A Toshiba Medical Systems Group Company

Company Name: Vital Images
Product Name: Vitrea Enterprise Suite V6.2
DICOM Conformance Statement
Internal Document Number: VLC-06965 Rev A
Date: 10/14/2011

1 Conformance Overview

The application supports image receives across the network from other systems for 2D and 3D viewing. The SOP Classes in table 1-1can be received and stored, table 1-3 defines the SOP Classes to be loaded and viewed in the 3D applications.
The application also supports the ability to query remote systems for a list of DICOM objects that may be retrieved. It also supports 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.
The application acts 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
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
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
Key Object Selection Document Storage	Yes	Yes
Encapsulated PDF Storage	Yes	Yes
Query/Retrieve		
Study Root Q/R – FIND	Yes	Yes
Study Root Q/R – MOVE	Yes	Yes
Workflow Management		
Storage Commitment Push Model	No	No
Print Management		
Basic Grayscale Print Management	Yes	Yes
Basic Color Print Management	Yes	Yes

Table 1-2 Media Services

Media Storage Application Profile	**Write Files (FSC or FSU)**	**Read Files (FSR)**
Compact Disk – Recordable		
General Purpose CD-R	Yes	Yes
DVD		
General Purpose DVD-RAM	Yes	Yes

Table 1-3 Viewable SOP Classes by Product

SOP Classes	SOP Class UID	VA	VC	VV
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	N	Y	Y
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	N	Y	Y
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	N	N	Y
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	N	N	Y
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.51.4.1.1.1.1	N	N	Y
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	N	N	Y
Digital Intra-Oral X-Ray Image Storage – For Presentation	1.2.840.10008.51.4.1.1.1.3	N	N	Y
Digital Intra-Oral X-Ray Image Storage – For Processing	1.2.840.10008.51.4.1.1.1.3.1	N	N	Y
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Y	Y	Y
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Y	Y	Y
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	N	Y	N
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	N	Y	Y
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Y	Y	Y
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Y	Y	Y
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	N	Y	N
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	N	Y	Y
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	N	Y	Y
Multi-frame Grayscale Single Bit Secondary Capture Image Storage	1.2.840.10008.51.4.1.1.7.1	N	Y	Y
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	N	Y	Y
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	N	Y	Y
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	N	Y	Y
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	N	N	N
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	N	Y	Y
X-Ray Radio fluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	N	Y	Y
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Y	Y	Y
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	N	Y	Y
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	N	N	N
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	N	N	N
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	N	N	N
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	N	N	N
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	N	N	Y
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	N	Y	Y
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	N	Y	Y
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	N	N	Y

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2 Introduction

2.1 Revision History

REVISION	EFF Date	AUTHORS	CHANGES FROM PREVIOUS REVISION
A	10/14/2011	Kelly Dupasquier	Initial Vitrea Enterprise Suite Version 6.2 release

2.2 Audience

This document is written for the people that need to understand how the Vitrea Enterprise Suite 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 3.1 Specification, Part 2: Conformance.

2.3 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between the Vitrea Enterprise Suite 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 Enterprise Suite participates in an industry-wide testing program sponsored by Integrating the Healthcare Enterprise (IHE). The IHE Integration Statement for the Vitrea Enterprise Suite, 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	Vitrea Advanced
VC	Vitrea Core
VV	Vitrea View
VL	Visible Light
VR	Value Representation
XA	X-ray Angiography

2.7 References

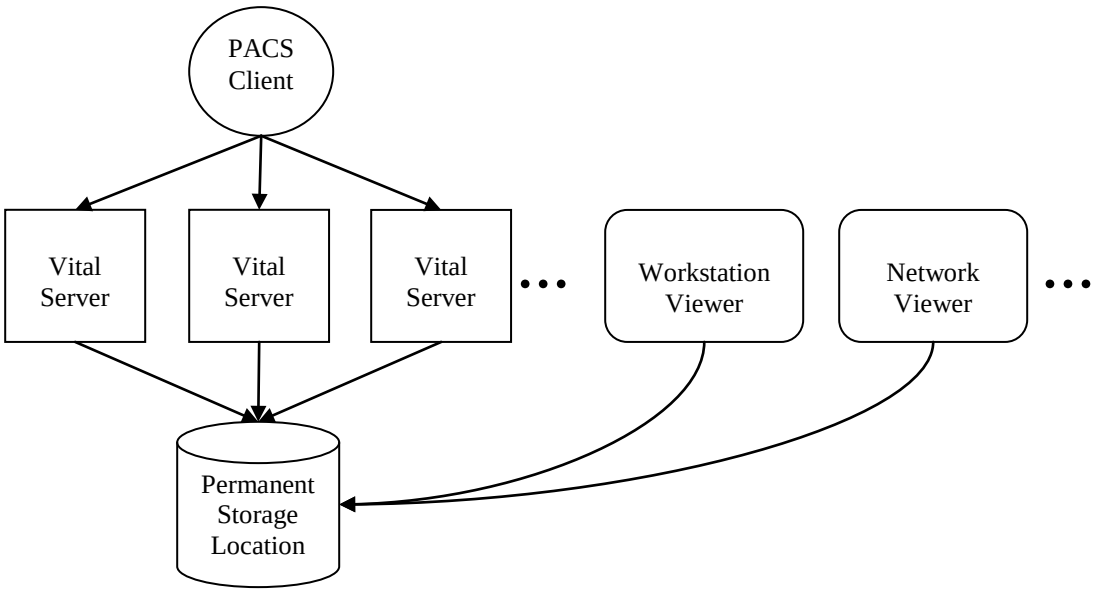
NEMA PS3 DICOM Standard, available free at http://medical.nema.org/ PS 3.1-2011

