Digiroebs
1.3

DICOM Conformance Statement

V 1.0

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1 Introduction

1.1 Purpose

A DICOM Conformance Statement is intended to describe which components, optional components or extensions of the DICOM standard are supported by a particular implementation. The Conformance Statement of one implementation can be compared with the Conformance Statement from another implementation to determine which capabilities are commonly supported.

DICOM does not, by itself, guarantee interoperability. Furthermore, the identification of common capabilities by comparing DICOM Conformance Statements is also not sufficient to guarantee connectivity between two devices.

A DICOM Conformance Statement cannot replace validation and cross-vendor testing with other devices. Validation and cross-vendor testing are still required to ensure that both devices are performing as intended.

The reader should be aware of a number of important issues:

- Even when comparing this Conformance Statement with the Conformance Statement of another device indicates that connectivity is possible, the system integrator is responsible for carrying out test procedures to ensure that the required connectivity is actually met.
- Neither the DICOM Standard nor this Conformance Statement can ensure interoperability when integrating devices from different vendors. It is the system integrator's responsibility to ensure that the application requirements of all devices within the complete system are met.
- The DICOM standard undergoes continual review and improvement in order to meet changing requirements. Corrections, extensions and additional services are added from time to time. Medigration reserves the right to make changes to the product described in this conformance statement in order to cover changes in the DICOM standard. Readers should be aware that connected devices should also follow changes in the DICOM standard in order to retain connectivity.

The intended audience for this Conformance Statement is hospital technical staff, system integrators and software engineers. The reader is assumed to have good understanding of the DICOM standard.

1.2 Scope

This conformance statement describes the DICOM capabilities of the medigration product **Digiroebs**. The **Digiroebs** is a digital radiography system producing DICOM images. It is specifically designed to be integrated into a PACS environment containing other DICOM storage devices like archives and workstations. It supports those DICOM services needed to store its images for archival and to print them out

on film or paper.

1.3 Definitions, Acronyms and Abbreviations

1.3.1 Definitions

System Integrator	A person or organization responsible for integrating devices into a new or existing system. The System Integrator takes responsibility for ensuring that the system works as a whole.

Other definitions can be found within the different parts of the DICOM standard [1].

1.3.2 Acronyms and Abbreviations

AE	**A**pplication **E**ntity
DCO	**D**ICOM **C**omposite **O**bject. A DICOM object such as an image, overlay, lookup-table, waveform, presentation state or radiotherapy plan which can be stored using the Storage Service Class.
DR	**D**igital **R**adiography
DX	**D**igital **X**-Ray
MPPS	**M**odality **P**erformed **P**rocedure **S**tep
MWL	**M**odality **W**ork**l**ist
SCU	**S**ervice **C**lass **U**ser
SW	**S**oft**w**are

Other acronyms and abbreviations used within this document are defined within the different parts of the DICOM standard [1].

1.4 References

[1] DICOM, PS3.(1-18)-2004, National Electrical Manufacturers Association, 1300 N. 17th Street Rosslyn, Virginia 22209, USA.

2 Implementation Model

Digiroebs is a device, which produces Digital X-Ray (DX) images. These images are stored on local magnetic disks and can be sent over a network interface for storage or can be printed on a hardcopy device. Digiroebs maintains a database of summary information about the locally stored images.

Digiroebs also acts as a Modality Performed Procedure Step SCU to send study results each time after an acquisition is performed and can request Modality Worklists.

