SIEMENS

MAGNETOM
MRease VA12A

MR

DICOM Conformance Statement

V 3.0

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History

Document History

Version	Date of Issue	Author	Change & Reason of Change / CHARM ID
V 0.1	16. April 1999	E. Seeberger	Creation of the Conformane Statement.
V 1.1	06. July 2000	E. Seeberger	Add new MR products.
V 2.1	17. Nov 2000	E. Seeberger	Add "*" wildcard query matching.

Released Versions History

Version	Release Date	Product Version
V 1.0	10. May 2000	Released version for MRease VA11A.
V 2.0	14. July 2000	Released version for MRease VA12A.
V 3.0	14. December 2000	Released version for MRease VA12A.

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DICOM Conformance Statement

Part I - Network

1 Introduction

1.1 Purpose

This DICOM Conformance Statement is written according to part PS 3.2 of [1].

The applications described in this conformance statement are the SIEMENS MR products using software MRease VA11A. The MR DICOM network implementation acts as SCU and SCP for the DICOM Storage, as SCU and SCP for the Query/Retrieve service and as SCU for the DICOM Basic Print and the Modality Worklist service.

1.2 Scope

This DICOM Conformance Statement refers to SIEMENS MR products using software MRease VA12A. The following table relates VA12A software names to SIEMENS MR products.

Table 1: *Siemens MR DICOM Products*

Software Name	SIEMENS MR Product
MRease VA12A	Magnetom Symphony
MRease VA12A	Magnetom Harmony
MRease VA12A	Magnetom Open viva
MRease VA12A	Magnetom Quantum
MRease VA12A	Magnetom Sonata

1.3 Definitions, Abbreviations

1.3.1 Definitions

DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DICOM Message Service Element with Composite information objects

1.3.2 Abbreviations

ACR	American College of Radiology
AE	DICOM Application Entity
ASCII	American Standard Code for Information Interchange
HIS	Hospital Information System

IOD	DICOM Information Object Definition
ISO	Internationl Standard Organisation
R	Required Key Attribute
NEMA	National Electrical Manufacturers Association
O	Optional Key Attribute
RIS	Radiology Information System
PDU	DICOM Protocol Data Unit
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair
U	Unique Key Attribute

1.4 References

[1] Digital Imaging and Communications in Medicine (DICOM) 3.0, NEMA PS 3.1-14, 1999

1.5 Connectivity and Interoperability

The implementation of the Siemens DICOM interface has been carefully tested to assure correspondence with this Conformance Statement. But the Conformance Statement and the DICOM standard does not guarantee interoperability of Siemens modalities and modalities of other vendors. The user must compare the relevant Conformance Statements and if a successful interconnection should be possible, the user is responsible to specify an appropriate test suite and to validate the interoperability, which is required. A network environment may need additional functions out of the scope of DICOM.

2 Implementation Model Storage

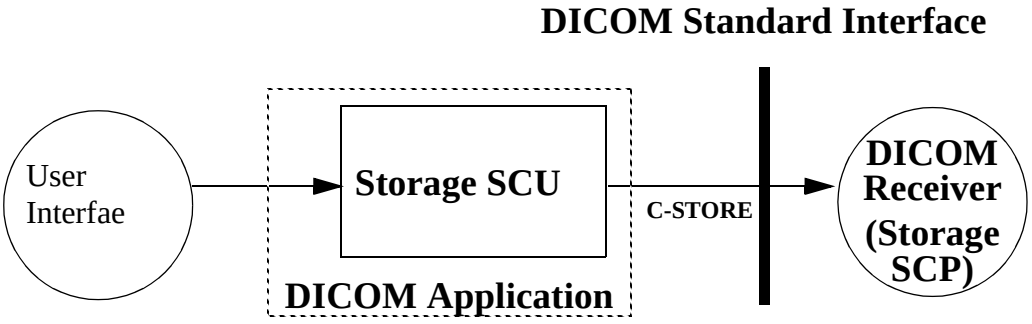
The Siemens MR DICOM Application Entity originates associations for Storage of DICOM Composite Information Objects in Remote Application Entities.

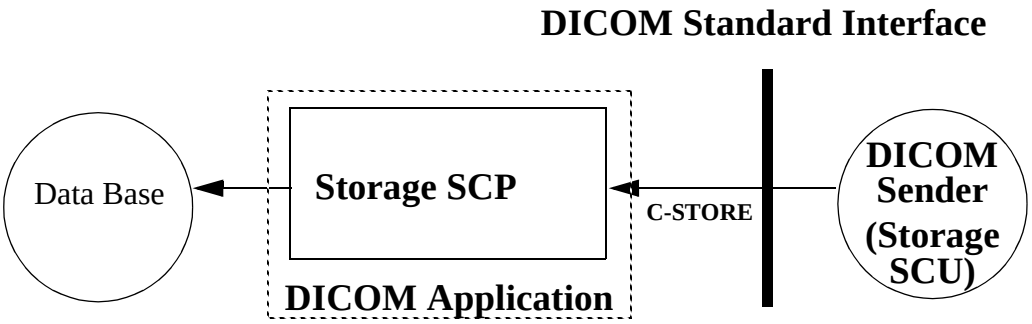
2.1 Application Data Flow Diagram

The MRease DICOM network implementation is a Windows NT application and acts as SCU and SCP for the C-Store DICOM network service.

These applications are started automatically and will be invoked via network.

The DICOM send service will be activated through the Patient Browser platform.





2.2 Functional Definitions of Application Entities

All components of the Siemens MR DICOM Storage SCP application are operating as background daemon processes. They are existing, when the machine is powered on and waiting for tasks.

2.3 Sequencing of real World Activities

The MR acquisition system obtains DICOM Worklist information regarding scheduled procedures from HIS/RIS and includes this information in the series of the acquired DICOM MR images. If the DICOM Worklist information is not available from HIS/RIS it will be typed by user during the registration of the patient.

3 Application Entity Specification Storage

3.1 Storage AEs Specification

The MR Storage service class user application provides one AE being used when initiating associations to remote DICOM nodes.

SIEMENS MR DICOM products provide Standard Conformance to the following DICOM V3.0 SOP Classes asSCU and SCP::

Table 2: *SOP Classes as SCU and SCP*

SOP Class Name	SOP Class UID
MR Image Information Object Storage	1.2.840.10008.5.1.4.1.1.4
CT Image Information Object Storage	1.2.840.10008.5.1.4.1.1.2
CR Image Storage	1.2.840.10008.5.1.4.1.1.1
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1
SC (Secondary Capture) Image Storage	1.2.840.10008.5.1.4.1.1.7
XA (X-Ray Angiographic) Image Storage	1.2.840.10008.5.1.4.1.1.12.1
XA Bi-Plane (X-Ray Angiographic Bi-Plane) Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3
XRF (X-Ray Radiofluoroscopic) Image Storage	1.2.840.10008.5.1.4.1.1.12.2
NM Image Storage	1.2.840.10008.5.1.4.1.1.20
PET Image Storage	1.2.840.10008.5.1.4.1.1.128
Verification (only SCP)	1.2.840.10008.1.1

Siemens DICOM products provide Private Conformance to the following DICOM V3.0 conform Private SOP Classes as both an SCU and SCP:

Table 3: *Private SOP Classes as an Storage SCU and an SCP*

SOP Class Name	SOP Class UID
CSA Non-Image Storage	1.3.12.2.1107.5.9.1

3.1.1 Association Establishment Policies

3.1.1.1 General

The configuration of the Siemens MR DICOM application defines the Application Entity Titles, the port numbers and of course the host name and net address.

3.1.1.2 Number of Associations

The Siemens MR DICOM application initiates several associations at a time, one for each transfer request being processed.

3.1.1.3 Asynchronous Nature

The Siemens MR DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

3.1.1.4 Implementation Identifying Information

The Siemens MR DICOM software provides a single Implementation Class UID of

- "1.3.12.2.1107.5.2"

and an Implementation Version Name of

- “MREASE_VA12A”.

3.1.2 Association Initiation Policy

The Siemens MR DICOM application attempts to initiate a new association for

- DIMSE-C-STORE

service operations.

3.1.2.1 Associated Real-World Activity

3.1.2.1.1 Associated Real-World Activity -Send Image Objects to a remote Node

The associated Real-World activity is a C-STORE request initiated by an internal daemon process. If the process successfully establishes an association to a remote Application Entity, it will transfer each image one after another via the open association. If the C-STORE Response from the remote Application contains a status other than Success the association is aborted.

The DICOM targets are configured at installation time.

3.1.2.1.2 Proposed Presentation Contexts

The Siemens MR DICOM application will propose Presentation Contexts as shown in the following table:

Table 4: *Initiation presentation context*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
MR Image Storage Service class	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
CR Image Storage Service class	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
CT Image Storage Service class	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
NM Image Storage Service class	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None

Table 4: *Initiation presentation context*

SC Image Storage Service class	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
XA Image Storage Service class	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
XA Bi-Plane Image Storage Service class (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
XRF Image Storage Service class	1.2.840.10008.5.1.4.1.1.12.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
US Image Storage Service class	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
PET Image Storage Service class	1.2.840.10008.5.1.4.1.1.128	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None

Table 4: *Initiation presentation context*

CSA Non-Image Storage Service class	1.3.12.2.1107.5.9.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

Note:

JPEG compression transfer syntaxes are supported only for Monochrome images (Photometric Interpretation = “MONOCHROME1” or “MONOCHROME2”)

3.1.2.1.3 SOP Specific Conformance Statement - Storage SCU

The DICOM images created by Siemens DICOM application conform to the DICOM IOD definitions (Standard extended IODs). But they will contain additional private elements which have to be discarded by a DICOM system when modifying the image.

The DICOM nodes are responsible for data consistency when modifying images. All unknown private attributes have to be removed upon modification!

A Siemens DICOM application System dosn’t change private attributes if no modification is done. During a Save as new operation all not Siemens defined private attributes are removed.

3.1.2.1.3.1 Image Pixel Attribute Description for Grayscale Images

The Siemens DICOM application supports the MONOCHROME1 and MONOCHROME2 photometric interpretation pixel format and graphic overlay with unsigned integer and 8 or 16 bits allocated. Possible values:

Pixel plane

- samples per pixel (attribute 0028, 0002) = 1
- photometric interpretation (attribute 0028,0004) = “MONOCHROME1”
- photometric interpretation (attribute 0028,0004) = “MONOCHROME2”
- pixel representation (attribute 0028, 0103) = 0
- bits allocated (attribute 0028, 0100) = 8, 16
- bits stored (attribute 0028,0101) = 8, 10, 12
- high bit (attribute 0028,0102) = 7, 9, 11

Overlay plane

- overlay type (attribute 60xx, 0040) = “G”
- overlay bits allocated (attribute 60xx, 0100) = 16
- overlay bit position (attribute 60xx, 0102) = 12, 13, 14, 15

Overlay plane

- overlay type (attribute 60xx, 0040) = “G”

- overlay bits allocated (attribute 60xx, 0100) = 1
- overlay bit position (attribute 60xx, 0102) = 0
- overlay data (attribute 60xx, 3000) = supported.

The Siemens DICOM application sends also the MONOCHROME1 and MONOCHROME2 photometric interpretation pixel format with binary 2's complement integer and 16 bits allocated. Possible values:

Pixel plane

- samples per pixel (attribute 0028, 0002) = 1
- photometric interpretation (attribute 0028,0004) = "MONOCHROME1"
- photometric interpretation (attribute 0028,0004) = "MONOCHROME2"
- pixel representation (attribute 0028, 0103) = 1
- bits allocated (attribute 0028, 0100) = 16
- bits stored (attribute 0028,0101) = 16
- high bit (attribute 0028,0102) = 15

Overlay plane

- overlay type (attribute 60xx, 0040) = "G"
- overlay bits allocated (attribute 60xx, 0100) = 1
- overlay bit position (attribute 60xx, 0102) = 0
- overlay data (attribute 60xx, 3000) = supported.

3.1.2.1.3.2 Image Pixel Attribute Description for Color Images

The Siemens DICOM application supports the RGB color image description with the unsigned integer 24 bit color image plane pixel format:

- samples per pixel (attribute 0028, 0002) = 3
- photometric interpretation (attribute 0028,0004) = "RGB"
- pixel representation (attribute 0028, 0103) = 0
- bits allocated (attribute 0028, 0100) = 8
- bits stored (attribute 0028,0101) = 8
- high bit (attribute 0028,0102) = 7
- planar configuration (attribute 0028,0006) = 0.

The Siemens DICOM application supports the "Palette Color" color image description with unsigned integer and 2's complement pixel format:

- samples per pixel (attribute 0028, 0002) = 1
- photometric interpretation (attribute 0028,0004) = "PALETTE COLOR"

- pixel representation (attribute 0028, 0103) = 0
- bits allocated (attribute 0028, 0100) = 8, 16
- bits stored (attribute 0028,0101) = 8, 16
- high bit (attribute 0028,0102) = 7, 15

Both 8bit and 16bit palettes are supported - but no Segmented Palette Color LUTs.

3.1.2.1.4 Performed MR Image IOD Modules

Patient Module

Attribute Name	Tag	Supported Values
Patient's Name	0010,0010	set by registration or worklist; used for image annotation
Patient ID	0010,0020	set by registration or worklist; used for image annotation
Patient's Birth Date	0010,0030	set by registration or worklist; used for image annotation
Patient's Sex	0010,0040	set by registration or worklist
Patient Comments	0010,4000	set by registration

General Study Module

Attribute Name	Tag	Supported Values
Study Instance UID	0020,000D	set by internal data base or worklist
Study Date	0008,0020	set by acquisition
Study Time	0008,0030	set by acquisition
Referring Physician's Name	0008,0090	set by registration or worklist
Study ID	0020,0010	set by internal data base; used for image annotation
Accession Number	0008,0050	set by registration or worklist

Attribute Name	Tag	Supported Values
Study Description	0008,1030	set by registration user interface
Physician(s) of Record	0008,1048	set by acquisition user interface
Name of Physician(s) Reading Study	0008,1060	set by acquisition user interface
Referenced Study Sequence	0008,1110	set by worklist
> Referenced SOP Class UID	0008,1150	set by worklist
> Referenced SOP Instance UID	0008,1155	set by worklist

Patient Study Module

Attribute Name	Tag	Supported Values
Admitting Diagnoses Description	0008,1080	set by acquisition user interface
Patient’s Age	0010,1010	set by registration or worklist
Patient’s Size	0010,1020	set by registration or worklist
Patient’s Weight	0010,1030	set by registration or worklist

General Series Module

Attribute Name	Tag	Supported Values
Modality	0008,0060	MR
Series Instance UID	0020,000E	set by internal data base
Series Number	0020,0011	set by internal data base; used for image annotation
Series Date	0008,0021	set by acquisition
Series Time	0008,0031	set by acquisition
Performing Physicians’ Name	0008,1050	set by registration user interface
Protocol Name	0018,1030	set by acquisition
Series Description	0008,103E	set by acquisition

Attribute Name	Tag	Supported Values
Operators' Name	0008,1070	set by registration user interface
Patient Position	0018,5100	set by registration user interface; used for image annotation
Request Attributes Sequence	0040,0275	set by worklist
> Requested Procedure ID	0040,1001	set by worklist
> Scheduled Procedure Step ID	0040,0009	set by worklist
> Scheduled Procedure Step Description	0040,0007	set by worklist

