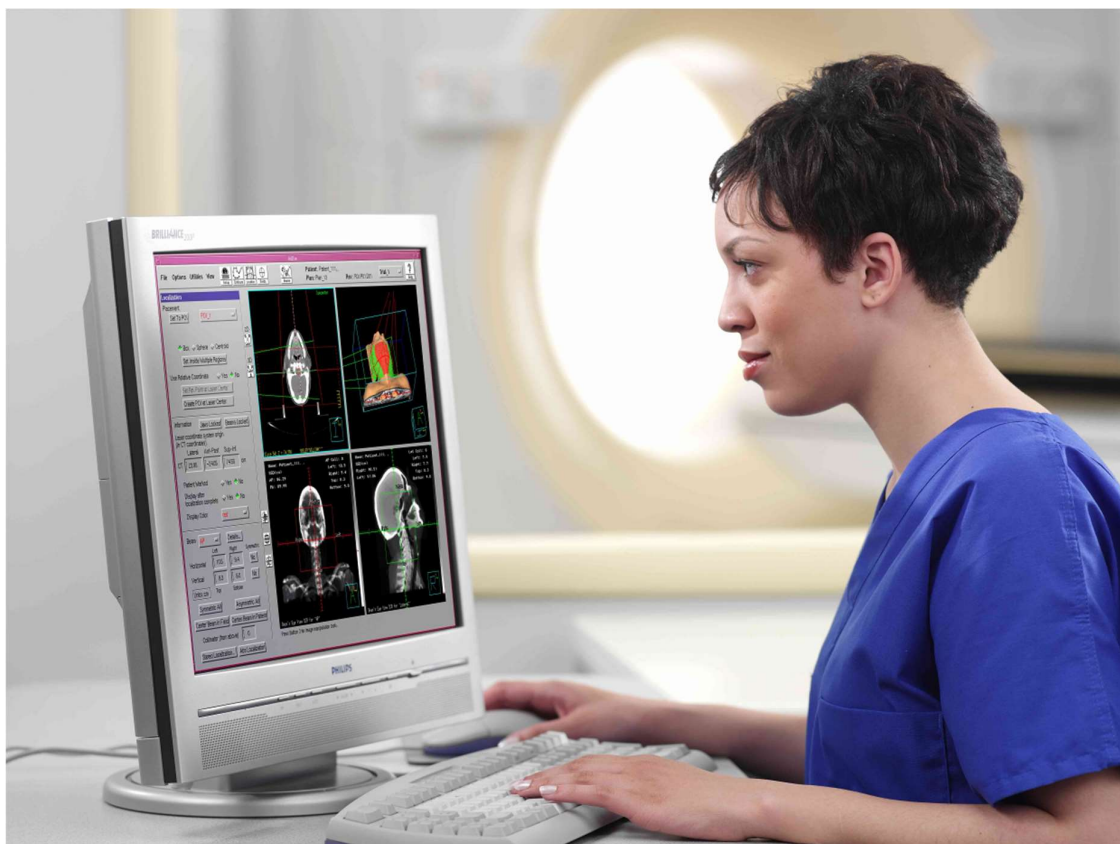# DICOM Conformance Statement

Pinnacle3 Radiotherapy Treatment Planning System R16.2.1

PHILIPS

Issued by:

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Internet: https://www.usa.philips.com/healthcare/about/customer-support

Document Number: DHF305591
Date   : 18-Jan-2019

1. DICOM Conformance Statement Overview

This conformance statement refers to the "Pinnacle[3] Radiation Treatment Planning System" which is used in conjunction with the record and verify (R&V) systems. This version of DICOM Conformance Statement applies to Philips Pinnacle workstation, version 16.2.1

Pinnacle[3] sets the standard for 3D treatment planning and visualization systems. As an imaging workstation, Pinnacle[3]'s sophisticated 2D and 3D imaging options, multi-modality image fusion, and treatment simulation tools allow users to accurately localize and delineate target and critical structures. Fully integrated photon, electron, proton, stereotactic radio surgery, and brachytherapy treatment planning allow users to perform all of their treatment planning from a single platform. Finally, accurate 3D dose calculation algorithms and plan evaluation tools facilitate the applications of new treatment techniques.

It contains a short description of the applications involved and provides technical information about the data exchange capabilities of the equipment. The main elements describing these capabilities are: the supported DICOM Service Object Pair (SOP) Classes, Roles, Information Object Definitions (IOD) and Transfer Syntaxes.

This application was developed using the MergeCOM-3 Advanced Software Tool Kit for DICOM Services supplied by Merge Technologies Incorporated, Milwaukee, Wisconsin USA.

The following Table presents an overview of all network services and the applicable SOP Classes as provided by the Pinnacle[3].

<div align="center">Table 1: Network Services</div>

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	**UID**		
Other			
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes
Print Management			
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes	No
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No
Transfer			
Positron Emission Tomography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Nuclear Medicine Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
RT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
RT Dose Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes
RT Structure Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes
RT Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
RT Ion Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.8	Yes	No
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	No	Yes
Spatial Registration Storage SOP Class	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	Yes	No

2. Table of Contents

3. Introduction

The introduction specifies product and relevant disclaimers as well as any general information that the vendor feels is appropriate.

3.1. Revision History

The revision history provides dates and differences of the different releases.

Table 2: Revision History

Document Version	Date of Issue	Status	Description
00	19 Jan 2019	Approved	Final version

3.2. Audience

This Conformance Statement is intended for:
- (Potential) customers
- System integrators of medical equipment
- Marketing staff interested in system functionality
- Software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

3.3. Remarks

The DICOM Conformance Statement is contained in chapter 4 through 8 and follows the contents and structuring requirements of DICOM PS 3.2.

This DICOM Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

- **Interoperability**
  Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment.
  It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

- **Validation**
  Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement.
  Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

- **New versions of the DICOM Standard**
  The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery. The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

3.4. Definitions, Terms and Abbreviations

Table 3: Definitions, Terms and Abbreviations

Abbreviation/Term	Explanation
AE	Application Entity
CD	Compact Disc
CD-R	CD-Recordable
CD-M	CD-Medical
CR	Computed Radiography
CT	Computed Tomography
DICOM	Digital Imaging and Communications in Medicine
EBE	Explicit VR Big Endian
ELE	DICOM Explicit VR Little Endian
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
ILE	DICOM Implicit VR Little Endian
IOD	Information Object Definition
Intensity Projection	An image set created by combining multiple pulmonary gated image sets.
MPPS	Modality Performed Procedure Step
MR	Magnetic Resonance
NEMA	National Electrical Manufacturers Association
NM	Nuclear Medicine
PDU	Protocol Data Unit
RIS	Radiology Information System
RT	Radiotherapy
RWA	Real-World Activity
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier

3.5. References

[DICOM] Digital Imaging and Communications in Medicine, Parts 1 - 21 (NEMA PS 3.1- PS 3.21),
National Electrical Manufacturers Association (NEMA) Publication Sales 1300 N. 17th Street, Suite 900 Rosslyn, Virginia. 22209,
United States of America
Internet: https://www.dicomstandard.org/

4. Networking

This section contains the networking related services (vs. the media related ones).

4.1. Implementation model

The implementation model consists of three sections:

- The application data flow diagram, specifying the relationship between the Application Entities and the "external world" or Real-World Activities,
- A functional description of each Application Entity, and
- The sequencing constraints among them.

4.1.1. Application Data Flow

The Pinnacle SCP server application stores received DICOM message information within a standard UNIX directory. This directory is specified on the command line of the application launched at system boot. The messages may then be imported into the Pinnacle³ database via the Launch Pad application's Import capability.

For DICOM RT messages, import is performed within the Pinnacle³ application. The Plan or Structure Set information is added to the plan being edited.

The Pinnacle SCP is a daemon, started at system boot, which runs continuously. Launch Pad is a Pinnacle³ application which utilizes an associated DICOM-to- Pinnacle³ file format converter to import DICOM image data to the Pinnacle³ database.

The Pinnacle SCU is the Pinnacle³ application. (Note that the actual AE Title will be the name of the workstation, capitalized; the default name ADACRTP_SCU will only be used if the workstation name cannot be determined.) The Pinnacle SCU will answer Verification requests only if the application is running. Print and RT transmission requests are submitted as requested by the user. It can also send the received CT, MR, NM, and PET images back to the remote server via the DICOM Image Export feature of Launch Pad or CT images used as the primary dataset of the Pinnacle³ plan via the DICOM Image Export feature of Pinnacle³.

The Pinnacle³-related Implementation Model is shown in the following figure.
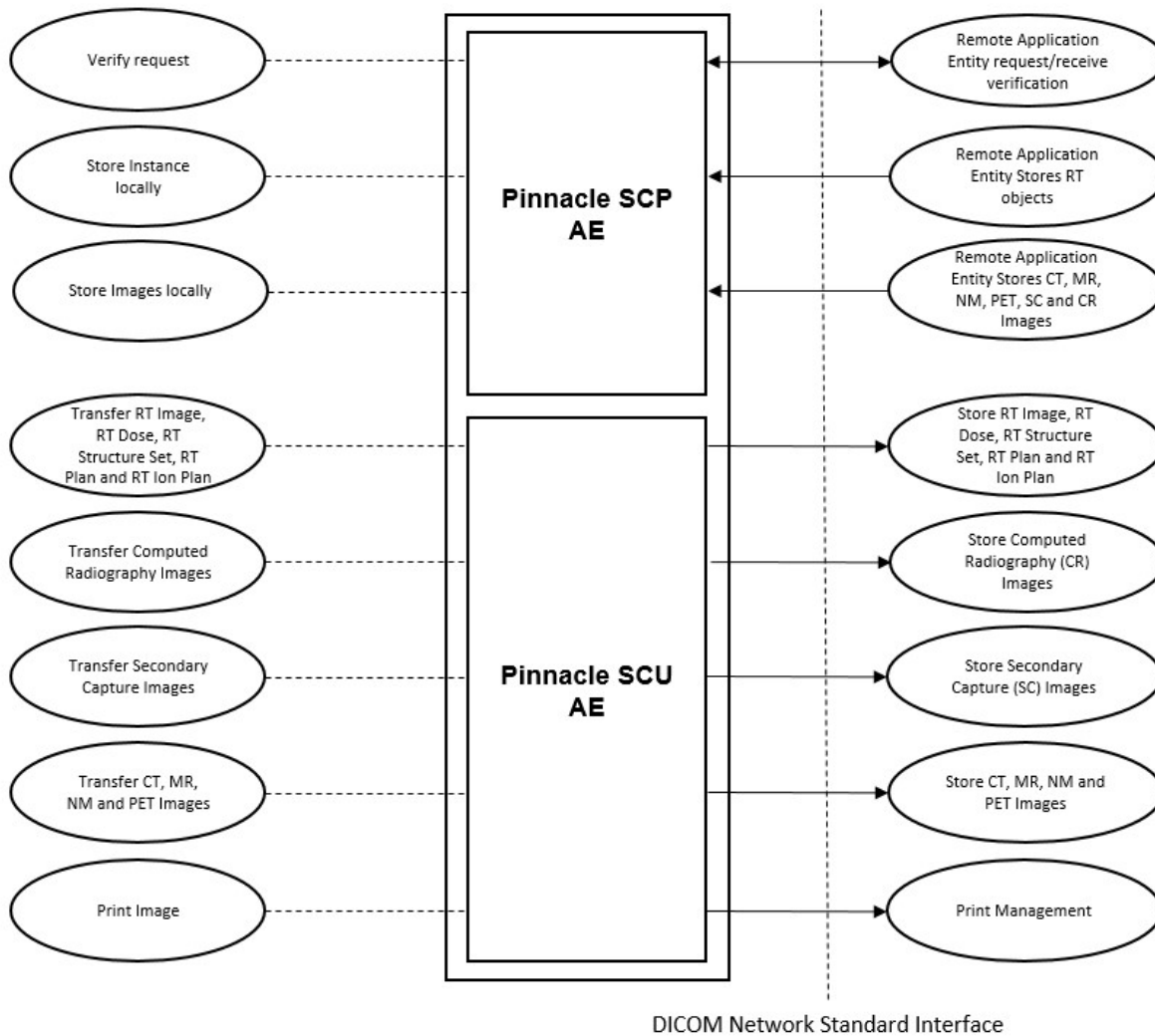
Figure 1: Pinnacle Implementation Model

As documented in PS 3.4, the arrows in the diagram have the following meanings:
An arrow pointing to the right indicates the local application entity initiates an association.
An arrow pointing to the left indicates the local application entity accepts an association.

4.1.2. Functional Definition of AE's

This section contains a functional definition for each individual local Application Entity.

4.1.2.1. Functional Definition of the Pinnacle SCP

The Pinnacle SCP server application waits until it receives a C-STORE request from a remote SCU. Upon receipt it will save the received data to a directory with a unique file name. The server is capable of handling multiple associations.

The Pinnacle SCP is a daemon, started at system boot, which runs continuously.
When invoked, the DICOM-to- Pinnacle³ file format converter will scan the directory of files for image messages written by the Pinnacle SCP to determine if individual files may be associated. The association criterion is a matching Series Instance UID. If files belong to the same series, they will be imported to Pinnacle³ as a single data set.

Launch Pad is a Pinnacle[3] application that utilizes the DICOM-to- Pinnacle[3] file format converter to import DICOM image data to the Pinnacle[3] database.

4.1.2.2. Functional Definition of the Pinnacle SCU

Import of RT Plan and RT Structure Set IODs is accomplished within Pinnacle[3]. The user creates a plan, edits it, and invokes the import operation. The message files will be scanned for RT messages and the selections presented to the user. On import the plan will be populated with the information as described in the selected RT Plan and/or RT Structure Set messages.

The Pinnacle[3] application, using the workstation's name as the AE Title or failing that, ADACRTP_SCU, communicates with the remote application using the DICOM protocol. At the user's request an association is established with the AE defined in the printer configuration just prior to sending a print request to that AE. After completion of the transmission the association is closed.

The Pinnacle[3] application also communicates with a remote SCP to transfer RT Plan, RT Structure Set, RT Dose, and RT Image IODs. At the user's request an association is established with an AE defined during installation. After completion of the transmission the association is closed. It is also capable of sending the CT, MR, NM and PET images back to the remote server, via the DICOM Image Export feature of Launch Pad or CT images used as the primary dataset of the Pinnacle[3] plan within the DICOM Image Export feature of Pinnacle[3].

The Pinnacle[3] application also communicates with a remote SCP to transfer computed radiography and secondary capture IODs. At the user's request an association is established with an AE. After completion of the transmission the association is closed.

4.1.3. Sequencing of Real World Activities

This section contains description of specific sequencing as well as potential constraints of Real-World Activities, including any applicable user interactions, as performed by the DICOM Server. Depending on the configured AE Title, when the DICOM Server receives the Storage Commitment request, the instances specified in the Storage Commitment would be automatically imported into LaunchPad in case of automatic import. It is verified that they are stored to disk in case of manual import.
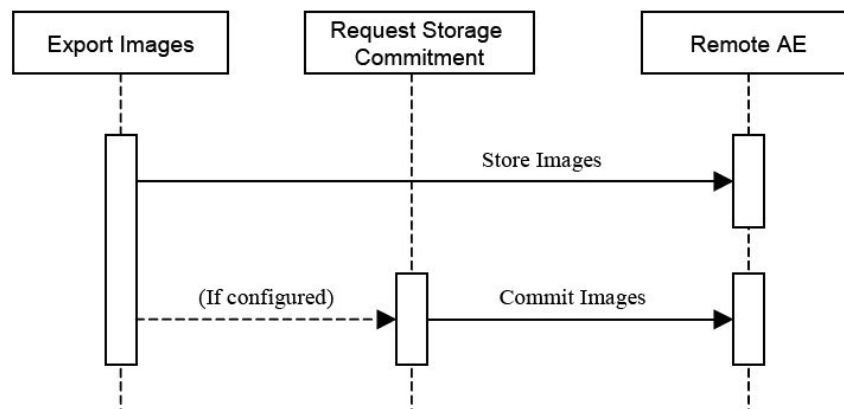
Figure 2: RWA Sequencing for Export Images

4.2. AE Specifications

The Network capabilities of the system consist of two DICOM Application Entities:
- An Imaging, RT Plan, RT Ion Plan, RT Dose, RT Structure Set, Spatial Registration, and Storage Commitment Import Storage AE (Pinnacle SCP)
- A Send Print, RT Plan, RT Ion Plan, RT Image, RT Dose, Structure Set, Computed Radiography, Secondary Capture, Spatial Registration, and Imaging AE (Pinnacle SCU)

Throughout this document ADACRTP_SCU is used to specify the AE Title representing the Pinnacle[3] application. In the field the presented AE Title will be the capitalized hostname of the machine sending the message.

4.2.1. Pinnacle SCP

The Pinnacle SCP Application Entity provides Standard Conformance to the DICOM SOP classes as an SCP specified in next table.

4.2.1.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 4: SOP Classes for the Pinnacle SCP

SOP Class Name	SOP Class UID	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes
Positron Emission Tomography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.128	Yes
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Yes
Nuclear Medicine Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.20	Yes
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4	Yes
RT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1	Yes
RT Dose Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.2	Yes
RT Structure Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.3	Yes
RT Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.5	Yes
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Yes
Spatial Registration Storage SOP Class	1.2.840.10008.5.1.4.1.1.66.1	Yes
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Yes

Notes:
- The SCP will accept Secondary Capture Image and RT Image, but Pinnacle does not support it and thus it cannot be opened in Pinnacle application. The sole exception is Philips pulmonary waveform Secondary Capture Image; see section 8.1.2.6.
- The SCP will accept Ultrasound Image, but Pinnacle does not fully support it and thus it likely will not be importable.

Any SOP specific behavior is documented later in the conformance statement in the applicable SOP specific conformance section.

4.2.1.2. Association Policies

Each AE specification contains a description of the general association establishment and acceptance policies of the AE.

4.2.1.2.1.   General

The Pinnacle SCP AE and the Pinnacle SCU AE always propose the following DICOM Application Context Name (ACN): 1.2.840.10008.3.1.1.1.

The maximum PDU length negotiation is included in all association establishment requests. For all services the maximum PDU size is 28672 bytes.

4.2.1.2.2.   Number of Associations

The number of simultaneous associations that will be accepted by the Pinnacle SCP is limited only by system resources. The Pinnacle SCP will spawn a new process to handle each connection request it receives. Therefore, the Pinnacle SCP can support multiple simultaneous connections, and there are no inherent limitations on the total number of simultaneous associations.
The Pinnacle SCU application entity opens a single association for each request.

4.2.1.2.3.   Asynchronous Nature

DICOM asynchronous mode is not supported, meaning that only one transaction may be outstanding over an association at any given point in time.

4.2.1.2.4. Implementation Identifying Information

The value supplied for Implementation Class UID and version name are documented here.

Table 5: DICOM Implementation Class and Version for the Pinnacle SCP

Implementation Class UID	1.3.46.670589.13.16.2.1
Implementation Version Name	PINN_SCP_16_2_1

4.2.1.2.5. Communication Failure Handling

The behavior of the AE during communication failure is summarized in next table.

Table 6: Communication Failure Behavior

Exception	Behavior	Comment
ARTIM Timeout	The system stops the ARTIM timer and closes the transport connection.	Configurable, minimum value=1.
Association Timeout	A release request is sent in order to close the association.	Configurable, minimum value=1.

4.2.1.3. Association Initiation Policy

Not applicable.

4.2.1.4. Association Acceptance Policy

When the Pinnacle SCP accepts an association, it will receive supported SOP Instances and store the messages to disk. There is neither limitation on who may connect to the SCP, nor on the number of simultaneous associations it will support.
When the Pinnacle SCP receives a verification request it responds with a success status.

Import of the data into Pinnacle[3] is a separate operation requested by the user. Upon import the attribute values contained in the message will be verified. Import may be performed from the standard directory, written by the SCP.

4.2.1.4.1. (Real-World) Activity – Verification as SCP

4.2.1.4.1.1. Description and Sequencing of Activities

The Pinnacle SCP accepts Associations from configured systems that wish to verify application level communication using the C-ECHO command.
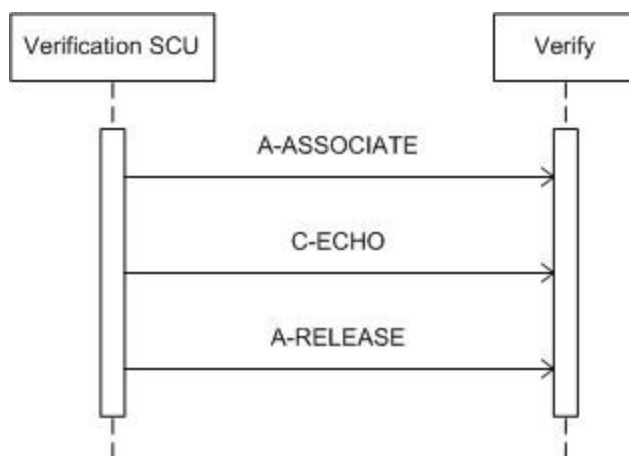
Figure 3: Data Flow Diagram – Verify

4.2.1.4.1.2.   Accepted Presentation Contexts

The presentation contexts are defined in the next table.

Table 7: Acceptable Presentation Contexts for (Real-World) Activity – Verification as SCP

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification SOP Class	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		

4.2.1.4.1.3.   SOP Specific Conformance for Verification SOP Class

The Pinnacle SCP server application responds to remote C-ECHO requests with success status.

4.2.1.4.1.3.1.   Dataset Specific Conformance for Verification C-ECHO SCP

Detail regarding the Dataset Specific response behavior will be reported in this section.

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 8: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Confirmation	Confirm the verification request.

4.2.1.4.2.   (Real-World) Activity – Image Import

4.2.1.4.2.1.   Description and Sequencing of Activities

The Pinnacle SCP server application will automatically handle requests for image storage and store them on receipt of C-STORE requests. Only requests from configured systems would be accepted. The file will be stored in the directory specified at startup of the daemon. This mechanism has been approved for use with Philips SCUs only.

The timers used for the management of associations and DICOM services (i.e., C-STORE) are specified in the configuration files for the server.

