Company Name: Vital Images
Product Name: VitreaView 6.11
DICOM Conformance Statement
Internal Document Number: VLC-09202 Rev A
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1 Conformance Overview

This conformance statement applies to the following Vitrea Software products:

- VitreaView

These applications support image receives across the network from other systems for 2D and 3D viewing. The SOP Classes in Table 1-1 can be received and stored, Table 1-3 defines the SOP Classes to be loaded and viewed in the 3D applications.

The applications also support the ability to query remote systems for a list of DICOM objects that may be retrieved. They also support incoming queries from remote systems for a list of DICOM objects and the ability to retrieve them from the application. CT, MR, XA and Secondary Capture images can be generated and sent to remote systems. GSPS can be generated for CT and MR images and sent to remote systems. Storage Commitment is supported when sending instances and GSPS to remote systems. Importing and creating of Media is also supported. The applications act as a Verification SOP Class SCU and SCP.

Table 1-1 Network Services

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Verification	Yes	Yes
CT Image Storage	Yes	Yes
Enhanced CT Image Storage	Yes	Yes
MR Image Storage	Yes	Yes
Enhanced MR Image Storage	Yes	Yes
Grayscale Softcopy Presentation State Storage	Yes	Yes
Color Softcopy Presentation State Storage	Yes	Yes
Segmentation Image Storage	Yes	Yes
Computed Radiography Image Storage	Yes	Yes
Digital X-Ray Image Storage – For Presentation	Yes	Yes
Digital X-Ray Image Storage – For Processing	Yes	Yes
Digital Mammography X-Ray Image Storage – For Presentation	Yes	Yes
Digital Mammography X-Ray Image Storage – For Processing	Yes	Yes
Breast Tomosynthesis Image Storage	Yes	Yes
Digital Intra-Oral X-Ray Image Storage – For Presentation	Yes	Yes
Digital Intra-Oral X-Ray Image Storage – For Processing	No	No
Ultrasound Multi-frame Image Storage (Retired)	Yes	Yes
Ultrasound Image Storage (Retired)	Yes	Yes
Ultrasound Multi-frame Image Storage	Yes	Yes
Ultrasound Image Storage	Yes	Yes
X-Ray Angiographic Image Storage	Yes	Yes
X-Ray Radio fluoroscopic Image Storage	Yes	Yes
X-Ray 3D Angiographic Image Storage	Yes	Yes
Enhanced XA Image Storage	Yes	Yes
Nuclear Medicine Image Storage	Yes	Yes
Nuclear Medicine Image Storage (Retired)	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

VL Image Storage (Retired)	Yes	Yes
VL Endoscopic Image Storage	Yes	Yes
VL Microscopic Image Storage	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	Yes	Yes
VL Photographic Image Storage	Yes	Yes
VL Multiframe Image Storage (Retired)	Yes	Yes
Photon Emission Tomography Image Storage	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
Deformable Spatial Registration	Yes	Yes
Segmentation Storage	Yes	Yes
Key Object Selection Document Storage	Yes	Yes
Encapsulated PDF Storage	Yes	Yes
Basic Text SR	Yes	Yes
Enhanced SR	Yes	Yes
Comprehensive SR	Yes	Yes
Query/Retrieve		
Study Root Q/R – FIND	Yes	Yes
Study Root Q/R – MOVE	Yes	Yes
Workflow Management		
Storage Commitment Push Model	Yes	No
Print Management		
Basic Grayscale Print Management	Yes	Yes
Basic Color Print Management	Yes	Yes

Table 1-2 Viewable SOP Classes by Product

(Abbreviations explained in section 2.6)

SOP Classes	SOP Class UID	VV
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Y
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Y
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Y
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Y
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.51.4.1.1.1.1	Y
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Y
Digital Intra-Oral X-Ray Image Storage – For Presentation	1.2.840.10008.51.4.1.1.1.3	Y
Digital Intra-Oral X-Ray Image Storage – For Processing	1.2.840.10008.51.4.1.1.1.3.1	Y
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Y
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Y
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	N
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Y
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Y
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Y
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	N
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Y
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Y

Multi-frame Grayscale Single Bit Secondary Capture Image Storage	1.2.840.10008.51.4.1.1.7.1	Y
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Y
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Y
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Y
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Y
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Y
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Y
X-Ray Radio fluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Y
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Y
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Y
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Y
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	N
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	N
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	N
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	N
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	Y
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Y
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Y
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Y

Table 1-3 DICOMWeb Services

Network Service	User of Service (User Agent)	Provider of Service (Origin Server)
WADO-RS		
Retrieve Study	Yes (VitreaView)	Yes (VioStream)
Retrieve Study Metadata	Yes (VitreaView)	No
Retrieve Frames	Yes (VitreaView)	No
Retrieve Bulk Data	Yes (VitreaView)	No
QIDO-RS		
Search For Studies	Yes (VitreaView)	No

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2 Introduction

2.1 Revision History

REVISION	EFF Date	AUTHORS	CHANGES FROM PREVIOUS REVISION
A	4-Aug-16	Jonathan Whitby	Initial Release.

2.2 Audience

This document is written for the people that need to understand how the Vitrea Software 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. Also note that this document is formatted according to the DICOM 3.0 Specification, Part 2: Conformance.

2.3 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between the Vitrea Software 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.

The Vitrea Software products participate in an industry-wide testing program sponsored by Integrating the Healthcare Enterprise (IHE). The IHE Integration Statement for Vitrea Software, together with the IHE Technical Framework, may facilitate the process of validation testing.

2.4 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.

Digital Imaging and Communications in Medicine (DICOM) - DICOM is a global Information-Technology standard used in all hospitals worldwide.

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.

Integrating the Healthcare Enterprise (IHE) - IHE is an initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information. IHE promotes the coordinated use of established standards such as DICOM and HL7 to address specific clinical need in support of optimal patient care.

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.

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.

2.5   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.

2.6 Abbreviations

AE	Application Entity
AET	Application Entity Title
CD-R	Compact Disk Recordable
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
GSPS	Grayscale Softcopy Presentation State
HIS	Hospital Information System
HL7	Health Level 7 Standard
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
JPEG	Joint Photographic Experts Group
MR	Magnetic Resonance Imaging
MSPS	Modality Scheduled Procedure Step
NM	Nuclear Medicine
PACS	Picture Archiving and Communication System
PET	Positron Emission Tomography
PDU	Protocol Data Unit
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SPS	Scheduled Procedure Step
SR	Structured Reporting
TCP/IP	Transmission Control Protocol/Internet Protocol
US	Ultrasound
VA	VitreaAdvanced (including VitreaWorkstation)
VC	VitreaCore
VES	Vitrea Enterprise Suite
VIMS	Vital Image Management System
VV	VitreaView
VL	Visible Light
VR	Value Representation
XA	X-ray Angiography

2.7 References

NEMA PS3	DICOM Standard, available free at http://medical.nema.org/
IHE	IHE, further information available at http://www.ihe.net/

3   Implementation Model

3.1   Vitrea Software Application Data Flow

Figure 3-2 Implementation Model

Local user requests query	FIND-SCU Application Entity	Remote entity returns query results
	FIND-SCP Application Entity	Remote user requests query
Local user requests retrieve	MOVE-SCU Application Entity	Remote entity receives retrieve request
Local entity receives retrieve request	MOVE-SCP Application Entity	Remote entity requests retrieve
Local user requests send or push requested objects	STORAGE-SCU Application Entity	Requested images stored to remote entity
	STORAGE-SCP Application Entity	Remote entity pushes images
Local user requests commitment	STORECOMMIT-SCU	Remote entity commits objects
Local user selects images for printing	PRINT-SCU Application Entity	Remote entity Prints sent image(s)

DICOM Standard Interface

☐ Application Entity

◯ Real-world Activity

The implementation consists of a set of applications which provide a user interface, internal database and network listeners that spawn additional threads or processes as necessary to handle incoming connections.

Conceptually the network services may be modeled as the following separate AEs, though in fact some AEs share (configurable) AE Titles:

- ECHO-SCU, which sends verification requests
- ECHO-SCP, which responds to verification requests
- FIND-SCU, which queries remote entities for lists of studies, series and instances
- FIND-SCP, which processes queries from remote entities for lists of studies, series and instances
- MOVE-SCU, which retrieves studies, series and instances from remote entities
- MOVE-SCP, which processes retrieve requests from remote entities for studies, series and instances
- STORAGE-SCU, which stores images and other composite instances to remote entities
- STORAGE-SCP, which receives images and other composite instances from remote entities
- STORECOMMIT-SCU, which sends storage commit requests to remote entities and receives storage commitment results.
- PRINT-SCU, which requests remote printer entities to print sets of images

3.2   Functional Definition of AE's

3.2.1   Functional Definition of VitreaView AE

The VitreaView Application Entity interqacts with one of the following AEs:
- VioStream AE
- VIMS AE
- 3rd party AEs

The VitreaView AE allows a user to view DICOM instances stored on one of the associated AEs.

The VitreaView AE includes support for the following DICOM AEs:

3.2.1.1   WADO-RS User Agent
WADO-RS is activated through the user interface when a user selects a study or series for retrieval. A connection to the WADO-RS Origin Server is established to retrieve the selected instances

3.2.1.2   QIDO-RS User Agent
QIDO-RS is activated through the user interface when a user selects a QIDO-RS Origin Server to query (from a pre-configured list), then initiates a query. Queries are performed at the study level. A user can further expand each result in the query, which then initiates a series level query.

3.2.2   Functional Definition of VioStream AE

The VioStream Application Entity initiates connections to a configured external DICOM Application Entity.

The VioStream AE includes support for the following DICOM AEs:

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

3.2.2.2   FIND-SCU
FIND-SCU is activated through the user interface when a user selects a remote AE to query (from a pre-configured list), then initiates a query. Queries are performed at the study level. A user can further expand each result in the query, which then initiates a series level query.

