



OncoView Server

DICOM Conformance Statement



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Abstract *The OncoView Server DICOM Conformance Statement (P/N 100048304-03) provides reference information and procedures for using the Web and Administration Interfaces to interact with the OncoView Server.*

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The Varian OncoView™ Server v2.0 is a networked computer device used for storing and retrieving medical images and associated records and documents. It allows external systems to send medical images and other records and documents to it for permanent storage, retrieve information about such images and records, and retrieve the images and records themselves. The OncoView Server maintains relationships among the various RT (radiotherapy) records in its store. The OncoView Server can also auto-forward data objects to workstations, broker data objects to 3rd party PACS systems and maintain information about such brokered objects, and crawl 3rd party PACS systems for images and records for patients already in the system. The OncoView Server contains a web browser interface which enables users to perform queries on the database of data objects in its store. The OncoView Server is designed to interface to radiation oncology systems manufactured by Varian and others, as well as with the VelocityAIS viewer manufactured by Velocity Medical Solutions.

About this Statement

Intended Audience

This document is written for the following:

- Software engineers and system integrators who are interfacing with the OncoView Server
- Customers who are using DICOM with the OncoView Server
- Marketing and sales persons

This document contains some basic DICOM definitions so that the reader may understand how this product implements DICOM features. However, integrators and engineers are expected to fully understand DICOM, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices which support compatible DICOM features.

Scope

The scope of this DICOM Conformance Statement is to facilitate integration between the OncoView Server 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 intended to replace validation with other DICOM equipment to ensure proper exchange of intended information. The user should be aware of the following important issues:

- The comparison of different Conformance Statements is just the first step towards assessing inter-connectivity and interoperability between the product and other DICOM equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific DICOM equipment, as established by the health care facility.

Visual Cues

Various technical documents use the following notational conventions to help you locate and identify information:



Note: *A note describes actions or conditions that can help the user obtain optimum performance from the equipment or software.*



CAUTION: A caution describes actions or conditions that can result in minor or moderate injury to personnel or can result in damage to equipment.



WARNING: A warning describes actions or conditions that can result in serious injury or death to personnel.

In addition to the notational conventions shown above, this manual also uses the following:

- *Italic text* — Identifies manual titles, new terminology, alternate terms, name of lists or data columns, or information you type in during procedures.
- **Bold text** — Used for names of dialog box options (command and option buttons, check boxes), window options (menus and menu options, and toolbar buttons), names of keys, controls, and switches.
- **Tools > Edit Configuration > General** — This sequence defines selecting a menu, then option selection from that menu, followed by a third selection. The selection here means to click on the **Tools** menu, then click the **Edit Configuration** option from that menu. With the Edit Configuration dialog box open, click on the **General** tab.

Terms and Definitions

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. This is one part of the Presentation Context.

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 (AE 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—An *ad hoc* network communication channel set up between Application Entities.

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

Auto-Forward—The service in the OncoView Server that is responsible for re-routing stored data objects to one or more workstations on the hospital PACS network.

Auto-forwarding—The routing of stored data objects to one or more workstations. Unlike in brokering, the data objects are still stored on the OncoView Server.

Broker—The service in the OncoView Server that is responsible for routing incoming data objects to a 3rd party PACS for storage. In brokering, the data objects are NOT saved in the OncoView Server.

Brokering—The routing of incoming data objects to a 3rd party PACS for storage. In this case, a record of the data objects is stored in the database, but the data objects themselves are NOT stored on the OncoView Server.

Crawler—The service in the OncoView Server which is responsible for searching for patient DICOM data objects stored in other PACS systems. If instances of objects belonging to a patient are found on other PACS systems, records are created of the locations of those objects in the OncoView Server database.

Data Object—Any of the various instances of types of data that can be sent across a DICOM connection including: images, reports, plans, documents, or any other kind of data.

DICOM—Digital Imaging and Communications in Medicine, a standard on image communications and storage in medical applications.

Information Entity (IE)—That portion of information defined by a Composite IOD which is related to one specific class of Real-World Object. There is a one-to-one correspondence between Information Entities and entities in the DICOM Application Model.

Information Object Definition (IOD)—The specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that

have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

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

Media Application Profile—The specification of DICOM information objects and encoding exchanged on removable media (i.e., 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 mechanism, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, or availability of exchanged DICOM data.

Service Class—A collection of SOP Classes and/or Meta SOP Classes which are related in that they are described together to accomplish a single operation. For example, the Storage Service Class consists of the collection of SOP classes used in the storage of DICOM data objects, such as CT Image Storage, MR Image Storage, RT Image Storage, RT Plan Storage, and so on.

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 include: imaging modality (image storage SCU and modality worklist SCU) and imaging workstation (image query/retrieve SCU).

Service/Object Pair (SOP) Class—the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance—an information object; a specific occurrence of information exchanged in a SOP Class. Examples: a specific x-ray image.

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

TCP/IP—Transmission Control Protocol / Internet Protocol, a widely used computer networking protocol

Transfer Syntax—The encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), Little Endian explicit value representation; one part of the Presentation Context.

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.

UID—Unique Identifier used to identify an object by a worldwide unique identifier.

Basis of DICOM Communication

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**, 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 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 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 Negotiation possible, they both use a **Media Application Profile** that specifies “pre-negotiated” exchange media format, Abstract Syntax, and Transfer Syntax.

