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# DICOM Conformance Statement

**for**

**mRay version 6.3**



**mbits**  
imaging<sup>all the people</sup>®

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**Scope:**

mRay Version 6.3  
Radiological viewer with image processing functionality  
©2021 mbits imaging GmbH

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# 1 Table of Contents

1	Table of Contents .....	3
2	DICOM Conformance Statement Overview .....	5
3	Introduction.....	8
3.1	Audience .....	8
3.2	Remarks.....	8
3.3	Definitions, Terms and Abbreviations .....	8
4	Networking .....	9
4.1	Implementation Model.....	9
4.1.1	Application Data Flow Diagram.....	9
4.1.1.1	System architecture .....	10
4.1.1.2	Network services.....	10
4.1.2	Functional Definitions of AE's.....	10
4.1.2.1	Find SCU .....	10
4.1.2.2	Move SCU.....	10
4.1.2.3	Store SCP.....	10
4.1.3	Sequencing of Real-World Activities.....	10
4.1.3.1	Server Import to local archive .....	10
4.1.3.2	Invalid DICOM file and unsupported SOP Classes .....	10
4.1.4	File Meta Information for Implementation Class and Version .....	11
4.2	AE Specifications .....	11
4.2.1	C-Find SCU.....	11
4.2.1.1	SOP Classes .....	11
4.2.1.2	Proposed Presentation Contexts .....	11
4.2.1.3	Association Policy.....	11
4.2.1.4	Association Initiation Policy .....	11
4.2.1.5	Association Acceptance Policy .....	12
4.2.1.6	Response Status.....	12
4.2.1.7	Implementation Identifying Information .....	12
4.2.2	C-Move SCU.....	12
4.2.2.1	SOP Classes .....	12
4.2.2.2	Proposed Presentation Contexts .....	12
4.2.2.3	Association Policies .....	13
4.2.2.4	Association Initiation Policy .....	13
4.2.2.5	Association Acceptance Policy .....	13
4.2.2.6	Response Status.....	13
4.2.2.7	Implementation Identifying Information .....	14
4.2.3	C-Store SCP .....	14
4.2.3.1	SOP Classes .....	14
4.2.3.2	Accepted Presentation Contexts .....	14

4.2.3.3	Association Policies .....	15
4.2.3.4	Association Initiation Policy .....	15
4.2.3.5	Association Acceptance Policy .....	15
4.2.3.6	Response Status.....	15
4.2.3.7	Implementation Identifying Information .....	15
4.2.4	C-Store SCU.....	15
4.2.4.1	SOP Classes .....	15
4.2.4.2	Proposed Presentation Contexts .....	17
4.2.4.3	Association Policies .....	17
4.2.4.4	Association Initiation Policy .....	17
4.2.4.5	Association Acceptance Policy .....	17
4.2.4.6	Implementation Identifying Information .....	18
4.3	Network Interfaces.....	18
4.3.1	Physical Network Interface .....	18
4.3.2	Additional Protocols.....	18
4.3.3	IPv4 and IPv6 Support .....	18
4.4	Configuration.....	18
4.4.1	AE Title/Presentation Address Mapping.....	18
4.4.2	Parameters .....	18
5	Support of Character Sets .....	19
6	Security .....	19
7	Annex .....	20
7.1	Created SOP Instances and IOD Contents .....	20
7.1.1	SOP class independent tags.....	20
7.1.2	Visual Light Photographic Image Storage .....	20
7.1.3	Secondary Capture Image Storage .....	21
7.1.4	Grayscale Softcopy Presentation State Storage .....	21
7.1.5	Basic Text SR Storage .....	22
7.1.6	Private Tags .....	22
7.1.7	Private Transfer Syntaxes.....	22
7.2	Grayscale Image Consistency .....	22

## 2 DICOM Conformance Statement Overview

mRay supports several DICOM Service Classes, using the OFFIS DICOM Toolkit (DCMTK), to provide the following capabilities:

- Receive DICOM images and store them in the local system.
- Send DICOM images stored in the local system to a remote system.
- Query a PACS for particular studies and retrieve these studies for local storage.

The following table gives an overview of the supported network transfer syntaxes of the C-Store service:

**Table 1: Network Services**

SOP Classes	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
<b>Transfer</b>			
ComputedRadiographyImageStorage	1.2.840.10008.5.1.4.1.1.1	NO	YES
DigitalXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.1	NO	YES
DigitalXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.1.1	NO	YES
DigitalMammographyXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.2	NO	YES
DigitalMammographyXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.2.1	NO	YES
DigitalIntraOralXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.3	NO	YES
DigitalIntraOralXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.3.1	NO	YES
CTImageStorage	1.2.840.10008.5.1.4.1.1.2	NO	YES
EnhancedCTImageStorage	1.2.840.10008.5.1.4.1.1.2.1	NO	YES
UltrasoundMultiframeImageStorage	1.2.840.10008.5.1.4.1.1.3.1	NO	YES
MRImageStorage	1.2.840.10008.5.1.4.1.1.4	NO	YES
EnhancedMRImageStorage	1.2.840.10008.5.1.4.1.1.4.1	NO	YES
MRSpectroscopyStorage	1.2.840.10008.5.1.4.1.1.4.2	NO	YES
EnhancedMRCOLORImageStorage	1.2.840.10008.5.1.4.1.1.4.3	NO	YES
UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6.1	NO	YES
EnhancedUSVolumeStorage	1.2.840.10008.5.1.4.1.1.6.2	NO	YES
SecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7	NO	YES
MultiframeSingleBitSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.1	NO	YES
MultiframeGrayscaleByteSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.2	NO	YES
MultiframeGrayscaleWordSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.3	NO	YES
MultiframeTrueColorSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.4	NO	YES
TwelveLeadECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.1	NO	YES
GeneralECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.2	NO	YES
AmbulatoryECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.3	NO	YES
HemodynamicWaveformStorage	1.2.840.10008.5.1.4.1.1.9.2.1	NO	YES
CardiacElectrophysiologyWaveformStorage	1.2.840.10008.5.1.4.1.1.9.3.1	NO	YES
BasicVoiceAudioWaveformStorage	1.2.840.10008.5.1.4.1.1.9.4.1	NO	YES
GeneralAudioWaveformStorage	1.2.840.10008.5.1.4.1.1.9.4.2	NO	YES
ArterialPulseWaveformStorage	1.2.840.10008.5.1.4.1.1.9.5.1	NO	YES
RespiratoryWaveformStorage	1.2.840.10008.5.1.4.1.1.9.6.1	NO	YES
GrayscaleSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.1	YES	YES
ColorSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.2	NO	YES
PseudoColorSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.3	NO	YES
BlendingSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.4	NO	YES
XAXRFGrayscaleSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.5	NO	YES
XRayAngiographicImageStorage	1.2.840.10008.5.1.4.1.1.12.1	NO	YES
EnhancedXALmageStorage	1.2.840.10008.5.1.4.1.1.12.1.1	NO	YES
XRayRadiofluoroscopicImageStorage	1.2.840.10008.5.1.4.1.1.12.2	NO	YES
EnhancedXRFIImageStorage	1.2.840.10008.5.1.4.1.1.12.2.1	NO	YES
zXRay3DAngiographicImageStorage	1.2.840.10008.5.1.4.1.1.13.1.1	NO	YES
XRay3DCraniofacialImageStorage	1.2.840.10008.5.1.4.1.1.13.1.2	NO	YES
BreastTomosynthesisImageStorage	1.2.840.10008.5.1.4.1.1.13.1.3	NO	YES
NuclearMedicineImageStorage	1.2.840.10008.5.1.4.1.1.20	NO	YES



RawDataStorage	1.2.840.10008.5.1.4.1.1.66	NO	YES
z	1.2.840.10008.5.1.4.1.1.66.1	NO	YES
SpatialFiducialsStorage	1.2.840.10008.5.1.4.1.1.66.2	NO	YES
DeformableSpatialRegistrationStorage	1.2.840.10008.5.1.4.1.1.66.3	NO	YES
SegmentationStorage	1.2.840.10008.5.1.4.1.1.66.4	NO	YES
SurfaceSegmentationStorage	1.2.840.10008.5.1.4.1.1.66.5	NO	YES
RealWorldValueMappingStorage	1.2.840.10008.5.1.4.1.1.67	NO	YES
VLEndoscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.1	NO	YES
VideoEndoscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.1.1	NO	YES
VLMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.2	NO	YES
VideoMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.2.1	NO	YES
VLSlideCoordinatesMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.3	NO	YES
VLPhotographicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.4	YES	YES
VideoPhotographicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.4.1	NO	YES
OphthalmicPhotography8BitImageStorage	1.2.840.10008.5.1.4.1.1.77.1.5.1	NO	YES
OphthalmicPhotography16BitImageStorage	1.2.840.10008.5.1.4.1.1.77.1.5.2	NO	YES
StereometricRelationshipStorage	1.2.840.10008.5.1.4.1.1.77.1.5.3	NO	YES
OphthalmicTomographyImageStorage	1.2.840.10008.5.1.4.1.1.77.1.5.4	NO	YES
VLWholeSlideMicroscopyImageStorage	1.2.840.10008.5.1.4.1.1.77.1.6	NO	YES
LensometryMeasurementsStorage	1.2.840.10008.5.1.4.1.1.78.1	NO	YES
AutorefractometryMeasurementsStorage	1.2.840.10008.5.1.4.1.1.78.2	NO	YES
KeratometryMeasurementsStorage	1.2.840.10008.5.1.4.1.1.78.3	NO	YES
SubjectiveRefractionMeasurementsStorage	1.2.840.10008.5.1.4.1.1.78.4	NO	YES
VisualAcuityMeasurementsStorage	1.2.840.10008.5.1.4.1.1.78.5	NO	YES
SpectaclePrescriptionReportStorage	1.2.840.10008.5.1.4.1.1.78.6	NO	YES
OphthalmicAxialMeasurementsStorage	1.2.840.10008.5.1.4.1.1.78.7	NO	YES
IntraocularLensCalculationsStorage	1.2.840.10008.5.1.4.1.1.78.8	NO	YES
MacularGridThicknessAndVolumeReportStorage	1.2.840.10008.5.1.4.1.1.79.1	NO	YES
OphthalmicVisualFieldStaticPerimetryMeasurementsSt.	1.2.840.10008.5.1.4.1.1.80.1	NO	YES
BasicTextSRStorage	1.2.840.10008.5.1.4.1.1.88.11	YES	YES
EnhancedSRStorage	1.2.840.10008.5.1.4.1.1.88.22	NO	YES
ComprehensiveSRStorage	1.2.840.10008.5.1.4.1.1.88.33	NO	YES
ProcedureLogStorage	1.2.840.10008.5.1.4.1.1.88.40	NO	YES
MammographyCADSRStorage	1.2.840.10008.5.1.4.1.1.88.50	NO	YES
KeyObjectSelectionDocumentStorage	1.2.840.10008.5.1.4.1.1.88.59	NO	YES
ChestCADSRStorage	1.2.840.10008.5.1.4.1.1.88.65	NO	YES
XRayRadiationDoseSRStorage	1.2.840.10008.5.1.4.1.1.88.67	NO	YES
ColonCADSRStorage	1.2.840.10008.5.1.4.1.1.88.69	NO	YES
ImplantationPlanSRDocumentStorage	1.2.840.10008.5.1.4.1.1.88.70	NO	YES
EncapsulatedPDFStorage	1.2.840.10008.5.1.4.1.1.104.1	NO	YES
EncapsulatedCDAStorage	1.2.840.10008.5.1.4.1.1.104.2	NO	YES
PositronEmissionTomographyImageStorage	1.2.840.10008.5.1.4.1.1.128	NO	YES
EnhancedPETImageStorage	1.2.840.10008.5.1.4.1.1.130	NO	YES
BasicStructuredDisplayStorage	1.2.840.10008.5.1.4.1.1.131	NO	YES
RTImageStorage	1.2.840.10008.5.1.4.1.1.481.1	NO	YES
RTDoseStorage	1.2.840.10008.5.1.4.1.1.481.2	NO	YES
RTStructureSetStorage	1.2.840.10008.5.1.4.1.1.481.3	NO	YES
RTBeamsTreatmentRecordStorage	1.2.840.10008.5.1.4.1.1.481.4	NO	YES
RTPlanStorage	1.2.840.10008.5.1.4.1.1.481.5	NO	YES
RTBrachyTreatmentRecordStorage	1.2.840.10008.5.1.4.1.1.481.6	NO	YES
RTTreatmentSummaryRecordStorage	1.2.840.10008.5.1.4.1.1.481.7	NO	YES
RTIonPlanStorage	1.2.840.10008.5.1.4.1.1.481.8	NO	YES
RTIonBeamsTreatmentRecordStorage	1.2.840.10008.5.1.4.1.1.481.9	NO	YES
GenericImplantTemplateStorage	1.2.840.10008.5.1.4.43.1	NO	YES
ImplantAssemblyTemplateStorage	1.2.840.10008.5.1.4.44.1	NO	YES
ImplantTemplateGroupStorage	1.2.840.10008.5.1.4.45.1	NO	YES
<b>Query/Retrieve</b>			
Study Root Query/ Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	YES	NO
Study Root Query/ Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	YES	NO