IHE IHE, further information available at http://www.ihe.net/

3 Implementation Model

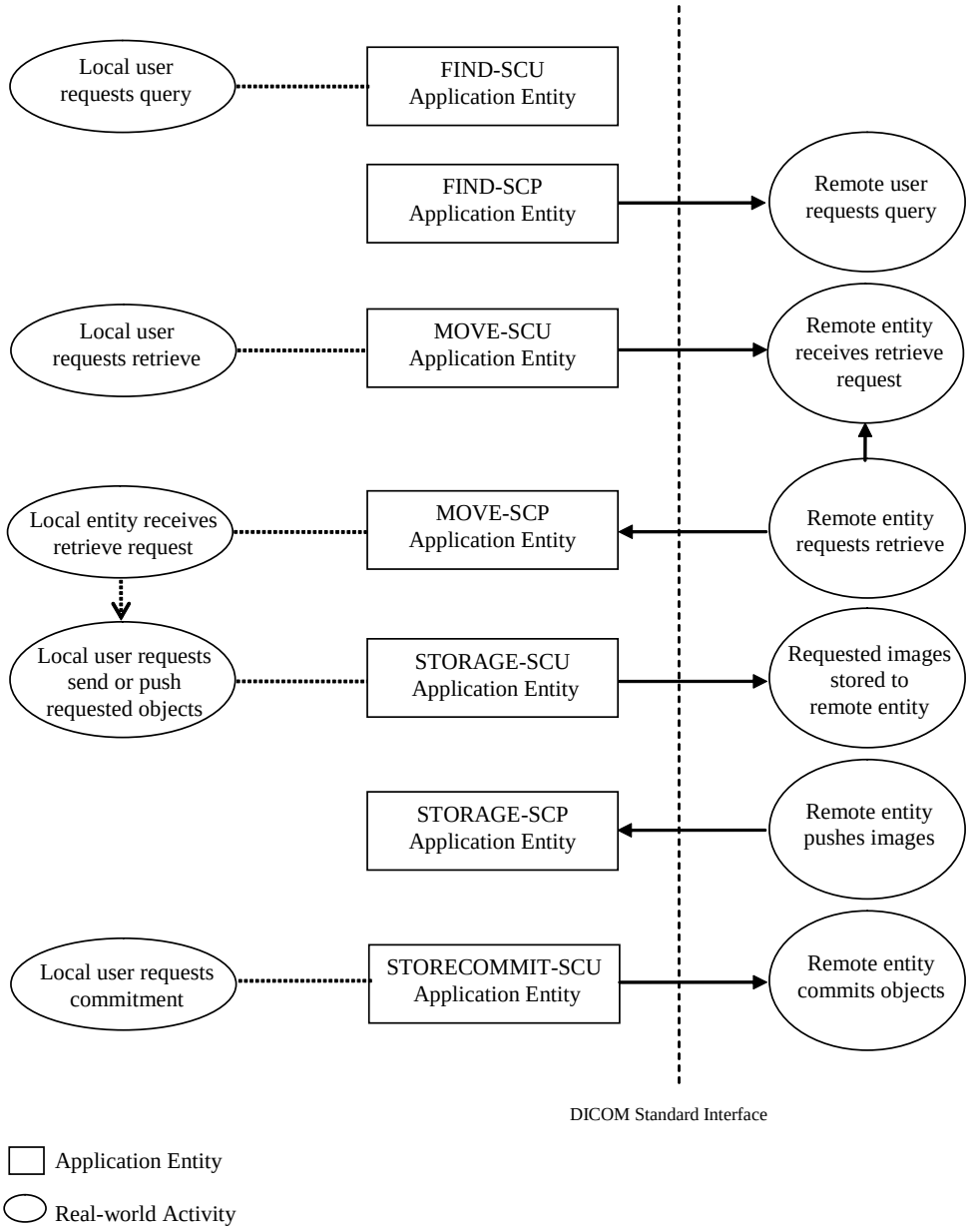
3.1 Application Data Flow

Figure 3-1 Architectural Model



The architectural model of the Vitrea Enterprise Suite includes multiple Vital Servers, workstations, and network client viewers. A Vital File Share resides in an accessible location so that any configured part of the solution can access the data.

Figure 3-2 Implementation Model



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-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

3.2 Functional Definition of AE's

3.2.1 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 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 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.

3.2.4 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.

3.2.5 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.

3.2.6 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.

3.2.7 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).

3.2.8 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.

3.2.9 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

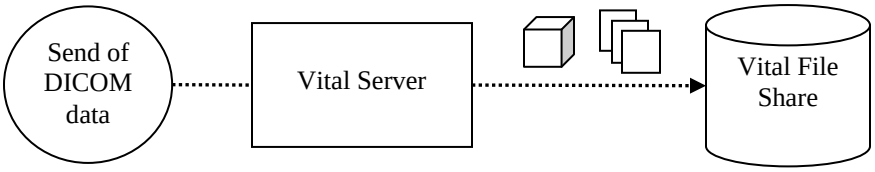
3.3.1 Proprietary data creation

The Vitrea Enterprise Suite 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 demogrpahic 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.

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 an healthcare enterprise as a woraround 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 ECHO-SCP

4.1.1 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

4.1.2 Association Policies

4.1.2.1 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

4.1.2.2 Number of Associations

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

Number of Associations	Unlimited

4.1.2.3 Asynchronous Nature

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

4.1.2.4 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

4.1.2.5 Association Acceptance Contexts

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.

Table 4-5 Accepted Presentation Contexts for ECHO-SCP

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

4.1.2.5.1 Extended Negotiation

No extended negotiation is performed.

4.1.2.5.2 SOP Specific Conformance

4.1.2.5.2.1 SOP Specific Conformance Verification SOP Class

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

4.1.2.5.2.2 Presentation Context Acceptance Criterion

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

4.1.2.5.2.3 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 ECHO-SCU

4.2.1 SOP Classes

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

Table 4-6 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

4.2.2 Association Policies

4.2.2.1 General

ECHO-SCU initiates associations through a user interface.

Table 4-7 Maximum PDU size received as a SCP for ECHO-SCU

Maximum PDU size received	Unlimited

4.2.2.2 Number of Associations

Table 4-8 Number of Associations as a SCP for ECHO-SCU

Number of Associations	Unlimited

4.2.2.3 Asynchronous Nature

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

4.2.2.4 Implementation Identifying Information

Table 4-9 DICOM Implementation Class and Version for ECHO-SCU

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

4.2.2.5 Association Initiation Policy

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.

4.2.2.5.1 Accepted Presentation Contexts

Table 4-10 Accepted Presentation Contexts for ECHO-SCU

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

4.2.2.5.2 Extended Negotiation

No extended negotiation is performed.

4.2.2.5.3 SOP Specific Conformance

4.2.2.5.3.1 SOP Specific Conformance to Verification SOP Classes

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

4.2.2.5.3.2 Presentation Context Acceptance Criterion

ECHO-SCU does not accept associations.

4.2.2.5.3.3 Transfer Syntax Selection Policies

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

4.3 FIND-SCU

4.3.1 SOP Classes

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

Table 4-11 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

4.3.2 Association Policies

4.3.2.1 General

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

Table 4-12 DICOM Application Context for FIND-SCU

Application Context Name	1.2.840.10008.3.1.1.1

Table 4-13 Maximum PDU Size Sent for FIND-SCU

Maximum PDU size sent	Unlimited, default is 65536

4.3.2.2 Number of Associations

Table 4-14 Number of Associations for FIND-SCU

Maximum number of simultaneous associations	1

4.3.2.3 Asynchronous Nature

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

4.3.2.4 Implementation Identifying Information

Table 4-15 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

4.3.3 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.

4.3.3.1 Activity – Query Remote AE

4.3.3.1.1 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.

4.3.3.1.2 Proposed Presentation Contexts

Table 4-16 Proposed Presentation Contexts for FIND-SCU and Query Remote AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**	**1**	
See Table 4-11 SOP Classes Supported by FIND-SCU	See Table 4-11	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

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

4.3.3.1.3 Extended Negotiation

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

4.3.3.1.4 Extended Negotiation

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

4.3.3.1.5 SOP Specific Conformance

4.3.3.1.5.1 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 4-17 Study Root Request Identifier for FIND-SCU

Name	Tag	Types of Matching
STUDY Level	1	2
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	3	4
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.

4.3.3.1.5.2 Presentation Context Acceptance Criterion

FIND-SCU does not accept associations.

4.3.3.1.5.3 Transfer Syntax Selection Policies

FIND-SCU uses only Implicit Little Endian Transfer Syntax.

4.3.3.1.5.4 Response Status

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

Table 4-18 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

4.3.4 Association Acceptance Policy

FIND-SCU does not accept associations.

4.4 FIND-SCP

4.4.1 SOP Classes

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

Table 4-19 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

4.4.2 Association Policies

4.4.2.1 General

FIND-SCP initiates but never accepts associations.

Table 4-20 Maximum PDU Size Received for FIND-SCP

Maximum PDU size received	Unlimited

4.4.2.2 Number of Associations

Table 4-21 Number of Associations for FIND-SCP

Maximum number of simultaneous associations	Unlimited

4.4.2.3 Asynchronous Nature

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

4.4.2.4 Implementation Identifying Information

Table 4-22 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

4.4.3 Association Negotiation Policy

FIND-SCP does not initiate associations.

4.4.4 Association Acceptance Policy

Incomming 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.

4.4.4.1 Activity – Receive Query Request

4.4.4.1.1 Description and Sequencing of Activities

All queries are matched against records in the database.

4.4.4.1.2 Accepted Presentation Contexts

Table 4-23 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 4-19	See Table 4-19	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.

4.4.4.1.2.1 Extended Negotiation

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

4.4.4.1.3 SOP Specific Conformance

4.4.4.1.3.1 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 4-24 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.

4.4.4.1.3.2 Presentation Context Acceptance Criterion

FIND-SCP accepts only a single presentation context.

4.4.4.1.3.3 Transfer Syntax Selection Policies

FIND-SCP uses only Implicit Little Endian Transfer Syntax.

4.4.4.1.3.4 Response Status

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

Table 4-25 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

4.5 MOVE-SCU

4.5.1 SOP Classes

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

Table 4-26 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

4.5.2 Association Policies

4.5.2.1 General

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

Table 4-27 DICOM Application Context for MOVE-SCU

Application Context Name	1.2.840.10008.3.1.1.1

Table 4-28 Maximum PDU Size Sent for MOVE-SCU

Maximum PDU size Sent	Unlimited, default of 65536

4.5.2.2 Number of Associations

Table 4-29 Number of Associations for MOVE-SCU

Maximum number of simultaneous associations	Configurable

4.5.2.3 Asynchronous Nature

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

4.5.2.4 Implementation Identifying Information

Table 4-30 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

4.5.3 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.

4.5.3.1 Activity – Retrieve from Remote AE

4.5.3.1.1 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.