Frame of Reference Module

Attribute Name	Tag	Supported Values
Frame of Reference UID	0020,0052	set by acquisition
Position Reference Indicator	0020,1040	set by acquisition

General Equipment Module

Attribute Name	Tag	Supported Values
Manufacturer	0008,0070	SIEMENS
Institution Name	0008,0080	set by configuration; used for image annotation
Institution Address	0008,0081	Street number, Street, City, District, Zip Code, Country
Manufacturer's Model Name	0008,1090	MAGNETOM xxx; used for image annotation
Device Serial Number	0018,1000	set by configuration
Software Versions	0018,1020	4VA11A; used for image annotation

General Image Module

Attribute Name	Tag	Supported Values
Image Number	0020,0013	set by internal data base; used for image annotation
Image Date	0008,0023	set by acquisition
Image Time	0008,0033	set by acquisition
Image Type	0008,0008	set by acquisition
Acquisition Number	0020,0012	set by acquisition
Acquisition Date	0008,0022	set by acquisition; used for image annotation
Acquisition Time	0008,0032	set by acquisition; used for image annotation
Referenced Image Sequence	0008,1140	set by Graphical Slice Position
> Referenced SOP Class UID	0008,1150	set by Graphical Slice Position
> Referenced SOP Instance UID	0008,1155	set by Graphical Slice Position
Derivation Description	0008,2111	set by applications which derive images
Source Image Sequence	0008,2112	set by applications which derive images
> Referenced SOP Class UID	0008,1150	set by applications which derive images
> Referenced SOP Instance UID	0008,1155	set by applications which derive images
Image Comments	0020,4000	set by registration user interface; used for image annotation

Image Plane Module

Attribute Name	Tag	Supported Values
Pixel Spacing	0028,0030	set by acquisition
Image Orientation	0020,0037	set by acquisition; used for image annotation
Image Position	0020,0032	set by acquisition; used for image annotation
Slice Thickness	0018,0050	set by acquisition; used for image annotation
Slice Location	0020,1041	set by acquisition; accumulated from image orientation and image position and used as term SP in the image annotation

Image Pixel Module

Attribute Name	Tag	Supported Values
Samples per Pixel	0028,0002	1
Photometric Interpretation	0028,0004	MONOCHROME2
Rows	0028,0010	set by acquisition
Columns	0028,0011	set by acquisition
Bits Allocated	0028,0100	16
Bits Stored	0028,0101	12
High Bit	0028,0102	11
Pixel Representation	0028,0103	0
Pixel Data	7FE0,0010	set by acquisition
Smallest Image Pixel Value	0028,0106	set by acquisition
Largest Image Pixel Value	0028,0107	set by acquisition

Contrast/Bolus Module

Attribute Name	Tag	Supported Values
Contrast/Bolus Agent	0018,0010	set by acquisition contrast user interface; used for image annotation
Contrast/Bolus Agent Sequence	0018,0012	set by acquisition contrast user interface
> Code Value	0008,0100	set by acquisition contrast user interface
> Code Scheme Designator	0008,0102	99SDM
Contrast/Bolus Volume	0018,1041	set by acquisition contrast user interface.
Contrast/Bolus Total Dose	0018,1044	set by acquisition contrast user interface.
Contrast Flow Duration(s)	0018,1047	set by acquisition contrast user interface.
Contrast/Bolus Ingredient	0018,1048	set by acquisition contrast user interface. Defined Terms: IODINE GADOLINIUM CARBON DIOXIDE BARIUM
Contrast/Bolus Ingredient Concentration	0018,1049	set by acquisition contrast user interface.

MR Image Module

Attribute Name	Tag	Supported Values
Image Type	0008,0008	set by acquisition/applications; used for image annotation
Samples per Pixel	0028,0002	1
Photometric Interpretation	0028,0004	MONOCHROME2
Bits Allocated	0028,0100	16

Attribute Name	Tag	Supported Values
Scanning Sequence	0018,0020	set by acquisition
Sequence Variant	0018,0021	set by acquisition
Scan Options	0018,0022	set by acquisition; used for image annotation
MR Acquisition Type	0018,0023	set by acquisition
Repetition Time	0018,0080	set by acquisition; used for image annotation
Echo Time	0018,0081	set by acquisition; used for image annotation
Echo Train Length	0018,0091	set by acquisition
Inversion Time	0018,0082	set by acquisition; used for image annotation
Trigger Time	0018,1060	set by acquisition; used for image annotation
Sequence Name	0018,0024	set by acquisition; used for image annotation
Angio Flag	0018,0025	set by acquisition
Number of Averages	0018,0083	set by acquisition
Imaging Frequency	0018,0084	set by acquisition
Imaged Nucleus	0018,0085	set by acquisition
Echo Number	0018,0086	set by acquisition
Magnetic Field Strength	0018,0087	set by acquisition
Spacing Between Slices	0018,0088	set by acquisition
Number of Phase Encoding Steps	0018,0089	set by acquisition
Percent Sampling	0018,0093	set by acquisition
Percent Phase Field of View	0018,0094	set by acquisition
Pixel Bandwith	0018,0095	set by acquisition
Cardiac Number of Images	0018,1090	set by EKG acquisition
Transmitting Coil	0018,1251	set by acquisition
Acquisition Matrix	0018,1310	set by acquisition
Phase Encoding Direction	0018,1312	set by acquisition

Attribute Name	Tag	Supported Values
Flip Angle	0018,1314	set by acquisition; used for image annotation
SAR	0018,1316	set by acquisition
Variable Flip Angle Flag	0018,1315	N
db/dt	0018,1318	set by acquisition

VOI LUT Module

Attribute Name	Tag	Supported Values
Window Center	0028,1050	set by acquisition; used for image annotation
Window Width	0028,1051	set by acquisition; used for image annotation
Window Center & Width Explanation	0028,1055	set by acquisition

SOP Common Module

Attribute Name	Tag	Supported Values
SOP Class UID	0008,0016	MR Storage SOP Class UID
SOP Instance UID	0008,0018	set by internal data base
Specific Character Set	0008,0005	configuration dependent

3.1.2.1.4.1 Image Pixel Attribute Description for performed MR Grayscale Images

The Siemens MR DICOM application supports the and monochrome 2 photometric interpretation with the unsigned integer 16 bit gray scale pixel and graphic overlay format. The lower 12 bits are used for pixel and the higher 4 bits are used for the graphic overlay:

Pixel plane

+ samples per pixel (attribute 0028, 0002) = 1
+ photometric interpretation (attribute 0028,0004) = "MONOCHROME2"
+ pixel representation (attribute 0028, 0103) = 0
+ bits allocated (attribute 0028, 0100) = 16
+ bits stored (attribute 0028,0101) = 12
+ high bit (attribute 0028,0102) = 11

Overlay plane

+ rows (attribute 60xx, 0010) = same as attribute 0028, 0010
+ columns (attribute 60xx, 0011) = same as attribute 0028, 0011
+ overlay type (attribute 60xx, 0040) = "G"
+ origin (attribute 60xx, 0050) = 1,1
+ bits allocated (attribute 60xx, 0100) = 16
+ bit position (attribute 60xx, 0102) = 12
+ overlay data (attribute 60xx, 3000) = supported.

3.1.3 Association Acceptance Policy

The Siemens MR DICOM application attempts to accept a new association for

- DIMSE-C-ECHO
- DIMSE-C-STORE

service operations.

3.1.3.1 Associated Real-World Activity

3.1.3.1.1 Associated Real-World Activity - Receiving Image Objects from a remote Node

The receiver daemon process will accept an association and will receive any images transmitted on that association and store the images on disk in the own data base.

The DICOM nodes are configured at installation time.

3.1.3.1.2 Proposed Presentation Contexts

The Siemens MR DICOM application will propose Presentation Contexts as shown in the following table.

Table 5: *Acceptable presentation contexts*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
CR Image Storage Service class	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended (2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless Non-hierarchical	1.2.840.10008.1.2.4.70		
CT Image Storage Service 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 Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended (2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless Non-hierarchical	1.2.840.10008.1.2.4.70		

Table 5: *Acceptable presentation contexts*

MR Image Storage Service class	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCP	None
NM Image Storage Service class	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCP	None
SC Image Storage Service class	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCP	None
XA Image Storage Service class	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCP	None
XA Bi-Plane Image Storage Service class (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCP	None
XRF Image Storage Service class	1.2.840.10008.5.1.4.1.1.12.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCP	None

Table 5: *Acceptable presentation contexts*

US Image Storage Service class	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCP	None
PET Image Storage Service class	1.2.840.10008.5.1.4.1.1.128	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian JPEG Baseline JPEG Extended (2 & 4) JPEG Lossless Non-hierarchical	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCP	None
CSA Non-Image Storage Service class	1.3.12.2.1107.5.9.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Verification	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None

Note:

JPEG compression transfer syntaxes are supported only for Monochrome images (Photometric Interpretation = “MONOCHROME1” or “MONOCHROME2”)

3.1.3.1.3 SOP Specific Conformance Statement - Storage SCP

The Siemens DICOM application conforms to the Full Storage Service Class at Level 2 - with the exception that private Sequences (private elements with VR=SQ) are not supported in Explicit VR Transfer syntax and will be ignored. When private Sequences are received in implicit VR then the whole sequence is stored as one binary element of VR=OW.

In the event of a successful C-STORE operation, the image has successful been written on disk in the Siemens CSA image format.

The DICOM receiver returns the status Success upon successfully operation otherwise one of the following status codes is returned and the association aborted:

- Refused (A700):
  This error status indicates a lack of Resources (e.g. not enough disk space) on the <xxx> modality.
- Error (A900 or C000):
  An error occurred while processing the image which makes it impossible to proceed. The image will not be stored and the association aborted.

If an image with the same SOP Instance UID (as that image being received) is already present in the database then the received image will be ignored. So if a remote node sends twice the same image (same SOP Instance UID) then there will still be only one image (the first) in the database of the DICOM receiver.

The Siemens MR DICOM receiver can receive all kinds of different image formats. But for Display of such images the following restrictions apply:

3.1.3.1.3.1 Image Pixel Attribute Acceptance Criterion for Grayscale Images

The Display application accepts the MONOCHROME1 and MONOCHROME2 photometric interpretation pixel format and graphic overlay with unsigned integer and 8 or 16 bits allocated. Accepted values:

Pixel plane

- samples per pixel (attribute 0028, 0002) = 1
- photometric interpretation (attribute 0028,0004) = “MONOCHROME1”
- photometric interpretation (attribute 0028,0004) = “MONOCHROME2”
- pixel representation (attribute 0028, 0103) = 0 (unsigned)
- bits allocated (attribute 0028, 0100) = 8, 16
- bits stored (attribute 0028,0101) = 8, 10, 12
- high bit (attribute 0028,0102) = 7, 9, 11

Overlay plane

- overlay type (attribute 60xx, 0040) = “G”
- overlay bits allocated (attribute 60xx, 0100) = 16
- overlay bit position (attribute 60xx, 0102) = 12, 13, 14, 15

Overlay plane

- overlay type (attribute 60xx, 0040) = “G”
- overlay bits allocated (attribute 60xx, 0100) = 1
- overlay bit position (attribute 60xx, 0102) = 0
- overlay data (attribute 60xx, 3000) = supported.

The Siemens DICOM application accepts also the MONOCHROME1 and MONOCHROME2 photometric interpretation pixel format with binary 2’s complement integer and 16 bits allocated. Accepted values:

Pixel plane

- samples per pixel (attribute 0028, 0002) = 1
- photometric interpretation (attribute 0028,0004) = “MONOCHROME1”
- photometric interpretation (attribute 0028,0004) = “MONOCHROME2”
- pixel representation (attribute 0028, 0103) = 1 (signed)
- bits allocated (attribute 0028, 0100) = 16
- bits stored (attribute 0028,0101) = 16
- high bit (attribute 0028,0102) = 15

Overlay plane

- overlay type (attribute 60xx, 0040) = “G”
- overlay bits allocated (attribute 60xx, 0100) = 1
- overlay bit position (attribute 60xx, 0102) = 0
- overlay data (attribute 60xx, 3000) = supported.

For MOD LUT both the linear LUT (Rescale Slope/Intercept) and the MOD LUT SQ are supported and considered when pixel data is displayed. However there are two limitations. The MOD LUT SQ will be ignored in the following cases:

- signed pixels

- the pixel format is changed by the MOD LUT (e.g. 8 bit -> 16 bit)

If the MOD LUT SQ contains multiple LUTs then only the first one is used.

For VOI LUT also both the linear LUT (Window Center/Width) and the VOI LUT SQ are supported (VOI LUT SQ with 8 or 16 bit LUT data).
But if both a VOI LUT SQ and a linear MOD LUT are specified within one image then the value for Rescale Slope is restricted to 1.

If the VOI LUT SQ contains multiple LUTs then only the first one is used.

The Display application supports only rectangular Shutters in this version. Images with other shutter types will be displayed without Shutter.

3.1.3.1.3.2 Image Pixel Attribute Acceptance Criterion for Color Images

The Siemens Display application supports the RGB color image description with the unsigned integer 24 bit color image plane pixel format. Accepted values:

- samples per pixel (attribute 0028, 0002) = 3
- photometric interpretation (attribute 0028,0004) = “RGB”
- pixel representation (attribute 0028, 0103) = 0
- bits allocated (attribute 0028, 0100) = 8
- bits stored (attribute 0028,0101) = 8
- high bit (attribute 0028,0102) = 7

- planar configuration (attribute 0028,0006) = 0 (pixel interleave)

The Siemens DICOM application supports the “Palette Color” color image description with unsigned integer and 2’s complement pixel format:

- samples per pixel (attribute 0028, 0002) = 1
- photometric interpretation (attribute 0028,0004) = “PALETTE COLOR”
- pixel representation (attribute 0028, 0103) = 0
- bits allocated (attribute 0028, 0100) = 8, 16
- bits stored (attribute 0028,0101) = 8, 16
- high bit (attribute 0028,0102) = 7, 15

Both 8bit and 16bit palettes are supported - but no Segmented Palette Color LUTs.

3.1.3.1.4 Presentation Context Acceptance Criterion - Storage SCP

The Siemens DICOM application will accept any number of verification or storage SOP classes that are listed above. There is no limit on the number of presentation contexts accepted except for the DICOM limit. In the event that the Siemens DICOM application runs out of resources, it will reject the association request.

3.1.3.1.5 Transfer Syntax Selection Policies - Storage SCP

The Siemens DICOM application supports

- the Implicit VR Little Endian, the Explicit VR Little Endian and Explicit VR Big Endian transfer syntaxes
- the JPEG Baseline and JPEG Extended transfer syntaxes (JPEG lossy).
- the JPEG Lossless Non-hierarchical transfer syntax.