The following table gives an overview of the viewable SOP Classes. Note that not all of the supported SOP Classes by network services are viewable in the mRay Client application.

**Table 2: Viewable SOP Classes**

SOP Classes	SOP Class UID	Viewable
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	YES
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	YES
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	YES
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	YES
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	YES
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	YES
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	YES
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	YES
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	YES
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	YES
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	YES
X-Ray Radio fluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	YES
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	NO
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	NO
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	YES
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	YES
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	NO
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	NO
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	YES
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	NO
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	YES

## 3 Introduction

This DICOM Conformance Statement describes the conformity of the mRay software in accordance to the DICOM standard (Digital Imaging and Communications in Medicine). This document is essential to evaluate the communication between this software and other DICOM conformed products.

### 3.1 Audience

This document delivers information for physicians and software administrators. It is assumed that the reader has basic knowledge of the DICOM standard.

### 3.2 Remarks

If another device follows the same DICOM specifications, there is a possibility of interoperability – but no guarantee.

### 3.3 Definitions, Terms and Abbreviations

<b>AE</b>	Application Entity
<b>CR</b>	Computed Radiography
<b>CT</b>	Computed Tomography
<b>DICOM</b>	Digital Imaging and Communications in Medicine
<b>ECG</b>	Echocardiography
<b>IE</b>	Information Entity
<b>IOD</b>	Information Object Definition
<b>ISO</b>	International Standards Organization
<b>MG</b>	Mammography
<b>MR</b>	Magnet Resonance (Tomography)
<b>SCP</b>	Service Class Provider
<b>SCU</b>	Service Class User
<b>SOP</b>	Service Object Pair
<b>TCP/IP</b>	Transmission Control Protocol / Internet Protocol
<b>UID</b>	Unique Identifier
<b>US</b>	Ultra Sound
<b>VM</b>	Value Multiplicity
<b>VR</b>	Value Representation
<b>XA</b>	X-RAY Angiography