3.2.2.3 MOVE-SCU

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

3.2.2.4 STORAGE-SCP

STORAGE-SCP continuously runs in the background, waiting for connections and will accept associations with Presentation Contexts for SOP Classes of the Storage Service Class and the Verification Service Class. It will store the received instances to the local database, complete preprocessing, and store the data to the Vital File Share, after which they are listed and viewed through the user interface. A configuration option for receiving only from known IPs is available; by default all incoming connections are accepted

3.2.2.5 WADO-RS Origin Server

WADO-RS origin server continuously runs in the background waiting for connections and will accept associations requesting Study resources using the DICOM Part 10 media type.

3.2.3 Functional Definition of VIMS AE

The Vital Image Management System Application Entity waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the Storage Server AE expects it to be a DICOM application.

The VIMS AE includes support supports the following DICOM AEs:

3.2.3.1 ECHO-SCP

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

3.2.3.2 ECHO-SCU

ECHO-SCU is activated through the user interface when a user requests an echo to a remote AE. An echo is performed to that remote AE, verifying basic DICOM connectivity and displaying results.

3.2.3.3 FIND-SCU

FIND-SCU is activated through the user interface when a user selects a remote AE to query (from a pre-configured list), then initiates a query. Queries are performed at the study level. A user can further expand each result in the query, which then initiates a series level query.

3.2.3.4 FIND-SCP

FIND-SCP continuously runs in the background, waiting for connections, and will accept associations from known IPs with Presentation Contexts for Study Root Query/Retrieve Model Service Class. It will query the permanent database based on the tags specified in the query, and send the appropriate responses to the requesting entity. A limit of 500 matching responses is currently imposed on the service. A configuration option for receiving from all IPs is available; by default only configured incoming connections are accepted.

3.2.3.5 MOVE-SCU

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

3.2.3.6 MOVE-SCP

MOVE-SCP continuously runs in the background, waiting for connections, and will accept associations with Presentation Contexts for Study Root Query/Retrieve Model Service Class. It will query the local database for instances matching the tags specified, and send the instances to the requested remote entity via the STORAGE-SCU.

3.2.3.7   STORAGE-SCU

STORAGE-SCU is activated through the user interface when a user selects instances from the permanent database, or the currently displayed instance, and requests that they be sent to a remote AE (selected from a pre-configured list).

3.2.3.8   STORAGE-SCP

STORAGE-SCP continuously runs in the background, waiting for connections and will accept associations with Presentation Contexts for SOP Classes of the Storage Service Class and the Verification Service Class. It will store the received instances to the local database, complete preprocessing, and store the data to the Vital File Share, after which they are listed and viewed through the user interface. A configuration option for receiving only from known IPs is available; by default all incoming connections are accepted.

3.2.3.9   STORECOMMIT-SCU

STORECOMMIT-SCU is activated automatically when the STORAGE-SCU has sent instances to a remote AE, and there is a STORECOMMIT-SCP configured for that entity. It requests the stored instances to be committed, then waits in the background for connections for the results of the commitment.

3.2.3.10   PRINT-SCU

PRINT-SCU is activated through the user interface when a user selects the currently displayed instance, and requests that it be printed by a remote AE (selected from a pre-configured list).

3.3 Sequencing of Real-World Activities

3.3.1 Proprietary data creation

Vitrea Software clients support the creation of proprietary data which is used internally for 3D viewing. Upon receive of data, the VIMS nodes will run pre-processing and post-processing steps.

To determine if the received data can be viewed in 3D it must pass a set of internal rules, and if so, a volumetric representation of the data will be generated. The rules that determine a volume are configurable. See the Users Guild for further information on configuration.

In addition to the generated volume, there are compressed instances created for each of the received instances. These compressed *thumbnail* versions of the original instances are used for worklist viewing within the client application.

Figure 3-3 Receive of data for processing
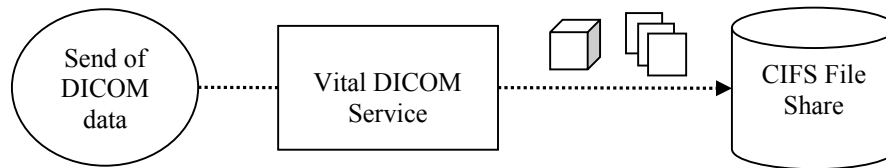
The received data is stored locally on the node and then transferred to the Vital File Share after the proprietary data has been created. When the data is available for 3D viewing the creation of Secondary Capture instances is provided. These *snapshot* instances are generated to the Vital File Share and can be sent through STORAGE-SCU. The application also provides the ability to generate related snapshots, referred to as *batches*. Both the snapshots and batches are encoded with Private Tags listed in the Private Attribute Data Dictionary section; see this section for further detail.

3.3.2 Data Deletion

After the data has been received and transferred to the Vital File Share it can be removed from the system. This can be done through the internal monitoring service which removes reviewed or old data based on configurable settings or it can be done manually upon request. See the Users Guide for further information on configuration.

3.3.3 DICOM Validation

3.3.3.1 Invalid Dicom Values

Within the system there is validation for DICOM tags. Any tags of type 1 (including all UIDs) which are missing, empty, or longer than the defined Standard value will be rejected at the time of SCP receive. These tags have been identified as possible patient hazards if incorrectly populated, therefore they will not be allowed into the system. Users should reconcile the non-conformant data if it is to be processed by the system.

3.3.3.2 Demographic Updates

SCP receives instances which may have changed demographic data. The new instances received replace the previously received specific instances. Demographic information in the system is updated to match the latest received instances and necessary volumes are regenerated.
New values for the following DICOM attributes can trigger a demographic update:

    PATIENT
- (0010,0010) Patient's Name
- (0010,0020) Patient ID
- (0010,0030) Patient's Birth Date
- (0010,0032) Patient's Birth Time

- (0010,0040) Patient's Sex
- (0010,1000) Other Patient IDs
- (0010,1001) Other Patient Names
- (0010,1010) Patient's Age
- (0010,1020) Patient's Size
- (0010,1030) Patient's Weight
- (0010,2160) Ethnic Group
- (0010,2180) Occupation
- (0010,21B0) Additional Patient History
- (0010,4000) Patient Comments

STUDY
- (0008,0020) Study Date
- (0008,0030) Study Time
- (0008,0050) Accession Number
- (0008,0090) Referring Physician's Name
- (0008,1060) Name of Physician(s) Reading Study
- (0008,1080) Admitting Diagnoses Description
- (0008,1030) Study Description
- (0020,0010) Study ID
- *(0020,1070) Other Study Numbers (RET)*

SERIES
- (0008,0021) Series Date
- (0008,0031) Series Time
- (0008,0060) Modality
- (0008,0070) Manufacturer
- (0008,0080) Institution Name
- (0008,103E) Series Description
- (0008,1090) Manufacturer's Model Name
- (0018,0015) Body Part Examined
- (0018,0022) Scan Options
- (0018,1030) Protocol Name
- (0020,0011) Series Number

3.3.3.3   Duplicate Unique IDs

Data with duplicate Unique IDs are in violation of the DICOM standard. However this kind of data is sometimes created in a healthcare enterprise as a workaround for certain workflows. The system has different levels of support depending on which UIDs are duplicated.

- Data with same (duplicate) StudyInstanceUID but with unique Series and/or InstanceUIDs is received and stored in the system.
- Data with same (duplicate) SeriesInsanceUID but in different Studies is received by the system but is not stored in the database. They need to be administratively cleaned out.
- Data with same (duplicate) SOPInstanceUID but in different Series is received and stored in the system.

4   AE Specifications

4.1   VitreaView AE

4.1.1   VitreaView AE SOP Classes

The VitreaView AE provides access to the following SOP Class(es): Table 1-2 Viewable SOP Classes by Product.

4.1.2   SOP Specific Conformance

This section describes any limitations to ViewView's ability to display standard SOP Classes.

The following modules are not supported:
- Overlay Plane

It is not possible to fully display instances containing these modules.

When displaying an image, a Grayscale Softcopy Presentation State or Color Softcopy Presentation State containing references to the image will be automatically applied in the following priority order:
1. A Presentation State referenced by the newest Key Object Selection instance referencing the image
2. The newest Grayscale Softcopy Presentation State or Color Softcopy Presentation State containing references to the image

The VitreaView user has the option to select any other Presentation States that also references the image. If no Presentation State references the image then no Presentation State will be applied by default.

The following Grayscale Softcopy Presentation State / Color Softcopy Presentation State modules are not supported by VitreaView:
- Presentation State Shutter
- Presentation State Mask
- Mask
- Display Shutter
- Bitmap Display Shutter
- Graphic Group
- Softcopy Presentation LUT

It is not possible to fully display Presentation States containing these modules.

The following Grayscale Softcopy Presentation State / Color Softcopy Presentation State attributes are supported by VitreaView with some limitations:
- Presentation Size Mode (0070,0100): restricted to "SCALE TO FIT" and "MAGNIFY"
- Presentation Pixel Aspect Ratio (0070,0102): restricted to "1\1"
- Fill Mode (0070,0257): restricted to "SOLID"

It is not possible to fully display Presentation States containing other values for these attributes.

All of the Image Storage SOP Classes listed in Table 1-3 as viewable by VitreaView are supported as references from instances of the Grayscale Softcopy Presentation State Storage SOP Class or of the Color Softcopy Presentation State.

4.2   ECHO-SCP

4.2.1   SOP Classes

ECHO-SCP provides Standard Conformance to the following SOP Class(es):

Table 4-1 SOP Classes Supported by ECHO-SCP

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes

4.2.2   Association Policies

4.2.2.1   General

ECHO-SCP accepts but never initiates associations.

Table 4-2 Maximum PDU size received as a SCP for ECHO-SCP

Maximum PDU size received	Unlimited

4.2.2.2   Number of Associations

Table 4-3 Number of Associations as a SCP for ECHO-SCP

Number of Associations	Unlimited

4.2.2.3   Asynchronous Nature

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

4.2.2.4   Implementation Identifying Information

Table 4-4 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

4.2.3   Association Acceptance Policy

4.2.3.1   Activity – Handle Verification Request

4.2.3.1.1   Description and Sequencing of Activities

When ECHO-SCP accepts an association, it will respond to echo requests. If the Called AE Title does not match the pre-configured AE Title of the application, the association will be rejected.