The real world activity associated with the C-STORE operation is the storage of the image in the memory of the system upon which DICOM Server is running in order to make it available for immediate processing by applications. DICOM Server will issue a failure status if it is unable to store the image in the memory.
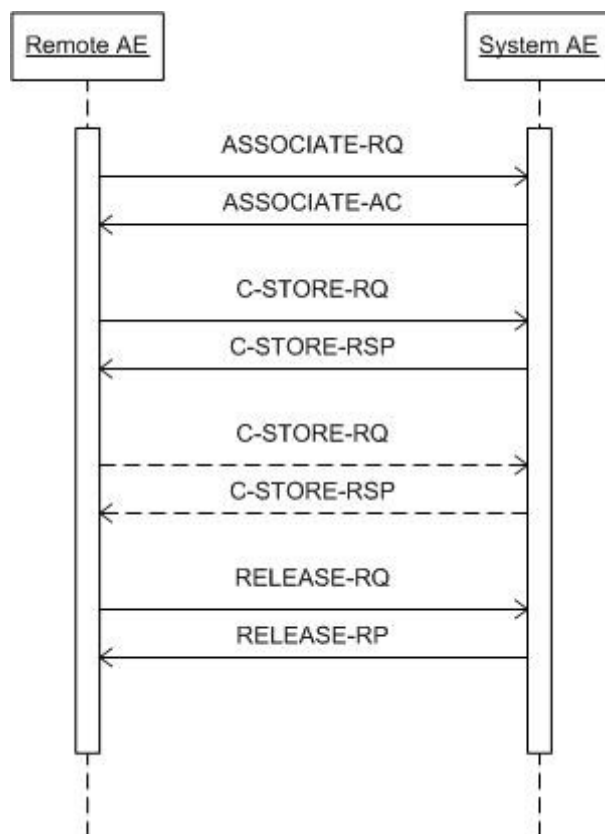
Figure 4: (Real World) Activity - Import

After the images are transferred, a Storage Commitment can be used to ensure the DICOM images are stored onto disk. The Storage Commitment can be sent on the same association as the DICOM images or a separate association. If the Pinnacle SCP is configured for auto import, the Storage Commitment will initiate the automatic import of the images specified in the Storage Commitment into the Launchpad database. If the images cannot be stored to disk, the Pinnacle SCP will issue a failure status in the N-EVENT-REPORT-RSP.

When Pinnacle issues a storage commitment the data is fully stored and ready to use. However, Pinnacle does not take the responsibility for storage of the data for any time frame to store the data, as such data can be manually deleted at any time.
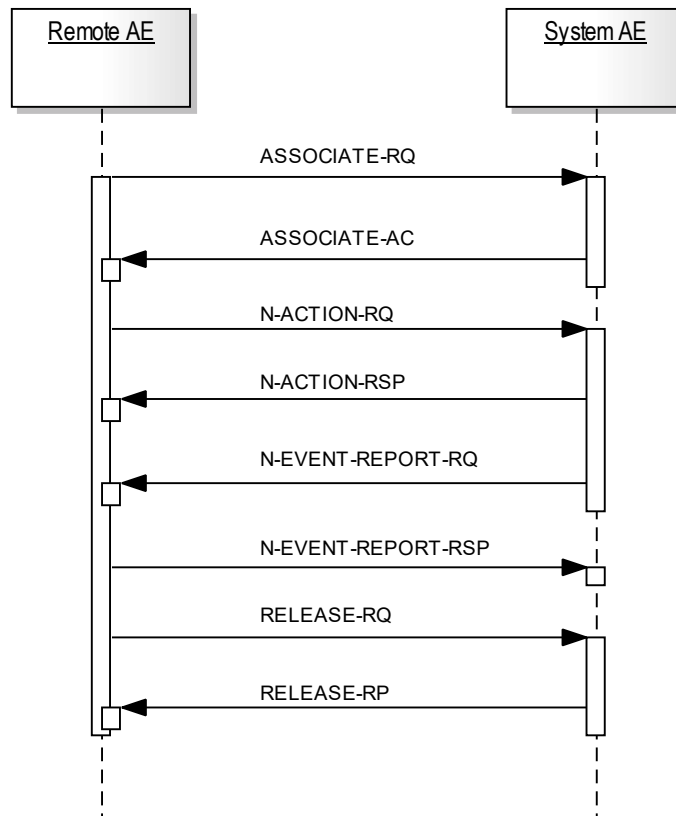
Figure 5: (Real World) Activity - Storage Commitment Push

4.2.1.4.2.2.   Accepted Presentation Contexts

Any of the presentation contexts in next table are acceptable for the Pinnacle SCP to receive images..

Table 9: Acceptable Presentation Contexts for (Real-World) Activity – Import

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Positron Emission Tomography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.128	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Nuclear Medicine Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
RT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
RT Dose Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
	1.2.840.10008.5.1.4.1.1.481.3	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
RT Structure Set Storage SOP Class		Implicit VR Little Endian	1.2.840.10008.1.2		
RT Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.5	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
Spatial Registration Storage SOP Class	1.2.840.10008.5.1.4.1.1.66.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

Note: For import, Pinnacle SCP is preconfigured for Implicit VR Little Endian and Explicit VR Little Endian transfer syntax. It is possible to configure the Pinnacle DICOM server to additionally handle Explicit Big Endian and Implicit Big Endian transfer syntax but it is not configured as such by default.

4.2.1.4.2.3. SOP Specific Conformance for Storage SOP Classes

This section and sub-section includes the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

DICOM Server provides standard conformance to the DICOM V3.0 Storage Service Class as a SCP. DICOM Server conforms to the SOPs of the Storage Service Class at Level 2 (Full). In case of a successful C-STORE, the stored image may be accessed by the processing applications.

4.2.1.4.2.3.1. Dataset Specific Conformance for C-STORE-RSP

The Pinnacle SCP conforms to the SOPs of the Image Storage Service Class at Level 0, meaning a subset of the attributes associated with the image will be stored. All others will be discarded.
Upon receipt of a C-STORE request by the Pinnacle SCP, the message is saved to a file in the directory specified to the process at startup. Upon saving the data to this file, a successful C-STORE-RSP is returned to the sender.
If insufficient resources exist to store the messages, a response indicating such will be transmitted and the association aborted. Images transferred prior to depleting the resources will be preserved. The image in the process of transfer upon depletion of resources will be removed.
Minimal interpretation of the transferred images is performed by the Image Storage SCP. Data consistency and orientation issues are addressed when the data is imported to Pinnacle[3].

Voxel sizing information is required for image data to be used within Pinnacle[3]. If the X, Y, or Z voxel dimensions are missing from the DICOM message, the user will be prompted for proper dimensions on import to Pinnacle[3].

Pinnacle[3] will not accept non-axial data sets for use as a primary data set.
On receipt of Nuclear Medicine data in a multi-image format, each frame of the multi-image is treated as a slice within a volume. The volume is spaced isotropically in the Z dimension.

The following table lists the actions that are performed when an exception occurs. The Service Name Status Responses that are returned by the Pinnacle SCP are given.

4.2.1.4.2.3.2.   Dataset Specific Conformance for Storage Commitment Push

After the Remote AE receives a C-STORE success from the Pinnacle SCP to store the dataset, there is an optional Storage Commitment Push that the Remote AE can send to:

1. Confirm that the dataset have been properly saved to disk. The AE Title for the Pinnacle SCP has to be configured for a manual import.
2. Confirm that the dataset have been automatically imported into the Launchpad database. The AE Title for the Pinnacle SCP has to be configured for an automatic import.

In the N-ACTION-RQ, the Remote AE has to specify the instance UIDs of the dataset that are required to be saved to disk or automatically imported into Launchpad.

If the AE Title is configured for manual import, the Pinnacle SCP will check on disk if the instances specified in the N-ACTION-RQ have been successfully saved to disk. If an instance could not be found on disk, the Pinnacle SCP will issue a failure in the N-EVENT-REPORT-RQ and list all instances of the dataset. If all instances were found on disk, the Pinnacle SCP will issue a success in the N-EVENT-REPORT-RQ and list all instances of the dataset.

If the AE Title is configured for automatic import, the Pinnacle SCP will first check on disk if the instances specified in the N-ACTION-RQ have been successfully saved to disk. If an instance could not be found on disk, the Pinnacle SCP will issue a failure in the N-EVENT-REPORT-RQ and list all instances of the dataset. If all instances were found, the Pinnacle SCP will attempt to import the dataset into the Launchpad database. If the dataset could not be imported into the Launchpad database, the Pinnacle SCP will issue a failure in the N-EVENT-REPORT-RQ and list all instances of the dataset. If the dataset was imported into the Launchpad database, the Pinnacle SCP will issue a success in the N-EVENT-REPORT-RQ and list all instances of the dataset.

Table 10: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0x0000	Successfully stored	Whenever the store operation succeeded.
Error	0xA700	Failed	Notification will be sent. Logging will be done and connection will be aborted.

4.2.2. Pinnacle SCU

4.2.2.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 11: SOP Classes for the Pinnacle SCU

SOP Class Name	SOP Class UID	SCU
Verification SOP Class	1.2.840.10008.1.1	Yes
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	Yes
Positron Emission Tomography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.128	Yes
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Yes
Nuclear Medicine Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.20	Yes
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4	Yes
RT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1	Yes
RT Dose Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.2	Yes
RT Structure Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.3	Yes
RT Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.5	Yes
RT Ion Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.8	Yes
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Yes
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes

SOP Class Name	SOP Class UID	SCU
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes
>Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Yes
>Printer SOP Class	1.2.840.10008.5.1.1.16	Yes
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes
>Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes
>Printer SOP Class	1.2.840.10008.5.1.1.16	Yes

Note: Any SOP specific behavior is documented later in the conformance statement in the applicable SOP specific conformance section.

4.2.2.2. Association Policies

Each AE specification contains a description of the general association establishment and acceptance policies of the AE.

4.2.2.2.1.   General

The Pinnacle SCU Network AE always proposes the following DICOM Application Context Name (ACN): 1.2.840.10008.3.1.1.1.
The maximum PDU length negotiation is included in all association establishment requests. The maximum PDU size is: 28 KB.
Note that the actual local AE Title will be the name of the workstation, capitalized: the default name 'ADACRTP_SCU' will only be used if the workstation name cannot be determined.

Table 12: DICOM Application Context

Description	Value
Application Context Name	1.2.840.10008.3.1.1.1

4.2.2.2.2.   Number of Associations

The Pinnacle SCU application entity opens a single association for each user requested transfer.

Table 13: Number of associations as an Association Initiator for this AE

Description	Value
Maximum number of simultaneous associations	1

4.2.2.2.3.   Asynchronous Nature

DICOM asynchronous mode is not supported meaning that only one transaction may be outstanding over an association at any given point in time.

Table 14: Asynchronous nature as an Association Initiator for this AE

Description	Value
Maximum number of outstanding asynchronous transactions	1

4.2.2.2.4.   Implementation Identifying Information

The value supplied for Implementation Class UID and version name are documented here.

Table 15: DICOM Implementation Class and Version for the Pinnacle SCU

Implementation Class UID	1.3.46.670589.13.16.2.1
Implementation Version Name	PINN_SCU_16_2_1

4.2.2.2.5.   Communication Failure Handling

Not applicable.

4.2.2.3. Association Initiation Policy

The Application Entity will respond to a received Association rejection as shown in the next table.

Associated Real-World Activity:

When transmitting RT IODs, the Pinnacle SCU initiates an association for RT Plan, RT Ion Plan, RT Image, RT Dose, RT Structure Set and Spatial Registration based on the information selected by the user. The association is closed after completion of the transfer. The configuration of the printer in Pinnacle[3] also includes the time-out value to wait for a reply message from the SCP. The default value is 30 seconds. If the time-out is exceeded, the Pinnacle SCU will abort the association.

Associated Real-World Activity for Storage Operations:

The Pinnacle SCU initiates associations on request from the user. An association is established with the specified application entity. The Pinnacle SCU sends a C_STORE request for each message to be sent.

Table 16: Association Rejection response

Result	Source	Reason/Diagnosis	Explanation
1 - rejected-permanent	1 - DICOM UL service-user	1 - no-reason-given	The connection is closed.
		2 - application-context-name-not supported	The connection is closed.
		3 - calling-AE-title-not-recognized	The connection is closed.
		7 - called-AE-title-not-recognized	The connection is closed.
	2 - DICOM UL service-provider (ACSE related function)	1 - no-reason-given	The connection is closed.
		2 - protocol-version-not-supported	The connection is closed.
	3 - DICOM UL service-provider (Presentation related function)	1 - temporary-congestion	The connection is closed.
		2 - Local-limit-exceeded	The connection is closed.
2 - rejected-transient	1 - DICOM UL service-user	1 - no-reason-given	The connection is closed.
		2 - application-context-name-not-supported	The connection is closed.
		3 - calling-AE-title-not-recognized	The connection is closed.
		7 - called-AE-title-not-recognized	The connection is closed.
	2 - DICOM UL service-provider (ACSE related function)	1 - no-reason-given	The connection is closed.
		2 - protocol-version-not-supported	The connection is closed.
	3 - DICOM UL service-provider (Presentation related function)	1 - temporary congestion	The connection is closed.
		2 - local-limit-exceeded	The connection is closed.

The behavior of the AE on receiving an association abort is summarized in next table.

Table 17: Association Abort Handling

Source	Reason/Diagnosis	behavior
0 - DICOM UL service-user (initiated abort)	0 - reason-not-specified	The connection is closed.
2 - DICOM UL service-provider (initiated abort)	0 - reason-not-specified	The connection is closed.
	1- unrecognized-PDU	The connection is closed.
	2 - unexpected-PDU	The connection is closed.
	4 - unrecognized-PDU parameter	The connection is closed.
	5 - unexpected-PDU parameter	The connection is closed.

Source	Reason/Diagnosis	behavior
	6 - invalid-PDU-parameter value	The connection is closed.

4.2.2.3.1.   (Real-World) Activity – Verification as SCU

4.2.2.3.1.1.   Description and Sequencing of Activities

The Pinnacle SCU implements the Verification service class / Verification SOP class to verify application level communication.
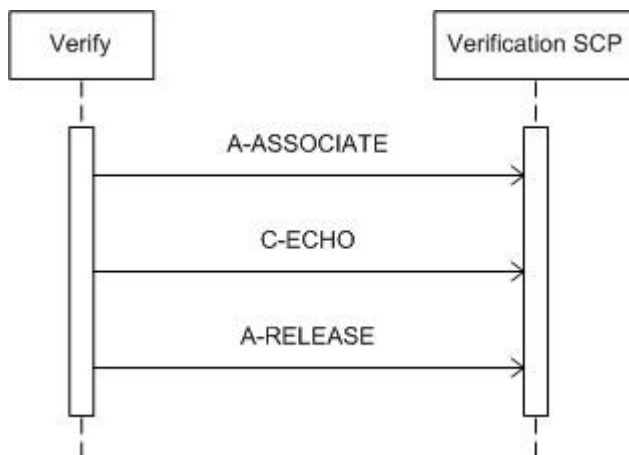
Figure 5: Data Flow Diagram – Verification as SCU

4.2.2.3.1.2.   Proposed Presentation Contexts

The presentation contexts are defined in the next table.

Table 18: Proposed Presentation Contexts for (Real-World) Activity – Verification as SCU

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

4.2.2.3.1.3.   SOP Specific Conformance for Verification SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.2.3.1.3.1.   Dataset Specific Conformance for Verification C-ECHO SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 19: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Confirmation	The SCP has successfully returned a verification response.

4.2.2.3.2. (Real-World) Activity – Image Export

4.2.2.3.2.1. Description and Sequencing of Activities

This section contains a UML sequence diagram, which depicts the Application Entity and Real-World Activities as vertical bars and shows the events exchanged between them as arrows.
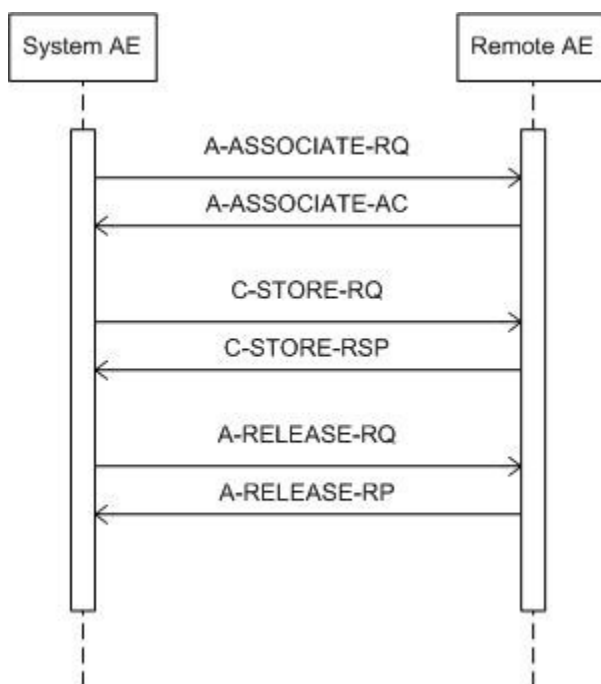
Figure 6: (Real World) Activity - Export

4.2.2.3.2.2. Proposed Presentation Contexts

The presentation contexts are defined in the next table.

Table 20: Proposed Presentation Contexts for (Real-World) Activity – Export

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Positron Emission Tomography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.128	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Nuclear Medicine Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
RT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
RT Dose Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
RT Structure Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
RT Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.5	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
RT Ion Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.8	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Spatial Registration Storage SOP Class	1.2.840.10008.5.1.4.1.1.66.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.2.2.3.2.3.   SOP Specific Conformance for Storage SOP Classes

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.2.3.2.3.1.   Dataset Specific Conformance for C-STORE-RQ

Detail regarding the Dataset Specific response behavior will be reported in this section.
This includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 21: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful stored	None - transfer succeeded
Failure	A700	Refused: Out of Resources	Dataset transfer is aborted
	A900	Error: Data Set does not match SOP Class	Dataset transfer is aborted
	C000	Error: cannot understand	Dataset transfer is aborted
	0110	Processing Failure	Dataset transfer is aborted
Warning	B000	Coercion of Data Elements	Dataset transfer is aborted
	B007	Data Set does not match SOP Class	Dataset transfer is aborted
	B006	Elements Discarded	Dataset transfer is aborted

4.2.2.3.3.   (Real-World) Activity – Print Management as SCU

4.2.2.3.3.1.   Description and Sequencing of Activities

The Pinnacle SCU application entity initiates an association for the Color or Grayscale print services class based on the configuration of the printer in Pinnacle[3]. The association is closed when the response to the N-ACTION on the Basic Film Session or Basic Film Box SOP classes is received.
The configuration of the printer in Pinnacle[3] also includes the time-out value to wait for a reply message from the SCP. The default value is 30 seconds. If the time-out is exceeded, the Pinnacle SCU will abort the association.

The Pinnacle SCU application entity initiates associations for the printing of images to a Basic Print SCP. The image to be printed is specified by the user.

When the user requests a print, an association is established with the configured application entity. The Pinnacle SCU sends a Printer, N-GET message to the Basic Print SCP to determine the status of the printer. This is followed by a Basic Film Session N-CREATE message, which in turn is followed by a Basic Film Box N-Create. Depending on the configuration of the printer, the Pinnacle SCU will then transmit a N-SET message on a Basic Grayscale or Color Image Box. Finally, an N-ACTION message is sent to instruct the Basic Print SCP to print either at the Basic Film Session or at the Basic Film Box level, depending on printer configuration.

The below UML sequence diagram depicts the Application Entity and Real-World Activities as vertical bars and shows the events exchanged between them as arrows.
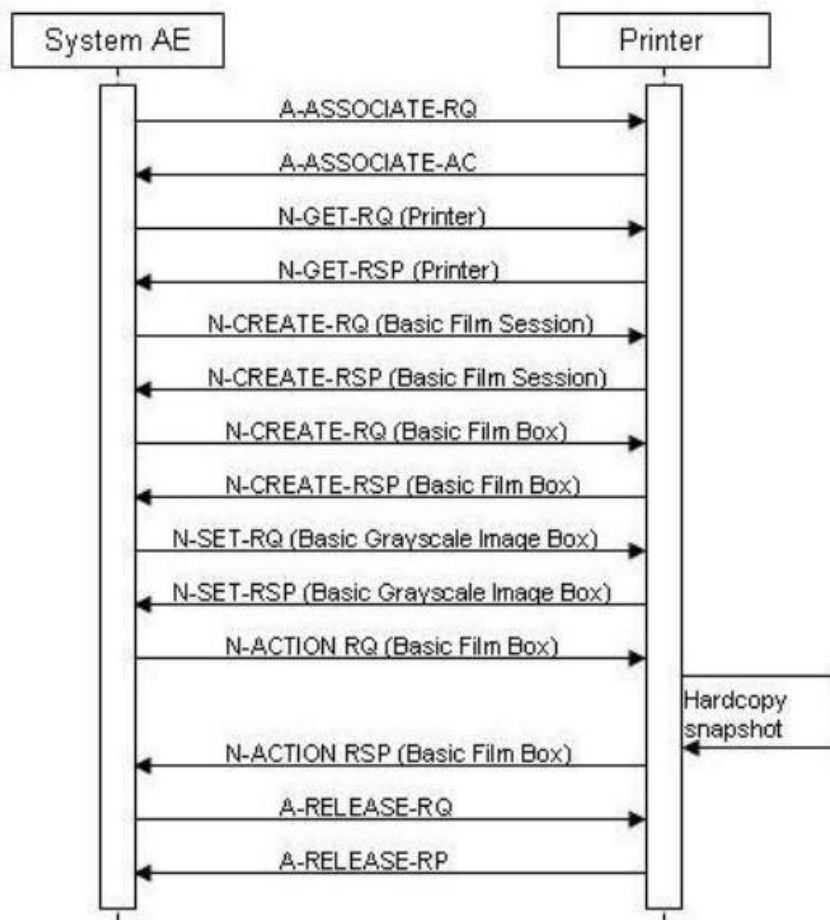
Figure 7: (Real World) Activity - Print Management as SCU

4.2.2.3.3.2.   Proposed Presentation Contexts

The presentation contexts are defined in the next table.

Table 22: Proposed Presentation Contexts for (Real-World) Activity – Print Management As SCU

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Basic Color Print Management Meta SOP Class (1.2.840.10008.5.1.1.18)					
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Presentation Context Table						
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**	
Name	**UID**	**Name List**	**UID List**			
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None	
>Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None	
>Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None	
Basic Grayscale Print Management Meta SOP Class (1.2.840.10008.5.1.1.9)						
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None	
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None	
>Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None	
>Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None	

This section specifies each IOD created (including private IOD's).

Abbreviations used in the Module table for the column "Presence of Value" are:

ALWAYS	The attribute is always present with a value
EMPTY	The attribute is always present without any value (attribute sent zero length)
VNAP	The attribute is always present and its Value is Not Always Present
	(attribute sent zero length if no value is present)
ANAP	The attribute is present under specified condition – if present then it will always have a value
ANAPCV	The attribute is present under specified condition – if present then its Value is Not Always Present
	(attribute sent zero length if condition applies and no value is present)
ANAPEV	The attribute is present under specified condition – if present then it will not have any value

The abbreviations used in the Module table for the column "Source" are:

AUTO	The attribute value is generated automatically
CONFIG	The attribute value source is a configurable parameter
COPY	The attribute value source is another SOP instance
FIXED	The attribute value is hard-coded in the application
IMPLICIT	The attribute value source is a user-implicit setting
MPPS	The attribute value is the same as that use for Modality Performed Procedure Step
MWL	The attribute value source is a Modality Worklist
USER	The attribute value source is explicit user input

4.2.2.3.3.3.   SOP Specific Conformance for Basic Film Session SOP Class of the Basic Color Print Management Meta SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.2.3.3.3.1.   Dataset Specific Conformance for Basic Film Session SOP Class N-CREATE-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

Table 23: Basic Film Session Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Number of Copies	2000,0010	IS	1	ANAPCV	CONFIG, USER	
Print Priority	2000,0020	CS	MEDIUM	ANAPCV	CONFIG, USER	Default: MEDIUM

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Medium Type	2000,0030	CS	PAPER, CLEAR FILM, or BLUE FILM	ANAPCV	USER	Default: PAPER
Film Destination	2000,0040	CS	MAGAZINE, PROCESSOR, BIN_1, BIN_2, BIN_3, BIN_4, BIN_5, BIN_6, BIN_7, or BIN_8	ANAPCV	USER	Default: MAGAZINE

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 24: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.3.2.   Dataset Specific Conformance for Basic Film Session SOP Class N-ACTION-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 25: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.4.   SOP Specific Conformance for Basic Film Session SOP Class of the Basic Grayscale Print Management Meta SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.2.3.3.4.1.   Dataset Specific Conformance for Basic Film Session SOP Class N-CREATE-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

Table 26: Basic Film Session Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Number of Copies	2000,0010	IS	1	ANAPCV	CONFIG, USER	
Print Priority	2000,0020	CS	MEDIUM	ANAPCV	CONFIG, USER	
Medium Type	2000,0030	CS	PAPER, CLEAR FILM, BLUE FILM	ANAPCV	USER	Default: PAPER

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Film Destination	2000,0040	CS	MAGAZINE, PROCESSOR, BIN_1, BIN_2, BIN_3, BIN_4, BIN_5, BIN_6, BIN_7, BIN_8	ANAPCV	USER	Default: MAGAZINE

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 27: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.4.2.   Dataset Specific Conformance for Basic Film Session SOP Class N-ACTION-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 28: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.5.   SOP Specific Conformance for Printer SOP Class of the Basic Color Print Management Meta SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.2.3.3.5.1.   Dataset Specific Conformance for Printer SOP Class N-EVENT-REPORT-SCP

Detail regarding the Dataset Specific response behavior will be reported in this section.