2.1 Application Data Flow Diagram

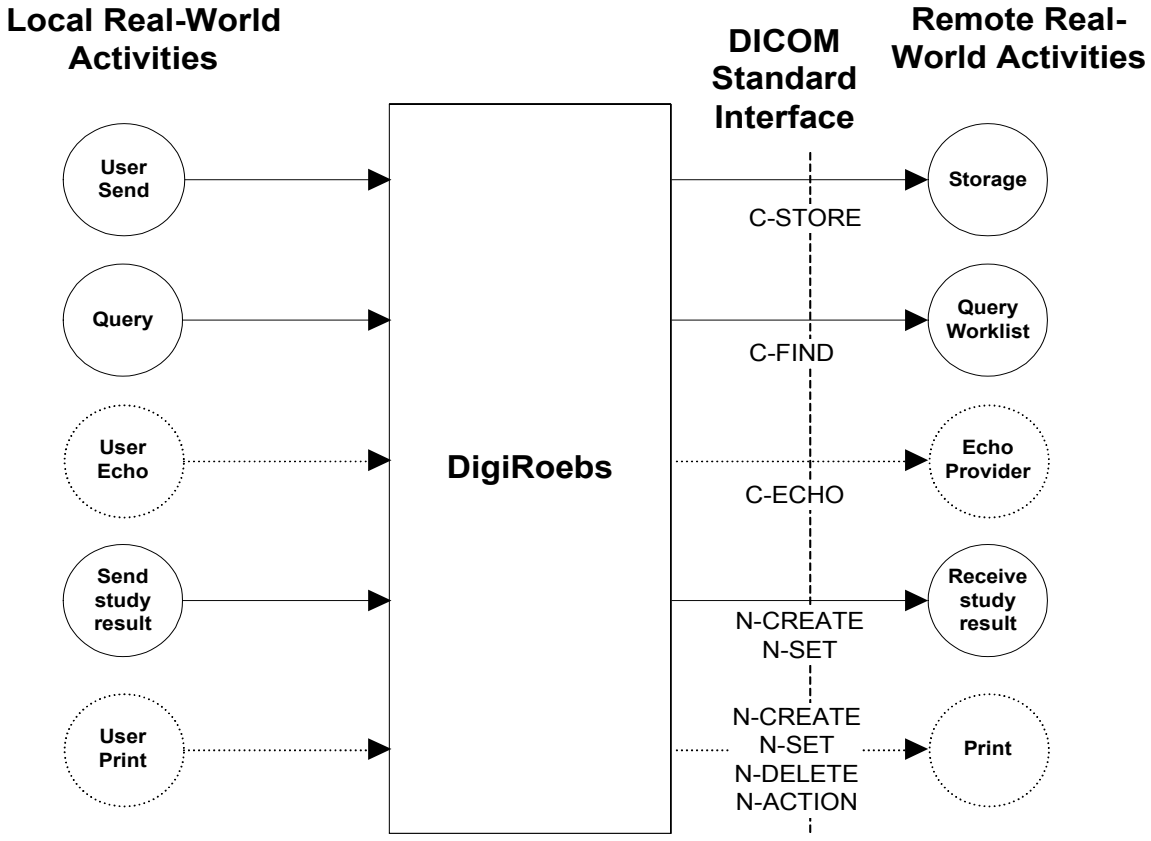

Figure 1: DigiRoebs Implementation Model, *Dicom Options are shown in dashed line

Figure 1 illustrates the relationships between the Digiroebs Application Entity (AE) and its associated Real-World Activities. The **Remote Real-World Activities** are shown on the right and the **Local Real-World Activities** are shown on the left.

Send to Archive is an activity performed by Digiroebs to send images to a DICOM device to be stored by the **Storage** remote activity.

Query is an activity performed by Digiroebs to receive patient lists from a remote device provided by the **Query Worklist** activity.

User Echo is an activity performed by Digiroebs to verify the ability of a remote device to respond to DICOM messages. Echo messages will be sent upon operation request. They are responded by the **Echo Provider** activity on the remote device.

Send study result is an activity performed by **Digiroebs** to send Modality Performed Procedure Step notifications to a remote device. These notifications are stored by the **Receive study result** activity.

2.2 Functional Definition of Application Entities

The Digiroebs software acts as a single Application Entity (AE), which is able to send images for storage, study result notifications and echo requests and to query a remote worklist database for patient lists.

Digiroebs acts as an SCU of the following DICOM Service Classes:

- Verification
- Storage
- Study Management
- Basic Worklist Management
- Print Management

2.3 Sequencing of Real World Activities

No sequencing of Real-World activities are relevant.

3 Digiroebs Application Entity Specification

Digiroebs provides standard conformance to the following Service Classes by supporting the SOP Classes and roles listed in Table 1.

SOP Class Name	UID	Role
Verification	1.2.840.10008.1.1	SCU
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	SCU
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	SCU
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	SCU
Basic Grayscale Print Management	1.2.840.10008.5.1.1.9	SCU

Table 1: Supported DICOM SOP Classes and Roles

3.1 Association Establishment Policies

3.1.1 General

All relevant DICOM communication parameters (AE Titles, hostnames or IP addresses, port numbers, etc.) are configurable. See section 5 for more information on configurable parameters. A maximum PDU size of 16KB will be offered when establishing associations.

3.1.2 Number of Associations

Digiroebs does not accept any DICOM associations.

3.1.3 Implementation Identifying Information

Implementation Class UID:	1.2.276.0.7230010.3.0.3.5.4
Implementation Version Name:	OFFIS_DCMTK_354

3.2 Association Initiation Policy

Digiroebs will initiate associations in the following situations:

- When instructed by an operator (via the user interface) to verify communication. (Dicom Option)
- When instructed by an operator (via the user interface) to send images to a remove device.
- When instructed by an operator (via the user interface) to print images to a remote device. (Dicom Option)
- When instructed by an operator to send study results to a remove device.
- When instructed by an operator to query for modality worklists.

3.2.1 Operator Initiated Communication Verification

3.2.1.1 Associated Real-World Activity: User Echo (Dicom Option)

An operator can - via a graphical user interface - initiate a test to verify communication. The associated local real-world activity is **User Echo** and the remote real world activity is **Echo Provider**. The communication verification test is considered successful if an association can be established, a presentation context for the Verification SOP Class can be negotiated, a response is received from the C-ECHO request and the association is released.

3.2.1.2 Proposed Presentation Contexts

A single presentation context will be proposed for *operator initiated communication verification* as shown in Table 2.

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

Table 2: Proposed presentation context for verification

3.2.1.3 SOP Specific Conformance

Standard conformance is provided for the Verification SOP Class.

3.2.1.4 Association Termination

The association will be released upon receipt of the C-ECHO-RSP message.

