exocad

exoplan

DICOM Conformance Statement

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Content

1 Introduction

The exoplan application capable of loading CT Image DICOM objects. This DICOM Conformance Statement specifies in detail how the application uses and interprets the DICOM fields.

1.1 Intended Audience

This DICOM Conformance Statement is intended for

- existing or potential users of the exoplan application;

It is assumed that the reader of this Conformance Statement is familiar with the DICOM standard and the common DICOM terms and expressions.

1.2 References

Digital Imaging and Communications in Medicine (DICOM) standard by the National Electrical Manufacturers Association (NEMA). PS3.x-2008

1.3 Definitions

AE	DICOM Application Entity
DICOM	Digital Imaging and Communications in Medicine. A standard developed by the American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA) for the electronic transfer of digital images and associated information.
IOD	DICOM Information Object Definition
PDU	Protocol Data Unit
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
UID	Unique Identifier
Type	Data Element Type (in DICOM module description) 1 – Required Data Elements – element shall be included, have value, no zero length 1C – Conditional Data Elements - element shall be included, have value, no zero length under certain conditions 2 - Mandatory element, zero value length and no value allowed 2C - Mandatory element, zero value length and no value allowed under certain conditions 3 – Optional element
PS3.3	DICOM PS3.3 2015c - Information Object Definitions

1.4 Note to the reader

This Conformance Statement in itself does not guarantee for correct interoperability. Though compatibility with the DICOM standard has been thoroughly tested, interoperability conflicts may arise when using the application with other devices. Interoperability does not lie within the scope of the DICOM standard.

2 Overview and General Definitions

The following sections define general items and terms, which are used later on in this conformance statement.

2.1 Supported SOP Class UIDs

The application is able to accept the following DICOM Objects:

DICOM Object	SOP Class UID	Role of the Application
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	SCP (Import)
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	SCP (Import)
Legacy Converted Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.2	SCP (Import): not supported.
X-Ray 3D Craniofacial Image Storage	1.2.840.10008.5.1.4.1.1.13.1.2	SCP (Import)

2.2 Supported Transfer Syntaxes

The application is supports the following Transfer Syntaxes as per tag (0002, 0010), Transfer Syntax UID:

Transfer Syntax UID	UID Name	Role of the Application
1.2.840.10008.1.2	Implicit VR Little Endian: (Default Transfer Syntax for DICOM)	SCP (Import)
1.2.840.10008.1.2.1	Explicit VR Little Endian	SCP (Import)
1.2.840.10008.1.2.2	Explicit VR Big Endian (Retired)	SCP (Import)

3 Information Object Usage

The application is able to import DICOM CT Image Objects, Enhanced CT Image Objects and X-Ray 3D Craniofacial Image Objects with equidistant images to construct a volumetric dataset on orthogonal, regular, Cartesian coordinate system.

3.1 CT Image Information Object

The following table provides information about the usage of the respective attributes:

Attribute Name	Tag	VR	Type	Comments
Specific Character Set	(0008,0005)	CS	1C	The following character sets are supported: Latin alphabet No. 1, ISO_IR 100, Cyrillic, ISO_IR 144 Greek, ISO_IR 126 Arabic, ISO_IR 127 Hebrew, ISO_IR 138 Unicode in UTF-8, ISO_IR 192
Image Type	(0008,0008)	CS	1	Parsed for "AXIAL" from first slice (delivered by OS), used for display on the user interface; AXIAL shall be 3rd value of image type
SOP Class UID	(0008,0016)	UI	1	Must be 1.2.840.10008.5.1.4.1.1.2
SOP Instance UID	(0008,0018)	UI	1	Used to reference the CT data in report files.
Study Date	(0008,0020)	DA	2	Used for display purpose; not displayed if empty.
Series Date	(0008,0021)	DA	3	Used for display on the user interface
Study Time	(0008,0030)	TM	2	Used for display purpose; not displayed if empty.
Series Time	(0008,0031)	TM	3	Used for display on the user interface
Accession Number	(0008,0050)	SH	2	Used for display on the user interface
Modality	(0008,0060)	CS	1	Shall be "CT"
Station Name	(0008,1010)	SH	3	- not used -
Study Description	(0008,1030)	LO	3	Used for display on the user interface
Series Description	(0008,103E)	LO	3	Used for display on the user interface
Patient's Name	(0010,0010)	PN	2	Used for display on the user interface
Patient ID	(0010,0020)	LO	2	Used for display on the user interface
Patient's Birth Date	(0010,0030)	DA	2	Used for display on the user interface
Patient's Sex	(0010,0040)	CS	2	Used for display on the user interface
Slice Thickness	(0018,0050)	DS	2	- not used -
Gantry/Detector Tilt	(0018,1120)	DS	3	Shall be 0.0 if provided, may be missing or empty.
Patient Position	(0018,5100)	CS	2C	- not used -
Study Instance UID	(0020,000D)	UI	1	Used to identify all files of a study

