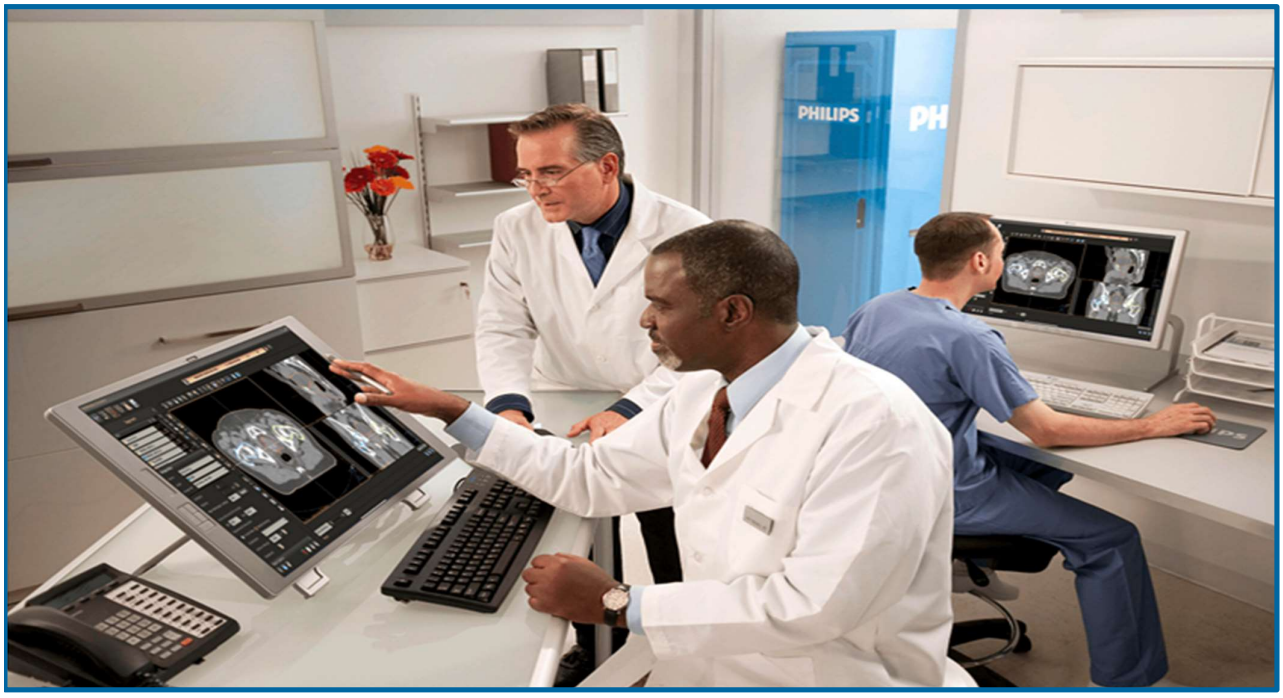
DICOM Conformance Statement

Multimodality Simulation Workspace v1.0



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1. DICOM Conformance Statement Overview

This conformance statement refers to the "Multimodality Simulation Workspace v1.0" which is used in conjunction with the record and verify (R&V) systems. This version of DICOM Conformance Statement applies to Philips Multimodality Simulation Workspace, version 1.0

Image data obtained from CT, MR, PET, PET-CT and SPECT devices that comply with the DICOM standard can be imported into MM Sim. Qualified medical professionals use MM Sim to perform virtual simulation workflows, including image fusion and registration, organ contouring, beam setup, and patient marking. Once these processes are complete, the system can transfer the finished RT Plan, RT Structure, and DICOM image sets to other devices used in the therapy process, such as a Radiation Therapy Plan System (RTPS), an Oncology Information System (OIS), and Picture Archiving and Communication System (PACS). Additionally, the system can directly send images to a DICOM printer and export coordinate information via DICOM to an external laser.

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 MM Sim.

Table 1: Network Services

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 Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Yes	No
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No
>Printer SOP Class	1.2.840.10008.5.1.1.16	Yes	No
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No
>Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No
>Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No
>Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes	No
>Printer SOP Class	1.2.840.10008.5.1.1.16	Yes	No
Transfer			
Positron Emission Tomography Image Storage SOP Class[1]	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
Secondary Capture Image Storage SOP Class[1]	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
MR Image Storage SOP Class[1]	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Spatial Registration Storage SOP Class[2]	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
RT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1	Yes	No
RT Structure Set Storage SOP Class[2]	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	No
Nuclear Medicine Image Storage SOP Class[1]	1.2.840.10008.5.1.4.1.1.20	Yes	Yes

Note[1] : MM Sim cannot create these SOP Class but can export the imported SOP Class without making modifications.

Note[2]:MM Sim can import & export this SOP Class making modifications.

2. 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	Description of change
01	13-June-2025	First Release for Multimodality Simulation Workspace v1.0

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 ensure 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
ANSI	American National Standard Institute
AP	Application Profile
BOT	Basic Offset Table
CD	Compact Disc
CD-R	CD-Recordable
CD-M	CD-Medical
CR	Computed Radiography
CT	Computed Tomography
DCR	Dynamic Cardio Review
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DIMSE-Composite
DIMSE-N	DIMSE-Normalized
DX	Digital X-Ray
EBE	DICOM Explicit VR Big Endian
ELE	DICOM Explicit VR Little Endian
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
GUI	Graphic User Interface
HIS	Hospital Information System
HL7	Health Level Seven
ILE	DICOM Implicit VR Little Endian
IOD	Information Object Definition
ISIS	Information System - Imaging System
MOD	Magneto-Optical Disk
MPPS	Modality Performed Procedure Step
MR	Magnetic Resonance
MM Sim	Multimodality Simulation workspace
NEMA	National Electrical Manufacturers Association
NM	Nuclear Medicine
PDU	Protocol Data Unit
RF	X-Ray Radiofluoroscopic
RIS	Radiology Information System
RT	Radiotherapy
RWA	Real-World Activity
SC	Secondary Capture

Abbreviation/Term	Explanation
SCM	Study Component Management
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
US	Ultrasound
USMF	Ultrasound Multi-frame
WLM	Worklist Management
XA	X-Ray Angiographic

3.5. References

[DICOM] Digital Imaging and Communications in Medicine, Parts 1 - 22 (NEMA PS 3.1- PS 3.22),
National Electrical Manufacturers Association
1300 North 17th Street
Suite 900
Arlington, Virginia 22209
Internet: https://www.dicomstandard.org/current

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 MM Sim 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 database via the application's Import capability.

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

The MM Sim SCP is a daemon, started at system boot, which runs continuously. MM Sim utilizes an associated DICOM-to- specified file format converter to import DICOM image data to the database.

The MM Sim SCU is the MM Sim application. (Note that the actual AE Title will be the name of the workstation, capitalized; the default name PHILIPS will only be used if the workstation name cannot be determined.) The MM Sim 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, and PET,SPECT images back to the remote server via the DICOM Image Export Feature of Patient Dashboard and Simulation plan or CT images used as the primary dataset of the MM Sim plan via the DICOM Image Export feature of MM Sim.

The MM Sim-related Implementation Model is shown in the following figure.

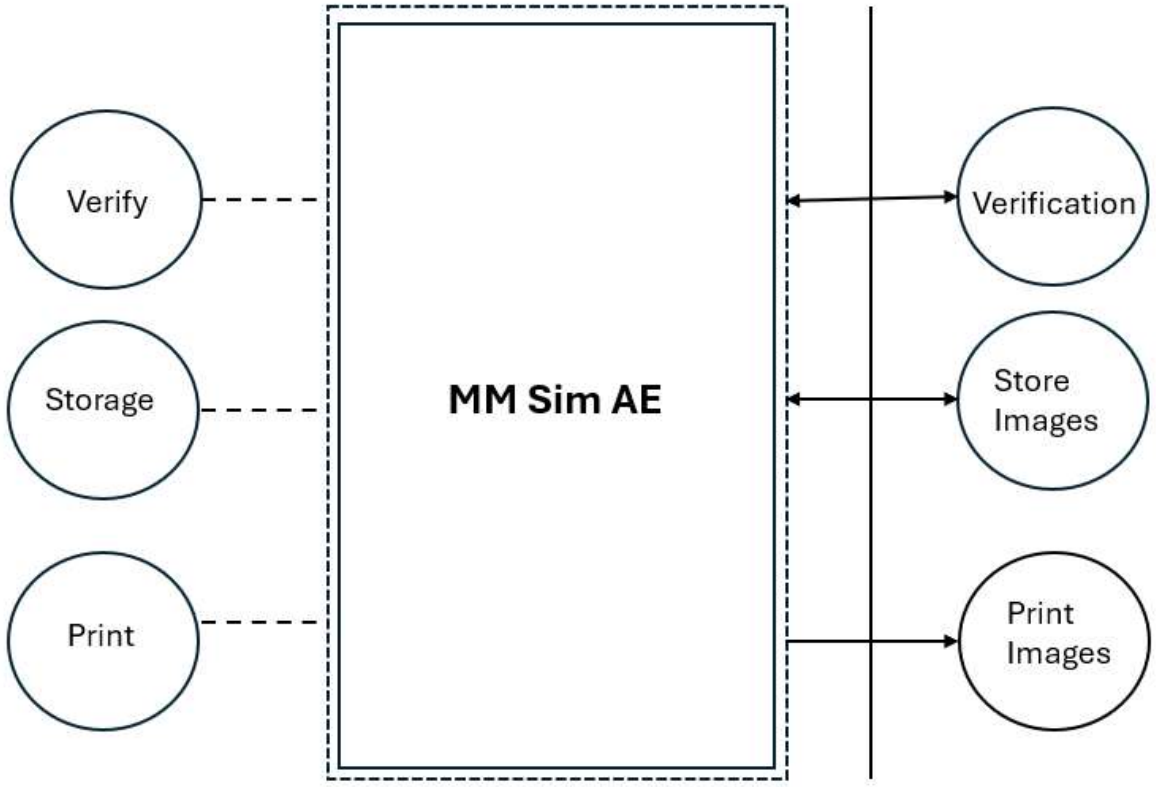

Figure 1: MM Sim Implementation Model

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 MM Sim SCP

The MM Sim 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 MM Sim SCP is a daemon, started at system boot, which runs continuously.
When invoked, the DICOM-to- MM Sim file format converter will scan the directory of files for image messages written by the MM Sim 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 MM Sim as a single data set.