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 29: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.5.2.   Dataset Specific Conformance for Printer SOP Class N-GET-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

Table 30: Printer Module*

Attribute Name	Tag	VR	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	ANAPCV	COPY	None

Attribute Name	Tag	VR	Presence of Value	Source	Comment
Manufacturer's Model Name	0008,1090	LO	ANAPCV	COPY	None
Device Serial Number	0018,1000	LO	ANAPCV	COPY	None
Software Version(s)	0018,1020	LO	ANAPCV	COPY	None
Printer Status	2110,0010	CS	ANAPCV	COPY	None
Printer Status Info	2110,0020	CS	ANAPCV	COPY	None

The System conforms to the SOPs of the Print Service Class at level 2 (full). No data elements are discarded or coerced by the System.

Note: *The actual values depend on the type of printer.

Table 31: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.6.   SOP Specific Conformance for Printer SOP Class of the Basic Grayscale Print Management Meta SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.2.3.3.6.1.   Dataset Specific Conformance for Printer SOP Class N-EVENT-REPORT-SCP

Detail regarding the Dataset Specific response behavior will be reported in this section.

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 32: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.6.2.   Dataset Specific Conformance for Printer SOP Class N-GET-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

Table 33: Printer Module*

Attribute Name	Tag	VR	Value*	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO		ANAPCV	AUTO	None
Manufacturer's Model Name	0008,1090	LO		ANAPCV	AUTO	None
Device Serial Number	0018,1000	LO		ANAPCV	AUTO	None
Software Version(s)	0018,1020	LO		ANAPCV	AUTO	None
Printer Status	2110,0010	CS		ANAPCV	AUTO	None
Printer Status Info	2110,0020	CS		ANAPCV	AUTO	None

The System conforms to the SOPs of the Print Service Class at level 2 (full). No data elements are discarded or coerced by the System.

Note: *The actual values depend on the type of printer.

Table 34: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.7.   SOP Specific Conformance for Basic Film Box SOP Class of the Basic Grayscale Print Management Meta SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.2.3.3.7.1.   Dataset Specific Conformance for Basic Film Box SOP Class N-CREATE-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

Table 35: Basic Film Box Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Display Format	2010,0010	ST	STANDARD\1,1	ALWAYS	CONFIG	
Film Orientation	2010,0040	CS	PORTRAIT	ANAPCV	USER	
Film Size ID	2010,0050	CS	14INX17IN, 14INX14IN, 11INX14IN, 10INX14IN, 10INX12IN, 8INX10IN, 24CMX30CM, or 24CMX24CM	ANAPCV	CONFIG, USER	Default: 14INX17IN
Magnification Type	2010,0060	CS	CUBIC, BILINEAR, or REPLICATE	ANAPCV	CONFIG	Default: CUBIC
Smoothing Type	2010,0080	CS		ANAPCV	CONFIG	
Border Density	2010,0100	CS	BLACK or WHITE	ANAPCV	CONFIG	Default: WHITE
Empty Image Density	2010,0110	CS	BLACK or WHITE	ANAPCV	CONFIG	Default: BLACK
Max Density	2010,0130	US		ANAPCV	CONFIG	
Trim	2010,0140	CS	YES or NO	ANAPCV	CONFIG, USER	Default: NO
Configuration Information	2010,0150	ST		ANAPCV	CONFIG	

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 36: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.7.2.   Dataset Specific Conformance for Basic Film Box SOP Class N-ACTION-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 37: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.8.   SOP Specific Conformance for Basic Film Box SOP Class of the Basic Color Print Management Meta SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.2.3.3.8.1.   Dataset Specific Conformance for Basic Film Box SOP Class N-CREATE-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

Table 38: Basic Film Box Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Display Format	2010,0010	ST	STANDARD\1,1	ALWAYS	CONFIG	
Film Orientation	2010,0040	CS	PORTRAIT	ANAPCV	CONFIG, USER	
Film Size ID	2010,0050	CS	14INX17IN, 14INX14IN, 11INX14IN, 10INX14IN, 10INX12IN, 8INX10IN, 24CMX30CM, or 24CMX24CM	ANAPCV	CONFIG, USER	Default: 14INX17IN
Magnification Type	2010,0060	CS	CUBIC, BILINEAR, or REPLICATE	ANAPCV	CONFIG	Default: CUBIC
Smoothing Type	2010,0080	CS		ANAPCV	CONFIG	
Border Density	2010,0100	CS	BLACK or WHITE	ANAPCV	CONFIG	Default: WHITE
Empty Image Density	2010,0110	CS	BLACK or WHITE	ANAPCV	CONFIG	Default: BLACK
Max Density	2010,0130	US		ANAPCV	CONFIG	
Trim	2010,0140	CS	YES or NO	ANAPCV	CONFIG, USER	Default: NO
Configuration Information	2010,0150	ST		ANAPCV	CONFIG	

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 39: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.8.2.   Dataset Specific Conformance for Basic Film Box SOP Class N-ACTION-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 40: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.9. SOP Specific Conformance for Basic Grayscale Image Box SOP Class of the Basic Grayscale Print Management Meta SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.2.3.3.9.1. Dataset Specific Conformance for Basic Grayscale Image Box SOP Class N-SET-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

Table 41: Image Box Pixel Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Box Position	2020,0010	US	1	ALWAYS	AUTO	
Polarity	2020,0020	CS		ANAPCV	AUTO	NORMAL or REVERSE
Requested Image Size	2020,0030	DS		ANAPCV	AUTO	
Basic Grayscale Image Sequence	2020,0110	SQ		ALWAYS	AUTO	
>Samples per Pixel	0028,0002	US	1	ALWAYS	AUTO	
>Photometric Interpretation	0028,0004	CS	MONOCHROME2	ALWAYS	AUTO	
>Rows	0028,0010	US		ALWAYS	AUTO	
>Columns	0028,0011	US		ALWAYS	AUTO	
>Pixel Aspect Ratio	0028,0034	IS		ANAP	AUTO	Value required only if not 1\1.
>Bits Allocated	0028,0100	US	8	ALWAYS	AUTO	
>Bits Stored	0028,0101	US	8	ALWAYS	AUTO	
>High Bit	0028,0102	US	7	ALWAYS	AUTO	
>Pixel Representation	0028,0103	US	0x0000	ALWAYS	AUTO	
>Pixel Data	7FE0,0010	OW/OB		ALWAYS	AUTO	

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 42: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.3.3.10. SOP Specific Conformance for Basic Color Image Box SOP Class of the Basic Color Print Management Meta SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.2.3.3.10.1. Dataset Specific Conformance for Basic Color Image Box SOP Class N-SET-SCU

Detail regarding the Dataset Specific response behavior will be reported in this section.

Table 43: Image Box Pixel Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Box Position	2020,0010	US	1	ALWAYS	AUTO	
Polarity	2020,0020	CS		ANAPCV	AUTO	NORMAL or REVERSE
Requested Image Size	2020,0030	DS		ANAPCV	AUTO	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Basic Color Image Sequence	2020,0111	SQ		ALWAYS	AUTO	
>Samples per Pixel	0028,0002	US	3	ALWAYS	AUTO	
>Photometric Interpretation	0028,0004	CS	RGB	ALWAYS	AUTO	
>Planar Configuration	0028,0006	US	0	ALWAYS	AUTO	
>Rows	0028,0010	US		ALWAYS	AUTO	
>Columns	0028,0011	US		ALWAYS	AUTO	
>Pixel Aspect Ratio	0028,0034	IS	1\1	ANAP	AUTO	
>Bits Allocated	0028,0100	US	8	ALWAYS	AUTO	
>Bits Stored	0028,0101	US	8	ALWAYS	AUTO	
>High Bit	0028,0102	US	7	ALWAYS	AUTO	
>Pixel Representation	0028,0103	US	0x0000	ALWAYS	AUTO	
>Pixel Data	7FE0,0010	OW/OB		ALWAYS	AUTO	

This part of the section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 44: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information

4.2.2.4. Association Acceptance Policy

Not applicable.

4.3. Network Interfaces

4.3.1. Physical Network Interfaces

The System provides only DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8 of the standard.
TCP/IP is the only protocol stack supported.
Supported physical medium include:
IEEE 802.3-1995, 10BASE-T
IEEE 802.3-1995, 100BASE-TX (Fast Ethernet)
IEEE 802.3, 1000BASE-X (Fiber Optic Gigabit Ethernet).

The TCP/IP Stack as supported by the underlying Operating System.
The API is the WinSock 2 interface as supported by the underlying Operating System.

4.3.2. Additional Protocols

Additional protocols such as used for network management are not applicable.

4.4. Configuration

Any implementation's DICOM conformance may be dependent upon configuration, which takes place at the time of installation. Issues concerning configuration are addressed in this section.

4.4.1. AE Title/Presentation Address Mapping

4.4.1.1. Local AE Titles

DICOM Port: The port number combined with the application entity title identifying the Pinnacle SCP to DICOM clients on the network (default: 104).

Application Entity Title: The name of the Pinnacle SCP by which, combined with the DICOM Port number, DICOM clients may address the server (default: ADACRTP_SCP).

The local AE title mapping and configuration are specified as:

Table 45: AE Title configuration table

Application Entity	Default AE Title	Default TCP/IP Port
DICOM Server	ADACRTP_SCP	104 (Configurable)
Pinnacle	<hostname>; ADACRTP_SCU	Configurable

4.4.1.2. Remote AE Title/Presentation Address Mapping

One or more remote AEs can be configured.
The following AE specific information must be available to configure a remote AE:
- AE title.
- Hostname or IP address (or both).
- Port number.

4.4.2. Parameters

The specification of important operational parameters, their default value and range (if configurable) is specified here.

Table 46: Configuration Parameters Table

General Parameter	Configurable	Default Value
Association Release Time-out	Yes	15 seconds
Association Reply Time-out	Yes	15 seconds
Association Time-out	Yes	30 seconds
Port-Number	Yes	104
Maximum PDU size the AE can receive	Yes	28672 bytes
Maximum PDU size the AE can send	Yes	28672 bytes
Connection Time-out	Yes	15 seconds
Inactivity Time-out	Yes	15 seconds

The customer Support is able to configure the above mentioned parameters.

5. Media Interchange

5.1. Implementation model

5.1.1. Application Data Flow Diagram

Not applicable, Pinnacle³ does not support any Media for image Import/Export.

5.1.2. Functional Definitions of AE's

Not applicable.

5.1.3. Sequencing of Real World Activities

Not applicable.

5.2. AE Specifications

Not applicable.

5.2.1. Media AE Media - Specification

Not applicable.

5.2.1.1. File Meta Information for the Media AE

Not applicable.

5.2.1.2. Real-World Activities

Not applicable.

5.2.1.2.1.   RWA - Read File-set

Not applicable.

5.2.1.2.1.1.   Media Storage Application Profile

Not applicable.

5.2.1.2.1.1.1.   Options

Not applicable.

5.2.1.2.2.   RWA - Create File-set

Not applicable.

5.2.1.2.2.1.   Media Storage Application Profile

Not applicable.

5.2.1.2.2.1.1.   Options

Not applicable.

5.3. Augmented and Private Application Profiles

Not applicable

5.4. Media Configuration

Not applicable.

6. Support of Character Sets

Any support for character sets in Network and Media services is described here.

Table 47: Supported DICOM Character Sets

Character Set Description	Defined Term	ESC Sequence	ISO Registration Number	Code Element	Character Set
Latin alphabet No. 1	ISO_IR 100	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 100	G1	Supplementary set of ISO 8859

* Pinnacle automatically removes certain characters from patient names upon import. These characters are listed in Table 48.

Table 48: Non-Supported Characters

Character	ASCII Code
!	33
"	34
#	35
$	36
%	37
&	38
'	39
(	40
)	41
*	42
+	43
,	44
.	46
:	58
;	59
<	60
=	61
>	62
?	63
@	64
[	91
]	93
`	96
{	123
|	124
}	125
~	126

7. Security

7.1. Security Profiles

Security profiles are not supported in this release.

7.1.1. Security use Profiles

Not applicable.

7.1.2. Security Transport Connection Profiles

Not applicable.

7.1.3. Digital Signature Profiles

Not applicable.

7.1.4. Media Storage Security Profiles

Not applicable.

7.1.5. Attribute Confidentiality Profiles

Not applicable.

7.1.6. Network Address Management Profiles

Not applicable.

7.1.7. Time Synchronization Profiles

Not applicable.

7.1.8. Application Configuration Management Profiles

Not applicable.

7.1.9. Audit Trail Profiles

Not applicable.

7.2. Association Level Security

The Pinnacle does not support Association Level Security. It will open an Association with any device that performs an Association request.

7.3. Application Level Security

The Pinnacle may be configured to only return results to AE-titles that have been configured.

8. Annexes of application "Pinnacle"

8.1. IOD Contents

8.1.1. Created SOP Instance

This section specifies each IOD created by this application.

This section specifies each IOD created (including private IOD's). It should specify the attribute name, tag, VR, and value. The value should specify the range and source (e.g. user input, Modality Worklist, automatically generated, etc.). For content items in templates, the range and source of the concept name and concept values should be specified. Whether the value is always present or not shall be specified.

Abbreviations used in the IOD tables for the column "Presence of Module" are:

ALWAYS   The module is always present
CONDITIONAL   The module is used under specified condition

Abbreviations used in the Module table for the column "Presence of Value" are:

ALWAYS   The attribute is always present with a value
EMPTY   The attribute is always present without any value (attribute sent zero length)
VNAP   The attribute is always present and its Value is Not Always Present
                (attribute sent zero length if no value is present)
ANAP   The attribute is present under specified condition – if present then it will always have a value
ANAPCV   The attribute is present under specified condition – if present then its Value is Not Always Present
                (attribute sent zero length if condition applies and no value is present)
ANAPEV   The attribute is present under specified condition – if present then it will not have any value

The abbreviations used in the Module table for the column "Source" are:

AUTO   The attribute value is generated automatically
CONFIG   The attribute value source is a configurable parameter
COPY   The attribute value source is another SOP instance
FIXED   The attribute value is hard-coded in the application
IMPLICIT   The attribute value source is a user-implicit setting
MPPS   The attribute value is the same as that use for Modality Performed Procedure Step
MWL   The attribute value source is a Modality Worklist
USER   The attribute value source is explicit user input

The Pinnacle³ application can DICOM-transmit CT images via the Tumor LOC Laser Coordinate Transmission mechanism. These images are identical to the received CT images with the following exceptions:
- Transfer Syntax UID is always 1.2.840.10008.1.2 (Implicit VR Little Endian)
- Patient Module is copied from the data entered in Launchpad. See Table 49.

Table 49: CT Image Patient Module as used by the Laser Transmission Functionality

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY, USER	Patient's name, as entered/imported in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/ imported in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/ imported in Launch Pad.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on Launch Pad entry/ import.

8.1.1.1. List of created SOP Classes

Table 50: List of created SOP Classes

SOP Class Name	SOP Class UID
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1
RT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1
RT Dose Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.2
RT Structure Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.3
RT Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.5
RT Ion Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.8
Spatial Registration Storage SOP Class	1.2.840.10008.5.1.4.1.1.66.1
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7
Computed Tomography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2

8.1.1.2. Computed Radiography Image Storage SOP Class

Table 51: IOD of Created Computed Radiography Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	General Series Module	ALWAYS
Series	CR Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Image	General Image Module	ALWAYS
Image	CR Image Module	ALWAYS
Image	VOI LUT Module	ALWAYS
Image	SOP Common Module	ALWAYS

Table 52: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY, USER	Patient's name, as entered/ imported in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/imported in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/imported in Launch Pad.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on Launch Pad entry/import.

Table 53: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Time	0008,0030	TM		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Accession Number	0008,0050	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Referring Physician's Name	0008,0090	PN		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Description	0008,1030	LO		ANAPCV	COPY, USER	Comment as entered/ imported in Launch Pad.
Physician of Record	0008,1048	PN		ANAPCV	COPY, USER	Physician as entered/ imported in Launch Pad.
Study Instance UID	0020,000D	UI		ALWAYS	AUTO, COPY	Copied from the Primary Image set, if imported via DICOM, else it is generated
Study ID	0020,0010	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.

Table 54: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	CR	ALWAYS	AUTO, FIXED, COPY	
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	Generated on Export.
Series Number	0020,0011	IS		VNAP	COPY	Empty.
Laterality	0020,0060	CS		ANAPCV	COPY	Empty.

Table 55: CR Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Body Part Examined	0018,0015	CS		VNAP	COPY	Empty.
View Position	0018,5101	CS		VNAP	COPY	Empty.

Table 56: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	VNAP	AUTO, COPY	
Station Name	0008,1010	SH		ANAPCV	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	Pinnacle[3]	ANAPCV	AUTO, COPY	
Software Version(s)	0018,1020	LO	16.2.1\16.2	ANAPCV	FIXED	

Table 57: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Content Date	0008,0023	DA		ANAPCV	AUTO	Date the transfer was performed.
Content Time	0008,0033	TM		ANAPCV	AUTO	Time the transfer was performed.
Instance Number	0020,0013	IS	1	VNAP	FIXED	
Patient Orientation	0020,0020	CS		ANAPCV	COPY	

Table 58: CR Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Imager Pixel Spacing	0018,1164	DS		ANAPCV	AUTO, COPY	
Photometric Interpretation	0028,0004	CS	MONOCHROME2	ALWAYS	COPY	

Table 59: VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Window Center	0028,1050	DS		ANAP	AUTO, COPY	The default window center value for the image, for display purposes.
Window Width	0028,1051	DS		ANAP	AUTO, COPY	The default window width value for the image, for display purposes.

Table 60: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAP	AUTO, COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	AUTO	
Instance Creation Time	0008,0013	TM		ANAPCV	AUTO	
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.1	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	

8.1.1.3. CT Image Storage SOP Class (Intensity Projections only)

The CT Image Storage SOP class is created for intensity projection image datasets only. Intensity projection datasets can be generated from pulmonary gated CT image acquisitions only. Standard image datasets are exported exactly as they are imported; see section 4.1.1.

Table 61: IOD of CT Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	General Series Module	ALWAYS
Frame of Reference	Frame of Reference	ALWAYS
Equipment	General Equipment Module	ALWAYS
Image	General Image Module	ALWAYS
Image	Image Plane Module	ALWAYS
Image	Image Pixel Module	ALWAYS
Image	CT Image Module	ALWAYS
Image	SOP Common Module	ALWAYS
Not Applicable	Extended DICOM and Private attributes (Refer section 8.5.3)	ALWAYS

Table 62: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY, USER	Patient's name, as entered/ imported in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/ imported in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/ imported in Launch Pad.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on Launch Pad entry/import.

Table 63: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	
Study Time	0008,0030	TM		VNAP	COPY	
Accession Number	0008,0050	SH		VNAP	COPY	
Referring Physician's Name	0008,0090	PN		VNAP	COPY	
Study Description	0008,1030	LO		ANAPCV	COPY	
Physician of Record	0008,1048	PN		ANAPCV	COPY	
Study Instance UID	0020,000D	UI		ALWAYS	COPY	
Study ID	0020,0010	SH		VNAP	COPY	

Table 64: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	CT	ALWAYS	AUTO, FIXED, COPY	
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	Generated upon export.
Series Number	0020,0011	IS		ALWAYS	AUTO	Generated upon export.
Laterality	0020,0060	CS		ANAP	COPY	
Series Description	0008,103E	LO		ALWAYS	CONFIG	Indicates the intensity projection type (MIP, MinIP or AIP) as well as the pulmonary phases used to generate this dataset. Example: MIP 40,50,60%
Patient Position	0018,5100	CS		ANAP	COPY	

Table 65: Frame of Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Frame of Reference UID	0020,0052	UI		ALWAYS	AUTO	Matches the Frame of Reference UID for the primary image set. If the patient position was altered on import, a new Frame of Reference UID will be generated.
Position Reference Indicator	0020,1040	LO		VNAP	COPY	

Table 66: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	VNAP	FIXED	
Station Name	0008,1010	SH		ANAPCV	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	Pinnacle[3]	ANAPCV	FIXED	
Software Version(s)	0018,1020	LO	16.2.1\16.2	ANAPCV	FIXED	

Table 67: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Content Date	0008,0023	DA		ANAPCV	AUTO	
Content Time	0008,0033	TM		ANAPCV	AUTO	
Instance Number	0020,0013	IS		ALWAYS	COPY, AUTO	Used as slice number. If no value exist in the source image set or values are the same throughout the image set, slice numbers are automatically assigned.
Patient Orientation	0020,0020	CS		ANAPCV	COPY	

Table 68: Image Plane Module

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

Table 69: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Samples per Pixel	0028,0002	US	1	ALWAYS	FIXED	
Photometric Interpretation	0028,0004	CS	MONOCHROME2	ALWAYS	COPY	
Rows	0028,0010	US		ALWAYS	COPY	
Columns	0028,0011	US		ALWAYS	COPY	
Bits Allocated	0028,0100	US		ALWAYS	COPY	
Bits Stored	0028,0101	US		ALWAYS	COPY	
High Bit	0028,0102	US		ALWAYS	COPY	
Pixel Representation	0028,0103	US		ALWAYS	COPY	
Pixel Data	7FE0,0010	OW		ALWAYS	IMPLICIT	Auto-generated based on user input.