4.5.3.1.2 Proposed Presentation Contexts

Table 4-31 Proposed Presentation Contexts for MOVE-SCU and Retrieve from Remote AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
See Table 4-26	See Table 4-26	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

MOVE-SCU will propose a single Presentation Context.

4.5.3.1.2.1 Extended Negotiation

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

4.5.3.1.3 SOP Specific Conformance

4.5.3.1.3.1 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 4-32 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

4.5.3.1.3.2 Presentation Context Acceptance Criterion

MOVE-SCU does not accept associations.

4.5.3.1.3.3 Transfer Syntax Selection Policies

MOVE-SCU uses only Implicit Little Endian Transfer Syntax.

4.5.3.1.3.4 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 4-33 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	A702	(0000,1020) (0000,1021)	Retrieval is terminated; Retries will occur

	sub-operations		(0000,1022) (0000,1023)	
	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

4.5.3.1.3.5 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.

4.5.4 Association Acceptance Policy

MOVE-SCU does not accept associations.

4.6 MOVE-SCP

4.6.1 SOP Classes

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

Table 4-34 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

4.6.2 Association Policies

4.6.2.1 General

MOVE-SCP accepts but never initiates associations.

Table 4-35 Maximum PDU Size Received for MOVE-SCP

Maximum PDU size received	Unlimited

4.6.2.2 Number of Associations

Table 4-36 Number of Associations for MOVE-SCP

Maximum number of simultaneous associations	Unlimited

4.6.2.3 Asynchronous Nature

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

4.6.2.4 Implementation Identifying Information

Table 4-37 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

4.6.3 Association Initiation Policy

MOVE-SCP does not initiate associations.

4.6.4 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.

4.6.4.1 Activity – Retrieve Request from Remote AE

4.6.4.1.1 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.

4.6.4.1.2 Accepted Presentation Contexts

Table 4-38 Accepted Presentation Contexts for MOVE-SCP and Retrieve Request from Remote AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
See Table 4-34	See Table 4-34	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

MOVE-SCP will accept a single Presentation Context.

4.6.4.1.2.1 Extended Negotiation

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

4.6.4.1.3 SOP Specific Conformance

4.6.4.1.3.1 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 4-39 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

4.6.4.1.3.2 Presentation Context Acceptance Criterion

MOVE-SCP accepts only a single Presentation Context.

4.6.4.1.3.3 Transfer Syntax Selection Policies

MOVE-SCP accepts only Implicit Little Endian Transfer Syntax.

4.6.4.1.3.4 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 4-40 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

4.6.4.1.3.5 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.

4.7 STORAGE-SCU

4.7.1 SOP Classes

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

4.7.2 Association Policies

4.7.2.1 General

STORAGE-SCU initiates, but never accepts associations.

Table 4-41 Maximum PDU Size Sent for STORAGE-SCU

Maximum PDU size sent	Unlimited, default is 16384

4.7.2.2 Number of Associations

Table 4-42 Number of Associations for STORAGE-SCU

Maximum number of simultaneous associations	1

4.7.2.3 Asynchronous Nature

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

4.7.2.4 Implementation Identifying Information

Table 4-43 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

4.7.3 Association Initiation Policy

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

4.7.3.1 Activity – Request Storage

4.7.3.1.1 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. If the Remote AE is configured to support Storage Commitment, a new task is initiated to request Storage Commitment.

4.7.3.1.2 Accepted Presentation Contexts

Table 4-44 Proposed Presentation Contexts for STORAGE-SCU and Request Storage

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
See **Error! Reference source not found.**	See **Error! Reference source not found.**	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

4.7.3.1.2.1 Extended Negotiation

No extended negotiation is performed, though STORAGE-SCU.

4.7.3.1.3 SOP Specific Conformance

4.7.3.1.3.1 SOP Specific Conformance to Storage SOP Classes

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

4.7.3.1.3.2 Presentation Context Acceptance Criterion

STORAGE-SCU does not accept associations.

4.7.3.1.3.3 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

4.7.3.1.3.4 Response Status

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

Table 4-45 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

4.7.4 Association Acceptance Policy

STORAGE-SCU does not accept associations.

4.8 STORAGE-SCP

4.8.1 SOP Classes

STORAGE-SCP 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-SCP accepts but never initiates associations.

Table 4-46 Maximum PDU Size Received for STORAGE-SCP

Maximum PDU size received	Unlimited, default is 16384

4.8.2.2 Number of Associations

Table 4-47 Number of Associations for STORAGE-SCP

Maximum number of simultaneous associations	Unlimited

4.8.2.3 Asynchronous Nature

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

4.8.2.4 Implementation Identifying Information

Table 4-48 DICOM Implementation Class and Version for STORAGE-SCP

Implementation Class UID	1.2.840.113747.20080222
Implementation Version Name	VIMS_1.0

4.8.3 Association Initiation Policy

STORAGE-SCP does not initiate associations.

4.8.4 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.

4.8.4.1 Activity – Receive Storage Request

4.8.4.1.1 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.

4.8.4.1.2 Accepted Presentation Contexts

Table 4-49 Accepted Presentation Contexts for STORAGE-SCP and Receive Storage Request

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
See Table 4-47	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

4.8.4.1.2.1 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

4.8.4.1.3 SOP Specific Conformance

4.8.4.1.3.1 SOP Specific Conformance to Storage SOP Classes

STORAGE-SCP provides standard conformance to the Storage Service Class. STORAGE-SCP does not support Grayscale Softcopy Presentation State as required by Enhanced CT Image Storage and Enhanced MR Image Storage.

4.8.4.1.3.2 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.

4.8.4.1.3.3 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.

4.8.4.1.3.4 Response Status

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

Table 4-50 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	B000	Never sent - no coercion is ever

	Elements		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	

4.9 PRINT-SCU

4.9.1 SOP Classes

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

Table 4-51 SOP Classes for PRINT-SCU

SOP Class Name	SOP Class UID	SCU	SCP
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes	No

4.9.2 Association Establishment Policy

4.9.2.1 General

4.9.2.2 Number of Associations

Table 4-52 Number of Associations for PRINT-SCU

Maximum number of simultaneous associations	1

4.9.2.3 Asynchronous Nature

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

4.9.2.4 Implementation Identifying Information

Table 4-53 DICOM Implementation Class and Version for PRINT-SCU

Implementation Class UID	1.3.6.1.4.1.25403.1.1.1
Implementation Version Name	Dicom 0.1

4.9.3 Association Initiation Policy

PRINT-SCU initiates a new association when the user performs a print action from the user interface.

4.9.4 AE Title Specification

The AE title to be used by the PRINT-SCU is "PRINTSCU". This is a static and non-configurable value.

4.9.4.1 Activity – Request Print

4.9.4.1.1 Description and Sequencing of Activities

A user can select images and request them to be printed to a pre-configured print server. Each request is forwarded to a job queue and processed individually. Only one print job may be active at a time, but any number of jobs may be in the queue, and are serviced on a first-come, first-serve basis. Each print job results in a separate association, but each print job may contain multiple film boxes. If a print job is not successful, it will be marked as failed and will be retried up to 5 times.

4.9.4.1.2 Proposed Presentation Contexts

EXAMPLE-PRINT-SERVER-MANAGEMENT will accept Presentation Contexts as shown in the following table:

Table 4-54 Proposed Presentation Contexts for PRINT-SCU

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
See Table 4-51	See Table 4-51	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.9.4.1.3 SOP Specific Conformance

4.9.4.1.3.1 Specific Conformance to Basic Grayscale Print Management Meta SOP Class

PRINT-SCU supports the following mandatory SOP classes as defined by the Basic Grayscale Print Management Meta SOP Class:

Table 4-55 SOP Classes for Basic Grayscale Print management Meta SOP Class

SOP Class Name	SOP Class UID	SCU	SCP
Basic Film Session	1.2.840.10008.5.1.1.1	Yes	No
Basic Film Box	1.2.840.10008.5.1.1.2	Yes	No
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	Yes	No
Printer	1.2.840.10008.5.1.1.16	Yes	No

The specific SOP Conformance statement for each of the Basic Grayscale Print Management Meta SOP Class components is described in the subsequent sections.