3.2.2 User Initiated Image Send

3.2.2.1 Associated Real-World Activity: User Send

An operator can - via a graphical user interface - initiate sending images to a remote application entity. The associated local real-world activity is **User Send** and the remote real world activity is **Storage**. All selected images will be sent over a single association.

3.2.2.2 Proposed Presentation Contexts

Two presentation contexts will be proposed for *user initiated image send* as outlined in Table 3. Digiroebs can be configured to use Little Endian Implicit transfer syntax only.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 3: Proposed presentation contexts for operator initiated image send

3.2.2.3 SOP Specific Conformance for DX Storage SOP Class

3.2.2.3.1 Status codes for C-STORE

The behavior when receiving C-STORE response status codes is shown in Table 4. The operator will be informed via the operator's user interface message area.

Status Code	Meaning	Behavior when receiving status code
	Any other status code not included in this table	An error message will be posted to the operator and an error message recorded in a log file. The images will be sent again after a configurable amount of time. All unsent images will be marked as **not archived** in the local database. These images will not be deleted automatically.
A7xx	Refused – Out of Resources	
A9xx	Error – Data Set does not match SOP Class	The remaining images will be sent if possible. An error message will be posted to the operator and an error message recorded in a log file. All unsent images will be marked as **not archived** in the local database. These images will not be deleted automatically.
Cxxx	Error – Cannot Understand	
B000	Warning – Coercion of Data Elements	The operator will be informed after all images have been sent. The images will be marked as **archived** in the local database for later removal.
B007	Warning – Data Set does not match SOP Class	
B006	Warning – Elements Discarded	
0000	Success	

Table 4: Behavior when receiving C-STORE response status codes (operator initiated)

Extended negotiation is not supported for the *User Send* Real-World Activity.

3.2.2.3.2 Supported IOD modules

Digiroebs uses the IOD modules shown in Table 5.

Information Entity	Module
Patient	Patient
Study	General Study
Series	General Series
	DX Series
Equipment	General Equipment
Image	General Image
	Image Pixel
	DX Anatomy Imaged
	DX Image
	DX Detector
	Acquisition Context
	SOP Common
	X-Ray Acquisition Dose
	X-Ray Filtration
	DX Positioning
	X-Ray Generation

Table 5: IOD modules used by Digiroebs

3.2.2.3.3 Supported DICOM Elements

3.2.2.3.3.1 Patient Module

Attribute Name	Tag	VR	Type	Value
Patient's Name	(0010,0010)	PN	2	Patient's full name.
Patient ID	(0010,0020)	LO	2	Primary hospital identification number or code for the patient.
Patient's Birth Date	(0010,0030)	DA	2	Birth date of the patient.
Patient's Sex	(0010,0040)	CS	2	Sex of the named patient

3.2.2.3.3.2 General Study Module

Attribute Name	Tag	VR	Type	Value
Study Instance UID	(0020,000D)	UI	1	Unique identifier for the Study.
Study Date	(0008,0020)	DA	2	Date the Study started.
Study Time	(0008,0030)	TM	2	Time the Study started.
Referring Physician's Name	(0008,0090)	PN	2	Name of the patient's referring physician.
Study ID	(0020,0010)	SH	2	User or equipment generated Study identifier.
Accession Number	(0008,0050)	SH	2	A RIS generated number that identifies the order for the Study.
Study Description	(0008,1030)	LO	3	Institution-generated description or classification of the Study (component) performed.

3.2.2.3.3.3 General Series Module

Attribute Name	Tag	VR	Type	Value
Modality	(0008,0060)	CS	1	DX
Series Instance UID	(0020,000E)	UI	1	Unique identifier of the Series.
Series Number	(0020,0011)	IS	2	A number that identifies this Series.
Image Laterality	(0020,0062)	CS	2C	Image Laterality R=right, L=left, U=Unpaired, B=Both
Series Date	(0008,0021)	DA	3	Date the Series started.
Series Time	(0008,0031)	TM	3	Time the Series started.
Series Description	(0008,103E)	LO	3	User provided description of the Series.
Body Part Examined	(0018,0015)	CS	3	

3.2.2.3.3.4 DX Series Module

Attribute Name	Tag	VR	Type	Value
Modality	(0008,0060)	CS	1	DX
Presentation Intent Type	(0008,0068)	CS	1	FOR PRESENTATION

3.2.2.3.3.5 General Equipment Module

Attribute Name	Tag	VR	Type	Value
Manufacturer	(0008,0070)	LO	2	medigration
Institution Name	(0008,0080)	LO	3	Institution where the equipment that produced the composite instances is located. Configurable.
Institution Address	(0008,0081)	ST	3	Mailing address of the institution where the equipment that produced the composite instances is located. Configurable.
Station Name	(0008,1010)	SH	3	User defined name identifying the machine that produced the composite instances. Configurable.
Manufacturer's Model Name	(0008,1090)	LO	3	Manufacturer's model name of the equipment that produced the composite instances.
Device Serial Number	(0018,1000)	LO	3	Manufacturer's serial number of the equipment that produced the composite instances.
Software Versions	(0018,1020)	LO	3	Manufacturer's designation of software version of the equipment that produced the composite instances.
Date of Last Calibration	(0018,1200)	DA	3	Date when the image acquisition device calibration was last changed.
Time of Last Calibration	(0018,1201)	TM	3	Time when the image acquisition device calibration was last changed.