Table 70: CT Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	DERIVED/SECONDARY/AXIAL	ALWAYS	FIXED	
Rescale Intercept	0028,1052	DS	-1000	ALWAYS	FIXED	
Rescale Slope	0028,1053	DS	1	ALWAYS	FIXED	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
KVP	0018,0060	DS		VNAP	COPY	
Acquisition Number	0020,0012	IS		VNAP	COPY	

Table 71: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAP	AUTO, COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAPCV	AUTO	The time the message was created.
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.2	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	

8.1.1.4. RT Image Storage SOP Class

Table 72: IOD of Created RT Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	RT Series Module	ALWAYS
Frame of Reference	Frame of Reference Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Image	General Image Module	ALWAYS
Image	Image Pixel Module	ALWAYS
Image	RT Image Module	ALWAYS
Image	Modality LUT Module	ALWAYS
Image	VOI LUT Module	ALWAYS
Image	SOP Common Module	ALWAYS
Image	Approval Module	ALWAYS

Table 73: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY, USER	Patient's name, as entered/imported in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/imported in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/imported in Launch Pad.
Patient's Sex	0010,0040	CS	M, F, or O	VNAP	COPY, USER	As appropriate based on Launch Pad entry/import.

Table 74: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Time	0008,0030	TM		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Accession Number	0008,0050	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM else it is generated.
Referring Physician's Name	0008,0090	PN		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Description	0008,1030	LO		ANAPCV	COPY, USER	Comment as entered in Launch Pad.
Physician of Record	0008,1048	PN		ANAPCV	COPY, USER	Physician as entered in Launch Pad.
Referenced Study Sequence	0008,1110	SQ		ANAPCV	COPY	
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.3.1.2.3.2	ANAP	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ANAP	AUTO	
Study Instance UID	0020,000D	UI		ALWAYS	AUTO, COPY	Generated.
Study ID	0020,0010	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.

Table 75: RT Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	RTIMAGE	ALWAYS	COPY	
Series Description	0008,103E	LO		ANAPCV	COPY, USER	Series Description from DICOM Export Window.
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	Generated.
Series Number	0020,0011	IS		VNAP	AUTO, COPY	Series Number from DICOM Export Window.
Operators' Name	0008,1070	PN		VNAP	COPY, USER	Dosimetrist Name as entered in Launch Pad.

Table 76: Frame of Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Frame of Reference UID	0020,0052	UI		ALWAYS	AUTO	Matches the Frame of Reference UID for the primary image set if the patient position has not been altered on import. If the patient position was altered on import, a new Frame of Reference UID will be generated.
Position Reference Indicator	0020,1040	LO		VNAP	COPY	

Table 77: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	VNAP	AUTO, COPY	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Station Name	0008,1010	SH		ANAPCV	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	Pinnacle[3]	ANAPCV	AUTO, COPY	
Software Version(s)	0018,1020	LO	16.2.1\16.2	ANAPCV	FIXED	

Table 78: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS		ANAPCV	AUTO	
Content Date	0008,0023	DA		ANAPCV	AUTO	Date the transfer was performed.
Content Time	0008,0033	TM		ANAPCV	AUTO	Time the transfer was performed.
Instance Number	0020,0013	IS		VNAP	AUTO	A unique number for each IOD instance sent in a single transfer operation.
Patient Orientation	0020,0020	CS		ANAPCV	COPY	

Table 79: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Samples per Pixel	0028,0002	US		ALWAYS	AUTO, COPY	
Photometric Interpretation	0028,0004	CS		ALWAYS	AUTO, COPY	
Rows	0028,0010	US		ALWAYS	AUTO, COPY	Number of rows in the image.
Columns	0028,0011	US		ALWAYS	AUTO, COPY	Number of columns in the image.
Pixel Aspect Ratio	0028,0034	IS	1/1	ALWAYS	AUTO	
Pixel Data	7FE0,0010	OW /OB		ALWAYS	COPY	Pixel data.
Bits Allocated	0028,0100	US		ALWAYS	AUTO, COPY	
Bits Stored	0028,0101	US		ALWAYS	AUTO, COPY	
High Bit	0028,0102	US		ALWAYS	AUTO, COPY	
Pixel Representation	0028,0103	US		ALWAYS	AUTO, COPY	

Table 80: RT Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	DERIVED\SECONDARY\DRR	ALWAYS	AUTO	
Conversion Type	0008,0064	CS	WSD	VNAP	AUTO, COPY	
Patient Position	0018,5100	CS		ANAPCV	COPY	
Samples per Pixel	0028,0002	US	1	ALWAYS	AUTO, COPY	
Photometric Interpretation	0028,0004	CS	MONOCHROME2	ALWAYS	COPY	

Bits Allocated	0028,0100	US	16		ALWAYS	COPY	Number of bits allocated for each pixel sample.('16')
Bits Stored	0028,0101	US	16		ALWAYS	COPY	Number of bits stored for each pixel sample. ('16')
High Bit	0028,0102	US	15		ALWAYS	COPY	Most significant bit for pixel sample data. ('15')
Pixel Representation	0028,0103	US	0		ALWAYS	COPY	Data representation of the pixel samples. ('0')
RT Image Label	3002,0002	SH			ALWAYS	AUTO, COPY	Beam Name appended with BEV.
RT Image Plane	3002,000C	CS	NORMAL		ALWAYS	COPY	
X-Ray Image Receptor Translation	3002,000D	DS	0/0/0		ANAPCV	AUTO	
X-Ray Image Receptor Angle	3002,000E	DS			VNAP	COPY	If Image Type (0008, 0008) is DRR, set to 0. Else it is equivalent to the collimator angle of the beam.
Image Plane Pixel Spacing	3002,0011	DS			VNAP	COPY	Pixel size in the format X\Y in mm.
RT Image Position	3002,0012	DS			VNAP	COPY	
Radiation Machine Name	3002,0020	SH			VNAP	COPY	The name of the machine assigned to the beam corresponding to this image.
Radiation Machine SAD	3002,0022	DS			VNAP	COPY	Distance from source to gantry rotation axis for the beam in mm.
Radiation Machine SSD	3002,0024	DS			ANAPCV	COPY	Distance from source to patient surface for the beam in mm.
RT Image SID	3002,0026	DS			VNAP	COPY	Exported in mm and is always equal to the value of Radiation Machine SAD (3002,0022).
Primary Dosimeter Unit	300A,00B3	CS	MU		VNAP	COPY	
Gantry Angle	300A,011E	DS			ANAPCV	COPY	The gantry angle of the beam for this control point. Control point zero will always represent the starting angle for the beam.
Beam Limiting Device Angle	300A,0120	DS			ANAPCV	COPY	The collimator angle for the beam.
Patient Support Angle	300A,0122	DS			ANAPCV	COPY	The couch angle for the beam.
Table Top Eccentric Angle	300A,0125	DS	0.0		ANAPCV	COPY	
Isocenter Position	300A,012C	DS			ANAPCV	COPY	Isocenter coordinates (x,y,z), in mm. Specifies the location of the beam isocenter.
Referenced RT Plan Sequence	300C,0002	SQ			ANAPCV	COPY	The sequence is included only if the export of an RT Plan is performed within the same association as RT Image instance.
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.5.1.4.1.1.481.5		ANAPCV	COPY	
>Referenced SOP Instance UID	0008,1155	UI			ANAPCV	COPY	Instance UID of RT plan object exported in the same association as this RT Image instance.
Referenced Beam Number	300C,0006	IS			ANAPCV	COPY	Identifies the beam number of this beam within that RT Plan instance exported simultaneously with the RT Image instance.
Exposure Sequence	3002,0030	SQ			ANAP	AUTO	
>Primary Fluence Mode Sequence	3002,0050	SQ			ALWAYS	AUTO	Only a single item will be exported in this sequence.

>>Fluence Mode	3002,0051	CS		ALWAYS	AUTO	If the beam's energy is commissioned as "FFF" or "SRS", this attribute will be exported as NON_STANDARD. Otherwise it will be exported as STANDARD.
>>Fluence Mode ID	3002,0052	SH		ANAP	AUTO	Possible Values are FFF or SRS depending on what the beam's energy has been commissioned as. This attribute is present only when the Fluence Mode (3002, 0050) has the value NON_STANDARD.
>Number of Blocks	300A,00F0	IS		ALWAYS	AUTO	
>Block Sequence	300A,,00F4	SQ		ANAP	AUTO	
>>Source to Block Tray Distance	300A,00F6	DS		ALWAYS	AUTO	
>>Block Type	300A,00F8	CS		ALWAYS	AUTO	
>>Block Divergence	300A,00FA	CS		ALWAYS	AUTO	
>>Material ID	300A,00E1	SH		ALWAYS	AUTO	
>>Block Number of Points	300A,0104	IS		ALWAYS	AUTO	
>>Block Data	300A,0106	DS		ALWAYS	AUTO	

Table 81: Modality LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Rescale Intercept	0028,1052	DS	0.0	ANAP	COPY	
Rescale Slope	0028,1053	DS	1.0	ANAP	COPY	
Rescale Type	0028,1054	LO	US	ANAP	COPY	

Table 82: VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Window Center	0028,1050	DS		ANAP	AUTO	The default window center value for the image, for display purposes.
Window Width	0028,1051	DS		ANAP	AUTO	The default window width value for the image, for display purposes.

Table 83: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAP	AUTO, COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAPCV	AUTO	The time the message was created.
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.481.1	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	Generated.
Instance Number	0020,0013	IS		ANAP	AUTO, COPY	

Table 84: Approval Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Approval Status	300E,0002	CS	UNAPPROVED	ALWAYS	FIXED	

8.1.1.5. RT Dose Storage SOP Class

Table 85: IOD of Created RT Dose Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	RT Series Module	ALWAYS
Frame of Reference	Frame of Reference Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Dose	General Image Module	ALWAYS
Dose	Image Plane Module	ALWAYS
Dose	Multi-Frame Module	ALWAYS
Dose	RT Dose Module	ALWAYS
Dose	SOP Common Module	ALWAYS
Dose	Image Pixel Module	ALWAYS

Table 86: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY, USER	Patient's name, as entered/imported in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/imported in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/ imported in Launch Pad.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on Launch Pad entry/ import.

Table 87: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Time	0008,0030	TM		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Accession Number	0008,0050	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Referring Physician's Name	0008,0090	PN		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Description	0008,1030	LO		ANAPCV	COPY, USER	Comment as entered in Launch Pad.
Physician of Record	0008,1048	PN		ANAPCV	COPY, USER	Physician as entered in Launch Pad.
Referenced Study Sequence	0008,1110	SQ		ANAPCV	COPY	
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.3.1.2.3.2	ALWAYS	AUTO	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	
Study Instance UID	0020,000D	UI		ALWAYS	AUTO, COPY	Copied from the Primary Image set, if imported via DICOM, else it is generated.
Study ID	0020,0010	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.

Table 88: RT Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	RTDOSE	ALWAYS	COPY	
Series Description	0008,103E	LO		ANAPCV	COPY, USER	Series Description from DICOM Export Window.
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	Generated.
Series Number	0020,0011	IS		VNAP	AUTO, COPY	Series Number from DICOM Export Window.

Table 89: Frame of Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Frame of Reference UID	0020,0052	UI		ALWAYS	AUTO	Matches the Frame of Reference UID for the primary image set if the patient position has not been altered on import.
Position Reference Indicator	0020,1040	LO		VNAP	COPY	

Table 90: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	VNAP	AUTO, COPY	
Station Name	0008,1010	SH		ANAPCV	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	Pinnacle³	ANAPCV	AUTO, COPY	
Software Version(s)	0018,1020	LO	16.2.1\16.2	ANAPCV	FIXED	

Table 91: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Content Date	0008,0023	DA		ANAPCV	AUTO	Date the transfer was performed.
Content Time	0008,0033	TM		ANAPCV	AUTO	Time the transfer was performed.
Instance Number	0020,0013	IS		VNAP	AUTO	A unique number for each IOD instance sent in a single transfer operation.
Patient Orientation	0020,0020	CS		ANAPCV	COPY	

Table 92: Image Plane Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Slice Thickness	0018,0050	DS		VNAP	AUTO	The spacing, in mm, between slices of the dose grid planes.
Image Position (Patient)	0020,0032	DS		ALWAYS	AUTO	The x, y, and z coordinates of the upper left hand corner (center of the first voxel transmitted) of the image, in mm.
Image Orientation (Patient)	0020,0037	DS		ALWAYS	AUTO	The direction cosines of the first row and the first column with respect to the patient. Matches the orientation of the Primary Image Set.
Pixel Spacing	0028,0030	DS		ALWAYS	AUTO	Physical distance in the patient between the center of each voxel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm.

Table 93: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Samples per Pixel	0028,0002	US	1	ALWAYS	AUTO, COPY	
Photometric Interpretation	0028,0004	CS	MONOCHROME2	ALWAYS	COPY	
Rows	0028,0010	US		ALWAYS	AUTO, COPY	Number of rows in the image.
Columns	0028,0011	US		ALWAYS	AUTO, COPY	Number of columns in the image.
Bits Allocated	0028,0100	US	16	ALWAYS	COPY	
Bits Stored	0028,0101	US	16	ALWAYS	COPY	
High Bit	0028,0102	US	15	ALWAYS	COPY	
Pixel Representation	0028,0103	US	0	ALWAYS	COPY	'0' designates unsigned integer
Pixel Data	7FE0,0010	OW/ OB		ALWAYS	COPY	Pixel data.

Table 94: Multi-Frame Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Number of Frames	0028,0008	IS		ALWAYS	COPY	Number of frames in a Multi-frame Image. See of the DICOM Part3 specification PS3.3 for explanation.
Frame Increment Pointer	0028,0009	AT		ALWAYS	FIXED, COPY	Contains the Data Element Tag of the attribute that is used as the frame increment in Multi-frame pixel data. Points to Grid Frame Offset Vector (300C,0004). See C.7.6.6.1.1 for further explanation.

Table 95: RT Dose Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Dose Units	3004,0002	CS	GY	ALWAYS	COPY	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Dose Type	3004,0004	CS		ALWAYS	COPY	PHYSICAL (physical dose) = all beams being exported in the trial are not proton beams EFFECTIVE = at least one beam being exported in the trial is a proton beam.
Normalization Point	3004,0008	DS		ANAPCV	AUTO	If specified for the plan, the position of the dose normalization point in the patient coordinates system.
Dose Summation Type	3004,000A	CS		ALWAYS	AUTO, COPY	MULTI_PLAN = dose calculated for the current trial and prior dose. PLAN = dose calculated for the entire trial. FRACTION = dose calculated for a selected prescription. BEAM = dose calculated for one or more beams in each selected prescription. CONTROL_POINT = dose calculated for one or more control points for each beam in the selected prescription. BRACHY is not supported.
Grid Frame Offset Vector	3004,000C	DS		ANAP	AUTO	An array which contains the z coordinates (in mm) of the image frames in a multi-frame dose. All coordinates are relative to Image Position (Patient) (0020, 0032).
Dose Grid Scaling	3004,000E	DS		ALWAYS	AUTO	Scaling factor that when multiplied by the dose grid data found in the Pixel Data (7FE0,0010) attribute of the Image Pixel Module, yields grid doses in the dose units as specified by Dose Units (3004,0002).
Tissue Heterogeneity Correction	3004,0014	CS		ANAPCV	AUTO	IMAGE = image data. ROI_OVERRIDE = one or more ROI densities override image or water values where they exist. WATER = entire volume treated as water equivalent.
Referenced RT Plan Sequence	300C,0002	SQ		ANAP	COPY	Introduces sequence of one Class/Instance pair describing the RT Plan associated with the dose. If the Dose Summation Type (3004,000A) is MULTI_PLAN, there will be two items in this sequence but one will reference non-existing RT Plans.
>Referenced SOP Class UID	0008,1150	UI		ANAP	AUTO	1.2.840.10008.5.1.4.1.1.481.5 - RT Plan Storage, 1.2.840.10008.5.1.4.1.1.481.8 - RT Ion Plan Storage

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Referenced SOP Instance UID	0008,1155	UI		ANAP	AUTO	Unique identifier of the referenced RT Plan SOP Instance.

Table 96: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAP	AUTO, COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAPCV	AUTO	The time the message was created.
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.481.2	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	Generated.

8.1.1.6. RT Structure Set Storage SOP Class

Table 97: IOD of Created RT Structure Set Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	RT Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Structure Set	Structure Set Module	ALWAYS
Structure Set	ROI Contour Module	ALWAYS
Structure Set	RT ROI Observations Module	ALWAYS
Structure Set	SOP Common Module	ALWAYS
Structure Set	Approval Module	ALWAYS

Table 98: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY, USER	Patient's name, as entered/imported in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/ imported in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/ imported in Launch Pad.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on Launch Pad entry/ import.

Table 99: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	Copied from the dataset the structures are assigned to, if imported via DICOM.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Time	0008,0030	TM		VNAP	COPY	Copied from the dataset the structures are assigned to, if imported via DICOM.
Accession Number	0008,0050	SH		VNAP	COPY	Copied from the dataset the structures are assigned to, if imported via DICOM.
Referring Physician's Name	0008,0090	PN		VNAP	COPY	Copied from the dataset the structures are assigned to, if imported via DICOM.
Study Description	0008,1030	LO		ANAPCV	COPY, USER	Comment as entered in Launch Pad.
Physician of Record	0008,1048	PN		ANAPCV	COPY, USER	Physician as entered in Launch Pad.
Referenced Study Sequence	0008,1110	SQ		ANAPCV	COPY	
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.3.1.2.3.2	ANAP	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ANAP	AUTO	Study UID of the data set from which this image was defined.
Study Instance UID	0020,000D	UI		ALWAYS	AUTO, COPY	Copied from the dataset the structures are assigned to, if imported via DICOM, else it is generated.
Study ID	0020,0010	SH		VNAP	COPY	Copied from the dataset the structures are assigned to, if imported via DICOM.

Table 100: RT Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	RTSTRUCT	ALWAYS	COPY	
Series Description	0008,103E	LO		ANAPCV	COPY, USER	Series Description from the DICOM Export Window.
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	Generated.
Series Number	0020,0011	IS		VNAP	AUTO, COPY	Series Number from the DICOM Export Window.

Table 101: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	VNAP	AUTO, COPY	
Station Name	0008,1010	SH		ANAPCV	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	Pinnacle[3]	ANAPCV	AUTO, COPY	
Software Version(s)	0018,1020	LO	16.2.1\16.2	ANAPCV	FIXED	

Table 102: Structure Set Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Structure Set Label	3006,0002	SH		ALWAYS	AUTO	The name of the plan.
Structure Set Name	3006,0004	LO	POIandROIandBolus	ANAPCV	FIXED	
Structure Set Date	3006,0008	DA		VNAP	AUTO	Date of transfer
Structure Set Time	3006,0009	TM		VNAP	AUTO	Time of transfer.
Referenced Frame of Reference Sequence	3006,0010	SQ		ANAPCV	AUTO	Introduces the sequence describing the frame of reference for the data set.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Frame of Reference UID	0020,0052	UI		ANAP	AUTO	Duplicated from the image data set the structure is assigned to, as transferred via DICOM.
>RT Referenced Study Sequence	3006,0012	SQ		ANAPCV	AUTO	Introduces the sequence describing studies referenced by this structure set.
>>RT Referenced Series Sequence	3006,0014	SQ		ANAP	AUTO	Introduces the sequence describing the series referenced by this structure set.
>>>Series Instance UID	0020,000E	UI		ANAP	AUTO	The Series UID duplicated from the image data set as transferred via DICOM.
>>>Contour Image Sequence	3006,0016	SQ		ANAP	AUTO	Introduces the list of Image Class and Instance UIDs within the data set series. There will be 1 entry per slice.
>>>>Referenced SOP Class UID	0008,1150	UI		ANAP	AUTO	The Image Class UID duplicated from the image data set as transferred via DICOM.
>>>>Referenced SOP Instance UID	0008,1155	UI		ANAP	AUTO	The instance UID duplicated from the image instance for the contour as transferred via DICOM.
>>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.3.1.2.3.2	ANAP	AUTO	
>>Referenced SOP Instance UID	0008,1155	UI		ANAP	AUTO	The Study UID duplicated from the image data set as transferred via DICOM.
Structure Set ROI Sequence	3006,0020	SQ		ANAPCV	AUTO	Introduces the sequence of structures. One entry per ROI or POI.
>ROI Number	3006,0022	IS		ANAP	AUTO	A unique number for POIs and ROIs within the message.
>Referenced Frame of Reference UID	3006,0024	UI		ANAP	AUTO	The Frame of Reference UID for each instance UID, duplicated from the image.
>ROI Name	3006,0026	LO		ANAPCV	AUTO	The name of the ROI or POI as entered in Pinnacle³
>ROI Volume	3006,002C	DS		ANAPCV	AUTO	The volume of the ROI in cubic cm.
>ROI Generation Algorithm	3006,0036	CS	SEMIAUTOMATIC	ANAPCV	FIXED	

Table 103: ROI Contour Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
ROI Contour Sequence	3006,0039	SQ		ALWAYS	AUTO	Introduces the sequence of Contour Sequences defining ROIs or POIs.
>ROI Display Color	3006,002A	IS		ANAPCV	AUTO	The color of the ROI.
>Contour Sequence	3006,0040	SQ		ANAPCV	AUTO	Introduces the sequence of Contours defining an ROI.
>>Contour Image Sequence	3006,0016	SQ		ANAPCV	AUTO	Introduces the sequence of image UIDs to which this contour corresponds. The sequence will contain 1 item.
>>>Referenced SOP Class UID	0008,1150	UI		ANAP	AUTO	Image class UID duplicated from the DICOM import of the assigned data set. Requires that the image data set has been imported via DICOM.
>>>Referenced SOP Instance UID	0008,1155	UI		ANAP	AUTO	Image instance UID duplicated from the DICOM import of the data set. Requires that the image data set has been imported via DICOM.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Contour Geometric Type	3006,0042	CS		ANAP	AUTO	For POIs: POINT. For ROIs: CLOSED_PLANAR.
>>Number of Contour Points	3006,0046	IS		ANAP	AUTO	1 for a POI; otherwise, the number of points describing the contour in the Contour Data attribute (3006, 0050).
>>Contour Data	3006,0050	DS		ANAP	AUTO	The (x, y, z) triplets describing the vertices of the ROI or point of the POI.
>Referenced ROI Number	3006,0084	IS		ALWAYS	AUTO	Unique identifier of POI or ROI within this message instance.

Table 104: RT ROI Observations Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
RT ROI Observations Sequence	3006,0080	SQ		ALWAYS	AUTO	Introduces a sequence of ROI observations. 1 per beam.
>Observation Number	3006,0082	IS		ALWAYS	AUTO	Unique identifier of POI or ROI within this message instance.
>Referenced ROI Number	3006,0084	IS		ALWAYS	AUTO	Unique identifier of POI or ROI within this message instance.
>RT ROI Interpreted Type	3006,00A4	CS		VNAP	AUTO	Type of ROI or POI: EXTERNAL, PTV, CTV, GTV, TREATED_VOLUME, IRRAD_VOLUME, AVOIDANCE, ORGAN, CAVITY, SUPPORT, FIXATION, DOSE_REGION, CONTROL, BOLUS, MARKER, REGISTRATION or ISOCENTER.
>ROI Interpreter	3006,00A6	PN		VNAP	COPY	Empty
>ROI Physical Properties Sequence	3006,00B0	SQ		ANAP	AUTO	Introduces sequence describing physical properties associated with current ROI interpretation. If the density override is set to 'Yes' for the ROI, this item will be present. If the density override is set to 'No' for the ROI, this item will not be present.
>>ROI Physical Property	3006,00B2	CS	REL_MASS_DENSITY	ALWAYS	COPY	Physical property specified by ROI Physical Property Value (3006, 00B4). Defined Terms: REL_MASS_DENSITY
>>ROI Physical Property Value	3006,00B4	DS		ALWAYS	COPY	User-assigned value for physical property in g/cm^3. If the ROI units are set to 'CT #' in Pinnacle, the value will be converted to g/cm^3.

