

FUJIFILM Healthcare Italia S.p.A.

MEDICAL DEVICE SOFTWARE MANUFACTURER

FABBRICANTE DI DISPOSITIVI MEDICI SOFTWARE

MEDICAL DEVICE

DISPOSITIVO MEDICO

SYNAPSE DOSE

Release 3.x.x.x

SYNAPSE[®]
dose

DICOM CONFORMITY STATEMENT

Rev.07 – 01/09/2025



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Rea: MI-1292685

EUDAMED ID/SRN: IT-MF-000029974



Medical Devices Regulation (EU) 2017/745: **Class IIa**
EN 62304: **B**
European Medical Device Nomenclature (EMDN)/Classificazione Nazionale Dispositivi medici (CND): **Z11069092 - STRUMENTAZIONE VARIA PER LA GESTIONE DELLE BIOIMMAGINI DIGITALI – DISPOSITIVI MEDICI SOFTWARE**

BASIC UDI: **805699280SYNAPSEDOSECE**

UDI-DI: **08056992800007**

Paesi dell'UE in cui si intende commercializzare il dispositivo medico:

- **Italia.**

DOCUMENT FILE NAME / NOME DEL FILE DEL DOCUMENTO

DCS DICOM Conformity Statement Synapse Dose 3.x.x.x rev.07 250901

DOCUMENT REVISION HISTORY / CRONOLOGIA DI REVISIONE DEL DOCUMENTO

REVISION / REVISIONE	DATE / DATA	CHANGE / MODIFICHE	NOTES / NOTE
Rev.07	01/09/2025	Modifica sede legale	SYNAPSE DOSE 3.X.X.X
Rev.06	30/09/2024	Calcolo del WED	SYNAPSE DOSE 3.1.0
Rev.05	24/04/2024	Passaggio a FUJIFILM Healthcare Italia S.p.A.	
Rev.04	26/06/2023	Modifiche Segnalazioni MDR (EU) 2017/745	
Rev.03	04/01/2023		SYNAPSE DOSE 3.0.x
Rev.02	12/05/2021		SYNAPSE DOSE 2.5.x

DOCUMENT CONFIDENTIALITY / RISERVATEZZA DEL DOCUMENTO

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1. INTRODUCTION

1.1. SCOPE AND FIELD OF APPLICATION

This document is the DICOM Conformance Statement for Synapse Dose. The purpose of this document is to describe how the application collaborates in a DICOM network with other Medical Imaging applications that conform to the DICOM 3.0 standard.

1.2. REFERENCES

See Digital Imaging and Communications in Medicine (DICOM), parts 1 through 12 (NEMA PS 3.1-12).

1.3. DEFINITIONS

See Digital Imaging and Communications in Medicine (DICOM), parts 1 through 12 (NEMA PS 3.1-12).

1.4. SYMBOLS AND ABBREVIATIONS

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Abbreviations and terms are as follows:

AE	DICOM Application Entity
AET	Application Entity Title
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
GSDF	Grayscale Standard Display Function
HIS/RIS	Hospital Information System / Radiology Information System.
IHE	Integrating the Healthcare Enterprise
IHE-TF	Integrating the Healthcare Enterprise Technical Framework
IAN	Instance Availability Notification
IOD	Information Object Definition
ISO	International Standard Organization
PDU	DICOM Protocol Data Unit
LUT	Look-up Table
MPPS	Modality Performed Procedure Step
MWL	Modality Worklist
P-LUT	Presentation Look-up Table
Q/R	Query Retrieve
SCP	Service Class Provider
SCU	Service Class User
SCN	Study Content Notification
SOP	DICOM Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
TLS	Transport Layer Security
UID	Unique Identifier
VR	Value Representation

1.5. IMPORTANT CONSIDERATIONS FOR THE READER

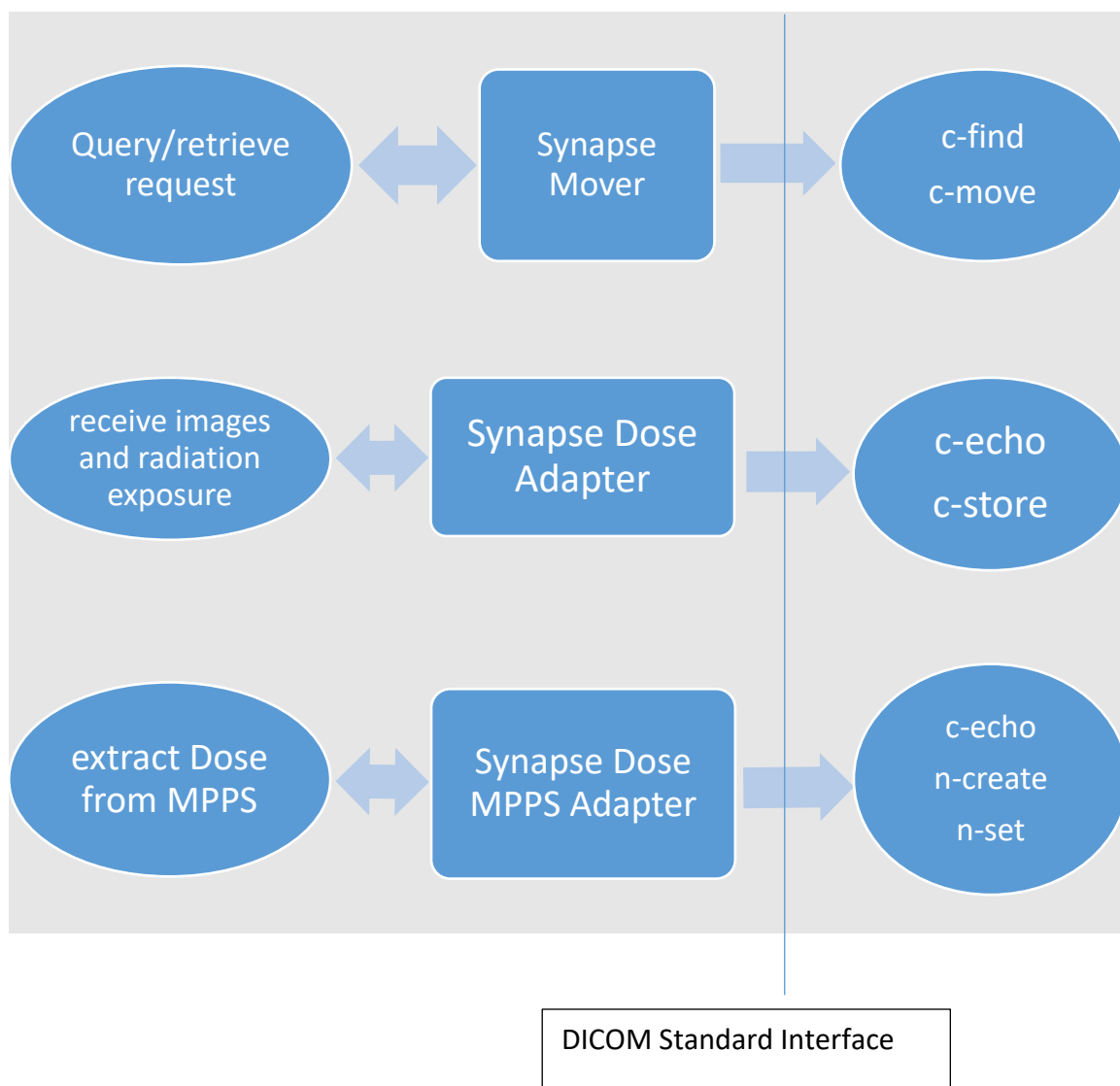
This Conformance Statement by itself does not guarantee successful interoperability.

Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into a networked environment may require application functions that are not specified within the scope of DICOM. Consequently, the information provided by this Conformance Statement does not guarantee interoperability.

It is the user's responsibility to analyze thoroughly the application requirements and the environment of the applications.

2. IMPLEMENTATION MODEL

2.1. APPLICATION DATA FLOW DIAGRAM



2.2. FUNCTIONAL DEFINITION OF APPLICATION ENTITIES

The Application Entity of the Synapse Mover acts as an SCU for the query and retrieve SOP classes.

The Application Entity of the Synapse Dose Adapter Application Entity waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the STORAGE-SCP AE expects it to be a DICOM application.

The STORAGE-SCP AE will accept Associations with Presentation Contexts for SOP Classes of the Verification, Storage, and Storage Commitment Service Classes.

DICOM Instances received in a Storage Request are filed on local (attached/mounted) file system(s). A subset of attributes from received Instances is also stored in records local database.

The MPPS Adapter Application Entity waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the MPPS Adapter AE expects it to be a DICOM application.

The MPPS Adapter AE will accept Associations with Presentation Contexts for SOP Classes of the Verification and Modality Performed Procedure Step Service Classes.

The MPPS Adapter stores the received MPPS instances in the local database for further processing.

3. SYNAPSE DOSE ADAPTER APPLICATION ENTITY SPECIFICATION

The central and peripheral nodes must be able to reach the remote update system via the Internet using the https protocol; peripheral nodes must be able to access the central node via https protocol; the central and peripheral nodes must be able to be reached by PACS via DICOM protocol.

3.1. SOP CLASSES

SOP Class Name	SOP Class UID
OphthalmicTomographyImageStorage	1.2.840.10008.5.1.4.1.1.77.1.5.4
ComprehensiveSRStorage	1.2.840.10008.5.1.4.1.1.88.33
EnhancedPETImageStorage	1.2.840.10008.5.1.4.1.1.130
StereometricRelationshipStorage	1.2.840.10008.5.1.4.1.1.77.1.5.3
MammographyCADSRStorage	1.2.840.10008.5.1.4.1.1.88.50
RTBrachyTreatmentRecordStorage	1.2.840.10008.5.1.4.1.1.481.6
EnhancedMRColorImageStorage	1.2.840.10008.5.1.4.1.1.4.3
XR-RayAngiographicImageStorage	1.2.840.10008.5.1.4.1.1.12.1
KeyObjectSelectionDocumentStorage	1.2.840.10008.5.1.4.1.1.88.59
RTBeamsDeliveryInstructionStorage	1.2.840.10008.5.1.4.34.7
ColorPaletteStorage	1.2.840.10008.5.1.4.39.1
UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6.1
RTStructureSetStorage	1.2.840.10008.5.1.4.1.1.481.3
RTIonPlanStorage	1.2.840.10008.5.1.4.1.1.481.8
GeneralECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.2
CTImageStorage	1.2.840.10008.5.1.4.1.1.2
VisualAcuityMeasurementsStorage	1.2.840.10008.5.1.4.1.1.78.5
VLMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.2
HangingProtocolStorage	1.2.840.10008.5.1.4.38.1
SurfaceSegmentationStorage	1.2.840.10008.5.1.4.1.1.66.5
DigitalMammographyXR-RayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.2
StandaloneVOILUTStorageRetired	1.2.840.10008.5.1.4.1.1.11
UltrasoundMultiFrameImageStorageRetired	1.2.840.10008.5.1.4.1.1.3

BasicVoiceAudioWaveformStorage	1.2.840.10008.5.1.4.1.1.9.4.1
GrayscaleSoftcopyPresentationStateStorageSOPClass	1.2.840.10008.5.1.4.1.1.11.1
ComprehensiveSRStorageTrialRetired	1.2.840.10008.5.1.4.1.1.88.4
SpectaclePrescriptionReportStorage	1.2.840.10008.5.1.4.1.1.78.6
ChestCADSRStorage	1.2.840.10008.5.1.4.1.1.88.65
VideoEndoscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.1.1
MRSpectroscopyStorage	1.2.840.10008.5.1.4.1.1.4.2
MultiFrameSingleBitSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.1
XRaysRadiationDoseSRStorage	1.2.840.10008.5.1.4.1.1.88.67
SubjectiveRefractionMeasurementsStorage	1.2.840.10008.5.1.4.1.1.78.4
RTConventionalMachineVerificationTrialRetired	1.2.840.10008.5.1.4.34.2
VLSlideCoordinatesMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.3
HardcopyGrayscaleImageStorageSOPClassRetired	1.2.840.10008.5.1.1.29
EnhancedCTImageStorage	1.2.840.10008.5.1.4.1.1.2.1
DigitalMammographyXRaysImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.2.1
SpatialRegistrationStorage	1.2.840.10008.5.1.4.1.1.66.1
VLMultiFrameImageStorageTrialRetired	1.2.840.10008.5.1.4.1.1.77.2
DigitalXRaysImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.1
StorageServiceClass	1.2.840.10008.4.2
PseudoColorSoftcopyPresentationStateStorageSOPClass	1.2.840.10008.5.1.4.1.1.11.3
AmbulatoryECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.3
VideoMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.2.1
RTIonMachineVerificationTrialRetired	1.2.840.10008.5.1.4.34.3
VideoPhotographicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.4.1
HardcopyColorImageStorageSOPClassRetired	1.2.840.10008.5.1.1.30
StandaloneModalityLUTStorageRetired	1.2.840.10008.5.1.4.1.1.10
StandalonePETCurveStorageRetired	1.2.840.10008.5.1.4.1.1.129
BasicStudyContentNotificationSOPClassRetired	1.2.840.10008.1.9
AutorefractionMeasurementsStorage	1.2.840.10008.5.1.4.1.1.78.2
ColorSoftcopyPresentationStateStorageSOPClass	1.2.840.10008.5.1.4.1.1.11.2
SecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7
MRImageStorage	1.2.840.10008.5.1.4.1.1.4
RTImageStorage	1.2.840.10008.5.1.4.1.1.481.1
NuclearMedicineImageStorageRetired	1.2.840.10008.5.1.4.1.1.5
OphthalmicPhotography16BitImageStorage	1.2.840.10008.5.1.4.1.1.77.1.5.2
RTPlanStorage	1.2.840.10008.5.1.4.1.1.481.5
RealWorldValueMappingStorage	1.2.840.10008.5.1.4.1.1.67
TwelveLeadECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.1
XRays3DAngiographicImageStorage	1.2.840.10008.5.1.4.1.1.13.1.1
KeratometryMeasurementsStorage	1.2.840.10008.5.1.4.1.1.78.3
StandaloneCurveStorageRetired	1.2.840.10008.5.1.4.1.1.9
UltrasoundImageStorageRetired	1.2.840.10008.5.1.4.1.1.6
SpatialFiducialsStorage	1.2.840.10008.5.1.4.1.1.66.2
XRaysAngiographicBiPlaneImageStorageRetired	1.2.840.10008.5.1.4.1.1.12.3
DeformableSpatialRegistrationStorage	1.2.840.10008.5.1.4.1.1.66.3
XRaysRadiofluoroscopicImageStorage	1.2.840.10008.5.1.4.1.1.12.2
StandaloneOverlayStorageRetired	1.2.840.10008.5.1.4.1.1.8
DigitalXRaysImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.1.1
CardiacElectrophysiologyWaveformStorage	1.2.840.10008.5.1.4.1.1.9.3.1
VLImageStorageTrialRetired	1.2.840.10008.5.1.4.1.1.77.1
EncapsulatedCDASStorage	1.2.840.10008.5.1.4.1.1.104.2
RTDoseStorage	1.2.840.10008.5.1.4.1.1.481.2
StoredPrintStorageSOPClassRetired	1.2.840.10008.5.1.1.27
DigitalIntraOralXRaysImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.3
XAXRFGrayscaleSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.5
LensometryMeasurementsStorage	1.2.840.10008.5.1.4.1.1.78.1
PositronEmissionTomographyImageStorage	1.2.840.10008.5.1.4.1.1.128