Attribute Name	Tag	VR	Type	Comments
Series Instance UID	(0020,000E)	UI	1	Used to identify all the files of a series.
Patient Orientation	(0020,0020)	CS	2C	- not used -
Image Position (Patient)	(0020,0032)	DS	1	Used to define (z-) position (in coordinate system defined by Image Orientation) of the slice, used to verify that all the slices have equal (tolerance 1/1000 mm) distance; derive z- pixel size from slice distance.
Image Orientation (Patient)	(0020,0037)	DS	1	Used for determination of the orientation of the image plane in DICOM coordinate system (ref. Image Position)
Slice Location	(0020,1041)	DS	3	- not used -
Samples per Pixel	(0028,0002)	US	1	Shall be '1'
Photometric Interpretation	(0028,0004)	CS	1	Shall be MONOCHROME2
Planar Configuration	(0028,0006)	US	1C	- not used -
Frame Increment Pointer	(0028,0009)	IS	1	- not used -
Rows	(0028,0010)	US	1	Used to determine pixel matrix dimensions
Columns	(0028,0011)	US	1	Used to determine pixel matrix dimensions
Pixel Spacing	(0028,0030)	DS	1	Used to define (x-, y-) pixel size.
Pixel Aspect Ratio	(0028,0034)	IS	1C	- not used -
Bits Allocated	(0028,0100)	US	1	Used to decode pixel data. Shall be '16'
Bits Stored	(0028,0101)	US	1	Used to decode pixel data. Shall be lower or equal to Bits Allocated
High Bit	(0028,0102)	US	1	Used to decode pixel data. Shall be equal to Bits Stored-1.
Pixel Representation	(0028,0103)	US	1	Interpreted.
Window Center	(0028,1050)	DS	1C	Used to provide one or multiple preset value(s) selectable in the user interface for display of the pixel data in combination with Window Width and the explanation tag.
Window Width	(0028,1051)	DS	1C	Used to provide one or multiple preset value(s) selectable in the user interface for display of the pixel data in combination with Window Center and the explanation tag.
Rescale Intercept	(0028,1052)	DS	1	Used to compute CT grey – values (e.g. HU values if CT is calibrated) displayed on the user interface from stored pixel values
Rescale Slope	(0028,1053)	DS	1	Used to compute CT grey – values (e.g. HU values if CT is calibrated) displayed on the user interface from stored pixel values

Attribute Name	Tag	VR	Type	Comments
Rescale Type	(0028,1054)	LO	1C	- not used -
Window Center & Width Explanation	(0028,1055)	LO	3	Used to provide a name of a window and width preset in the user interface (if present)
Pixel Data	(7FE0,0010)	OW	1	CT Image grey-values

3.2 Enhanced CT Image Information Object

The following table provides information about the usage of the respective attributes:

Attribute Name	Tag	VR	Type	Comments
Specific Character Set	(0008,0005)	CS	1C	The following character sets are supported: Latin alphabet No. 1, ISO_IR 100, Cyrillic, ISO_IR 144 Greek, ISO_IR 126 Arabic, ISO_IR 127 Hebrew, ISO_IR 138 Unicode in UTF-8, ISO_IR 192
Image Type	(0008,0008)	CS	1	Value 1 shall be ORIGINAL or DERIVED; not verified. Value 2 shall be PRIMARY; not verified. Value 3 shall be VOLUME; presence of value is verified. Value 4 shall be NONE; not verified.
SOP Class UID	(0008,0016)	UI	1	Must be 1.2.840.10008.5.1.4.1.1.2.1
SOP Instance UID	(0008,0018)	UI	1	Used to reference the CT data in report files.
Study Date	(0008,0020)	DA	2	Used for display purpose; not displayed if empty.
Series Date	(0008,0021)	DA	3	Used for display on the user interface
Study Time	(0008,0030)	TM	2	Used for display purpose; not displayed if empty.
Series Time	(0008,0031)	TM	3	Used for display on the user interface
Accession Number	(0008,0050)	SH	2	Used for display on the user interface
Modality	(0008,0060)	CS	1	Shall be "CT"
Station Name	(0008,1010)	SH	3	- not used -
Study Description	(0008,1030)	LO	3	Used for display on the user interface
Series Description	(0008,103E)	LO	3	Used for display on the user interface
Patient's Name	(0010,0010)	PN	2	Used for display on the user interface
Patient ID	(0010,0020)	LO	2	Used for display on the user interface
Patient's Birth Date	(0010,0030)	DA	2	Used for display on the user interface
Patient's Sex	(0010,0040)	CS	2	Used for display on the user interface
CT Acquisition Details Sequence	(0018,9304)	SQ	1	---
> Gantry/Detector Tilt	(0018,1120)	DS	1C	Provided if Image Type is ORIGINAL. Shall be 0.0 if provided, may be missing or empty.
Patient Position	(0018,5100)	CS	2C	- not used -
Study Instance UID	(0020,000D)	UI	1	Used to identify all files of a study
Series Instance UID	(0020,000E)	UI	1	- not used -
Patient Orientation	(0020,0020)	CS	2C	- not used -
Samples per Pixel	(0028,0002)	US	1	Shall be '1'