MM Sim application utilizes the DICOM-to- MM Sim file format converter to import DICOM image data to the MM Sim database.

4.1.2.2. Functional Definition of MM Sim SCU

Import of Spatial Registration and RT Structure is accomplished within MM Sim. 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.

The MM Sim application, using the workstation's name as the AE Title or failing that, PHILIPS, 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 MM Sim application also communicates with a remote SCP to transfer RT Plan, RT Structure Set. 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 ,PET and SPECT images back to the remote server, via the DICOM Image Export feature of Patient Dashboard or Simulation Plan or CT images used as the primary dataset of the MM Sim plan within the DICOM Image Export feature of MM Sim.

4.2. AE Specifications

The Network capabilities of the system consist of two DICOM Application Entities:

- Throughout this document PHILIPS is used to specify the AE Title representing the MM Sim application. In the field the presented AE Title will be the capitalized hostname of the machine sending the message.

4.2.1. MM Sim SCU

Detail of this specific Application Entity is specified in this section.

4.2.1.1. SOP Classes

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

Table 4: SOP Classes for storage AE

SOP Class Name	SOP Class UID	SCU
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
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4	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
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
RT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	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.

4.2.1.2. 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 DICOM standard application context is specified below.

Table 5: DICOM Application Context

Description	Value
Application Context Name	1.2.840.10008.3.1.1.1

4.2.1.2.2 Number of Associations

The number of simultaneous associations that an Application Entity may support as an Initiator or Acceptor is specified here.

Table 6: Number of associations as an Association Initiator for this AE

Description	Value
Maximum number of simultaneous associations	1

4.2.1.2.3 Asynchronous Nature

The implementation supports negotiation of multiple outstanding transactions, along with the maximum number of outstanding transactions supported.

Table 7: Asynchronous nature as an Association Initiator for this AE

Description	Value
Maximum number of outstanding asynchronous transactions	1

4.2.1.2.4 Implementation Identifying Information

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

Table 8: DICOM Implementation Class and Version for storage AE

Implementation Class UID	1.3.46.670589.13.2024.1.0.0
Implementation Version Name	MM SIM_SCU_1_0_0

4.2.1.2.5 Communication Failure Handling

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

Table 9: Communication Failure Behavior

Exception	Behavior
Timeout	e.g. The Association is aborted using A-ABORT and the command is marked as failed. The reason is logged and reported to the user.
	e.g. Association aborted
	e.g. Failed to connect

4.2.1.3. Association Initiation Policy

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

Associated Real-World Activity:

The MM Sim SCU initiates associations on request from the user. An association is established with the specified application entity. The MM Sim SCU sends a C_STORE request for each message to be sent. When transmitting RT IODs, the MM Sim SCU initiates an association for RT Plan, 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 MM Sim also includes the time-out value to wait for a reply message from the SCP. The default value is 60 seconds. If the time-out is exceeded, the Pinnacle SCU will abort the association.

Table 10: 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.

Result	Source	Reason/Diagnosis	Explanation
		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 11: 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.
	6 - invalid-PDU-parameter value	The connection is closed.

4.2.1.3.1 Real-World) Activity – Verification as SCU

4.2.1.3.1.1 Description and Sequencing of Activities

The MM SIM SCU implements the Verification service class / Verification SOP class to verify application level communication.

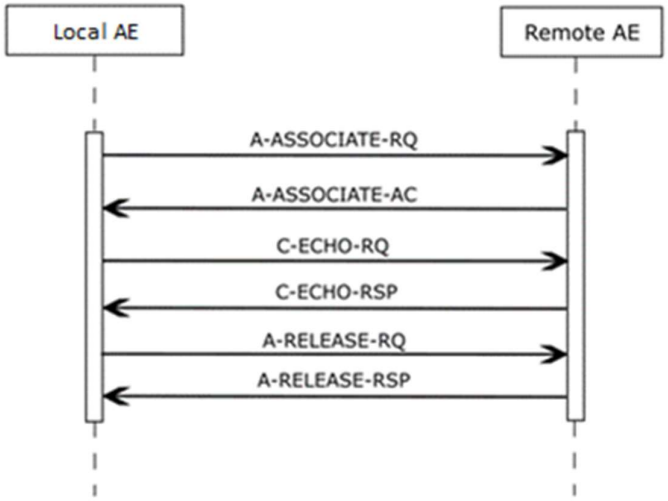

Figure 2: Verification as SCU

4.2.1.3.1.2 Proposed Presentation Contexts

The presentation contexts are defined in the next table.

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

4.2.1.3.1.3 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.

4.2.1.3.1.3.1 Dataset Specific Conformance 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 12: Status Response

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

4.2.1.3.2 (Real-World) Activity – Image Export

4.2.1.3.2.1 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.

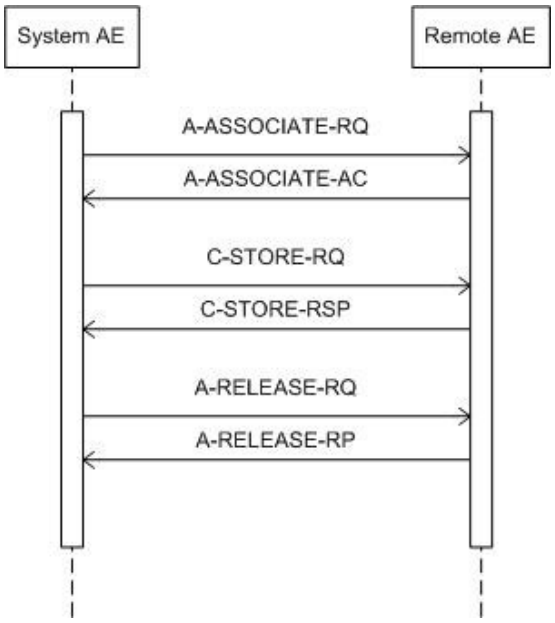

Figure 3: Real world activity - export

- When one or more SOP Classes are not accepted by Remote System, the MM Sim shows a warning on the UI "DICOM Message: Image Transmission Failed".
- When Abort happens during export operation, MM Sim displays “Unrecoverable errors - an error occurred when closing the Association” on the UI.
- When the data is imported to the MM Sim and the same data is exported to the Remote Node the data is consistent.

4.2.1.3.2.2 Proposed Presentation Contexts

The presentation contexts are defined in the next table.

Table 13: Proposed Presentation Contexts for (Real-World) Activity – Image Export

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	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
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 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
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

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
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
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
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.2.1.3.2.3 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.

4.2.1.3.2.3.1 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 14: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful stored	Success message 'DICOM Image transmitted successfully' is shown on UI
Failure	A700	Refused: Out of Resources	'DICOM Image transmitted Failed' is shown on UI
	A900	Error: Data Set does not match SOP Class	'DICOM Image transmitted Failed' is shown on UI
	C000	Error: cannot understand	'DICOM Image transmitted Failed' is shown on UI
	0110	Processing Failure	'DICOM Image transmitted Failed' is shown on UI
	0210H	Duplicate Invocation	'DICOM Image transmitted Failed' is shown on UI
	0117H	Invalid Object Instance	'DICOM Image transmitted Failed' is shown on UI
	0212H	Mistyped Argument	'DICOM Image transmitted Failed' is shown on UI
Warning	B000	Coercion of Data Elements	'DICOM Image transmitted Failed' is shown on UI
	B007	Data Set does not match SOP Class	'DICOM Image transmitted Failed' is shown on UI
	B006	Elements Discarded	'DICOM Image transmitted Failed' is shown on UI

Service Status	Error Code	Further Meaning	Behavior
	0107H	Attribute List Error	'DICOM Image transmitted Failed' is shown on UI

4.2.1.3.3 (Real-World) Activity – Print Management as SCU

4.2.1.3.3.1 Description and Sequencing of Activities

The MM Sim SCU application entity initiates an association for the Color or Grayscale print services class based on the configuration of the printer in MM Sim. 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 MM Sim also includes the time-out value to wait for a reply message from the SCP. The default value is 60 seconds. If the time-out is exceeded, the MM Sim SCU will abort the association.

The MM Sim 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 MM Sim 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 MM Sim 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.