RespiratoryWaveformStorage	1.2.840.10008.5.1.4.1.1.9.6.1
EnhancedMRIImageStorage	1.2.840.10008.5.1.4.1.1.4.1
ProcedureLogStorage	1.2.840.10008.5.1.4.1.1.88.40
VLPhotographicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.4
AudioSRStorageTrialRetired	1.2.840.10008.5.1.4.1.1.88.2
ComputedRadiographyImageStorage	1.2.840.10008.5.1.4.1.1.1
OphthalmicPhotography8BitImageStorage	1.2.840.10008.5.1.4.1.1.77.1.5.1
BasicTextSRStorage	1.2.840.10008.5.1.4.1.1.88.11
GeneralAudioWaveformStorage	1.2.840.10008.5.1.4.1.1.9.4.2
HemodynamicWaveformStorage	1.2.840.10008.5.1.4.1.1.9.2.1
NuclearMedicineImageStorage	1.2.840.10008.5.1.4.1.1.20
WaveformStorageTrialRetired	1.2.840.10008.5.1.4.1.1.9.1
SegmentationStorage	1.2.840.10008.5.1.4.1.1.66.4
RTBeamsTreatmentRecordStorage	1.2.840.10008.5.1.4.1.1.481.4
BreastTomosynthesisImageStorage	1.2.840.10008.5.1.4.1.1.13.1.3
EnhancedXAImageStorage	1.2.840.10008.5.1.4.1.1.12.1.1
VLEndoscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.1
BasicStructuredDisplayStorage	1.2.840.10008.5.1.4.1.1.131
VerificationSOPClass	1.2.840.10008.1.1
MultiFrameTrueColorSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.4
XR3DCraniofacialImageStorage	1.2.840.10008.5.1.4.1.1.13.1.2
EncapsulatedPDFStorage	1.2.840.10008.5.1.4.1.1.104.1
MultiFrameGrayscaleWordSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.3
DigitalIntraOralXRImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.3.1
RTIonBeamsTreatmentRecordStorage	1.2.840.10008.5.1.4.1.1.481.9
EnhancedUSVolumeStorage	1.2.840.10008.5.1.4.1.1.6.2
TextSRStorageTrialRetired	1.2.840.10008.5.1.4.1.1.88.1
RawDataStorage	1.2.840.10008.5.1.4.1.1.66
ColonCADSRStorage	1.2.840.10008.5.1.4.1.1.88.69
UltrasoundMultiFrameImageStorage	1.2.840.10008.5.1.4.1.1.3.1
MacularGridThicknessAndVolumeReportStorage	1.2.840.10008.5.1.4.1.1.79.1
ArterialPulseWaveformStorage	1.2.840.10008.5.1.4.1.1.9.5.1
EnhancedXRFImageStorage	1.2.840.10008.5.1.4.1.1.12.2.1
RTTreatmentSummaryRecordStorage	1.2.840.10008.5.1.4.1.1.481.7
DetailSRStorageTrialRetired	1.2.840.10008.5.1.4.1.1.88.3
MultiFrameGrayscaleByteSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.2
BlendingSoftcopyPresentationStateStorageSOPClass	1.2.840.10008.5.1.4.1.1.11.4
EnhancedSRStorage	1.2.840.10008.5.1.4.1.1.88.22

3.2. ASSOCIATION ESTABLISHMENT POLICIES

3.2.1. GENERAL

The Synapse Dose Adapter AE can both accept and propose Association Requests. The Synapse Dose Adapter AE will accept Association Requests for the Verification, Storage, and Storage Commitment Push Model Services. It will propose Associations only for the Storage Commitment Push Model Service. The DICOM standard application context name for DICOM 3.0 is always accepted and proposed:

Application Context Name	1.2.840.10008.3.1.1.1
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3.2.2. NUMBER OF ASSOCIATIONS

The Synapse Dose Adapter AE can support multiple simultaneous Associations requested by peer AEs.

3.2.3. ASYNCHRONOUS NATURE

The Synapse Dose Adapter AE does not support asynchronous communication. Multiple outstanding transactions are not supported. It allows up to one invoked and one performed operation on an Association (it is synchronous). Asynchronous mode of operation is not supported.

3.2.4. IMPLEMENTATION IDENTIFYING INFORMATION

The implementation information for this Application Entity is:

Implementation Class UID	1.2.40.0.13.1.1
Implementation Version name	Dcm4che-3.3.7

3.3. ASSOCIATION INITIATION POLICY

3.3.1. ACTIVITY – SEND STORAGE COMMITMENT NOTIFICATION OVER NEW ASSOCIATION

An Association Request is sent to the peer AE that sent the Storage Commitment Push Model request and upon successful negotiation of the required Presentation Context the outstanding N-EVENT-REPORT is sent.

3.3.1.1 PROPOSED PRESENTATION CONTEXTS

Synapse Dose Adapter will propose Presentation Contexts as shown in the following table:

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Storage Commitment Push Model	1.2.840.10008.1.20.1.1 .1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2 .1		

3.3.1.2 SOP SPECIFIC CONFORMANCE FOR VERIFICATION SOP CLASS

Standard conformance is provided to the DICOM Verification Service Class as an SCU. The Verification Service as an SCU is actually only supported as a diagnostic service tool for network communication issues. It can be used to test whether Associations can actually be opened with a peer AE that is issuing Storage Commitment Push Model requests (i.e. to test whether the indicated TCP/IP port and AE Title for sending NEVENT-REPORT Requests to the peer AE are truly functional).