Table 105: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAP	AUTO, COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	AUTO	The date the message was created.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Instance Creation Time	0008,0013	TM		ANAPCV	AUTO	The time the message was created.
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.481.3	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	Generated.

Table 106: Approval Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Approval Status	300E,0002	CS	UNAPPROVED	ALWAYS	FIXED	

8.1.1.7. RT Plan Storage SOP Class

Table 107: IOD of Created RT Plan Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	RT Series Module	ALWAYS
Frame of Reference	Frame of Reference Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Plan	RT General Plan Module	ALWAYS
Plan	RT Prescription Module	CONDITIONAL
Plan	RT Tolerance Tables Module	ALWAYS
Plan	RT Patient Setup Module	ALWAYS
Plan	RT Fraction Scheme Module	ALWAYS
Plan	RT Beams Module	ALWAYS
Plan	SOP Common Module	ALWAYS
Plan	Approval Module	ALWAYS
Not Applicable	Extended DICOM and Private attributes (Refer section8.5.1)	ALWAYS

Table 108: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY, USER	Patient's name, as entered/ imported in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/ imported in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/ imported in Launch Pad.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on Launch Pad entry/ import.

*This date will be in yyyymmdd format. If entered or imported in yyyy-mm-dd format, the date will be converted automatically upon export. Other date formats will not be exported.

Table 109: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Time	0008,0030	TM		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Accession Number	0008,0050	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Referring Physician's Name	0008,0090	PN		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Description	0008,1030	LO		ANAPCV	COPY, USER	Comment as entered in Launch Pad.
Physician of Record	0008,1048	PN		ANAPCV	COPY, USER	Physician as entered in Launch Pad.
Referenced Study Sequence	0008,1110	SQ		ANAPCV	COPY	
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.3.1.2.3.2	ANAP	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ANAP	COPY	Study UID of the data set from which this image was defined.
Study Instance UID	0020,000D	UI		ALWAYS	AUTO, COPY	Generated.
Study ID	0020,0010	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.

Table 110: RT Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	RTPLAN	ALWAYS	COPY	
Series Description	0008,103E	LO		ANAPCV	COPY, USER	Series Description from DICOM Export Window.
Operators' Name	0008,1070	PN		VNAP	COPY, USER	Dosimetrist Name as entered in Launch Pad.
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	Generated.
Series Number	0020,0011	IS		VNAP	AUTO, COPY	Series Number from DICOM Export Window.

Table 111: Frame of Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Frame of Reference UID	0020,0052	UI		ALWAYS	AUTO	
Position Reference Indicator	0020,1040	LO		EMPTY	FIXED	

Table 112: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	VNAP	AUTO, COPY	
Station Name	0008,1010	SH		ANAPCV	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	Pinnacle[3]	ANAPCV	AUTO, COPY	
Software Version(s)	0018,1020	LO	16.2.1\16.2	ANAPCV	FIXED	

Table 113: RT General Plan Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
RT Plan Label	300A,0002	SH		ALWAYS	AUTO, USER	The plan name as entered in Launch Pad concatenated with the Trial Number (i.e., <planName>-<Trial#>).
RT Plan Name	300A,0003	LO		ANAPCV	AUTO, USER	The plan name as entered in Launch Pad.
RT Plan Description	300A,0004	ST		ANAPCV	AUTO, USER	The comment as entered in Launch Pad.
RT Plan Date	300A,0006	DA		VNAP	AUTO	The date that the message was created.
RT Plan Time	300A,0007	TM		VNAP	AUTO	The time that the message was created.
RT Plan Geometry	300A,000C	CS		ALWAYS	AUTO	Set to PATIENT if the primary data set coordinate system is valid and Structure Sets are being exported with the plan. Else the value is TREATMENT_DEVICE. Note: The coordinate system is considered valid if it's a valid DICOM format (not Pinnacle format), and the dataset has not been modified in the Volume Editor.
Referenced Structure Set Sequence	300C,0060	SQ		ANAP	AUTO	Sent if RT Plan Geometry is PATIENT.
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.5.1.4.1.1.481.3	ANAP	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ANAP	AUTO	Indicates the structure set that references the patient's coordinate system frame of reference.

Table 114: RT Prescription Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Prescription Description	300A,000E	ST		ANAP	AUTO	Description of all exported prescriptions. Present only if all exported prescriptions are in Prescribe mode.
Dose Reference Sequence	300A,0010	SQ		ANAP	AUTO	Sequences of dose references. Contains the same number of items as the number of prescriptions selected for export. Present only if all exported prescriptions are in Prescribe mode.
>Dose Reference Number	300A,0012	IS		ALWAYS	AUTO	Prescription number in Pinnacle.
>Dose Reference UID	300A,0013	UI		ALWAYS	AUTO	Unique identifier for the dose reference.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Dose Reference Structure Type	300A,0014	CS		ALWAYS	AUTO	Structure type of Dose Reference. Can be one of the following: POINT – If dose reference point is specified as Point Dose. VOLUME – If dose reference volume is specified as ROI Max, ROI Min or ROI Mean. COORDINATES – If dose reference is specified as Max Dose.
>Dose Reference Description	300A,0016	ST		ALWAYS	AUTO	
>Referenced ROI Number	3006,0084	IS		ANAP	AUTO	Uniquely identifies ROI representing the dose reference specified by ROI Number (3006,0022) in Structure Set ROI Sequence (3006,0020) in Structure Set Module within RT Structure Set in Referenced Structure SetSequence (300C,0060) in RT General Plan module. Required if Dose Reference Structure Type (300A,0014) is POINT or VOLUME.
>Dose Reference Point Coordinates	300A,0018	DS		ANAP	AUTO	Coordinates of Max Dose Point of the selected prescription(s). Required if Dose Reference Structure Type (300A,0014) is COORDINATES.
>Dose Reference Type	300A,0020	CS	TARGET	ALWAYS	AUTO	
>Target Prescription Dose	300A,0026	DS		ALWAYS	AUTO, USER	Dose prescribed by this prescription.

Table 115: RT Tolerance Tables Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Tolerance Table Sequence	300A,0040	SQ		ANAPCV	AUTO	Introduces sequence of tolerance tables to be used for delivery of treatment plan. One or more items may be included in sequence.
>Tolerance Table Number	300A,0042	IS		ALWAYS	AUTO	Identification number of the Tolerance Table as defined in the physics machine. The value of Tolerance Table Number (300A,0042) will be unique within the RT Plan in which it is created. Required if Tolerance Table Sequence (300A,0040) is sent.
>Tolerance Table Label	300A,0043	SH		ANAPCV	AUTO	User-defined label for Tolerance Table. Defined as part of the tolerance table in the physics machine.

Table 116: RT Patient Setup Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient Setup Sequence	300A,0180	SQ		ALWAYS	COPY	Introduces the sequence of patient setup data.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Patient Position	0018,5100	CS		ANAP	COPY	The treatment position defined by the CT scan. Duplicated from the Primary data set on which the plan was created.
>Patient Setup Number	300A,0182	IS	1	ALWAYS	FIXED	
>Table Top Vertical Setup Displacement	300A,01D2	DS		VNAP	AUTO	Vertical table top displacement between the setup point and isocenter. Populated only if the laser localizer has been placed and a single isocenter exists; otherwise empty. Always empty when generated by TumorLOC.
>Table Top Longitudinal Setup Displacement	300A,01D4	DS		VNAP	AUTO	Longitudinal table top displacement between the setup point and isocenter.. Populated only if the laser localizer has been placed and a single isocenter exists; otherwise empty. Always empty when generated by TumorLOC.
>Table Top Lateral Setup Displacement	300A,01D6	DS		VNAP	AUTO	Lateral table top displacement between the setup point and isocenter. Populated only if the laser localizer has been placed and a single isocenter exists; otherwise empty. Always empty when generated by TumorLOC.

Table 117: RT Fraction Scheme Module*

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Fraction Group Sequence	300A,0070	SQ		ALWAYS	AUTO, COPY	Introduces sequence of Fraction Groups in current Fraction Scheme. Each Fraction Group is translated to a Prescription in Pinnacle[3].
>Fraction Group Number	300A,0071	IS		ALWAYS	AUTO, COPY	Prescription number in Pinnacle.
>Number of Fractions Planned	300A,0078	IS		VNAP	AUTO, COPY	The number of fractions for the selected prescription.
>Number of Beams	300A,0080	IS		ALWAYS	AUTO, COPY	The number of beams using this prescription. If the user chooses to include setup beam references, and if setup beams are being exported, this number will include 2 additional beams.
>Number of Brachy Application Setups	300A,00A0	IS	0	ALWAYS	FIXED	
>Referenced Beam Sequence	300C,0004	SQ		ANAP	AUTO, COPY	Introduces the sequence of treatment beams in the current Fraction Group.
>>Beam Dose Specification Point	300A,0082	DS		ALWAYS	AUTO, COPY	The location of the Dose Reference Point for the beam, as specified in the Monitor Units window.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Beam Dose	300A,0084	DS		ALWAYS	AUTO	The dose in Gy, to the reference point, calculated for this beam. This will have a value of '0' for setup beams and uncomputed beams.
>>Beam Dose Point Depth	300A,0088	DS		ALWAYS	AUTO	This has been added for backward compatibility.
>>Beam Dose Point Equivalent Depth	300A,0089	DS		ALWAYS	AUTO	This has been added for backward compatibility.
>>Beam Dose Point SSD	300A,008A	DS		ALWAYS	AUTO	This has been added for backward compatibility.
>>Beam Meterset	300A,0086	DS		ANAPCV	AUTO	The monitor units calculated for this beam. This will be a value of '0' for setup beams.
>>Beam Delivery Duration Limit	300A,00C5	FD		ANAPCV	AUTO	The expected delivery time in seconds. This is the maximum time span allowed to deliver a single fraction of a beam.
>>Referenced Beam Number	300C,0006	IS		ANAP	AUTO	Specifies the Beam Number (300A, 00C0) of the beam using this prescription.
>Referenced Dose Reference Sequence	300C,0050	SQ		ANAP	AUTO	Present only if the RT Prescription Module is present.
>>Referenced Dose Reference Number	300C,0051	IS		ALWAYS	AUTO	

*Attributes related to brachytherapy treatments are not supported

Table 118: RT Beams Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Beam Sequence	300A,00B0	SQ		ALWAYS	AUTO	Introduces the sequence of treatment beams for this RT Plan. There will be 1 entry per beam.
>Manufacturer	0008,0070	LO		ANAPCV	AUTO	The manufacturer of the machine assigned to this beam.
>Institution Name	0008,0080	LO		ANAPCV	AUTO	The name of the institution in Pinnacle[3].
>Treatment Machine Name	300A,00B2	SH		VNAP	AUTO	The name of the machine assigned to this beam.
>Primary Dosimeter Unit	300A,00B3	CS	MU	ANAPCV	AUTO	
>Source-Axis Distance	300A,00B4	DS		ANAPCV	AUTO	The SAD of the machine assigned to this beam in mm.
>Beam Limiting Device Sequence	300A,00B6	SQ		ALWAYS	AUTO	Introduces the sequence of beam limiting devices (collimator) jaw or leaf (element) sets.
>>RT Beam Limiting Device Type	300A,00B8	CS		ALWAYS	AUTO	As appropriate: X = symmetric jaw pair in X direction Y = symmetric jaw pair in Y direction ASYMX = asymmetric jaw pair in X direction ASYMY = asymmetric jaw pair in Y direction MLCX = multileaf jaw pair in X direction MLCY = multileaf jaw pair in Y direction.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Source to Beam Limiting Device Distance	300A,00BA	DS		ANAPCV	AUTO	The Source to Beam Limiting Device distance in mm. As entered for the device in the machine definition. (Note that this is suppressible via script. See our latest DICOM RT Release Note for more detail.)
>>Number of Leaf/Jaw Pairs	300A,00BC	IS		ALWAYS	AUTO	1 for jaws or the number of leaf pairs for an MLC.
>>Leaf Position Boundaries	300A,00BE	DS		ANAPCV	AUTO	The position of the edges of the leaf boundaries with respect to the central axis. There will be the number of leaf pairs + 1 entries.
>Beam Number	300A,00C0	IS		ALWAYS	AUTO	The ordinal representing the position of the beam in the beam list as displayed in Pinnacle[3].
>Beam Name	300A,00C2	LO		ANAPCV	AUTO	If the Field ID is specified for the beam, its value is exported in this attribute and the Pinnacle[3] Beam Name is exported in the Beam Description attribute (300A, 00C3). If the Field ID is not specified this attribute contains the name of the beam as specified in Pinnacle[3].
>Beam Description	300A,00C3	ST		ANAPCV	AUTO	If Field ID is specified for the beam, this attribute contains the Pinnacle[3] Beam Name.
>Beam Type	300A,00C4	CS		ALWAYS	AUTO	'DYNAMIC' for a beam in which treatment geometry or characteristics are modified during delivery. 'STATIC' for a fixed field, fixed beam. (Note that there is a method to override this field. See our latest DICOM RT Release Note for more detail.)
>Radiation Type	300A,00C6	CS		VNAP	AUTO, FIXED	PHOTON or ELECTRON
>Primary Fluence Mode Sequence	3002,0050	SQ		ALWAYS	AUTO	
>>Fluence Mode	3002,0051	CS		ALWAYS	AUTO	If the beam's energy is commissioned as "FFF" or "SRS", this attribute will be sent as NON_STANDARD. Else it will have the value STANDARD.
>>Fluence Mode ID	3002,0052	SH		ANAP	AUTO	Possible values are FFF or SRS depending on what the beam's energy is commissioned as. This attribute is present only when the Fluence Mode (3002,0050) has the value NON_STANDARD.
>Referenced Patient Setup Number	300C,006A	IS		ANAPCV	AUTO, COPY	References the Patient Setup number (300A, 0182) as defined in the Patient Setup Module.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>High-Dose Technique Type	300A,00C7	CS		ANAP	FIXED	For photon and stereo beams if the computed MU value of a beam exceeds the MU threshold specified in the High-Dose Technique configuration of the treatment machine or if the user selects SRS Technique as Yes, the attribute is set to "SRS" and is exported with the beam module of the RT plan. The attribute will be exported only If machine is configured in Physics as High Dose Mode and if either of the above conditions hold true.
>Treatment Delivery Type	300A,00CE	CS		ANAPCV	AUTO	TREATMENT or SETUP
>Planned Verification Image Sequence	300A,00CA	SQ		ANAPCV	AUTO	
>>RT Image Position	3002,0012	DS	0/0	VNAP	COPY	This tag is only exported for non-Proton beams.
>>RT Image SID	3002,0026	DS		VNAP	COPY	Exported in mm, as specified in Physics.
>>RT Image Plane	3002,000C	CS	NORMAL	ALWAYS	COPY	
>Number of Wedges	300A,00D0	IS		ALWAYS	AUTO	0 or 1
>Wedge Sequence	300A,00D1	SQ		ANAP	AUTO	
>>Wedge Number	300A,00D2	IS	0	ANAP	FIXED	
>>Wedge Type	300A,00D3	CS		ANAPCV	AUTO	As appropriate: STANDARD = standard (static) wedge DYNAMIC = moving beam limiting device jaw simulating wedge MOTORIZED = single wedge that can be removed from beam remotely.
>>Wedge ID	300A,00D4	SH		ANAPCV	AUTO	The Manufacturer code of the wedge assigned to the beam.
>>Wedge Angle	300A,00D5	IS		ANAPCV	AUTO	The angle of the wedge for the beam.
>>Wedge Factor	300A,00D6	DS		ANAPCV	COPY	Empty.
>>Wedge Orientation	300A,00D8	DS		ANAPCV	AUTO	The orientation of the wedge.
>Number of Compensators	300A,00E0	IS	0	ALWAYS	AUTO	
>Number of Boli	300A,00ED	IS		ALWAYS	AUTO, FIXED	Number of Boli assigned to beam.
>Number of Blocks	300A,00F0	IS		ALWAYS	AUTO, FIXED	The number of blocks in the Block Sequence (300A, 00F4). For Aktina cones this will always be 1.
>Total Block Tray Factor	300A,00F2	DS		ANAPCV	AUTO	The tray factor of the beam.
>Block Sequence	300A,00F4	SQ		ANAP	AUTO	Introduces sequence of blocks associated with Beam. Required if Number of Blocks is non-zero.
>>Material ID	300A,00E1	SH		ANAPCV	COPY	Empty
>>Block Tray ID	300A,00F5	SH		ANAPCV	AUTO	The tray number, if any, otherwise UNKNOWN TRAY ID. For Aktina cones, the nominal cone diameter in millimeters.
>>Source to Block Tray Distance	300A,00F6	DS		ANAPCV	AUTO	The Source to Tray Distance as defined for the machine. Empty for Aktina cones.

DICOM Conformance Statement Pinnacle³ Radiotherapy Treatment Planning System R16.2.1
Doc Id: DHF305591
Doc status: Approved

Page 65 of 101

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Block Type	300A,00F8	CS		ANAP	AUTO	Sent as APERTURE for Aktina cones, SHIELDING for others
>>Block Divergence	300A,00FA	CS	PRESENT	ANAPCV	FIXED	Empty for Aktina cones.
>>Block Number	300A,00FC	IS		ANAP	AUTO	The identifying number for this contour.
>>Block Thickness	300A,0100	DS		ANAPCV	COPY	Empty
>>Block Transmission	300A,0102	DS		ANAPCV	AUTO	The block and tray factor of the beam. Empty for Aktina cones
>>Block Number of Points	300A,0104	IS		ANAPCV	AUTO	The number of points used to describe the contour. Empty for Aktina cones
>>Block Data	300A,0106	DS		ANAPCV	AUTO	Data containing the (x, y) pairs describing the edge of the contour. Empty for Aktina cones
>Applicator Sequence	300A,0107	SQ		ANAPCV	AUTO	Introduces the sequence of Applicators. Only a single item will be permitted in this sequence.
>>Accessory Code	300A,00F9	LO		ANAP	AUTO	If an Accessory Code is provided in the stereo collimator definition of the machine, the Accessory Code is exported in this attribute. If an accessory code is not provided in the Stereo Collimator definition of the machine, this attribute is not exported. Electron accessories are not exported.
>>Applicator ID	300A,0108	SH		ALWAYS	AUTO	The user name assigned to the applicator or circular collimator. For a stereo beam, the name of the circular collimator. For an electron beam, the electron applicator name. For a photon beam, the user-specified applicator ID. For Aktina cones, "Aktina SRS."
>>Applicator Type	300A,0109	CS		ANAP	AUTO	For a stereo beam, set to 'STEREOTACTIC'. For an electron beam the dimensions of the applicator will be checked, if length = height 'ELECTRON_SQUARE' will be sent. Otherwise 'ELECTRON_RECT'. For a photon beam user selected option will be sent. Options are: PHOTON_SQUARE, PHOTON_RECT, PHOTON_CIRC, STEREOTACTIC
>Final Cumulative Meterset Weight	300A,010E	DS	1	ANAP	AUTO	
>Number of Control Points	300A,0110	IS		ALWAYS	AUTO	The number of control points used to describe the beam behavior during treatment. (Setup beams will each use 2 control points.)
>Control Point Sequence	300A,0111	SQ		ALWAYS	AUTO	Introduces the sequence of machine configurations describing this treatment beam.
>>Control Point Index	300A,0112	IS		ANAP	AUTO	Sequentially numbered starting at 0.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Nominal Beam Energy	300A,0114	DS		ANAPCV	AUTO	The selected machine energy for this beam.
>>Dose Rate Set	300A,0115	DS		ANAPCV	AUTO	Dose rate of the control point.
>>Wedge Position Sequence	300A,0116	SQ		ANAPCV	AUTO	Introduces sequence of Wedge positions and identities for this control point.
>>>Wedge Position	300A,0118	CS		ALWAYS	FIXED	IN or OUT
>>>Referenced Wedge Number	300C,00C0	IS		ALWAYS	AUTO, COPY	The Wedge Number (300A,00D2) assigned to the selected wedge for this control point.
>>Beam Limiting Device Position Sequence	300A,011A	SQ		ANAP	AUTO	Introduces the sequence of beam limiting device (collimator) jaw or leaf (element) positions.
>>>RT Beam Limiting Device Type	300A,00B8	CS		ALWAYS	AUTO	Assigned as appropriate: X = symmetric jaw pair in X direction Y = symmetric jaw pair in Y direction ASYMX = asymmetric jaw pair in X direction ASYMY = asymmetric jaw pair in Y direction MLCX = multileaf jaw pair in X direction MLCY = multileaf jaw pair in Y direction.
>>>Leaf/Jaw Positions	300A,011C	DS		ALWAYS	AUTO	The jaw or MLC leaf positions for this control point in mm.
>>Gantry Angle	300A,011E	DS		ANAP	AUTO	The gantry angle of the beam for this control point. Control point zero will always represent the starting angle for the beam.
>>Gantry Rotation Direction	300A,011F	CS		ANAP	AUTO	If an arc is being described, this will represent the direction of the gantry rotation ('CW' or 'CC'). If this is a fixed treatment the value will be 'NONE'.
>>Beam Limiting Device Angle	300A,0120	DS		ANAP	AUTO	The collimator angle for the beam.
>>Beam Limiting Device Rotation Direction	300A,0121	CS	NONE	ANAP	FIXED	
>>Patient Support Angle	300A,0122	DS		ANAP	AUTO	The couch angle for the beam.
>>Patient Support Rotation Direction	300A,0123	CS	NONE	ANAP	FIXED	
>>Table Top Eccentric Angle	300A,0125	DS	0	ANAP	FIXED	
>>Table Top Eccentric Rotation Direction	300A,0126	CS	NONE	ANAP	FIXED	
>>Table Top Vertical Position	300A,0128	DS		ANAPCV	COPY	Exported in mm, as specified in Physics or Planning. For SETUP beams, this value is the same as in the first treatment beam.
>>Table Top Longitudinal Position	300A,0129	DS		ANAPCV	COPY	Exported in mm, as specified in Physics or Planning. For SETUP beams, this value is the same as in the first treatment beam.
>>Table Top Lateral Position	300A,012A	DS		ANAPCV	COPY	Exported in mm, as specified in Physics or Planning. For SETUP beams, this value is the same as in the first treatment beam.

DICOM Conformance Statement Pinnacle³ Radiotherapy Treatment Planning System R16.2.1
Doc Id: DHF305591
Doc status: Approved

Page 67 of 101

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Isocenter Position	300A,012C	DS		ANAPCV	AUTO	Sent in mm in the DICOM Patient coordinate system, if RT Plan Geometry (300A, 000C) is PATIENT. Empty, if RT Plan Geometry is TREATMENT_DEVICE.
>>Source to Surface Distance	300A,0130	DS		ANAPCV	AUTO	SSD of the beam in mm.
>>Cumulative Meterset Weight	300A,0134	DS		ANAPCV	AUTO	For control point 0, this is 0.0. For each subsequent control point this represents the weight of the MU delivered during this control point, expressed as a percentage. The final value will be 1.
>Referenced Tolerance Table Number	300C,00A0	IS		ANAPCV	AUTO	The number associated with the Tolerance Table in the DICOM Export Window as defined in your physics machine.
>Referenced Bolus Sequence	300C,00B0	SQ		ANAP	AUTO	Introduces the sequence of boluses associated with the beam.
>>Referenced ROI Number	3006,0084	IS		ALWAYS	AUTO	Indicates that bolus is specified for the beam.