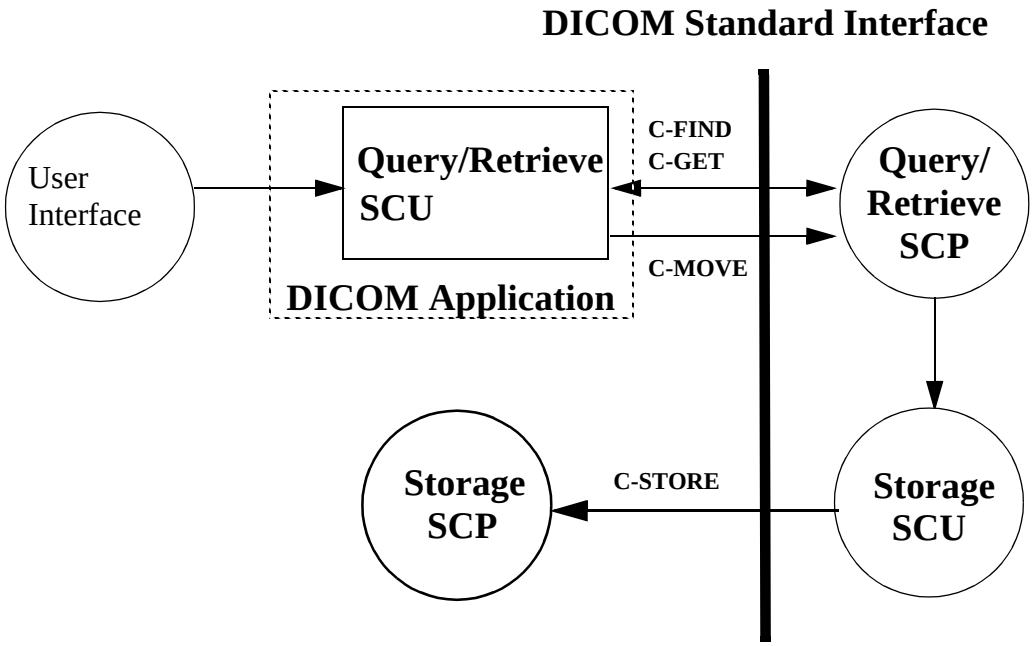
Any proposed presentation context which includes one of these transfer syntaxes will be accepted Any proposed presentation context that does not include one of these transfer syntaxes will be rejected.

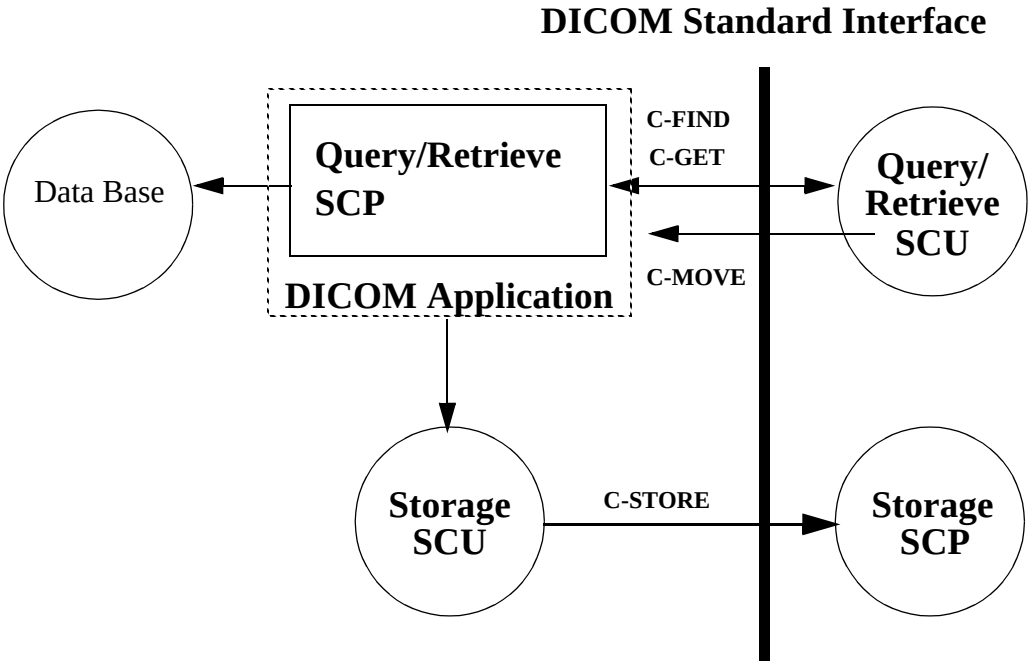
4 Implementation Model Query/Retrieve

The query/retrieve service classe defines an application-level class of services which facilitates the management of images and patient data against the well defined information model of DICOM and allows a DICOM AE to retrieve images from a remote DICOM node or to request a remote DICOM AE to initiate a transfer of images to another DICOM AE. The MR DICOM query/retrieve application supports the query/retrieve services to act as SCU and SCP.

4.1 Application Data Flow Diagram

The MR DICOM network implementation is a Windows NT application and acts as SCU and SCP for the query/retrieve network service.





4.2 Functional Definitions of Application Entities

The query/retrieve SCU requests the query/retrieve SCP to perform a match to the keys specified in the request and a C-MOVE DIMSE service initiates a C-STORE suboperation to transfer an image from a Storage SCU to a Storage SCP.

The query/retrieve SCP responds to C-FIND DIMSE services and a C-MOVE involves the Siemens MR DICOM query/retrieve SCP application to initiate a C-STORE suboperation to a Storage SCP.

All components of the Siemens MR DICOM query/retrieve SCP applications are operating as background daemon processes. They are launched at consol startup and respond to queries based on the records stored in the MR database.

4.3 Sequencing of real World Activities

not applicable.

5 Application Entity Specification Query/ Retrieve

5.1 Query/Retrieve Service AEs Specification

The Query/Retrieve SCU request that the remote SCP perform a match of all keys specified in the request, against the information in its database and the identified images will be moved or retrieved to the same or a different storage association.

The Query/Retrieve SCP responds to queries based on the records based on its database and images will be send to the requesting SCU or to a different storage destination.

SIEMENS MR DICOM products provide Standard Conformance to the following DICOM V3.0 SOP Classes as SCU and SCP:

Table 6: *SOP Classes as an SCU*

SOP Class Name	SOP Class UID
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2

Table 7: *SOP Classes as an SCP*

SOP Class Name	SOP Class UID
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Patient Root Query/Retrieve Information Model - GET	1.2.840.10008.5.1.4.1.2.1.3
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2

Table 7: *SOP Classes as an SCP*

SOP Class Name	SOP Class UID
Study Root Query/Retrieve Information Model - GET	1.2.840.10008.5.1.4.1.2.2.3
Patient/Study Only Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2
Patient/Study Only Query/Retrieve Information Model - GET	1.2.840.10008.5.1.4.1.2.3.3

Note

See also the Storage DICOM Conformance Statement of the Siemens MR DICOM application to compare for conformance of the C-STORE sub-operation generated by the C-MOVE DIMSE service and compare also the Storage Service SOP classes described in the Storage DICOM Conformance Statement of the modality to which the images shall be transfered initiated by the C-MOVE DIMSE service.

5.1.1 Association Establishment Policies

5.1.1.1 General

The configuration of the Siemens MR DICOM query/retrieve application defines the Application Entity Titles, the port numbers and of course the host name and net address.

5.1.1.2 Number of Associations

The Siemens MR DICOM application initiates one/several association(s) at a time, one for each transfer request being processed.

5.1.1.3 Asynchronous Nature

The Siemens MR DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

5.1.1.4 Implementation Identifying Information

The Siemens MR DICOM software provides a single Implementation Class UID of

- “1.3.12.2.1107.5.2"

and an Implementation Version Name of

- "MREASE_VA12A".

5.1.2 Association Initiation Policy

The Query/Retrieve SCU and SCP establish an association by using the DICOM association services. During association establishment the Query/Retrieve application entities negotiate the supported SOP classes to exchange the capabilities of the SCU and the SCP.

The following DIMSE-C operations are supported as SCU:

- C-FIND
- C-MOVE

5.1.2.1 Real World Activity - Find SCU

5.1.2.1.1 Associated Real-World Activity - Find SCU

The associated Real-World activity is to initate query request to an SCP with the query model Patient Root and Study Root.

5.1.2.1.2 Proposed Presentation Contexts - Find SCU

The Siemens DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Patient Root Query/Retrieve Find	1.2.840.10008.5.1.4.1.2.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	See Note
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2		
Study Root Query/Retrieve Find	1.2.840.10008.5.1.4.1.2.2.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	See Note
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2		

Note

It is configurable which of the two query models (or both) are to be used by the Siemens Query SCU application.

5.1.2.1.3 SOP Specific Conformance Statement - Find SCU

The Siemens DICOM Query/Retrieve SCU supports hierarchical with all mandatory search keys. The following four tables describe the search keys for the four levels of query that the SCU supports.

Table 8: *Patient level attributes*

Attribute name	Tag	Usage SCU/SCP
Patient name	(0010,0010)	R ("*" wild card matching)
Patient id	(0010,0020)	U ("*" wild card matching)
Patient's birth date	(0010,0030)	O
Patient's sex	(0010,0040)	O

Table 9: *Study level attributes*

Attribute name	Tag	Usage SCU/SCP
Study instance UID	(0020,000D)	U
Study id	(0020,0010)	R
Study date	(0008,0020)	R
Study time	(0008,0030)	R
Accession number	(0008,0050)	R
Study description	(0008,1030)	O

Table 10: *Series level attributes*

Attribute name	Tag	Usage SCU/SCP
Series instance UID	(0020,000E)	U
Series number	(0020,0011)	R
Modality	(0008,0060)	R
Series date	(0008,0021)	O
Series time	(0008,0031)	O
Series description	(0008,103E)	O

Table 11: *Image level attributes*

Attribute name	Tag	Usage SCU/SCP
SOP instance UID	(0008,0018)	U
Image number	(0020,0013)	R

The Find SCU interprets following status codes:

Table 12: *C-FIND response status*

Service Status	Meaning	Protocol Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier

Table 12: *C-FIND response status*

Service Status	Meaning	Protocol Codes	Related Fields
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

5.1.2.2 Real World Activity - Move SCU

5.1.2.2.1 Associated Real-World Activity - Move SCU

The operator uses the Siemens DICOM Query application to enter the query values and then initiates the retrieval of all matching DICOM composite objects (like images) from the remote node.

This will generate retrieval requests to a remote C-MOVE SCP using the C-MOVE operation with the query model Patient Root, Study Root and Patient/Study Only. The Storage Service Class Conformance Statement of the SCP must describe the C-STORE service which is generated by the C-MOVE service.

5.1.2.2.2 Proposed Presentation Contexts - Move SCU

The Siemens DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Patient Root Query/Retrieve Move	1.2.840.10008.5.1.4.1.2.1.2	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	See Note
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2		

Study Root Query/Retrieve Move	1.2.840.10008.5.1.4.1.2.2.2	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	See Note

Note

C-MOVE Extended Negotiation will not be supported by the SCU.

5.1.2.2.3 SOP Specific Conformance Statement - Move SCU

At association establishment time the C-MOVE presentation context shall be negotiated. The C-STORE sub-operations must be done on a different association to transfer images to another SCP of the Storage Service Class.

The Move SCU interprets following status codes:

Table 13: *C-MOVE response status*

Service Status	**Meaning**	**Protocol Codes**	**Related Fields**
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform suboperations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
Failed	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

Table 13: *C-MOVE response status*

Service Status	Meaning	Protocol Codes	Related Fields
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

5.1.3 Association Acceptance Policy

The Query/Retrieve SCU and SCP establish an association by using the DICOM association services. During association establishment the Query/Retrieve application entities negotiate the supported SOP classes to exchange the capabilities of the SCU and the SCP.

The following DIMSE-C operations are supported as SCP:

- C-FIND
- C-GET
- C-MOVE
- C-FIND-CANCEL

5.1.3.1 Real World Activity - Find SCP

5.1.3.1.1 Associated Real-World Activity - Find SCP

The associated Real-World activity is to respond to query requests to an SCU with the query model Patient Root, Study Root and Patient/Study Only.

5.1.3.1.2 Proposed Presentation Contexts - Find SCP

The Siemens MR DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation

Patient Root Query/Retrieve Find	1.2.840.10008.5.1.4.1.2.1.1	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	See Note
Study Root Query/Retrieve Find	1.2.840.10008.5.1.4.1.2.2.1	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	See Note
Patient/Study Only Query/ Retrieve Find	1.2.840.10008.5.1.4.1.2.3.1	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	See Note

Note

C-FIND Extended Negotiation will not be supported by the SCP.

5.1.3.1.3 SOP Specific Conformance Statement - Patient Root

The Siemens MR DICOM Query/Retrieve SCP supports hierarchical queries with all mandatory and optional search keys. The following four tables describe the search keys for the four levels of query that the SCP supports for Patient Root.

Table 14: *Patient level attrbutes*

Attribute name	Tag	Usage SCU/SCP
Patient name	(0010,0010)	R
Patient id	(0010,0020)	U
Patient’s birth date	(0010,0030)	O
Patient’s birth time	(0010,0032)	O
Patient’s sex	(0010,0040)	O
Ethnic group	(0010,2160)	O
Patient comments	(0010,4000)	O

Table 15: *Study level attributes*

Attribute name	Tag	Usage SCU/SCP
Study instance UID	(0020,000D)	U
Study id	(0020,0010)	R
Study date	(0008,0020)	R
Study time	(0008,0030)	R
Accession number	(0008,0050)	R
Referring physician's name	(0008,0090)	O
Study description	(0008,1030)	O
Admitting diagnoses description	(0008,1080)	O
Patient's age	(0010,1010)	O
Patient's size	(0010,1020)	O
Patient's weight	(0010,1030)	O
Occupation	(0010,2180)	O
Additional patient history	(0010,21B0)	O
Interpretation author	(4008,010C)	O

Table 16: *Series level attributes*

Attribute name	Tag	Usage SCU/SCP
Series instance UID	(0020,000E)	U
Series number	(0020,0011)	R
Modality	(0008,0060)	R
Laterality	(0020,0060)	O
Referenced study component sequence	(0008,1111)	O
Body part examined	(0018,0015)	O
Patient position	(0018,5100)	O

Attribute name	Tag	Usage SCU/SCP
Smallest pixel value in series	(0028,0108)	O
Largest pixel value in series	(0028,0109)	O
Protocol name	(0018,1030)	O
Series date	(0008,0021)	O
Series time	(0008,0031)	O
Series description	(0008,103E)	O

Table 17: *Image level attributes*

Attribute name	Tag	Usage SCU/SCP
SOP instance UID	(0008,0018)	U
Image number	(0020,0013)	R
Image date	(0008,0023)	O
Image time	(0008,0033)	O

The query attributes are case sensitive and the symbol "?" in wildcard queries is treated as "*"by the SCP. So a wildcard query with "?abc*" is actually treated as "*abc*".

The C_FIND_RSP message will contain the following attributes:

- specific character set (0008,0005)
- query/retrieve level (0008,0052) returned from the C_FIND_RQ
- retrieve AE title (0008,0054)
  this attribute is supported in the lowest level of the query model
- attributes requested by C_FIND_RQ.

A Remote DICOM AE can cancel the query by sending a C_CANCEL_FIND_RQ message.If the Find SCP receives C_CANCEL_FIND_RQ before it has completed the processing of thematches it shall stop the data

5.1.3.1.4 SOP Specific Conformance Statement - Study Root

The Siemens MR DICOM Query/Retrieve SCP supports hierarchical queries with all mandatory and optional search keys. The following three tables describe the search keys for the three levels of query that the SCP supports for Study Root.