# 4 Networking

## 4.1 Implementation Model

### 4.1.1 Application Data Flow Diagram

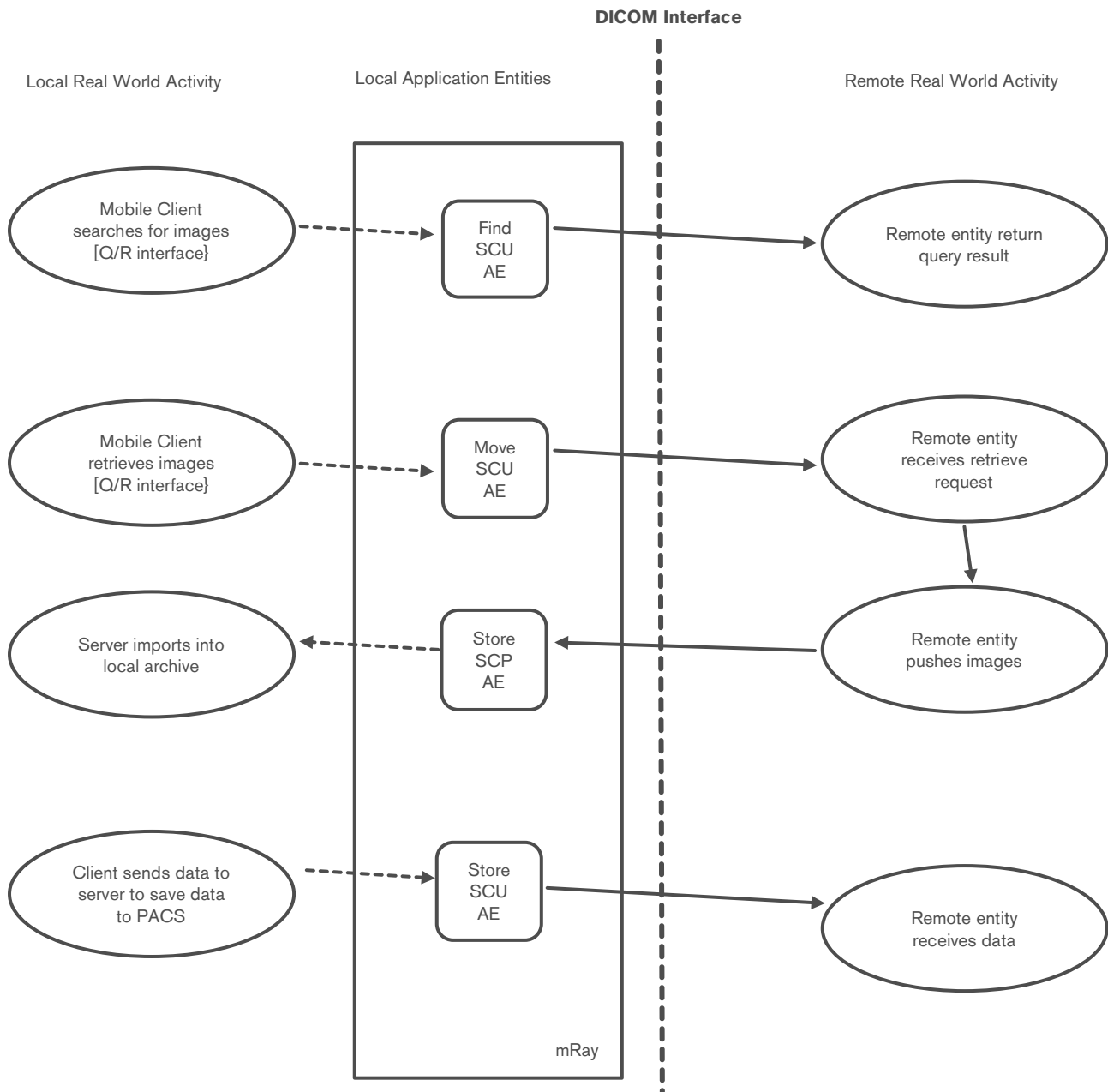


Figure 1: Application Dataflow



#### 4.1.1.1 System architecture

mRay consists of two components - a server and a client application. The server application receives, encrypts and distributes all data. It also performs the user rights management. The client application is a DICOM viewer, which receives data from the server and displays it.

#### 4.1.1.2 Network services

The implementation consists of the network services shown in Figure 1. Their instances work simultaneously and asynchronously. mRay has a local archive for incoming datasets. There may be an individual Store SCP AE for each data pool in the local archive.

### 4.1.2 Functional Definitions of AE's

#### 4.1.2.1 Find SCU

mRay sends a C-Find request to search for studies on a remote DICOM node. The Find SCU is at STUDY or SERIES level. The initial query is initiated at STUDY level. The user can then select results to perform a query at SERIES level.

#### 4.1.2.2 Move SCU

A C-MOVE may be initiated through the user interface for study, series or image retrieval. The Store SCP receives the retrieved instances.

#### 4.1.2.3 Store SCP

The network service Store SCP is running in the background, listening for incoming connections including multiple associations at the same time. Store SCP receives objects within an association and then saves the data to the local archive.

#### 4.1.2.4 Store SCU

The Store SCP network service is initiated by mRay server to send DICOM datasets to a specified PACS. There is no restriction on AE titles except the DICOM typical rules.

### 4.1.3 Sequencing of Real-World Activities

All activities despite *Server imports to local archive* are performed asynchronously.

#### 4.1.3.1 Server Import to local archive

All data is encrypted as soon as the server receives it. The data is converted into a proprietary file format. The encrypted files can only be viewed by mRay applications. The distribution of the files is also encrypted.

#### 4.1.3.2 Invalid DICOM file and unsupported SOP Classes

Due to possible patient hazard any DICOM file containing invalid values or missing DICOM tags will not be imported. Instead, there will be a dummy entry in the patient list to inform the user about the non-conformant data. Unsupported SOP Classes, which are not viewable by the client application will be treated the same way.



## 4.1.4 File Meta Information for Implementation Class and Version

Currently, mRay Server uses the OFFIS DCMTK (Source: <https://dicom.offis.de/dcmtdk.php.de>) as a baseline toolkit to support DICOM functionality. The following is the version and class of the library and utilities.

File Meta Information Version	0x00 0x01
Implementation Class UID	1.2.276.0.7230010.3.0.3.6.4
Implementation Version Name	OFFIS_DCMTK_364

Note: UIDs created by mRay Server itself, such as the Study Instance UID, the Series Instance UID, the SOP Instance UID, etc. originate from the <org root> UID of mbits imaging GmbH, which is as follows:

<org root> UID of mbits imaging GmbH	1.2.276.0.76.3.1.248
--------------------------------------	----------------------

## 4.2 AE Specifications

### 4.2.1 C-Find SCU

#### 4.2.1.1 SOP Classes

For a detailed overview of supported SOP Classes see table 1.

#### 4.2.1.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

#### 4.2.1.3 Association Policy

##### General

By default, FIND-SCU needs a standard application context name:

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

The “maximum PDU size” sent is 16384 bytes.

##### Number of associations

The maximum number of simultaneous associations is 1.

#### 4.2.1.4 Association Initiation Policy

FIND-SCU initiates a new association whenever the user initiates a query from the client application. A single attempt will be made to connect to the remote AE. If the connection fails, there will be no further attempts.

For presentation contexts, see table 1. The system only supports study root queries at STUDY, SERIES and IMAGE level according to the request generated by the client application. The maximum number of search results is limited to 1024 per query (can be changed by parameter), per PACS. All search results at STUDY level are grouped to patients for a better user experience. All DICOM tags used within C-FIND operations are presented in the following table:

Name	DICOM Tag
Study Time	(0x0008,0x0030)
Study Date	(0008,0020)
Study Description	(0x0008,0x103E)
Modalities in Study	(0008,0061)
Patient's Name	(0010,0010)



Patient's ID	(0010,0020)
Patient's Birth Date	(0010,0030)
Referring Physician's Name	(0x0008,0x0090)
Requesting Service	(0x0032, 0x1033)
Accession Number	(0x0008,0x0050)

#### 4.2.1.5 Association Acceptance Policy

FIND-SCU does not accept associations.