4.9.4.1.3.1.1 Specific Conformance for Basic Film Session SOP Class

PRINT-SCU provides support for the following DIMSE Services:

- N-CREATE
- N-SET
- N-ACTION
- N-DELETE

4.9.4.1.3.1.1.1 Basic Film Session SOP Class Operations for N-CREATE

The EXAMPLE-PRINT-SERVER-MANAGEMENT provides the following support for the Film Session attributes sent by the N-CREATE DIMSE service:

Table 4-56 Basic Film Session SOP Class N-CREATE Request Attributes

Attribute	Tag	Valid Range	Default Value
Number of Copies	(2000,0010)	1 – 99	1
Print Priority	(2000,0020)	LOW MED HIGH	LOW
Medium Type	(2000,0030)	CLEAR FILM	Current configured

		BLUE FILM PAPER STORED PRINT	setting
Film Destination	(2000,0040)	MAGAZINE PROCESSOR STORED PRINT	Current configured setting
Film Session Label	(2000,0050)	Any string	Empty String

PRINT-SCU will behave as described in the Table below when receiving the N-CREATE response command message.

Table 4-57 Film Session SOP Class N-CREATE Response Status Handling Reasons

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	The N-CREATE operation is successful.
Warning	Attribute Value Out of Range	0116	The N-CREATE operation is considered successful but the status meaning is logged.
Warning	Memory allocation not supported	B600	N-CREATE operation is considered successful, but the status meaning is logged.
Warning	Attribute List Error	0107	The N-CREATE operation is considered successful but the status meaning is logged
Failure	Invalid attribute value	0106	The N-CREATE operation failed, and the print job is marked as failed.
Failure	Processing failure	0110	The N-CREATE operation failed, and the print job is marked as failed.
Failure	Invalid object instance	0117	The N-CREATE operation failed, and the print job is marked as failed.
Failure	Resource limitation	0213	The N-CREATE operation failed, and the print job is marked as failed.

4.9.4.1.3.1.1.2 Film Session SOP Class Operations for N-SET

PRINT-SCU provides the support for the Film Session attributes sent by the N-SET DIMSE service identically as it is described for the Film Session with N-CREATE, Table 4-56.

The Print Server Management behavior and specific status codes sent for the N-SET of a specific Film Session is described in the following table:

Table 4-58 Film Session SOP Class N-SET Response Status Handling Reasons

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	The N-SET operation is successful.
Warning	Attribute Value Out of Range	0116	The N-SET operation is considered successful
Warning	Attribute List Error	0107	The N-SET operation is considered successful
Warning	Memory allocation not supported	B600	The N-SET operation is considered successful

Failure	Invalid attribute value	0106	The N-SET operation failed, and the print job is marked as failed.
Failure	Processing failure	0110	The N-SET operation failed, and the print job is marked as failed.
Failure	Invalid object instance	0112	The N-SET operation failed, and the print job is marked as failed.

4.9.4.1.3.1.1.3 Film Session SOP Class Operations for N-DELETE

PRINT-SCU behavior and specific status codes sent for the N-DELETE of a specific Film Session is described in the following table:

Table 4-59 Film Session SOP Class N-DELETE Response Status Handling Reasons

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	The SCP has completed the operation successfully. Film session has been successfully deleted.
Failure	Unknown UID	0112	No such object instance: the instance UID given does not exist. The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged.

4.9.4.1.3.1.1.4 Film Session SOP Class Operations for N-ACTION

PRINT-SCU behavior and specific status codes sent for the N-ACTION of a specific Film Session is described in the following table:

Table 4-60 Film Session SOP Class N-ACTION Response Status Handling Reasons

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	N-ACTION operation is successful.
Warning	Empty film page	B602	N-ACTION operation is considered successful.
Warning	Image larger then Image Box	B604	N-ACTION operation is considered successful.
Warning	Image larger then Image Box	B609	N-ACTION operation is considered successful.
Warning	Image larger then Image Box	B60A	N-ACTION operation is considered successful.
Failure	Invalid object	0112	The N-ACTION operation failed, and the print job is marked as failed.
Failure	Invalid operation	0211	The N-ACTION operation failed, and the print job is marked as failed.
Failure	Processing failure	C600	The N-ACTION operation failed, and the print job is marked as failed.
Failure	OUT of Resources	C601	The N-ACTION operation failed, and the print job is marked as failed.
Failure	Wrong Image size	C603	The N-ACTION operation failed, and the print job is marked as failed.
Failure	Wrong Print Image size	C613	The N-ACTION operation failed, and the print job is marked as failed.

4.9.4.1.3.1.2 Specific Conformance for Basic Film Box SOP Class

PRINT-SCU provides support for the following DIMSE Services:

- N-CREATE
- N-SET
- N-ACTION
- N-DELETE

4.9.4.1.3.1.2.1 Basic Film Box SOP Class Operations for N-CREATE

PRINT-SCU provides the following support for the Film Box attributes sent by the N-CREATE DIMSE service.

Table 4-61 Basic Film Box SOP Class N-CREATE Request Attributes

Attribute	Tag	Valid Range	Default Value if not sent by SCU or invalid value received
Image Display Format	(2010,0010)	STANDARD\C,R ROW\R1,R2,R3 COL\C1,C2,C3	Configurable
Film Orientation	(2010,0040)	PORTRAIT LANDSCAPE	Configurable
Film Size Id	(2010,0050)	8INX10IN 11INX14IN 14INX17IN	Configurable
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	Configurable
Max Density	(2010,0130)	170-350	Configurable
Smoothing Type	(2010,0080)	0-15, the value is laser specific.	Configurable
Border Density	(2010,0100)	WHITE BLACK	Configurable
Trim	(2010,0140)	YES NO	Configurable

PRINT-SCU behavior and specific status codes sent for the N-CREATE of a specific Film Box is described in the following table:

Table 4-62 Film Box SOP Class N-CREATE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The N-CREATE operation is successful.
Warning	Attribute Value Out of Range	0116	The N-CREATE operation is assumed to be successful.
Warning	Min/Max Density out-range	B605	The N-CREATE operation is assumed to be successful.
Failure	Invalid attribute value	0106	The N-CREATE operation failed, and the print job is marked as failed.
Failure	Processing failure	0110	The N-CREATE operation failed, and the print job is marked as

			failed.
Failure	Duplicate SOP instance	0111	The N-CREATE operation failed, and the print job is marked as failed.
Failure	Invalid object instance	0117	The N-CREATE operation failed, and the print job is marked as failed.
Failure	Missing attribute	0120	The N-CREATE operation failed, and the print job is marked as failed.
Failure	Missing attribute value	0121	The N-CREATE operation failed, and the print job is marked as failed.
Failure	Resource limitation	0213	The N-CREATE operation failed, and the print job is marked as failed.
Failure	Out of Print Job Sequence	C616	The N-CREATE operation failed, and the print job is marked as failed.

4.9.4.1.3.1.2.2 Basic Film Box SOP Class Operations for N-SET

PRINT-SCU provides the support for the following Film Box attributes sent by the N-SET DIMSE service:

Table 4-63 Basic Film Box SOP Class N-SET Request Attributes

Attribute	Tag	Valid Range	Default Value if not sent by SCU or invalid value received
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	Configurable
Max Density	(2010,0130)	170-350	Configurable
Smoothing Types	(2010,0080)	0-15, the value is laser specific.	Configurable
Border Density	(2010,0100)	WHITE BLACK	Configurable
Trim	(2010,0140)	YES NO	Configurable

PRINT-SCU behavior and specific status codes sent for the N-SET of a specific Film Box is described in the following table:

Table 4-64 Film Box SOP Class N-SET Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The N-SET operation is successful.
Warning	Illegal Attribute	0107	The N-SET operation is assumed to be successful.
Warning	Attribute out of range	0116	The N-SET operation is assumed to be successful.
Failure	Invalid attribute value	0106	The N-SET operation failed, and the print job is marked as failed.
Failure	Processing failure	0110	The N-SET operation failed, and the print job is marked as failed.
Failure	No object instance	0112	The N-SET operation failed, and the print job is marked as failed.

Failure	Missing attribute value	0121	The N-SET operation failed, and the print job is marked as failed.

4.9.4.1.3.1.2.3 Basic Film Box SOP Class Operations for N-DELETE

PRINT-SCU provides the support for deleting the last created Film Box.
The specific behavior and status codes sent for the N-DELETE of the last created Film Box is described in the following table:

Table 4-65 Film Box SOP Class N-DELETE Response Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The N-DELETE operation is successful.
Failure	Illegal UID	0112	The N-DELETE operation failed, and the print job is marked as failed.