Table 18: *Study level attributes*

Attribute name	Tag	Usage SCU/SCP
Study instance UID	(0020,000D)	U
Study id	(0020,0010)	R
Study date	(0008,0020)	R
Study time	(0008,0030)	R
Accession number	(0008,0050)	R
Referring physician's name	(0008,0090)	O
Study description	(0008,1030)	O
Admitting diagnoses description	(0008,1080)	O
Patient's age	(0010,1010)	O
Patient's size	(0010,1020)	O
Patient's weight	(0010,1030)	O
Occupation	(0010,2180)	O
Additional patient history	(0010,21B0)	O
Interpretation author	(4008,010C)	O

Table 19: *Series level attributes*

Attribute name	Tag	Usage SCU/SCP
Series instance UID	(0020,000E)	U
Series number	(0020,0011)	R
Modality	(0008,0060)	R
Laterality	(0020,0060)	O
Referenced study component sequence	(0008,1111)	O
Body part examined	(0018,0015)	O
Patient position	(0018,5100)	O
Smallest pixel value in series	(0028,0108)	O

Attribute name	Tag	Usage SCU/SCP
Largest pixel value in series	(0028,0109)	O
Protocol name	(0018,1030)	O
Series date	(0008,0021)	O
Series time	(0008,0031)	O
Series description	(0008,103E)	O

Table 20: *Image level attributes*

Attribute name	Tag	Usage SCU/SCP
SOP instance UID	(0008,0018)	U
Image number	(0020,0013)	R
Image date	(0008,0023)	O
Image time	(0008,0033)	O

The query attributes are case sensitive and the symbol "?" in wildcard queries is treated as "*"by the SCP. So a wildcard query with "?abc*" is actually treated as "*abc*".

The C_FIND_RSP message will contain the following attributes:

- specific character set (0008,0005)
- query/retrieve level (0008,0052) returned from the C_FIND_RQ
- retrieve AE title (0008,0054)
  this attribute is supported in the lowest level of the query model
- attributes requested by C_FIND_RQ.

A Remote DICOM AE can cancel the query by sending a C_CANCEL_FIND_RQ message.If the Find SCP receives C_CANCEL_FIND_RQ before it has completed the processing of thematches it shall stop the data

5.1.3.1.5 SOP Specific Conformance Statement - Patient/Study only

The Siemens MR DICOM Query/Retrieve SCP supports hierarchical queries with all mandatory and optional search keys. The search keys for Patient/Study only are the same as for Patient Root.

5.1.3.1.6 The C-Find SCP Status Codes

Tabelle 21: *C-Find return status*

Service Status	Meaning	Protocol Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

5.1.3.2 Real World Activity - Get SCP

5.1.3.2.1 Associated Real-World Activity - Get SCP

The associated Real-World activity is to respond to retrieve requests initiated from an SCU. The SCP supports the query model Patient Root, Study Root and Patient/Study Only. The Storage Service Class Conformance Statement describes the C-STORE service which is generated by the C-GET service.

5.1.3.2.2 Proposed Presentation Contexts - Get SCP

The Siemens DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table			
Abstract Syntax	Transfer Syntax	Role	Extended

Name	UID	Name List	UID List		Negotiation
Patient Root Query/Retrieve Get	1.2.840.10008.5.1.4.1.2.1.3	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	See Note
Study Root Query/Retrieve Get	1.2.840.10008.5.1.4.1.2.2.3	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	See Note
Patient/Study Only Query/ Retrieve Get	1.2.840.10008.5.1.4.1.2.3.3	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	See Note

Note

C-GET Extended Negotiation will not be supported by the SCP.

5.1.3.2.3 SOP Specific Conformance Statement - Get SCP

At association establishment time the C-GET presentation context must be negotiated along with the C-STORE sub-operations which must be accomplished on the same association as the C-GET operation.

The query attributes are case sensitive and the symbol "?" in wildcard queries is treated as "*"by the SCP. So a wildcard query with "?abc*" is actually treated as "*abc*".

The Get SCP returns following status codes:

Table 22: *C-GET return status*

Service Status	Meaning	Protocol Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform suboperations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
Failed	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

5.1.3.3 Real World Activity - Move SCP

5.1.3.3.1 Associated Real-World Activity - Move SCP

The associated Real-World activity is to respond to retrieve requests to an SCU. The SCP supports the query model Patient Root, Study Root and Patient/Study Only. The Storage Service Class Conformance Statement describes the C-STORE service which is generated by the C-MOVE service.

5.1.3.3.2 Proposed Presentation Contexts - Move SCP

The Siemens MR DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Patient Root Query/Retrieve Move	1.2.840.10008.5.1.4.1.2.1.2	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	See Note
Study Root Query/Retrieve Move	1.2.840.10008.5.1.4.1.2.2.2	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	See Note
Patient/Study Only Query/ Retrieve Move	1.2.840.10008.5.1.4.1.2.3.2	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	See Note

Note

C-MOVE Extended Negotiation will not be supported by the SCP.

5.1.3.3.3 SOP Specific Conformance Statement - Move SCP

At association establishment time the C-MOVE presentation context shall be negotiated. The C-STORE sub-operations is done on a different association, specified in the C-MOVE request, to transfer images to them same or another SCP of the Storage Service Class.

The query attributes are case sensitive and the symbol "?" in wildcard queries is treated as "*"by the SCP. So a wildcard query with "?abc*" is actually treated as "*abc*".

The Move SCP returns following status codes:

Table 23: *C-MOVE return status*

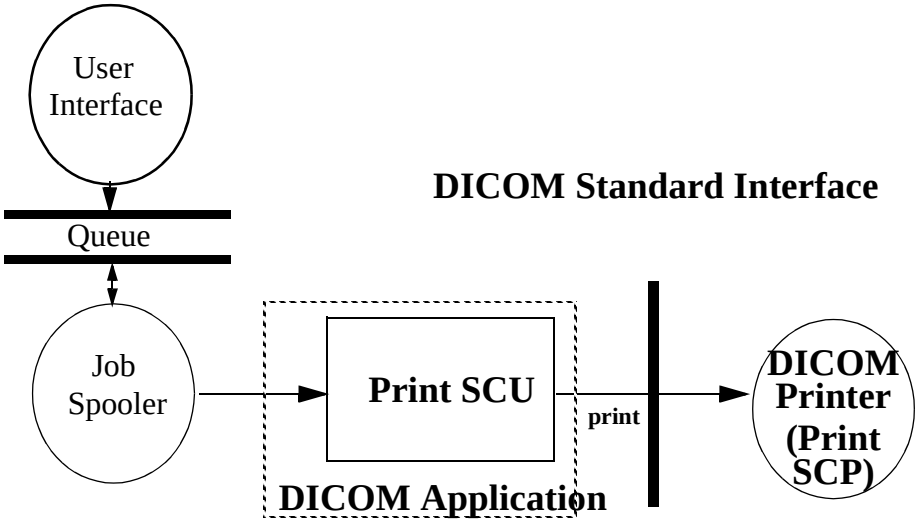
Service Status	Meaning	Protocol Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches Out of Resources - Unable to perform suboperations	A701 A702	(0000,0902) (0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
Failed	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

6 Implementation Model Print

The Print Management Service Classes define an application-level class of services which facilitate the printing of images on a hardcopy medium. The print management SCU and print management SCP are peer DICOM print management application entities. The MR DICOM print application supports the print management DIMSE services to act as SCU.

6.1 Application Data Flow Diagram

The MR-DICOM network implementation is a Windows NT application and acts as SCU for the print managment network service.



6.2 Functional Definitions of Application Entities

The user invokes a print job and the SCU uses the SOP classes of a film session, a film box and image boxes for acquiring all the information which is required for a film session. The N-ACTION is used to print the film session.

The MR DICOM Basic Print application offer the user the follwing features:

+ user functions are Filming/Setting (select documentation features), Filming/Configuration (film format and size properties, image quality properties), virtuell Filmsheet (film images in batch jobs) and Filming/Jobcontrol (change the priority or restart film jobs),
+ selected images are allocated to film jobs. Jobs are spooled to the Print SCU,
+ the SCU invokes a print job by using the SOP classes of a film session, a film box and image boxes for acquiring all the information which is required for a film session. The N-Action is used to print the film session.

6.3 Sequencing of real World Activities

Not applicable.

7 Application Entity Specification Print

7.1 Print Management AE Specification

The print management SCU invokes print management DIMSE services to transfer images from the local AE to the remote SCP AE to print the images with the defined film format and size on a selected network DICOM hardcopy printer.

7.1.1 Basic Print Management Meta SOP Classes

SIEMENS MR DICOM products provide Standard Conformance to the following DICOM V3.0 Basic Print Management SOP Classes as an SCU:

Table 24: *SOP Classes as an SCU*

SOP Class Name	SOP Class UID
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
- Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
- Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4
- Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1
- Printer SOP Class	1.2.840.10008.5.1.1.16
Print Job SOP Class	1.2.840.10008.5.1.1.14

7.1.1.1 Basic film session SOP class

The Basic Film Session information object definition describes all the user defined parameter which are common for all the films of a film session. The Basic Film Session refers to one or more Basic Film Boxes and that are printed on one hardcopy printer.

7.1.1.1.1 Used attributes

Table 25: *Mandatory Basic Film Session N-CREATE attributes*

Attribute name	**Tag**	**Usage SCU**	**Supported Values**
Number of Copies	(2000,0010)	U	set by user

Table 25: *Mandatory Basic Film Session N-CREATE attributes*

Attribute name	Tag	Usage SCU	Supported Values
Medium Type	(2000,0030)	U	BLUE FILM CLEAR FILM PAPER
Film Destination	(2000,0040)	U	MAGAZINE PROCESSOR

7.1.1.1.2 Status handling

The Basic Film Session SOP class uses following status codes:

Table 26: *Basic Film Session SOP status*

Service Status	Meaning	Protocol Codes
Failure	Film session SOP instances hierarchy does not contain film box SOP instances	C600
Failure	Unable to create print job, print queue is full	C601
Failure	Image position collision	C604
Failure	Image size is larger than images box size	C603
Warning	Memory allocation not supported	B600
Warning	Film session printing is not supported	B601
Warning	Film box does not contain image box (empty page)	B602
Success	Film belonging to the film session are accepted for printing	0000

7.1.1.2 Basic Film Box SOP class

The Basic Film Box information object definition describes all the user defined parameter of one film of the film session. The Basic Film Box information description defines the presentation parameters which are common for all images on a given sheet of film.

The Basic Film Box refers to one or more Image Boxes.

7.1.1.2.1 Used attributes

Table 27: *Mandatory Film Box N-CREATE attributes*

Attribute name	Tag	Usage SCU	Supported Values
Image Display Format	(2010,0010)	M	
Referenced Film Session Sequence	(2010,0500)	M	
>Referenced SOP Class UID	(0008,1150)	M	1.2.840.10008.5.1.1.1
>Referenced SOP Instance UID	(0008,1155)	M	
Film Orientation	(2010,0040)	M	PORTRAIT, LANDSCAPE
Film Size ID	(2010,0050)	M	8IN*10IN 10IN*12IN 10IN*14IN 11IN*14IN 14IN*14IN 14IN*17IN 24CM*24CM 24CM*30CM
Magnification Type	(2010,0060)	M	REPLICATE, BILINEAR, CUBIC NONE
Max Density	(2010,0130)	U	(4)
Min Density	(2010,0120)	U	(4)

The N_CREATE_RSP message from the SCP then contains the References Image Box Sequence with its SOP Class and Instance UIDs which is stored internally and then used for the Basic Image Box SOP Class N-SET RQ messages.

After all parameters for the Image boxes on the filmsheet have been set then the Siemens DICOM print application SCU will issue a N_ACTION_RQ message with the SOP Instance UID of the Basic Film Box (returned in N_CREATE_RSP of Basic Film Box SOP class) and the Action Type ID set to 1.

The Affected SOP Instance UID received in N_CREATE_RSP message from SCP will be saved internally and can be used later for N_DELETE_RQ request on the Basic Film Box SOP Class - see table below:)

Table 28: Attributes of the N_DELETE_RQ on the Basic Film Session SOP Class

Attribute name	Tag	Source of information
Requested SOP Instance UID	(0008,0018)	Affected SOP Instance UID of N_CREATE_RSP on Basic Film Box

7.1.1.2.2 Status handling

The Basic Film Box SOP class uses following status codes:

Tabelle 29: *Basic Film Box SOP status*

Service Status	Meaning	Protocol Codes
Failure	Unable to create print job; print queue is full	C602
Failure	Image size is larger than image box size	C603
Warning	Film box does not contain image box (empty page)	B603
Warning	Requested MinDensity or MaxDensity outside of printer's operating range	B605
Success	Film accepted for printing	0000

7.1.1.3 Basic Greyscale Image Box SOP Class

The Basic Greyscale Image Box information object definition is the presentation of an image and image related data in the image area of a film. The Basic Image Box information describtion describes the presentation parameters and image pixel data which apply to a single image of a sheet of film.

7.1.1.3.1 Used attributes

Table 30: *Mandatory Basic Grayscale Image Box N-SET attributes*

Attribute name	Tag	Usage SCU	Supported Values
Image Position	(2020,0010)	M	1
Preformatted Grayscale Image Sequence	(2020,0110)	M	
> Samples Per Pixel	(0028,0002)	M	1
>Photometric Interpretation	(0028,0004)	M	MONOCHROME2
>Rows	(0028,0010)	M	
>Columns	(0028,0011)	M	
>Pixel Aspect Ratio	(0028,0034)	M	1/1
>Bits Allocated	(0028,0100)	M	8
>Bits Stored	(0028,0101)	M	8
>High Bit	(0028,0102)	M	7
>Pixel Representation	(0028,0103)	M	0
>Pixel Data	(7FE0,0010)	M	OW

7.1.1.3.2 Status handling

The Grayscale Image Box SOP class uses following status codes:

Table 31: *Basic Grayscale Image Box SOP status*

Service Status	Meaning	Protocol Codes
Failure	Image contains more pixel than printer can print in Image box	C603
Failure	Insufficient memory in printer to store the image	C605
Success		0000

7.1.1.3.2.1 SOP Specific Conformance to Basic Color Image Box SOP Class

The Basic Color Image Box information object definition is the presentation of an image and image related data in the image area of a film. The Basic Image Box information describes the presentation parameters and image pixel data which apply to a single image of a sheet of film.

The Color Image Box SOP class uses only the N_SET_RQ with the following attributes

Table 32: *Used Basic Color Image Box N-SET attributes*

Attribute name	Tag	Usage SCU	Supported Values
Image Position	(2020,0010)	M	1
Preformatted Grayscale Image Sequence	(2020,0110)	M	
>Samples Per Pixel	(0028,0002)	M	3
>Photometric Interpretation	(0028,0004)	M	RGB
>Rows	(0028,0010)	M	
>Columns	(0028,0011)	M	
>Pixel Aspect Ratio	(0028,0034)	M	
>Bits Allocated	(0028,0100)	M	8
>Bits Stored	(0028,0101)	M	8
>High Bit	(0028,0102)	M	7
>Pixel Representation	(0028,0103)	M	0
>Pixel Data	(7FE0,0010)	M	
>Planar Configuration	(0028,0006)	M	0

The Color Image Box SOP class interprets following status codes:

Table 33: *Basic Color Image Box SOP status*

Service Status	Meaning	Protocol Codes
Warning	Requested MinDensity or MaxDensity outside of printer's operating range	B605

Service Status	Meaning	Protocol Codes
Failure	Image contains more pixel than printer can print in Image box	C603
	Insufficient memory in printer to store the image	C605
Success		0000

7.1.1.4 Printer SOP Class

The Printer SOP Class is the possibility to monitor the status of the hardcopy printer in a synchronous and an asynchronous way.