#### 4.2.1.6 Response Status

Service Status	Further Meaning	Status Code	Behavior
Refused	Out of Resources	A700	Current query is terminated; remaining queries continue
Error	Identifier does not match SOP Class	A900	Current query is terminated; remaining queries continue
	Unable to process	Cxxx	Current query is terminated; remaining queries continue
Cancel	Matching terminated due to Cancel request	FE00	Current query is terminated; remaining queries continue
Success	Matching is complete - No final Identifier is supplied	0000	Query is successful
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier used to populate worklist
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	FF01	Returned values not overridden

#### 4.2.1.7 Implementation Identifying Information

FIND-SCU will respond with the implementation identifying parameters listed in the following table.

Implementation Class UID	1.2.276.0.7230010.3.0.3.6.4
Implementation Version Name	OFFIS_DCMTK_364

### 4.2.2 C-Move SCU

#### 4.2.2.1 SOP Classes

For a detailed overview of supported SOP Classes see table 1.

#### 4.2.2.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None



### 4.2.2.3 Association Policies

#### General

By default, MOVE-SCU needs a standard application context name:

Application Context Name	1.2.840.10008.3.1.1.1
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The maximum PDU size sent is 16384 bytes.

#### Number of associations

The maximum number of simultaneous associations is 1.

### 4.2.2.4 Association Initiation Policy

MOVE-SCU initiates a new association whenever the user initiates a retrieve from the client application. A single attempt will be made to connect to the remote AE. If the connection fails, there will be further attempts.

The system supports the following retrieve request types:

Name	DICOM Tag
<b>STUDY level</b>	
Study Instance UID	(0020,000D)
<b>SERIES level</b>	
Series Instance UID	(0020,000E)

### 4.2.2.5 Association Acceptance Policy

MOVE-SCU does not accept associations.

### 4.2.2.6 Response Status

Service Status	Further Meaning	Status Code	Related Fields	Behavior
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)	Retrieval is terminated; Retries will occur
	Out of Resources - Unable to perform sub-operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is terminated; Retries will occur
	Move Destination unknown	A801	(0000,0902)	Retrieval is terminated; Retries will occur
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)	Retrieval is terminated; Retries will occur
	Unable to process	Cxxx	(0000,0901) (0000,0902)	Retrieval is terminated; Retries will occur
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is terminated; Retries will occur
Warning	Sub-operations Complete - One or more Failures	B000	(0000,1020) (0000,1022) (0000,1023)	Retrieval is terminated; Retry will occur
Success	Sub-operations Complete - No Failures	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Success of the retrieve
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval continues



#### 4.2.2.7 Implementation Identifying Information

MOVE-SCU will respond with the implementation identifying parameters listed in the following table:

Implementation Class UID	1.2.276.0.7230010.3.0.3.6.4
Implementation Version Name	OFFIS_DCMTK_364

Note: UIDs created by mRay Server itself, such as the Study Instance UID, the Series Instance UID, the SOP Instance UID, etc. originate from the <org root> UID of mbits imaging GmbH, which is as follows:

<org root> UID of mbits imaging GmbH	1.2.276.0.76.3.1.248
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#### 4.2.3 C-Store SCP

##### 4.2.3.1 SOP Classes

For a detailed overview of supported SOP Classes see table 1.

##### 4.2.3.2 Accepted Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
All SOP classes listed in table of section 4.2.3.1		Implicit VR Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Deflated Explicit VR Little Endian	1.2.840.10008.1.2.1.99	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCP	None
		JPEG Baseline (Processes 2 & 4)	1.2.840.10008.1.2.4.51	SCP	None
		JPEG Lossless, Non-hierarchical, First- Order Prediction (Processes 14 [Selection Value 1])	1.2.840.10008.1.2.4.70	SCP	None
		JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80	SCP	None
		JPEG-LS Lossy (Near- Lossless) Image Compression	1.2.840.10008.1.2.4.81	SCP	None
		JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90	SCP	None
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	SCP	None
		MPEG2 Main Profile Main Level	1.2.840.10008.1.2.4.100	SCP	None
		MPEG-2 Main Profile High Level	1.2.840.10008.1.2.4.101	SCP	None
		MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102	SCP	None
		MPEG-4 AVC/H.264 BD-compatible High Profile / Level 4.1	1.2.840.10008.1.2.4.103	SCP	None
		MPEG-4 AVC/H.264 High Profile / Level 4.2 For 2D Video	1.2.840.10008.1.2.4.104	SCP	None
		MPEG-4 AVC/H.264 High Profile / Level 4.2 For 3D Video	1.2.840.10008.1.2.4.105	SCP	None
		MPEG-4 AVC/H.264 Stereo High Profile / Level 4.2	1.2.840.10008.1.2.4.106	SCP	None
		HEVC/H.265 Main Profile / Level 5.1	1.2.840.10008.1.2.4.107	SCP	None
		HEVC/H.265 Main 10 Profile / Level 5.1	1.2.840.10008.1.2.4.108	SCP	None
	RLE Lossless	1.2.840.10008.1.2.5	SCP	None	



### 4.2.3.3 Association Policies

Store SCP accepts new associations but never initiates one. The default PDU size is 16384 bytes (minimum is 4096 bytes, maximum is 131072 bytes).

#### Number of Associations

The number of associations is unlimited.

#### Asynchronous Nature

Store SCP will handle each association asynchronously.

### 4.2.3.4 Association Initiation Policy

Store SCP does not initiate associations on its own.

### 4.2.3.5 Association Acceptance Policy

Store SCP will try to accept all incoming associations without any restrictions based on network addresses or AE titles. For an overview of the supported transfer syntaxes see table 1.

### 4.2.3.6 Response Status

Service	Further Meaning	Status Codes	Reason
Success	Success	0000	Successfully sent objects
Refused	Out of resources	A700-A7FF	Association limit reached; local disk space low
Error	Data Set does not match SOP Class	A900-A9FF	Never sent
	Cannot Understand	C000-CFFF	Internal processing error
Warning	Coercion of Data Elements	B000	Never sent
	Data Set does not match SOP Class	B007	Never sent
	Elements Discarded	B006	Never sent

### 4.2.3.7 Implementation Identifying Information

STORE-SCP will respond with the implementation identifying parameters listed in the following table.