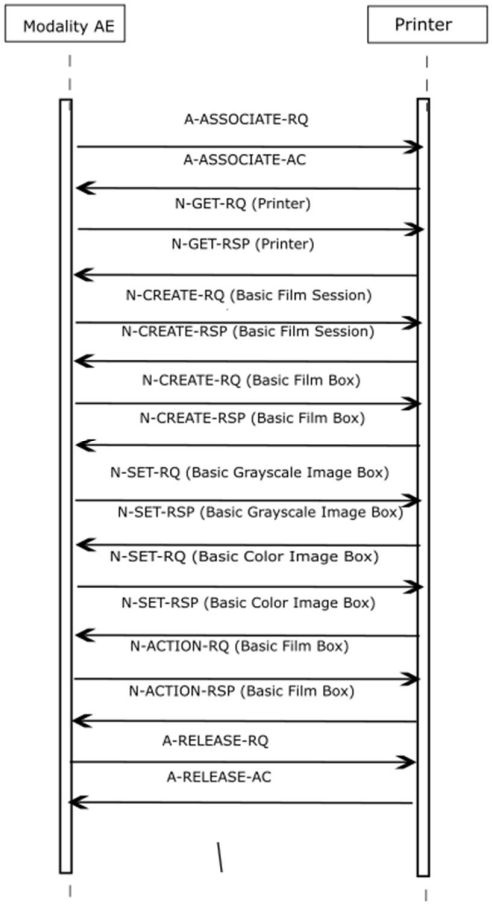

Figure 4: Real world activity – Print management as SCU

4.2.1.3.3.2 Proposed Presentation Contexts

The presentation contexts are defined in the below table.

Table 15: 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
>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

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

4.2.1.3.3.3 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 16: Basic Film Session Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Number of Copies	2000,0010	IS	1	ANAP	CONFIG, USER	
Print Priority	2000,0020	CS	MEDIUM	ANAP	CONFIG, USER	Default: MEDIUM
Medium Type	2000,0030	CS	PAPER, CLEAR FILM, or BLUE FILM	ANAP	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	ANAP	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 17: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information
Warning	<xxxx>	All warning numbers	Print job is terminated and error message is displayed on UI.
Failure	<xxxx>	All error numbers	Print job is terminated and error message is displayed on UI.

4.2.1.3.3.4 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.

4.2.2.3.3.4.1. 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 18: 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	ANAP	CONFIG, USER	
Film Size ID	2010,0050	CS	14INX17IN, 14INX14IN, 11INX14IN, 10INX14IN, 10INX12IN, 8INX10IN, 24CMX30CM, or 24CMX24CM	ANAP	CONFIG, USER	Default: 14INX17IN
Magnification Type	2010,0060	CS	CUBIC, BILINEAR, or REPLICATE	ANAP	CONFIG	Default: CUBIC
Smoothing Type	2010,0080	CS		ANAP	CONFIG	
Border Density	2010,0100	CS	BLACK or WHITE	ANAP	CONFIG	Default: WHITE
Empty Image Density	2010,0110	CS	BLACK or WHITE	ANAP	CONFIG	Default: BLACK
Max Density	2010,0130	US		ANAP	CONFIG	
Trim	2010,0140	CS	YES or NO	ANAP	CONFIG, USER	Default: NO
Configuration Information	2010,0150	ST		ANAP	CONFIG	

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	Matching is complete	The SCU has successfully returned all matching information
Warning	<xxxx>	All warning numbers	Print job is terminated and error message is displayed on UI.
Failure	<xxxx>	All error numbers	Print job is terminated and error message is displayed on UI.

4.2.2.3.3.4.2. 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 20: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information
Warning	<xxxx>	All warning numbers	Print job is terminated and error message is displayed on UI.
Failure	<xxxx>	All error numbers	Print job is terminated and error message is displayed on UI.

4.2.2.3.3.5. 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.

4.2.2.3.3.5.1 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 21: 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		ANAP	AUTO	NORMAL or REVERSE
Requested Image Size	2020,0030	DS		ANAP	AUTO	
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 22: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information
Warning	<xxxx>	All warning numbers	Print job is terminated and error message is displayed on UI.
Failure	<xxxx>	All error numbers	Print job is terminated and error message is displayed on UI.

4.2.2.3.3.6. 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.

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

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

Table 23: Printer Module*

Attribute Name	Tag	VR	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	ANAP	COPY	None
Manufacturer's Model Name	0008,1090	LO	ANAP	COPY	None
Device Serial Number	0018,1000	LO	ANAP	COPY	None
Software Version(s)	0018,1020	LO	ANAP	COPY	None
Printer Status	2110,0010	CS	ANAP	COPY	None
Printer Status Info	2110,0020	CS	ANAP	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 24: Status Response

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

4.2.2.3.3.7. 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.

4.2.2.3.3.7.1. 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 25: Basic Film Session Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Number of Copies	2000,0010	IS	1	ANAP	CONFIG, USER	
Print Priority	2000,0020	CS	MEDIUM	ANAP	CONFIG, USER	
Medium Type	2000,0030	CS	PAPER, CLEAR FILM, BLUE FILM	ANAP	USER	Default: PAPER
Film Destination	2000,0040	CS	MAGAZINE, PROCESSOR, BIN_1, BIN_2, BIN_3, BIN_4, BIN_5, BIN_6, BIN_7, BIN_8	ANAP	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 26: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information
Warning	<xxxx>	All warning numbers	Print job is terminated and error message is displayed on UI.
Failure	<xxxx>	All error numbers	Print job is terminated and error message is displayed on UI.

4.2.2.3.3.8. 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.

4.2.2.3.3.8.1. 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 27: 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	ANAP	USER	
Film Size ID	2010,0050	CS	14INX17IN, 14INX14IN, 11INX14IN, 10INX14IN, 10INX12IN, 8INX10IN, 24CMX30CM, or 24CMX24CM	ANAP	CONFIG, USER	Default: 14INX17IN
Magnification Type	2010,0060	CS	CUBIC, BILINEAR, or REPLICATE	ANAP	CONFIG	Default: CUBIC
Smoothing Type	2010,0080	CS		ANAP	CONFIG	
Border Density	2010,0100	CS	BLACK or WHITE	ANAP	CONFIG	Default: WHITE
Empty Image Density	2010,0110	CS	BLACK or WHITE	ANAP	CONFIG	Default: BLACK
Max Density	2010,0130	US		ANAP	CONFIG	
Trim	2010,0140	CS	YES or NO	ANAP	CONFIG, USER	Default: NO
Configuration Information	2010,0150	ST		ANAP	CONFIG	

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
Warning	<xxxx>	All warning numbers	Print job is terminated and error message is displayed on UI.
Failure	<xxxx>	All error numbers	Print job is terminated and error message is displayed on UI.

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 29: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information
Warning	<xxxx>	All warning numbers	Print job is terminated and error message is displayed on UI.
Failure	<xxxx>	All error numbers	Print job is terminated and error message is displayed on UI.

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

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

Table 30: 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		ANAP	AUTO	NORMAL or REVERSE
Requested Image Size	2020,0030	DS		ANAP	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 31: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete	The SCU has successfully returned all matching information
Warning	<xxxx>	All warning numbers	Print job is terminated and error message is displayed on UI.
Failure	<xxxx>	All error numbers	Print job is terminated and error message is displayed on UI.

4.2.2.3.3.10. 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.

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

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

Table 32: Printer Module*

Attribute Name	Tag	VR	Value*	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO		ANAP	AUTO	None
Manufacturer's Model Name	0008,1090	LO		ANAP	AUTO	None
Device Serial Number	0018,1000	LO		ANAP	AUTO	None
Software Version(s)	0018,1020	LO		ANAP	AUTO	None
Printer Status	2110,0010	CS		ANAP	AUTO	None
Printer Status Info	2110,0020	CS		ANAP	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 33: 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. MM Sim SCP

Detail of this specific Application Entity is specified in this section.

4.2.2.1. SOP Classes

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

Table 34: SOP Classes for Verification AE

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

SOP Class Name	SOP Class UID	SCP
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4	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
RT Structure Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.3	Yes

Note:

- The SCP will import Secondary Capture Image, but MM Sim does not support it and thus it cannot be opened in MM Sim application.
- The SCP will import Images only when the Pixel Data attribute with value is present.

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 DICOM standard application context is specified below.

Table 35: 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 number of simultaneous associations that an Application Entity may support as an Initiator or Acceptor is specified here.

Table 36: Number of associations as an Association Acceptor for this AE

Description	Value
Maximum number of simultaneous associations	1

4.2.2.2.3 Asynchronous Nature

The implementation supports negotiation of multiple outstanding transactions, along with the maximum number of outstanding transactions supported.

Table 37: Asynchronous nature as an Association Initiator for this AE

Description	Value
Maximum number of outstanding asynchronous transactions	No Limit

4.2.2.2.4 Implementation Identifying Information

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

Table 38: DICOM Implementation Class and Version for Verification AE

Implementation Class UID	1.3.46.670589.13.2024.1.0.0
Implementation Version Name	MM SIM_SCP_1_0_0

4.2.2.2.5 Communication Failure Handling

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

Table 39: Communication Failure Behavior

Exception	Behavior
Timeout	e.g. The Association is aborted using A-ABORT and the command is marked as failed. The reason is logged and reported to the user.
	e.g. Association aborted
	e.g. Failed to connect

4.2.2.3. Association Acceptance Policy

When the MM Sim 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 MM Sim SCP receives a verification request it responds with a success status.

Import of the data into MM Sim 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.

4.2.2.3.1 (Real-World) Activity – Verification as SCP

4.2.2.3.1.1 Description and Sequencing of Activities

The MM SIM SCP accepts Associations from configured systems that wish to verify application level communication using the C-ECHO command.