Figure 4.1 Sequencing of Activity – Handling Verification Request
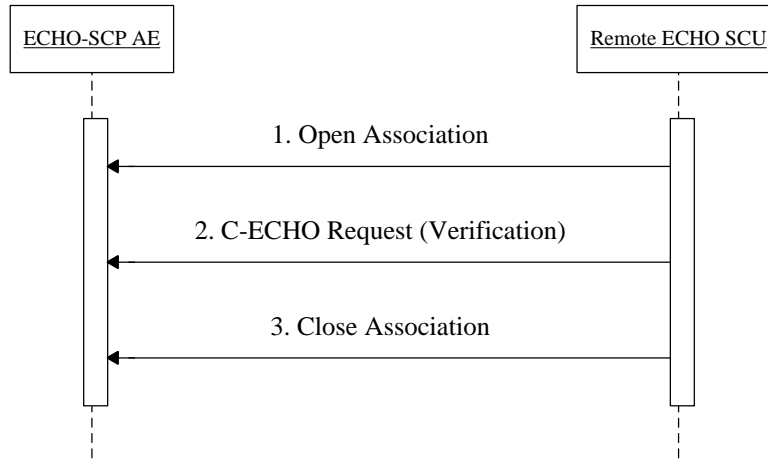
4.2.3.1.2   Accepted Presentation Contexts

Table 4-5 Accepted Presentation Contexts for ECHO-SCP

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

4.2.3.1.3   Extended Negotiation
No extended negotiation is performed.

4.2.3.1.4   SOP Specific Conformance
4.2.3.1.4.1   SOP Specific Conformance Verification SOP Class
ECHO-SCP provides standard conformance to the Verification Service Class.

4.2.3.1.4.2   Presentation Context Acceptance Criterion
ECHO-SCP will only accept a Presentation Context compatible with the one listed in DICOM PS3.2 Table D.4.2-5.

4.2.3.1.4.3   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.
4.2.3.1.4.4   Response Status
STORAGE-SCP will behave as described in the Table below when generating the C-STORE response command message.

Table 4-6 Response Status for STORAGE-SCP and Receive Storage Request

Service Status	Further Meaning	Status Codes	Reason

Refused	Out of Resources	A7xx	Association limit reached, local disk space low
Error	Data Set does not match SOP Class	A9xx	Never sent – data set is not checked prior to storage
	Cannot understand	Cxxx	Internal processing error
Warning	Coercion of Data Elements	B000	Never sent - no coercion is ever performed
	Data Set does not match SOP Class	B007	Never sent - data set is not checked prior to storage
	Elements Discarded	B006	Never sent – all elements are always stored
Success		0000	

4.3   ECHO-SCU

4.3.1   SOP Classes

ECHO- SCU provides Standard Conformance to the following SOP Class(es):

Table 4-7 SOP Classes Supported by ECHO-SCU

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	No

4.3.2   Association Policies

4.3.2.1   General

ECHO-SCU initiates associations through a user interface.

Table 4-8 Maximum PDU size received as a SCP for ECHO-SCU

Maximum PDU size received	Unlimited, default is 16384

4.3.2.2   Number of Associations

Table 4-9 Number of Associations as a SCP for ECHO-SCU

Number of Associations	1

4.3.2.3   Asynchronous Nature

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

4.3.2.4   Implementation Identifying Information

Table 4-10 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

4.3.3   Association Initiation Policy

4.3.3.1   Activity – Sending Verification Request
4.3.3.1.1   Description and Sequencing of Activities

ECHO-SCU attempts to initiate a new association when the user requests an Echo from the user interface to a single remote AE. A single attempt will be made to verify the remote AE. If the verification fails, for whatever reason, no retry will be performed. The results will be displayed.

Figure 4.2 Sequencing of Activity – Sending Verification Request
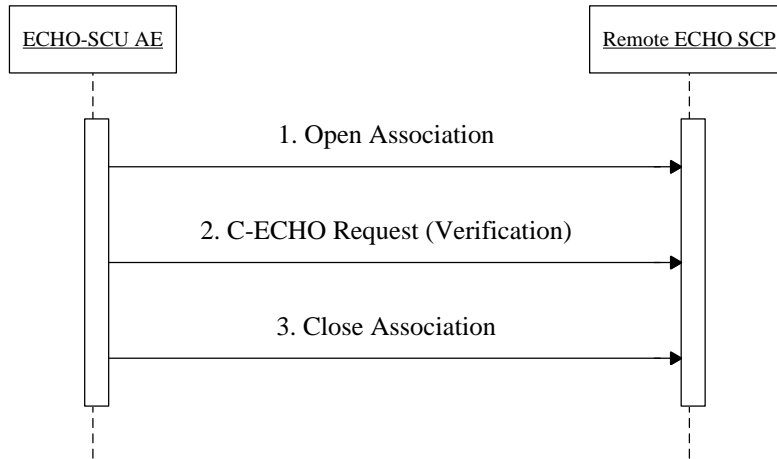
4.3.3.1.2   Proposed Presentation Contexts

Table 4-11 Accepted Presentation Contexts for ECHO-SCU

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

4.3.3.1.3   Extended Negotiation
No extended negotiation is performed.

4.3.3.1.4   SOP Specific Conformance
4.3.3.1.4.1   SOP Specific Conformance to Verification SOP Classes
ECHO-SCU provides standard conformance to the Verification Service Class.

4.3.3.1.4.2   Presentation Context Acceptance Criterion
ECHO-SCU does not accept associations.

4.3.3.1.4.3   Transfer Syntax Selection Policies
ECHO-SCU prefers Explicit VR Little Endian Transfer Syntax, which is always first in the proposed Presentation Context.
4.3.3.1.4.4   Response Status
STORAGE-SCU will behave as described in the Table below when generating the C-STORE response command message.

Table 4-12 Response Status for STORAGE-SCU and Request Storage

Service Status	Further Meaning	Status Codes	Reason
Refused	Out of Resources	A7xx	Job set to Failed state
Error	Data Set does not match SOP Class	A9xx	Job set to Failed state

	Cannot understand	Cxxx	Job set to Failed state
Warning	Coercion of Data Elements	B000	Job set to Complete state
	Data Set does not match SOP Class	B007	Job set to Failed state
	Elements Discarded	B006	Job set to Complete state
Success		0000	Job set to Complete state

4.4 FIND-SCU

4.4.1 SOP Classes

FIND-SCU provides Standard Conformance to the following SOP Class(es):

Table 4-13 SOP Classes Supported by FIND-SCU

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

4.4.2 Association Policies

4.4.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 4-14 DICOM Application Context for FIND-SCU

Application Context Name	1.2.840.10008.3.1.1.1

Table 4-15 Maximum PDU Size Sent for FIND-SCU

Maximum PDU size sent	Unlimited, default is 65536

4.4.2.2 Number of Associations

Table 4-16 Number of Associations for FIND-SCU

Maximum number of simultaneous associations	1

4.4.2.3 Asynchronous Nature

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

4.4.2.4 Implementation Identifying Information

Table 4-17 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

4.4.3 Association Initiation Policy

FIND-SCU attempts to initiate a new association when the user initiates a 3D session from a PACS and the study is not available on the server or in response to a user action.

4.4.3.1 Activity – Query Remote AE
4.4.3.1.1 Description and Sequencing of Activities

A single attempt will be made to query the remote AE. If the query fails, for whatever reason, no retry will be performed and the user is visually notified of the failure.

Figure 4.3 Sequencing of Activity – Query Remote AE
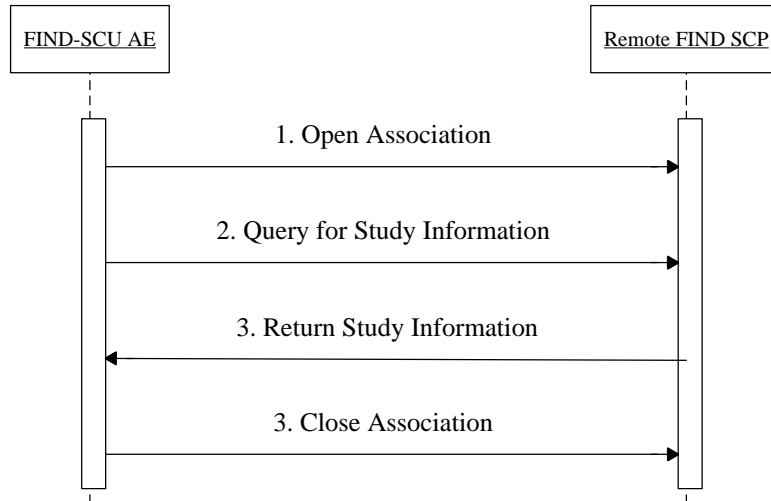
4.4.3.1.2   Proposed Presentation Contexts

Table 4-18 Proposed Presentation Contexts for FIND-SCU and Query Remote AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name**	**UID**		**Negotiation**
See Table 4-13 SOP Classes Supported by FIND-SCU	See Table 4-13	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	Fuzzy Semantic Matching (optional)
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	Fuzzy Semantic Matching (optional)
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	Fuzzy Semantic Matching (optional)

FIND-SCU will propose a single Presentation Context, specified in the above table.

4.4.3.1.3   Extended Negotiation
If configured, Fuzzy Semantic Matching will be requested. Relational queries are not supported.

4.4.3.1.4   SOP Specific Conformance
4.4.3.1.4.1   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. Queries are initiated at the STUDY and SERIES levels, according to the request generated by the user interface. CANCEL requests are issued when the total number of matches exceeds the

configurable limit, to avoid overflow of data, where the default limit is 100 matches. Unexpected attributes returned in a C-FIND response (those not requested) are ignored. Requested return attributes not returned by the SCP will not cause a failure and will be interpreted as empty values, this will be logged for further information. 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 worklist. Duplicate responses will replace existing entries in the display.