4.9.4.1.3.1.2.4 Basic Film Box SOP Class Operations for N-Action

PRINT-SCU provides the support for submitting the print job for printing the specific Film Box. The Film BOX N-ACTION arguments are defined in the DICOM Standard PS 3.4, table H.4-8.

The specific behavior and status codes sent for the N-ACTION of the specific Film Box is described in the following table:

Table 4-66 Film Box SOP Class N-ACTION Response Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The N-ACTION operation is successful, and the film is accepted for printing.
Warning	Empty Film Page	B603	The N-ACTION operation is considered successful, but the empty page will not be printed.
Warning	Image larger then Image Box	B604	The N-ACTION operation is considered successful.
Warning	Image larger then Image Box	B609	The N-ACTION operation is considered successful.
Warning	Image larger then Image Box	B60A	The N-ACTION operation is considered successful.
Failure	Out of Resources	C602	The N-ACTION operation failed, and the print job is marked as failed.
Failure	Wrong Image size	C603	The N-ACTION operation failed, and the print job is marked as failed.
Failure	Wrong Print Image size	C613	The N-ACTION operation failed, and the print job is marked as failed.

4.9.4.1.3.1.3 Specific Conformance for Image Box SOP Class

PRINT-SCU provides the following support for the attributes contained in the N-SET DIMSE Service of the Basic Grayscale Image Box SOP Class:

Table 4-67 Image Box SOP Class N-SET Request Attributes

Attribute	Tag	Valid Range	Default Value if not sent by SCU or invalid value received
Image Position	(2020,0010)	1 - Max number of images for Display Format	Mandatory, no default.

Basic Grayscale Image Sequence	(2020,0110)	N/A	N/A
>Samples Per Pixel	(0028,0002)	1	Mandatory, no default.
>Photometric Interpretation	(0028,0004)	MONOCHROME1 MONOCHROME2	Mandatory, no default.
>Rows	(0028,0010)	1 – Maximum rows for film size	Mandatory, no default.
>Columns	(0028,0011)	1 – Maximum columns for film size.	Mandatory, no default.
>Pixel Aspect Ratio	(0028,0034)	Any pair of valid positive integers (1 to 215-1)	No default
>Bits Allocated	(0028,0100)	8 or 16	Mandatory, no default.
>Bits Stored	(0028,0101)	8 – 16	Mandatory, no default.
>High Bit	(0028,0102)	7-15	Mandatory, no default.
>Pixel Representation	(0028,0103)	0 = unsigned 1 = 2's Complement	Mandatory, no default.
Polarity	(2020,0020)	NORMAL REVERSE	NORMAL
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	Configurable
Smoothing Type	(2010,0080)	0-15, the value is laser specific.	Configurable

PRINT-SCU behavior and specific status codes sent for the N-SET of a specific Image Box is described in the following table:

Table 4-68 Image Box SOP Class N-SET Response Status Handling Behavior

Service Status	**Further Meaning**	**Error Code**	**Behavior**
Success	Success	0000	The N-SET operation is successful.
Warning	Attribute out of range	0116	The N-SET operation is considered successful.
Warning	Image larger then Image Box	B604	The N-SET operation is considered successful.
Warning	Image larger then Image Box	B609	The N-SET operation is considered successful.
Warning	Image larger then Image Box	B60A	The N-SET operation is considered successful.
Failure	No object instance	0112	The N-SET operation failed, and the print job is marked as failed.
Failure	Missing attributes	0120	The N-SET operation failed, and the print job is marked as failed.
Failure	Missing attribute value	0121	The N-SET operation failed, and the print job is marked as failed.
Failure	Image size	C603	The N-SET operation failed, and the print job is marked as failed.

	doesn't match		
Failure	Out of Resources	C605	The N-SET operation failed, and the print job is marked as failed.

4.9.4.1.3.1.4 Specific Conformance for Printer SOP Class

PRINT-SCU never issues N-GET or N-EVENT-REPORT requests for the Printer SOP Class.

4.9.4.1.3.2 Specific Conformance to Basic Color Print Management Meta SOP Class

PRINT-SCU supports the following mandatory SOP classes as defined by the Basic Grayscale Print Management Meta SOP Class:

Table 4-69 SOP Classes for Basic Color Print Management Meta SOP Class

SOP Class Name	SOP Class UID	SCU	SCP
Basic Film Session	1.2.840.10008.5.1.1.1	No	Yes
Basic Film Box	1.2.840.10008.5.1.1.2	No	Yes
Basic Color Image Box	1.2.840.10008.5.1.1.4.1	No	Yes
Printer	1.2.840.10008.5.1.1.16	No	Yes

The specific SOP Conformance statement for each of the Basic Color Print Management Meta SOP Class components is described in the subsequent sections.

4.9.4.1.3.2.1 Specific Conformance for Basic Film Session SOP Class

See Section 4.9.4.1.3.1.1

4.9.4.1.3.2.2 Specific Conformance for Basic Film Box SOP Class

See Section 4.9.4.1.3.1.2

4.9.4.1.3.2.3 Specific Conformance for Basic Color Image Box SOP Class

PRINT-SCU provides the following support for the attributes contained in the N-SET DIMSE Service of the Basic Grayscale Image Box SOP Class:

Table 4-70 Image Box SOP Class N-SET Request Attributes

Attribute	Tag	Valid Range	Default Value if not sent by SCU or invalid value received
Image Position	(2020,0010)	1 - Max number of images for Display Format	Mandatory, no default.
Basic Grayscale Image Sequence	(2020,0110)	N/A	N/A
>Samples Per Pixel	(0028,0002)	3	Mandatory, no default.
>Photometric Interpretation	(0028,0004)	RBG	Mandatory, no default.
>Rows	(0028,0010)	1 – Maximum rows for film size	Mandatory, no default.
>Columns	(0028,0011)	1 – Maximum columns for film size.	Mandatory, no default.
>Pixel Aspect Ratio	(0028,0034)	Any pair of valid positive integers (1 to 215-1)	No default

>Bits Allocated	(0028,0100)	8 or 16	Mandatory, no default.
>Bits Stored	(0028,0101)	8 – 16	Mandatory, no default.
>High Bit	(0028,0102)	7-15	Mandatory, no default.
>Pixel Representation	(0028,0103)	0 = unsigned 1 = 2's Complement	Mandatory, no default.
Polarity	(2020,0020)	NORMAL REVERSE	NORMAL
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	Configurable
Smoothing Type	(2010,0080)	0-15, the value is laser specific.	Configurable

PRINT-SCU behavior and specific status codes sent for the N-SET of a specific Image Box is described in the following table:

Table 4-71 Image Box SOP Class N-SET Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The N-SET operation is successful.
Warning	Attribute out of range	0116	The N-SET operation is considered successful.
Warning	Image larger then Image Box	B604	The N-SET operation is considered successful.
Warning	Image larger then Image Box	B609	The N-SET operation is considered successful.
Warning	Image larger then Image Box	B60A	The N-SET operation is considered successful.
Failure	No object instance	0112	The N-SET operation failed, and the print job is marked as failed.
Failure	Missing attributes	0120	The N-SET operation failed, and the print job is marked as failed.
Failure	Missing attribute value	0121	The N-SET operation failed, and the print job is marked as failed.
Failure	Image size doesn't match	C603	The N-SET operation failed, and the print job is marked as failed.
Failure	Out of Resources	C605	The N-SET operation failed, and the print job is marked as failed.

4.9.4.1.3.2.4 Specific Conformance for Printer SOP Class

PRINT-SCU never issues N-GET or N-EVENT-REPORT requests for the Printer SOP Class.

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

Parameter	Configurable	Default Value
General Parameters		
SOP Class support	Yes	See Table 6-2
Transfer Syntax support	Yes	See Table 6-3
Supported DIMSE services	Yes	None

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
Implict 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-idenification 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 destribes 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 paitient 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 8.1), no attribute values are generated.

9 IOD CONTENTS

The following sections specify the attributes used for the SOP Instances created by STORAGE-SCU. The following tables use a number of abbreviations. The abbreviations used in the “Presence of …” column are:

VNAP	Value Not Always Present (attribute sent zero length if no value is present)
ANAP	Attribute Not Always Present
ALWAYS	Always Present
EMPTY	Attribute is sent without a value

The abbreviations used in the “Source” column:

SRC	the attribute value source is from the original SOP Instance
USER	the attribute value source is from User input
CONFIG	the attribute value source is a configurable parameter
AUTO	the attribute is automatically generated

NOTE: All dates and times are encoded in the local configured calendar and time.