7.1.1.4.1 Used attributes

The SCU uses the mandatory N-EVENT Report DIMSE service to monitor the changes of the printer status in an asynchronus way.

Table 34: *Mandatory Printer N-EVENT report*

Event type name	Event	Attributes	Tag	Usage SCU
Normal	1			
Warning	2	Printer Status Info	(2110,0020)	U
Failure	3	Printer Status Info	(2110,0020)	U

The N-GET Report DIMSE service is mandatory for the SCP and is used to get information from the hardcopy printer.

Table 35: *Mandatory Printer N-GET attributes*

Attribute name	Tag	Usage SCU	Supported Values
Printer Status	(2110,0010)	U	NORMAL FAILURE WARNING
Printer Status Info	(2110,0020)	U	SUPPLY EMPTY(1) SUPPLY LOW RECEIVER FULL NO RECEIVE MGZ FILM JAM

(1) Only valid in case of Printer Status WARNING.

7.1.1.5 Print Job SOP Class

The Print Job SOP Class is the possibility to monitor the status of the execution of the print pocess. The Siemens MR DICOM Print application supports the optional N-EVENT Report DIMSE service to receive the changes of the print job status in an asynchronous way.

It can receive events from the SCP asynchronously:

- N-EVENT-REPORT

The following information is supported:

Table 36: *Used Print Job N-EVENT report*

Event type name	Event	Attributes	Tag	Usage SCU
Normal	1	Execution Status Info	(2110,0030)	U
		Print Job ID	(2110,0010)	(Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Printing	2	Execution Status Info	(2110,0030)	U
		Print Job ID	(2110,0010)	(Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Done	3	Execution Status Info	(2110,0030)	U
		Print Job ID	(2110,0010)	(Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U

Event type name	Event	Attributes	Tag	Usage SCU
Failure	4	Execution Status Info	(2110,0030)	U
		Print Job ID	(2110,0010)	(Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U

7.1.2 Association Establishment Policies

7.1.2.1 General

The configuration of the Siemens MR DICOM print management SCU defines the Application Entity Titles, the port numbers and of course the host name and net address..

7.1.2.2 Number of Associations

The Siemens MR DICOM application initiates one/several association at a time, one for each association being processed.

7.1.2.3 Asynchronous Nature

The Siemens MR DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

7.1.2.4 Implementation Identifying Information

The Siemens MR DICOM software provides a single Implementation Class UID of

- “1.3.12.2.1107.5.2"

and an Implementation Version Name of

- “MREASE_VA12A”.

7.1.3 Association Initiation Policy

The Print Management SCU and SCP establish an association by using the DICOM association services. During association establishment the Print Managment application entities negotiate the supported SOP classes to exchange the capabilities of the SCU and the SCP.

The association is kept open to report asynchronous errors or warnings.

The association is closed if the user switched to another camera or he left the Exposure application.

7.1.3.1 Associated Real-World Activity

7.1.3.1.1 Associated Real-World Activity

The associated Real-World activity is to print over a network a set of images on a film sheet with one or more copies. The images are converted to a proper image size. If the response from the remote application contains a status other than success or warning the association is aborted.

7.1.3.1.2 Proposed Presentation Contexts

The Siemens MR DICOM application will propose Presentation Contexts as shown in the following table:

Table 37: Presentation Context

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotia-tion
Basic film session SOP class	1.2.840.10008.5.1.1.1	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax, DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Basic film box SOP class	1.2.840.10008.5.1.1.2	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax, DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Basic gray-scale image box SOP class	1.2.840.10008.5.1.1.4	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax, DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

Basic color image box SOP class	1.2.840.10008.5.1.1.4	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Printer SOP class	1.2.840.10008.5.1.1.16	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax, DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Print Job SOP class	1.2.840.10008.5.1.1.14	DICOM Implicit VR Little Endian Transfer Syntax DICOM Explicit VR Big Endian Transfer Syntax, DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

7.1.3.1.3 SOP Specific Conformance Statement

The Siemens MR DICOM SCU conforms to the DICOM Basic Greyscale Print Managment Class and Basic Color Print Management Meta SOP Class.

The Print SCU application uses a setting platform to define the properties of the connected Print SCP, e.g.:

- maximum number of print jobs in the queue
- maximum number of print copies
- supported film sizes of the connected DICOM SCP
- supported film formats of the DICOM SCP
- lookup table definition

In the case of a failure return status of the Print SCP the current film job will be suspended.

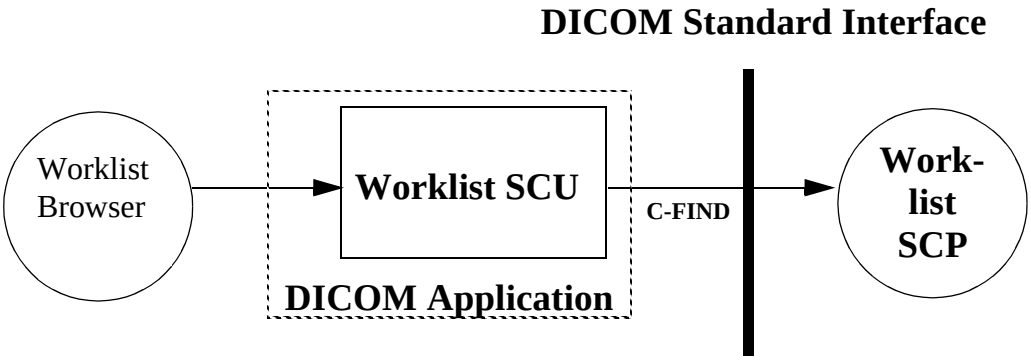
8 Implementation Model Worklist

The Worklist Service Class defines an application-level class of service which facilitates the transfer of worklists from the information system to the imaging modality. The worklist is queried by the AE and supplies the SCU with the scheduled tasks which have to be performed on the modality. The MR DICOM worklist application supports the worklist service to act as SCU.

8.1 Application Data Flow Diagram

The MR DICOM network implementation is a Windows NT application and acts as SCU for the worklist network service.

Figure 1: *Application data flow diagram*



8.2 Functional Definitions of Application Entities

The worklist SCU requests the worklist SCP to perform a match to the keys specified in the C-Find DIMSE service.

The worklist SCP responses to the C-FIND query and scheduled imaging service requests and patient demographic information will be downloaded from the information system to the modality.

8.3 Sequencing of real World Activities

The MR acquisition system obtains worklist information regarding scheduled procedures from HIS/RIS and includes this information in the series of the acquired DICOM MR images. If the worklist information is not available from HIS/RIS it will be typed by user during the registration of the patient.

9 Application Entity Specification Worklist

9.1 Modality Worklist Service AEs Specification

The basic worklist SCU requests that the remote SCP performs a match of all keys specified in the query against the information in its worklist database.

SIEMENS MR DICOM products provide Standard Conformance to the following DICOM V3.0 SOP Class as an SCU:

Table 38: *SOP Classes as an SCU*

SOP Class Name	SOP Class UID
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31

9.1.1 Association Establishment Policies

9.1.1.1 General

The configuration of the Siemens MR DICOM worklist application defines the Application Entity Titles, the port numbers and of course the host name and net address.

9.1.1.2 Number of Associations

The Siemens MR DICOM application initiates one/several association(s) at a time, one for each transfer request being processed.

9.1.1.3 Asynchronous Nature

The Siemens MR DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

9.1.1.4 Implementation Identifying Information

The Siemens MR DICOM software provides a single Implementation Class UID of

- “1.3.12.2.1107.5.2"

and an Implementation Version Name of

- “MREASE_VA12A”.

9.1.2 Association Initiation Policy

The modality worklist SCU establish an association by using the DICOM association services. During association establishment the negotiation of SOP classes to exchange the capabilities of the SCU and the SCP is not supported.

The following DIMSE-C operation is supported as SCU:

- C-FIND

9.1.2.1 Real World Activity

9.1.2.1.1 Associated Real-World Activity

The associated Real-World activity is to initate query requests to an SCP by using the DICOM Worklist Information Model.

9.1.2.1.2 Proposed Presentation Contexts

The Siemens Magnetom DICOM application will propose Presentation Contexts as shown in the following table:

Table 39: *Proposed presentation contexts*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Modality Worklist Information Model- FIND	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2		

9.1.2.1.3 SOP Specific Conformance Statement

Search Key Attributes of the Worklist C-FIND

The Siemens DICOM worklist SCU supports worklist queries with all required search keys. The following tables describe the search keys that the SCU supports.

Table 40: *Scheduled Procedure Step Search Key Attributes*

Attribute name	Tag	Matching Key Type	query value
Scheduled Procedure Step Sequence	(0040,0100)	R	
>Scheduled Station AE Title	(0040,0001)	R	Configurable: own AET or empty
>Scheduled Procedure Step Start Date	(0040,0002)	R	today-today
>Scheduled Procedure Step Start Time	(0040,0003)	R	0000-235959
>Modality	(0008,0060)	R	own
>Scheduled Performing Physician's Name	(0040,0006)	R	NULL

Table 41: *Patient Identification Search Key Attributes*

Attribute name	Tags	Matching Key Type	query value
Patient's Name	(0010,0010)	R	NULL
Patient ID	(0010,0020)	R	NULL

Return Key Attributes of the Worklist C-FIND

The Siemens Magnetom DICOM worklist SCU supports worklist queries with return key attributes of type 1 and 2 and all attributes necessary for patient registration.

Table 42: *Basic Worklist C_FIND_RSP Return Key Attributes*

Attribute name	Tag	Return Key Type	displayed in User Interface
SOP Common			
Specific Character Set	(0008,0005)	1C	
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	1	-
>Scheduled Station AE Title	(0040,0001)	1	yes
>Scheduled Procedure Step Start Date	(0040,0002)	1	yes
>Scheduled Procedure Step Start Time	(0040,0003)	1	yes
>Scheduled Procedure Step End Date	(0040,0004)	3	-
>Scheduled Procedure Step End Time	(0040,0005)	3	-
>Modality	(0008,0060)	1	-
>Scheduled Performing Physician's Name	(0040,0006)	1	yes
>Scheduled Procedure Step Description	(0040,0005)	1C	yes
>Scheduled Station Name	(0040,0010)	2	-
>Scheduled Procedure Step Location	(0040,0011)	2	-
>Scheduled Action Item Code Sequence	(0040,0008)	1C	-
>>Code Value	(0008,0100)	1C	-
>>Coding Scheme Designator	(0008,0102)	1C	-
>>Code Meaning	(0008,0104)	3	-
>Pre-Medication	(0040,0012)	2C	-
>Scheduled Procedure Step ID	(0040,0009)	1	-
>Requested Contrast Agent	(0032,1070)	2C	-
>Comments on the Scheduled Procedure Step	(0040,0400)	3	-

Attribute name	Tag	Return Key Type	displayed in User Interface
Requested Procedure			
Requested Procedure ID	(0040,1001)	1	yes
Requested Procedure Description	(0032,1060)	1C	-
Requested Procedure Code Sequence	(0032,1064)	1C	-
>Code Value	(0008,0100)	1C	-
>Code Scheme Designator	(0008,0102)	1C	-
>Code Meaning	(0008,0104)	3	-
Study Instance UID	(0020,000D)	1	-
Referenced Study Sequence	(0008,1110)	2	-
>Referenced SOP Class UID	(0008,1150)	1C	-
>Referenced SOP Instance UID	(0008,1155)	1C	-
Requested Procedure Priority	(0040,1003)	2	-
Patient Transport Arrangements	(0040,1004)	2	-
Reason for the Requested Procedure	(0040,1002)	3	-
Placer Order Number / Procedure	(0040,1006)	3	-
Filler Order Number / Procedure	(0040,1007)	3	-
Confidentiality Code	(0040,1008)	3	-
Reporting Priority	(0040,1009)	3	-
Names of Intended Recipients of results	(0040,1010)	3	-
Requested Procedure Comments	(0040,1400)	3	-
Requested Procedure Location	(0040,1005)	3	-
Imaging Service Request			
Accession Number	(0008,0050)	2	yes
Requesting Physician	(0032,1032)	2	-
Referring Physician’s Name	(0008,0090)	2	yes
Reason for the Imaging Service Request	(0040,2001)	3	-
Imaging Service Request Comments	(0040,2400)	3	-
Requesting Service	(0032,1033)	3	-

Attribute name	Tag	Return Key Type	displayed in User Interface
Issuing Date of Imaging Service Request	(0040,2004)	3	-
Issuing Time of Imaging Service Request	(0040,2005)	3	-
Placer Order Number / Imaging Service Request	(0040,2006)	3	-
Filler Order Number / Imaging Service Request	(0040,2007)	3	-
Order entered by...	(0040,2008)	3	-
Order Enterer's Location	(0040,2009)	3	-
Order Callback Phone Number	(0040,2010)	3	-
Visit Identification			
Admission ID	(0038,0010)	2	-
Visit Status			
Current Patient Location	(0038,0300)	2	-
Patient's Institution Residence	(0038,0400)	3	yes
Visit Relationship			
Referenced Patient Sequence	(0008,1120)	2	-
>Referenced SOP Class UID	(0008,1150)	2	-
>Referenced SOP Instance UID	(0008,1155)	2	-
Patient Identification			
Patient's Name	(0010,0010)	1	yes
Patient ID	(0010,0020)	1	yes
Patient Demographic			
Patients Birth Date	(0010,0030)	2	yes
Patient's Sex	(0010,0040)	2	yes
Patient's Weight	(0010,1030)	2	yes
Confidential constraint on patient data	(0040,3001)	2	-
Patient Medical			
Patient State	(0038,0500)	2	-[a]

Attribute name	Tag	Return Key Type	displayed in User Interface
Pregnancy Status	(0010,21C0)	2	yes
Medical Alerts	(0010,2000)	2	yes
Contrast Allergies	(0010,2110)	2	yes
Special Needs	(0038,0050)	2	-[a]

a. not displayed yet in current Version

Status Codes of the Worklist C-FIND

The worklist SCU interprets following status codes:

Table 43: *C-FIND Response Status*

Service Status	Meaning	Status Codes (0000,0900)	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

10 Communication Profiles

10.1 Supported Communication Stacks

The Siemens MR DICOM application provide DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

10.1.1 OSI Stack

not supported.

10.1.2 TCP/IP Stack

The Siemens MR DICOM application uses the TCP/IP stack from the Windows NT system upon which it executes. It uses the MergeCOM-3 subroutine library from Merge Technologies Inc.

10.1.2.1 API

The Siemens MR DICOM application uses the MergeCOM library that is based on a TCP/IP socket interface.

10.1.2.2 Physical Media Support

The Siemens MR DICOM application is indifferent to the physical medium over which TCP/IP executes; it inherits this from the Windows NT system upon which it executes.

10.1.3 Point-to-Point Stack

not supported.