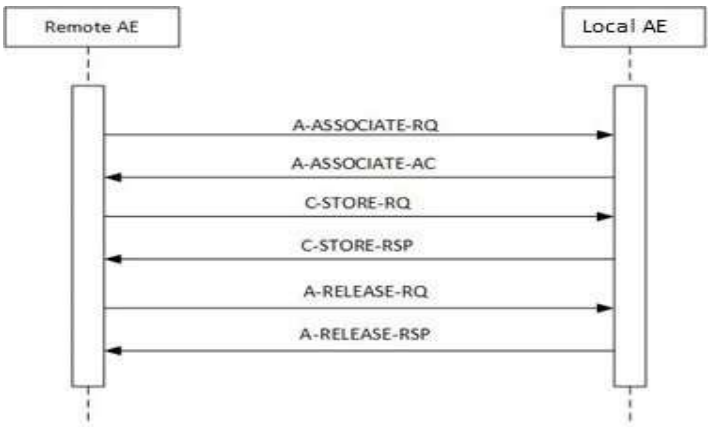

Figure 5:Data Flow Diagram- Verify

4.2.2.3.1.2 Proposed Presentation Contexts

The presentation contexts are defined in the next table.

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 Big Endian	1.2.840.10008.1.2.2		

4.2.2.3.1.3 SOP Specific Conformance for Verification SOP Class

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

4.2.2.3.1.3.1 Dataset Specific Conformance 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 40:Status Response

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

4.2.2.3.2 (Real-World) Activity – Image Import

4.2.2.3.2.1 Description and Sequencing of Activities

The MM Sim 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.

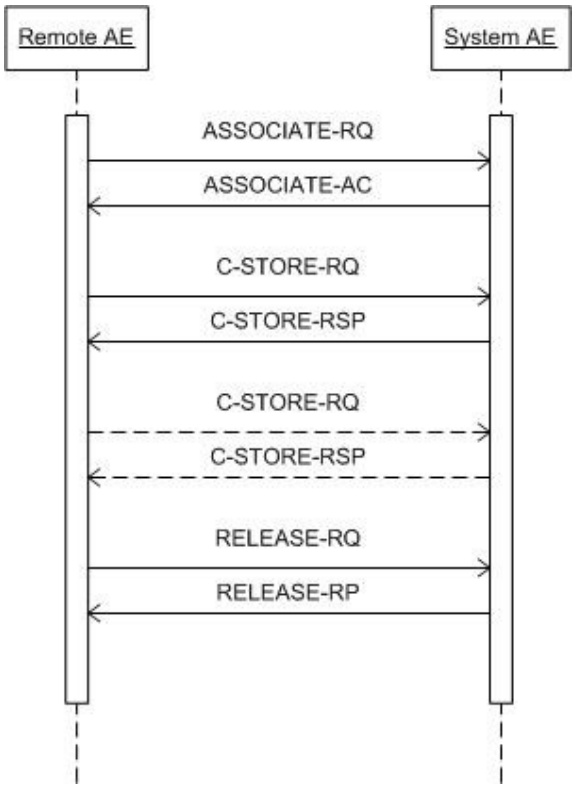

Figure 6: Real world activity – Image Import

4.2.2.3.2.2 Accepted Presentation Contexts

The presentation contexts are defined in below table.

Table 41: Acceptable Presentation Contexts for (Real-World) Activity – Image 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		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
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		
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		
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	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

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

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.

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.

4.2.2.3.2.3.1 Dataset Specific Conformance for C-STORE-RSP

The MM Sim 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 MM Sim 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 MM Sim.

Voxel sizing information is required for image data to be used within MM Sim. 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 MM Sim.

MM Sim 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 isotopically in the Z dimension.

- MM Sim imported the patient data with missing Study Instance UID or SOP Instance UID.
- MM Sim does not import the patient data with missing Series Instance UID.
- When duplicate patient data is imported into MM Sim system patient data is stored single time.
- MM Sim will send A-Abort when there is Network Timeout
- MM Sim will update Patient information on UI when importing patient data after editing patient demographics information.
- MM Sim imports the patient data which contains an illegal SOP Instance UID value (prefix a numeric component with 0)
- MM Sim will not import the patient data when Dataset being imported is encoded in a different transfer syntax other than the one which was negotiated in the association.
- MM Sim imports patient data with empty values for attributes - Patient's Name (0010,0010) and Patient ID (0010,0020).
- MM Sim will not import patient data with an invalid value for Modality (0008,0060) attribute.
- MM Sim closes the connection unexpectedly when a different SOP class is used in the C-Store-RQ command set than the one negotiated, during import.
- MM Sim will import patient data with Study Time which contains value in Retired format (HH:MM:SS)
- MM Sim will import patient data with Study Date which contains value in Retired format (YYYY.MM.DD)
- MM Sim will not import the second image when importing two images each belonging to a different patient but with identical Patient ID values.
- MM Sim will send Abort on observing delay during Network disconnect.
- MM Sim will send A-ABORT message when same patient data is imported twice.
- MM Sim will import patient data which contains non-Philips private attributes.
- When patient data, which contains an incorrect encoding of Unicode characters, is imported into the MM Sim System and the patient data is displayed in the patient directory.
- When MM Sim System receives an Abort message while performing an Import operation, the store operation is not completed, and the patient data is not displayed in the Patient directory.

Table 42: Status Response– Image Import

Service Status	Error Code	Further Meaning	Reason
Success	0000	Confirmation	Import is successful
Failure	A700	Refused: Out of Resources	When MM Sim is unable to store the composite SOP Instance because it was out of resources.
	A901	Error: Data Set does not match SOP Class	When MM Sim is unable to store the composite SOP Instance because the Data Set does not match the SOP Class
	C000	Error: Cannot understand	When MM Sim is unable to give Storage Commitment for requested Dataset.

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
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
An important installation issue is the translation from AE title to presentation address. How this is to be performed is described here.

4.4.1.1. Local AE Titles
DICOM Port: The port number combined with the application entity title identifying the MM Sim SCP to DICOM clients on the network (default: 30104).

Application Entity Title: The name of the MM Sim 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 43: AE Title configuration table

Application Entity	Default AE Title	Default TCP/IP Port
DICOM Server	ADACRTP_SCP	30104 (Configurable)
MM Sim	PHILIPS	FIXED

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) are specified here.

Table 44: 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	64234 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

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

6. Support of Character Sets

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

Table 45: Supported DICOM Character Sets

Character Set Description	Defined Term		ESC Sequence	ISO Registration Number	Code Element	Character Set
	Without code extensions	With code extensions				
Default repertoire	None	ISO 2022 IR 6	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
Chinese	GB18030	N/A				GB18030
Unicode in UTF-8	ISO_IR 192	N/A				ISO_IR 192
Latin alphabet No. 1	ISO_IR 100	ISO 2022 IR 100	ESC 02/13 04/01	ISO-IR 100	G1	ISO IR 100 ISO/IEC 8859-1
			ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
Latin alphabet No. 2	ISO_IR 101	ISO 2022 IR 101	ESC 02/13 04/02	ISO-IR 101	G1	ISO IR 101 ISO/IEC 8859-2
			ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
Cyrillic	ISO_IR 144	ISO 2022 IR 144	ESC 02/13 04/12	ISO-IR 144	G1	ISO IR 144 ISO/IEC 8859-5
			ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
Japanese (Multi-byte)	None	ISO 2022 IR 87	ESC 02/04 04/02	ISO-IR 87	G0	JIS X 0208 : Kanji

* MM Sim automatically removes certain characters from patient names upon import. These characters are listed in the below Table 46.

Table 46: 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

7.1.1. Security use Profiles

Not applicable.

7.1.2. Security Transport Connection Profiles

MM Sim supports BCP 195 TLS Secure Transport Connection Profile.

Table 47: Secure Transport Connections Profiles

Profile	Secured AE	Sender	Receiver
BCP195 TLS Secure Transport Connection	ALL	Y	Y

The System supports X.509 certificates. The following TLS Certification checks will be done (TLS Handshake). The machine (either server or client) that will send its certificate will:

- Choose the certificate according to Common Name (CN) value in the Subject-field.
- This name is case-sensitive. All present certificates should have unique CN names.

The server verifies:

- That the client certificate is a X.509 certificate which is untampered
- That the client certificate is in the list of trusted certificates
- That the client certificate is not expired (present time is between "Valid From" and "Valid To" fields of the X.509 certificate)
- That the client certificate has the correct purpose (at least the Client Authentication purpose)

The client verifies:

- That the server certificate is a X.509 certificate untampered
- That the server certificate is in the list of trusted certificates
- That the server certificate is not expired (present time is between "Valid From" and "Valid To" fields of the X.509 certificate)
- That the server certificate has the correct purpose (at least Server Authentication purpose)

No verification is done on:

- Revocation of certificates
- Limiting the connection to a limited set of IP-addresses

Node authentication with or without encryption is only possible when both nodes have:

- An access to their own private keys
- An access to a copy of the certificate of the other node containing its public key

The System can only read certificates from the certificate stores of the HKEY_LOCAL_MACHINE registry key. It is the responsibility of the Hospital to setup and maintain the certificate stores. This includes the removal of revoked certificates and certificate updates prior to their expiration. Since neither X.500 directories,

Lightweight Directory Access Protocol (LDAP) nor Certificate Revocation Lists (CRLs) are supported, the whole certificate chain needs to be replaced after a security breach.

The following figure presents the message flow of TLS handshake supported.