Table 119: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAP	AUTO, COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAPCV	AUTO	The time the message was created.
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.481.5	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	Generated.

Table 120: Approval Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Approval Status	300E,0002	CS	UNAPPROVED	ALWAYS	FIXED	

8.1.1.8. RT Ion Plan Storage SOP Class

Table 121: IOD of Created RT Ion Plan Storage Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	RT Series Module	ALWAYS
Frame of Reference	Frame of Reference Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Plan	RT General Plan Module	ALWAYS
Plan	RT Prescription Module	CONDITIONAL
Plan	RT Patient Setup Module	CONDITIONAL
Plan	RT Fraction Scheme Module	CONDITIONAL

Information Entity	Module	Presence Of Module
Plan	RT Ion Beams Module	CONDITIONAL
Plan	Approval Module	CONDITIONAL
Plan	SOP Common Module	ALWAYS
Not Applicable	Extended DICOM and Private attributes (Refer section 8.5.2)	ALWAYS

Table 122: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY, USER	Patient's name, as entered/ imported in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/ imported in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/ imported in Launch Pad.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on Launch Pad entry/ import.

*This date will be in yyyymmdd format. If entered or imported in yyyy-mm-dd format, the date will be converted automatically upon export. Other date formats will not be exported.

Table 123: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Time	0008,0030	TM		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Accession Number	0008,0050	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Referring Physician's Name	0008,0090	PN		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Description	0008,1030	LO		ANAPCV	COPY, USER	Comment as entered in Launch Pad.
Physician of Record	0008,1048	PN		ANAPCV	COPY, USER	Physician as entered in Launch Pad.
Referenced Study Sequence	0008,1110	SQ		ANAPCV	COPY	
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.3.1.2.3.2	ANAP	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ANAP	AUTO	Study UID of the data set from which this image was defined.
Study Instance UID	0020,000D	UI		ALWAYS	AUTO, COPY	Copied from Primary image set, if imported via DICOM. Else it is generated.
Study ID	0020,0010	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.

Table 124: RT Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	RTPLAN	ALWAYS	COPY	
Series Description	0008,103E	LO		ANAPCV	COPY, USER	Series Description from DICOM Export Window.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	Generated.
Series Number	0020,0011	IS		VNAP	AUTO, COPY	Series Number from DICOM Export Window.

Table 125: Frame of Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Frame of Reference UID	0020,0052	UI		ALWAYS	AUTO	Uniquely identify the Frame of Reference for the series. For CT and MR data must be the same for every image in the series.
Position Reference Indicator	0020,1040	LO		VNAP	AUTO	

Table 126: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	VNAP	AUTO, COPY	
Station Name	0008,1010	SH		ANAPCV	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	Pinnacle³	ANAPCV	AUTO, COPY	
Software Version(s)	0018,1020	LO	16.2.1\16.2	ANAPCV	FIXED	

Table 127: RT General Plan Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Operators' Name	0008,1070	PN		VNAP	AUTO, USER	The Dosimetrist name as entered in Launch Pad.
RT Plan Label	300A,0002	SH		ALWAYS	AUTO, USER	The plan name as entered in Launch Pad concatenated with the Trial Number (i.e., <planName>-<Trial#>).
RT Plan Name	300A,0003	LO		ANAPCV	AUTO, USER	The plan name as entered in Launch Pad.
RT Plan Description	300A,0004	ST		ANAPCV	AUTO, USER	The comment as entered in Launch Pad.
RT Plan Date	300A,0006	DA		VNAP	AUTO	The date that the message was created.
RT Plan Time	300A,0007	TM		VNAP	AUTO	The time that the message was created.
Plan Intent	300A,000A	CS		ANAP	AUTO	
RT Plan Geometry	300A,000C	CS		ALWAYS	AUTO	Set to PATIENT if the primary data set was transferred via DICOM. If the primary data set was not transferred via DICOM, the value is TREATMENT_DEVICE.
Referenced Structure Set Sequence	300C,0060	SQ		ANAP	AUTO	Sent if RT Plan Geometry is PATIENT.
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.5.1.4.1.1.481.3	ANAP	AUTO	

DICOM Conformance Statement Pinnacle³ Radiotherapy Treatment Planning System R16.2.1
Doc Id: DHF305591
Doc status: Approved

Page 70 of 101

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Referenced SOP Instance UID	0008,1155	UI		ANAP	AUTO	Indicates the structure set that references the patient's coordinate system frame of reference.

Table 128: RT Prescription Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Prescription Description	300A,000E	ST		ALWAYS	AUTO	Description of all exported prescriptions.
Dose Reference Sequence	300A,0010	SQ		ALWAYS	AUTO	Sequences of dose references. Contains the same number of items as the number of prescriptions selected for export.
>Dose Reference Number	300A,0012	IS		ALWAYS	AUTO	Prescription number in Pinnacle.
>Dose Reference UID	300A,0013	UI		ALWAYS	AUTO	Unique identifier for the dose reference.
>Dose Reference Structure Type	300A,0014	CS		ALWAYS	AUTO	Structure type of Dose Reference. Can be one of the following: POINT – If dose reference point is specified as Point Dose VOLUME – If dose reference volume is specified as ROI Max, ROI Min or ROI Mean COORDINATES – If dose reference is specified as Max Dose
>Dose Reference Description	300A,0016	ST		ALWAYS	AUTO	
>Referenced ROI Number	3006,0084	IS		ANAP	AUTO	Uniquely identifies ROI representing the dose reference specified by RT Structure Set | RT General Plan Module | Referenced Structure Set Sequence (300C,0060) | Structure Set Module | Structure Set ROI Sequence (3006,0020) | ROI Number (3006,0022). Required if Dose Reference Structure Type (300A,0014) is POINT or VOLUME.
>Dose Reference Point Coordinates	300A,0018	DS		ANAP	AUTO	Coordinates of Max Dose Point of the selected prescription/s. Required if Dose Reference Structure Type is COORDINATES.
>Dose Reference Type	300A,0020	CS	TARGET	ALWAYS	AUTO	
>Target Prescription Dose	300A,0026	DS		ALWAYS	AUTO, USER	

Table 129: RT Patient Setup Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient Setup Sequence	300A,0180	SQ		ALWAYS	COPY	
>Patient Position	0018,5100	CS		ANAP	COPY	'The treatment position defined by the CT scan. Duplicated from the Primary data set on which the plan was created.
>Patient Setup Number	300A,0182	IS	1	ALWAYS	FIXED	

Table 130: RT Fraction Scheme Module*

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Fraction Group Sequence	300A,0070	SQ		ALWAYS	AUTO, COPY	Introduces sequence of Fraction Groups in current Fraction Scheme. Each Fraction Group is translated to a Prescription in Pinnacle[3].
>Fraction Group Number	300A,0071	IS		ALWAYS	AUTO, COPY	Prescription number in Pinnacle.
>Number of Fractions Planned	300A,0078	IS		VNAP	AUTO, COPY	The number of fractions for the selected prescription.
>Number of Beams	300A,0080	IS		ALWAYS	AUTO, COPY	The number of treatment beams using this prescription. If the user chooses to include setup beam references, and if setup beams are being exported, this number will include 2 additional beams.
>Number of Brachy Application Setups	300A,00A0	IS	0	ALWAYS	FIXED	
>Referenced Beam Sequence	300C,0004	SQ		ANAP	AUTO, COPY	Introduces the sequence of treatment beams in the current Fraction Group.
>>Beam Dose Specification Point	300A,0082	DS		ANAPCV	AUTO, COPY	The location of the Dose Reference Point for the beam, as specified in the Monitor Units window.
>>Beam Dose	300A,0084	DS		ANAPCV	AUTO, COPY	The dose in Gy, to the reference point, calculated for this beam. Present only if the RT Prescription Module is present. This will be a value of '0' for setup beams.
>>Beam Meterset	300A,0086	DS		ANAPCV	AUTO, COPY	The monitor units calculated for this beam. This will be a value of '0' for setup beams.
>>Referenced Beam Number	300C,0006	IS		ANAP	AUTO, COPY	Specifies the Beam Number (300A, 00C0) of the beam using this prescription.
>Referenced Dose Reference Sequence	300C,0050	SQ		ANAP	AUTO, COPY	
>>Referenced Dose Reference Number	300C,0051	IS		ALWAYS	AUTO, COPY	

*Attributes related to brachytherapy treatments are not supported

Table 131: RT Ion Beams Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Ion Beam Sequence	300A,03A2	SQ		ALWAYS	AUTO	
>Manufacturer	0008,0070	LO		ANAPCV	AUTO	
>Institution Name	0008,0080	LO		ANAPCV	AUTO	
>Treatment Machine Name	300A,00B2	SH		VNAP	AUTO	
>Primary Dosimeter Unit	300A,00B3	CS	MU	ALWAYS	AUTO	
>Beam Number	300A,00C0	IS		ALWAYS	AUTO	Sequentially numbered starting at 1.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Beam Name	300A,00C2	LO		ALWAYS	AUTO	If the Field ID is specified for the beam, its value is exported in this attribute and the Pinnacle³ Beam Name is exported in the Beam Description attribute (300A,00C3). If the Field ID is not specified this attribute contains the name of the beam as specified in Pinnacle³.
>Beam Description	300A,00C3	ST		ANAPCV	AUTO	If Field ID is specified for the beam, this attribute contains the Pinnacle³ Beam Name.
>Beam Type	300A,00C4	CS	STATIC	ALWAYS	AUTO, FIXED	
>Radiation Type	300A,00C6	CS	PROTON	ALWAYS	AUTO, FIXED	
>Treatment Delivery Type	300A,00CE	CS	TREATMENT	ALWAYS	AUTO	
>Number of Wedges	300A,00D0	IS	0	ALWAYS	AUTO	
>Number of Compensators	300A,00E0	IS		ALWAYS	AUTO	0 or 1
>Number of Boli	300A,00ED	IS	0	ALWAYS	AUTO, FIXED	
>Number of Blocks	300A,00F0	IS	1	ALWAYS	AUTO, FIXED	
>Final Cumulative Meterset Weight	300A,010E	DS		ANAP	AUTO	Value of Cumulative Meterset Weight (300A, 0134) for final Control Point in Control Point Sequence (300A, 0111). In case of Scan Mode (300A, 0308) being NONE or UNIFORM, this value will be 1 if the system has capabilities of handling a factor of 100 for specific target machines, else it will be 100.
>Number of Control Points	300A,0110	IS		ALWAYS	AUTO	
>Ion Range Compensator Sequence	300A,02EA	SQ		ANAP	AUTO	
>>Material ID	300A,00E1	SH		VNAP	AUTO	
>>Compensator Number	300A,00E4	IS	1	ALWAYS	AUTO	If Compensator is present, it will be 1.
>>Compensator ID	300A,00E5	SH		ANAPCV	AUTO, USER	It is a max 16 character ID provided by the user as ID for the compensator.
>>Compensator Rows	300A,00E7	IS		ALWAYS	AUTO	
>>Compensator Columns	300A,00E8	IS		ALWAYS	AUTO	
>>Compensator Pixel Spacing	300A,00E9	DS		ALWAYS	AUTO	
>>Compensator Position	300A,00EA	DS		ALWAYS	AUTO	
>>Compensator Thickness Data	300A,00EC	DS		ALWAYS	AUTO	
>>Compensator Divergence	300A,02E0	CS	ABSENT	ALWAYS	AUTO, FIXED	
>>Compensator Mounting Position	300A,02E1	CS	SOURCE_SIDE	ALWAYS	AUTO, FIXED	
>>Isocenter to Compensator Tray Distance	300A,02E4	FL		ANAP	AUTO	
>>Compensator Column Offset	300A,02E5	FL		ANAP	AUTO	It will be 0 for continuous milling method. For plunge milling method, it will be a non-zero value for each even numbered row.
>>Compensator Relative Stopping Power Ratio	300A,02E7	FL		ANAPCV	AUTO	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Compensator Milling Tool Diameter	300A,02E8	FL		ANAP	AUTO	It will be exported only if the milling method for the compensator is plunge.
>Scan Mode	300A,0308	CS		ALWAYS	AUTO, FIXED	None - Double Scattering UNIFORM - Uniform Scanning MODULATED – Spot Scanning
>Virtual Source-Axis Distances	300A,030A	FL		ALWAYS	AUTO	
>Snout Sequence	300A,030C	SQ		ANAP	AUTO	
>>Snout ID	300A,030F	SH		ALWAYS	AUTO	
>Number of Range Shifters	300A,0312	IS		ALWAYS	AUTO, FIXED	Will be 1 for beams with Scan Mode(300A,0308) as MODULATED having Range Shifter, else it will be 0.
>Range Shifter Sequence	300A,0314	SQ		ANAP	AUTO	Introduces the range shifters sequence associated with the current beam. Required if Number of Range Shifters (300A,0312) is non-zero. There will only be 1 range shifter assigned to a beam.
>>Range Shifter Number	300A,0316	IS	1	ALWAYS	AUTO, FIXED	
>>Range Shifter ID	300A,0318	SH		ALWAYS	AUTO	
>>Range Shifter Type	300A,0320	CS	BINARY	ALWAYS	AUTO, FIXED	
>Number of Range Modulators	300A,0340	IS	0 or 1	ALWAYS	AUTO, FIXED	
>Ion Block Sequence	300A,03A6	SQ		ANAP	AUTO	Introduces sequence of blocks associated with the current beam. This sequence is not present if Scan Mode (300A, 0308) is MODULATED.
>>Material ID	300A,00E1	SH		VNAP	AUTO	
>>Isocenter to Block Tray Distance	300A,00F7	FL		ALWAYS	AUTO	
>>Block Type	300A,00F8	CS	APERTURE	ALWAYS	AUTO, FIXED	
>>Block Divergence	300A,00FA	CS	ABSENT	ALWAYS	AUTO, FIXED	
>>Block Mounting Position	300A,00FB	CS	SOURCE_SIDE	ALWAYS	AUTO, FIXED	
>>Block Number	300A,00FC	IS	1	ALWAYS	FIXED	
>>Block Name	300A,00FE	LO		ANAPCV	AUTO	It is a max 16 character string provided by the user as ID for the aperture.
>>Block Thickness	300A,0100	DS		ALWAYS	AUTO	
>>Block Number of Points	300A,0104	IS		ALWAYS	AUTO	
>>Block Data	300A,0106	DS		ALWAYS	AUTO	
>Ion Control Point Sequence	300A,03A8	SQ		ALWAYS	AUTO	
>>Control Point Index	300A,0112	IS		ALWAYS	AUTO	Sequentially numbered starting at 0.
>>Nominal Beam Energy	300A,0114	DS		ANAP	AUTO	
>>Gantry Angle	300A,011E	DS		ANAP	AUTO	
>>Gantry Rotation Direction	300A,011F	CS	NONE	ANAP	FIXED	
>>Gantry Pitch Angle	300A,014A	DS		ANAPCV	AUTO, FIXED	Empty.
>>Gantry Pitch Rotation Direction	300A,014C	CS		ANAPCV	AUTO, FIXED	Empty.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Beam Limiting Device Angle	300A,0120	DS	0.0	ANAP	AUTO, FIXED	
>>Beam Limiting Device Rotation Direction	300A,0121	CS	NONE	ANAP	FIXED	
>>Patient Support Angle	300A,0122	DS		ANAP	AUTO	
>>Patient Support Rotation Direction	300A,0123	CS	NONE	ANAP	FIXED	
>>Table Top Vertical Position	300A,0128	DS		ANAPCV	AUTO, FIXED	Empty.
>>Table Top Longitudinal Position	300A,0129	DS		ANAPCV	AUTO, FIXED	Empty.
>>Table Top Lateral Position	300A,012A	DS		ANAPCV	AUTO, FIXED	Empty.
>>Cumulative Meterset Weight	300A,0134	DS		VNAP	AUTO	Cumulative weight to current control point. The first Control point will have value 0. For beams with Scan Mode (300A,0308) as NONE or UNIFORM, If the system has capabilities of handling a factor of 100 for specific target machines, the second control point will have a value of 1, else 100.
>>Table Top Pitch Angle	300A,0140	FL	0	ANAPCV	AUTO, FIXED	
>>Table Top Pitch Rotation Direction	300A,0142	CS	NONE	ANAPCV	AUTO, FIXED	
>>Table Top Roll Angle	300A,0144	FL	0	ANAPCV	AUTO, FIXED	
>>Table Top Roll Rotation Direction	300A,0146	CS	NONE	ANAPCV	AUTO, FIXED	
>>Snout Position	300A,030D	FL		ANAPCV	AUTO	
>>Isocenter Position	300A,012C	DS		ANAPCV	AUTO	
>Patient Support Type	300A,0350	CS	TABLE	ALWAYS	AUTO, FIXED	
>Number of Lateral Spreading Devices	300A,0330	IS		ALWAYS	AUTO, USER	The value will be 0 for delivery technique of type Uniform Scanning (i.e. Scan Mode (300A, 0308) is "UNIFORM"). The value will be 2 for delivery technique of type Double Scattering (i.e. Scan Mode is "NONE"). The value will be the number of commissioned lateral spreading devices for Spot Scattering (i.e. Scan mode is "MODULATED").
>Lateral Spreading Device Sequence	300A,0332	SQ		ALWAYS	AUTO	The presence of the sequence is controlled in the Physics module.
>>Lateral Spreading Device Number	300A,0334	IS		ALWAYS	AUTO	Sequentially numbered starting from 1.
>>Lateral Spreading Device ID	300A,0336	SH		ALWAYS	AUTO, USER	
>>Lateral Spreading Device Type	300A,0338	CS		ALWAYS	AUTO, USER	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Range Modulator Sequence	300A,0342	SQ		ALWAYS	AUTO	
>>Range Modulator Number	300A,0344	IS	1	ALWAYS	AUTO	
>>Range Modulator ID	300A,0346	SH		ALWAYS	AUTO, USER	
>>Range Modulator Type	300A,0348	CS		ALWAYS	AUTO	WHL_FIXEDWEIGHTS = For Uniform Scanning and Double Scattering beams FIXED = For Spot Scanning beams.
>>Range Shifter Settings Sequence	300A,0360	SQ		ANAP	AUTO	
>>>Referenced Range Shifter Number	300C,0100	IS	1	ALWAYS, FIXED	AUTO	
>>>Range Shifter Setting	300A,0362	LO	1	ALWAYS	AUTO, CONFIG	If Range Shifter is present, the default value will be 1. This can be changed by the user.
>>>Isocenter to Range Shifter Distance	300A,0364	FL		ALWAYS	AUTO	
>>>Range Shifter Water Equivalent Thickness	300A,0366	FL		ALWAYS	AUTO	
>>Lateral Spreading Device Settings Sequence	300A,0370	SQ		ANAP	AUTO	Introduces sequence of Lateral Spreading Device settings for the current control point. The presence of the sequence is controlled in the Physics module.
>>>Referenced Lateral Spreading Device Number	300C,0102	IS		ALWAYS	AUTO	
>>>Lateral Spreading Device Setting	300A,0372	LO		ALWAYS	AUTO	Value will be IN.
>>Scan Spot Tune ID	300A,0390	SH		ANAP	AUTO	
>>Number of Scan Spot Positions	300A,0392	IS		ANAP	AUTO	
>>Scan Spot Position Map	300A,0394	FL		ANAP	AUTO	
>>Scan Spot Meterset Weights	300A,0396	FL		ANAP	AUTO	
>>Scanning Spot Size	300A,0398	FL		ANAP	AUTO	
>>Number of Paintings	300A,039A	IS		ANAP	AUTO	

Table 132: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAP	AUTO, COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAPCV	AUTO	The time the message was created.
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.481.8	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	Generated.

8.1.1.9. Spatial Registration Storage SOP Class

Table 133: IOD of Created Spatial Registration Storage Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	RT Series Module	ALWAYS
Frame of Reference	Frame of Reference Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Spatial Registration	Spatial Registration Module	ALWAYS
	SOP Common Module	ALWAYS

Table 134: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY, USER	Patient's name, as entered/ imported in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/ imported in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/ imported in Launch Pad.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on Launch Pad entry/ import.

*This date will be in yyyymmdd format. If entered or imported in yyyy-mm-dd format, the date will be converted automatically upon export. Other date formats will not be exported.

Table 135: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Time	0008,0030	TM		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Accession Number	0008,0050	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Referring Physician's Name	0008,0090	PN		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Description	0008,1030	LO		ANAPCV	COPY, USER	Comment as entered in Launch Pad.
Physician of Record	0008,1048	PN		ANAPCV	COPY, USER	Physician as entered in Launch Pad.
Referenced Study Sequence	0008,1110	SQ		ANAPCV	COPY	Introduces the sequence describing the study containing the data set for which this set of ROIs was defined.
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.3.1.2.3.2	ANAP	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ANAP	AUTO	Study UID of the data set from which this image was defined.
Study Instance UID	0020,000D	UI		ALWAYS	AUTO, COPY	Copied from the Primary Image Set, if imported via DICOM, else it is generated.
Study ID	0020,0010	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.

Table 136: RT Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	REG	ALWAYS	COPY	
Series Description	0008,103E	LO		ANAPCV	COPY, USER	Series Description from the DICOM Export Window.
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	Generated.
Series Number	0020,0011	IS		VNAP	AUTO, COPY	Series Number from the DICOM Export Window.

Table 137: Frame of Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Frame of Reference UID	0020,0052	UI		ALWAYS	AUTO	Matches the Frame of Reference UID for the primary image set if the patient position has not been altered on import. If the patient position was altered on import, a new Frame of Reference UID will be generated.
Position Reference Indicator	0020,1040	LO		VNAP	COPY	

Table 138: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	VNAP	AUTO, COPY	
Station Name	0008,1010	SH		ANAPCV	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	Pinnacle[3]	ANAPCV	AUTO, COPY	
Software Version(s)	0018,1020	LO	16.2.1\16.2	ANAPCV	FIXED	

Table 139: Spatial Registration Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Content Date	0008,0023	DA		ALWAYS	COPY	Copied from Plan.
Content Time	0008,0033	TM		ALWAYS	COPY	Copied from Plan.
Registration Sequence	0070,0308	SQ		ALWAYS	AUTO	Introduces two registration sequences.
>Frame of Reference UID	0020,0052	UI		ANAP	AUTO	Identifies the dataset's Frame of Reference.
>>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	The SOP Class UID of each image in the dataset.
>>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	The SOP Instance UID of each image in the dataset.
>Matrix Registration Sequence	0070,0309	SQ		ALWAYS	AUTO	Introduces a single matrix registration sequence.
>>Registration Type Code Sequence	0070,030D	SQ		VNAP	COPY	Empty.
>>Matrix Sequence	0070,030A	SQ		ALWAYS	AUTO	Introduces a single matrix registration.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>>Frame of Reference Transformation Matrix	3006,00C6	DS		ALWAYS	AUTO	A 4x4 homogeneous transformation matrix that registers the secondary dataset to the primary dataset. Matrix elements will be listed in row-major order. The primary dataset must be an identity matrix.
Instance Number	0020,0013	IS	1	ALWAYS	FIXED	
Content Label	0070,0080	CS		ALWAYS	AUTO	Current time/date stamp.