9.1 CT Image SOP Instances

See PS 3.3 A.3.1

Table 9-1 IOD of Created CT SOP Instances

IE	Module	Reference	Presence of Module
Patient	Patient	9.6.1.1	ALWAYS
Study	General Study	9.6.1.3	ALWAYS
	Patient Study	9.6.1.2	ALWAYS
Series	General Series	9.6.1.5	ALWAYS
Frame of Reference	Frame of Reference	9.6.1.13	ALWAYS
Equipment	General Equipment	9.6.1.4	ALWAYS
Image	General Image	9.6.1.6	ALWAYS
	Image Plane	9.6.1.7	ALWAYS
	Image Pixel	9.6.1.8	ALWAYS
	Contrast/Bolus	9.6.1.9	Included if Contrast used in original images
	CT Image	9.6.1.16	ALWAYS
	SOP Common	9.6.1.12	ALWAYS
	Modality LUT	9.6.1.11	ALWAYS
	VOI LUT	9.6.1.10	ALWAYS
	Vital Images Private	9.6.1.31	ALWAYS

9.2 MR SOP Instances

See PS 3.3 A.4.1

Table 9-2 IOD of Created MR SOP Instances

IE	Module	Reference	Presence of Module
Patient	Patient	9.6.1.1	ALWAYS
Study	General Study	9.6.1.3	ALWAYS
	Patient Study	9.6.1.2	ALWAYS
Series	General Series	9.6.1.5	ALWAYS
Frame of Reference	Frame of Reference	9.6.1.13	ALWAYS

Equipment	General Equipment	9.6.1.4	ALWAYS
Image9.6.1.9	General Image	9.6.1.6	ALWAYS
	Image Pixel	9.6.1.7	ALWAYS
	Image Plane	9.6.1.8	ALWAYS
	Contrast/Bolus	9.6.1.9	Included if Contrast used in original images
	MR Image	9.6.1.17	ALWAYS
	VOI LUT	9.6.1.10	ALWAYS
	SOP Common	9.6.1.12	ALWAYS
	Vital Images Private	9.6.1.31	ALWAYS

9.3 Secondary Capture SOP Instances

See PS 3.3 A.8.1

Table 9-3 IOD of Created Secondary Capture SOP Instances

IE	Module	Reference	Presence of Module
Patient	Patient	9.6.1.1	ALWAYS
Study	General Study	9.6.1.3	ALWAYS
	Patient Study	9.6.1.2	ALWAYS
Series	General Series	9.6.1.5	ALWAYS
Equipment	General Equipment	9.6.1.4	ALWAYS
	SC Equipment	9.6.1.14	ALWAYS
Image	General Image	9.6.1.6	ALWAYS
	Image Pixel	9.6.1.7	ALWAYS
	SC Image	9.6.1.15	ALWAYS
	SOP Common	9.6.1.12	ALWAYS
	Vital Images Private	9.6.1.31	ALWAYS

9.4 XA SOP Instances

See PS 3.3 A.14.1

Table 9-4 IOD of Created XA SOP Instances

IE	Module	Reference	Presence of Module
Patient	Patient	9.6.1.1	ALWAYS
Study	General Study	9.6.1.3	ALWAYS
	Patient Study	9.6.1.2	ALWAYS
Series	General Series	9.6.1.5	ALWAYS
Frame of Reference	Frame of Reference	9.6.1.13	ALWAYS

Equipment	General Equipment	9.6.1.4	ALWAYS
Image	General Image	9.6.1.6	ALWAYS
	Image Pixel	9.6.1.7	ALWAYS
	X-Ray Image	9.6.1.18	ALWAYS
	X-Ray Acquisition	9.6.1.19	ALWAYS
	XA Positioner	9.6.1.20	ALWAYS
	SOP Common	9.6.1.12	ALWAYS
	Vital Images Private	9.6.1.31	ALWAYS

9.5 Grayscale Softcopy Presentation State SOP Instances

See PS 3.3 A.33.1

Table 9-5 IOD of Created GSPS SOP Instances

IE	Module	Reference	Presence of Module
Patient	Patient	9.6.1.1	ALWAYS
Study	General Study	9.6.1.3	ALWAYS
	Patient Study	9.6.1.2	ALWAYS
Series	General Series	9.6.1.5	ALWAYS
	Presentation Series	9.6.1.21	ALWAYS
Frame of Reference	Frame of Reference	9.6.1.13	ALWAYS
Equipment	General Equipment	9.6.1.4	ALWAYS
Presentation State	Presentation State Identification	9.6.1.22	ALWAYS
	Presentation State Relationship	9.6.1.23	ALWAYS
	Displayed Area	9.6.1.24	ALWAYS
	Graphic Annotation	9.6.1.25	ALWAYS
	Spatial Transformation	9.6.1.26	ALWAYS
	Graphic Layer	9.6.1.27	ALWAYS
	Modality LUT	9.6.1.29	ALWAYS
	Softcopy VOI LUT	9.6.1.28	ALWAYS
	Softcopy Presentation LUT	9.6.1.30	ALWAYS
	SOP Common	9.6.1.12	ALWAYS

9.6 Modules

9.6.1 Common Modules

9.6.1.1 Patient Module

See DICOM PS 3.3 C.7.1.1 for more information.

Table 9-6 Patient Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	From source images	VNAP	SRC
Patient ID	(0010,0020)	LO	From source images	VNAP	SRC
Patient's Birth Date	(0010,0030)	DA	From source images	VNAP	SRC
Patient's Sex	(0010,0040)	CS	From source images	VNAP	SRC

9.6.1.2 Patient Study Module

See DICOM PS 3.3 C.7.2.2 for more information.

Table 9-7 Patient Study Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Age	(0010,1010)	AS	From source images	VNAP	SRC

9.6.1.3 General Study Module

See DICOM PS 3.3 C.7.2.1 for more information.

Table 9-8 General Study Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Date	(0008,0020)	DA	From source images	VNAP	SRC
Study Time	(0008,0030)	TM	From source images	VNAP	SRC
Accession Number	(0008,0050)	SH	From source images	VNAP	SRC
Referring Physician's Name	(0008,0090)	PN	From source images	VNAP	SRC
Study Description	(0008,1030)	LO	From source images	ANAP	SRC
Name of Physician(s) Reading Study	(0008,1060)	PN	From source images	ANAP	SRC
Study Instance UID	(0020,000D)	UI	From source images	ALWAYS	SRC
Study ID	(0020,0010)	SH	From source images	VNAP	SRC

9.6.1.4 General Equipment Module

See DICOM PS 3.3 C.7.5.1

Table 9-9 General Equipment Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	“Vital Images, Inc”	ALWAYS	AUTO
Institution Name	(0008,0080)	LO	From source images	VNAP	SRC
Institution Address	(0008,0081)	ST	From source images	VNAP	SRC
Institution Department	(0008,1040)	LO	From source images	VNAP	SRC
Manufacturer’s Model Name	(0008,1090)	LO	“Vitrea 2”	ALWAYS	AUTO

9.6.1.5 General Series Module

See DICOM PS 3.3 C.7.3.1

Table 9-10 General Series Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	Based on IOD	ALWAYS	AUTO
Series Description	(0008,103E)	LO	Automatically Generated	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Automatically Generated	ALWAYS	AUTO
Series Number	(0020,0011)	IS	Automatically Generated	ALWAYS	AUTO

9.6.1.6 General Image Module

See DICOM PS 3.3 C.7.6.1

Table 9-11 General Image Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS	Automatically Generated	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Automatically Generated	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Automatically Generated	ALWAYS	AUTO
Instance Number	(0020,0013)	IS	Automatically Generated	ALWAYS	AUTO
Burned In Annotation	(0028,0301)	CS	Automatically Generated	ANAP	AUTO

9.6.1.7 Image Plane Module

See DICOM PS 3.3 C.7.6.2

Table 9-12 Image Plane Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Slice Thickness	(0018,0050)	DS	Automatically Generated	ALWAYS	AUTO
Image Orientation (Patient)	(0020,0032)	DS	Automatically Generated	ALWAYS	AUTO
Image Position (Patient)	(0020,0037)	DS	Automatically Generated	ALWAYS	AUTO
Pixel Spacing	(0028,0030)	DS	Automatically Generated	ALWAYS	AUTO