3.3.1.3 SPECIFIC CONFORMANCE FOR STORAGE COMMITMENT SOP CLASSES

The associated Activity with the Storage Commitment Push Model service is the communication by the Synapse Dose Adapter AE to peer AEs that it has committed to permanently store Composite SOP Instances that have been sent to it.

It thus allows peer AEs to determine whether the Synapse Dose Adapter has taken responsibility for the archiving of specific SOP Instances so that they can be flushed from the peer AE system.

3.4. ASSOCIATION ACCEPTANCE POLICY

3.4.1. ACTIVITY – RECEIVE IMAGES AND STORAGE COMMITMENT REQUESTS

A remote peer DICOM Application Entity, acting as a Storage SCU, establishes an association with Synapse Dose Adapter that accepts these Associations for the purpose of receiving supported SOP Class Instances and Storage Commitment requests.

In the default configuration any Calling and Called AET will be accepted. But if the Called AET does not correspond to the actual Storage Server AET, only a Presentation Context for the Verification SOP Class will be accepted and the SCU can only verify the DICOM Association but cannot invoke any other related DICOM service.

The Storage Server AE may reject Association attempts as shown in the table below. The Result, Source and Reason / Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU

Association Rejection Reasons:

Result	Source	Reason	Description
2 - rejected transient	provider	2 - locallimit exceeded	The (configurable) maximum number of simultaneous associations has been reached. An association request with the same parameters may succeed at a later time.
1 - rejected permanent	user	2 - application context name not supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will NOT succeed at a later time.
1 - rejected permanent	user	3 – calling AE title not recognized	The Association request contained an unrecognized Calling AE Title. An association request with the same parameters will NOT succeed at a later time unless configuration changes are made.

3.4.1.1 ACCEPTED PRESENTATION CONTEXTS

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Storage Commitment Push Model	1.2.840.10008.1.20.1.1.1	Transfer Syntaxes for Non-Image Storage Services		SCP	None
Hardcopy Grayscale Image Storage SOP Class	1.2.840.10008.5.1.1.29	Transfer Syntaxes for Image Storage Service		SCP	None
Hardcopy Color Image Storage SOP Class	1.2.840.10008.5.1.1.30	Transfer Syntaxes for Image Storage Service		SCP	None

Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Transfer Syntaxes for Image Storage Service	SCP	None
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Transfer Syntaxes for Image Storage Service	SCP	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Transfer Syntaxes for Image Storage Service	SCP	None
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Transfer Syntaxes for Image Storage Service	SCP	None
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Transfer Syntaxes for Image Storage Service	SCP	None
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Transfer Syntaxes for Image Storage Service	SCP	None
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Transfer Syntaxes for Image Storage Service	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Transfer Syntaxes for Image Storage Service	SCP	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Transfer Syntaxes for Image Storage Service	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Transfer Syntaxes for Image Storage Service	SCP	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Transfer Syntaxes for Image Storage Service	SCP	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Transfer Syntaxes for Image Storage Service	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Transfer Syntaxes for Image Storage Service	SCP	None

X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Transfer Syntaxes for Image Storage Service	SCP	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Transfer Syntaxes for Image Storage Service	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Transfer Syntaxes for Image Storage Service	SCP	None
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Transfer Syntaxes for Image Storage Service	SCP	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Transfer Syntaxes for Image Storage Service	SCP	None
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Transfer Syntaxes for Image Storage Service	SCP	None
VL Slide- Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Transfer Syntaxes for Image Storage Service	SCP	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Transfer Syntaxes for Image Storage Service	SCP	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Transfer Syntaxes for Image Storage Service	SCP	None
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Transfer Syntaxes for Image Storage Service	SCP	None
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Transfer Syntaxes for Image Storage Service	SCP	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Transfer Syntaxes for Image Storage Service	SCP	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Transfer Syntaxes for Image Storage Service	SCP	None
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Transfer Syntaxes for Image Storage Service	SCP	None

Accepted Transfer Syntaxes for Non-Image Storage Services

Name	UID
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endia	1.2.840.10008.1.2.1
JPEG Baselin	1.2.840.10008.1.2.4.50
JPEG Extended	1.2.840.10008.1.2.4.51
JPEG Lossless, Non-Hierarchical	1.2.840.10008.1.2.4.57
JPEG Lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70
JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80
JPEG-LS Lossy (Near-Lossless) Image	1.2.840.10008.1.2.4.81
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90
JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91

3.4.1.2 SPECIFIC CONFORMANCE FOR VERIFICATION SOP CLASS

Synapse Dose Storage Server provides standard conformance to the DICOM Verification Service Class as a SCP. The status code for the C-ECHO is described in the following table:

Service Status	Further Meaning	Error Code	Behaviour
Success	Success	0000	The C-ECHO request is accepted

3.4.1.3 SPECIFIC CONFORMANCE FOR STORAGE SOP CLASSES

The associated Activity with the Storage service is the storage of medical DICOM data received over the network on a designated storage repository. The Synapse Dose Adapter AE will return a failure status if it is unable to store the received instance(s).

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

The Synapse Dose Adapter AE is configured to retain the original DICOM data in DICOM Part 10 compliant file format. The Synapse Dose Adapter AE is Level 2 (Full) conformant as a Storage SCP. In addition, all Private and SOP Class Extended Elements are maintained in the DICOM format files. In addition to saving all Elements in files, a subset of the Elements is stored in the Synapse Dose Server database.

3.4.1.4 STORAGE SERVER AE C-STORE RESPONSE

Service Status	Further Meaning	Error Code	Behaviour
Success	Success	0000	The Composite SOP Instance was successfully received, verified, and stored in the system repository.
Error	Processing Failure	0110	This status is returned due to internal errors such as a processing failure response from the internal database or a filesystem

			operation. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.
Warning	Coercion of Data Elements	B000	This status is returned if one or more Attribute values were coerced/ modified on reception. Image transmission is considered successful. The appropriate SUCCESS Status will be sent in the C-STORE Response. Warning indication message is output to the Service Log.
Warning	Data Set does not match SOP class	B007	This status is returned if the C-STORE Request specifies Attributes that are not specific as part of the Storage SOP class. Image transmission is considered successful. The appropriate SUCCESS Status will be sent in the C-STORE Response. Warning indication message is output to the Service Log.

4. SYNAPSE MOVER APPLICATION ENTITY SPECIFICATION

4.1. SOP CLASSES

SOP Classes as SCU	
SOP Class Name	SOP Class UID
Study Root Q/R - Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Q/R - Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2

4.2. ASSOCIATION POLICIES

4.2.1. ACTIVITY – RECEIVE IMAGES AND STORAGE COMMITMENT REQUESTS

The Synapse Mover AE can only propose Association Requests. The Synapse Dose Adapter AE will accept Association Requests for the Verification, Storage, and Storage Commitment Push Model Services. It will propose Associations for the Study root Q/R Information Model Service. The DICOM standard application context name for DICOM 3.0 is always accepted and proposed:

Application Context Name	1.2.840.10008.3.1.1.1
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4.2.2. NUMBER OF ASSOCIATIONS

The Synapse Mover AE can initiate multiple simultaneous associations at a time in order to retrieve all the study information matching the search criteria.

