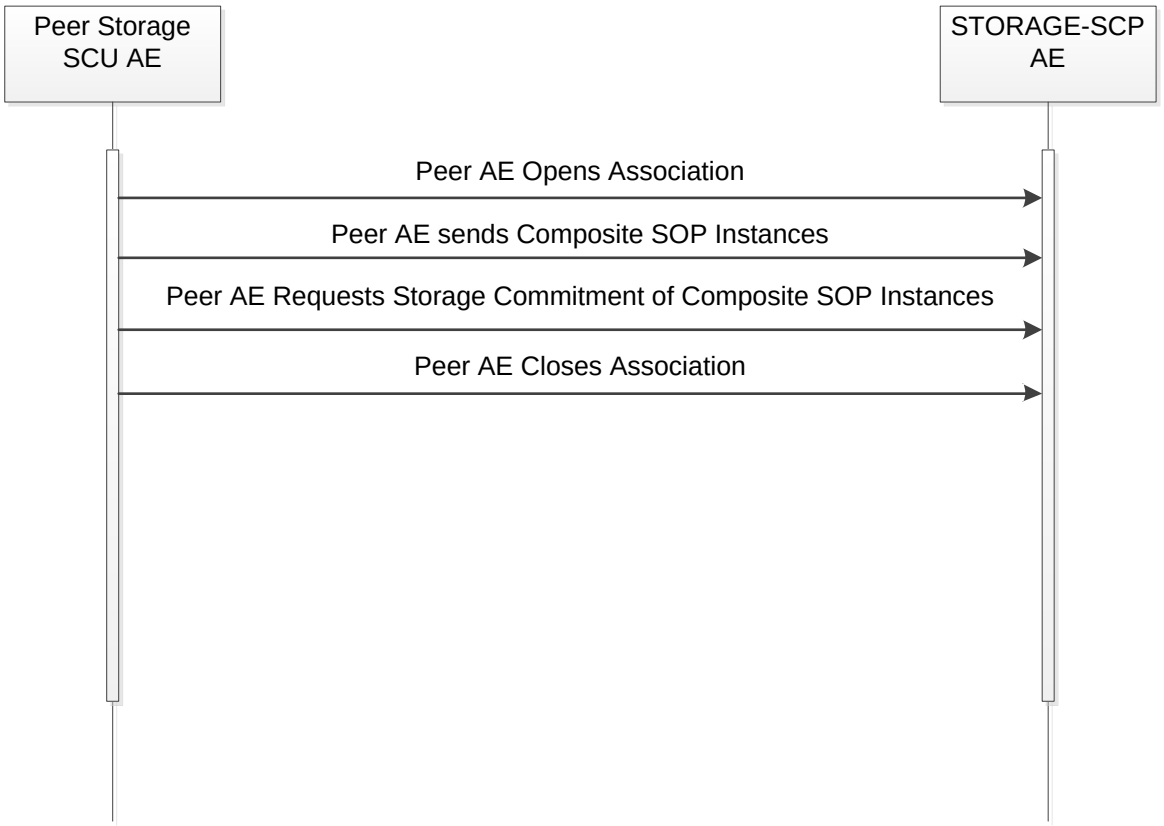
4.2.1.4.1. Activity – Receive Images and Storage Commitment Requests

- 4.2.1.4.1.1 Description and Sequencing of Activity

The STORAGE-SCP AE accepts Associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted then the Association Request itself if rejected. It can be configured to only accept Associations with certain hosts (using TCP/IP address or hostname), ports, and/or Application Entity Titles.

The default behavior of the STORAGE-SCP AE is to always attempt to send a Storage Commitment Push Model Notification (N-EVENT-REPORT) on a new Association. It is also the behavior of the STORAGE-SCP AE to send Storage Commitment Push Model Notification (N-EVENT-REPORT) with a status of success regardless of whether or not the Peer Storage SCU AE has in fact sent the composite SOP Instance to Compass. The purpose of Compass' implementation of Storage Commitment is to accept all storage commitment requests on behalf of an ultimate destination that does not implement storage commitment.

Figure 4.2.1.4.1.1-1



The following sequencing constraints illustrated in Figure 4.2.1.4.1.1-1 apply to the STORAGE-SCP AE for handling storage commitment requests:

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

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

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

Table 4.2.1.4.1.1-1

Result	Source	Reason/Diag	Explanation
2 – rejected-transient	c	2 – local-limit-exceeded	The (configurable) maximum number of simultaneous Associations has been reached. An Association request with the same parameters may succeed at a later time.