3.2.2.3.3.6 General Image Module

Attribute Name	Tag	VR	Type	Value
Instance Number	(0020,0013)	IS	2	
Patient Orientation	(0020,0020)	CS	2C	
Content Date	(0008,0023)	DA	2C	The date the image pixel data creation started.
Content Time	(0008,0033)	TM	2C	The time the image pixel data creation started.
Image Type	(0008,0008)	CS	1	Siehe Abschnitt 3.2.2.3.3.9
Acquisition Date	(0008,0022)	DA	3	The date the acquisition of data that resulted in this image started.
Acquisition Time	(0008,0032)	TM	3	The time the acquisition of data that resulted in this image started.
Image Comments	(0020,4000)	LT	3	User-defined comments about the image.
Quality Control Image	(0028,0300)	CS	3	Indicates whether or not this image is a quality control or phantom image. YES NO
Burned In Annotation	(0028,0301)	CS	1	Siehe Abschnitt 3.2.2.3.3.9 .
Lossy Image Compression	(0028,2110)	CS	1	Siehe Abschnitt 3.2.2.3.3.9 .

3.2.2.3.3.7 Image Pixel Module

Attribute Name	Tag	VR	Type	Value
Samples per Pixel	(0028,0002)	US	1	1
Photometric Interpretation	(0028,0004)	CS	1	MONOCHROME 1
Rows	(0028,0010)	US	1	Number of rows in the image.
Columns	(0028,0011)	US	1	Number of columns in the image.
Bits Allocated	(0028,0100)	US	1	16
Bits Stored	(0028,0101)	US	1	14
High Bit	(0028,0102)	US	1	13
Pixel Representation	(0028,0103)	US	1	0
Pixel Data	(7FE0,0010)	OB	1	
Pixel Aspect Ratio	(0028,0034)	IS	1C	1\1

3.2.2.3.3.8 DX Anatomy Imaged Module

Attribute Name	Tag	VR	Type	Value
Image Laterality	(0020,0062)	CS	1	Laterality of (possibly paired) body part examined. R = right L = left U = unpaired B = both left and right
Anatomic Region Sequence	(0008,2218)	SQ	2	

3.2.2.3.3.9 DX Image Module

Attribute Name	Tag	VR	Type	Value
Image Type	(0008,0008)	CS	1	ORIGINAL\PRIMARY\
Samples per Pixel	(0028,0002)	US	1	Siehe Abschnitt 3.2.2.3.3.6
Photometric Interpretation	(0028,0004)	CS	1	Siehe Abschnitt 3.2.2.3.3.6
Bits Allocated	(0028,0100)	US	1	Siehe Abschnitt 3.2.2.3.3.6
Bits Stored	(0028,0101)	US	1	Siehe Abschnitt 3.2.2.3.3.6
High Bit	(0028,0102)	US	1	Siehe Abschnitt 3.2.2.3.3.6
Pixel Representation	(0028,0103)	US	1	Siehe Abschnitt 3.2.2.3.3.6
Pixel Intensity Relationship	(0028,1040)	CS	1	LIN
Pixel Intensity Relationship Sign	(0028,1041)	SS	1	1
Rescale Intercept	(0028,1052)	DS	1	0
Rescale Slope	(0028,1053)	DS	1	1
Rescale Type	(0028,1054)	LO	1	US
Presentation LUT Shape	(2050,0020)	CS	1	INVERSE
Lossy Image Compression	(0028,2110)	CS	1	00
Patient Orientation	(0020,0020)	CS	1	
Calibration Image	(0050,0004)	CS	3	NO
Burned In Annotation	(0028,0301)	CS	1	NO
Window Center	(0028,1050)	DS	1C	Window Center for display.
Window Width	(0028,1051)	DS	1C	Window Width for display.

3.2.2.3.3.10 DX Detector Module

Attribute Name	Tag	VR	Type	Value
Detector Type	(0018,7004)	CS	2	DIRECT
Detector Configuration	(0018,7005)	CS	3	AREA
Detector Description	(0018,7006)	LT	3	
Detector Mode	(0018,7008)	LT	3	
Detector ID	(0018,700A)	CS	3	
Date of Last Detector Calibration	(0018,700C)	DA	3	
Time of Last Detector Calibration	(0018,700E)	TM	3	
Detector Active Time	(0018,7014)	DS	3	
Detector Conditions Nominal Flag	(0018,7000)	CS	3	
Detector Temperature	(0018,7001)	DS	3	
Imager Pixel Spacing	(0018,1164)	DS	1	
Detector Element Physical Size	(0018,7020)	DS	3	
Detector Active Shape	(0018,7024)	CS	3	
Detector Active Dimension(s)	(0018,7026)	DS	3	
Detector Manufacturer Name	(0018,702A)	CS	3	
Detector Manufacturer's Model Name	(0018,702B)	CS	3	