Implementation Class UID	1.2.276.0.7230010.3.0.3.6.4
Implementation Version Name	OFFIS_DCMTK_364

Note: UIDs created by mRay Server itself, such as the Study Instance UID, the Series Instance UID, SOP Instance UID, etc. originate from the <org root> UID of mbits imaging GmbH, which is as follows:

<org root> UID of mbits imaging GmbH	1.2.276.0.76.3.1.248
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## 4.2.4 C-Store SCU

### 4.2.4.1 SOP Classes

The following Storage SOP Classes are provided by mRay Server via C-Store SCU.

Sop Class	SOP Class UID
<b>ComputedRadiographyImageStorage</b>	1.2.840.10008.5.1.4.1.1.1
<b>DigitalXRayImageStorageForPresentation</b>	1.2.840.10008.5.1.4.1.1.1.1
<b>DigitalXRayImageStorageForProcessing</b>	1.2.840.10008.5.1.4.1.1.1.1.1
<b>DigitalMammographyXRayImageStorageForPresentation</b>	1.2.840.10008.5.1.4.1.1.1.2
<b>DigitalMammographyXRayImageStorageForProcessing</b>	1.2.840.10008.5.1.4.1.1.1.2.1
<b>DigitalIntraOralXRayImageStorageForPresentation</b>	1.2.840.10008.5.1.4.1.1.1.3
<b>DigitalIntraOralXRayImageStorageForProcessing</b>	1.2.840.10008.5.1.4.1.1.1.3.1
<b>CTImageStorage</b>	1.2.840.10008.5.1.4.1.1.2



<b>EnhancedCTImageStorage</b>	1.2.840.10008.5.1.4.1.1.2.1
<b>UltrasoundMultiframeImageStorage</b>	1.2.840.10008.5.1.4.1.1.3.1
<b>MRIImageStorage</b>	1.2.840.10008.5.1.4.1.1.4
<b>EnhancedMRIImageStorage</b>	1.2.840.10008.5.1.4.1.1.4.1
<b>MRSpectroscopyStorage</b>	1.2.840.10008.5.1.4.1.1.4.2
<b>UltrasoundImageStorage</b>	1.2.840.10008.5.1.4.1.1.6.1
<b>SecondaryCaptureImageStorage</b>	1.2.840.10008.5.1.4.1.1.7
<b>MultiframeSingleBitSecondaryCaptureImageStorage</b>	1.2.840.10008.5.1.4.1.1.7.1
<b>MultiframeGrayscaleByteSecondaryCaptureImageStorage</b>	1.2.840.10008.5.1.4.1.1.7.2
<b>MultiframeGrayscaleWordSecondaryCaptureImageStorage</b>	1.2.840.10008.5.1.4.1.1.7.3
<b>MultiframeTrueColorSecondaryCaptureImageStorage</b>	1.2.840.10008.5.1.4.1.1.7.4
<b>TwelveLeadECGWaveformStorage</b>	1.2.840.10008.5.1.4.1.1.9.1.1
<b>GeneralECGWaveformStorage</b>	1.2.840.10008.5.1.4.1.1.9.1.2
<b>AmbulatoryECGWaveformStorage</b>	1.2.840.10008.5.1.4.1.1.9.1.3
<b>HemodynamicWaveformStorage</b>	1.2.840.10008.5.1.4.1.1.9.2.1
<b>CardiacElectrophysiologyWaveformStorage</b>	1.2.840.10008.5.1.4.1.1.9.3.1
<b>BasicVoiceAudioWaveformStorage</b>	1.2.840.10008.5.1.4.1.1.9.4.1
<b>GrayscaleSoftcopyPresentationStateStorage</b>	1.2.840.10008.5.1.4.1.1.11.1
<b>ColorSoftcopyPresentationStateStorage</b>	1.2.840.10008.5.1.4.1.1.11.2
<b>PseudoColorSoftcopyPresentationStateStorage</b>	1.2.840.10008.5.1.4.1.1.11.3
<b>BlendingSoftcopyPresentationStateStorage</b>	1.2.840.10008.5.1.4.1.1.11.4
<b>XRayAngiographicImageStorage</b>	1.2.840.10008.5.1.4.1.1.12.1
<b>EnhancedXAIImageStorage</b>	1.2.840.10008.5.1.4.1.1.12.1.1
<b>XRayRadiofluoroscopicImageStorage</b>	1.2.840.10008.5.1.4.1.1.12.2
<b>EnhancedXRFIImageStorage</b>	1.2.840.10008.5.1.4.1.1.12.2.1
<b>NuclearMedicineImageStorage</b>	1.2.840.10008.5.1.4.1.1.20
<b>RawDataStorage</b>	1.2.840.10008.5.1.4.1.1.66
<b>SpatialRegistrationStorage</b>	1.2.840.10008.5.1.4.1.1.66.1
<b>SpatialFiducialsStorage</b>	1.2.840.10008.5.1.4.1.1.66.2
<b>RealWorldValueMappingStorage</b>	1.2.840.10008.5.1.4.1.1.67
<b>VLEndoscopicImageStorage</b>	1.2.840.10008.5.1.4.1.1.77.1.1
<b>VLMicroscopicImageStorage</b>	1.2.840.10008.5.1.4.1.1.77.1.2
<b>VLSlideCoordinatesMicroscopicImageStorage</b>	1.2.840.10008.5.1.4.1.1.77.1.3
<b>VLPhotographicImageStorage</b>	1.2.840.10008.5.1.4.1.1.77.1.4
<b>OphthalmicPhotography8BitImageStorage</b>	1.2.840.10008.5.1.4.1.1.77.1.5.1
<b>OphthalmicPhotography16BitImageStorage</b>	1.2.840.10008.5.1.4.1.1.77.1.5.2
<b>StereometricRelationshipStorage</b>	1.2.840.10008.5.1.4.1.1.77.1.5.3
<b>OphthalmicTomographyImageStorage</b>	1.2.840.10008.5.1.4.1.1.77.1.5.4
<b>BasicTextSRStorage</b>	1.2.840.10008.5.1.4.1.1.88.11
<b>EnhancedSRStorage</b>	1.2.840.10008.5.1.4.1.1.88.22
<b>ComprehensiveSRStorage</b>	1.2.840.10008.5.1.4.1.1.88.33
<b>ProcedureLogStorage</b>	1.2.840.10008.5.1.4.1.1.88.40
<b>MammographyCADSRStorage</b>	1.2.840.10008.5.1.4.1.1.88.50
<b>KeyObjectSelectionDocumentStorage</b>	1.2.840.10008.5.1.4.1.1.88.59
<b>ChestCADSRStorage</b>	1.2.840.10008.5.1.4.1.1.88.65
<b>XRayRadiationDoseSRStorage</b>	1.2.840.10008.5.1.4.1.1.88.67
<b>ColonCADSRStorage</b>	1.2.840.10008.5.1.4.1.1.88.69
<b>EncapsulatedPDFStorage</b>	1.2.840.10008.5.1.4.1.1.104.1
<b>PositronEmissionTomographyImageStorage</b>	1.2.840.10008.5.1.4.1.1.128
<b>RTImageStorage</b>	1.2.840.10008.5.1.4.1.1.481.1
<b>RTDoseStorage</b>	1.2.840.10008.5.1.4.1.1.481.2
<b>RTStructureSetStorage</b>	1.2.840.10008.5.1.4.1.1.481.3
<b>RTBeamsTreatmentRecordStorage</b>	1.2.840.10008.5.1.4.1.1.481.4
<b>RTPlanStorage</b>	1.2.840.10008.5.1.4.1.1.481.5
<b>RTBrachyTreatmentRecordStorage</b>	1.2.840.10008.5.1.4.1.1.481.6
<b>RTTreatmentSummaryRecordStorage</b>	1.2.840.10008.5.1.4.1.1.481.7