Result	Source	Reason/Diag	Explanation
2 – rejected-transient	c	1 – temporary congestion	No Associations can be accepted at this time due to the real-time requirements of higher priority activities (e.g. during image acquisition no Associations will be accepted) or because insufficient resources are available (e.g. memory, processes, threads). An Association request with the same parameters may succeed at a later time.
1 – rejected-permanent	a	2 – application-context-name-not-supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will not succeed at a later time.
1 – rejected-permanent	a	7 – called-AE-title-not-recognized	The Association request contained an unrecognized Called AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association initiator is incorrectly configured and attempts to address the Association acceptor using the wrong AE Title.
1 – rejected-permanent	a	3 – calling-AE-title-not-recognized	The Association request contained an unrecognized Calling AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association acceptor has not been configured to recognize the AE Title of the Association initiator.
1 – rejected-permanent	b	1 – no-reason-given	The Association request could not be parsed. An Association request with the same format will not succeed at a later time.

- 4.2.1.4.1.2 **Accepted Presentation Contexts**

The default Behavior of the STORAGE-SCP AE supports all of the presentation contexts listed in Table 4.2.1.1.1-1. The STORAGE-SCP AE can be configured to accept a subset or a superset of these presentation contexts by adding or removing SOP Classes and/or transfer syntaxes.

If multiple Transfer Syntaxes are proposed per Presentation Context then only the most preferable Transfer Syntax is accepted. The order of Transfer Syntax preference for the STORAGE-SCP AE is configurable.

- 4.2.1.4.1.3 **SOP Specific Conformance for Verification SOP Class**

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

- 4.2.1.4.1.4 **SOP Specific Conformance for Storage SOP Class**

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

The STORAGE-SCP AE does not have any dependencies on the number of Associations used to send images to it. Images belonging to more than one Study or Series can be sent over a single or multiple Associations. Images belonging to a single Study or Series can also be sent over different Associations. There is no limit on either the number of SOP Instances or the maximum amount of total SOP Instance data that can be transferred over a single Association. The STORAGE-SCP AE is configured to retain the original DICOM data in DICOM Part 10 compliant file format. The STORAGE-SCP AE is Level 2 (Full) conformant as a Storage SCP. In addition, all Private and SOP Class Extended Elements are maintained in the DICOM format files. In addition to saving all Elements in files, a subset of the Elements is stored in Compass' database to support the creation and organization of jobs for the STORAGE-SCU AE.

The behavior for handling duplicate SOP Instances is not configurable. Compass will accept (assuming the presentation context is acceptable) any duplicate SOP Instances and route them as is.

Table 4.2.1.4.1.4-1

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	The Composite SOP Instance was successfully received, verified, and stored in the system database.
Refused	Out of Resources	A700	Indicates that there was not enough disk space to store the image.

Service Status	Further Meaning	Error Code	Reason
Error	Data Set does not match SOP Class	A900	Indicates that the Data Set does not encode a valid instance of the SOP Class specified. This status is returned if the DICOM Object stream can be successfully parsed but does not contain values for one or more mandatory Elements of the SOP Class. The STORAGE-SCP AE does not perform a comprehensive check, as it only checks a subset of required Elements. In addition, if the SOP Class is for a type of image but the SOP Instance does not contain values necessary for its display then this status is returned.
Error	Cannot understand	C000	Indicates that the STORAGE-SCP AE cannot parse the Data Set into Elements.
Warning	Coercion of Data Elements	B000	Indicates that one or more Element values were coerced.

NOTE: If a failure condition does occur when handling an Association then all images previously received successfully over the Association are maintained in the Compass database. No previously successfully received images are discarded. Even if an image is successfully received but an error occurs transmitting the C-STORE Response then this final image is maintained rather than discarded. If the loss of an Association is detected then the Association is closed.

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

Table 4.2.1.4.1.4-2

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

- 4.2.1.4.1.5 **SOP Specific Conformance for Storage Commitment SOP Class**

The STORAGE-SCP AE takes the list of Composite SOP Instance UIDs specified in a Storage Commitment Push Model N-ACTION Request and attempts to send a Notification request (N-EVENT-REPORT-RQ) on a new Association. The STORAGE-SCP AE will request a new Association with the configured peer AE. The STORAGE-SCP AE does not require that it previously received a specified Composite SOP Instance in order to respond with the Composite SOP Instance UID in the N-EVENT-REPORT-RQ.