11 Extensions/Specializations/ Privatizations

11.1 Standard Extended/Specialized/Private SOPs

11.1.1 Standard Extensions of all SOP Classes

The following tables list the data dictionary of all DICOM IOD attributes where the DICOM standard definitions are extended:

.

Table 44: *Standard Extensions of all SOP Classes*

Attribute Name	Tag	Private Creator	Type	Notes
Image Type	(0008,0008)	-	1	additional Defined Terms: R - real image M - total sum image P - phase image ADC - ADC map image TTP - time to peak map image SCM - Signal change map image TCS - Time course of signal image TTEST - TTest image MIP - Maximum intensity projection image ADD - Addition imag MEAN - Mean value image COR - Correlation image DIFFER - Differentation image DIFFUS - Diffusion image DIV - Division image INT - Integration image LOG - Logarithm image MULT - Multiplication image QSUM - Square sum image SLOPE - Slope image SDEV - standard deviation image SUB - Substraktion image T1 - T1 image T2 - T2 image TTP - Time to peak image NORM - Normalized image DIS2D - distortion correction 2D CV(1-20) - Context Vision filter POSDISP - Position display image GSP - Graphical slice position image CSA AVERAGE - Average image CSA BLACK IMAGE - Black image CSA RESAMPLED - resamapled image CSA MIP - MIP image CSA MPR - MPR image CSA MPR CURVED - MPR curved image CSA MPR THICK - MPR thick image CSA SSD - SSD image CSA SUBTRACT - Substract image

Table 44: *Standard Extensions of all SOP Classes*

Attribute Name	Tag	Private Creator	Type	Notes
Scan Options	(0018,0022)	-	2	additional Defined Terms: RG CG SP FS WS WE FE IR SR DB GX L(x) SAT(y) MT RT CT
Patient Position	(0018,5100)	-	2C	additional Defined Terms for the Magnetom Open: HLS HLP FLS FLP HLDL HLDR FLDL FLDR

All SOP classes may contain additional type 3 attributes which DICOM standard defines in a different DICOM IOD or DICOM SOP class (attributes from Normalized SOP classes).

This is the case for example for

- Rescale Slope (0028,1053)
- Rescale Intercept (0028,1052)

which are also used in the MR IOD.

11.1.2 Private Elements for Storage SOP Classes

The following private attributes are defined by Siemens MedCom based DICOM applications.

11.1.2.1 Registry of DICOM Data Elements

Tag	Private Owner Code	Name	VR	VM
(0029,xx08)	SIEMENS CSA HEADER	CSA Image Header Type	CS	1
(0029,xx09)	SIEMENS CSA HEADER	CSA Image Header Version	LO	1
(0029,xx10)	SIEMENS CSA HEADER	CSA Image Header Info	OB	1
(0029,xx18)	SIEMENS CSA HEADER	CSA Series Header Type	CS	1
(0029,xx19)	SIEMENS CSA HEADER	CSA Series Header Version	LO	1
(0029,xx20)	SIEMENS CSA HEADER	CSA Series Header Info	OB	1
(0029,xx08)	SIEMENS CSA NON-IMAGE	CSA Data Type	CS	1
(0029,xx09)	SIEMENS CSA NON-IMAGE	CSA Data Version	LO	1
(0029,xx10)	SIEMENS CSA NON-IMAGE	CSA Data Info	OB	1
(0029,xx08)	SIEMENS MEDCOM HEADER	MedCom Header Type	CS	1
(0029,xx09)	SIEMENS MEDCOM HEADER	MedCom Header Version	LO	1
(0029,xx10)	SIEMENS MEDCOM HEADER	MedCom Header Info	OB	1
(0029,xx20)	SIEMENS MEDCOM HEADER	MedCom History Information	OB	1
(0029,xx31)	SIEMENS MEDCOM HEADER	PMTF Information 1	LO	1
(0029,xx32)	SIEMENS MEDCOM HEADER	PMTF Information 2	UL	1
(0029,xx33)	SIEMENS MEDCOM HEADER	PMTF Information 3	UL	1
(0029,xx34)	SIEMENS MEDCOM HEADER	PMTF Information 4	CS	1
(0029,xx08)	SIEMENS MEDCOM OOG	MEDCOM OOG Type	CS	1
(0029,xx09)	SIEMENS MEDCOM OOG	MEDCOM OOG Version	LO	1
(0029,xx10)	SIEMENS MEDCOM OOG	MEDCOM OOG Info	OB	1

Tag	Private Owner Code	Name	VR	VM
(7FE1,xx10)	SIEMENS CSA NON-IMAGE	CSA Data	OB	1

The next subsections will explain in which IODs these private data elements are used.

11.1.2.2 All MedCom Supported Image SOP Classes

11.1.2.2.1 extended Image IOD Module Table

Table 45: *CSA Image IOD Modules*

IE	Module	Usage	Note
Patient	Patient	M	
Study	General Study	M	
	Patient Study	U	
Series	General Series	M	
Equipment	General Equipment	U	
Image	General Image	M	
	Image Pixel	M	
	IOD specific modules	M/U	depends on the IOD
	CSA Image Header	U	
	CSA Series Header	U	
	MEDCOM Header	U	private History information
	MEDCOM OOG	U	if object graphics is attached to image
	SOP Common	M	

11.1.2.2.2 CSA Image Header Module

The table in this section contains private IOD Attributes that describe the CSA Image Header.

Table 46: *CSA Image Header Module*

Attribute Name	Tag	Private Creator	Type	Notes
CSA Image Header Type	(0029,xx08)	SIEMENS CSA HEADER	1	CSA Image Header identification characteristics. Defined Terms: <NUM 4 = NUMARIS/4 > <SOM 5 = SOMARIS/5 >
CSA Image Header Version	(0029,xx09)	SIEMENS CSA HEADER	3	Version of CSA Image Header Info (0029,xx10) format.
CSA Image Header Info	(0029,xx10)	SIEMENS CSA HEADER	3	product dependent information.

11.1.2.2.3 CSA Series Header Module

The table in this section contains private IOD Attributes that describe the CSA Series Header.

Table 47: *CSA Series Header Module*

Attribute Name	Tag	Private Creator	Type	Notes
CSA Series Header Type	(0029,xx18)	SIEMENS CSA HEADER	1	CSA Series Header identification characteristics. Defined Terms: <NUM 4 = NUMARIS/4> <SOM 5 = Somaris/5
CSA Series Header Version	(0029,xx19)	SIEMENS CSA HEADER	3	Version of CSA Series Header Info (0029,xx20) format.
CSA Series Header Info	(0029,xx20)	SIEMENS CSA HEADER	3	product dependent information.

11.1.2.2.4 MEDCOM Header Module

The table in this section contains private IOD Attributes that describe MEDCOM Header.

Table 48: *MEDCOM Header Module*

Attribute Name	Tag	Private Creator	Type	Notes
MedCom Header Type	(0029,xx08)	SIEMENS MEDCOM HEADER	1C	MedCom Header identification characteristics. Defined Terms: MEDCOM 1 Required if MedCom Header Info (0029,xx10) present.
MedCom Header Version	(0029,xx09)	SIEMENS MEDCOM HEADER	2C	Version of MedCom Header Info (0029,xx10) format. Required if MEDCOM Header Info (0029,xx10) present.
MedCom Header Info	(0029,xx10)	SIEMENS MEDCOM HEADER	3	Manufacturer model dependent information. The value of the attribute MedCom Header Info (0029,xx10) can be build up in each user defined format.
MedCom History Information	(0029,xx20)	SIEMENS MEDCOM HEADER	3	MedCom defined Patient Registration history information. See 11.1.2.2.4.1.
PMTF Information 1	(0029,xx31)	SIEMENS MEDCOM HEADER	3	Transformation Information
PMTF Information 2	(0029,xx32)	SIEMENS MEDCOM HEADER	3	Transformation Information

Table 48: *MEDCOM Header Module*

Attribute Name	Tag	Private Creator	Type	Notes
PMTF Information 3	(0029,xx33)	SIEMENS MEDCOM HEADER	3	Transformation Information
PMTF Information 4	(0029,xx34)	SIEMENS MEDCOM HEADER	3	Transformation Information

11.1.2.2.4.1 MEDCOM History Information

The value of the attribute MEDCOM History Information (0029,xx20) is defined in the following way:

Table 49: *MEDCOM History Information*

Part	Name	Type	Bytes	Notes
header	Identifier	string	32	always "CSA HISTORY"
	Version	string	32	e.g. "V1.10"
> n items	Class Name	string	64	
	Modification String	string	1024	

11.1.2.2.5 MEDCOM OOG Module

The table in this section contains private IOD Attributes that describe MEDCOM Object Oriented Graphics (OOG). This module is used when object graphics is drawn on the image and stores the properties of the graphics objects (Line, Circle, Rectangle, Arrow, and so on). So the graphics objects will remain re-animatable even if such an image is transferred via DICOM C-Store SOP class..

Table 50: *MEDCOM OOG Module*

Attribute Name	Tag	Private Creator	Type	Notes
MedCom OOG Type	(0029,xx08)	SIEMENS MEDCOM OOG	1	MEDCOM Object Oriented Graphics (OOG) identification characteristics. Defined Terms: MEDCOM OOG 1
MedCom OOG Version	(0029,xx09)	SIEMENS MEDCOM OOG	3	Version of MEDCOM OOG Info (0029,xx10) format.
MedCom OOG Info	(0029,xx10)	SIEMENS MEDCOM OOG	3	MEDCOM Object Oriented Graphics (OOG) data.

The graphics objects are also stored in one Image overlay plane for compatibility with other products which don’t support the OOG module. Any system which does not suppothis OOG module has to remove these private attributes when modifying the image overlay data.

11.1.3 Private SOP class CSA Non-Image

This chapter includes the definition of the Siemens AG B Med defined private Non-Image Object (called CsaNonImage IOD). The focus of this private Non-Image Object is to address the requirement for non-image data sets found in SynGo based applications.

The Non-Image Information Object Definition specifies data sets that are converted from a non-DICOM format to a modality independent DICOM format.

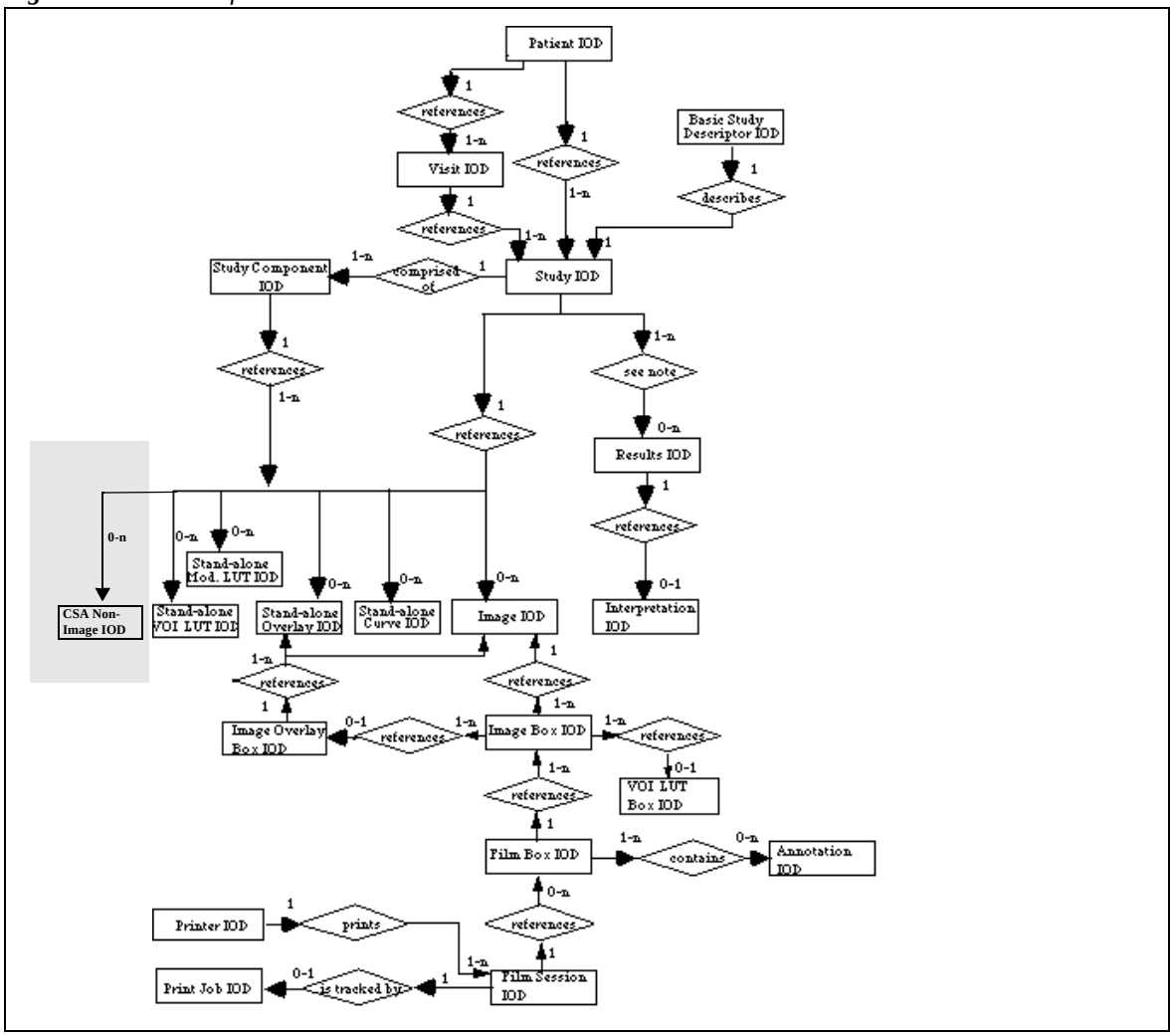
Examples of such manufacturer model dependent data sets are:

- MR Raw Data
- MR Spectroscopy Data

11.1.3.1 CSA Non-Image IOD Entity Relationship Model

The E-R model in [DICOM] A.1.2 depicts those components of the DICOM Information Model which directly refer to the CSA Non-Image IOD. The frame of reference IE, overlay IE, modality look up table IE, VOI lookup table IE and curve IE are not components of the CSA Non-Image IOD.

Figure 2: *DICOM Information Model*



11.1.3.2 CSA Non-Image IOD Module Table

Table 51: *CSA Non-Image IOD Modules*

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
	Patient Study	U
Series	General Series	M
Equipment	General Equipment	U
CSA	CSA Image Header	U
	CSA Series Header	U
	MEDCOM Header	U
	MEDCOM OOG	U
	CSA Non-Image	M
	SOP Common	M

11.1.3.3 CSA Non-Image Module

The table in this section contains private IOD Attributes that describe CSA Non-Images.

Table 52: *CSA Non-Image Module*

Attribute Name	Tag	Private Creator	Type	Notes
Image Type	(0008,0008)	-	3	Image identification characteristics.
Acquisition Date	(0008,0022)	-	3	The date the acquisition of data that resulted in this data set started.
Acquisition Time	(0008,0032)	-	3	The time the acquisition of data that resulted in this data set started.
Derivation Description	(0008,2111)	-	3	A text description of how this data set was derived.
Acquisition Number	(0020,0012)	-	3	A number identifying the gathering of data over a period of time which resulted in this data set.
CSA Data Type	(0029,xx08)	SIEMENS CSA NON-IMAGE	1	CSA Data identification characteristics. Defined Terms: RAW DATA NUM 4 = NUMARIS/4 Raw Data SPEC NUM 4 = NUMARIS/4 Spectroscopy RAW DATA SOM 5 = SOMARIS/5 Raw Data BSR REPORT = BSR Study Report Data
CSA Data Version	(0029,xx09)	SIEMENS CSA NON-IMAGE	3	Version of CSA Data Info (0029,xx10) format and CSA Non-Image Data (7FE1,xx10) format.