For the Retrieve request only one association is initiated per destination.

4.2.2.1 ASYNCHRONOUS NATURE

The Synapse Dose Adapter AE does not support asynchronous communication. Multiple outstanding transactions are not supported. It allows up to one invoked and one performed operation on an Association (it is synchronous). Asynchronous mode of operation is not supported.

4.2.2.2 IMPLEMENTATION IDENTIFYING INFORMATION

The implementation information for this Application Entity is:

Implementation Class UID	1.2.40.0.13.1.1
Implementation Version name	Dcm4che-3.3.7

4.3. ASSOCIATION INITIATION POLICIES

4.3.1. ACTIVITY – SEARCH FOR STUDY (C-FIND)

Synapse Mover has a scheduler functionality that will automatically fill out a C-FIND query in order to obtain all the Study of a calculated Date/Time range. The user can submit more scheduled Task in order to Query different remote AE.

4.3.1.1 PROPOSED PRESENTATION CONTEXTS

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.3.1.2 SOP SPECIFIC CONFORMANCE

Supported keys for Study Root Query/Retrieve				
Level	Description	Tag	Type	Matching
Study	Study Date	(0008,0020)	R	Range
Study	Study	(0008,0030)	O	Range

The Synapse Mover AE C-FIND SCU interprets following status codes:

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

Refused	Out of Resources	A700	System reached the limit in disk space or memory usage. Error message is output to as an alert to the User Interface, and to the Service Log.
Failed	Identifier does not match SOP Class	A900	The C-FIND query identifier contains invalid Elements or values, or is missing mandatory Elements or values for the specified SOP Class. Error message is output to the Service Log.
	Unable to process	C001	The C-FIND query identifier is valid for the specified SOP Class but cannot be used to query the database. For example, this can occur if a Patient Level query is issued but the identifier has only empty values for both the Patient ID and the Patient Name. Error message is output to the Service Log.
Cancel	Matching terminated due to Cancel Request	FE00	The C-FIND SCU sent a Cancel Request. This has been acknowledged and the search for matches has been halted.
Pending	Matches are continuing and current match is supplied.	FF00	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming. This status code is returned if all Optional keys in the query identifier are actually supported.
	Matches are continuing but one or more Optional Keys were not	FF01	Indicates that the search for further matches is continuing.

	supported.		This is returned when each successful match is returned and when further matches are forthcoming. This status code is returned if there are Optional keys in the query identifier that are not supported.
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4.3.2. ACTIVITY – RETRIEVE IMAGES (C-MOVE)

When the Synapse Mover AE C-FIND activity is finished a retrieval C-MOVE request will be issued in order to initiate the import of all the selected Study to the configured Destination AE.

4.3.2.1 PROPOSED PRESENTATION CONTEXTS

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Query/Retrieve Model Study Root - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.3.2.2 SPECIFIC CONFORMANCE

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	All the Composite SOP Instances have been successfully sent to the C-MOVE Destination AE.
Refused	Out of Resources Unable to calculate number of matches	A701	Number of matches cannot be determined due to system failure. Returned if the server's database is not functioning so the search for matches to the C-MOVE Request cannot be found. Error message is output as an alert on the User Interface, and to the Service Log.
	Out of Resources Unable to perform suboperations	A702	C-STORE sub-operations cannot be performed due to failure to access Composite SOP Instances in archive, or failure of a C-STORE Request. For example, this Status will be returned if the required SOP Instances are determined to be off-line (i.e. the MO media has been removed from the archive jukebox). Error message is output as an alert on the User Interface, and to the Service Log.
	Move destination unknown	A801	The Destination Application Entity named in the C-MOVE Request is unknown to Query-Retrieve SCP AE. Error message is output to the Service Log.
Failed	Identifier does not match SOP Class	A900	The C-MOVE identifier contains invalid Elements or values, or is missing mandatory Elements or values for the specified SOP Class or retrieval level.

			Error message is output to the Service Log.
Cancel	Matching terminated due to Cancel Request	FE00	The C-MOVE SCU sent a Cancel Request. This has been acknowledged and the export of Composite SOP Instances to the C-MOVE Destination AE has been halted.
Pending	Suboperations are continuing	FF00	A Response with this Status Code is sent every time a Composite SOP Instance has been successfully sent to the C-MOVE Destination AE.

5. SYNAPSE DOSE MPPS ADAPTER APPLICATION ENTITY SPECIFICATION

5.1. SOP CLASSES

SOP Class Name	SOP Class UID
VerificationSOPClass	1.2.840.10008.1.1
ModalityPerformedProcedureStepSOPClass	1.2.840.10008.3.1.2.3.3

5.2. ASSOCIATION ESTABLISHMENT POLICIES

5.2.1. GENERAL

Synapse Dose MPPS Adapter receives Modality Performed Procedure Step messages from modalities, stores them in database and later extract dose related information. The operators allowed are MPPS N-CREATE and N-SET. Only after the N-SET message with status COMPLETED is received, the message attributes are stored in local database.

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

Application Context Name	1.2.840.10008.3.1.1.1
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5.2.2. NUMBER OF ASSOCIATIONS

The Synapse Dose MPPS Adapter AE can support multiple simultaneous Associations requested by peer AEs.

5.2.3. ASYNCHRONOUS NATURE

The Synapse Dose MPPS Adapter AE does not support asynchronous communication.

5.2.4. IMPLEMENTATION IDENTIFYING INFORMATION

The implementation information for this Application Entity is:

Implementation Class UID	1.2.40.0.13.1.1
Implementation Version name	Dcm4che-3.3.7

5.3. ASSOCIATION INITIATION POLICIES

5.3.1. ACTIVITY - MPPS N-CREATE

When an N-CREATE request is received, an initial validation is performed internally for the presence of mandatory attributes in the message and for ensuring the absence of certain attributes as mentioned in the DICOM standards. The message is saved to local file system.

Synapse Dose MPPS Adapter will behave as described in next table when constructing the N-CREATE response command message.

Service Status	Further Meaning	Error Code	Behavior
Success	Processing Success	0000	N-CREATE message received successfully
Failure	Processing failure	0110	N-CREATE message transfer failed
Failure	Duplicate SOP Instance	0111	N-CREATE message transfer failed

5.3.2. ACTIVITY - MPPS N-SET

When an N-SET request is received and the Performed Procedure Step Status has status COMPLETED, the message is stored to the Synapse Dose database and later processed for extracting dose information.

Synapse Dose MPPS Adapter will behave as described in next table when constructing the N-SET response command message.