The STORAGE-SCP AE will support Storage Commitment Push Model requests for SOP Instances of any of the Storage SOP Classes that are also supported by the STORAGE-SCP AE specified in Table 4.2.1.1-1.

4.2.2. Storage-SCU Application Entity Specification

4.2.2.1. SOP Classes

Compass provides Standard Conformance to the following DICOM V3.0 SOP Classes:

Table 4.2.2.1-1
SOP Classes for AE Storage

SOP Classes	SOP Class UID	SCU	SCP
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	No
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	No
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	No
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	No
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	No
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	No
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	No
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	No
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes	No
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	No

SOP Classes	SOP Class UID	SCU	SCP
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	No
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	No
Standalone Overlay Storage (Retired)	1.2.840.10008.5.1.4.1.1.8	Yes	No
Standalone Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.9	Yes	No
Standalone Modality LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.10	Yes	No
Standalone VOI LUT Storage (Retired)	1.2.840.10008.5.1.4.1.1.11	Yes	No
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Yes	No
Color Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.2	Yes	No
Pseudo-Color Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.3	Yes	No
Blending Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.4	Yes	No
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Yes	No
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	No
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Yes	No
Twelve Lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	No
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	No
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	No
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	No
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	No
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes	No
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	No
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	No
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	No
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes	No
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	No
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	No
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes	No

SOP Classes	SOP Class UID	SCU	SCP
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	No
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Yes	No
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Yes	No
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	Yes	No
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes	No
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	No
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	Yes	No
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	Yes	No
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	Yes	No
Chest CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.65	Yes	No
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes	No
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	No
Standalone PET Curve Storage (Retired)	1.2.840.10008.5.1.4.1.1.129	Yes	No
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	No
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	No
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	No
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	No
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	No
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	No
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	No
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.	Yes	No
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Yes	No
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	No
Verification	1.2.840.10008.1.1	Yes	No

4.2.2.1.1. Proposed Presentation Contexts

Compass is capable of proposing or receiving a presentation context consisting of any SOP class listed in Table 4.2.1.1-1 and any transfer syntax listed in Table 4.2.2.1.1-1 below:

Table 4.2.2.1.1-1

Abstract Syntax Name	Transfer Syntax Name	Transfer Syntax UID	SCU	SCP

Abstract Syntax Name	Transfer Syntax Name	Transfer Syntax UID	SCU	SCP
*	Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	No
*	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	No
*	Explicit VR Big Endian	1.2.840.10008.1.2.2	Yes	No
*	RLE Lossless	1.2.840.10008.1.2.5	Yes	No
*	JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])	1.2.840.10008.1.2.4.70	Yes	No
*	JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90	Yes	No
*	JPEG 2000	1.2.840.10008.1.2.4.91	Yes	No
*	JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	Yes	No
*	JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	Yes	No
*	JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51	Yes	No
*	JPEG-LS Lossless	1.2.840.10008.1.2.4.80	Yes	No
*	JPEG-LS Lossy (Near-Lossless)	1.2.840.10008.1.2.4.81	Yes	No
*	MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100	Yes	No
*	MPEG2 Main Profile @ High Level	1.2.840.10008.1.2.4.101	Yes	No
*	JPEG 2000 Part 2 Multi-component (Lossless Only)	1.2.840.10008.1.2.4.92	Yes	No
*	JPEG 2000 Part 2 Multi-component	1.2.840.10008.1.2.4.93	Yes	No

* Indicates any SOP class from Table 4.2.2.1-1.

4.2.2.2. Association Establishment Policies

4.2.2.2.1. General

The STORAGE-SCU AE can only request the opening of an Association. It cannot accept requests to open Associations from external Application Entities.

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

Table 4.2.2.2.1-1
DICOM Application Context For STORAGE-SCU

Application Context Name	1.2.840.10008.3.1.1.1

4.2.2.2.2. Number of Associations

The maximum number of simultaneous Associations is configurable. The STORAGE-SCU AE can initiate simultaneous Associations to a given external C-STORE Destination AE up to the maximum number configured. Each C-STORE Destination AE can have its own configurable maximum number of simultaneous Associations, but not more than the system-wide maximum number of simultaneous Associations will be honored.

If the first attempt to open an Association fails then the STORAGE-SCU AE will reschedule the task to attempt it again after a configurable time delay. The total number of times to attempt Association establishment is configurable, with the default being 3.