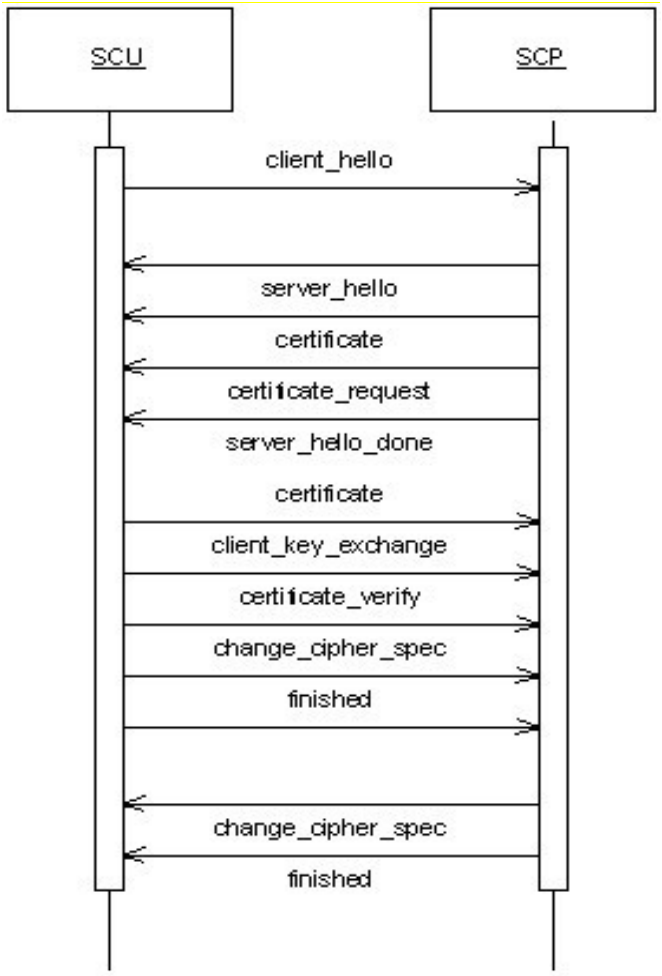

Figure 7: Message flow of TLS handshake

Secure communication is a "mode of operation" supported by the implementation of the DICOM Basic TLS Secure Transport Connection Profile [DICOM]. This functionality will be used by the nodes, which can authenticate each other before they exchange DICOM information. For secure communication the TLS protocol v1.0,1.1 &1.2 is used which provides message authentication, integrity, confidentiality, and replay protection. Confidentiality is optional and can be controlled by the encryption settings. The System may communicate using the following Cipher Suites:

Table 48: Secure Transport Connections and Cipher Suites

Profile	Cipher Suite
BCP 195 TLS Secure Transport Connection	TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 TLS_DHE_RSA_WITH_AES_256_GCM_SHA384 TLS_DHE_RSA_WITH_AES_128_GCM_SHA256 TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384 TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256 TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384 TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256 TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA TLS_RSA_WITH_AES_256_GCM_SHA384 TLS_RSA_WITH_AES_128_GCM_SHA256 TLS_RSA_WITH_AES_256_CBC_SHA256 TLS_RSA_WITH_AES_128_CBC_SHA256 TLS_RSA_WITH_AES_256_CBC_SHA TLS_RSA_WITH_AES_128_CBC_SHA

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
MM Sim conforms to the IHE CT Profile. It is possible to synchronize time with the NTP Timeserver using serviceability. The NTP Timeserver is an element of Hospital Infrastructure..

7.1.8. Application Configuration Management Profiles
Not applicable.

7.1.9. Audit Trail Profiles
Not applicable.

7.2. Association Level Security

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

8. Annexes of application "MM Sim"

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

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

8.1.1.1. List of created SOP Classes

Table 49: List of created SOP Classes

SOP Class Name	SOP Class UID
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2
RT Image Set Storage SOP Class	1.2.840.10008.5.1.4.1.1.481.1
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
Spatial Registration Storage SOP Class	1.2.840.10008.5.1.4.1.1.66.1

8.1.1.2. 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 50: IOD of CT Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
	Patient Study Module	CONDITIONAL
Series	General Series Module	ALWAYS
Frame of Reference	Frame of Reference	ALWAYS
Equipment	General Equipment Module	ALWAYS
Image	General Acquisition Module	ALWAYS
	General Image Module	ALWAYS
	Image Plane Module	ALWAYS
	Image Pixel Module	ALWAYS
	CT Image Module	ALWAYS
	VOI LUT Module	CONDITIONAL
	SOP Common Module	ALWAYS
	Extended DICOM and Private attributes (Refer section 8.6.1)	ALWAYS

Table 51: 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 the application.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/ imported in the application.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/ imported in the application.
Patient's Birth Time	0010,0032	TM		ANAP	COPY, USER	The patient's Birth time, as entered/ imported in the application.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on the application entry/import.
Referenced Patient Sequence	0008,1120	SQ		ANAP	COPY, USER	
Ethnic Group	0010,2160	SH		ANAP	COPY, USER	
Patient Comments	0010,4000	LT		ANAP	COPY, USER	

Table 52: 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	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Referring Physician's Name	0008,0090	PN		VNAP	COPY	
Study Description	0008,1030	LO		ANAP	COPY	
Procedure Code Sequence	0008,1032	SQ		ANAP	COPY	
Physician of Record	0008,1048	PN		ANAP	COPY	
Study Instance UID	0020,000D	UI		ALWAYS	COPY	
Study ID	0020,0010	SH		VNAP	COPY	
Name of Physician(s) Reading Study	0008,1060	PN		ANAP	COPY	
Referenced Study Sequence	0008,1110	SQ		ANAP	COPY	
Requesting Service	0032,1033	LO		ANAP	COPY	

Table 53: Patient Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Age	0010,1010	AS		ANAP	AUTO	
Patient's Size	0010,1020	DS		ANAP	MWL , USER	
Patient's Weight	0010,1030	DS		ANAP	MWL , USER	
Medical Alerts	0010,2000	LO		ANAP	COPY	
Allergies	0010,2110	LO		ANAP	COPY	
Additional Patient History	0010,21B0	LT		ANAP	MWL	
Pregnancy Status	0010,21C0	US		ANAP	COPY	
Admission ID	0038,0010	LO		ANAP	COPY	
Patient State	0038,0500	LO		ANAP	COPY	

Table 54: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Date	0008,0021	DA		ANAP	AUTO	
Series Time	0008,0031	TM		ANAP	AUTO	
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		VNAP	AUTO	Generated upon export.
Series Description	0008,103E	LO		ANAP	COPY	
Patient Position	0018,5100	CS		ANAP	COPY	
Operators' Name	0008,1070	PN		ANAP	AUTO	
Protocol Name	0018,1030	LO		ANAP	AUTO	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Referenced Performed Procedure Step Sequence	0008,1111	SQ		ANAP	AUTO	
>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	
Performed Procedure Step ID	0040,0253	SH		ANAP	AUTO	
Performed Procedure Step Description	0040,0254	LO		ANAP	AUTO	
Performed Protocol Code Sequence	0040,0260	SQ		ANAP	AUTO	
Request Attributes Sequence	0040,0275	SQ		ANAP	AUTO	

Table 55: 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 56: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO		VNAP	COPY	
Institution Name	0008,0080	LO		ANAP	CONFIG, USER	
Institution Address	0008,0081	ST		ANAP	CONFIG, USER	
Station Name	0008,1010	SH		ANAP	CONFIG, COPY	
Institutional Department Name	0008,1040	LO		ANAP	CONFIG	
Manufacturer's Model Name	0008,1090	LO		ANAP	COPY	
Software Versions	0018,1020	LO		ANAP	COPY	

Note: Manufacturer's Model Name and Software Versions do not have fixed value and is copied from imported Application

Table 57: General Acquisition Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Acquisition Date	0008,0022	LO		ANAP	AUTO	
Acquisition Time	0008,0032	LO		ANAP	AUTO	
Acquisition Number	0020,0012	ST		ANAP	AUTO	

Table 58: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS		ANAP	AUTO	
Content Date	0008,0023	DA		VNAP	AUTO	
Acquisition DateTime	0008,002A	DT		ANAP	AUTO	
Content Time	0008,0033	TM		VNAP	AUTO	
Instance Number	0020,0013	IS		VNAP	COPY, AUTO	Used as slice number. If no value exists in the source image set or values are the same throughout the image set, slice numbers are automatically assigned.
Patient Orientation	0020,0020	CS		ANAP	COPY	
Image Comments	0020,4000	LT		ANAP		

Table 59: Image Plane Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Pixel Spacing	0028,0030	DS		ALWAYS	COPY	
Slice Location	0020,1041	DS		ANAP	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 60: 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 61: CT Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	ORIGINAL\PRIMARY\AXIAL	ALWAYS	FIXED	
Scan Options	0018,0022	CS		ANAP	COPY	
Data Collection Diameter	0018,0090	DS		ANAP	COPY	
Reconstruction Diameter	0018,1100	DS		ANAP	COPY	
Distance Source to Detector	0018,1110	DS		ANAP	COPY	
Distance Source to Patient	0018,1111	DS		ANAP	COPY	
Gantry/Detector Tilt	0018,1120	DS		ANAP	COPY	
Table Height	0018,1130	DS		ANAP	COPY	
Rotation Direction	0018,1140	CS		ANAP	COPY	
Exposure Time	0018,1150	IS		ANAP	COPY	
X-Ray Tube Current	0018,1151	IS		ANAP	COPY	
Exposure	0018,1152	IS		ANAP	COPY	
Filter Type	0018,1160	SH		ANAP	COPY	
Generator Power	0018,1170	IS		ANAP	COPY	
Focal Spot(s)	0018,1190	DS		ANAP	COPY	
Convolution Kernel	0018,1210	SH		ANAP	COPY	
Exposure Modulation Type	0018,9323	CS		ANAP	COPY	
CTDIvol	0018,9345	FD		ANAP	COPY	
Rescale Intercept	0028,1052	DS		ALWAYS	COPY	
Rescale Slope	0028,1053	DS	1	ALWAYS	FIXED	
KVP	0018,0060	DS		VNAP	COPY	
Acquisition Number	0020,0012	IS		VNAP	COPY	
Samples per Pixel	0028,0002	US	1	ALWAYS	FIXED	
Photometric Interpretation	0028,0004	CS	MONOCHROME2	ALWAYS	COPY	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
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	