Table 52: *CSA Non-Image Module*

Attribute Name	Tag	Private Creator	Type	Notes
CSA Data Info	(0029,xx10)	SIEMENS CSA NON-IMAGE	3	Information to describe the CSA Data (7FE1,xx10). The value of the attribute CSA Data Info (0029,xx10) can be build up in each user defined format.
CSA Data	(7FE1,xx10)	SIEMENS CSA NON-IMAGE	2	Binary data as byte stream.

11.2 Private Transfer Syntaxes

none

12 Configuration

To ensure unique identification the hostname should be part of the AE Titles (e.g. HRI_myhost). The string can be up to 16 characters long and must not contain any extended characters, only 7 bit ASCII characters (excluding control characters) are allowed according to the DICOM standard.

Local AE Titels and Presentation Addresses

The local AETs can be configured using the Service application.
The following AETs can be entered:

- One common AET for Storage AE and Query/Retrieve AE
  default: AN_hostname
  port: 104
- One AET for Basic Worklist AE
  default: HRI_hostname
- One AET for Print AE
  default: PR_hostname.

Remote AE Titles and Presentation Addresses

For remote AETs, host names, IP addresses and port numbers can be configured using the Service configuration application. For each AET a list of supported services can also be configured.

The Application Entity Titles, host names and port numbers are configured using the Service configuration tool.

12.1 Configurable Parameters

12.1.1 DICOM Verification AE Title

The DICOM Verifcation application provides the application entity title used in the Dicom Service Tools:

MERGE_ECHO_SCU.

12.1.2 Storage and Query Retrieve SCP

The Service application can be used to set the AETs, port numbers, host names, IP addresses and capabilities for the remote nodes' (SCP's). The user can select transfer syntaxes, compression types and query models for each SCP separately.

12.1.3 Basic Print SCP

The Service application can be used to configure the SCP.
Application entity, host name, IP address and port number can be set.

12.1.4 Basic Worklist SCP

The Service application can be used to set the AETs, port numbers, host names, IP addresses, capabilities and timeouts for the remote nodes' (SCP's)

Additional configurable parameters for Basic Worklist Query are:

- Query Waiting time - the time to wait for the C-FIND-RSP after sending the C-FIND-RQ (default 20 sec)
- Max Query Match Number - the maximum number of entries accepted in one worklist (default is 100)
- Query Interval: the time between two C-FIND-RQ to the Hospital Information system (default is 60 min)

12.2 Default Parameters

- maximal PDU size is set to 28672 Bytes
- time-out for accepting/rejecting an association request: 240 s
- time-out for responding to an association open/close request: 240 s
- time-out for accepting a message over network: 240 s
- time-out for waiting for data between TCP/IP-packets: 240 s

The Timeouts for waiting for a Request/Response message from the remote node are as following:

- for Storage SCP/SCU: 600 s
- for Query/Retrieve SCP/SCU: 600 s
- for Basic Worklist SCU: configurable
- for Print Management SCU:
  timeout for Response to N-SET-RQ: 240 s
  timeout for Response to other Requests: 60 s.

13 Support of Extended Character Sets

The Siemens MR DICOM application supports the ISO 8859 Latin 1 (ISO-IR 100) character set and also the Japanese language sets JIS X 0201 (ISO-IR 13 Japanese katakana and ISO-IR 14 Japanese romaji), JIS X 0208 (ISO-IR 87 Japanese kanji) and JIS X 0212 (ISO-IR 159 Supplementary Japanese kanji).

MRease

DICOM Conformance Statement

Part II - Media Storage

14 Introduction

14.1 Purpose

This DICOM Conformance Statement is written according to part PS 3.2 of [1].

The applications described in this conformance statement are the SIEMENS <product> DICOM off-line media applications. The Siemens MR DICOM off-line media storage service implementation acts as FSC, FSU and/or FSR for the specified application profiles and the related SOP Class instances.

14.2 Scope

This DICOM Conformance Statement refers to SIEMENS MRease product. The following table relates software names to SIEMENS MRease products.

Table 53: *Siemens MR DICOM Products*

Software Name	SIEMENS <xxx> Product
MRease VA12A	Magnetom Symphony
MRease VA12A	Magnetom Harmony
MRease VA12A	Magnetom Sonata
MRease VA12A	Magnetom Open viva

14.3 Definitions, Abbreviations

14.3.1 Definitions

DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DICOM Message Service Element with Composite information objects

14.3.2 Abbreviations

ACR	American College of Radiology
AE	DICOM Application Entity
ASCII	American Standard Code for Information Interchange
DB	Database
DCS	DICOM Conformance Statement
FSC	File Set Creator

FSR	File Set Reader
FSU	File Set Updater
IOD	DICOM Information Object Definition
ISO	International Standard Organization
R	Required Key Attribute
NEMA	National Electrical Manufacturers Association
O	Optional Key Attribute
PDU	DICOM Protocol Data Unit
RWA	Real-World Activity
U	Unique Key Attribute

14.4 References

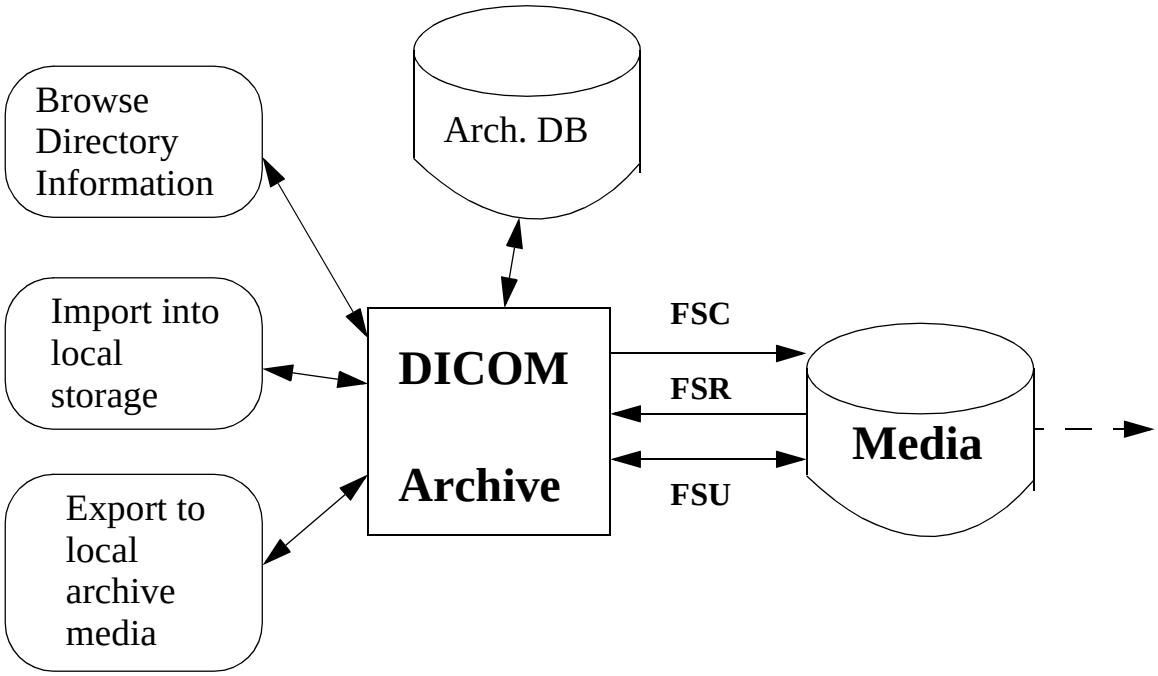
[2] Digital Imaging and Communications in Medicine (DICOM) 3.0, NEMA PS 3.10-12, 1998

14.5 Connectivity and Interoperability

The implementation of the Siemens DICOM interface has been carefully tested to assure correspondence with this Conformance Statement. But the Conformance Statement and the DICOM standard does not guarantee interoperability of Siemens modalities and modalities of other vendors. The user must compare the relevant Conformance Statements and if a successful interconnection should be possible, the user is responsible to specify an appropriate test suite and to validate the interoperability, which is required. A network environment may need additional functions out of the scope of DICOM.

15 Implementation Model

15.1 Application Data Flow Diagram



The DICOM archive application will serve as an interface to the CD-R or MOD off-line medium device. It serves interfaces to include the off-line media directory into the browser and to copy SOP instances to a medium or retrieve SOP Instances from medium into local storage.

The DICOM Archive application will support CD-R and MOD media (see Table 54:).

The FSU role will update new SOP Instances only to media with pre-existing File-sets conforming to the Application Profiles supported.

The contents of the DICOMDIR will be temporarily stored in Archive-Database.

15.2 Functional definitions of AE's

The MRease product DICOM off-line media storage application consists of the DICOM Archive application entity serving all interfaces to access off-line media. The DICOM Archive application is capable of

1. creating a new File-set onto an unwritten medium.
2. updating an existing File-set by writing new SOP Instances onto the medium.
3. copying SOP Instances from the medium onto local storage

4. reading the File-set's DICOMDIR information temporarily into database and pass it to display applications.

15.3 Sequencing of Real World Activities

The DICOM Archive application will not perform updates before the Directory information of the DICOMDIR is completely read.

15.4 File Meta Information Options

The Implementation Class UID is:

- "1.3.12.2.1107.5.2"

and an Implementation Version Name of

- "MREASE_VA12A".

16 AE Specifications

16.1 DICOM Archive Specification

The DICOM Archive provides Standard conformance to Media Storage Service Class (Interchange Option).

Table 54: *Application profiles, Activities, and Roles for DICOM Archive*

Application Profiles Supported	Real World Activity	Role	SC Option
STD-GEN-CD STD-CTMR-MOD650 STD-CTMR-MOD12 STD-CTMR-MOD23 STD-CTMR-CD STD-XABC-CD STD-XA1K-CD STD-US-ID-SF-FLOP STD-US-ID-SF-MOD128 STD-US-ID-SF-MOD230 STD-US-ID-SF-MOD540 STD-US-ID-SF-MOD650 STD-US-ID-SF-MOD12 STD-US-ID-SF-MOD23 STD-US-ID-SF-CDR STD-WVFM-GEN-FD	Browse Directory Information	FSR	Interchange
	Import into local Storage	FSR	Interchange
	Export to local archive media	FSC,FSU	Interchange

Configuration of uncompressed Transfer Syntax for export will result in compatibility to the STD-GEN-CD profile.

16.1.1 File Meta Information for the Application Entity

The Source Application Entity Title is set by configuration.

16.1.2 Real-World Activities for this Application Entity

16.1.2.1 Real-World Activity: Browse Directory Information

The DICOM Archive application acts as FSR using the interchange option when requested to read the media directory.

The DICOM archive application will read the DICOMDIR and insert that directory entries, which are supported, into a local database. The database can the then be used for browsing media contents.

Note:

IconImageSQ is also supported in DICOMDIR. But only those IconImages with BitsAllocated (0028,0100) equal to 8 and size 64 by 64 or 128 by 128 pixels are imported into database and are visible in PatientBrowser.

16.1.2.1.1 Application Profiles for the RWA: Browse Directory Information

See Table 54: for the Application Profiles listed that invoke this Application Entity for the Browse Directory Information RWA.

16.1.2.2 Real-World Activity: Import into local Storage

The DICOM Archive application acts as FSR using the interchange option when requested to read SOP Instances from the medium into the local storage.

The SOP Instance selected from the media directory will be copied into the local storage. Only SOP Instances, that are supported, can be retrieved from media storage.

16.1.2.2.1 Application Profiles for the RWA: Import into local Storage

See Table 54: for the Application Profiles listed that invoke this Application Entity for the Copy to Local Storage RWA.

16.1.2.3 Real-World Activity: Export to local Archive Media

The DICOM Archive application acts as FSU (for media with existing DICOM file-set) or FSC (media not initialized) using the interchange option when requested to copy SOP Instances from the local storage to local Archive medium.

The DICOM Archive application will receive a list of SOP Instances to be copied to the local archive medium. According to the state of the medium inserted (new medium, Medium with DICOM file-set) the SOP Instances are either updated or created on the media. Only valid SOP Instances are accepted.

The DICOM archive application will not close the CD-R medium.

16.1.2.3.1 Application Profiles for the RWA: Export to local Archive Media

See Table 54: for the Application Profiles listed that invoke this Application Entity for the Copy to local Archive RWA.

Note:

If the image to be archived also has an IconImage in the database then there will be a IconImageSQ be generated in DICOMDIR file for this image. The IconImageSQ will contain the following attributes:

- SamplesPerPixel (0028,0002) = 1
- Photometric Interpretation (0028,0004) = “MONOCHROME2”
- Rows (0028,0010), Columns (0028,0011)
  = 128,128 for XA IOD images
  = 64,64 for other images
- Bits Allocated (0028,0100) = 8
- Bits Stored (0028,0101) = 8
- High Bit (0028,0102) = 7
- Pixel Representation (0028,0103) = 0 (unsigned int)
- Planar Configuration (0028, 0006) is not set
- Pixel Aspect Ration (0028,0034) is not set (aspect ratio is 1/1)

16.1.3 Application profiles

16.1.3.1 DICOMDIR keys

The DICOMDIR file will contain the following attributes for the levels Patient - Study - Series - Image/Curve (valid for all Application profiles described in this section) :

Table 55: *DICOMDIR keys*

Attribute Name	Tag	Type	Notes
File-Set identification			
File-set ID	(0004,1130)	2	volume label of media
Directory information			
Offset of the First Directory Record of the Root Directory Entry	(0004,1200)	1	
Offset of the Last Directory Record of the Root Directory Entity	(0004,1202)	1	
File-set Consistency Flag	(0004,1212)	1	0000H
Directory Record Sequence	(0004,1220)	2	
> Offset of the Next Directory Record	(0004,1400)	1C	
> Record In-use flag	(0004,1410)	1C	FFFFH
> Offset of Referenced Lower-Level Directory Entity	(0004,1420)	1C	

Table 55: *DICOMDIR keys*

Attribute Name	Tag	Type	Notes
> Directory Record Type	(0004,1430)	1C	PATIENT, STUDY, SERIES, IMAGE, CURVE, PRIVATE (see section 17.2.1)
> Referenced File ID	(0004,1500)	1C	contains the filename on media for the Directory Records of Type IMAGE and PRIVATE
> Referenced SOP Class UID in File	(0004,1510)	1C	for the Directory Records of Type IMAGE and PRIVATE
> Referenced SOP Instance UID in File	(0004,1511)	1C	for the Directory Records of Type IMAGE and PRIVATE
> Referenced Transfer Syntax UID in File	(0004,1512)	1C	for the Directory Records of Type IMAGE and PRIVATE
> Record Selection Keys	see below		
Patient Keys			**Directory Record Type PATIENT**
Specific Character Set	(0008,0005)	1C	
Patient's Name	(0010,0010)	2	
Patient ID	(0010,0020)	1	
Date Of Birth	(0010,0030)	3	Type 2 in STD-XA* profiles
Patient's Sex	(0010,0040)	3	Type 2 in STD-XA* profiles
Study Keys			**Directory Record Type STUDY**
Specific Character Set	(0008,0005)	1C	
Study Date	(0008,0020)	1	
Study Time	(0008,0030)	1	
Accession Number	(0008,0050)	2	
Study Description	(0008,1030)	2	
Study Instance UID	(0020,000D)	1C	
Study ID	(0020,0010)	1	Will be generated automatically, if not present. Value = "-"
Series Keys			**Directory Record Type SERIES**
Specific Character Set	(0008,0005)	1C	
Series Date	(0008,0021)	3	
Series Time	(0008,0031)	3	
Modality	(0008,0060)	1	
Institution name	(0008,0080)	3	Type 2 in STD-XA* profiles
Institution Address	(0008,0081)	3	Type 2 in STD-XA* profiles