Service Status	Further Meaning	Error Code	Behavior
Success	Processing Success	0000	N- SET message received successfully
Failure	Processing failure	0110	N-SET message transfer failed
Failure	No Such SOP Instance	0112	N-SET message transfer failed

6. COMMUNICATION PROFILE

6.1. SUPPORTED COMMUNICATION STACKS

DICOM Upper Layer over TCP/IP is supported.

6.2. TCP/IP STACK

The Synapse Dose Adapter and Mover AE inherits their TCP/IP stack from the installed Java Runtime Environment.

6.2.1. PHYSICAL NETWORK INTERFACE

The Synapse Dose Adapter and Mover AE are indifferent to the physical medium over which TCP/IP executes; it inherits this from the Java Runtime Environment.

7. ACQUISITION OF RADIATION EXPOSURE

The Synapse Dose Adapter implements DICOM services to acquire the Radiation Exposure. Radiation dose information can be acquired from DICOM Radiation Dose SR instances, DICOM MPPS messages or DICOM image headers.

7.1. DICOM IMAGE HEADER

7.1.1. X-RAY / RF INSTANCES

When DICOM X-Ray instances are acquired from the Synapse Dose Adapter, a list of attributes is stored in records local database. Here below a list of the attributes which are stored and mapped to local information entities in the database is represented.

Attribute Name	Tag	Mandatory
Patient ID	0010,0020	YES
Patient's Birth Date	0010,0030	NO
Patient's Sex	0010,0040	NO
Patient's Name	0010,0010	NO
Accession Number	0008,0050	NO
Study Date	0008,0020	YES
Study Time	0008,0030	YES
Study Description	0008,1030	YES
Study Instance UID	0020,000D	YES
Patient Weight	0010,1030	NO
Patient Size	0010,1020	NO
SOP Instance UID	0008,0018	YES
Instance Number	0020,0013	NO
Series Number	0020,0011	NO
Series Instance UID	0020,000E	NO
Series Description	0008,103E	NO
Body Part Examined	0018,0015	NO
Protocol Name	0018,1030	NO
Acquisition Date	0008,0022	NO
Acquisition Time	0008,0032	NO
Anatomic Region Sequence	0008,2218	NO
Irradiation Event UID	0008,3010	NO
Image Laterality	0020,0062	NO
Image Comments	0020,4000	NO
Number of Frames	0028,0008	NO
Manufacturer	0008,0070	NO

Institution Name	0008,0080	NO
Station Name	0008,1010	NO
Manufacturer's Model Name	0008,1090	NO
Device Serial Number	0018,1000	NO
Software Versions	0018,1020	NO
Exposure Control Mode	0018,7060	NO
KVP	0018,0060	NO
Exposure Time	0018,1150	NO
X-Ray Tube Current	0018,1151	NO
Exposure	0018,1152	NO
Distance Source to Detector	0018,1110	NO
Distance Source to Patient	0018,1111	NO
Image and Fluoroscopy Area Dose Product	0018,115E	NO
Body Part Thickness	0018,11A0	NO
Filter Material	0018,7050	NO
Filter Thickness Minimum	0018,7052	NO
Filter Thickness Maximum	0018,7054	NO
Exposed Area	0040,0303	NO
Positioner Primary Angle	0018,1510	NO
Positioner Secondary Angle	0018,1511	NO
Patient Position	0018,5100	NO
View Position	0018,5101	NO
Field of View Shape	0018,1147	NO
Field of View Dimension(s)	0018,1149	NO
Grid	0018,1166	NO
Acquisition Device Processing Description	0018,1400	NO

7.1.2. DIGITAL MAMMOGRAPHY X-RAY INSTANCES

When Digital Mammography X-Ray instances are acquired from the Synapse Dose Adapter, a list of attributes is stored in records local database. Here below a list of the attributes which are stored and mapped to local information entities in the database is represented.

Attribute Name	Tag	Mandatory
Patient ID	0010,0020	YES
Patient's Birth Date	0010,0030	NO
Patient's Sex	0010,0040	NO
Patient's Name	0010,0010	NO
Accession Number	0008,0050	NO
Study Date	0008,0020	YES
Study Time	0008,0030	YES
Study Description	0008,1030	YES
Study Instance UID	0020,000D	YES
Patient Weight	0010,1030	NO
Patient Size	0010,1020	NO
SOP Instance UID	0008,0018	YES
Instance Number	0020,0013	NO
Series Number	0020,0011	NO
Series Instance UID	0020,000E	NO
Series Description	0008,103E	NO
Body Part Examined	0018,0015	NO
Protocol Name	0018,1030	NO
Acquisition Date	0008,0022	NO
Acquisition Time	0008,0032	NO
Anatomic Region Sequence	0008,2218	NO
Irradiation Event UID	0008,3010	NO
Image Laterality	0020,0062	NO

Image Comments	0020,4000	NO
Number of Frames	0028,0008	NO
Manufacturer	0008,0070	NO
Institution Name	0008,0080	NO
Station Name	0008,1010	NO
Manufacturer's Model Name	0008,1090	NO
Device Serial Number	0018,1000	NO
Software Versions	0018,1020	NO
Exposure Control Mode	0018,7060	NO
KVP	0018,0060	NO
Exposure Time	0018,1150	NO
X-Ray Tube Current	0018,1151	NO
Exposure	0018,1152	NO
Distance Source to Detector	0018,1110	NO
Distance Source to Patient	0018,1111	NO
Body Part Thickness	0018,11A0	NO
Filter Material	0018,7050	NO
Filter Thickness Minimum	0018,7052	NO
Filter Thickness Maximum	0018,7054	NO
Positioner Primary Angle	0018,1510	NO
Positioner Secondary Angle	0018,1511	NO
View Position	0018,5101	NO
Field of View Shape	0018,1147	NO
Field of View Dimension(s)	0018,1149	NO
Grid	0018,1166	NO
Organ Dose	0040,0316	NO
Anode Target Material	0018,1191	NO
Half Value Layer	0040,0314	NO
Entrance Dose in mGy	0040,8302	NO
Compression Force	0018,11A2	NO
Focal Spot(s)	0018,1190	NO

7.1.3. DIGITAL ANGIOGRAPHY INSTANCES

When Digital Angiography instances are acquired from the Synapse Dose Adapter, a list of attributes is stored in records local database. Here below a list of the attributes which are stored and mapped to local information entities in the database is represented.