Table 62: VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Window Center	0028,1050	DS		CONDITIONAL	AUTO	
Window Width	0028,1051	DS		CONDITIONAL	AUTO	

Table 63: 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		ANAP	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAP	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	
Instance Number	0020,0013	IS		ANAP		

8.1.1.3. CT Image Storage SOP Class (Mid position)

The CT Image Storage SOP class is created for MidPosition dataset. Standard image datasets are exported exactly as they are imported; see section 4.1.1

Table 64: 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 Acquisition Module	ALWAYS
Image	General Image Module	ALWAYS
Image	Image Plane Module	ALWAYS
Image	Image Pixel Module	ALWAYS
Image	CT Image Module	ALWAYS
Image	VOI LUT Module	CONDITIONAL
Image	SOP Common Module	ALWAYS
	Extended DICOM and Private attributes (Refer section 8.6.1)	ALWAYS

Table 65: 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 the application.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/ imported in the application.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/ imported in the application.
Patient's Birth Time	0010,0032	TM		ANAP	COPY, USER	The patient's Birth time, as entered/ imported in the application.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on the application entry/import.
Referenced Patient Sequence	0008,1120	SQ		ANAP	COPY, USER	
Ethnic Group	0010,2160	SH		ANAP	COPY, USER	
Patient Comments	0010,4000	LT		ANAP	COPY, USER	

Table 66: 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		ANAP	COPY	
Procedure Code Sequence	0008,1032	SQ		ANAP	COPY	
Physician of Record	0008,1048	PN		ANAP	COPY	
Study Instance UID	0020,000D	UI		ALWAYS	COPY	
Study ID	0020,0010	SH		VNAP	COPY	
Name of Physician(s) Reading Study	0008,1060	PN		ANAP	COPY	
Referenced Study Sequence	0008,1110	SQ		ANAP	COPY	
Requesting Service	0032,1033	LO		ANAP	COPY	

Table 67: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Date	0008,0021	DA		ANAP	AUTO	
Series Time	0008,0031	TM		ANAP	AUTO	

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		VNAP	AUTO	Generated upon export.
Series Description	0008,103E	LO		ALWAYS	USER	"MidPosition 0,10,20,30,40 ,50,60,70,80, 90% Ref:50% "
Patient Position	0018,5100	CS		ANAP	COPY	
Operators' Name	0008,1070	PN		ANAP	AUTO	
Protocol Name	0018,1030	LO		ANAP	AUTO	
Referenced Performed Procedure Step Sequence	0008,1111	SQ		ANAP	AUTO	
>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	
Performed Procedure Step ID	0040,0253	SH		ANAP	AUTO	
Performed Procedure Step Description	0040,0254	LO		ANAP	AUTO	
Performed Protocol Code Sequence	0040,0260	SQ		ANAP	AUTO	
Request Attributes Sequence	0040,0275	SQ		ANAP	AUTO	

Table 68: 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 69: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO		VNAP	COPY	
Institution Name	0008,0080	LO		ANAP	CONFIG,USER	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Institution Address	0008,0081	ST		ANAP	CONFIG,USER	
Station Name	0008,1010	SH		ANAP	CONFIG, COPY	
Institutional Department Name	0008,1040	LO		ANAP	CONFIG	
Manufacturer's Model Name	0008,1090	LO		ANAP	COPY	
Software Versions	0018,1020	LO		ANAP	COPY	

Note: Manufacturer's Model Name and Software Versions do not have fixed value and is copied from imported Application

Table 70: General Acquisition Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Acquisition Date	0008,0022	LO		ANAP	AUTO	
Acquisition Time	0008,0032	LO		ANAP	AUTO	
Acquisition Number	0020,0012	ST		ANAP	AUTO	

Table 71: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS		ANAP	AUTO	
Content Date	0008,0023	DA		VNAP	AUTO	
Acquisition DateTime	0008,002A	DT		ANAP	AUTO	
Content Time	0008,0033	TM		VNAP	AUTO	
Instance Number	0020,0013	IS		VNAP	COPY, AUTO	Used as slice number. If no value exists in the source image set or values are the same throughout the image set, slice numbers are automatically assigned.
Patient Orientation	0020,0020	CS		ANAP	COPY	
Image Comments	0020,4000	LT		ANAP		

Table 72: Image Plane Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Pixel Spacing	0028,0030	DS		ALWAYS	COPY	
Slice Location	0020,1041	DS		ANAP	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 73: 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 74:CT Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	ORIGINAL\PRIMARY\AXIAL	ALWAYS	FIXED	
Scan Options	0018,0022	CS		ANAP	COPY	
Data Collection Diameter	0018,0090	DS		ANAP	COPY	
Reconstruction Diameter	0018,1100	DS		ANAP	COPY	
Distance Source to Detector	0018,1110	DS		ANAP	COPY	
Distance Source to Patient	0018,1111	DS		ANAP	COPY	
Gantry/Detector Tilt	0018,1120	DS		ANAP	COPY	
Table Height	0018,1130	DS		ANAP	COPY	
Rotation Direction	0018,1140	CS		ANAP	COPY	
Exposure Time	0018,1150	IS		ANAP	COPY	
X-Ray Tube Current	0018,1151	IS		ANAP	COPY	
Exposure	0018,1152	IS		ANAP	COPY	
Filter Type	0018,1160	SH		ANAP	COPY	
Generator Power	0018,1170	IS		ANAP	COPY	
Focal Spot(s)	0018,1190	DS		ANAP	COPY	
Convolution Kernel	0018,1210	SH		ANAP	COPY	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Exposure Modulation Type	0018,9323	CS		ANAP	COPY	
CTDIvol	0018,9345	FD		ANAP	COPY	
Rescale Intercept	0028,1052	DS		ALWAYS	COPY	
Rescale Slope	0028,1053	DS	1	ALWAYS	FIXED	
KVP	0018,0060	DS		VNAP	COPY	
Acquisition Number	0020,0012	IS		VNAP	COPY	
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	

Table 75: VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Window Center	0028,1050	DS		CONDITIONAL	AUTO	
Window Width	0028,1051	DS		CONDITIONAL	AUTO	

Table 76: 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		ANAP	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAP	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	
Instance Number	0020,0013	IS		ANAP		

8.1.1.4. RT Image Storage SOP Class

Table 77: IOD of Created RT Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS

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

Table 78: 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 the application.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/imported in the application.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/imported in the application.
Patient's Sex	0010,0040	CS	M, F, or O	VNAP	COPY, USER	As appropriate based on the application entry/import.

Table 79: 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		ANAP	COPY, USER	Comment as entered in the application.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Physician of Record	0008,1048	PN		ANAP	COPY, USER	Physician as entered in the application.
Referenced Study Sequence	0008,1110	SQ		ANAP	COPY	
>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	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 80 : 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		ANAP	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 the application.

Table 81: 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 82: 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		ANAP	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	MM Sim	ANAP	AUTO, COPY	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Software Version(s)	0018,1020	LO	1.0.0	ANAP	FIXED	

Table 83: General Image Module

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

Table 84: 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 85: 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		ANAP	COPY	
Samples per Pixel	0028,0002	US	1	ALWAYS	AUTO, COPY	
Photometric Interpretation	0028,0004	CS	MONOCHROME2	ALWAYS	COPY	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
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	ANAP	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		ANAP	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		ANAP	COPY	The gantry angle of the beam for this

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						control point. Control point zero will always represent the starting angle for the beam.
Beam Limiting Device Angle	300A,0120	DS		ANAP	COPY	The collimator angle for the beam.
Patient Support Angle	300A,0122	DS		ANAP	COPY	The couch angle for the beam.
Table Top Eccentric Angle	300A,0125	DS	0.0	ANAP	COPY	
Isocenter Position	300A,012C	DS		ANAP	COPY	Isocenter coordinates (x,y,z), in mm. Specifies the location of the beam isocenter.
Referenced RT Plan Sequence	300C,0002	SQ		ANAP	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		ANAP	COPY	
>Referenced SOP Instance UID	0008,1155	UI		ANAP	COPY	Instance UID of RT plan object exported in the same association as this RT Image instance.
Referenced Beam Number	300C,0006	IS		ANAP	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

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						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 86: 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 87: 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 88: Approval Module

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

Table 89: 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		ANAP	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAP	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	

8.1.1.5. RT Structure Set Storage SOP Class

Table 90: 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	CONDITIONAL

Table 91: 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 the application.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient’s Medical Record Number, as entered/ imported in the application.
Patient's Birth Date	0010,0030	DA		VNAP	COPY, USER	The patient’s Birth date, as entered/ imported in the application.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on the application entry/ import.