Abbreviations

AE—Application Entity

AET—Application Entity Title

CAD—Computer Aided Detection

CD-R—Compact Disk Recordable

CR—Computed Radiography

CT—Computed Tomography

DHCP—Dynamic Host Configuration Protocol

DICOM—Digital Imaging and Communications in Medicine

DIMSE—DICOM Message Service Element

DNS—Domain Name System

DX—Digital X-ray

FSC—File-Set Creator

FSU—File-Set Updater

FSR—File-Set Reader

HL7—Health Level 7 Standard

IE—Information Entity

IOD—Information Object Definition

IPv4—Internet Protocol version 4

IPv6—Internet Protocol version 6

ISO—International Organization for Standards

JPEG—Joint Photographic Experts Group
LUT—Look-up Table
MPEG—Moving Picture Experts Group
MG—Mammography (X-ray)
MR—Magnetic Resonance Imaging
MWL—Modality Worklist
NM—Nuclear Medicine
O—Optional (Key Attribute)
OSI—Open Systems Interconnection
PACS—Picture Archiving and Communication System
PET—Positron Emission Tomography
PDU—Protocol Data Unit
R—Required (Key Attribute)
RF—Radiofluoroscopy
RT—Radiotherapy
SC—Secondary Capture
SCP—Service Class Provider
SCU—Service Class User
SOP—Service-Object Pair
SPECT—Single Photon Emission Computed Tomography
SR—Structured Reporting
TCP/IP—Transmission Control Protocol/Internet Protocol
U—Unique (Key Attribute)
UID—Unique Identifier
UL—Upper Layer
US—Ultrasound
VR—Value Representation
XA—X-ray Angiography

References

Digital Imaging and Communications in Medicine (DICOM) Standard, available at no charge at <http://medical.nema.org>.

Contacting Support

Support services are available without charge during the initial warranty period. If you seek information not included in this publication, call Varian Medical Systems support at the following locations:

- United States and Canada telephone support — + 1 888 827 4265
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Chapter 2 DICOM Conformance Statement

Conformance Statement Overview

Table 1 provides an overview of the network services supported by the OncoView Server.

Table 1 Network Services

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Computed Radiography Image Storage	Yes	Yes
CT Image Storage	Yes	Yes
Ultrasound Multi-Frame Image Storage	Yes	Yes
MR Image Storage	Yes	Yes
Ultrasound Image Storage	Yes	Yes
Secondary Capture Image Storage	Yes	Yes
X-Ray Angiographic Image Storage	Yes	Yes
Enhanced XA Image Storage	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	Yes	Yes
X-Ray 3D Angiographic Image Storage	Yes	Yes
Nuclear Medicine Image Storage	Yes	Yes
Spatial Registration Storage	Yes	Yes
Deformable Spatial Registration Storage	Yes	Yes
Basic Text SR Storage	Yes	Yes
Enhanced SR Image Storage	Yes	Yes
Comprehensive SR Storage	Yes	Yes
Encapsulated PDF Storage	Yes	Yes
Positron Emission Tomography Image Storage	Yes	Yes
RT Image Storage	Yes	Yes
RT Dose Storage	Yes	Yes

Table 1 Network Services

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
RT Structure Set Storage	Yes	Yes
RT Beams Treatment Record Storage	Yes	Yes
RT Plan Storage	Yes	Yes
RT Brachy Treatment Record Storage	Yes	Yes
RT Treatment Summary Record Storage	Yes	Yes
RT Ion Plan Storage	Yes	Yes
RT Ion Beams Treatment Record Storage	Yes	Yes
Query/Retrieve		
Patient Root Information Model FIND	No	Yes
Patient Root Information Model MOVE	No	Yes
Study Root Information Model FIND	Yes	Yes
Study Root Information Model MOVE	Yes	Yes
Workflow Management		
Storage Commitment Push Model	Yes	Yes



Note: *Relation queries are not supported either as an SCU or SCP.*

Networking

Implementation Model



Figure 1 Application Data Interface

Functional Definition of AE

Functional Definition of VERIFICATION SCP Service

The OncoView Server will respond to C-ECHO messages sent to it.

Functional Definition of STORAGE SCP Service

The STORAGE-SCP waits for another application to connect by listening on the TCP port. When another application entity attempts to connect, a Negotiation will occur in which the two entities must agree on a Presentation Context, that is the type of data (Abstract Syntax) and the format of the data (Transfer Syntax) that will be exchanged between the calling application entity and the STORAGE-SCP application entity. The STORAGE-SCP AE accepts Associations with Presentation Contexts for SOP Classes of the Verification, Storage, and Storage Commitment Service Classes. Any data objects (images, plans, reports, documents, or other data) received on such Presentation Contexts will be added to the OncoView Server database and/or passed on to either a workstation or a 3rd party PACS. If a Storage Commitment Push Model N-ACTION Request is received, then the STORAGE-COMMITMENT-SCP AE will immediately check if the referenced SOP Instances are in the database and return an N-EVENT-REPORT notification. It does not “cache” Storage Commitment Push Model Requests and wait for a SOP Instance to be received at a later time.

Functional Definition of STORAGE SCU Service

The STORAGE-SCU AE can be invoked by the QUERY-RETRIEVE-SCP AE to trigger the transfer of specific data objects (images, plans, reports, documents, or other data) to a remote destination AE. The STORAGE-SCU AE can also be invoked by the STORAGE-SCP AE if images are to be sent to either a workstation (auto-forwarding) or to a 3rd party PACS (brokering). The STORAGE-SCU AE must be correctly configured in the system configuration table with the host and port number of any external DICOM AE's that are to be C-MOVE retrieval destinations. The Presentation Contexts to use are determined from the headers of DICOM files to be transferred ((0008,0016) [SOP Class UID] and (0002,0010) [Transfer Syntax UID] (if present)). Some conversion of the DICOM image objects is possible if the original Presentation Context is not supported by the remote destination AE or if compression is preferred.

Functional Definition of QUERY-RETRIEVE SCP Service

The QUERY-RETRIEVE-SCP AE waits for another application entity to connect to it by listening on the TCP port configured in the system configuration file. When another application entity attempts to connect, a Negotiation will occur in which the two entities must agree on a Presentation Context, that is the type of data (Abstract Syntax) and the format of the data (Transfer Syntax) that will be exchanged between the calling application entity and the QUERY-RETRIEVE-SCP application entity. The QUERY-RETRIEVE-SCP AE accepts Associations with Presentation Contexts for SOP Classes of the Verification and Query/Retrieve Service Classes. It will handle query and retrieve requests on these Presentation Contexts and respond with data objects with values corresponding to the contents of the OncoView Server database. For C-MOVE requests, the destination for the data objects is determined from the Destination AE Title contained in the C-MOVE request. When a retrieval request is received, the QUERY-RETRIEVE-SCP AE issues a command to the STORAGE-SCU AE to send the specified images to the C-MOVE Destination AE.