Attribute Name	Tag	VR	Type	Comments
Photometric Interpretation	(0028,0004)	CS	1	Shall be MONOCHROME2
Planar Configuration	(0028,0006)	US	1C	- not used -
Number of Frames	(0028,0008)	IS	1	Used to read according number of frames from the file
Rows	(0028,0010)	US	1	Used to determine pixel matrix dimensions
Columns	(0028,0011)	US	1	Used to determine pixel matrix dimensions
Pixel Aspect Ratio	(0028,0034)	IS	1C	- not used -
Bits Allocated	(0028,0100)	US	1	Used to decode pixel data. Shall be '16'
Bits Stored	(0028,0101)	US	1	Used to decode pixel data. Shall be lower or equal to Bits Allocated
High Bit	(0028,0102)	US	1	Used to decode pixel data. Shall be equal to Bits Stored-1.
Pixel Representation	(0028,0103)	US	1	Interpreted.
Shared Functional Groups Sequence	(5200,9229)	SQ	1	---
>Pixel Measures Sequence	(0028,9110)	SQ	1	**---**
>> Slice Thickness	(0018,0050)	DS	2	- not used -
>>Pixel Spacing	(0028,0030)	DS	1	Used to define (x-, y-) pixel size.
>Pixel Value Transformation Sequence	(0028,9145)	SQ	1	---
>>Rescale Intercept	(0028,1052)	DS	1	Used to compute CT grey – values (e.g. HU values if CT is calibrated) displayed on the user interface from stored pixel values
>>Rescale Slope	(0028,1053)	DS	1	Used to compute CT grey – values (e.g. HU values if CT is calibrated) displayed on the user interface from stored pixel values
>>Rescale Type	(0028,1054)	LO	1C	- not used -
>Frame VOI LUT Sequence	(0028,9132)	SQ	1	The VOI LUT transformations applied to this frame.
>>Window Center	(0028,1050)	DS	1C	Used to provide one or multiple preset value(s) selectable in the user interface for display of the pixel data in combination with Window Width and the explanation tag.
>>Window Width	(0028,1051)	DS	1C	Used to provide one or multiple preset value(s) selectable in the user interface for display of the pixel data in combination with Window Center and the explanation tag.
>>Window Center & Width	(0028,1055)	LO	3	Used to provide a name of a window and width

Attribute Name	Tag	VR	Type	Comments
Explanation				preset in the user interface (if present)
Per-frame Functional Groups Sequence	(5200,9230)	SQ	1	---
>Plane Position Sequence	(0020,9113)	SQ	1	---
>>Image Position (Patient)	(0020,0032)	DS	1c	Used to define (z-) position (in coordinate system defined by Image Orientation) of each slice, used to verify that all the slices have equal (tolerance 1/1000 mm) distance; derive z- pixel size from slice distance.
>Plane Orientation Sequence	(0020,9116)	SQ	1	---
>>Image Orientation	(0020,0037)	DS	1	Used for determination of the orientation of the image plane in DICOM coordinate system (ref. Image Position)
Pixel Data	(7FE0,0010)	OW	1	CT Image grey-values

3.3 X-Ray 3D Craniofacial Information Object

The following table provides information about the usage of the respective attributes:

Attribute Name	Tag	VR	Type	Comments
Specific Character Set	(0008,0005)	CS	1C	The following character sets are supported: Latin alphabet No. 1, ISO_IR 100, Cyrillic, ISO_IR 144 Greek, ISO_IR 126 Arabic, ISO_IR 127 Hebrew, ISO_IR 138 Unicode in UTF-8, ISO_IR 192
Image Type	(0008,0008)	CS	1	Value 1 shall be ORIGINAL or DERIVED; not verified. Value 2 shall be PRIMARY; not verified. Value 3 shall be VOLUME; presence of value is verified. Value 4 shall be NONE; not verified.
SOP Class UID	(0008,0016)	UI	1	Must be 1.2.840.10008.5.1.4.1.1.13.1.2
SOP Instance UID	(0008,0018)	UI	1	Used to reference the CT data in report files.
Study Date	(0008,0020)	DA	2	Used for display purpose; not displayed if empty.
Series Date	(0008,0021)	DA	3	Used for display on the user interface
Study Time	(0008,0030)	TM	2	Used for display purpose; not displayed if empty.
Series Time	(0008,0031)	TM	3	Used for display on the user interface
Accession Number	(0008,0050)	SH	2	Used for display on the user interface
Modality	(0008,0060)	CS	1	Shall be "DX"
Station Name	(0008,1010)	SH	3	- not used -
Study Description	(0008,1030)	LO	3	Used for display on the user interface
Series Description	(0008,103E)	LO	3	Used for display on the user interface
Patient's Name	(0010,0010)	PN	2	Used for display on the user interface
Patient ID	(0010,0020)	LO	2	Used for display on the user interface
Patient's Birth Date	(0010,0030)	DA	2	Used for display on the user interface
Patient's Sex	(0010,0040)	CS	2	Used for display on the user interface
Patient Position	(0018,5100)	CS	2C	- not used -
Study Instance UID	(0020,000D)	UI	1	Used to identify all files of a study
Series Instance UID	(0020,000E)	UI	1	- not used -
Patient Orientation	(0020,0020)	CS	2C	- not used -
Samples per Pixel	(0028,0002)	US	1	Shall be '1'
Photometric Interpretation	(0028,0004)	CS	1	Shall be MONOCHROME2
Planar Configuration	(0028,0006)	US	1C	- not used -
Number of Frames	(0028,0008)	IS	1	Used to read according number of frames from the

Attribute Name	Tag	VR	Type	Comments
				file
Rows	(0028,0010)	US	1	Used to determine pixel matrix dimensions
Columns	(0028,0011)	US	1	Used to determine pixel matrix dimensions
Pixel Aspect Ratio	(0028,0034)	IS	1C	- not used -
Bits Allocated	(0028,0100)	US	1	Used to decode pixel data. Shall be '16'
Bits Stored	(0028,0101)	US	1	Used to decode pixel data. Shall be lower or equal to Bits Allocated
High Bit	(0028,0102)	US	1	Used to decode pixel data. Shall be equal to Bits Stored-1.
Pixel Representation	(0028,0103)	US	1	Interpreted.
Shared Functional Groups Sequence	(5200,9229)	SQ	1	---
>Pixel Measures Sequence	(0028,9110)	SQ	1	---
>> Slice Thickness	(0018,0050)	DS	2	- not used -
>>Pixel Spacing	(0028,0030)	DS	1	Used to define (x-, y-) pixel size.
>Pixel Value Transformation Sequence	(0028,9145)	SQ	1	---
>>Rescale Intercept	(0028,1052)	DS	1	Used to compute CT grey – values (e.g. HU values if CT is calibrated) displayed on the user interface from stored pixel values
>>Rescale Slope	(0028,1053)	DS	1	Used to compute CT grey – values (e.g. HU values if CT is calibrated) displayed on the user interface from stored pixel values
>>Rescale Type	(0028,1054)	LO	1C	- not used -
>Frame VOI LUT Sequence	(0028,9132)	SQ	1	The VOI LUT transformations applied to this frame.
>>Window Center	(0028,1050)	DS	1C	Used to provide one or multiple preset value(s) selectable in the user interface for display of the pixel data in combination with Window Width and the explanation tag.
>>Window Width	(0028,1051)	DS	1C	Used to provide one or multiple preset value(s) selectable in the user interface for display of the pixel data in combination with Window Center and the explanation tag.
>>Window Center & Width Explanation	(0028,1055)	LO	3	Used to provide a name of a window and width preset in the user interface (if present)
Per-frame Functional Groups Sequence	(5200,9230)	SQ	1	---

Attribute Name	Tag	VR	Type	Comments
>Plane Position Sequence	(0020,9113)	SQ	1	---
>>Image Position (Patient)	(0020,0032)	DS	1c	Used to define (z-) position (in coordinate system defined by Image Orientation) of each slice, used to verify that all the slices have equal (tolerance 1/1000 mm) distance; derive z- pixel size from slice distance.
>Plane Orientation Sequence	(0020,9116)	SQ	1	---
>>Image Orientation	(0020,0037)	DS	1	Used for determination of the orientation of the image plane in DICOM coordinate system (ref. Image Position)
Pixel Data	(7FE0,0010)	OW	1	CT Image grey-values