Table 4.2.2.2.2-1
Number Of Associations As A SCU For STORAGE-SCU AE

Maximum number of simultaneous Associations	25 (Configurable)

4.2.2.2.3. Asynchronous Nature

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

Table 4.2.2.2.3-1
Asynchronous Nature As A SCU For STORAGE-SCU AE

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)

4.2.2.2.4. Implementation Identifying Information

Table 4.2.2.2.4-1
DICOM Implementation Class And Version For STORAGE-SCU AE

Implementation Class UID	1.2.840.114089.1.0.0.3.3.18
Implementation Version Name	DCF 3.3.18c

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

4.2.2.3. Association Initiation Policy

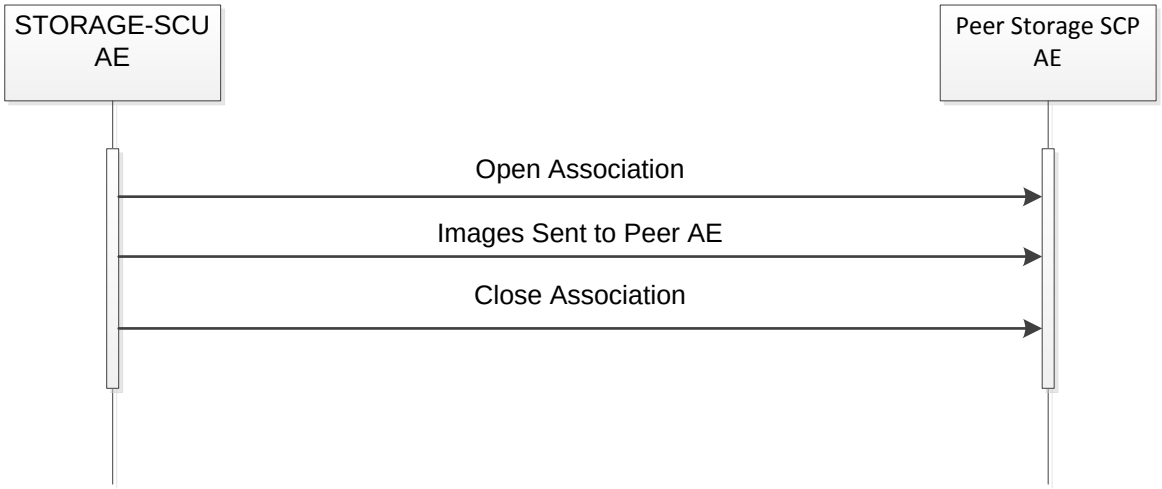
4.2.2.3.1. Activity – Send Images to an External Peer AE

- 4.2.2.3.1.1 Description and Sequencing of Activity

The STORAGE-SCU AE will initiate a new Association to transmit images. An Association Request is sent to the specified C-STORE Destination AE and upon successful negotiation of the required Presentation Context the

image transfer is started. In all cases an attempt will be made to transmit all the indicated images in a single Association, but this may not always be possible. The Association will be released when all the images have been sent. If an error occurs during transmission over an open Association then the image transfer is halted.

Figure 4.2.2.3.1.1-1
Sequencing of Activity – Send Images to an External Peer AE



The following sequencing constraints illustrated in Figure 4.2.2.3.1.1-1 apply to the STORAGE-SCU AE:

1. STORAGE-SCU AE opens a new Association with the Peer Storage SCP AE.
2. STORAGE-SCU AE sends Composite SOP Instances.
3. STORAGE-SCU AE closes the Association.

- 4.2.2.3.1.2 SOP Specific Conformance for Verification SOP Class

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

- SOP Specific Conformance for Image SOP Classes

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

The STORAGE-SCU AE will exhibit the following Behavior according to the Status Code value returned in a C-STORE Response from a destination C-STORE SCP:

Table 4.2.2.3.1.2-1
STORAGE-SCU AE C-STORE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully stored the SOP Instance. If all SOP Instances in a store job have status Success then the store job is marked as Sent.
Refused	Out of Resources	A700 – A7FF	This is treated as a failure. The store job will be requeued if it has not reached its max attempts.
Error	Data Set does not match SOP Class	A900 – A9FF	This is treated as a failure. The store job will be requeued if it has not reached its max attempts.