9.6.1.8 Image Pixel Module

See DICOM PS 3.3 C.7.6.3

Table 9-13 Image Pixel Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples Per Pixel	(0028,0002)	US	Automatically Generated	ANAP	AUTO
Planar Configuration	(0028,0006)	US	Automatically Generated	ANAP	AUTO
Rows	(0028,0010)	US	Automatically Generated	ALWAYS	AUTO
Columns	(0028,0011)	US	Automatically Generated	ALWAYS	AUTO
Pixel Aspect Ratio	(0028,0034)	IS	Automatically Generated	ANAP	AUTO
Bits Allocated	(0028,0100)	US	Automatically Generated	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	Automatically Generated	ALWAYS	AUTO
High Bit	(0028,0102)	US	Automatically Generated	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	Automatically Generated	ALWAYS	AUTO
Pixel Data	(7FE0,0010)	OB/ OW	Automatically Generated	ALWAYS	AUTO

9.6.1.9 Contrast/Bolus Module

See DICOM PS 3.3 C.7.6.4

Table 9-14 Contrast/Bolus Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Contrast/Bolus Agent	(0018,0010)	LO	From source images	ANAP	SRC

9.6.1.10 VOI LUT Module

See DICOM PS 3.3 C.11.2

Table 9-15 VOI LUT Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Window Center	(0028,1050)	DS	Automatically Generated	ANAP	AUTO
Window Width	(0028,1051)	DS	Automatically Generated	ANAP	AUTO

9.6.1.11 Modality LUT Module

See DICOM PS 3.3 C.11.1

Table 9-16 Modality LUT Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Rescale Intercept	(0028,1052)	DS	Automatically Generated	ANAP	AUTO
Rescale Slope	(0028,1053)	DS	Automatically Generated	ANAP	AUTO

Rescale Type	(0028,1054)	LO	US	ANAP	AUTO

9.6.1.12 SOP Common Module

See DICOM PS 3.3 C.12.1

Table 9-17 SOP Common Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	Automatically Generated	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Automatically Generated	ALWAYS	AUTO

9.6.1.13 Frame of Reference Module

See DICOM PS 3.3 C.7.4.1

Table 9-18 Frame of Reference Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame of Reference UID	(0020,0052)	UI	From source images	ALWAYS	SRC
Position Reference Indicator	(0020,1040)	LO	From source images	VNAP	SRC

9.6.1.14 Secondary Capture Equipment Module

See DICOM PS 3.3 C.8.6.1

Table 9-19 Secondary Capture Equipment Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Conversion Type	(0008,0064)	CS	Automatically generated	ALWAYS	AUTO

9.6.1.15 Secondary Capture Image Module

See DICOM PS 3.3 C.8.6.2

Table 9-20 Secondary Capture Image Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Date of Secondary Capture	(0018,1012)	DA	Automatically generated	ALWAYS	AUTO
Time of Secondary Capture	(0018,1014)	TM	Automatically generated	ALWAYS	AUTO

9.6.1.16 CT Image Module

See DICOM PS 3.3 C.8.2.1

Table 9-21 CT Image Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
KVP	(0018,0060)	DS	From source images	VNAP	SRC

Data Collection Diameter	(0018,0090)	DS	From source images	ANAP	SRC
Reconstruction Diameter	(0018,1100)	DS	From source images	ANAP	SRC
Gantry/Detector Tilt	(0018,1120)	DS	From source images	ANAP	SRC
Table Height	(0018,1130)	DS	From source images	ANAP	SRC
Rotation Direction	(0018,1140)	CS	From source images	ANAP	SRC
Exposure Time	(0018,1150)	IS	From source images	ANAP	SRC
X-Ray Tube Current	(0018,1151)	IS	From source images	ANAP	SRC
Exposure	(0018,1152)	IS	From source images	ANAP	SRC
Filter Type	(0018,1160)	SH	From source images	ANAP	SRC
Generator Power	(0018,1170)	IS	From source images	ANAP	SRC
Convolution Kernel	(0018,1210)	SH	From source images	ANAP	SRC
Acquisition Number	(0020,0012)	IS	From source images	VNAP	SRC

9.6.1.17 MR Image Module

See DICOM PS 3.3 C.8.3.1

Table 9-22 MR Image Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Scanning Sequence	(0018,0020)	CS	From source images	ALWAYS	SRC
Sequence Variant	(0018,0021)	CS	From source images	ALWAYS	SRC
Scan Options	(0018,0022)	CS	From source images	VNAP	SRC
MR Acquisition Type	(0018,0023)	CS	From source images	VNAP	SRC
Sequence Name	(0018,0024)	SH	From source images	ANAP	SRC
Angio Flag	(0018,0025)	CS	From source images	ANAP	SRC
Repetition Time	(0018,0080)	DS	From source images	VNAP	SRC
Echo Time	(0018,0081)	DS	From source images	VNAP	SRC
Inversion Time	(0018,0082)	DS	From source images	VNAP	SRC
Number of Averages	(0018,0083)	DS	From source images	ANAP	SRC
Imaging Frequency	(0018,0084)	DS	From source images	ANAP	SRC
Imaged Nucleus	(0018,0085)	SH	From source images	ANAP	SRC
Echo Number(s)	(0018,0086)	IS	From source images	ANAP	SRC
Magnetic Field Strength	(0018,0087)	DS	From source images	ANAP	SRC
Spacing Between Slices	(0018,0088)	DS	From source images	ANAP	SRC
Number of Phase Encoding Steps	(0018,0089)	IS	From source images	ANAP	SRC
Echo Train Length	(0018,0091)	IS	From source images	VNAP	SRC
Reconstruction Diameter	(0018,1100)	DS	From source images	ANAP	SRC

Receive Coil Name	(0018,1250)	SH	From source images	ANAP	SRC
Transmit Coil Name	(0018,1251)	SH	From source images	ANAP	SRC
In-Plane Phase Encoding Direction	(0018,1312)	CS	From source images	ANAP	SRC

9.6.1.18 X-Ray Image Module

See DICOM PS 3.3 C.8.7.1

Table 9-23 X-Ray Image Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Pixel Intensity Relationship	(0028,1040)	CS	From source images	ALWAYS	SRC

9.6.1.19 X-Ray Acquisition Module

See DICOM PS 3.3 C.8.7.2

Table 9-24 X-Ray Acquisition Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
KVP	(0018,0060)	DS	From source images	ALWAYS	SRC
Exposure Time	(0018,1150)	IS	From source images	ALWAYS	SRC
X-Ray Tube Current	(0018,1151)	IS	From source images	ALWAYS	SRC
Exposure	(0018,1152)	IS	From source images	ALWAYS	SRC
Radiation Setting	(0018,1155)	CS	From source images	ALWAYS	SRC

9.6.1.20 XA Positioner Module

See DICOM PS 3.3 C.8.7.5

Table 9-25 XA Positioner Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Positioner Primary Angle	(0018,1510)	DS	Automatically generated	ALWAYS	AUTO
Positioner Secondary Angle	(0018,1511)	DS	Automatically generated	ALWAYS	AUTO

9.6.1.21 Presentation Series Module

See DICOM PS 3.3 C.11.9

Table 9-26 Presentation Series Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008.0060)	CS	PR	ALWAYS	SRC

9.6.1.22 Presentation State Identification Module

See DICOM PS 3.3 C.11.10

Table 9-27 Presentation State Identification of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Automatically generated	ALWAYS	AUTO
Content Label	(0070,0080)	CS	Automatically generated	ALWAYS	AUTO
Content Description	(0070,0081)	LO	Automatically generated	ALWAYS	AUTO
Presentation Creation Date	(0070,0082)	DA	Automatically generated	ALWAYS	AUTO
Presentation Creation Time	(0070,0083)	TM	Automatically generated	ALWAYS	AUTO
Content Creator's Name	(0070,0084)	PN	Vitrea 2	ALWAYS	AUTO