Table 4-19 Study Root Request Identifier for FIND-SCU

Name	Tag	Types of Matching
STUDY Level		
Study Date	(0008,0020)	*,U,R
Study Time	(0008,0030)	*,U,R
Accession Number	(0008,0050)	S,*,U
Modalities In Study	(0008,0061)	S,U
Referring Physician's Name	(0008,0090)	U
Study Description	(0008,1030)	U
Patient's Name	(0010,0010)	S,*,U
Patient's ID	(0010,0020)	S,*,U
Study Instance UID	(0020,000D)	UNIQUE
Study ID	(0020,0010)	U
Number of Study Related Instances	(0020,1208)	U
SERIES Level		
Series Date	(0008,0021)	U
Series Time	(0008,0031)	U
Modality	(0008,0060)	U
Series Description	(0008,103E)	U
Protocol	(0018,1030)	U
Series Instance UID	(0020,000E)	UNIQUE
Series Number	(0020,0011)	U
Number of Series Related Instances	(0020,1209)	U

Types of Matching:
S   Indicates the identifier attribute uses Single Value Matching
R   Indicates Range Matching
*   Indicates wildcard matching
U   Indicates Universal Matching
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.

4.4.3.1.4.2   Presentation Context Acceptance Criterion
FIND-SCU does not accept associations.

4.4.3.1.4.3   Transfer Syntax Selection Policies
FIND-SCU uses only Implicit Little Endian Transfer Syntax.

4.4.3.1.4.4   Response Status
FIND-SCU will behave as described in DICOM PS 3.2 Table D.4.2-24 in response to the status returned in the C-FIND response command message(s).

Table 4-20 Response Status for FIND-SCU and Query Remote AE Request

Service Status	Further Meaning	Status Codes	Behavior
Refused	Out of Resources	A700	Current query is terminated; remaining queries continue
Error	Identifier does not match SOP Class	A900	Current query is terminated; remaining queries continue
	Unable to process	Cxxx	Current query is terminated; remaining queries continue
Cancel	Matching terminated due to Cancel request	FE00	Current query is terminated; remaining queries continue
Success	Matching is complete - No final Identifier is supplied	0000	Query is successful
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier used to populate worklist
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	FF01	Returned values not overridden

4.4.4   Association Acceptance Policy

FIND-SCU does not accept associations.

4.5 FIND-SCP

4.5.1 SOP Classes

FIND-SCP provides Standard Conformance to the following SOP Class(es):

Table 4-21 SOP Classes Supported by FIND-SCP

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

4.5.2 Association Policies
4.5.2.1 General
FIND-SCP initiates but never accepts associations.

Table 4-22 Maximum PDU Size Received for FIND-SCP

Maximum PDU size received	Unlimited

4.5.2.2 Number of Associations

Table 4-23 Number of Associations for FIND-SCP

Maximum number of simultaneous associations	Unlimited

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

4.5.2.4 Implementation Identifying Information

Table 4-24 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

4.5.3 Association Negotiation Policy

FIND-SCP does not initiate associations.

4.5.4 Association Acceptance Policy

Incoming connections must be defined from a pre-configured list of known IPs, only these connections will be accepted by default. A configuration option for receiving from all IPs is available. When FIND-SCP accepts an association, it will process query requests. If the Called AE Title does not match the pre-configured AE Title for the FIND-SCP, the association will be rejected.

4.5.4.1 Activity – Receive Query Request
4.5.4.1.1 Description and Sequencing of Activities
All queries are matched against records in the database.

Figure 4.4 Sequencing of Activity – Receive Query Request
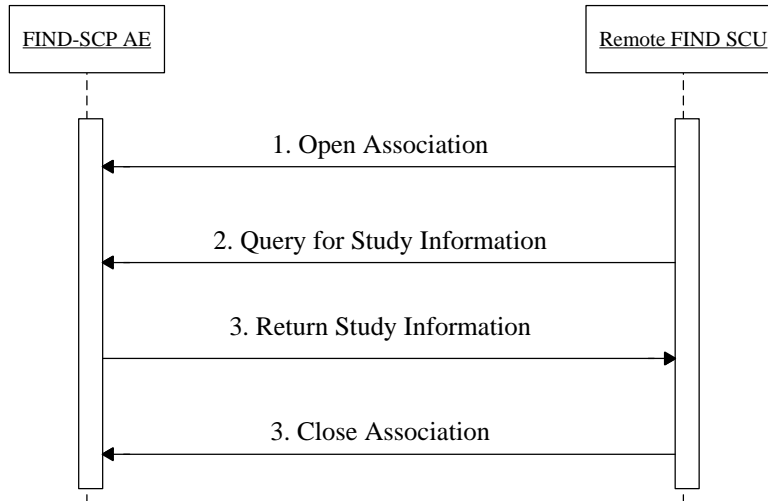
4.5.4.1.2 Accepted Presentation Contexts

Table 4-25 Accepted 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 4-21	See Table 4-21	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

FIND-SCP will accept a single Presentation Context, specified in the above table.

4.5.4.1.2.1 Extended Negotiation
No extended negotiation is performed. In particular, relational queries are not supported.

4.5.4.1.3 SOP Specific Conformance
4.5.4.1.3.1 SOP Specific Conformance to C-FIND SOP Classes
FIND-SCP provides standard conformance to the supported C-FIND SOP Classes. Only a single information model, Study Root, is supported. Queries may be initiated at the STUDY, SERIES or IMAGE levels. Required data conforms to the IHE recommended type matching.

CANCEL requests may be issued at any time, which will terminate the current query.

A hierarchical model will be followed for data matches. The Identifier shall contain all of the Unique Keys at higher levels and all of the values of the Attributes which were passed in on the C-FIND request. Unsupported attributes requested in a C-FIND request are ignored.

All data matching the passed in criteria at the specified level will be returned on the C-FIND response up to a five hundred response limit. Once the responses have reached the limit a successful response will be sent.

Table 4-26 Study Root Request Identifier for FIND-SCP

Name	Tag	Types of Matching
STUDY Level		
Study Date	(0008,0020)	S,*,U,R
Study Time	(0008,0030)	S,*,U,R
Accession Number	(0008,0050)	S,*,U
Modalities In Study	(0008,0061)	S,*,U
Referring Physician's Name	(0008,0090)	S,*,U
Study Description	(0008,1030)	S,*,U
Patient's Name	(0010,0010)	S,*,U
Patient's ID	(0010,0020)	S,*,U
Study Instance UID	(0020,000D)	UNIQUE
Study ID	(0020,0010)	S,*,U
Number of Study Related Instances	(0020,1208)	U
Number of Study Related Series	(0020,1206)	U
Patient's Birth Date	(0010,0030)	S,U,R
Patient's Sex	(0010,0040)	S,U
SERIES Level		
Series Date	(0008,0021)	S,*,U,R
Series Time	(0008,0031)	S,*,U,R
Modality	(0008,0060)	S,*,U
Series Description	(0008,103E)	S,*,U
Protocol	(0018,1030)	S,*,U
Series Instance UID	(0020,000E)	UNIQUE
Series Number	(0020,0011)	S,*,U
Number of Series Related Instances	(0020,1209)	U
IMAGE Level		
SOP Class UID	(0008,0016)	S,*,U
SOP Instance UID	(0008,0018)	UNIQUE
Instance Number	(0020,0013)	S,*,U
Rows	(0028,0010)	U
Columns	(0028,0011)	U
Bits Allocated	(0028,0100)	U
Number of Frames	(0028,0008)	U

Types of Matching:
S   Indicates the identifier attribute uses Single Value Matching
R   Indicates Range Matching
*   Indicates wildcard matching
U   Indicates Universal Matching
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.

4.5.4.1.3.2   Presentation Context Acceptance Criterion
FIND-SCP accepts only a single presentation context.

4.5.4.1.3.3   Transfer Syntax Selection Policies
FIND-SCP uses only Implicit Little Endian Transfer Syntax.

4.5.4.1.3.4   Response Status

FIND-SCP will behave as described in DICOM PS 3.2 Table D.4.2-24 in response to the status returned in the C-FIND response command message(s).

Table 4-27 Response Status for FIND-SCP and Receive Query Request

Service Status	Further Meaning	Status Codes	Behavior
Refused	Out of Resources	A700	Association limit reached
Error	Identifier does not match SOP Class	A900	Query keys are not valid
	Unable to process	Cxxx	Internal processing error
Cancel	Matching terminated due to Cancel request	FE00	Current query is terminated; remaining queries continue
Success	Matching is complete - No final Identifier is supplied	0000	Current query is finished; remaining queries continue
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	All query attributes are supported, matches continuing
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	FF01	One or more query attributes are not supported, matches continuing

4.6 MOVE-SCU

4.6.1 SOP Classes

MOVE-SCU provides Standard Conformance to the following SOP Class(es):

Table 4-28 SOP Classes Supported by MOVE-SCU

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

4.6.2 Association Policies
4.6.2.1 General
The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 4-29 DICOM Application Context for MOVE-SCU

Application Context Name	1.2.840.10008.3.1.1.1

Table 4-30 Maximum PDU Size Sent for MOVE-SCU

Maximum PDU size Sent	Unlimited, default of 65536

4.6.2.2 Number of Associations

Table 4-31 Number of Associations for MOVE-SCU

Maximum number of simultaneous associations	Configurable

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

4.6.2.4 Implementation Identifying Information
Table 4-32 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

4.6.3 Association Initiation Policy

MOVE-SCU attempts to initiate a new association when the user initiates a 3D session from the PACS and the study is not found on the vital server.

4.6.3.1 Activity – Retrieve from Remote AE
4.6.3.1.1 Description and Sequencing of Activities
For the entity (study or series) selected from the user interface to be retrieved, an attempt will be made to retrieve it from the selected remote AE. If the retrieve fails, for whatever reason, it will be retried every minute up to 3 times. This number of retries is configurable through the configuration tool.