Table 140: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAP	AUTO, COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAPCV	AUTO	The time the message was created.
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.66.1	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	Generated.

8.1.1.10.　　Secondary Capture Image Storage SOP Class

Table 141: IOD of Created Secondary Capture Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	General Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Equipment	SC Equipment Module	ALWAYS
Image	General Image Module	ALWAYS
Image	VOI LUT Module	ALWAYS
Image	SOP Common Module	ALWAYS

Table 142: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY, USER	Patient's name, as entered/ imported in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/ imported in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/ imported in Launch Pad.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on Launch Pad entry/ import.

Table 143: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Time	0008,0030	TM		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Accession Number	0008,0050	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Referring Physician's Name	0008,0090	PN		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Description	0008,1030	LO		ANAPCV	COPY, USER	Comment as entered in Launch Pad.
Physician of Record	0008,1048	PN		ANAPCV	COPY, USER	Physician as entered in Launch Pad.
Study Instance UID	0020,000D	UI		ALWAYS	AUTO, COPY	Copied from the Primary Image set, if imported via DICOM, else it is generated.
Study ID	0020,0010	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.

Table 144: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	Generated on Export.
Series Number	0020,0011	IS		VNAP	COPY	Empty.
Laterality	0020,0060	CS		ANAPCV	COPY	Empty.

Table 145: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	VNAP	AUTO, COPY	
Station Name	0008,1010	SH		ANAPCV	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	Pinnacle[3]	ANAPCV	AUTO, COPY	
Software Version(s)	0018,1020	LO	16.2.1\16.2	ANAPCV	FIXED	

Table 146: SC Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	OT	ALWAYS	AUTO	
Conversion Type	0008,0064	CS	WSD	ALWAYS	AUTO	

Table 147: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Content Date	0008,0023	DA		ANAPCV	AUTO	Date the transfer was performed.
Content Time	0008,0033	TM		ANAPCV	AUTO	Time the transfer was performed.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Instance Number	0020,0013	IS	1	VNAP	AUTO	
Patient Orientation	0020,0020	CS		ANAPCV	COPY	Empty.

Table 148: VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Window Center	0028,1050	DS		ANAP	AUTO, COPY	The default window center value for the image, for display purposes.
Window Width	0028,1051	DS		ANAP	AUTO, COPY	The default window width value for the image, for display purposes.

Table 149: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAP	AUTO, COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAPCV	AUTO	The time the message was created.
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.7	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	

8.1.2. Usage of Attributes from Received IOD

8.1.2.1. Usage of the Functionality CT, MR, NM and PET Image Storage IODs

The following table lists the supported SOP Classes which can be used by these applications.

Table 150: Supported SOP Classes for functionality CT, MR, NM and PET Image Storage IODs

SOP Class name	SOP Class UID
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4
Nuclear Medicine Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.20
Positron Emission Tomography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.128

Table 151: Used modules from CT, MR, NM and PET Image SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	General Series Module	ALWAYS
Series	NM/PET Patient Orientation Module*	ALWAYS
Frame of Reference	Frame of Reference Module	CONDITIONAL
Equipment	General Equipment Module	ALWAYS
Image	General Image Module	ALWAYS
Image	Image Plane Module	ALWAYS
Image	Image Pixel Module	ALWAYS

DICOM Conformance Statement Pinnacle³ Radiotherapy Treatment Planning System R16.2.1
Doc Id: DHF305591
Doc status: Approved

Page 81 of 101

Information Entity	Module	Presence Of Module
Image	CT Image Module*	ALWAYS
Image	MR Image Module*	ALWAYS
Image	NM Image Pixel Module*	ALWAYS
Image	NM Reconstruction Module*	CONDITIONAL
Image	PET Image Module*	ALWAYS
Image	SOP Common Module	CONDITIONAL

Note: * Modules are only present per imaging modality.

Table 152: Supported attributes of functionality CT, MR, NM and PET SOP Class Instances

Attribute Name	Tag	VR	Value	Comment
Image Type	0008,0008	CS		Image identification characteristics.
SOP Class UID	0008,0016	UI		Used in identifying the SOP class.
SOP Instance UID	0008,0018	UI		Used in identifying the SOP Instance.
Study Date	0008,0020	DA		Displayed to user. Need to contain same value throughout the study or null.
Series Date	0008,0021	DA		Displayed to user.
Series Time	0008,0031	TM		Displayed to user.
Study Time	0008,0030	TM		Displayed to user. Need to contain same value throughout the study or null.
Modality	0008,0060	CS		Determine special processing required for interpretation of the image data.
Manufacturer	0008,0070	LO		
Referring Physician's Name	0008,0090	PN		Patient's referring physician. Used in the Patient Demographics feature of AcQSim³.
Study Description	0008,1030	LO		Study description. Used in the "Comments" field of the Patient Demographics feature of AcQSim3.
Manufacturer's Model Name	0008,1090	LO		Manufacturer's model name.
Irradiation Event UID	0008,3010	UI		Used to detect whether pulmonary gated phases were created from more than one data acquisition. If tag does not exist or is empty, the system assumes that all phases are sourced from the same acquisition.
Patient's Name	0010,0010	PN		Displayed to user.
Patient ID	0010,0020	LO		Patient ID. Used in the "Medical Record Number" part of the Patient Demographics feature of AcQSim³.
Patient's Birth Date	0010,0030	DA		Birth date of the patient. Used in the Patient Demographics feature of AcQSim³.
Patient's Sex	0010,0040	CS		Displayed to user.
Slice Thickness	0018,0050	DS		Nominal slice thickness, in mm.

Attribute Name	Tag	VR	Value	Comment
Spacing Between Slices	0018,0088	DS		Used to determine the spacing of the slices for rendering.
Data Collection Diameter	0018,1100	DS		Tumor LOC only: Displayed as 2D viewer annotation for Extended Field of View reconstructions only (see section 8.5.3).
Gantry/Detector Tilt	0018,1120	DS		If present, must be zero.
Table Height	0018,1130	DS		Couch height.
Patient Position	0018,5100	CS		Used to determine the patient's original position/orientation at the scanner. The value can be HFS, HFP, HFDL, HFDR, FFS, FFP, FFDL, or FFDR Required for PET images if the following tags are not sent: Patient Orientation Code Sequence (0054,0410), Patient Orientation Modifier Code Sequence (0054,0412), Patient Gantry Relationship Code Sequence (0054,0414)
Study Instance UID	0020,000D	UI		Used to associate multiple images into a single Pinnacle3 data file.
Series Instance UID	0020,000E	UI		Used to associate multiple images into a single Pinnacle³ data file.
Study ID	0020,0010	SH		Not used; required for import to succeed
Series Number	0020,0010	IS		Not used; required for import to succeed
Instance Number	0020,0013	IS		Used as slice number. If no value exists or values are the same throughout the dataset, Pinnacle3 uses its own slice numbering mechanism.
Image Position (Patient)	0020,0032	DS		The x, y, and z coordinates of the upper left corner (center of first voxel transmitted) of the image in mm. Used to properly position each slice in the dataset.
Image Orientation (Patient)	0020,0037	DS		Used to find out how the image is stored (how it is reconstructed as compared to the original patient scan orientation). In combination with information from "Patient Position" (0018, 5100) field, this is used to properly import the images in the original orientation of the patient scan.
Frame of Reference UID	0020,0052	UI		Uniquely identify the Frame of Reference for the series. For CT and MR data must be the same for every image in the series.
Slice Location	0020,1041	DS		Position of slice relative to an unspecified implementation-specific reference point. Used to represent horizontal couch position in Philips scanners only.
Samples per Pixel	0028,0002	US	1	
Photometric Interpretation	0028,0004	CS	MONOCHROME2	
Rows	0028,0010	US		Number of rows in the image.
Columns	0028,0011	US		Number of columns in the image.
Pixel Spacing	0028,0030	DS		Physical distance in the patient between the center of each pixel.

Attribute Name	Tag	VR	Value	Comment
Bits Allocated	0028,0100	US		Number of bits allocated for each pixel sample.
Bits Stored	0028,0101	US		Number of bits stored for each pixel sample.
High Bit	0028,0102	US		Most significant bit for pixel sample data. For CT, NM and PT, value is one less than the value in Bits Stored.
Pixel Representation	0028,0103	US		Data representation of the pixel samples.
Pixel Padding Value	0028,0120	US/SS		Value of pixels added to non-rectangular image to pad to rectangular format.
Rescale Intercept	0028,1052	DS		Used to scale data to appropriate units. Always zero for PET images.
Rescale Slope	0028,1053	DS		Used to scale data to Hounsfield Units.
Pixel Data	7FE0,0010	OW/OB		Pixel data.

Table 153: NM/PET Patient Orientation Module

Attribute Name	Tag	VR	Value	Comment
Patient Orientation Code Sequence	0054,0410	SQ		Sequence that describes the orientation of the patient with respect to gravity. Required if Patient Position (0018,5100) is not sent.
>Code Value	0008,0100	SH	F-10450 (recumbent)	Values other than the specified terms will result in the image being rejected..
>Patient Orientation Modifier Code Sequence	0054,0412	SQ		Patient orientation modifier. Only a single Item will be included in this Sequence. Required if Patient Orientation Code Sequence (0054,0410) is sent.
>>Code Value	0008,0100	SH		Values other than these specified terms will result in the image being rejected: F-10310 (prone) F-10340 (supine) F-10317 (right lateral decubitus) F-10319 (left lateral decubitus)
Patient Gantry Relationship Code Sequence	0054,0414	SQ		Sequence which describes the orientation of the patient with respect to the gantry. Only a single item will be included in this Sequence. Required if Patient Position (0018,5100) is not sent.
>Code Value	0008,0100	SH		Values other than these specified terms will result in the image being rejected: F-10470 (head first) F-10340 (feet first) G-5190 (head first) G-5191 (feet first)

8.1.2.2. Usage of the Functionality RT Structure Set Storage SOP Class

The following table lists the supported SOP Classes which can be used by this application.

Table 154: Supported SOP Classes for functionality RT Structure Set Storage SOP Class

SOP Class name	SOP Class UID
RT Structure Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.3

Table 155: Used attributes from RT Structure Set Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Series	RT Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Structure Set	Structure Set Module	ALWAYS
Structure Set	ROI Contour Module	ALWAYS
Structure Set	RT ROI Observations Module	ALWAYS
Structure Set	SOP Common Module	ALWAYS

Table 156: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY	Used to verify the patient plan matches with the data. Matched with the patient name as entered in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY	Used to verify the patient plan matches with the data. Matched with the medical record number as entered in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY	Not used.
Patient's Sex	0010,0040	CS		VNAP	COPY	Used to verify the patient plan matches with the data.

Table 157: RT Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	RTSTRUCT	ALWAYS	COPY	
Series Description	0008,103E	LO		ANAPCV	COPY	Not used.
Series Instance UID	0020,000E	UI		ALWAYS	COPY	Written to transfer log.
Series Number	0020,0011	IS		VNAP	COPY	Not used.

Table 158: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO		VNAP	COPY	
Station Name	0008,1010	SH		ANAPCV	COPY	
Manufacturer's Model Name	0008,1090	LO		ANAPCV	COPY	
Software Version(s)	0018,1020	LO		ANAPCV	COPY	

Table 159: Structure Set Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Structure Set Label	3006,0002	SH		ALWAYS	COPY	Copied from the primary dataset, if it is imported via DICOM.
Structure Set Name	3006,0004	LO		ANAPCV	COPY	Copied from the primary dataset, if it is imported via DICOM.
Structure Set Date	3006,0008	DA		VNAP	COPY	Copied from the primary dataset, if it is imported via DICOM.
Structure Set Time	3006,0009	TM		VNAP	COPY	Copied from the primary dataset, if it is imported via DICOM.
Referenced Frame of Reference Sequence	3006,0010	SQ		ANAPCV	COPY	Introduces the sequence describing the frame of reference for the data set. Data must have been imported to Pinnacle³ via DICOM.
>Frame of Reference UID	0020,0052	UI		ANAP	COPY	Must equal the Frame of Reference UID of the plan data set.
>RT Referenced Study Sequence	3006,0012	SQ		ANAPCV	COPY	Introduces the sequence describing studies referenced by this structure set. In Pinnacle³ this identifies the data set used by the plan.
>>RT Referenced Series Sequence	3006,0014	SQ		ANAP	COPY	Introduces the sequence describing the series referenced by this structure set. In Pinnacle³ this identifies the data set.
>>>Series Instance UID	0020,000E	UI		ANAP	COPY	Used to verify that the structure set corresponds to the current plan. If not the discrepancy is logged and the user warned.
>>>Contour Image Sequence	3006,0016	SQ		ANAP	COPY	Introduces the list of Image Class and Instance UIDs within the data set series. May include images that have no contours assigned.
>>>>Referenced SOP Class UID	0008,1150	UI		ANAP	COPY	Used to verify that images used to define contours are of the correct class. If not the discrepancy is logged and the user warned.
>>>>Referenced SOP Instance UID	0008,1155	UI		ANAP	COPY	Used to verify that the image to which the contour is assigned has been transferred to Pinnacle³. If not the discrepancy is logged and the user warned.
>>Referenced SOP Class UID	0008,1150	UI		ANAP	COPY	Not used.
>>Referenced SOP Instance UID	0008,1155	UI		ANAP	COPY	Used to verify that the structure set corresponds to the current plan. If not the discrepancy is logged and the user warned.
Structure Set ROI Sequence	3006,0020	SQ		ANAPCV	COPY	Introduces the sequence of structures. One entry per ROI.
>ROI Number	3006,0022	IS		ANAP	COPY	Uniquely identifies an ROI when referenced by an ROI Contour and RT ROI Observations modules.
>Referenced Frame of Reference UID	3006,0024	UI		ANAP	COPY	Must match the Frame of Reference UID for the data set. If not the discrepancy is logged and the user notified.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>ROI Name	3006,0026	LO		ANAPCV	COPY	Used as the ROI or POI name in Pinnacle[3]. If the name is not a valid Pinnacle[3] name or duplicates an existing name, a new unique name will be generated, the action logged, and the user warned.
>ROI Volume	3006,002C	DS		ANAPCV	COPY	Not used.
>ROI Generation Algorithm	3006,0036	CS		ANAPCV	COPY	Not used.

Table 160: ROI Contour Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
ROI Contour Sequence	3006,0039	SQ		ALWAYS	COPY	Introduces the sequence of Contour Sequences defining ROIs.
>ROI Display Color	3006,002A	IS		ANAPCV	COPY	Used to assign a color to the ROI.
>Contour Sequence	3006,0040	SQ		ANAPCV	COPY	Introduces the sequence of Contours defining an ROI.
>>Contour Image Sequence	3006,0016	SQ		ANAPCV	COPY	Introduces the sequence of image UIDs to which this contour corresponds. The sequence will contain 1 item.
>>>Referenced SOP Class UID	0008,1150	UI		ANAP	COPY	Required that all Class UIDs are the same. If not the discrepancy will be logged.
>>>Referenced SOP Instance UID	0008,1155	UI		ANAP	COPY	If present, and if the contour is transverse, the contour is assigned to the image identified by this UID, ignoring the z coordinate specified in the contour data.
>>Contour Geometric Type	3006,0042	CS		ANAP	COPY	If POINT, the contour represents a POI. If CLOSED_PLANAR, the contour represents an ROI.
>>Number of Contour Points	3006,0046	IS		ANAP	COPY	The number of points describing the contour in the Contour Data attributes.
>>Contour Data	3006,0050	DS		ANAP	COPY	The (x, y, z) coordinates of the vertices of a single contour in the ROI.
>Referenced ROI Number	3006,0084	IS		ALWAYS	COPY	Used to match the contours with the ROI data in the Structure Set.

Table 161: RT ROI Observations Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
RT ROI Observations Sequence	3006,0080	SQ		ALWAYS	COPY	Introduces a sequence of ROI observations. 1 per beam.
>Observation Number	3006,0082	IS		ALWAYS	COPY	Not used.
>Referenced ROI Number	3006,0084	IS		ALWAYS	COPY	Not used.
>RT ROI Interpreted Type	3006,00A4	CS		VNAP	COPY	Type of ROI or POI: EXTERNAL, PTV, CTV, GTV, TREATED_VOLUME, IRRAD_VOLUME, AVOIDANCE, ORGAN, CAVITY, SUPPORT, FIXATION, DOSE_REGION, CONTROL, BOLUS or MARKER

Table 162: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS		ANAP	COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	COPY	
Instance Creation Time	0008,0013	TM		ANAPCV	COPY	
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.481.3	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	COPY	

8.1.2.3. Usage of the Functionality RT Plan Storage SOP Class

The following table lists the supported SOP Classes which can be used by this application.

Table 163: Supported SOP Classes for functionality RT Plan Storage SOP Class

SOP Class name	SOP Class UID
RT Plan Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.5

Table 164: Used attributes from RT Plan Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Series	RT Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Plan	RT General Plan Module	ALWAYS
Plan	RT Fraction Scheme Module	ALWAYS
Plan	RT Beams Module	ALWAYS
Plan	SOP Common Module	ALWAYS

Table 165: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY	Used to verify the patient plan matches with the data. Matched with the patient name as entered in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY	Used to verify the patient plan matches with the data. Matched with the medical record number as entered in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY	Copied from the primary dataset, if it is imported via DICOM.
Patient's Sex	0010,0040	CS		VNAP	COPY	Used to verify the patient plan matches with the data.

Table 166: RT Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS		ALWAYS	COPY	RTPLAN
Series Description	0008,103E	LO		ANAPCV	COPY	User defined description for this series.
Series Instance UID	0020,000E	UI		ALWAYS	COPY	Written to transfer log.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Number	0020,0011	IS		VNAP	COPY	A number that identifies this series.

Table 167: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO		VNAP	COPY	
Station Name	0008,1010	SH		ANAPCV	COPY	
Manufacturer's Model Name	0008,1090	LO		ANAPCV	COPY	
Software Version(s)	0018,1020	LO		ANAPCV	COPY	

Table 168: RT General Plan Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Operators' Name	0008,1070	PN		VNAP	COPY	Copied from Launchpad.
RT Plan Label	300A,0002	SH		ALWAYS	COPY	Copied from Launchpad.
RT Plan Name	300A,0003	LO		ANAPCV	COPY	Copied from Launchpad.
RT Plan Description	300A,0004	ST		ANAPCV	COPY	Copied from Launchpad.
RT Plan Date	300A,0006	DA		VNAP	COPY	Copied from Launchpad.
RT Plan Time	300A,0007	TM		VNAP	COPY	Copied from Launchpad.
RT Plan Geometry	300A,000C	CS		ALWAYS	COPY	Copied from Launchpad.

Table 169: RT Fraction Scheme Module*

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Fraction Group Sequence	300A,0070	SQ		ALWAYS	COPY	Introduces sequence of Fraction Groups in current Fraction Scheme. Each Fraction Group is translated to a Prescription in Pinnacle³.
>Fraction Group Number	300A,0071	IS		ALWAYS	COPY	Identifies the fraction scheme for a beam.
>Number of Fractions Planned	300A,0078	IS		VNAP	COPY	The number of fractions for a prescription.
>Number of Beams	300A,0080	IS		ALWAYS	COPY	Used to verify the consistency of the transmitted plan. If this does not match the actual number of beams using this plan, the discrepancy is logged and the user warned.
>Number of Brachy Application Setups	300A,00A0	IS		ALWAYS	COPY	Not used.
>Referenced Beam Sequence	300C,0004	SQ		ANAP	COPY	Introduces the sequence of treatment beams in the current Fraction Group.
>>Beam Dose	300A,0084	DS		ANAPCV	COPY	Not used.
>>Beam Meterset	300A,0086	DS		ANAPCV	COPY	Not used.
>>Referenced Beam Number	300C,0006	IS		ANAP	COPY	Associates a prescription with a beam.

Note: * Attributes related to brachytherapy treatments are not supported.