Table 55: *DICOMDIR keys*

Attribute Name	Tag	Type	Notes
Series Description	(0008,103E)	3	
Performing Physician	(0008,1050)	3	Type 2 in STD-XA* profiles
Series Instance UID	(0020,000E)	1	
Series Number	(0020,0011)	1	
Image Keys			**Directory Record Type IMAGE**
Specific Character Set	(0008,0005)	1C	
Image Type	(0008,0008)	3	identification characteristics Type 1 in STD-XA* profiles
SOP Class UID	(0008,0016)	3	
SOP Instance UID	(0008,0018)	3	
Image Date	(0008,0023)	3	
Image Time	(0008,0033)	3	
Referenced Image Sequence	(0008,1140)	3	Type 1C in STD-CTMR profile, required if present in image
> Referenced SOP Class UID	(0008,1150)		
> Referenced SOP Instance UID	(0008,1155)		
Image Number	(0020,0013)	1	
Image Position (Patient)	(00020,0032)	3	Type 1C in STD-CTMR profile, required if present in image
Image Orientation (Patient)	(0020,0037)	3	Type 1C in STD-CTMR profile, required if present in image
Frame Of Reference UID	(0020,0052)	3	Type 1C in STD-CTMR profile, required if present in image
Rows	(0028,0010)	3	
Columns	(0028,0011)	3	
Pixel Spacing	(0028,0030)	3	Type 1C in STD-CTMR profile, required if present in image
Calibration Image	(0050,0004)	3	Type 2 in STD-XA* profiles, for XA IOD
Icon Image Sequence	(0088,0200)	3	required for XA Application profiles, optional for the others
> Samples per Pixel	(0028,0002)		1
> Photometric Interpretation	(0028,0004)		MONOCHROME2
> Rows	(0028,0010)		128 for XA IOD, 64 otherwise Type 1 in STD-CTMR profile
> Columns	(0028,0011)		128 for XA IOD, 64 otherwise Type 1 in STD-CTMR profile

Table 55: *DICOMDIR keys*

Attribute Name	Tag	Type	Notes
> Bits Allocated	(0028,0100)		8
> Bits Stored	(0028,0101)		8
> High Bit	(0028,0102)		7
> Pixel Representation	(0028,0103)		0 (unsigned)
> Pixel Data	(7FE0,0010)		Icon Image pixel data
Waveform Keys			**Directory Record Type CURVE**
Specific Character Set	(0008,0005)	1C	
Curve Number	(0020,0024)	1	

see also section 17.2.1 on page 113 for the DICOMDIR attributres set for CsaNonImage IOD.

16.1.3.2 STD-GEN-CD

For media conforming to the STD-GEN-CD Profile the following SOP classes will be supported as an FSR, FSC,FSU

Table 56: *STD-GEN-CD Supported SOP Classes*

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
CR Image	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
CT Image	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
US-MF image	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
MR Image	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
US Image	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
SC Image	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
Waveform	1.2.840.10008.5.1.4.1.1.9.3.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
XA Image	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
XA-BiPlane Image	1.2.840.10008.5.1.4.1.1.12.3	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
XRF-Image	1.2.840.10008.5.1.4.1.1.12.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
NM Image	1.2.840.10008.5.1.4.1.1.20	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
PET Image	1.2.840.10008.5.1.4.1.1.128	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes

Standalone IODs (Standalone Overlay, Standalone Curve, ..) are not supported by either FSR/FSC/FSU.

Detached Patient Management is not supported for import and therefore no precedence of values from those Instances can be supported.

16.1.3.3 STD-CTMR-xxxx

For media conforming to the STD-CTMR-MOD650, STD-CTMR-MOD12, STD-CTMR-MOD23, STD-CTMR-CD Profiles the following SOP classes will be supported as an FSR, FSC,FSU

Table 57: *STD-CTMR-xxxx Supported SOP Classes*

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
CT Image	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
CT Image	1.2.840.10008.5.1.4.1.1.2	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
MR Image	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
MR Image	1.2.840.10008.5.1.4.1.1.4	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
SC Image (grayscale)	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
SC Image (grayscale)	1.2.840.10008.5.1.4.1.1.7	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
SC Image (palette color)	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
SC Image (palette color)	1.2.840.10008.5.1.4.1.1.7	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes

Detached Patient Management is not supported for import and therefore no precedence of values from those Instances can be supported.

16.1.3.4 STD-XABC-CD

For media conforming to the STD-XABC-CD Profile the following SOP classes will be supported as an FSR, FSC,FSU

Table 58: *STD-XABC-CD Supported SOP Classes*

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
XA Image	1.2.840.10008.5.1.4.1.1.12.1	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes

Detached Patient Management is not supported for import and therefore no precedence of values from those Instances can be supported.

The FSC will create only images with Rows = Columns = 512 on the media.

16.1.3.5 STD-XA1K-CD

For media conforming to the STD-XABC-CD Profile the following SOP classes will be supported as an FSR, FSC,FSU

Table 59: *STD-XA1K-CD Supported SOP Classes*

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
XA Image	1.2.840.10008.5.1.4.1.1.12.1	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
SC Image	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes

Standalone IODs (Standalone Overlay, Standalone Curve, ..) are not supported by either FSR/FSC/FSU.

Detached Patient Management is not supported for import and therefore no precedence of values from those Instances can be supported.

16.1.3.6 STD-US-ID-SF-xxx

For media conforming to the STD-US-ID-SF-FLOP, STD-US-ID-SF-MOD128, STD-US-ID-SF-MOD230, STD-US-ID-SF-MOD540, STD-US-ID-SF-MOD650, STD-US-ID-SF-MOD12, STD-US-ID-SF-MOD23, STD-US-ID-SF-CDR Profiles the following SOP classes and transfer syntaxes will be supported as an FSR, FSC,FSU

Table 60: *STD-US-ID-SF-xxx Supported SOP Classes*

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
Ultrasound Image	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
Ultrasound Multiframe Image	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes

Only the following Photometric Interpretations are supported by FSR/FSC/FSU:

- MONOCHROME2
- PALETTE COLOR
- RGB

This restriction also applies for FSR.

16.1.3.7 STD-WVFM-GEN-FD

For media conforming to the STD-WVFM-GEN-FD Profile the following SOP classes will be supported as an FSR, FSC,FSU

Table 61: *STD-WVFM-GEN-FD Supported SOP Classes*

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
Waveform	1.2.840.10008.5.1.4.1.1.9.3.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes

Detached Patient Management is not supported for import and therefore no precedence of values from those Instances can be supported.

17 Augmented and Private Profiles

17.1 Augmented Application Profiles

When configuring a compressed Transfer Syntax the STD-CTMR and STD-GEN application profile classes will be extended to store instances of the following SOP classes in compressed format:

Table 62: *Augmented Application profiles, Activities, and Roles for DICOM Archive*

Application Profiles Supported	Real World Activity	Role	SC Option
AUG-GEN-CD AUG-CTMR-MOD650 AUG-CTMR-MOD12 AUG-CTMR-MOD23 AUG-CTMR-CD	Browse Directory Information	FSR	Interchange
	Import into local Storage	FSR	Interchange
	Export to local archive media	FSC,FSU	Interchange

17.1.1 AUG-GEN-CD, AUG-CTMR-xxxx

For media conforming to the AUG-GEN-CD or AUG-CTMR-MOD650, AUG-CTMR-MOD12, AUG-CTMR-MOD23, AUG-CTMR-CD Profile the following SOP classes will be supported as an FSR, FSC,FSU

Table 63: *AUG-GEN-CD, AUG-CTMR-xxxx Supported SOP Classes*

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
CR Image	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
CR Image	1.2.840.10008.5.1.4.1.1.1	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	no	yes	no
CR Image	1.2.840.10008.5.1.4.1.1.1	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
CR Image	1.2.840.10008.5.1.4.1.1.1	JPEG lossy (baseline or extended) 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	yes	yes	yes

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
CT Image	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
CT Image	1.2.840.10008.5.1.4.1.1.2	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	no	yes	no
CT Image	1.2.840.10008.5.1.4.1.1.2	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
CT Image	1.2.840.10008.5.1.4.1.1.2	JPEG lossy (baseline or extended) 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	yes	yes	yes
US-MF image	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
US-MF image	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	no	yes	no
US-MF image	1.2.840.10008.5.1.4.1.1.3.1	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
US-MF image	1.2.840.10008.5.1.4.1.1.3.1	JPEG lossy (baseline or extended) 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	yes	yes	yes
MR Image	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
MR Image	1.2.840.10008.5.1.4.1.1.4	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	no	yes	no
MR Image	1.2.840.10008.5.1.4.1.1.4	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
MR Image	1.2.840.10008.5.1.4.1.1.4	JPEG lossy (baseline or extended) 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	yes	yes	yes
US Image	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
US Image	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	no	yes	no
US Image	1.2.840.10008.5.1.4.1.1.6.1	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
US Image	1.2.840.10008.5.1.4.1.1.6.1	JPEG lossy (baseline or extended) 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	yes	yes	yes
SC Image	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
SC Image	1.2.840.10008.5.1.4.1.1.7	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	no	yes	no
SC Image	1.2.840.10008.5.1.4.1.1.7	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
SC Image	1.2.840.10008.5.1.4.1.1.7	JPEG lossy (baseline or extended) 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	yes	yes	yes
Waveform	1.2.840.10008.5.1.4.1.1.9.3.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
XA Image	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
XA Image	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	no	yes	no
XA Image	1.2.840.10008.5.1.4.1.1.12.1	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
XA Image	1.2.840.10008.5.1.4.1.1.12.1	JPEG lossy (baseline or extended) 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	yes	yes	yes
XA-BiPlane Image	1.2.840.10008.5.1.4.1.1.12.3	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
XA-BiPlane Image	1.2.840.10008.5.1.4.1.1.12.3	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	no	yes	no
XA-BiPlane Image	1.2.840.10008.5.1.4.1.1.12.3	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
XA-BiPlane Image	1.2.840.10008.5.1.4.1.1.12.3	JPEG lossy (baseline or extended) 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	yes	yes	yes
XRF-Image	1.2.840.10008.5.1.4.1.1.12.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
XRF-Image	1.2.840.10008.5.1.4.1.1.12.2	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	no	yes	no
XRF-Image	1.2.840.10008.5.1.4.1.1.12.2	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
XRF-Image	1.2.840.10008.5.1.4.1.1.12.2	JPEG lossy (baseline or extended) 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	yes	yes	yes

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
NM Image	1.2.840.10008.5.1.4.1.1.20	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
NM Image	1.2.840.10008.5.1.4.1.1.20	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	no	yes	no
NM Image	1.2.840.10008.5.1.4.1.1.20	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
NM Image	1.2.840.10008.5.1.4.1.1.20	JPEG lossy (baseline or extended) 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	yes	yes	yes
PET Image	1.2.840.10008.5.1.4.1.1.128	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes
PET Image	1.2.840.10008.5.1.4.1.1.128	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	no	yes	no
PET Image	1.2.840.10008.5.1.4.1.1.128	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	yes	yes	yes
PET Image	1.2.840.10008.5.1.4.1.1.128	JPEG lossy (baseline or extended) 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	yes	yes	yes

17.2 Private Application Profiles

The following Private Application Profiles supported to store private objects in addition to the Standard SOP classes allowed for the corresponding Standard Application Profile

Table 64: *Private Application profiles, Activities, and Roles for DICOM Archive*

Application Profiles Supported	Real World Activity	Role	SC Option
PRI-GEN-CD PRI-CTMR-MOD650 PRI-CTMR-MOD12 PRI-CTMR-MOD23 PRI-CTMR-CD	Browse Directory Information	FSR	Interchange
	Import into local Storage	FSR	Interchange
	Export to local archive media	FSC,FSU	Interchange

17.2.1 PRI-GEN-CD, PRI-CTMR-xxxx

For media conforming to the PRI-GEN-CD or PRI-CTMR-MOD650, PRI-CTMR-MOD12, PRI-CTMR-MOD23, PRI-CTMR-CD Profile the following SOP classes will be supported as an FSR, FSC,FSU in addition to the Standard SOP classes allowed for the corresponding Standard Application Profiles.

Table 65: *PRI-GEN-CD, PRI-CTMR-xxxx Supported SOP Classes*

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
CsaNonImage	1.3.12.2.1107.5.9.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	yes	yes	yes

The DICOMDIR file will contain the Directory record as described in section 16.1.3 on page 100 but with the following Private Keys instead of the Image Keys:

Table 66: *DICOMDIR keys for CsaNonImage*

Attribute Name	Tag	Private Creator	Type	Notes
Directory Record Type	(0004,1430)	-	1	PRIVATE
Private Record UID	(0004,1432)	-	1	1.3.12.2.1107.5.9.1
Private keys				
SOP Class UID	(0008,0016)	-	3	1.3.12.2.1107.5.9.1

Table 66: *DICOMDIR keys for CsaNonImage*

Attribute Name	Tag	Private Creator	Type	Notes
SOP Instance UID	(0008,0018)	-	3	
Image Type	(0008,0008)	-	3	identification characteristics
Acquisition Date	(0008,0022)	-	3	The date the acquisition of data that resulted in this data set started.
Acquisition Time	(0008,0032)	-	3	The time the acquisition of data that resulted in this data set started.
Acquisition Number	(0020,0012)	-	3	A number identifying the single continuous gathering of data over a period of time which resulted in this data set.
CSA Data Type	(0029,xx08)	SIEMENS CSA NON-IMAGE	1	CSA Data identification characteristics.
CSA Data Version	(0029,xx09)	SIEMENS CSA NON-IMAGE	3	Version of CSA Non-Image Data

No IconImageSQ will be stored for CsaNonImage objects.

18 Extensions, Specializations and Privatizations of SOP Classes and Transfer Syntaxes

not applicable.

19 Configuration

19.1 AE Title Mapping

19.1.1 DICOM Media Storage AE Title

The DICOM Storage application (Image Manager) provides the application entity title:

CsaImageManager

20 Support of Extended Character Sets

The Siemens DICOM archive application supports the ISO 8859 Latin 1 (ISO-IR 100) character set.

Also the Japanese language character sets JIS X 0201 (ISO-IR 13 Japanese katakana and ISO-IR 14 Japanese romaji), JIS X 0208 (ISO-IR 87 Japanese kanji) and JIS X 0212 (IOS-IR 159 Supplementary Japanese kanji) are supported.

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