3.2.2.3.3.11 Acquisition Context Module

Attribute Name	Tag	VR	Type	Value
AcquisitionContextSequence	(0040,0555)	SQ	2	

3.2.2.3.3.12 SOP Common Module

Attribute Name	Tag	VR	Type	Value
SOP Class UID	(0008,0016)	UI	1	1.2.840.10008.5.1.4.1.1.1.1
SOP Instance UID	(0008,0018)	UI	1	Uniquely identifies the SOP Instance.
Specific Character Set	(0008,0005)	CS	1C	ISO_IR 100

3.2.2.3.3.13 X-Ray Acquisition Dose Module

Attribute Name	Tag	VR	Type	Value
KVP	(0018,0060)	DS	2	Peak kilo voltage output of the X-Ray generator used.
X-Ray Tube Current	(0018,1151)	IS	2C	X-Ray Tube Current in mA.
Exposure Time	(0018,1150)	IS	2C	Duration of X-Ray exposure in msec.
Exposure	(0018,1152)	IS	2C	The exposure expressed in mAs.
Distance Source to Detector	(0018,1110)	DS	3	Distance in mm from source to detector center.
Grid	(0018,1166)	CS	3	
Imager Pixel Spacing	(0018,1164)	DS	1	Siehe Abschnitt 3.2.2.3.3.10
Focal Spot	(0018,1190)	DS	3	Nominal focal spot size in mm used to acquire this image.
Image Area Dose Product	(0018,115E)	DS	3	X-Ray dose, measured in dGy*cm², to which the patient was exposed for the acquisition of this image.

3.2.2.3.3.14 X-Ray Filtration Module

Attribute Name	Tag	VR	Type	Value
Filter Type	(0018,1160)	SH	3	STRIP WEDGE BUTTERFLY MULTIPLE NONE

3.2.2.3.3.15 DX Positioning Module

Attribute Name	Tag	VR	Type	Value
View Position	(0018,5101)	CS	3	Radiographic view of the image relative to the imaging subject's orientation.
Distance Source to Detector	(0018,1110)	DS	3	Siehe Abschnitt 3.2.2.3.3.13 .
Positioner Type	(0018,1508)	CS	2	CARM COLUMN MAMMOGRAPHIC PANORAMIC CEPHALOSTAT RIGID NONE
Positioner Primary Angle	(0018,1510)	DS	3	Position of the X-Ray beam about the patient from the RAO to LAO direction where movement from RAO to vertical is positive, if Positioner Type (0018,1508) is CARM.
Detector Primary Angle	(0018,1530)	DS	3	Angle of the X-Ray beam in the row direction in degrees relative to the normal to the detector plane. Positive values indicate that the X-Ray beam is tilted toward higher numbered columns. Negative values indicate that the X-Ray beam is tilted toward lower numbered columns.

3.2.2.3.3.16 X-Ray Generation Module

Attribute Name	Tag	VR	Type	Value
Exposure Control Mode	(0018,7060)	CS	3	AUTOMATIC MANUAL
Exposure Control Mode Description	(0018,7062)	LT	3	
Exposure Status	(0018,7064)	CS	3	NORMAL ABORTED

3.2.2.4 Association Termination

The association will be released upon receipt of the C-STORE-RSP message for the last sent image or upon receipt of refused or unknown status code.

If the peer AE aborts the association prematurely, all unsent SOP Instances are considered failed.

3.2.3 User initiated Print (Dicom Option)

3.2.3.1 Associated Real-World Activity

An operator can initiate printing images to a remote application entity. The associated local real-world activity is **User Print** and the remote real world activity is **Print**.

3.2.3.2 Proposed Presentation Contexts

A single presentation context will be proposed for *user initiated print* as shown in Table 6.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

Table 6: Proposed presentation context for print

3.2.3.3 SOP Specific Conformance

3.2.3.3.1 Basic Grayscale Print Management

Digiroebs supports the SOP classes defined by the Basic Grayscale Print Management Meta SOP Class listed in the following table.

SOP Class Name	SOP Class UID
Basic Film Session	1.2.840.10008.5.1.1.1
Basic Film Box	1.2.840.10008.5.1.1.2
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4
Printer	1.2.840.10008.5.1.1.16

Table 7: SOP Classes of Basic Grayscale Print Management Meta SOP Class

The SOP specific conformance of the classes listed above is described in the subsequent sections.

3.2.3.3.2 Basic Film Session

3.2.3.3.2.1 Supported DIMSE Services

Name	Usage	Description
N-CREATE	M/M	Creates a new film session.
N-SET	U/M	Updates attribute values of the film session.
N-DELETE	U/M	Deletes the film session including all associated film boxes, images and annotations.
N-ACTION	U/U	Sending of the N-ACTION will command the SCP to print all films of the film session.

Table 8: Supported DIMSE Services for Basic Film Session

3.2.3.3.2.2 Supported SOP Class Elements

Attribute Name	Tag	Valid Range
Number of Copies	(2000,0010)	1 - 999
Print Priority	(2000,0020)	LOW MED HIGH
Medium Type	(2000,0030)	Up to 16 characters.
Film Destination	(2000,0040)	MAGAZINE PROCESSOR
Film Session Label	(2000,0050)	Up to 64 characters.