Table 170: RT Beams Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Beam Sequence	300A,00B0	SQ		ALWAYS	COPY	Introduces the sequence of treatment beams for this RT Plan. There will be 1 entry per beam.
>Manufacturer	0008,0070	LO		ANAPCV	COPY	The manufacturer of the machine assigned to this beam.
>Institution Name	0008,0080	LO		ANAPCV		Not used.
>Treatment Machine Name	300A,00B2	SH		VNAP	COPY	The name of the machine assigned to this beam.
>Primary Dosimeter Unit	300A,00B3	CS	MU	ANAPCV	COPY	"MINUTE" is not supported.
>Source-Axis Distance	300A,00B4	DS		ANAPCV	COPY	The SAD of the machine assigned to this beam in mm.
>Beam Limiting Device Sequence	300A,00B6	SQ		ALWAYS	COPY	Introduces the sequence of beam limiting devices (collimator) jaw or leaf (element) sets.
>>RT Beam Limiting Device Type	300A,00B8	CS		ALWAYS	COPY	As appropriate: X = symmetric jaw pair in X direction Y = symmetric jaw pair in Y direction ASYMX = asymmetric jaw pair in X direction ASYMY = asymmetric jaw pair in Y direction MLCX = multileaf jaw pair in X direction MLCY = multileaf jaw pair in Y direction.
>>Source to Beam Limiting Device Distance	300A,00BA	DS		ANAPCV	COPY	The Source to Beam Limiting Device distance in mm.
>>Number of Leaf/Jaw Pairs	300A,00BC	IS		ALWAYS	COPY	
>>Leaf Position Boundaries	300A,00BE	DS		ANAPCV	COPY	The position of the edges of the leaf boundaries with respect to the central axis. There will be the number of leaf pairs + 1 entries.
>Beam Number	300A,00C0	IS		ALWAYS	COPY	Must be unique within the sequence, and within the plan.
>Beam Name	300A,00C2	LO		ANAPCV	COPY	Must be unique.
>Beam Description	300A,00C3	ST		ANAPCV		Not used.
>Beam Type	300A,00C4	CS		ALWAYS	COPY	STATIC or DYNAMIC. Only 2 control points are supported, so essentially we support a static or arc beam.
>Radiation Type	300A,00C6	CS		VNAP	COPY	PHOTON or ELECTRON
>Referenced Patient Setup Number	300C,006A	IS		ANAPCV	COPY	References the Patient Setup number (300A,0182) as defined in the Patient Setup Module. However Pinnacle only has one primary data set, so there can only be a single sequence.
>Primary Fluence Mode Sequence	3002,0050	SQ		ANAP	COPY	Only a single item will be permitted in this sequence. If there is more than one item, the Primary Fluence Mode Sequence will be ignored and the user warned.
>>Fluence Mode	3002,0051	CS		ANAPCV	COPY	Not used.
>>Fluence Mode ID	3002,0052	SH	FFF	ANAPCV	COPY	The matching energy commissioned as FFF will be used for this beam. If there is no commissioned FFF energy, the default energy will be used.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>High-Dose Technique Type	300A,00C7	CS	NORMAL	ANAPCV	COPY	If sent, the only value supported is NORMAL. If not the discrepancy is logged and the user warned.
>Treatment Delivery Type	300A,00CE	CS		ANAPCV	COPY	TREATMENT or SETUP
>Number of Wedges	300A,00D0	IS	0 or 1	ALWAYS	COPY	
>Wedge Sequence	300A,00D1	SQ		ANAP	COPY	Introduces sequence of treatment wedges. Required if Number of Wedges is non-zero.
>>Wedge Number	300A,00D2	IS	0	ANAP		Not used.
>>Wedge Type	300A,00D3	CS		ANAPCV	COPY	As appropriate: STANDARD = standard (static) wedge DYNAMIC = moving beam limiting device jaw simulating wedge MOTORIZED = single wedge that can be removed from beam remotely.
>>Wedge ID	300A,00D4	SH		ANAPCV	COPY	The Manufacturer code of the wedge assigned to the beam. Must match a code in wedge list.
>>Wedge Angle	300A,00D5	IS		ANAPCV	COPY	The angle of the wedge for the beam.
>>Wedge Factor	300A,00D6	DS		ANAPCV	COPY	Not used.
>>Wedge Orientation	300A,00D8	DS		ANAPCV	COPY	The orientation of the wedge. Must be 0, 90, 180, 270, or 360.
>Number of Compensators	300A,00E0	IS		ALWAYS	COPY	Not supported.
>Compensator Sequence	300A,00E3	SQ		ANAP		Not supported.
>Number of Boli	300A,00ED	IS		ALWAYS		Not supported.
>Number of Blocks	300A,00F0	IS		ALWAYS	COPY	The number of blocks in the Block Sequence (300A,00F4). For Aktina cones, will only support 1 item. If more than 1 item is sent then the last cone will be used.
>Total Block Tray Factor	300A,00F2	DS		ANAPCV	COPY	The tray factor of the beam.
>Block Sequence	300A,00F4	SQ		ANAP	COPY	Introduces sequence of blocks associated with Beam. Required if Number of Blocks is non-zero.
>>Material ID	300A,00E1	SH		ANAPCV	COPY	Not used.
>>Block Tray ID	300A,00F5	SH		ANAPCV	AUTO	The tray number. If not specified, UNKNOWN TRAY ID. For Aktina cones, the nominal cone diameter in mm.
>>Source to Block Tray Distance	300A,00F6	DS		ANAPCV	COPY	The Source to Tray Distance as defined for the machine.
>>Block Type	300A,00F8	CS		ANAP	AUTO	Sent as APERTURE for Aktina Cones, SHIELDING for others
>>Block Divergence	300A,00FA	CS	PRESENT	ANAPCV	FIXED	Not used for Aktina cones.
>>Block Number	300A,00FC	IS		ANAP	AUTO	The identifying number for this block contour.
>>Block Thickness	300A,0100	DS		ANAPCV	COPY	Not used.
>>Block Transmission	300A,0102	DS		ANAPCV	AUTO	The block and tray factor of the beam. Not used for Aktina cones.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Block Number of Points	300A,0104	IS		ANAPCV	AUTO	The number of points used to describe the block contour. Not used for Aktina cones.
>>Block Data	300A,0106	DS		ANAPCV	AUTO	Data containing the (x, y) pairs describing the edge of the block contour. Not used for Aktina cones.
>Applicator Sequence	300A,0107	SQ		ANAPCV	COPY	Introduces the sequence of Applicators. Only a single item will be permitted in this sequence.
>>Accessory Code	300A,00F9	LO		ANAP	COPY	Must match the accessory code of a commissioned machine if the Applicator Type is STEREOTACTIC.
>>Applicator ID	300A,0108	SH		ALWAYS	COPY	Name of the applicator or circular collimator assigned to the beam. For a stereo beam, the name of the circular collimator. For an electron beam, the electron applicator name. Must match an electron applicator or circular collimator in the applicator list. For Aktina cones, must be "Aktina SRS"
>>Applicator Type	300A,0109	CS		ANAP	COPY	For a stereo beam, set to 'STEREOTACTIC'. For an electron beam the dimensions of the applicator will be checked, if length = height 'ELECTRON_SQUARE' will be set. Otherwise 'ELECTRON_RECT'.
>Final Cumulative Meterset Weight	300A,010E	DS		ANAP	COPY	Must be 1.
>Number of Control Points	300A,0110	IS	2	ALWAYS	COPY	Must be 2, else the beam will be rejected.
>Control Point Sequence	300A,0111	SQ		ALWAYS	COPY	Introduces the sequence of machine configurations describing this treatment beam.
>>Control Point Index	300A,0112	IS		ANAP		
>>Nominal Beam Energy	300A,0114	DS		ANAPCV	COPY	The selected machine energy for this beam. Pinnacle does not support the import of different energies for multiple control points within the same beam.
>>Dose Rate Set	300A,0115	DS		ANAPCV		Not used.
>>Wedge Position Sequence	300A,0116	SQ		ANAPCV		Not used, since we only support a sequence of 1 wedge.
>>>Wedge Position	300A,0118	CS		ANAP	AUTO	If this tag is present, the wedge is presumed to be "IN" since it was defined at all.
>>>Referenced Wedge Number	300C,00C0	IS		ANAP		Not used.
>>Beam Limiting Device Position Sequence	300A,011A	SQ		ANAP		Not used.
>>>RT Beam Limiting Device Type	300A,00B8	CS		ANAP		Not used.
>>>Leaf/Jaw Positions	300A,011C	DS		ANAP	COPY	The jaw or MLC leaf positions for this control point in mm.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Gantry Angle	300A,011E	DS		ANAP	COPY	The gantry angle of the beam for this control point. Control point zero will always represent the starting angle for the beam.
>>Gantry Rotation Direction	300A,011F	CS		ANAP	COPY	If an arc is being described, this will represent the direction of the gantry rotation ('CW' or 'CC'). If this is a fixed treatment the value should be 'NONE'.
>>Beam Limiting Device Angle	300A,0120	DS		ANAP	COPY	The collimator angle for the beam.
>>Beam Limiting Device Rotation Direction	300A,0121	CS	NONE	ANAP	FIXED	Pinnacle does not support rotation of the collimator during treatment.
>>Patient Support Angle	300A,0122	DS		ANAP	COPY	The couch angle for the beam.
>>Patient Support Rotation Direction	300A,0123	CS	NONE	ANAP	FIXED	Pinnacle does not support rotation of the couch during treatment.
>>Table Top Eccentric Angle	300A,0125	DS		ANAP		Not used.
>>Table Top Eccentric Rotation Direction	300A,0126	CS		ANAP		Not used.
>>Table Top Vertical Position	300A,0128	DS		ANAPCV		Not used.
>>Table Top Longitudinal Position	300A,0129	DS		ANAPCV		Not used.
>>Table Top Lateral Position	300A,012A	DS		ANAPCV		Not used.
>>Isocenter Position	300A,012C	DS		ANAPCV	COPY	Pinnacle does not support movement of the isocenter during treatment.
>>Source to Surface Distance	300A,0130	DS		ANAPCV		Not imported. Pinnacle computes the SSD.
>>Cumulative Meterset Weight	300A,0134	DS		ANAPCV	FIXED	The first control point weight must be 0, and the second must be 1.
>Referenced Tolerance Table Number	300C,00A0	IS		ANAPCV		Not used.
>Referenced Bolus Sequence	300C,00B0	SQ		ANAP		Not used.
>>Referenced ROI Number	3006,0084	IS		ANAP		Not used

Table 171: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS		ANAP	COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	COPY	
Instance Creation Time	0008,0013	TM		ANAPCV	COPY	
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.481.5	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	COPY	

8.1.2.4. Usage of the Functionality Spatial REGISTRATION Storage SOP Class

The following table lists the supported SOP Classes which can be used by this application.

Table 172: Supported SOP Classes for functionality Spatial Registration Storage SOP Class

SOP Class name	SOP Class UID
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1

Table 173: Used attributes from Spatial Registration Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Series	RT Series Module	ALWAYS
Frame of Reference	Frame of Reference Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Spatial Registration	Spatial Registration Module	ALWAYS
	SOP Common Module	ALWAYS

Table 174: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY	Used to verify the patient plan matches with the data. Matched with the patient name as entered in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY	Used to verify the patient plan matches with the data. Matched with the medical record number as entered in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY	Copied from primary imageset, if imported via DICOM.
Patient's Sex	0010,0040	CS		VNAP	COPY	Used to verify the patient plan matches with the data.

Table 175: RT Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	REG	ALWAYS	COPY	
Series Description	0008,103E	LO		ANAPCV	COPY	User defined description for this series.
Series Instance UID	0020,000E	UI		ALWAYS	COPY	Written to transfer log.
Series Number	0020,0011	IS		VNAP	COPY	A number that identifies this series.

Table 176: Frame of Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Frame of Reference UID	0020,0052	UI		ALWAYS	COPY	Not used.
Position Reference Indicator	0020,1040	LO		VNAP	COPY	Not used.

Table 177: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO		VNAP	COPY	
Station Name	0008,1010	SH		ANAPCV	COPY	
Manufacturer's Model Name	0008,1090	LO		ANAPCV	COPY	
Software Version(s)	0018,1020	LO		ANAPCV	COPY	

Table 178: Spatial Registration Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Content Date	0008,0023	DA		ALWAYS	COPY	Not used.
Content Time	0008,0033	TM		ALWAYS	COPY	Not used.
Registration Sequence	0070,0308	SQ		ALWAYS	COPY	Introduces two registration sequences.
>Frame of Reference UID	0020,0052	UI		ANAP	COPY	Identifies the dataset's Frame of Reference.
>>Referenced SOP Class UID	0008,1150	UI		ALWAYS	COPY	Not used.
>>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	COPY	Not used.
>Matrix Registration Sequence	0070,0309	SQ		ALWAYS	COPY	Introduces a single matrix registration sequence.
>>Frame of Reference Transformation Comment	3006,00C8	DS		ANAPCV	COPY	Not used.
>>Registration Type Code Sequence	0070,030D	SQ		VNAP	COPY	Not used.
>>Matrix Sequence	0070,030A	SQ		ALWAYS	COPY	Introduces a single matrix registration.
>>>Frame of Reference Transformation Matrix	3006,00C6	DS		ALWAYS	COPY	A 4x4 homogeneous transformation matrix that registers the secondary dataset to the primary dataset. Matrix elements will be listed in row-major order. The primary dataset must be an identity matrix.
Instance Number	0020,0013	IS		ALWAYS	COPY	Not used.
Content Label	0070,0080	CS		ALWAYS	COPY	Not used.

Table 179: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS		ANAP	COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	COPY	
Instance Creation Time	0008,0013	TM		ANAPCV	COPY	
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.66.1	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	COPY	

8.1.2.5. Usage of the Functionality RT Dose Storage SOP Class

The following table lists the supported SOP Classes which can be used by this application.

Table 180: Supported SOP Classes for functionality RT Dose Storage SOP Class

SOP Class name	SOP Class UID
RT Dose Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.2

Table 181: Used attributes from RT Dose Storage Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	RT Series Module	ALWAYS
Frame of Reference	Frame of Reference Module	ALWAYS
Equipment	General Equipment Module	ALWAYS

Information Entity	Module	Presence Of Module
Dose	Image Plane Module	ALWAYS
Dose	Image Pixel Module	ALWAYS
Dose	Multi-Frame Module	ALWAYS
Dose	RT Dose Module	ALWAYS
Dose	SOP Common Module	ALWAYS

Table 182: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY	Used to verify the patient plan matches with the data. Matched with the patient name as entered in Launch Pad.
Patient ID	0010,0020	LO		VNAP	COPY	Used to verify the patient plan matches with the data. Matched with the medical record number as entered/ imported in Launch Pad.
Patient's Birth Date	0010,0030	DA		VNAP	COPY	Copied from the primary imageset, if transferred via DICOM. .
Patient's Sex	0010,0040	CS		VNAP	COPY	Used to verify the patient plan matches with the data.

Table 183: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Time	0008,0030	TM		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Accession Number	0008,0050	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Referring Physician's Name	0008,0090	PN		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.
Study Description	0008,1030	LO		ANAPCV	COPY, USER	
Physician of Record	0008,1048	PN		ANAPCV	COPY, USER	
Referenced Study Sequence	0008,1110	SQ		ANAPCV	COPY	
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.3.1.2.3.2	ANAP	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ANAP	AUTO	
Study Instance UID	0020,000D	UI		ALWAYS	AUTO, COPY	Copied from Primary image set, if imported via DICOM. Else it is generated.
Study ID	0020,0010	SH		VNAP	COPY	Copied from the Primary Image set, if imported via DICOM.

Table 184: RT Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	RTDOSE	ALWAYS	COPY	
Operators' Name	0008,1070	PN		ANAP	COPY	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Description	0008,103E	LO		ANAPCV	COPY, USER	Copied from the DICOM Export Window.
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	Generated.
Series Number	0020,0011	IS		VNAP	AUTO, COPY	Copied from the DICOM Export Window.

Table 185: Frame of Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Frame of Reference UID	0020,0052	UI		ALWAYS	COPY	Matches the Frame of Reference UID to the image set. If there are multiple Frame of References that match (i.e. gated dataset) then we let the user decide which dataset to assign the dose to upon import.
Position Reference Indicator	0020,1040	LO		VNAP	COPY	

Table 186: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO		VNAP	COPY	
Station Name	0008,1010	SH		ANAPCV	COPY	
Manufacturer's Model Name	0008,1090	LO		ANAPCV	COPY	
Software Version(s)	0018,1020	LO		ANAPCV	COPY	

Note: For DICOM Images (PET, CT, MR, NM) we use the Patient Orientation tag. However, for RT Dose import, we do not use the Patient Orientation. Therefore for the SCP in the RT Dose IOD, we do not process any General Image Module tags.

Table 187: Image Plane Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Slice Thickness	0018,0050	DS		ALWAYS	COPY	Nominal slice thickness, in mm.
Image Orientation (Patient)	0020,0037	DS		ALWAYS	COPY	Must be axial to import dose, and it will determine the dose coordinate system.
Pixel Spacing	0028,0030	DS		ALWAYS	COPY	Physical distance in the patient between the center of each voxel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm.

Table 188: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Samples per Pixel	0028,0002	US	1	ALWAYS	COPY	
Photometric Interpretation	0028,0004	CS	MONOCHROME2	ALWAYS	COPY	
Rows	0028,0010	US		ALWAYS	AUTO, COPY	Number of rows in the image.
Columns	0028,0011	US		ALWAYS	AUTO, COPY	Number of columns in the image.
Bits Allocated	0028,0100	US	16	ALWAYS	COPY	
Bits Stored	0028,0101	US	16	ALWAYS	COPY	
High Bit	0028,0102	US	15	ALWAYS	COPY	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Pixel Representation	0028,0103	US	0	ALWAYS	COPY	'0' designates unsigned integer.

Table 189: Multi-Frame Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Number of Frames	0028,0008	IS		ALWAYS	COPY	Number of frames in a Multi-frame Image. See of the DICOM Part3 specification PS3.3 for explanation.
Frame Increment Pointer	0028,0009	AT		ALWAYS	COPY	

Table 190: RT Dose Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Dose Units	3004,0002	CS	GY	ALWAYS	COPY	
Dose Type	3004,0004	CS		ALWAYS	COPY	PHYSICAL (physical dose). EFFECTIVE if it is a PROTON Dose.
Dose Summation Type	3004,000A	CS	PLAN	ALWAYS	COPY	'PLAN' (dose calculated for a single Prescription (Fraction Group) within an RT Plan)
Grid Frame Offset Vector	3004,000C	DS		ANAP	COPY	We accept only grid based dose whose direction is increasing or decreasing, does not change direction, and is not variably spaced.
Dose Grid Scaling	3004,000E	DS		ALWAYS	COPY	Scaling factor that when multiplied by the dose grid data found in the Pixel Data (7FE0,0010) attribute of the Image Pixel Module, yields grid doses in the dose units as specified by Dose Units (3004,0002).

Table 191: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS		ANAP	COPY	
Instance Creation Date	0008,0012	DA		ANAPCV	COPY	
Instance Creation Time	0008,0013	TM		ANAPCV	COPY	
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.481.2	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI		ALWAYS	COPY	

8.1.2.6. Usage of the Functionality SC Image Storage SOP Class (Pulmonary Waveform)

The following table lists the supported SOP Classes which can be used to import Pulmonary Waveforms in Secondary Capture objects, generated as part of a respiratory gated CT acquisition on Philips scanners.

Table 192: Supported SOP Classes for functionality Secondary Capture Image Storage SOP Class (Pulmonary Waveform)

SOP Class name	SOP Class UID
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7

Table 193: Used attributes from Secondary Capture Image Storage (Pulmonary Waveform) Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	General Series Module	ALWAYS
Image	General Image Module	ALWAYS
Image	SOP Common Module	ALWAYS
Not Applicable	Extended DICOM and Private attributes (Refer section 8.5.4)	ALWAYS

Table 194: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY	Copied from primary image set, if imported via DICOM.
Patient ID	0010,0020	LO		VNAP	COPY	Copied from primary image set, if imported via DICOM.

Table 195: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	Copied from primary image set, if imported via DICOM.
Study Time	0008,0030	TM		VNAP	COPY	Copied from primary image set, if imported via DICOM.
Study ID	0020,0010	SH		VNAP	COPY	Copied from primary image set, if imported via DICOM.
Study Instance UID	0020,000D	UI		VNAP	COPY	Copied from primary image set, if imported via DICOM.

Table 196: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Date	0008,0021	DA		VNAP	COPY	Copied from primary image set, if imported via DICOM.
Series Time	0008,0031	TM		VNAP	COPY	Copied from primary image set, if imported via DICOM.
Modality	0008,0060	CS	"SC"	VNAP	COPY	Identifies the object as a pulmonary waveform candidate.
Series Number	0020,0011	IS		VNAP	COPY	Copied from primary image set, if imported via DICOM.
Series Instance UID	0020,000E	UI		VNAP	COPY	Copied from primary image set, if imported via DICOM.

Table 197: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	DERIVED\SECONDARY \RESPIRATORY_WAVE	VNAP	COPY	Copied from primary image set, if imported via DICOM.

Table 198: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
SOP Class UID	0008,0016	UI	-	ALWAYS	COPY	
SOP Instance UID	0008,0018	UI	-	ALWAYS	COPY	

8.1.3. Attribute Mapping

Not applicable.

8.1.4. Coerced/Modified fields

Not applicable.

8.2. Data Dictionary of Private Attributes

Pinnacle[3] is not responsible for, but will seek to resolve, any conflicts that arise due to changes in Private Creator data elements controlled by other vendors.

8.3. Coded Terminology and Templates

Not applicable.

8.3.1. Context Groups

Not applicable.

8.3.2. Template Specifications

Not applicable.

8.3.3. Private code definitions

Not applicable.

8.4. Grayscale Image consistency

Not applicable.

8.5. Standard Extended/Specialized/Private SOPs

8.5.1. RT Plan Storage SOP Class Instances

Table 199: Extended DICOM and private attributes for RT Plan Storage SOP Class Instances*

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Private Creator Code	3253,0010		Varian	ALWAYS	AUTO	-
OBI Field Type Specification	3253,1000			ANAP	AUTO	-
OBI Information Length	3253,1001			ANAP	AUTO	-
Extended Interface Format	3253,1002			ANAP	AUTO	-
Referenced Beam Sequence	300C,0004	SQ		ANAP	AUTO, COPY	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Private Creator Code **	3249,0010	LO	Varian Medical Systems VISION 3249	ALWAYS	AUTO	
>Maximum Treatment Time	3249,1000	DS		ALWAYS	AUTO	The maximum treatment time, which should not be exceeded. Units in [min].
>Referenced Primary Dose Reference UID	3249,1010	UI		ANAP	AUTO	Referenced Primary Dose Reference UID" (3249, 1010) is equal for all beams and will reference the "Dose Reference UID" (300A, 0013) (RT Prescription Module) Present only if the RT Prescription Module is present.

* The Varian Private attributes are only included if Varian OBI support has been enabled and Setup beams are being exported.

** Pinnacle[3] is not responsible for, but will seek to resolve, any conflicts that arise due to changes in Private Creator data elements controlled by other vendors.

8.5.2. RT Ion Plan Storage SOP Class Instances

Table 200: Extended DICOM and private attributes for RT Ion Plan Storage SOP Class Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Ion Beam Sequence	300A,03A2	SQ		ALWAYS	AUTO	
>Private Creator Code	300B,0010	LO	IMPAC	ALWAYS	AUTO	
>Maximum Collimated Field Diameter	300B,1002	FL		ALWAYS	AUTO	The maximum diameter (in mm) of a circle, centered about the beam axis, which contains the collimated field.
>Planned Distal target distance	300B,1004	FL		ALWAYS	AUTO	It represents the 90% of the distal Bragg peak.
>Nominal SOPB width	300B,100E	FL		ALWAYS	AUTO	Distance (in mm) between maximal Water-Equivalent distance to distal border of target and minimal Water-Equivalent Distance to proximal border of target.
Private Creator Code*	300B,0010	LO	IMPAC	ANAP	AUTO	
Beam Line Data Table Version	300B,1008	SH		ANAP	AUTO	As specified in Physics, the version of the lookup tables used to convert prescription information into beam line settings. Required if Scan Mode (300A, 0308) is MODULATED. The default value exported is 'LUT0'.

* Pinnacle[3] is not responsible for, but will seek to resolve, any conflicts that arise due to changes in Private Creator data elements controlled by other vendors.

8.5.3. CT Image Storage SOP Class Instances

Table 201: Extended DICOM and private attributes for CT Image Storage SOP Class Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Private Creator Code	00E1,0010	LO	ELSCINT1	ALWAYS	AUTO, COPY	Implementer ID

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Orthopedic Metal Artifact Reduction	00E1,1040	SH	O-MAR	ANAPCV	IMPLICIT	Present only if the imageset was reconstructed with Orthopedic Metal Artifact Reduction.
Couch ID	00E1,1042	LO		ALWAYS	AUTO, COPY	Specifies the couch used to acquire the original scan.
Private Creator Code	01F1,0010	LO	ELSCINT1	ALWAYS	AUTO, COPY	Implementer ID
Gating	01F1,1039	LO		ALWAYS	AUTO, COPY	Specifies the intensity projection type of the current dataset as MIP, MinIP or AIP
Extended Field of View	01F1,1053	SH	Extended FOV	ANAPCV	IMPLICIT	Present only if the imageset was reconstructed with Extended Field of View.

8.5.4. Secondary Capture (Pulmonary Waveform) SOP Class Instances

This section applies to imported pulmonary waveforms only.

Table 202: Extended DICOM and private attributes for Secondary Capture (Pulmonary Waveform) SOP Class Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Private Creator Code	01E1,0010	LO	ELSCINT1	ALWAYS	AUTO	
ElscintCT Pulmo Data	01E1,1018	OB		ALWAYS	AUTO	Pulmonary waveform data, as captured by a Philips CT scanner. Contains amplitudes, peak indicators, x-ray on/off indicators, and timing information.

8.6. Private Transfer Syntaxes

Not applicable.