#### 4.2.4.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
All SOP classes listed in table of section 4.2.4.1		Implicit VR Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Deflated Explicit VR Little Endian	1.2.840.10008.1.2.1.99	SCU	None
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Baseline (Processes 2 & 4)	1.2.840.10008.1.2.4.51	SCU	None
		JPEG Spectral Selection, Non-hierarchical (Processes 6 & 8)	1.2.840.10008.1.2.4.53	SCU	None
		JPEG Full Progression, Non-hierarchical (Processes 10 & 12)	1.2.840.10008.1.2.4.55	SCU	None
		JPEG Lossless, Non-hierarchical (Processes 14)	1.2.840.10008.1.2.4.57	SCU	None
		JPEG Lossless, Non-hierarchical, First- Order Prediction (Processes 14 [Selection Value 1])	1.2.840.10008.1.2.4.70	SCU	None
		JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80	SCU	None
		JPEG-LS Lossy (Near- Lossless) Image Compression	1.2.840.10008.1.2.4.81	SCU	None
	RLE Lossless	1.2.840.10008.1.2.5	SCU	None	

#### 4.2.4.3 Association Policies

Store SCU initiates associations but does not accept new ones. The default PDU size is 16384 bytes (minimum is 4096 bytes, maximum is 131072 bytes).

##### Number of Associations

The number of associations is 1 per DICOM file. Multiple Store SCU processes may be used. The maximum number of simultaneous associations is depending on the system specifications.

##### Asynchronous Nature

Asynchronous handling is not supported.

#### 4.2.4.4 Association Initiation Policy

Store SCU initiates associations on demand to send data from mRay server to any pre-configured remote AET. Depending on the number of instances in a series an attempt to transmit a series will be made in a single association or multiple associations.

##### Proposed Presentation Contexts

By default, mRay will propose uncompressed transfer syntaxes.

#### 4.2.4.5 Association Acceptance Policy

Store SCU does not accept any association.



#### 4.2.4.6 Implementation Identifying Information

STORE-SCU will respond with the implementation identifying parameters listed in the following table.

Implementation Class UID	1.2.276.0.7230010.3.0.3.6.4
Implementation Version Name	OFFIS_DCMTK_364

Note: UIDs created by mRay Server itself, such as the Study Instance UID, the Series Instance UID, SOP Instance UID, etc. originate from the <org root> UID of mbits imaging GmbH, which is as follows:

<org root> UID of mbits imaging GmbH	1.2.276.0.76.3.1.248
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### 4.3 Network Interfaces

#### 4.3.1 Physical Network Interface

Depends on the operation system. The application is indifferent to the physical medium over which TCP/IP executes.

#### 4.3.2 Additional Protocols

None.

#### 4.3.3 IPv4 and IPv6 Support

mRay only supports IPv4 connections.

### 4.4 Configuration

#### 4.4.1 AE Title/Presentation Address Mapping

The corresponding AE title is set in the server application along with the IP address and port.

#### 4.4.2 Parameters

Parameter	Configurable	Default value
PDU Size	No	16 kB
General DIMSE level time-out values	No	30 seconds

## 5 Support of Character Sets

mRay supports the following character sets:

- ISO\_IR 100 (ISO 8859-1:1987 Latin Alphabet No. 1 supplementary set)
- ISO\_IR 138 (Hebrew - supplementary set of ISO 8859)
- ISO\_IR 192 (Unicode in UTF-8)

## 6 Security

mRay uses state-of-the-art security measures internally to keep received data safe. As far as the DICOM interface is concerned, mRay does not offer additional security. It is assumed that the system is always used in a secured environment, which includes:

- Firewall or router protections to ensure that only approved external hosts have network access to the software.
- Firewall or router protections to ensure that the software only has network access to approved external hosts and services.