Figure 4.5 Sequencing of Activity – Retrieve from Remote AE
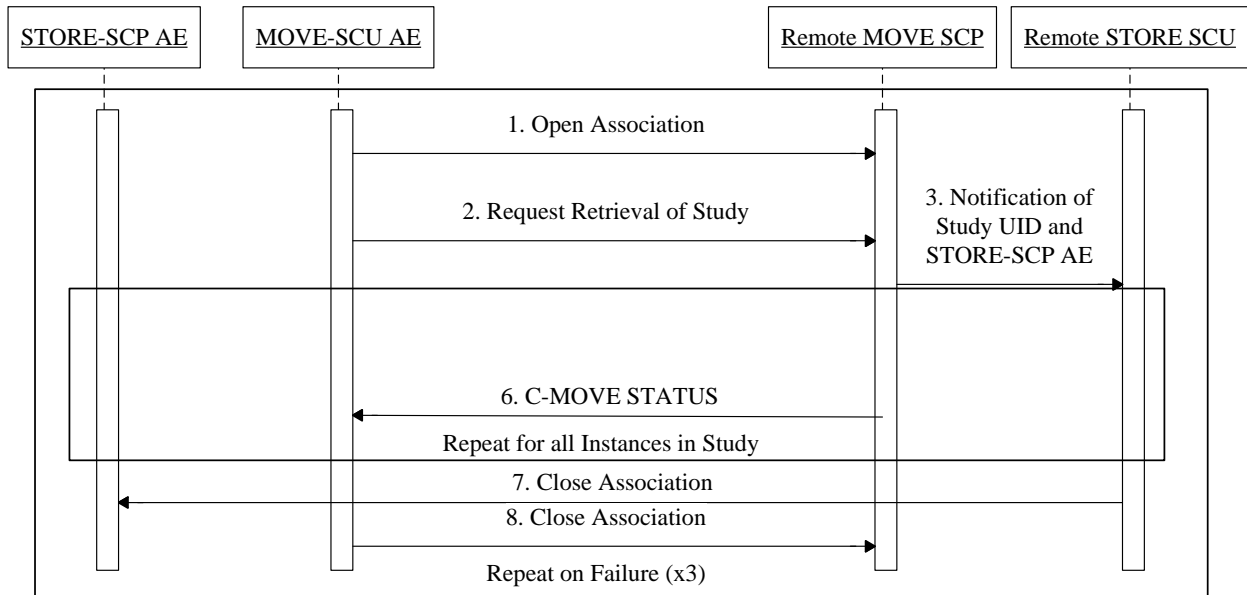
4.6.3.1.2 Proposed Presentation Contexts

Table 4-33 Proposed Presentation Contexts for MOVE-SCU and Retrieve from Remote AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name	UID		Negotiation
See Table 4-28	See Table 4-28	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

MOVE-SCU will propose a single Presentation Context.

4.6.3.1.2.1 Extended Negotiation
No extended negotiation is performed. In particular, relational retrievals are not supported.

4.6.3.1.3 SOP Specific Conformance
4.6.3.1.3.1 SOP Specific Conformance to C-MOVE SOP Classes
MOVE-SCU provides standard conformance to the supported C-MOVE SOP Classes. Only a single information model, Study Root, is supported. Retrieval will be performed at the STUDY or SERIES level depending on what level of entity has been selected by the user in the browser. No CANCEL requests are ever issued.

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

Table 4-34 Study Root Request Identifier for MOVE-SCU

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

4.6.3.1.3.2   Presentation Context Acceptance Criterion

MOVE-SCU does not accept associations.

4.6.3.1.3.3   Transfer Syntax Selection Policies

MOVE-SCU uses only Implicit Little Endian Transfer Syntax.

4.6.3.1.3.4   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 4-35 Response Status for MOVE-SCU and Retrieve from Remote AE Request

Service Status	Further Meaning	Status Codes	Related Fields	Behavior
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)	Retrieval is terminated; Retries will occur
	Out of Resources - Unable to perform sub-operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is terminated; Retries will occur
	Move Destination unknown	A801	(0000,0902)	Retrieval is terminated; Retries will occur
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)	Retrieval is terminated; Retries will occur
	Unable to process	Cxxx	(0000,0901) (0000,0902)	Retrieval is terminated; Retries will occur
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is terminated; Retries will occur
Warning	Sub-operations Complete - One or more Failures	B000	(0000,1020) (0000,1022) (0000,1023)	Retrieval is terminated; Retry will occur
Success	Sub-operations Complete - No Failures	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Success of the retrieve
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval continues

4.6.3.1.3.5   Sub-operation dependent behavior

Since the C-MOVE operation is dependent on completion of C-STORE sub-operations that are occurring on a separate association, the question of failure of operations on the other association(s) must be considered. 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 successfully retrievals are made available in the local database to the user is purely dependent on the success or failure of the C-STORE sub-operations, not on any explicit action by MOVE-SCU. If there are any failures that are recoverable, the retrieve will be retried up to a configurable limit, where the default is 3 times on a one minute interval.

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

4.6.4   Association Acceptance Policy

MOVE-SCU does not accept associations.

4.7 MOVE-SCP

4.7.1 SOP Classes

MOVE-SCP provides Standard Conformance to the following SOP Class(es):

Table 4-36 SOP Classes Supported by MOVE-SCP

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

4.7.2 Association Policies
4.7.2.1 General
MOVE-SCP accepts but never initiates associations.

Table 4-37 Maximum PDU Size Received for MOVE-SCP

Maximum PDU size received	Unlimited

4.7.2.2 Number of Associations

Table 4-38 Number of Associations for MOVE-SCP

Maximum number of simultaneous associations	Unlimited

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

4.7.2.4 Implementation Identifying Information

Table 4-39 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

4.7.3 Association Initiation Policy

MOVE-SCP does not initiate associations.

4.7.4 Association Acceptance Policy

When MOVE-SCP accepts an association, it will respond to retrieve requests. If the Called AE Title does not match the pre-configured AE Title for the RETRIEVE-SCP, the association will be rejected.

4.7.4.1 Activity – Retrieve Request from Remote AE
4.7.4.1.1 Description and Sequencing of Activities
When retrieve requests are received, the attributes specified in the request are used to query the database. The instances that match are sent as sub-operations by the STORAGE-SCU to the requested destination.

Figure 4.6 Sequencing of Activity – Retrieve Request from Remote AE
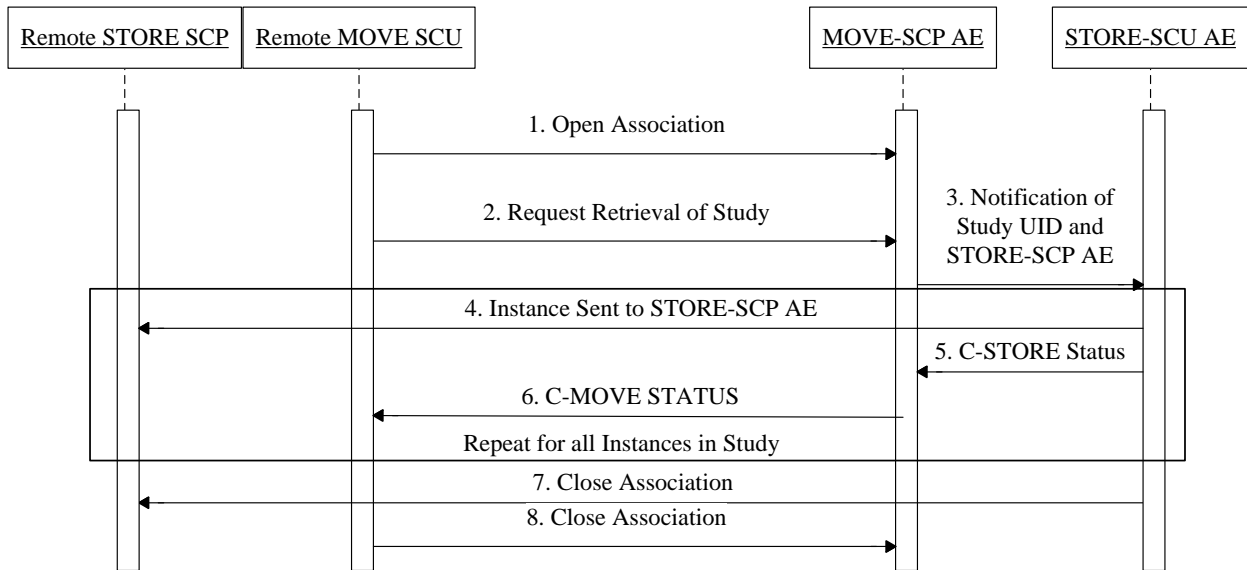
4.7.4.1.2   Accepted Presentation Contexts

Table 4-40 Accepted Presentation Contexts for MOVE-SCP and Retrieve Request from Remote AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name**	**UID**		**Negotiation**
See Table 4-36	See Table 4-36	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

MOVE-SCP will accept a single Presentation Context.

4.7.4.1.2.1   Extended Negotiation
No extended negotiation is performed. In particular, relational retrievals are not supported.

4.7.4.1.3   SOP Specific Conformance
4.7.4.1.3.1   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. Retrieval may be performed at the STUDY, SERIES or IMAGE level depending on what level of entity has been requested.

CANCEL requests may be issued at any time, which will terminate the current retrieve.

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

Table 4-41 Study Root Request Identifier for MOVE-SCP

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

4.7.4.1.3.2   Presentation Context Acceptance Criterion
MOVE-SCP accepts only a single Presentation Context.

4.7.4.1.3.3   Transfer Syntax Selection Policies
MOVE-SCP accepts only Implicit Little Endian Transfer Syntax.

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

Table 4-42 Response Status for MOVE-SCP and Retrieve Request from Remote AE

Service Status	Further Meaning	Status Codes	Related Fields	Behavior
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)	Association limit reach; Retrieval is terminated;
	Out of Resources - Unable to perform sub-operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Never used in a response
	Move Destination unknown	A801	(0000,0902)	Retrieval is terminated
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)	Retrieval is terminated
	Unable to process	Cxxx	(0000,0901) (0000,0902)	Retrieval is terminated
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is terminated
Warning	Sub-operations Complete - One or more Failures	B000	(0000,1020) (0000,1022) (0000,1023)	Retrieval is terminated
Success	Sub-operations Complete - No Failures	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is finished
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval continues

4.7.4.1.3.5   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 by the STORAGE-SCU, the question of failure of operations on the other association(s) must be considered. 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 locally stored. If the association on which the C-MOVE was issued is aborted for any reason, the C-STORE sub-operations are halted. Failures are automatically retried based on the STORAGE-SCU configuration for each of the destinations specified in the C-MOVE request.