Table 9: Supported SOP Class Elements for Basic Film Session

3.2.3.3.3 Basic Film Box

3.2.3.3.3.1 Supported DIMSE Services

Name	Usage	Description

N-CREATE	M/M	Creates a new film box.
N-SET	U/M	Updates attribute values of the film box.
N-DELETE	U/M	Deletes the film box including all associated images and annotations.
N-ACTION	U/U	Sending of the N-ACTION will command the SCP to print all films of the film box.

Table 10: Supported DIMSE Services for Basic Film Box

3.2.3.3.3.2 Supported SOP Class Elements

Attribute Name	Tag	Valid Range
Image Display Format	(2010,0010)	Details below.
Annotation Display Format Id	(2010,0030)	Values from configuration file.
Film Orientation	(2010,0040)	PORTRAIT LANDSCAPE
Film Size Id	(2010,0050)	Values from configuration file. Details below.
Magnification Type	(2010,0060)	BILINEAR[1]
Smoothing Type	(2010,0080)	ignored
Border Density	(2010,0100)	BLACK , WHITE or an integer number (hundreds of OD).
Empty Image Display Density	(2010,0110)	BLACK , WHITE or an integer number (hundreds of OD).
Min Density	(2010,0120)	must be >= than configured min density and <= than max density and <= than configured max density
Max Density	(2010,0130)	must be <= than configured max density and >= than min density and >= than configured min density
Trim	(2010,0140)	YES, NO
Configuration Information	(2010,0150)	Values from configuration file[1]. Details below.
Illumination	(2010,015E)	0 – 10000

[1] Value can be ignored.

Reflected Ambient Light	(2010,0160)	0
Referenced Film Session Sequence	(2010,0500)	---
> Referenced SOP Class UID	(0008,1150)	1.2.840.10008.5.1.1.1
> Referenced SOP Instance UID	(0008,1155)	SOP Instance UID from creation of Basic Film Session.
Referenced Image Box Sequence	(2010,0510)	---
> Referenced SOP Class UID	(0008,1150)	1.2.840.10008.5.1.1.4 or 1.2.840.10008.5.1.1.4.1
> Referenced SOP Instance UID	(0008,1155)	---

Table 11: Supported SOP Class Elements for Basic Film Box

Image Display Format

DICOM defines the Image Display Formats **STANDARD**, **ROW**, **COL**, **SLIDE**, **SUPERSLIDE** and **CUSTOM**. Digiroebs only supports the layout STANDARD.

3.2.3.3.4 Basic Grayscale Image Box

3.2.3.3.4.1 Supported DIMSE Services

Name	Usage	Description
N-SET	M/M	Updates attribute values of the image box.

Table 12: Supported DIMSE Services for Basic Grayscale Image Box

3.2.3.3.4.2 Supported SOP Class Elements

Attribute Name	Tag	Valid Range
Magnification Type	(2010,0060)	BILINEAR
Smoothing Type	(2010,0080)	ignored

Min Density	(2010,0120)	ignored
Max Density	(2010,0130)	ignored
Image Position	(2020,0010)	1 - max number of images for Image Display Format
Polarity	(2020,0020)	NORMAL REVERSE
Requested Image Size	(2020,0030)	ignored
Basic Grayscale Image Sequence	(2020,0110)	---
>Samples Per Pixel	(0028,0002)	1
>Photometric Interpretation	(0028,0004)	MONOCHROME1 MONOCHROME 1 MONOCHROME2 MONOCHROME 2
>Rows	(0028,0010)	0 < Rows < 10000
>Columns	(0028,0011)	0 < Columns < 10000
>Pixel Aspect Ratio	(0028,0034)	Any pair of valid positive integers (1 to 2^{15}-1).
>Bits Allocated	(0028,0100)	8 or 16
>Bits Stored	(0028,0101)	8 or 12
>High Bit	(0028,0102)	BitsStored-1
>Pixel Representation	(0028,0103)	0 = unsigned
>Pixel Data	(7FE0,0010)	---

Table 13: Supported SOP Class Elements for Basic Grayscale Image Box

3.2.3.3.5 Printer

3.2.3.3.5.1 Supported DIMSE Services

Name	Usage	Description
N-EVENT-REPORT	M/M	The N-EVENT-REPORT is used to report the changes of the printer status in an asynchronous way.

N-GET	U/M	The N-GET is used to retrieve information about the printer.

Table 14: Supported DIMSE Services for Printer

3.2.3.3.5.2 Supported SOP Class Elements

Attribute Name	Tag	Valid Range
Printer Status	(2110,0010)	NORMAL WARNING FAILURE
Printer Status Info	(2110,0020)	
Printer Name	(2110,0030)	
Manufacturer	(0008,0070)	
Manufacturer's Model Name	(0008,1090)	
Device Serial Number	(0018,1000)	
Software Version(s)	(0018,1020)	
Date of Last Calibration	(0018,1200)	
Time of Last Calibration	(0018,1201)	

Table 15: Supported SOP Class Elements for Printer

3.2.4 Operator initiated query for Modality Worklist

3.2.4.1 Associated Real-World Activity

An operator can initiate sending a worklist query request to a remote application entity. The associated local real-world activity is **Query** and the remote real world activity is **Query Worklist**.