Attribute Name	Tag	Mandatory
Patient ID	0010,0020	YES
Patient's Birth Date	0010,0030	NO
Patient's Sex	0010,0040	NO
Patient's Name	0010,0010	NO
Accession Number	0008,0050	NO
Study Date	0008,0020	YES
Study Time	0008,0030	YES
Study Description	0008,1030	YES
Study Instance UID	0020,000D	YES
Patient Weight	0010,1030	NO
Patient Size	0010,1020	NO
SOP Instance UID	0008,0018	YES
Instance Number	0020,0013	NO
Series Number	0020,0011	NO
Series Instance UID	0020,000E	NO
Series Description	0008,103E	NO
Body Part Examined	0018,0015	NO
Protocol Name	0018,1030	NO

Acquisition Date	0008,0022	NO
Acquisition Time	0008,0032	NO
Anatomic Region Sequence	0008,2218	NO
Irradiation Event UID	0008,3010	NO
Image Laterality	0020,0062	NO
Image Comments	0020,4000	NO
Number of Frames	0028,0008	NO
Manufacturer	0008,0070	NO
Institution Name	0008,0080	NO
Station Name	0008,1010	NO
Manufacturer's Model Name	0008,1090	NO
Device Serial Number	0018,1000	NO
Software Versions	0018,1020	NO
KVP	0018,0060	NO
Exposure Time	0018,1150	NO
X-Ray Tube Current	0018,1151	NO
Exposure	0018,1152	NO
Distance Source to Detector	0018,1110	NO
Distance Source to Patient	0018,1111	NO
Image and Fluoroscopy Area Dose Product	0018,115E	NO
Body Part Thickness	0018,11A0	NO
Filter Material	0018,7050	NO
Filter Thickness Minimum	0018,7052	NO
Filter Thickness Maximum	0018,7054	NO
Exposed Area	0040,0303	NO
Positioner Primary Angle	0018,1510	NO
Positioner Secondary Angle	0018,1511	NO
Patient Position	0018,5100	NO
View Position	0018,5101	NO
Field of View Shape	0018,1147	NO
Field of View Dimension(s)	0018,1149	NO
Grid	0018,1166	NO
Acquisition Device Processing Description	0018,1400	NO
Intensifier Size	0018,1162	NO
Estimated Radiographic Magnification Factor	0018,1114	NO
Focal Spot(s)	0018,1190	NO
Cine Rate	0018,0040	NO
Frame Time	0018,1063	NO
Average Pulse Width	0018,1154	NO
Collimator Left Vertical Edge	0018,1702	NO
Collimator Right Vertical Edge	0018,1704	NO
Collimator Upper Horizontal Edge	0018,1706	NO
Collimator Lower Horizontal Edge	0018,1708	NO
Patient Orientation	0020,0020	NO
Radiation Mode	0018,115A	NO

7.1.4. COMPUTED TOMOGRAPHY INSTANCES

When Computed Tomography instances are acquired from the Synapse Dose Adapter, a list of attributes is stored in records local database. Here below a list of the attributes which are stored and mapped to local information entities in the database is represented.

Attribute Name	Tag	Mandatory
Patient ID	0010,0020	YES
Patient's Birth Date	0010,0030	NO
Patient's Sex	0010,0040	NO

Patient's Name	0010,0010	NO
Accession Number	0008,0050	NO
Study Date	0008,0020	YES
Study Time	0008,0030	YES
Study Description	0008,1030	YES
Study Instance UID	0020,000D	YES
Patient Weight	0010,1030	NO
Patient Size	0010,1020	NO
SOP Instance UID	0008,0018	YES
Instance Number	0020,0013	NO
Media Storage SOP Class UID	0002,0002	NO
Series Number	0020,0011	NO
Series Instance UID	0020,000E	NO
Series Description	0008,103E	NO
Body Part Examined	0018,0015	NO
Acquisition Date	0008,0022	NO
Acquisition Time	0008,0032	NO
Irradiation Event UID	0008,3010	NO
Image Comments	0020,4000	NO
Number of Frames	0028,0008	NO
Water Equivalent Diameter	0018,1271	NO
Pixel Spacing	0028,0030	NO
Image Position	0020,0032	NO
Software Versions	0018,1020	NO
X-Ray Tube Current	0018,1151	NO
Raws Attribute	0028,0010	NO

7.1.5. SECONDARY CAPTURE INSTANCES

When DICOM X-Ray instances are acquired from the Synapse Dose Adapter, a list of attributes is stored in records local database. Here below a list of the attributes which are stored and mapped to local information entities in the database is represented.

Attribute Name	Tag	Mandatory
Patient ID	0010,0020	YES
Patient's Birth Date	0010,0030	NO
Patient's Sex	0010,0040	NO
Patient's Name	0010,0010	NO
Accession Number	0008,0050	NO
Study Date	0008,0020	YES
Study Time	0008,0030	YES
Study Description	0008,1030	YES
Study Instance UID	0020,000D	YES
Patient Weight	0010,1030	NO
Patient Size	0010,1020	NO
SOP Instance UID	0008,0018	YES
Instance Number	0020,0013	NO
Series Number	0020,0011	NO

Series Instance UID	0020,000E	NO
Series Description	0008,103E	NO
Acquisition Date	0008,0022	NO
Acquisition Time	0008,0032	NO
Image Comments	0020,4000	NO
Number of Frames	0028,0008	NO
Manufacturer	0008,0070	NO
Institution Name	0008,0080	NO
Station Name	0008,1010	NO
Manufacturer's Model Name	0008,1090	NO
Device Serial Number	0018,1000	NO
Software Versions	0018,1020	NO
Exposure Dose Sequence	0040,030E	NO

Exposure Dose Sequence

Attribute Name	Tag	Mandatory
Body Part Examined	0018,0015	NO
Protocol Name	0018,1030	NO
Exposure Time	0018,1150	NO
Exposure in μ As	0018,1153	NO
Single Collimation Width	0018,9306	NO
Total Collimation Width	0018,9307	NO
KVP	0018,0060	NO
Spiral Pitch Factor	0018,9311	NO
Acquisition Type	0018,9302	NO
CTDIvol	0018,9345	NO
CTDI Phantom Type Code Sequence	0018,9346	NO
DLP	00E10021	NO

7.2. CT/ X-RAY RADIATION DOSE SR INSTANCES

When DICOM Radiation Dose SR instances are acquired from the Synapse Dose Adapter, a list of attributes is stored in records local database. Here below the modules acquired from the SyncoDose Adapter present the attributes which are stored and mapped to local information entities in the database.

CT Radiation Dose

NL	Rel with Parent	VT	Concept Name
		CONTAINER	113701 , X-Ray Radiation Dose Report
>	HAS CONCEPT MOD	CODE	121058 , Procedure reported
>	HAS OBS CONTEXT	DATETIME	113809 , Start of X-ray Irradiation
>	HAS OBS CONTEXT	DATETIME	113810 , End of X-ray Irradiation
>	CONTAINS	INCLUDE	113811 , CT Accumulated Dose Data
>	CONTAINS	INCLUDE	113819 , CT Irradiation Event Data

CT ACCUMULATED DOSE DATA

NL	Rel with Parent	VT	Concept Name
		CONTAINER	113811 , CT Accumulated Dose Data
>	CONTAINS	NUM	113812 , Total Number of Irradiation Events