4.8 STORAGE-SCU

4.8.1 SOP Classes

STORAGE-SCU provide Standard Conformance to the following SOP Class(es): Table 1-1 Network Services

4.8.2 Association Policies

4.8.2.1 General

STORAGE-SCU initiates, but never accepts associations.

Table 4-43 Maximum PDU Size Sent for STORAGE-SCU

Maximum PDU size sent	Unlimited, default is 16384

4.8.2.2 Number of Associations

Table 4-44 Number of Associations for STORAGE-SCU

Maximum number of simultaneous associations	1

4.8.2.3 Asynchronous Nature

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

4.8.2.4 Implementation Identifying Information

Table 4-45 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

4.8.3 Association Initiation Policy

STORAGE-SCU initiates a new association when the user performs an export action from the user interface.

4.8.3.1 Activity – Request Storage
4.8.3.1.1 Description and Sequencing of Activities

A user can select images and request them to be sent to a pre-configured destination. Each request is forwarded to the job queue and processed individually.

STORAGE-SCU is invoked by the job control interface that is responsible for processing export tasks. The job consists of data describing the instances to be stored and the destination. An internal daemon process triggered by a job for a specific network destination initiates a C-STORE request to store images. If the process successfully establishes an Association to a remote Application Entity, it will transfer each marked instance one after another via the open Association. Status of the transfer is reported through the job control interface. Only one job will be active at a time. If the C-STORE Response from the remote Application contains a status other than Success or Warning, the Association is aborted and the related Job is switched to a retry state. It will be retried automatically up to 5 times.

The Storage AE attempts to initiate a new Association in order to issue a C-STORE request. If the job contains multiple images then multiple C-STORE requests will be issued over the same Association.

Figure 4.7 Sequencing of Activity –Request Storage
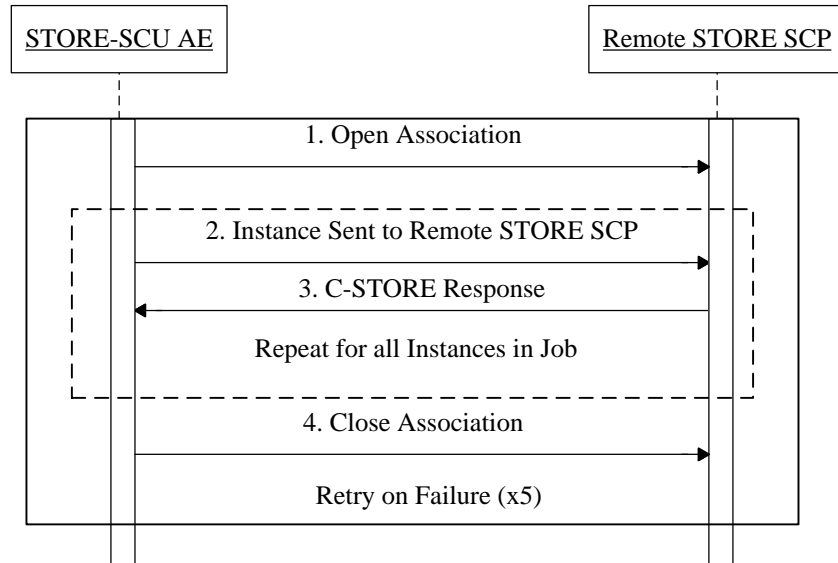
4.8.3.1.2   Accepted Presentation Contexts

Table 4-46 Proposed Presentation Contexts for STORAGE-SCU and Request Storage

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name**	**UID**		**Negotiation**
See Table 1-1	See Table 1-1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	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	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 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 Spectral Selection, Non-Hierarchical (Process 6 & 8) (*Retired*)	1.2.840.10008.1.2.4.53	SCU	None
		JPEG Full Progression, Non-Hierarchical (Process 10 & 12) (*Retired*)	1.2.840.10008.1.2.4.55	SCU	None
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	SCU	None
		RLE Lossless	1.2.840.10008.1.2.5	SCU	None

4.8.3.1.2.1   Extended Negotiation
No extended negotiation is performed, though STORAGE-SCU.

4.8.3.1.3   SOP Specific Conformance
4.8.3.1.3.1   SOP Specific Conformance to Storage SOP Classes
STORAGE-SCU provides standard conformance to the Storage Service Class.

4.8.3.1.3.2   Presentation Context Acceptance Criterion
STORAGE-SCU does not accept associations.

4.8.3.1.3.3   Transfer Syntax Selection Policies
STORAGE-SCU prefers JPEG Lossless transfer syntaxes. If offered a choice of Transfer Syntaxes in a Presentation Context, it will apply the following priority to the choice of Transfer Syntax:
- First encountered JPEG Lossless Transfer Syntax (including JPEG 2000 Lossless)

- First encountered Implicit Transfer Syntax

- Default Transfer Syntax

4.8.3.1.3.4   Response Status
STORAGE-SCU will behave as described in the Table below when generating the C-STORE response command message.

Table 4-47 Response Status for STORAGE-SCU and Request Storage

Service Status	Further Meaning	Status Codes	Reason
Refused	Out of Resources	A7xx	Job set to Retry state
Error	Data Set does not match SOP Class	A9xx	Job set to Failed state
	Cannot understand	Cxxx	Job set to Retry state
Warning	Coercion of Data Elements	B000	Job set to Complete state
	Data Set does not match SOP Class	B007	Job set to Failed state
	Elements Discarded	B006	Job set to Complete state
Success		0000	Job set to Complete state

4.8.4   Association Acceptance Policy
STORAGE-SCU does not accept associations.

4.9   STORAGE-SCP

4.9.1   SOP Classes

STORAGE-SCP provide Standard Conformance to the following SOP Class(es): Table 1-1 Network Services

4.9.2   Association Policies
4.9.2.1   General

STORAGE-SCP accepts but never initiates associations.

Table 4-48 Maximum PDU Size Received for STORAGE-SCP

Maximum PDU size received	Unlimited, default is 16384

4.9.2.2   Number of Associations

Table 4-49 Number of Associations for STORAGE-SCP

Maximum number of simultaneous associations	Unlimited

4.9.2.3   Asynchronous Nature

STORAGE-SCP will not perform asynchronous operations window negotiation for outstanding negotiations.

4.9.2.4   Implementation Identifying Information

Table 4-50 DICOM Implementation Class and Version for STORAGE-SCP

Implementation Class UID	1.2.840.113747.20080222
Implementation Version Name	VIMS_1.0

4.9.3   Association Initiation Policy

STORAGE-SCP does not initiate associations.

4.9.4   Association Acceptance Policy

When STORAGE-SCP accepts an association, it will respond to storage requests. The exact behavior for a given AE title can be configured by service personnel. A configuration option for receiving only from known IPs is available, by default all incoming connections are accepted.

4.9.4.1   Activity – Receive Storage Request
4.9.4.1.1   Description and Sequencing of Activities

As instances are received they are written to the local file system and a record inserted into the temporary database. If the received instance is a duplicate of a previously received instance, the old file will be overwritten with the new one, however the database records will not. At a later time, the received DICOM instances will be moved to the Vital File Share, updated in the permanent tables, and are then made available for viewing.

Figure 4.8 Sequencing of Activity – Receive Storage Request
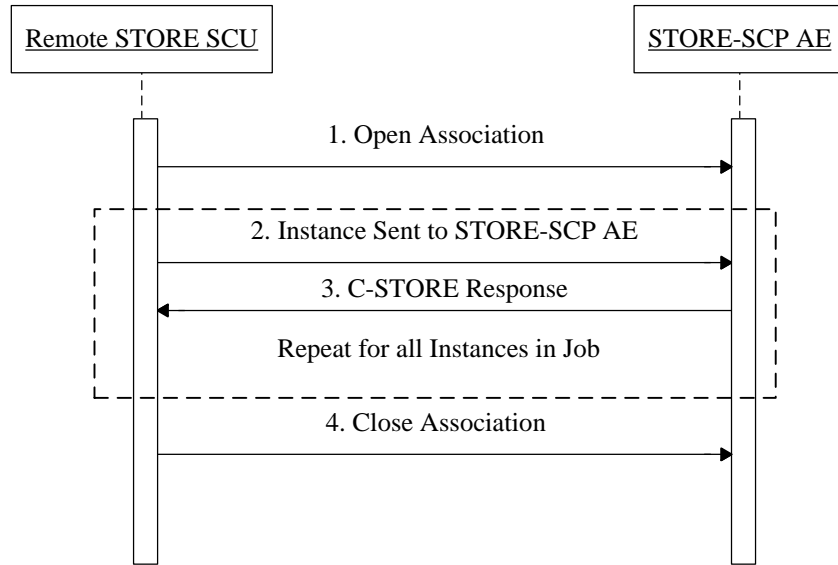
4.9.4.1.2   Accepted Presentation Contexts

Table 4-51 Accepted Presentation Contexts for STORAGE-SCP and Receive Storage Request

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name**	**UID**		**Negotiation**
See Table 4-47	See Table 4-47	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	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	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 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 Spectral Selection, Non-Hierarchical (Process 6 & 8) (*Retired*)	1.2.840.10008.1.2.4.53	SCP	None
		JPEG Full Progression, Non-Hierarchical (Process 10 & 12) (*Retired*)	1.2.840.10008.1.2.4.55	SCP	None
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	SCP	None
		RLE Lossless	1.2.840.10008.1.2.5	SCP	None

4.9.4.1.2.1   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

4.9.4.1.3 SOP Specific Conformance
4.9.4.1.3.1 SOP Specific Conformance to Storage SOP Classes
STORAGE-SCP provides standard conformance to the Storage Service Class.