3.2.4.2 Proposed Presentation Contexts

One presentation context will be proposed for **operator initiated query for modality**

worklist as outlined in Table 16.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 16: Proposed presentation contexts for operator initiated query for modality worklist

3.2.4.3 SOP Specific Conformance

3.2.4.3.1 Status codes for C-FIND

The behavior when receiving C-FIND response status codes is shown in Table 17.

Status Code	Meaning	Behavior when receiving status code
	Any other status code not included in this table	The **Query** activity will be terminated. An error message will be recorded in a log file.
Cxxx	Failed operation.	
0000	Success	The **Query** activity will be terminated. The results will be displayed on a user interface.
FFxx	Pending	The **Query** activity will be continued.

Table 17: Behavior when receiving C-STORE response status codes (operator initiated)

Extended negotiation is not supported for the **Query** Real-World Activity.

3.2.4.3.2 Supported DICOM Elements

The DICOM attributes sent in a C-FIND-RQ are listed in Table 18.

Name / Module	Tag	Description
SOP Common		
Specific Character Set	(0008,0005)	
Scheduled Procedure Step		

Scheduled Procedure Step Sequence	(0040,0100)	
>Scheduled Station AE Title	(0040,0001)	
>Scheduled Procedure Step Start Date	(0040,0002)	Current date.
>Scheduled Procedure Step Start Time	(0040,0003)	
>Modality	(0008,0060)	DX
Requested Procedure		
Requested Procedure Description	(0032,1060)	
Study Instance UID	(0020,000D)	
Imaging Service Request		
Accession Number	(0008,0050)	
Referring Physician's Name	(0008,0090)	
Patient Identification		
Patient's Name	(0010,0010)	
Patient ID	(0010,0020)	
Patient Demographic		
Patient's Birth Date	(0010,0030)	
Patient's Sex	(0010,0040)	

Table 18: Dicom attributes for Modality Worklist

3.2.5 Operator initiated Sending of Study Results

3.2.5.1 Associated Real-World Activity

An operator can initiate sending modality performed procedure steps to a remote application entity. The associated local real-world activity is **Send Study Result** and the remote real world activity is **Receive Study Result**.

3.2.5.2 Proposed Presentation Contexts

One presentation context will be proposed for **operator initiated sending of study results** as outlined in Table 19.

Presentation Context Table			
Abstract Syntax	**Transfer Syntax**	**Role**	**Extended**

Name	UID	Name	UID		Negotiation
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 19: Proposed presentation contexts for operator initiated sending of study results

3.2.5.3 SOP Specific Conformance

3.2.5.3.1 N-CREATE attributes

The DICOM attributes sent in a N-CREATE-RQ are listed in Table 20.

Name / Module	Tag	Description
SOP Common		
Specific Character Set	(0008,0005)	ISO_IR 100
SOP Instance UID	(0008,0018)	
Performed Procedure Step Relationship		
Scheduled Step Attribute Sequence	(0040,0270)	
>Study Instance UID	(0020,000D)	Study Instance UID of the study to be performed.
>Referenced Study Sequence	(0008,1110)	empty
>Accession Number	(0008,0050)	
>Requested Procedure ID	(0040,1001)	
>Requested Procedure Description	(0032,1060)	
>Scheduled Procedure Step ID	(0040,0009)	
>Scheduled Procedure Step Description	(0040,0007)	
>Scheduled Protocol Code Sequence	(0040,0008)	empty
Patient's Name	(0010,0010)	
Patient ID	(0010,0020)	
Patient's Birth Date	(0010,0030)	
Patient's Sex	(0010,0040)	
Referenced Patient Sequence	(0008,1120)	empty

Performed Procedure Step Information		
Performed Procedure Step ID	(0040,0253)	
Performed Station AE Title	(0040,0241)	AE Title of DigiRoebs
Performed Station Name	(0040,0242)	configurable
Performed Location	(0040,0243)	configurable
Performed Procedure Step Start Date	(0040,0244)	
Performed Procedure Step Start Time	(0040,0245)	
Performed Procedure Step End Date	(0040,0250)	empty
Performed Procedure Step End Time	(0040,0251)	empty
Performed Procedure Step Status	(0040,0252)	IN PROGRESS
Performed Procedure Step Description	(0040,0254)	
Performed Procedure Type Description	(0040,0255)	
Procedure Code Sequence	(0008,1032)	empty
Image Acquisition Results		
Modality	(0008,0060)	DX
Study ID	(0020,0010)	
Performed Protocol Code Sequence	(0040,0260)	empty
Performed Series Sequence	(0040,0340)	empty

Table 20: DICOM attributes sent in a N-CREATE-RQ

3.2.5.3.2 N-SET attributes

The DICOM attributes sent in a N-SET-RQ are listed in Table 21.