Functional Definition of QUERY-RETRIEVE SCU Service

The QUERY-RETRIEVE-SCU is invoked by the OncoView Server Crawler function, which searches other PACS systems on the hospital network for DICOM data objects corresponding to a patient already stored on the OncoView Server. When the Crawler function finds qualifying data objects residing on another PACS system in the hospital, it generates Instance class records of those objects and stores their location in the OncoView Server database.

Functional Definition of STORAGE-COMMITMENT SCP Service

After the OncoView Server receives and stores data objects (images, plans, reports, documents, or other data) sent to it by a sending application entity, it may receive a Storage Commitment request from the sending application entity. This is the means for the sending application entity to receive confirmation from the STORAGE-SCP (OncoView) that it has stored the images and is committed to keeping them for a set period of time (or indefinitely). When a Storage Commitment Push Model N-ACTION Request is received from the sending application entity, then the STORAGE-COMMITMENT-SCP AE will immediately check if the referenced SOP Instances are in the

database and return a successful N-EVENT-REPORT notification if the referenced SOP Instances are in the database. It does not “cache” Storage Commitment Push Model Requests and wait for a SOP Instance to be received at a later time.

Functional Definition of STORAGE-COMMITMENT SCU Service

The STORAGE-COMMITMENT-SCU is invoked by the OncoView Server Broker function, which requests commitment for storage of SOP Instances of 3rd party PACS systems acting as a broker for storage of DICOM data objects. The Storage Commitment request is made after the OncoView Server has received confirmation of receipt of DICOM data objects from the 3rd party PACS system via a C-FIND operation. The support of 3rd party PACS systems for Storage Commitment is optional. The indication of support of such is configured in the PACS devices table of the OncoView Server.

AE Specifications

OncoView Application Entity Specification

SOP Classes

The OncoView AE provides Standard Conformance to the following DICOM SOP Classes:

Table 2 SOP Classes for Storage-SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	No	Yes
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes

Table 2 SOP Classes for Storage-SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3	Yes	Yes
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes
Enhanced SR Image Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	Yes
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	Yes

Table 2 SOP Classes for Storage-SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	Yes	Yes
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	Yes	Yes
Patient Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	Yes
Patient Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	Yes
Study Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes
Study Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes

These are the default SOP classes. It is possible to alter the configuration in the OncoView Server to provide support for additional SOP Classes.

Association Policies

General

The OncoView AE will both accept and propose Association Requests. The OncoView AE will accept Association Requests for the Verification, Storage, Storage Commitment Push Model, and Query/Retrieve Services. It will propose Associations for the Storage, Query/Retrieve, and Storage Commitment Push Model Services. Some SCP Services (Storage, Query/Retrieve) will themselves initiate Association Requests either to workstations or to 3rd party PACS systems. For example, the C-STORE-SCP will initiate a C-STORE-SCU Association Request to a workstation or 3rd party PACS system for the purpose of sending and/or storing data objects to those systems. In addition, stand-alone tasks such as the Crawler Service in the OncoView Server will initiate C-FIND Association Requests for the purpose of gathering information on data objects stored for a patients whose records exist on the OncoView Server.

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

Application Context Name	1.2.10008.3.1.1.1
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Number of Associations

The OncoView AE can support multiple simultaneous Associations requested by peer AEs. Each time the OncoView AE receives an Association, a child process is spawned to process the Service requests. The maximum number of simultaneous Associations that can be processed is 10 in total.

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

Table 3 Number of Simultaneous Associations as an SCP for OncoView AE

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

Asynchronous Nature

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

Table 4 Asynchronous Nature as an SCP for OncoView AE

Maximum number of outstanding asynchronous transactions	1
---	---

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

Table 5 Outstanding Storage Commitment Push Model Requests for OncoView AE

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

The implementation information for this Application Entity appears in the following table.

Table 6 DICOM Implementation Class and Version For OncoView AE

Implementation Class UID	1.840.xxxxxxx.yyy.(to be completed)
Implementation Version Name	AAAAA_BBBB_C (to be completed)

Association Initiation Policy

Activity – Send Storage Commitment Request over new Association

DESCRIPTION AND SEQUENCING OF ACTIVITY

The OncoView AE will initiate a new Association to send the Storage Commitment Push Model Request (N-ACTION) after it sends DICOM data objects to a 3rd party PACS which supports Storage Commitment as indicated in the PACS devices table in the OncoView Server.



Figure 2 Sequencing of Activity—Send Storage Commitment Request

PROPOSED PRESENTATION CONTEXTS

The OncoView AE will propose Presentation Contexts as shown in the following table.

Table 7 Proposed Presentation Contexts by OncoView AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext neg
Name	UID	Name	UID		
Storage Commitment Push Model	1.2.840.10008.1.20.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

SOP SPECIFIC CONFORMANCE FOR STORAGE COMMITMENT REQUEST SOP CLASSES

The associated Activity with the Storage Commitment Push Model service is the communication by the OncoView AE to peer AEs that it would like to request that the peer AE commit to permanently store Composite SOP Instances that have been sent to it. With the receipt of a storage commitment notification, it thus allows the OncoView AE to determine whether the 3rd party PACS system has taken responsibility for the archiving of specific SOP Instances so that they can be flushed from the OncoView AE system.

Activity – Send Storage Commitment Notification over new Association

DESCRIPTION AND SEQUENCING OF ACTIVITY

The OncoView AE will initiate a new Association to send the Storage Commitment Push Model Notification (N-EVENT-REPORT) when it receives a Storage Commitment Push Model Request. The new Association can be initiated even while the original Association is still open. The new Association will be initiated on the same entity which sent the Storage Commitment Push Model Request and the Storage Commitment Push Model Notification (N-EVENT-REPORT) will be sent on that Association.