Table 92: 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.
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		ANAP	COPY, USER	Comment as entered in the application.
Physician of Record	0008,1048	PN		ANAP	COPY, USER	Physician as entered in the application.
Referenced Study Sequence	0008,1110	SQ		ANAP	COPY	
>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	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 93: RT Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS		ALWAYS	COPY	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Description	0008,103E	LO		ANAP	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.
Series Date	0008,0021	DA		ALWAYS	AUTO	
Series Time	0008,0031	TM		ALWAYS	AUTO	
Operators' Name	0008,1070	PN		VNAP	AUTO	

Table 94: 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		ANAP	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	MM Sim	ANAP	AUTO, COPY	
Software Version(s)	0018,1020	LO	1.0.0	ANAP	FIXED	

Table 95: 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 96: 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	ANAP	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		ANAP	AUTO	Introduces the sequence describing the frame of reference for the data set.
>Frame of Reference UID	0020,0052	UI		ANAP	AUTO	Duplicated from the image data set the

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						structure is assigned to, as transferred via DICOM.
>RT Referenced Study Sequence	3006,0012	SQ		ANAP	AUTO	Introduces the sequence describing studies referenced by this structure set.
>>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	
>>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	The Study UID duplicated from the image data set as transferred via DICOM.
>>RT Referenced Series Sequence	3006,0014	SQ		ALWAYS	AUTO	Introduces the sequence describing the series referenced by this structure set.
>>>Series Instance UID	0020,000E	UI		ALWAYS	AUTO	The Series UID duplicated from the image data set as transferred via DICOM.
>>>Contour Image Sequence	3006,0016	SQ		ALWAYS	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.
Structure Set ROI Sequence	3006,0020	SQ		ALWAYS	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		ALWAYS	AUTO	The Frame of Reference UID for each instance UID, duplicated from the image.
>ROI Name	3006,0026	LO		ANAP	AUTO	The name of the ROI or POI as entered in MM Sim
>ROI Volume	3006,002C	DS		ANAP	AUTO	The volume of the ROI in cubic cm.
>ROI Generation Algorithm	3006,0036	CS	SEMIAUTOMATIC	VNAP	FIXED	

Table 97: 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		ANAP	AUTO	The color of the ROI.
>Contour Sequence	3006,0040	SQ		ANAP	AUTO	Introduces the sequence of Contours defining an ROI.
>>Contour Image Sequence	3006,0016	SQ		ANAP	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.
>>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 98: 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.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>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 99: Approval Module

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

Table 100: 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		ANAP	AUTO	The date the message was created.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Instance Creation Time	0008,0013	TM		ANAP	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.

8.1.1.6. RT Plan Storage SOP Class

Table 101: 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 Patient Setup Module	ALWAYS
Plan	RT Fraction Scheme Module	ALWAYS
Plan	RT Beams Module	ALWAYS
Plan	Approval Module	ALWAYS
Plan	SOP Common Module	ALWAYS

Table 102: 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 the application.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient’s Medical Record Number, as entered/ imported in the application.
Patient's Birth Date**	0010,0030	DA		VNAP	COPY, USER	The patient’s Birth date, as entered/ imported in the application.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on the application 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 103: 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.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
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		ANAP	COPY, USER	Comment as entered in the application.
Physician of Record	0008,1048	PN		ANAP	COPY, USER	Physician as entered in the application.
Referenced Study Sequence	0008,1110	SQ		ANAP	COPY	
>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	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 104: 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		ANAP	COPY, USER	Series Description from DICOM Export Window.
Operators' Name	0008,1070	PN		VNAP	COPY, USER	Dosimetrist Name as entered in the application.
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	Generated.
Series Number	0020,0011	IS		VNAP	AUTO, COPY	Series Number from DICOM Export Window.
Series Date	0008,0021	DA		ALWAYS	AUTO	
Series Time	0008,0031	TM		ALWAYS	AUTO	

Table 105: 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 106: 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		ANAP	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	MM Sim	ANAP	AUTO, COPY	
Software Version(s)	0018,1020	LO	1.0.0	ANAP	FIXED	

Table 107 : 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 the application concatenated with the Trial Number (i.e., <planName>-<Trial#>).
RT Plan Name	300A,0003	LO		ANAP	AUTO, USER	The plan name as entered in the application.
RT Plan Description	300A,0004	ST		ANAP	AUTO, USER	The comment as entered the application.
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	ALWAYS	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	Indicates the structure set that references the

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						patient's coordinate system frame of reference.

Table 108: 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		ANAP	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		ANAP	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.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						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		ANAP	AUTO, USER	Dose prescribed by this prescription.

Table 109: RT Tolerance Tables Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Tolerance Table Sequence	300A,0040	SQ		ANAP	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		ANAP	AUTO	User-defined label for Tolerance Table. Defined as part of the tolerance table in the physics machine.

Table 110: 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.
>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		ANAP	AUTO	Vertical table top displacement between the setup point and isocenter. Populated only if the laser

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						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		ANAP	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		ANAP	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.
Setup Technique	300A,01B0	CS		ALWAYS	AUTO	

Table 111 : 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 MM Sim.
>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	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>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.
>>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		ANAP	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		ANAP	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		ALWAYS	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	
Beam Dose Type	300A,0090	CS		VNAP	AUTO	

*Attributes related to brachytherapy treatments are not supported

Table 112: 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		ALWAYS	IMPLICIT	The manufacturer of the machine assigned to this beam.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Institution Name	0008,0080	LO		ANAP	AUTO	The name of the institution in MM Sim.
>Treatment Machine Name	300A,00B2	SH		VNAP	AUTO	The name of the machine assigned to this beam.
>Primary Dosimeter Unit	300A,00B3	CS	MU	ANAP	AUTO	
>Source-Axis Distance	300A,00B4	DS		ANAP	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.
>>Source to Beam Limiting Device Distance	300A,00BA	DS		ANAP	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		ANAP	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.
>Number of Wedges	300A,00D0	IS	0	ALWAYS	AUTO	
>Number of Compensators	300A,00E0	IS	0	ALWAYS	AUTO	
>Number of Boli	300A,00ED	IS	0	ALWAYS	AUTO	
>Beam Number	300A,00C0	IS		ALWAYS	AUTO	The ordinal representing the position of the beam in the beam list as displayed in MM Sim.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Beam Name	300A,00C2	LO		ANAP	AUTO	If the Field ID is specified for the beam, its value is exported in this attribute and the MM Sim 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 MM Sim.
>Beam Description	300A,00C3	ST		ANAP	AUTO	If Field ID is specified for the beam, this attribute contains the MM Sim 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		ANAP	AUTO, COPY	References the Patient Setup number (300A, 0182) as defined in the Patient Setup Module.
>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

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						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		ANAP	AUTO	TREATMENT or SETUP
>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.
>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.)
>Total Block Tray Factor	300A,00F2	DS		ANAP	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		ANAP	COPY	Empty
>>Block Tray ID	300A,00F5	SH		ANAP	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		ANAP	AUTO	The Source to Tray Distance as defined for the machine. Empty for Aktina cones.
>>Block Type	300A,00F8	CS		ANAP	AUTO	Sent as APERTURE for Aktina cones, SHIELDING for others
>>Block Divergence	300A,00FA	CS	PRESENT	ANAP	FIXED	Empty for Aktina cones.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Block Number	300A,00FC	IS		ANAP	AUTO	The identifying number for this contour.
>>Block Thickness	300A,0100	DS		ANAP	COPY	Empty
>>Block Transmission	300A,0102	DS		ANAP	AUTO	The block and tray factor of the beam. Empty for Aktina cones
>>Block Number of Points	300A,0104	IS		ANAP	AUTO	The number of points used to describe the contour. Empty for Aktina cones
>>Block Data	300A,0106	DS		ANAP	AUTO	Data containing the (x, y) pairs describing the edge of the contour. Empty for Aktina cones
>Applicator Sequence	300A,0107	SQ		ANAP	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

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						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.
>Tabletop Pitch Angle		FL		ALWAYS	AUTO	
>Tabletop Pitch Rotation Direction		CS		ALWAYS	AUTO	
>Tabletop Roll Angle		FL		ALWAYS	AUTO	
>Tabletop Roll Rotation		CS		ALWAYS	AUTO	
>>Control Point Index	300A,0112	IS		ANAP	AUTO	Sequentially numbered starting at 0.
>>Nominal Beam Energy	300A,0114	DS		ANAP	AUTO	The selected machine energy for this beam.
>>Dose Rate Set	300A,0115	DS		ANAP	AUTO	Dose rate of the control point.
>>Wedge Position Sequence	300A,0116	SQ		ANAP	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

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						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		ANAP	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		ANAP	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		ANAP	COPY	Exported in mm, as specified in Physics or Planning. For SETUP beams, this value is the same as in the first treatment beam.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>Isocenter Position	300A,012C	DS		ANAP	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		ANAP	AUTO	SSD of the beam in mm.
>>Cumulative Meter set Weight	300A,0134	DS		ANAP	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 Patient Setup Number	300C,006A	IS		ANAP	AUTO	
>Referenced Tolerance Table Number	300C,00A0	IS		ANAP	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 113: Approval Module

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

Table 114: 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		ANAP	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAP	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.