Name / Module	Tag	Description
SOP Common		
SOP Instance UID	(0008,0018)	
Performed Procedure Step Information		

Performed Procedure Step Status	(0040,0252)	COMPLETED or DISCONTINUED
Performed Procedure Step Description	(0040,0254)	
Performed Procedure Type Description	(0040,0255)	
Procedure Code Sequence	(0008,1032)	empty
Performed Procedure Step End Date	(0040,0250)	
Performed Procedure Step End Time	(0040,0251)	
Image Acquisition Results		
Performed Protocol Code Sequence	(0040,0260)	empty
Performed Series Sequence	(0040,0340)	Includes all the series performed.
>Performing Physician's Name	(0008,1050)	
>Protocol Name	(0018,1030)	
>Operator's Name	(0008,1070)	
>Series Instance UID	(0020,000E)	
>Series Description	(0008,103E)	
>Retrieve AE Title	(0008,0054)	
>Referenced Image Sequence	(0008,1140)	Includes all the images performed for this series.
>>Referenced SOP Class UID	(0008,1150)	
>>Referenced SOP Instance UID	(0008,1155)	
Radiation Dose		
Total Time of Fluoroscopy	(0040,0300)	Total duration of X-Ray exposure during fluoroscopy in seconds (pedal time) during this Performed Procedure Step.
Total Number of Exposures	(0040,0301)	Total number of exposures made during this Performed Procedure Step.
Distance Source to Detector	(0018,1110)	Distance in mm from the source to detector center.

Distance Source to Entrance	(0040,0306)	Distance in mm from the source to the surface of the patient closest to the source during this Performed Procedure Step. **Note**: This may be an estimated value based on assumptions about the patient's body size and habitus.
Entrance Dose	(0040,0302)	Average entrance dose value measured in dGy at the surface of the patient during this Performed Procedure Step. **Note**: This may be an estimated value based on assumptions about the patient's body size and habitus.
Entrance Dose in mGy	(0040,8302)	Average entrance dose value measured in mGy at the surface of the patient during this Performed Procedure Step. **Note**: This may be an estimated value based on assumptions about the patient's body size and habitus.
Exposed Area	(0040,0303)	Typical dimension of the exposed area at the detector plane. If Rectangular: row dimension followed by column; if Round: diameter. Measured in mm. **Note**: This may be an estimated value based on assumptions about the patient's body size and habitus.
Image Area Dose Product	(0018,115E)	Total area-dose-product to which the patient was exposed, accumulated over the complete Performed Procedure Step and measured in dGy*cm*cm, including fluoroscopy. **Notes**: 1. The sum of the Image Area Dose Product of all images of a Series or a Study may not result in the actual area dose product to which the patient was exposed. 2. This may be an estimated value based on assumptions about the patient's body size and habitus.

Comments on Radiation Dose	(0040,0310)	User-defined comments on any special conditions related to radiation dose encountered during this Performed Procedure Step.
Exposure Dose Sequence	(0040,030E)	Exposure Dose Sequence will contain Total Number of Exposures (0040, 0301) items plus an item for each fluoroscopy episode not already counted as an exposure.
>Radiation Mode	(0018,115A)	Specifies X-Ray radiation mode. Enumerated Values: CONTINUOUS PULSED
>KVp	(0018,0060)	Peak kilo voltage output of the x-ray generator used. An average in the case of fluoroscopy (continuous radiation mode).
>X-ray Tube Current in µA	(0018,8151)	X-ray Tube Current in µA. An average in the case of fluoroscopy (continuous radiation mode).
>Exposure Time	(0018,1150)	Time of x-ray exposure or fluoroscopy in msec.
>Filter Type	(0018,1160)	Type of filter(s) inserted into the X-Ray beam (e.g. wedges).
>Filter Material	(0018,7050)	The X-Ray absorbing material used in the filter. May be multi-valued.

Table 21: DICOM attributes sent in a N-CREATE-RQ

Extended negotiation is not supported for the **Send Study Result** Real-World Activity.

3.3 Association Acceptance Policy

Digiroebs will not accept any dicom associations.

4 Communication Profiles

4.1 Supported Communication Stacks

TCP/IP Network Communication is supported as defined in PS 3.8.

4.1.1 TCP/IP Stack

The TCP/IP stack is inherited from the underlying operating system.

4.1.1.1 Physical Network Media Support

No dependency exists on the physical network medium over which TCP/IP executes. The supported physical network media are inherited from the underlying operating system. Typical physical network media options include 10BASE-T Ethernet, 100BASE-TX Ethernet, FDDI and ATM.

5 Configuration

The following DICOM-related network parameters are configurable by the user via a graphical user interface:

- The title of the Digiroebs Application Entity.
- The AE Titles, IP Addresses and Port Numbers for all peer application entities. These parameters must be configured before associations can be initiated.
- Support by peer application entities for the Verification SOP Class. If supported, a connectivity test can be performed upon user request.
- The preferred transfer syntax for each peer application entity.

The following DICOM-related network parameters are configurable by a field service engineer for the all local activities:

- General association inactivity timeout (default 1800 seconds).
- Timeout waiting for a DIMSE request (default 1200 seconds).
- Timeout waiting for a DIMSE response (default 300 seconds).
- Maximum size of a received PDU (default 16KB).

6 Support of Extended Character Sets

The following extended character sets are supported:

ISO-IR 100 Latin Alphabet Supplementary Set No. 1 (ISO 8859-1)

Note: The DICOM default character set (ISO-IR 6) is a subset of ISO-IR 100.