9.6.1.23 Presentation State Relationship Module

See DICOM PS 3.3 C.11.11

Table 9-28 Presentation State Relationship Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Referenced Series Sequence	(0008,1115)	SQ	N/A	ALWAYS	N/A
>Series Instance UID	(0020,000E)	UI	From source images	ALWAYS	SRC
>Referenced Image Sequence	(0008,1140)	SQ	N/A	ALWAYS	N/A
>>Referenced SOP Class UID	(0008,1150)	UI	From source images	ALWAYS	SRC
>>Referenced SOP Instance UID	(0008,1155)	UI	From source images	ALWAYS	SRC

9.6.1.24 Displayed Area Module

See DICOM PS 3.3 C.10.4

Table 9-29 Displayed Area Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Displayed Area Selection Sequence	(0070,005A)	SQ	N/A	ALWAYS	N/A
>Referenced Image Sequence	(0008,1140)	SQ	N/A	ALWAYS	N/A
>>Referenced SOP Class UID	(0008,1150)	UI	From source images	ALWAYS	SRC
>>Referenced SOP Instance UID	(0008,1155)	UI	From source images	ALWAYS	SRC
>Displayed Area Top Left Hand Corner	(0070,0052)	SL	Automatically generated	ALWAYS	AUTO
>Displayed Area Bottom	(0070,0053)	SL	Automatically generated	ALWAYS	AUTO

Right Hand Corner					
>Presentation Size Mode	(0070,0100)	CS	Automatically generated	ALWAYS	AUTO
>Presentation Pixel Spacing	(0070,0101)	DS	Automatically generated	ALWAYS	AUTO
>Presentation Pixel Axpect Ratio	(0070,0102)	IS	Automatically generated	ALWAYS	AUTO
>Presentation Pixel Magnification Ratio	(0070,0103)	FL	Automatically generated	ALWAYS	AUTO

9.6.1.25 Graphic Annotation Module

See DICOM PS 3.3 C.10.5

Table 9-30 Graphic Annotation Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Graphic Annotation Sequence	(0070,0001)	SQ	N/A	ALWAYS	N/A
>Referenced Image Sequence	(0008,1140)	SQ	N/A	ALWAYS	N/A
>>Referenced SOP Class UID	(0008,1150)	UI	From source images	ALWAYS	SRC
>>Referenced SOP Instance UID	(0008,1155)	UI	From source images	ALWAYS	SRC
>Graphic Layer	(0070,0002)	CS	Automatically generated	ALWAYS	AUTO
>Text Object Sequence	(0070,0008)	SQ	N/A	ALWAYS	N/A
>>Bounding Box Annotation Units	(0070,0003)	CS	Automatically generated	ANAP	AUTO
>>Anchor Point Annotation Unites	(0070,0004)	CS	Automatically generated	ANAP	AUTO
>>Graphic Annotation Units	(0070,0005)	CS	Automatically generated	ANAP	AUTO
>>Unformatted Text Value	(0070,0006)	ST	User generated	ALWAYS	USER
>Graphic Object Sequence	(0070,0009)	SQ	Automatically generated	ANAP	AUTO
>>Bounding Box Top Left Hand Corner	(0070,0010)	FL	Automatically generated	ANAP	AUTO
>>Bounding Box Bottom Right Hand Corner	(0070,0011)	FL	Automatically generated	ANAP	AUTO
>>Bounding Box Text Horizontal Justification	(0070,0012)	CS	Automatically generated	ANAP	AUTO
>>Anchor Point	(0070,0014)	FL	Automatically generated	ANAP	AUTO
>>Anchor Point Visibility	(0070,0015)	CS	Automatically generated	ANAP	AUTO
>>Graphic Dimensions	(0070,0020)	US	Automatically generated	ANAP	AUTO

>>Graphic Data	(0070,0022)	FL	Automatically generated	ANAP	AUTO
>>Graphic Type	(0070,0023)	CS	Automatically generated	ANAP	AUTO
>>Graphic Filled	(0070,0024)	CS	Automatically generated	ANAP	AUTO

9.6.1.26 Spatial Transformation Module

See DICOM PS 3.3 C.10.6

Table 9-31 Spatial Transformation Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Horizontal Flip	(0070,0041)	CS	Automatically generated	ALWAYS	AUTO
Image Rotation	(0070,0042)	US	Automatically generated	ALWAYS	AUTO

9.6.1.27 Graphic Layer Module

See DICOM PS 3.3 C.10.7

Table 9-32 Graphic Layer Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Graphic Layer Sequence	(0070,0060)	SQ	N/A	ALWAYS	N/A
>Graphic Layer	(0070,0002)	CS	Automatically generated	ALWAYS	AUTO
>Graphic Layer Order	(0070,0062)	IS	Automatically generated	ALWAYS	AUTO

9.6.1.28 Softcopy VOI LUT Module

See DICOM PS 3.3 C.11.8

Table 9-33 Softcopy VOI LUT Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Window Center	(0028,1050)	DS	Automatically generated	ALWAYS	AUTO
Window Width	(0028,1051)	DS	Automatically generated	ALWAYS	AUTO

9.6.1.29 Modality LUT Module

See DICOM PS 3.3 C.11.1

Table 9-34 Modality LUT Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Rescale Intercept	(0028,1052)	DS	Automatically generated	ALWAYS	AUTO
Rescale Slope	(0028,1053)	DS	Automatically generated	ALWAYS	AUTO
Rescale Type	(0028,1054)	LO	US	ALWAYS	AUTO

9.6.1.30 Softcopy Presentation LUT Module

See DICOM PS 3.3 C.11.6

Table 9-35 Softcopy Presentation LUT Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Presentation LUT Shape	(2050,0020)	CS	IDENTITY	ALWAYS	AUTO

9.6.1.31 Vital Images Private Module

Table 9-36 Vital Images Private Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Saved Workflow	(5653,xx10)	OB	Automatically Generated	ALWAYS	AUTO
Saved Workflow File Sequence	(5653,xx14)	SQ	Automatically Generated	ANAP	AUTO
>Saved Workflow File Name	(5653,xx11)	LO	Automatically Generated	ANAP	AUTO
>Saved Workflow File Data	(5653,xx12)	OB	Automatically Generated	ANAP	AUTO
>Saved Workflow File Length	(5653,xx13)	SL	Automatically Generated	ANAP	AUTO
Image Sequence	(5653,xx15)	SQ	Automatically Generated	ANAP	AUTO
>Image Orientation (Patient)	(0020,0032)	DS	Automatically Generated	ANAP	AUTO
>Image Position (Patient)	(0020,0037)	DS	Automatically Generated	ANAP	AUTO
Volume Interpolated Slices	(5653,xx16)	SL	Automatically Generated	ANAP	AUTO
Volume SOP Instance UID	(5653,xx17)	UI	Automatically Generated	ANAP	AUTO
Saved Workflow Type	(5653,xx18)	SH	Automatically Generated	ANAP	AUTO
Volume Study Instance UID	(5653,xx19)	UI	Automatically Generated	ANAP	AUTO
Volume Series Instance UID	(5653,xx22)	UI	Automatically Generated	ANAP	AUTO
Saved Workflow Code Meaning	(5653,xx23)	LO	Automatically Generated	ANAP	AUTO
Saved Workflow Data	(5653,xx24)	OB	Automatically Generated	ANAP	AUTO
Saved Workflow Data Length	(5653,xx25)	SL	Automatically Generated	ANAP	AUTO

10 Data Dictionary of Private Attributes

Table 10-1 Vital Images Private Attributes

Tag	Attribute Name	VR	VM
(5653,00xx)	Private Creator	LO	1
(5653,xx10)	Saved Workflow	OB	1
(5653,xx11)	Saved Workflow File Name	LO	1
(5653,xx12)	Saved Workflow File Data	OB	1
(5653,xx13)	Saved Workflow File Length	SL	1
(5653,xx14)	Saved Workflow File Sequence	SQ	1
(5653,xx15)	Image Sequence	SQ	1
(5653,xx16)	Volume Interpolated Slices	SL	1
(5653,xx17)	Volume SOP Instance UID	UI	1
(5653,xx18)	Saved Workflow Type	SH	1
(5653,xx19)	Volume Study Instance UID	UI	1
(5653,xx20)	NumStudySwf	SL	1
(5653,xx21)	NumSeriesSwf	SL	1
(5653,xx22)	Volume Series Instance UID	UI	1
(5653,xx23)	Saved Workflow Code Meaning	LO	1
(5653,xx24)	Saved Workflow Data	OB	1
(5653,xx25)	Saved Workflow Data Length	SL	1