8.1.1.7. Spatial Registration Storage SOP Class

Table 115: IOD of Created Spatial Registration Storage Instances

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

Table 116: 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 Patient Dashboard.
Patient ID	0010,0020	LO		VNAP	COPY, USER	The patient's Medical Record Number, as entered/ imported in Patient Dashboard.
Patient's Birth Date**	0010,0030	DA		VNAP	COPY, USER	The patient's Birth date, as entered/ imported in Patient Dashboard.
Patient's Sex	0010,0040	CS		VNAP	COPY, USER	M, F, or O as appropriate based on Patient Dashboard 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 117: 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.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Description	0008,1030	LO		ANAP	COPY, USER	Comment as entered in Patient Dashboard.
Physician of Record	0008,1048	PN		ANAP	COPY, USER	Physician as entered in Patient Dashboard.
Referenced Study Sequence	0008,1110	SQ		ANAP	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		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 118: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS		ALWAYS	COPY	
Operators' Name	0008,1070	PN		VNAP	COPY	
Series Description	0008,103E	LO		ANAP	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.
Laterality	0020,0060	CS		VNAP		

Table 119: Spatial Registration Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS		ALWAYS	COPY	

Table 120: 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

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						Reference UID will be generated.
Position Reference Indicator	0020,1040	LO		VNAP	COPY	

Table 121: 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		ANAP	CONFIG, COPY	
Manufacturer's Model Name	0008,1090	LO	MM Sim	ANAP	AUTO, COPY	
Software Version(s)	0018,1020	LO	1.0.0	ANAP	FIXED	

Table 122: 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.
Instance Number	0020,0013	IS	1	ALWAYS	FIXED	
Content Label	0070,0080	CS		ALWAYS	AUTO	Current time/date stamp.
Content Description	0070,0081	LO		VNAP	EMPTY	
Content Creator's Name	0070,0084	PN		ANAP	EMPTY	
Update POV Registration Sequence	0070,0308	SQ		ALWAYS	AUTO	Introduces two registration sequences.
Referenced Image Sequence	0008,1140	SQ		ALWAYS		
>>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.
>Frame of Reference UID	0020,0052	UI		ANAP	AUTO	Identifies the dataset's Frame of Reference.
>Matrix Registration Sequence	0070,0309	SQ		ALWAYS	AUTO	Introduces a single matrix registration sequence.
>>Matrix Sequence	0070,030A	SQ		ALWAYS	AUTO	Introduces a single matrix registration.
>>>Frame of Reference Transformation Matrix Type	0070,030C	CS		ALWAYS	AUTO	
>>>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

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						primary dataset must be an identity matrix.
>>Registration Type Code Sequence	0070,030D	SQ		VNAP	COPY	Empty.

Table 123: Common Instance Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Referenced Series Sequence	0008,1115	SQ		AUTO	AUTO, COPY	if this Instance references Instances in this Study
>Referenced Instance Sequence	0008,114A	SQ		ALWAYS	AUTO	
>>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.
>Series Instance UID	0020,000E	UI		ALWAYS	AUTO	

Table 124: 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		ANAP	AUTO	The date the message was created.
Instance Creation Time	0008,0013	TM		ANAP	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.
Instance Number	0020,0013	IS		ANAP	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 125: 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 126: 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
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 127: Supported attributes of functionality CT, MR, NM and PET SOP Class Instances

Attribute Name	Tag	VR	Value	Comment
Specific Character Set	0008,0005	CS		Character set defined
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.
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 AcQSim[3].
Patient's Birth Date	0010,0030	DA		Birth date of the patient. Used in the Patient Demographics feature of AcQSim[3].
Patient's Sex	0010,0040	CS		Displayed to user.

Attribute Name	Tag	VR	Value	Comment
Slice Thickness	0018,0050	DS		Nominal slice thickness, in mm.
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 8.5.2).
Gantry/Detector Tilt	0018,1120	DS		If present, it 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 MM Sim data file.
Series Instance UID	0020,000E	UI		Used to associate multiple images into a single MM Sim 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, MM Sim 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.

Attribute Name	Tag	VR	Value	Comment
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.
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 128: 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)

Attribute Name	Tag	VR	Value	Comment
				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 129: 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 130: 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 131: 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 the application.
Patient ID	0010,0020	LO		VNAP	COPY	Used to verify the patient plan matches with the data. Matched

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						with the medical record number as entered in the application.
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 132: 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		ANAP	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 133: General Equipment Module

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

Table 134: 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		ANAP	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		ANAP	COPY	Introduces the sequence describing the frame of reference for the data set. Data must have been imported to Pinnacle^3 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		ANAP	COPY	Introduces the sequence describing studies referenced by this structure set. In Pinnacle^3 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 Pinnacle^3 this identifies the data set.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>>>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 Pinnacle[3]. 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		ANAP	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.
>ROI Name	3006,0026	LO		ANAP	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		ANAP	COPY	Not used.
>ROI Generation Algorithm	3006,0036	CS		ANAP	COPY	Not used.

Table 135: 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		ANAP	COPY	Used to assign a color to the ROI.

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
>Contour Sequence	3006,0040	SQ		ANAP	COPY	Introduces the sequence of Contours defining an ROI.
>>Contour Image Sequence	3006,0016	SQ		ANAP	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 136: 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 137: 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		ANAP	COPY	
Instance Creation Time	0008,0013	TM		ANAP	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 Spatial Registration Storage SOP Class

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

Table 138: 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 139: 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
Common Module	SOP Common Module	ALWAYS

Table 140: 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 Patient Dashboard.
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 Patient Dashboard.
Patient's Birth Date	0010,0030	DA		VNAP	COPY	Copied from primary image set, if imported via DICOM.
Patient's Sex	0010,0040	CS		VNAP	COPY	Used to verify the patient plan matches with the data.

Table 141: 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		ANAP	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 142: 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 143: General Equipment Module

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

Table 144: 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		ANAP	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 145: 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		ANAP	COPY	
Instance Creation Time	0008,0013	TM		ANAP	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	

8.1.2.4. 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 146: 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 147: 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 8.6.1)	ALWAYS

Table 148: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 149: 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 150: 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 151: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 152: 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	

Table 153: 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

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
						amplitudes, peak indicators, x-ray on/off indicators, and timing information.

8.1.3. Attribute Mapping
Not Applicable.

8.1.4. Coerced/Modified fields
Not Applicable.

8.2. IOD Contents (for SPR Images)

8.2.1.Created SOP Instances
This section specifies each IOD related to Stopping Power Ratio (SPR) Estimates generated by MM SIM System.

Derived CT Image Attributes
Image Plane module attributes:
- All derived CT images, contain the Image Position (0020, 0032) and Image Orientation (0020,0037) attributes.
- All derived CT images contain the Pixel Spacing (0028, 0030) and Slice Thickness (0018, 0050) attributes.

Copied modules to the derived IODs
The following table lists the modules that are always copied from the source images when the created SOP Class IOD is the same as the source SOP Class IOD.

Table 154: Modules copied to the derived IOD's table

Information Entity	Module Name
Patient	Patient Module
	Clinical Trial Subject Module
Study	General Study Module
	Patient Study Module
	Clinical Trial Study Modules
Series	General Series Modules
	Clinical Trial Series Module
Frame of Reference	Frame of Reference Module
Equipment	General Equipment Module

The copied attributes from the original images are not included in the description of the created Spectral images in the chapter.

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

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
Items in the Value and Comment columns in the following tables are filled in where appropriate to further clarify the use or meaning of each attribute beyond the definition provided by the DICOM Standard. All others are left blank for ease of use. See PS3.3 of the DICOM Standard for the complete attribute definitions

8.2.2. List of created SOP Classes

Table 155: List of created SOP Classes

SOP Class Name	SOP Class UID
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2

8.2.2.1. SPR Image

SPR images are created as a standard CT IOD image with specific attribute values as specified in the tables below:

Table 156: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Date	0008,0021	DA		ALWAYS	AUTO	
Series Time	0008,0031	TM		ANAP	AUTO	
Modality	0008,0060	CS		ALWAYS	AUTO	
Series Description	0008,103E	LO	Generated SPR estimates	ANAP	FIXED	
Operators' Name	0008,1070	PN		ANAP	AUTO	
Referenced Performed Procedure Step Sequence	0008,1111	SQ		ALWAYS	AUTO	
>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	
>Specific Character Set	0008,0005	CS		ANAP	AUTO	
Body Part Examined	0018,0015	CS		ANAP	AUTO	
Patient Position	0018,5100	CS		ANAP	AUTO	
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	
Series Number	0020,0011	IS		VNAP	AUTO	
Performed Procedure Step Start Date	0040,0244	DA		ANAP	AUTO	

Performed Procedure Step Start Time	0040,0245	TM		ANAP	AUTO	
Performed Procedure Step Start Time	0040,0260	SQ		ANAP	AUTO	

Table 157: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	DERIVED\SECONDARY\AXIAL\SPR	ANAP	FIXED	
Acquisition Date	0008,0022	DA		ANAP	AUTO	
Content Date	0008,0023	DA		ANAP	AUTO	
Acquisition DateTime	0008,002A	DT		ANAP	AUTO	
Acquisition Time	0008,0032	TM		ANAP	AUTO	
Content Time	0008,0033	TM		ANAP	AUTO	
Irradiation Event UID	0008,3010	UI		ANAP	AUTO	
Acquisition Number	0020,0012	DT		ANAP	AUTO	
Instance Number	0020,0013	TM		VNAP	AUTO	
Image Comments	0020,4000	TM	Generated SPR estimates	ANAP	FIXED	

8.3. Data Dictionary of Private Attributes

MM Sim 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.

8.4. Coded Terminology and Templates

Not applicable.

8.4.1. Context Groups

Not applicable.

8.4.2. Template Specifications

Not applicable.

8.4.3. Private code definitions

Not applicable.

8.5. Grayscale Image consistency

Not applicable.

8.6. Standard Extended/Specialized/Private SOPs

8.6.1. CT Image Storage SOP Class Instances

Table 158: 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	ANAP	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	ANAP	IMPLICIT	Present only if the imageset was reconstructed with Extended Field of View.

Note: MM Sim will export the private module from the imported data without making any modifications.

8.6.2. Secondary Capture (Pulmonary Waveform) SOP Class Instances

This section applies to imported pulmonary waveforms only.

Table 159: 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.

8.7. Private Transfer Syntaxes

Not applicable.

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