Figure 3 Sequencing of Activity—Send Storage Commitment Notification

PROPOSED PRESENTATION CONTEXTS

The OncoView AE will propose Presentation Contexts as shown in the following table.

Table 8 Proposed Presentation Contexts by OncoView AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
Storage Commitment Push Model	1.2.840.10008.1.20.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

SOP SPECIFIC CONFORMANCE FOR STORAGE COMMITMENT NOTIFICATION SOP CLASSES

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

Activity—Send Data Objects Requested by an External Peer AE or by the Auto-Forward or Broker Services

DESCRIPTION AND SEQUENCING OF ACTIVITY

The OncoView AE will initiate a new Association under the following circumstances:

1. In response to a C-MOVE request from an external peer AE
2. In response to an incoming data object via C-STORE request being redirected either to an external workstation via instructions in the auto-forward configuration or to a 3rd party PACS via instructions in the broker configuration

An Association Request is sent to the specified destination AE (from the Destination AE in the C-MOVE request in a) above or from the destination in either the auto-forward or broker tables in b) above). Upon successful negotiation of the required Presentation Context, the image transfer is started. In all cases, an attempt will be made to transmit all indicated data objects in a single Association, but this may not always be possible. The Association will be released when all of the data objects have been sent. If an error occurs during transmission over an open Association, the data object transfer is halted. The C-STORE-SCU process will not attempt to independently retry the data object export.



Figure 4 Sequencing of Activity—Sendintg Images Requested by Peer AE

PROPOSED PRESENTATION CONTEXTS

The OncoView AE will propose Presentation Contexts as shown in the following table.

Table 9 Proposed Presentation Contexts by OncoView AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	—	—
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	—	—	—	—
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	—	—	—	—
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	—	—	—	—
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	—	—	—	—
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.1.2.1	—	—	—	—
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.1.2.1.1	—	—	—	—
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.1.2.2	—	—	—	—
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.1.3	—	—	—	—
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.2.0	—	—	—	—

Table 9 Proposed Presentation Contexts by OncoView AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.6 6.1	—	—	—	—
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.6 6.3	—	—	—	—
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.8 8.33	—	—	—	—
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.1 04.1	—	—	—	—
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.1 28	—	—	—	—
RT Image Storage	1.2.840.10008.5.1.4.1.1.4 81.1	—	—	—	—
RT Dose Storage	1.2.840.10008.5.1.4.1.1.4 81.2	—	—	—	—
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.4 81.3	—	—	—	—
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.4 81.4	—	—	—	—
RT Plan Storage	1.2.840.10008.5.1.4.1.1.4 81.5	—	—	—	—
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.4 81.6	—	—	—	—
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.4 81.7	—	—	—	—
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.4 81.8	—	—	—	—

Table 9 Proposed Presentation Contexts by OncoView AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.4 81.9	—	—	—	—

SOP SPECIFIC CONFORMANCE FOR DATA OBJECT SOP CLASSES

Composite DICOM SOP Instances are maintained as DICOM Part 10 compliant files in the OncoView Server local store as well as in any external 3rd party PACS systems to which the OncoView Server may send data objects for storage. The entire set of tags received with the image will be saved in the OncoView Server; this includes all Private and SOP Extended Elements. When a SOP Instance is selected for export via the OncoView Server (either from the local store or from a 3rd party PACS), its content will be exported as it was originally received except for a few possible exceptions. The format of data objects stored by the OncoView Server may be different than was originally sent due to different transfer syntax.

Patient demographic and Study information will remain unaltered in the DICOM data objects. However, a Patient Map is kept in the OncoView Server database, so images with different Patient Names (e.g. maiden or married names) or Patient IDs may be grouped under a single patient.

The OncoView Server creates log files which can be used to monitor the status of the server and diagnose any problems which may arise. If an error occurs during a DICOM operation, messages are output to these log files.

The OncoView AE will exhibit the following behavior according to the Status Code value returned in a C-STORE Response from a destination C-STORE SCP.

Table 10 OncoView AE C-Store Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	The SCP has successfully stored the exported SOP Instance. The Query/Retrieve service will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response.
Refused	Out of Resources	A700 – A7FF	This is treated as a permanent failure.
Error	Data Set does not match SOP Class	A900- A9FF	One or more required DICOM elements are missing. This is treated as a permanent failure.
Error	Cannot Understand	C000 - CFFF	This is treated as a permanent failure.
Warning	—	B000 - BFFF	Image transmission is considered successful.

Activity—Query Remote AE

DESCRIPTION AND SEQUENCING OF ACTIVITIES

An attempt will be made to query a remote AE in response to a request from the Crawler service.



Figure 5 Sequencing of Activities—Querying 3rd Party PACS

PROPOSED PRESENTATION CONTEXTS

Table 11 Proposed Presentation Contexts for FIND-SCU and Query Remote AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
Patient Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Study Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

SOP SPECIFIC CONFORMANCE FOR 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.

All queries are initiated at the highest level of the information model (in this case, the STUDY level), and then for each response received, recursively repeated at the next lower levels (the SERIES and then IMAGE levels), in order to completely disambiguate the “tree” of instances available on the remote AE.

No CANCEL requests are ever issued.

Activity—Retrieve from Remote AE

DESCRIPTION AND SEQUENCING OF ACTIVITIES

C-MOVE requests to a remote AE (3rd party PACS) are initiated by the Query/Retrieve process in response to C-MOVE requests received by it for data objects which happen to reside on an external 3rd party PACS. For the entity (study, series, or instance) selected, a single attempt will be made to retrieve it from the specified remote AE. If the retrieve fails, for whatever reason, no retry will be performed.



Figure 6 Sequencing of Activities—Retrieve From Remote AE

PROPOSED PRESENTATION CONTEXTS

Table 12 Proposed Presentation Contexts for FIND-SCU and Query Remote AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
Patient Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 12 Proposed Presentation Contexts for FIND-SCU and Query Remote AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
Study Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

SOP SPECIFIC CONFORMANCE FOR 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.