4.9.4.1.3.2 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.

4.9.4.1.3.3 Transfer Syntax Selection Policies
STORAGE-SCP prefers JPEG Lossless Transfer Syntaxes. If offered a choice of Transfer Syntaxes in a Presentation Context, it will apply the following priority to the choice of Transfer Syntax:
- First encountered JPEG Lossless Transfer Syntax (including JPEG 2000 Lossless)
- First encountered Implicit Transfer Syntax
- Default Transfer Syntax

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 priority for selecting a Transfer Syntax for each.

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

Table 4-52 Response Status for STORAGE-SCP and Receive Storage Request

Service Status	Further Meaning	Status Codes	Reason
Refused	Out of Resources	A7xx	Association limit reached, local disk space low
Error	Data Set does not match SOP Class	A9xx	Never sent – data set is not checked prior to storage
	Cannot understand	Cxxx	Internal processing error
Warning	Coercion of Data Elements	B000	Never sent - no coercion is ever performed
	Data Set does not match SOP Class	B007	Never sent - data set is not checked prior to storage
	Elements Discarded	B006	Never sent – all elements are always stored
Success		0000	

4.10 STORECOMMIT-SCU

4.10.1 SOP Classes
STORECOMMIT-SCU provides Standard Conformance to the following SOP Class(es):

Table 4-53 SOP Classes Supported by STORECOMMIT-SCU

SOP Class Name	SOP Class UID	SCU	SCP
Storage Commitment Push Model	1.2.840.10008.5.1.20.1	Yes	No

4.10.2   Association Policies

4.10.2.1   General
STORECOMMIT-SCU initiates and accepts associations.

Table 4-54 Maximum PDU Size Sent for STORECOMMIT-SCU

Maximum PDU size sent	Unlimited

4.10.2.2   Number of Associations

Table 4-55 Number of Associations for STORECOMMIT-SCU

Maximum number of simultaneous associations	10

The maximum number of simultaneous associations includes the total number of FIND-SCP, STORE_SCP, MOVE-SCP and STORECOMMIT-SCU associations.

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

4.10.2.4   Implementation Identifying Information

Table 4-56 DICOM Implementation Class and Version for STORECOMMIT-SCU

Implementation Class UID	1.2.840.113747.1.3.9
Implementation Version Name	VI_DICOM_3.9

4.10.3   Association Initiation Policy

STORECOMMIT-SCU attempts to initiate a new association when the user performs the export action from the user interface. STORECOMMIT-SCU is initiated once the requested instances have been sent to the remote entity.

4.10.3.1   Activity – Request Storage Commitment
4.10.3.1.1   Description and Sequencing of Activities
For the storage commitment entity related to the storage entity selected from the user interface, an attempt will be made to request Storage Commitment from the remote AE. If the request fails, for whatever reason, it will not be retried.

4.10.3.1.2   Proposed Presentation Contexts

Table 4-57 Proposed Presentation Contexts for STORECOMMIT-SCU

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name	UID		Negotiation

See Table 4-53	See Table 4-53	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

STORECOMMIT-SCU will propose a single Presentation Context.

4.10.3.1.2.1 Extended Negotiation
No extended negotiation is performed.

4.10.3.1.3 SOP Specific Conformance
4.10.3.1.3.1 SOP Specific Conformance to STORAGE COMMITMENT SOP Classes
STORECOMMIT-SCU will be activated by STORE-SCU if the selected storage entity has a configured storage commitment entity. STORECOMMIT-SCU will request storage commitment for instances of the CT Image Storage SOP Class, MR Image Storage SOP Class, Secondary Capture Image Storage SOP Class and Grayscale Softcopy Presentation State Storage SOP Class. The Storage AE will consider Storage Commitment failed if no N-EVENT-REPORT is received for a Transaction UID within 24 hours after receiving a successful N-ACTION response (duration of applicability for a Transaction UID). The Storage AE does not send the optional Storage Media FileSet ID & UID Attributes or the Referenced Study Component Sequence Attribute in the N-ACTION.

4.10.3.1.3.2 Transfer Syntax Selection Policies
STORECOMMIT-SCU uses only Implicit Little Endian Transfer Syntax.

4.10.3.1.3.3 Response Status
The behavior of Storage AE when encountering status codes in an N-ACTION response is summarized in the Table below:

Table 4-58 Storage Commitment N-ACTION Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The request for storage comment is considered successfully sent. A timer is started which will expire if no N-EVENT-REPORT for the Transaction UID is received within 24 hours.
*	*	Any other status code.	The Association is aborted using A-ABORT and the request for storage comment is marked as failed. The status meaning is logged.

4.10.4   Association Acceptance Policy

When STORECOMMIT-SCU accepts an association, it will receive storage commitment results. If the Called AE Title does not match the pre-configured AE Title for the STORECOMMIT-SCU, the association will be rejected.

4.10.4.1   Activity – Receive Results from Remote AE
4.10.4.1.1   Description and Sequencing of Activities
When storage commitment results are received, the successful instances are marked in the local database for future deletion. The failed instances are logged in the log files.

4.10.4.1.2   Proposed Presentation Contexts

Table 4-59 Accepted Presentation Contexts for STORECOMMIT-SCU

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		

See Table 4-36	See Table 4-36	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

STORECOMMIT-SCU will accept a single Presentation Context.

4.10.4.1.2.1   Extended Negotiation
Extended negotiation is used to select the SCP/SCU role for STORECOMMIT-SCU. STORECOMMIT-SCU will only allow the SCU role.

4.10.4.1.3   SOP Specific Conformance
4.10.4.1.3.1   SOP Specific Conformance to STORAGE COMMITMENT SOP Classes
STORECOMMIT-SCU is capable of receiving an N-EVENT-REPORT notification if it has successfully negotiated a Presentation Context for the Storage Commitment Push Model (i.e. only associations established with archive devices). Upon receipt of an N-EVENT-REPORT the timer associated with the Transaction UID will be canceled. The behavior of STORECOMMIT-SCU when receiving Event Types within the N-EVENT-REPORT is summarized in the Table below.

Table 4-60 Storage Commitment N-EVENT-REPORT Behavior

Event Type Name	Event Type ID	Behavior
Storage Commitment Request Successful	1	The Referenced SOP Instances under Referenced SOP Sequence (0008,1199) are marked within the database as available for automatic deletion. The conditions under which automatic deletion is initiated and the amount of space freed are site configurable. SOP Instances will not be deleted if they are marked with a lock flag.
Storage Commitment Request Complete – Failures Exist	2	The Referenced SOP Instances under Referenced SOP Sequence (0008,1199) are treated in the same way as in the success case (Event Type 1). The Referenced SOP Instances under Failed SOP Sequence (0008,1198) are marked within the database as failed. The Failure Reasons are logged. A job that failed storage commitment will not be automatically restarted.

The reasons for returning specific status codes in an N-EVENT-REPORT response are summarized in the Table below.

Table 4-61 Storage Commitment N-EVENT-REPORT Response Status Reasons

Service Status	Further Meaning	Error Code	Reasons
Success	Success	0000	The storage commitment result has been successfully received.
Failure	Unrecognized Operation	0211H	The Transaction UID in the N-EVENT-REPORT request is not recognized (was never issued within an N-ACTION request).
Failure	Resource Limitation	0213H	The Transaction UID in the N-EVENT-REPORT request has expired (no N-EVENT-REPORT was received within a configurable time limit).
Failure	No Such Event Type	0113H	An invalid Event Type ID was supplied in the N-EVENT-REPORT request.
Failure	Processing Failure	0110H	An internal error occurred during processing of the N-EVENT-REPORT. A short description of the error will be returned in Error Comment (0000,0902).
Failure	Invalid Argument Value	0115H	One or more SOP Instance UIDs with the Referenced SOP Sequence (0008,1199) or Failed SOP Sequence (0008,1198) was not included in the Storage Commitment Request associated with this Transaction UID. The unrecognized SOP Instance UIDs will be returned within the Event Information of the N-EVENT-REPORT response.

4.10.4.1.3.2 Presentation Context Acceptance Criterion
STORECOMMIT-SCU accepts only a single Presentation Context.

4.10.4.1.3.3 Transfer Syntax Selection Policies
STORECOMMIT-SCU accepts only Implicit Little Endian Transfer Syntax.

4.11 QIDO-RS User Agent

4.11.1 SOP Classes

QIDO-RS User Agent supports the following transactions:

Table 4-62 Transactions Supported by WADO-RS Origin Server

Transaction	Resource
Search For Studies	{service}/studies?

4.11.2 Connection Policies

4.11.2.1 General

QIDO-RS User Agent initiates associations based on user actions.

Table 4-63 QIDO-RS Specification

Category	Restrictions
Media Types supported	multipart/related; type=application/dicom+xml

4.11.2.2 Number of Associations

Table 4-64 Number of Associations for FIND-SCU

Maximum number of simultaneous associations	1

4.11.2.3 Asynchronous Nature

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

4.11.3 Association Initiation Policy

QIDO-RS User Agent attempts to initiate a new association when the user initiates a search from a QIDO-RS Origin Server.

4.11.3.1 QIDO-RS Query Parameters

QIDO-RS User Agent supports the following search query keys.

Table 4-65 QIDO-RS Query Parameters

Name	Tag	Types of Matching
STUDY Level		
Study Date	(0008,0020)	*,U,R
Study Time	(0008,0030)	*,U,R
Accession Number	(0008,0050)	S,*,U
Modalities In Study	(0008,0061)	S,U
Study Description	(0008,1030)	U
Patient's Name	(0010,0010)	S,*,U
Patient's ID	(0010,0020)	S,*,U
Issuer of Patient ID	(0010,0021)	S,*,U
Study Instance UID	(0020,000D)	UNIQUE

Study ID	(0020,0010)	U
Number of Study Related Instances	(0020,1208)	U
SERIES Level		
Institution Name	(0008,0080)	S,*,U
Other		
Limit	N/A	N/A

Types of Matching:

S	Indicates the identifier attribute uses Single Value Matching
R	Indicates Range Matching
*	Indicates wildcard matching
U	Indicates Universal Matching
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.