The communication between mRay instances i.e. server and client devices is encrypted and safe. In addition, all files stored on client devices are encrypted as well and automatically deleted after the specified time.



## 7 Annex

### 7.1 Created SOP Instances and IOD Contents

#### 7.1.1 SOP class independent tags

All files of supported SOP classes generated by mRay are containing the following set of DICOM tags:

attribute	Presence	Notes
Patient ID	Always	
Patient Name	Always	
Patient Birth Date	Always	
Patient Sex	Always	
Study Instance UID	Always	
Study ID	Always	
Study Description	Always	
Study Date	Always	
Study Time	Always	
Series Instance UID	Always	
Series Number	Always	
Series Description	Always	User defined content
Series Number	Always	
Series Date	Always	Date of dataset creation (based on local time of device)
Series Time	Always	Time of dataset creation (based on local time of device)
Content Date	Always	Same as series date
Content Time	Always	Same as series time
Acquisition Date	Always	Same as series date
Acquisition Time	Always	Same as series time
Referring Physicians Name	Optional	
Performing Physicians Name	Always	User that created the dataset
Instance Number	Always	
SOP Instance UID	Always	
Manufacturer	Always	Set to "mbits imaging GmbH"
Software Versions	Always	Version code for mRay server application
Specific Character Set	Always	Type is based on configuration of the server application
Accession Number	Always	May be empty
Institution Name	Optional	

#### 7.1.2 Visual Light Photographic Image Storage

attribute	Presence	Notes
SOP Class UID	Always	1.2.840.10008.5.1.4.1.1.77.1.4 [Visual Light Photographic Image Storage]
Modality	Always	Set to "XC" (External camera), can configured to "OT"
Rows	Always	Based on camera resolution of capturing device
Columns	Always	Based on camera resolution of capturing device
Photometric Interpretation	Always	Set to "RGB"
Samples Per Pixel	Always	Set to 3 (RGB)
Bits Stored	Always	Set to 8
Bits Allocated	Always	Set to 8
High Bit	Always	Set to 7
Planar Configuration	Always	Set to 0
Window Center	Always	Set to 128
Window Width	Always	Set to 255
Pixel Spacing	Always	Set to [1.0 / 1.0]
Pixel Data	Always	



### 7.1.3 Secondary Capture Image Storage

attribute	Presence	Notes
<b>SOP Class UID</b>	Always	1.2.840.10008.5.1.4.1.1.7 [SecondaryCaptureImageStorage]
<b>Modality</b>	Always	Set to "OT" (Other)
<b>Rows</b>	Always	Based on the resolution of an image file
<b>Columns</b>	Always	Based on the resolution of an image file
<b>Photometric Interpretation</b>	Always	Set to "RGB", "MONOCHROME1" or "MONOCHROME2"
<b>Samples Per Pixel</b>	Always	Set to 3 (RGB) or (1)
<b>Bits Stored</b>	Always	Set to 8 or 12
<b>Bits Allocated</b>	Always	Set to 8 or 16
<b>High Bit</b>	Always	Set to 7 or 11
<b>Planar Configuration</b>	Optional	Set to 0 for "RGB"
<b>Window Center</b>	Always	Set to 128 or depending on image content
<b>Window Width</b>	Always	Set to 255 or depending on image content
<b>Pixel Spacing</b>	Always	Set to [1.0 / 1.0]
<b>Samples Per Pixel</b>	Monochrome images	Set to 1
<b>Pixel Representation</b>	Monochrome images	Set to 0
<b>Pixel Data</b>	Always	
<b>Rescale Slope</b>	Optional	For "MONOCHROME1" or "MONOCHROME2"
<b>Rescale Intercept</b>	Optional	For "MONOCHROME1" or "MONOCHROME2"
<b>Rescale Type</b>	Optional	Set to "US" for "MONOCHROME1" or "MONOCHROME2"
<b>Conversion Type</b>	Always	Set to "SYN"

### 7.1.4 Grayscale Softcopy Presentation State Storage

attribute	Presence	Notes
<b>SOP Class UID</b>	Always	1.2.840.10008.5.1.4.1.1.11.1 [Grayscale Softcopy Presentation State Storage]
<b>Modality</b>	Always	Set to "PR"
<b>Presentation Creation Date</b>	Always	Same as series date
<b>Presentation Creation Time</b>	Always	Same as series time
<b>Referenced Series Sequence</b>	Always	Single valued. Containing one referenced SOP Instance
<b>Displayed Area Selection Sequence</b>	Always	Single valued
<b>Text Object Sequence</b>	Optional	May be multi valued. Bounding Box Annotation Units = PIXEL Bounding Box Text Horizontal Justification = CENTER
<b>Graphic Object Sequence</b>	Optional	Graphic Annotation Units = PIXEL Type is POLYLINE.
<b>Compound Graphic Sequence</b>	Optional	Compound Graphic Units = PIXEL Type may be either MULTILINE or ARROW



## 7.1.5 Basic Text SR Storage

<b>attribute</b>	<b>Presence</b>	<b>Notes</b>
<b>SOP Class UID</b>	Always	1.2.840.10008.5.1.4.1.1.88.11 [Basic Text SR Storage]
<b>Modality</b>	Always	Set to "SR"
<b>Completion Flag</b>	Always	Set to COMPLETE
<b>Verification Flag</b>	Always	Set to UNVERIFIED
<b>Content Sequence</b>	Always	report content
<b>Verifying Observer Sequence</b>	Optional	Depending on reporting workflow, set if approval step is configured

## 7.1.6 Private Tags

mRay does not write any private tags.

## 7.1.7 Private Transfer Syntaxes

mRay does not implement any private transfer syntax.

## 7.2 Grayscale Image Consistency

mRay features a calibration of mobile device displays to support the Grayscale Standard Display Function (GSDF). The calibration can be performed for devices upon request.