A retrieval will be performed at the STUDY, SERIES, or IMAGE level depending on what level of entity has been specified by the Query/Retrieve process in response to receipt of its own C-MOVE request.

No CANCEL requests are ever issued.

Association Acceptance Policy

Activity—Receive Images and Other Data Objects and Storage Commitment Requests

DESCRIPTION AND SEQUENCING OF ACTIVITY

The OncoView AE accepts associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted, then the Association Request itself is rejected.



Figure 7 Sequencing of Activity—Receive Images and Other Data Objects and Storage Commitment Requests

ACCEPTED PRESENTATION CONTEXTS

The default Behavior of the OncoView AE supports the Implicit VR Little Endian and Explicit VR Little Endian Transfer Syntaxes for all Associations. In addition, a number of JPEG (baseline and extended lossy) compression syntaxes are supported for all image, report, and document storage classes.

If multiple Transfer Syntaxes are proposed per Presentation Context, then all supported Transfer Syntaxes will be accepted and the peer AE can decide which Transfer Syntax to support.

Any of the Presentation Contexts shown in the following table are acceptable to the OncoView AE for accepting data objects:

Table 13 Accepted Presentation Contexts by OncoView AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Storage Commitment Push Model	1.2.840.10008.1.20.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Computed Radiology Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1				
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	DICOM JPEG Baseline (Process 1); Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50	—	—
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1			—	—
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7			—	—

Table 13 Accepted Presentation Contexts by OncoView AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	DICOM JPEG Extended (Process 2 & 4): Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression (Process 4 only)	1.2.840.10008.1.2.4.51	—	—
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1			—	—
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2			—	—
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13			—	—
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.120	DICOM JPEG Lossless Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	—	—
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1			—	—
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3	DICOM JPEG Lossless Non-Hierarchical First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression	1.2.840.10008.1.2.4.70	—	—
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11			—	—
Enhanced SR Image Storage	1.2.840.10008.5.1.4.1.1.88.22			—	—
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.104.1			—	—
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1			—	—

Table 13 Accepted Presentation Contexts by OncoView AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	DICOM JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80	—	—
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	DICOM JPEG-LS	1.2.840.10008.1.2.4.81	—	—
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Lossy (Near-Lossless) Image Compression		—	—
RT Structure Set	1.2.840.10008.5.1.4.1.1.481.3			—	—
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	DICOM JPEG 2000 Compression (Lossless Only)	1.2.840.10008.1.2.4.90	—	—
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5			—	—
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	DICOM JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	—	—
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7			—	—
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	DICOM MPEG2 Main Profile @ Lower Level	1.2.840.10008.1.2.4.100	—	—
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	DICOM RLE Lossless	1.2.840.10008.1.2.5	—	—

SOP SPECIFIC CONFORMANCE FOR VERIFICATION SOP CLASS

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

SOP SPECIFIC CONFORMANCE FOR STORAGE SOP CLASSES

The associated Activity with the Storage Service is the storage of oncology image, reports, planning, and document data received over the network either on the local store or to a 3rd party PACS system. A record of the storage is kept in the OncoView Server database. The OncoView AE will return a failure status if it is unable to store and/or record the data objects sent to it.

The OncoView AE does not have any dependencies on the number of Associations used to send data objects to it. Data objects belonging to more than one Study or Series can be sent over a single or multiple Associations in any order. Data objects belonging to a single Study or Series can also be sent over different Associations in any order. There is no limit on either the number of SOP Instances or the maximum number of total SOP Instance data that can be transferred over a single Association.

The OncoView AE is configured to retain the original DICOM data in DICOM Part 10 compliant file format. The OncoView AE is Level 2 (Full) conformant as a Storage SCP. In addition, all Private and SOP Class Extended Elements are maintained in the DICOM format files. In addition to saving all Elements in files, a subset of the Elements are stored in the OncoView Server database to support query and retrieval request, to maintain associations among various RT data objects, and to allow the updating of Patient, Study, and Series information by user input or HL7 (Health Level Seven) messages.

The OncoView Server assumes that if a DICOM object is sent to it with a SOP Instance UID which is the same as an existing SOP Instance in the database, it is a DICOM object coming from a 3rd party as the result of a C-MOVE operation from the OncoView Server. In this case, the object in question is sent to the cache for possible further processing.

Table 14 OncoView AE C-Store Response Status Return Reasons

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	The Composite SOP Instance was successfully received, verified, and stored either in the local store or on a 3 rd party PACS, and a record of the SOP Instance was stored in the database.

Table 14 OncoView AE C-Store Response Status Return Reasons

Service Status	Further Meaning	Error Code	Reason
Refused	Out of Resources	A700	<p>There was either not enough room on the local store to save the data object or there was no room in the database to store the record of the SOP Instance.</p> <p>Error message is output to the DICOM error log. The SOP Instance is not saved.</p>
Error	Cannot Understand	C000	<p>Error could be because of one of the following:</p> <p>Cannot read or parse the data object.</p> <p>Either Patient Name, Patient ID, Study UID, Series UID, or SOP Instance UID is not defined for the data object.</p> <p>Cannot understand or the OncoView Server does not support the SOP Class of the object.</p> <p>Error message is output to the DICOM error log. The SOP Instance is not saved.</p>



Note: *If a failure condition occurs when handling an Association, then all data objects previously received successfully over the Association are maintained in the OncoView Server database. No previously successfully received data objects are discarded. Even if a data object is successfully received but an error occurs transmitting the C-STORE Response, then this final image is maintained rather than discarded. If the loss of an Association is detected, then the Association is closed.*

SOP SPECIFIC CONFORMANCE FOR STORAGE COMMITMENT SOP CLASS

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

The OncoView AE takes the list of Composite SOP Instance UIDs specified in a Storage Commitment Push Model N-ACTION Request and checks if they are present in the OncoView Server database. As

long as the Composite SOP Instance UIDs are present in the database, the OncoView AE will consider those Composite SOP Instances to actually be successfully archived. The OncoView AE does not require the Composite SOP Instances to actually be successfully written to archive media in order to commit to responsibility for maintaining these SOP instances.