4.11.4 Association Acceptance Policy

QIDO-RS User Agent does not accept associations.

4.12 WADO-RS User Agent

4.12.1 SOP Classes

WADO-RS User Agent supports the following transactions:

Table 4-66 Transactions Supported by WADO-RS User Agent

Transaction	Resource
Retrieve Study	{service}/studies/{StudyInstanceUID}
Retrieve Study Metadata	{service}/studies/{StudyInstanceUID}/metadata
Retrieve Frames	{service}/studies/{StudyInstanceUID}/series/{SeriesInstanceUID}/instances/{SOPInstanceUID}/frames/{frameList}
Retrieve Bulk Data	{bulkDataURL}

4.12.2 Connection Policies

4.12.2.1 General

WADO-RS User Agent initiates associations based on user actions.

Table 4-67 WADO-RS Specification

Category	Restrictions
Media Types supported	multipart/related; type=application/dicom multipart/related; type=application/dicom+xml multipart/related; type=application/octet-stream
Transfer Syntaxes Supported	1.2.840.10008.1.2 (Implicit VR Little Endian) 1.2.840.10008.1.2.1 (Explicit VR Little Endian)
SOP Class Restrictions	Restricted to Storage SOP Classes specified in **Error! Reference source not found.**

4.12.2.2 Number of Associations

Table 4-68 Number of Associations for WADO-RS User Agent

Maximum number of simultaneous associations	Unlimited

4.12.2.3 Asynchronous Nature

WADO-RS User Agent will only make a single outstanding operation on an Association.

4.12.3 Association Initiation Policy

WADO-RS User Agent attempts to initiate a new association when the user initiates a retrieval from a WADO-RS Origin Server.

4.12.4 Association Acceptance Policy

WADO-RS User Agent does not accept associations.

4.13 WADO-RS Origin Server

4.13.1 SOP Classes

WADO-RS Origin Server supports the following tranactions:

Table 4-69 Transactions Supported by WADO-RS Origin Server

Transaction	Resource
Retrieve Study	{service}/studies/{StudyInstanceUID}

4.13.2 Connection Policies

4.13.2.1 General

WADO-RS Origin Server accepts but never initiates associations.

Table 4-70 WADO-RS Specification

Category	Restrictions
Media Types supported	multipart/related; type=application/dicom
Transfer Syntaxes Supported	1.2.840.10008.1.2 (Implicit VR Little Endian) 1.2.840.10008.1.2.1 (Explicit VR Little Endian)
SOP Class Restrictions	Restricted to Storage SOP Classes specified in **Error! Reference source not found.**

4.13.2.2 Number of Associations

Table 4-71 Number of Associations for WADO-RS Origin Server

Maximum number of simultaneous associations	Unlimited

4.13.2.3 Asynchronous Nature

WADO-RS Origin Server will only allow a single outstanding operation on an Association. Therefore, WADO-RS Origin Server will not perform asynchronous operations window negotiation.

4.13.3 Association Initiation Policy

WADO-RS Origin Server does not initiate associations.

4.13.4 Response Status

The WADO-RS Origin Server response message header contains status codes indicating success, warning, or failure as shown in the "HTTP/1.1 Standard Response Codes" below. No additional status codes are used.

Table 4-72 HTTP/1.1 Standard Response Codes

Service Status	HTTP/1.1 Status Code	WADO-RS Description
Failure	400 - Bad Request	Malformed resource
	401 - Unauthorized	The WADO-RS Service refused to create or append any instances because the client is not authorized.
	403 - Forbidden	The WADO-RS Service understood the request, but is refusing to fulfill it (e.g., an

		authorized user with insufficient privileges).
	406 – Not Acceptable	The WADO-RS does not cannot return the requested resource in any of the media types specified by the Accept header.
	503 - Busy	This indicates that the WADO-RS Service was unable to send any instances because it was out of resources.
Success	200 - OK	This indicates that the WADO-RS Service successfully sent all the instances.

4.13.5 Support of Character Sets

All WADO-RS services support Unicode UTF-8 for all transactions.

The WADO-RS Origin Server does not convert character sets when sending PS3.10 binary Instances. The original DICOM encoded character sets are preserved.

5 Network Interfaces

5.1 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.

5.2 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.

6 Configuration

Configuration is performed through the use of an administration tool. Refer to the product documentation for specific details.

6.1 AE Title/Presentation Address Mapping

All SCU requests are performed using the "local" AE. Each AE has an alias assigned to allow a user to easily distinguish AEs from each other. Aliases are configurable, and are generally human-readable strings. Presentation addresses (IP address and Port) are also configurable for all AEs.

6.2 Parameters

Table 6-1 Configuration Parameters Table

Parameter	Configurable	Default Value
General Parameters		
PDU Size	Yes	65kB
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	No	60 seconds
General DIMSE level time-out values	No	60 seconds
Time-out waiting for response to TCP/IP connect() request. (Low-level timeout)	No	60 seconds
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	No	60 seconds
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	No	60 seconds
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	No	Unlimited
Maximum PDU size the AE can send	Yes	65kB
AE specific DIMSE level time-out values	No	60 seconds
Number of simultaneous Associations by Service and/or SOP Class	No	Unlimited
Number of retries on failure (MOVE-SCU AE, STORE-SCU AE, PRINT-SCU AE only)	Yes	3 (MOVE-SCU AE), 5 (STORE-SCU AE and PRINT-SCU AE)
SOP Class support	Yes	See Table 6-2
Transfer Syntax support	Yes	See Table 6-3
Supported DIMSE services	Yes	None
AE Specific Parameters (FIND-SCU)		

Fuzzy Semantic Matching	Yes	False
Transfer Syntaxes	Yes	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2

Table 6-2 Default SOP Classes for Configured AEs

SOP Class Name	SOP Class UID
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1

Table 6-3 Default Transfer Syntaxes for Configured AEs

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

7 Support of Character Sets

All Vital Images DICOM applications support ISO_IR 100 (ISO 8859-1:1987 Latin Alphabet No. 1 supplementary set). No other character sets are supported.

8 Security

8.1 Network

Vital Images DICOM applications do not support any specific network security measures. It is assumed the software is used within a secured environment. It is assumed that a secured environment includes at a minimum:

- Firewall or router protections to ensure that only approved external hosts have network access to the software.

- Firewall or router protections to ensure that the software only has network access to approved external hosts and services.

- 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)).

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.

8.2 Basic Application Level Confidentiality Profile (De-Identification)

The application can remove patient identification from images during STORAGE-SCP and Media Storage reading. Partial de-identification can also be done by selecting Patient Editing vs. Anonymization. Editing modifies only those DICOM tags which are selected by the user. The remainder of this section describes anonymization.

The de-identification (Anonymization) process maintains the study/series/image hierarchy of the original images, and any cross references that may exist between images.

The following table describes which DICOM tags are removed or available for modification during de-identification. All other tags (defined in DICOM 3.0 data dictionary) are left unchanged. Private tags are not maintained. The application removes, re-maps, nulls (empty value), or adjusts the required attributes as specified in DICOM PS 3.15 Table E.1-1. Additional attributes from the Patient Identification and Patient Demographic Modules are also removed based on common usage for identifying information.

Note: No change is made to the pixel data, therefore any burnt-in annotations which contain patient identification will remain. The application does not add or modify the Patient Identity Removed (0012,0062) attribute since it is impossible to determine whether or not the image pixel data has been de-identified.

Table 8-1 Attributes Modified During De-Identification

Attribute Name	Dicom Tag	De-identification Action
Instance Creation Date	(0008,0012)	O
Instance Creation Time	(0008,0013)	O
Instance Creator UID	(0008,0014)	R
SOP Instance UID	(0008,0018)	M
Series Date	(0008,0021)	O
Instance Creation Date	(0008,0012)	O
Acquisition DateTime	(0008,002A)	O
Series Time	(0008,0031)	O
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
Series Description	(0008,103E)	N, U
Institutional Department Name	(0008,1040)	N, U
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
Additional Patient's History	(0010,21B0)	N
Responsible Person	(0010,2297)	R
Responsible Person Role	(0010,2298)	R
Responsible Organization	(0010,2299)	R
Patient Comments	(0010,4000)	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)	N
Patient's Primary Language Seq	(0010,0101)	R
Patients Insurance Plan Code Seq	(0010,0050)	R
Other Patient Ids	(0010,1000)	N
Other Patient Names	(0010,1001)	N
Other Patient IDs Sequence	(0010,1002)	R
Patient's Birth Name	(0010,1005)	R
Patient's Age	(0010,1010)	N
Patient's Size	(0010,1020)	N
Patient's Weight	(0010,1030)	N
Occupation	(0010,2180)	N
Ethnic Group	(0010,2160)	N
Patient's Address	(0010,1040)	R
Patient's Telephone Numbers	(0010,2154)	R
Medical Record Locator	(0010,1090)	N
Branch of Service	(0010,1081)	R

Military Rank	(0010,1080)	R
Patient's Mother's Birth Name	(0010,1060)	R
Device Serial Number	(0018,1000)	N
Protocol Name	(0018,1030)	N
Radiopharmaceutical Start DateTime	(0018,1078)	O
Radiopharmaceutical Stop DateTime	(0018,1079)	O
Frame Acquisition DateTime	(0018,9074)	O
Frame Reference DateTime	(0018,9151)	O
Content Date	(0008,0023)	O
Content Time	(0008,0033)	O
Start Acquisition DateTime	(0018,9516)	O
Stop Acquisition DateTime	(0018,9517)	O
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
Substance Administration DateTime	(0044,0010)	O
Creation Date	(2100,0040)	O
Referenced Frame of Reference UID	(3006,0024)	M
Related Frame of Reference UID	(3006,00C2)	M
Date of Secondary Capture	(0018,1012)	O
Time of Secondary Capture	(0018,0014)	O

In the de-identification action 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: the value is generated.
- 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, replacing the existing DICOM tab values. 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), no attribute values are generated.