CT IRRADIATION EVENT DATA

NL	Rel with Parent	VT	Concept Name
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		CONTAINER	113819 , CT Acquisition
>	CONTAINS	TEXT	125203 , Acquisition Protocol
>	CONTAINS	CODE	123014 , Target Region
>	CODE	CODE	113820 , CT Acquisition Type
>	CONTAINS	UIDREF	113769 , Irradiation Event UID
>	CONTAINS	CONTAINER	113822 , CT Acquisition Parameters
>>	CONTAINS	NUM	113824 , Exposure Time
>>	CONTAINS	NUM	113825 , Scanning Length
>>	CONTAINS	NUM	113826 , Nominal Single Collimation Width
>>	CONTAINS	NUM	113827 , Nominal Total Collimation Width
>>	CONTAINS	NUM	113828 , Pitch Factor
>>	CONTAINS	NUM	113823 , Number of X-ray Sources
>>	CONTAINS	NUM	113897 , Top Z Location of Scanning Length
>>	CONTAINS	NUM	113898 , Bottom Z Location of Scanning Length
>>	CONTAINS	CONTAINER	113831 , CT X-ray Source Parameters
>>>	CONTAINS	TEXT	113832 , Identification Number of the X-ray Source
>>>	CONTAINS	NUM	113733 , KVP
>>>	CONTAINS	NUM	113833 , Maximum X-ray Tube Current
>>>	CONTAINS	NUM	113734 , Mean X-ray Tube Current
>>>	CONTAINS	NUM	113834 , Exposure Time per Rotation
>	CONTAINS	CONTAINER	113829 , CT Dose
>>	CONTAINS	NUM	113830 , Mean CTDIvol
>>	CONTAINS	CODE	113835 , CTDIw Phantom Type
>>	CONTAINS	NUM	113836 , CTDIfreeair Calculation Factor
>>	CONTAINS	NUM	113837 , Mean CTDIfreeair

>>	CONTAINS	NUM	113838, DLP
>>	CONTAINS	NUM	113839, Effective Dose

X-Ray Radiation Dose

NL	Rel with Parent	VT	Concept Name
		CONTAINER	113701, X-Ray Radiation Dose Report
>	HAS CONCEPT MOD	CODE	121058, Procedure reported
>	CONTAINS	INCLUDE	113702, Accumulated XRay Dose Data
>	CONTAINS	INCLUDE	113706, Irradiation Event XRay Data

ACCUMULATED X-RAY DOSE

NL	Rel with Parent	VT	Concept Name
		CONTAINER	113702, Accumulated XRay Dose Data
>	HAS CONCEPT MOD	CODE	113764, Acquisition Plane
>	CONTAINS	TEXT	113780, Reference Point Definition
>	CONTAINS	NUM	113722, Dose Area Product Total
>	CONTAINS	NUM	113725, Dose (RP) Total
>	CONTAINS	NUM	113726, Fluoro Dose Area Product Total
>	CONTAINS	NUM	113728, Fluoro Dose (RP) Total
>	CONTAINS	NUM	113730, Total Fluoro Time
>	CONTAINS	NUM	113727, Acquisition Dose Area Product Total
>	CONTAINS	NUM	113729, Acquisition Dose (RP) Total
>	CONTAINS	NUM	113855, Total Acquisition Time
>	HAS CONCEPT MOD	CODE	G-C171, Laterality

IRRADIATION EVENT X-RAY DATA

NL	Rel with Parent	VT	Concept Name
		CONTAINER	113706, Irradiation Event XRay Data
>	CONTAINS	CODE	111031, Image View
>	HAS CONCEPT MOD	CODE	113764, Acquisition Plane
>	CONTAINS	TEXT	125203, Acquisition Protocol
>	CONTAINS	TEXT	113780, Reference Point Definition
>	CONTAINS	UIDREF	113769, Irradiation Event UID
>	CONTAINS	NUM	122130, Dose Area Product
>	CONTAINS	NUM	113738, Dose (RP)
>	CONTAINS	NUM	112011, Positioner Primary Angle
>	CONTAINS	NUM	112012, Positioner Secondary Angle
>	CONTAINS	NUM	113790, Collimated Field Area
>	CONTAINS	CONTAINER	113771, X-Ray Filters
>	CONTAINS	NUM	113733, KVP
>>	CONTAINS	CODE	113772, X-Ray Filter Type
>>	CONTAINS	CODE	113757, X-Ray Filter Materia
>>	CONTAINS	NUM	113758, X-Ray Filter Thickness Minimum
>>	CONTAINS	NUM	113773, X-Ray Filter Thickness Maximum
>	CONTAINS	CODE	113732, Fluoro Mode
>	CONTAINS	NUM	113791, Pulse Rate
>	CONTAINS	NUM	113768, Number of Pulses
>	CONTAINS	NUM	113734, X-Ray Tube Current
>	CONTAINS	NUM	113748, Distance Source to Isocenter
>	CONTAINS	NUM	113750, Distance Source to Detector
>	CONTAINS	NUM	113735, Exposure Time
>	CONTAINS	NUM	113793, Pulse Width
>	CONTAINS	NUM	113736, Exposure

>	CONTAINS	NUM	113766 , Focal Spot Size
>	CONTAINS	NUM	113742 , Irradiation Duration
>	CONTAINS	CODE	123014 , Target Region
>	CONTAINS	NUM	111631 , Average Glandular Dose
>	CONTAINS	CODE	111632 , Anode Target Material
>	CONTAINS	NUM	111633 , Compression Thickness
>	CONTAINS	NUM	111634 , Half Value Layer
>	CONTAINS	NUM	111636 , Entrance Exposure at RP
>	CONTAINS	CODE	113721 , Irradiation Event Type
>	CONTAINS	DATETIME	111526 , DateTime Started
>	HAS CONCEPT MOD	CODE	G-C171 , Laterality
>	CONTAINS	CODE	111635 , X-Ray Grid
>	CONTAINS	NUM	113751 , Table Longitudinal Position
>	CONTAINS	NUM	113753 , Table Height Position
>	CONTAINS	NUM	113752 , Table Lateral Position
>	CONTAINS	CODE	113876 , Device Role in Procedure

7.3. DICOM MPPS MESSAGES

When DICOM Mpps messages are received from the Synapse Dose Adapter, a list of attributes is stored in records local database. Here below a list of the attributes which are stored and mapped to local information entities in the database is represented.

Attribute Name	Tag	Mandatory
Scheduled Step Attributes Sequence	0040,0270	YES
Patient ID	0010,0020	YES
Patient's Sex	0010,0040	NO
Patient's Name	0010,0010	NO
Patient's Birth Date	0010,0030	NO
Performed Procedure Step Description	0040,0254	YES
Performed Procedure Step Start Time	0040,0245	YES
Media Storage SOP Instance UID	0002,0003	YES
Total Number of Exposures	0040,0301	NO
Exposure Dose Sequence	0040,030E	NO
Image and Fluoroscopy Area Dose Product	0018,115E	NO
Station AE Title	0008,0055	YES

Scheduled Step Attributes Sequence

Attribute Name	Tag	Mandatory
Accession Number	0008,0050	NO
Study Instance UID	0020,000D	YES

Exposure Dose Sequence

Attribute Name	Tag	Mandatory
Body Part Examined	0018,0015	NO
Exposure Time	0018,1150	NO
Exposure in μ As	0018,1153	NO
KVP	0018,0060	NO
X-Ray Tube Current in μ A	0018,8151	NO



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