Once the OncoView AE has checked for the existence of the specified Composite SOP Instances, it will then attempt to send the Notification Request (N-EVENT-REPORT-RQ). This notification will be sent over a new Association to the same AE which sent the N-ACTION Request. A successful N-EVENT-REPORT status will be returned if the referenced SOP Instance is in the database. If one or more referenced SOP Instances do not appear in the database, a Failed status will be returned for said SOP Instances.

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

The OncoView AE does not support the optional Storage Media File-Set ID and UID attributes in N-ACTION.

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

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

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

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	The SCP has successfully received the Storage Commitment Push Model N-ACTION Request and can process the commitment request for the indicated SOP Instances.

Activity—Handling Query and Retrieval Requests

DESCRIPTION AND SEQUENCING OF ACTIVITY

The OncoView AE accepts associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted, then the Association Request itself is rejected.

If the OncoView AE receives a query (C-FIND) request, then the response(s) will be sent over the same Association used to send the C-FIND Request.

If the OncoView AE receives a retrieval (C-MOVE) request, then the responses will be sent over the same Association used to send the C-MOVE Request. The OncoView AE will send the requested SOP Instances to the C-MOVE Destination via a C-STORE-SCU request on a separate Association. The OncoView AE will send a C-MOVE Response indicating the status after each C-STORE-SCU send attempt. Once the C-STORE-SCU sending has been completed, the OncoView AE sends a final C-MOVE Response indicating the overall status of the attempted retrieval.



Figure 8 Sequencing of Activity—Handling Query and Retrieval Requests

ACCEPTED PRESENTATION CONTEXTS

The OncoView AE will accept Presentation Contexts for Query and Retrieval as shown in the following table:.

Table 15 Accepted Presentation Contexts by OncoView AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

Table 15 Accepted Presentation Contexts by OncoView AE

Presentation Context Table					
Abstract Syntax(es)		Transfer Syntax(es)		Role	Ext Neg
Name	UID	Name	UID		
Patient Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.2.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Patient Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.2.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.2.2.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.2.2.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

SOP SPECIFIC CONFORMANCE FOR VERIFICATION SOP CLASS

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

SOP SPECIFIC CONFORMANCE FOR QUERY SOP CLASSES

The OncoView AE supports hierarchical queries and not relational queries. There are no attributes always returned by default. Only those attributes requested in the query header are returned. Query responses always return values from the OncoView Server database. Exported SOP Instances are always updated with the latest values in the database prior to export. Thus, a change in Patient demographic information will be contained in both the C-FIND Responses and any Composite SOP Instances exported to a C-MOVE Destination AE.

PATIENT ROOT INFORMATION MODEL

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

STUDY ROOT INFORMATION MODEL

All the required search keys on each of the three levels (Study, Series, and Image) are supported. If no partial values are specified for Study attributes, then either the Patient ID (0010,0010) key or the Patient's Name (0010,0010) should have at least a partial value specified to prevent the return of all patient records in the database.

Table 16 Patient Root C-FIND SCP Supported Elements

Level Name Attribute Name	Tag	VR	Types of Matching
Patient Level			
Patient's Name	0010,0010	P	S*,U
Patient ID	0010,0020	N	S*,U
Patient's Birth Date	0010,0030	LO	NONE
Patient's Sex	0010,0040	D A CS	NONE
Study Level			
Study Instance UID	0020,000D	UI	S,U
Modalities In Study	0008,0061	CS	NONE
Study Date	0008,0020	D	NONE
Study Time	0008,0030	A	NONE
Referring Physician's Name	0008,0090	T	S*,U
Study ID	0020,0010	M	S,U
Accession Number	0008,0050	P	S*,U
Study Description	0008,1030	N SH SH LO	NONE

Table 16 Patient Root C-FIND SCP Supported Elements

Level Name Attribute Name	Tag	VR	Types of Matching
Series Level			
Modality	0008,0060	CS	S,U
Series Number	0020,0011	IS	NONE
Series Instance UID	0020,000E	UI	S,U
Series Date	0008,0021	D	NONE
Series Time	0008,0031	A	NONE
Acquisition Date	0008,0022	T	NONE
Acquisition Time	0008,0032	M	NONE
Series Description	0008,103E	D A T M L O	S,*,U
Image Level			
SOP Instance UID	0008,0018	UI	S,U
SOP Class UID	0008,0016	UI	NONE
Instance Number	0020,0013	IS	NONE
Content Date	0008,0023	D	NONE
Content Time	0008,0033	A T M	NONE

Table 17 Study Root C-FIND SCP Supported Elements

Level Name Attribute Name	Tag	VR	Types of Matching
Study Level			
Patient's Name	0010,0010	P	
Patient ID	0010,0020	N	
Patient's Birth Date	0010,0030	LO	NONE
Patient's Sex	0010,0040	D	NONE
Modality	0008,0060	A	NONE
Study Instance UID	0020,000D	CS	S,U
Study Date	0008,0020	CS	NONE
Study Time	0008,0030	UI	NONE
Referring Physician	0008,0090	D	S*,U
Study Description	0008,1030	A T M P N LO	NONE
Series Level			
Modality	0008,0060	CS	S,U
Series Number	0020,0011	IS	NONE
Series Instance UID	0020,000E	UI	S,U
Series Date	0008,0021	D	NONE
Series Time	0008,0031	A	NONE
Acquisition Date	0008,0022	T	NONE
Acquisition Time	0008,0032	M	NONE
Series Description	0008,103E	D A T M LO	S*,U

Table 17 Study Root C-FIND SCP Supported Elements

Level Name Attribute Name	Tag	VR	Types of Matching
Image Level			
SOP Instance UID	0008,0018	UI	S,U
SOP Class UID	0008,0016	UI	NONE
Instance Number	0020,0013	IS	NONE
Content Date	0008,0023	D	NONE
Content Time	0008,0033	A T M	NONE

The tables should be read as follows:

- Attribute Name: Attributes supported for returned C-FIND responses.
- Tag: Appropriate DICOM tag for this attribute.
- VR: Appropriate DICOM VR for this attribute.
- Types of Matching: The types of Matching supported by the C-FIND SCP. A "S" indicates the identifier attribute can specify Single Value Matching, an "R" will indicate Range Matching, a "*" will denote Wildcard Matching, a "U" will indicate Universal Matching, and "L" will indicate that UID lists are supported for matching. "NONE" indicates that no matching is supported, but that values for this element in the database can be returned.