Service Status	Further Meaning	Error Code	Behavior
Error	Cannot Understand	C000-CFFF	This is treated as a failure. The store job will be requeued if it has not reached its max attempts.
Warning	Coercion of Data Elements	B000	Compass can configurable treat this status as success or failure. If treated as failure the store job will be requeued if it has not reached its max attempts.
Warning	Data Set does not match SOP Class	B007	Compass can configurable treat this status as success or failure. If treated as failure the store job will be requeued if it has not reached its max attempts.
Warning	Elements Discarded	B006	Compass can configurable treat this status as success or failure. If treated as failure the store job will be requeued if it has not reached its max attempts.
Warning	Attribute List Error	0107	Compass can configurable treat this status as success or failure. If treated as failure the store job will be requeued if it has not reached its max attempts.
Warning	Attribute Value Out of Range	0116	Compass can configurable treat this status as success or failure. If treated as failure the store job will be requeued if it has not reached its max attempts.
*	*	Other	This is treated as a failure. The store job will be requeued if it has not reached its max attempts.

Table 4.2.2.3.1.2-2
STORAGE-SCU AE Communication Failure Behavior

Exception	Behavior
Timeout expiry for an expected DICOM Message Response (DIMSE level timeout).	The Association is aborted using a DICOM A-ABORT and the store-job is requeued if it has not reached its max attempts.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout).	The Association is aborted using a DICOM A-ABORT and the store-job is requeued if it has not reached its max attempts.
Association A-ABORTed by the SCP or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	The store-job is requeued if it has not reached its max attempts.

4.2.2.4. Association Acceptance Policy

The STORAGE-SCU AE does not accept Associations.

4.3. Network Interfaces

4.3.1. Physical Network Interface

Compass supports any network interface that implements the TCP/IP protocol.

4.3.2. Additional Protocols

None.

4.3.3. IPv4 and IPv6 Support

This product only supports IPv4 connections.

4.4. Configuration

4.4.1. AE Title/Presentation Address Mapping

4.4.1.1. Local AE Titles

The specification of AE titles, TCP/IP addresses, and ports is configurable.

Table 4.4.1.1-1

Application Entity	Role	Default AE Title	Default TCP/IP Port
STORAGE-SCU	SCU	Compass	<None>
STORAGE-SCP	SCP	<None>	11112

The STORAGE-SCU and STORAGE-SCP Application Entities can be configured to have the same AE title. The STORAGE-SCP Application Entity does not have a Default AE Title; instead, it will accept any Called AE Title by default. It can be configured to accept only a specified AE Title.

4.4.2. Parameters

Table 4.4.2-1
STORAGE-SCP AE Configuration Parameters

Parameter	Configurable	Default Value
Maximum Send PDU Size	Yes	1048576
Maximum Receive PDU Size	Yes	1048576
Maximum number of simultaneous Associations	Yes	25
Time-out waiting on an open Association for the next Request message (C-STORE-RQ, Association Close Request, etc.) (DIMSE timeout)	Yes	Infinite
Archival time of SOP Instances that have been successfully sent to a Peer AE	Yes	72 Hours
Always open a new Association to send a Storage Commitment Push Model Notification request (N-EVENT-REPORT-RQ)	No	TRUE

Table 4.4.2-2
STORAGE-SCU AE Configuration Parameters

Parameter	Configurable	Default Value
Maximum Send PDU Size	Yes	1048576
Maximum Receive PDU Size	Yes	1048576
Maximum number of simultaneous Associations	Yes	25
STORAGE-SCU AE time-out waiting for a Response to a C-STORE-RQ. (DIMSE timeout)	Yes	Infinite

Parameter	Configurable	Default Value
Number of times a failed send job to a C-STORE Destination is automatically retried	Yes	2 retries (for a total of 3 attempts)
Amount of time to wait between retries to a C-STORE Destination	Yes	1 minute
Amount of time to wait prior to initial send attempt to a C-STORE Destination	Yes	0 minutes
Always combine SOP Instances for the same Study Instance UID received on separate Associations within a given time window into a single outbound Association	Yes	FALSE

5. Media Interchange

Compass does not support Media Interchange.

6. Support of Extended Character Sets

All Compass DICOM applications support the following:

ISO_IR 100 (ISO 8859-1:1987 Latin Alphabet No. 1 supplementary set) for routing decisions and filtering; other character sets can be stored and forwarded.

7. Security

It is assumed that Compass is used within a secured environment. It is assumed that a secured environment includes at a minimum:

a. Firewall or router protections to ensure that only approved external hosts have network access to Compass.

b. Firewall or router protections to ensure that Compass only has network access to approved external hosts and services.

c. Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g. such as a Virtual Private Network (VPN)). Alternatively, Compass can be configured to send and receive images via an encrypted mechanism such as SSL or TLS.

Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

7.1. Association Level Security

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

- Calling AE Title
- Called AE Title
- Remote IP Address
- Remote Port Number
- Application Context