Table 18 OncoView AE C-Find Response Status Return Reasons

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Matching is complete. No final identifier is supplied.

Table 18 OncoView AE C-Find Response Status Return Reasons

Service Status	Further Meaning	Error Code	Reason
Pending	Matches are continuing and current match is supplied.	FF00	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming.

SOP SPECIFIC CONFORMANCE FOR RETRIEVAL SOP CLASSES

The OncoView AE will initiate an Association with a DICOM Application Entity named by the external C-MOVE SCU (through a MOVE Destination AE Title). It will perform C-STORE operations on Presentation Contexts listed above.

The OncoView Server can support lists of UIDs in the C-MOVE Request at the Study, Series, and Image Levels. The list of UIDs must be at the Level of the C-MOVE Request and above. For example, for Series Level Requests, the Patient ID, Study Instance UID, and Series Instance UID values must be specified.

An initial C-MOVE Response is always sent after confirming that the C-MOVE Request itself can be processed. After this, the OncoView AE will return a response to the C-MOVE SCU after it has attempted to send each data object. This response reports the number of remaining SOP instances to transfer and the number transferred having a successful, failed, or warning status. If the Composite SOP Instances must be retrieved from long-term archive prior to export, there may be quite a long delay between the first C-MOVE Response and the next one after the attempt to export the first data object. The maximum length of time for this delay will depend on the particular type of archive used as well as the connectivity status of the PACS network.

ONCOVIEW AE C-MOVE RESPONSE STATUS RETURN REASONS

Table 19 OncoView AE C-Move Response Status Return Reasons

Service Status	Further Meaning	Error Code	Reason
Success	Sub-operations complete – No Failures	0000	All the Composite SOP Instances have been successfully sent to the C-MOVE Destination AE.
Pending	Sub-operations are continuing.	FF00	A Response with this Status Code is sent every time a Composite SOP Instance has been successfully sent to the C-MOVE Destination AE.

Media Interchange

The OncoView Server does not support Media Storage.

Support of Character Sets

The OncoView Server supports the following character sets:

- ISO_IR 100 (ISO 8859-1: 1987 Latin Alphabet No. 1 supplementary set)
- ISO_IR 192 (Unicode in UTF-8)

Application Level Security

The Query/Retrieve SCP and Storage SCP services check the following DICOM values when determining whether to accept Association Open Requests:

- Calling AE Title
- Called AE Title
- Application Context

Each SCP will only accept Associations from a list of Calling AE Titles, which are configured in the OncoView Server. Any Associations from AEs not listed in the AE Titles list in the OncoView Server will be rejected by the OncoView Server.

Saved Attributes

Data Types are defined as follows:

- Type 1—Mandatory data element.
- Type 1C—Type 1 mandatory data element required only when certain conditions are met.

In the OncoView Server, most Type 1 elements must be present. For such elements, an Error status will be returned to the STORE-SCU application if these data elements are not present.

Other Type 1 elements will be accepted by the OncoView Server and will be stored with a default value. Such elements will be indicated as such in the tables below.

- Type 2—Mandatory data element, but can be encoded with zero Value Length and no value.
- Type 2C—Type 2 mandatory data element required only when certain conditions are met.

In the OncoView Server, Type 2 and 2C elements will be processed as no value data elements if they are not present and no Error status will be returned to the C-STORE-SCU application entity if they are not present (except in the case of Patient name (0010,0010) and Patient ID (0010,0020)).

- Type 3—Optional data element.

In the OncoView Server, no Error status will be returned to the C-STORE-SCU application entity when Type 3 data elements are not present in the DICOM object.

Patient Table

Table 20 Patient Table

Attribute Name	Tag	Type	Description
Patient's Name	(0010,0010)	2*	Patient's full legal name
Patient ID	(0010,0020)	2*	Primary hospital identification number or code for the patient
Patient's Birth Date	(0010,0030)	2	Date of birth for the named patient
Patient's Birth Time	(0010,0032)	2	Time of birth for the named patient
Patient's Sex	(0010,0040)	2	Sex of the named patient. Enumerated values: M = male F = female O = other

*=Patient Name (0010,0010) and Patient ID (0010,0020) are required to be present and non-zero in the OncoView Server as DICOM objects are referenced in the OncoView Server using the Patient Name and Patient ID.

Study Table

Table 21 Study Table

Attribute Name	Tag	Type	Description
Study Instance UID	(0020,000D)	1	Unique identifier for the Study
Study Date	(0008,0020)	2	Date the Study started
Study Time	(0008,0030)	2	Time the Study started
Referring Physician's Name	(0008,0090)	2	Name of the patient's referring physician
Study ID	(0020,0010)	2	User or equipment generated Study identifier
Accession Number	(0008,0050)	2	A RIS generated number that identifies the order for the Study
Study Description	(0008,1030)	3	Institution-generated description or classification of the Study performed.

Series Table

Table 22 Series Table

Attribute Name	Tag	Type	Description
Series Instance UID	(0020,000E)	1	Unique identifier of the Series
Modality	(0008,0060)	1	Type of equipment that originally acquired the data used to create the image/other data in this Series
Series Number	(0020,0011)	2*	A number that identifies the Series
Series Date	(0008,0021)	3**	Date the Series started
Series Time	(0008,0031)	3**	Time the Series started
Acquisition Date	(0008,0022)	3	The date the acquisition of data that resulted in this image started

Table 22 Series Table

Attribute Name	Tag	Type	Description
Acquisition Time	(0008,0032)	3	The time the acquisition of data that resulted in this image started
Series Description	(0008,103E)	3**	User provided description of the Series

*=Series Number (0020,0011) is set to a value of '0' if it is not present in the DICOM object.

**=Series Date (0008,0021) and Series Time (0008,0031) are set to StudyDate (0008,0020) and Study Time (0008,0030) respectively if they are not present in the DICOM object.

Instance Table

SOP Common Module

Table 23 SOP Common Module

Attribute Name	Tag	Type	Description
SOP Instance UID	(0008,0018)	1	Unique identifier for the SOP Instance
SOP Class UID	(0008,0016)	1	Unique identifier for the SOP Class

General Image Module

Table 24 General Image Module

Attribute Name	Tag	Type	Description
Image Type	(0008,0008)	3	Image identification characteristics
Instance Number	(0020,0013)	2*	A number that identifies this object instance
Content Date	(0008,0023)	2C	The date the image pixel / other data creation started
Content Time	(0008,0033)	2C	The time the image pixel / other data creation started

* =Instance Number (0020,0013) is set to a value of '0' if it is not present in the DICOM object.

RT Image Module

Table 25 RT Image Module

Attribute Name	Tag	Type	Description
Referenced RT Plan Sequence	(300C,0002)	3	Sequence of one Class/Instance pair describing the RT Plan associated with the image.
>Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the referenced SOP Instance.

RT Dose Module

Table 26 RT Dose Module

Attribute Name	Tag	Type	Description
Dose Summation Type	(3004,000A)	1	Type of dose summation. Defined Terms: PLAN = dose calculated for entire RT Plan FRACTION = dose calculated for a single Fraction Group within RT Plan BEAM = dose calculated for one or more Beams within RT Plan BRACHY = dose calculated for one or more Brachy Application Setups within RT Plan CONTROL_POINT = dose calculated for one or more Control Points within a Beam

Table 26 RT Dose Module

Attribute Name	Tag	Type	Description
Referenced RT Plan Sequence	(300C,0002)	1C	Sequence of one Class/Instance pair describing the RT Plan associated with the dose. Required if Dose Summation Type (3004,000A) is PLAN, FRACTION, BEAM, BRACHY or CONTROL_POINT
>Referenced SOP Instance UID	(0008,1155)	1*	Uniquely identifies the referenced SOP Instance.

*=Referenced SOP Instance UID (0008,1155) is ignored if not present.

RT Structure Set Module

Table 27 RT Structure Set Module

Attribute Name	Tag	Type	Description
Referenced Frame of Reference Sequence	(3006,0010)	3	Sequence of items describing Frames of Reference in which the ROIs are defined.
>Study Instance UID	(0020,000D)	3	Unique Identifier for the study containing the images
>>Series Instance UID	(0020,000E)	3	Unique identifier for the series containing the images.
Structure Set ROI Sequence	(3006,0020)	3	Sequence of ROIs for current Structure Set. One or more items may be included in this sequence.
>ROI Number	(3006,0022)	1*	Identification number of the ROI.
>Referenced Frame of Reference UID	(3006,0024)	1*	Uniquely identifies the Frame of Reference in which the ROI is defined
>ROI Name	(3006,0026)	2	User-defined name for ROI

*=ROI Number (3006,0022) is set to a value of '0' if it is not present in the DICOM object.

RT Plan Module

Table 28 RT Plan Module

Attribute Name	Tag	Type	Description
RT Plan Label	(300A,0002)	1*	User-defined label for treatment plan
RT Plan Name	(300A,0003)	3	User-defined name for treatment plan
RT Plan Date	(300A,0006)	2	Date treatment plan was last modified
RT Plan Time	(300A,0007)	2	Time treatment plan was last modified
Approval Status	(300E,0002)	1*	Approval status at the time the SOP Instance was created
RT Plan Geometry	(300A,000C)	1	Describes whether RT Plan is based on patient or treatment device geometry. Defined Terms: PATIENT = RT Structure Set exists TREATMENT_DEVICE = RT Structure Set does not exist
Referenced Structure Set Sequence	(300C,0060)	1C	Introduces sequence of one Class/Instance pair describing instance of RT Structure Set on which the RT Plan is based. Only a single item shall be permitted in this sequence. Required if RT Plan Geometry (300A,000C) is PATIENT.

Table 28 RT Plan Module

Attribute Name	Tag	Type	Description
Referenced RT Plan Sequence	(300C,0002)	3	Sequence of related SOP Class/Instance pairs describing related instances of RT Plan.
>RT Plan Relationship	(300A,0055)	1**	Relationship of referenced plan with respect to current plan. Defined Terms: PRIOR = plan delivered prior to current treatment ALTERNATIVE = alternative plan prepared for current treatment PREDECESSOR = plan used in derivation of current plan VERIFIED_PLAN = plan which is verified using the current plan. This value shall only be used if Plan Intent (300A,000A) is present and has a value of VERIFICATION.

*=These values are set to a value of "" if it is not present in the DICOM object

**=RT Plan Relationship (300A,0055) is ignored if not present.

RT Treatment Record Module

Table 29 RT Treatment Record Module

Attribute Name	Tag	Type	Description
Treatment Date	(3008,0250)	2	Date when current fraction was delivered, or Date last fraction was delivered in case of RT Treatment Summary Record IOD.
Treatment Time	(3008,0251)	2	Time when current fraction was delivered, or Time last fraction was delivered in case of RT Treatment Summary Record IOD.

Table 29 RT Treatment Record Module

Attribute Name	Tag	Type	Description
Referenced RT Plan Sequence	(300C,0002)	2	Sequence which provides reference to one RT Plan SOP Class/Instance pair.
>Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the referenced SOP Instance.

*=Referenced SOP Instance UID (0008,1155) is ignored if not present.

Registration

Table 30 Registration

Attribute Name	Tag	Type	Description
Referenced Series Sequence	(0008,1115)	3	Sequence of series items
Studies Containing Other Referenced Instances Sequence	(0008,1200)	3	List of Studies other than the Study of which this Instance is a part