DICOM
Conformance Statement
CAAS Workstation

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1 Introduction

This document describes the DICOM interface for the Pie Medical Imaging BV CAAS product in terms of part 2 of the DICOM standard.

1.1 Revision history

Document Version	Date of Issue	Author	Description
1.0	May 01, 2013	Pie Medical Imaging BV	First release version
2.0	December 19, 2013	Pie Medical Imaging BV	Release version 7.1
3.0	December 5, 2014	Pie Medical Imaging BV	Release version 7.2
4.0	January 21, 2016	Pie Medical Imaging BV	Release version 7.3
5.0	September 22, 2016	Pie Medical Imaging BV	Release version 7.4
6.0	April 24, 2017	Pie Medical Imaging BV	Release version 7.5
7.0	October 30, 2017	Pie Medical Imaging BV	Release version 8.0
8.0	November 23, 2017	Pie Medical Imaging BV	Release version 8.0
9.0	May 15, 2018	Pie Medical Imaging BV	Release version 8.1
10.0	March 04, 2019	Pie Medical Imaging BV	Release version 8.2

1.2 Audience

This Conformance Statement is intended for:

- (Potential) customers
- Hospital staff
- Health system integrators
- Software designers implementing system interfaces

It is assumed that the reader is at least familiar with the DICOM standard.

1.3 Definitions Terms and Abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3 and PS 3.4.

The following acronyms and abbreviations are used in this document:

AE	Application Entity
ANSI	American National Standard Institute
AP	Application Profile
CD	Compact Disc
CD-R	CD-Recordable
CD-M	CD-Medical
CR	Computed Radiography
DICOM	Digital Imaging and Communications in Medicine
FSC	File-set Creator
FSR	File-set Reader
GUI	Graphic User Interface
HIS	Hospital Information System
IOD	Information Object Definition
IVUS	Intravascular Ultrasound
NEMA	National Electrical Manufacturers Association
OCT	Optical Coherence Tomography
PDF	Portable Document Format
SC	Secondary Capture
SOP	Service Object Pair
UID	Unique Identifier

XA X-Ray Angiographic

1.4 References

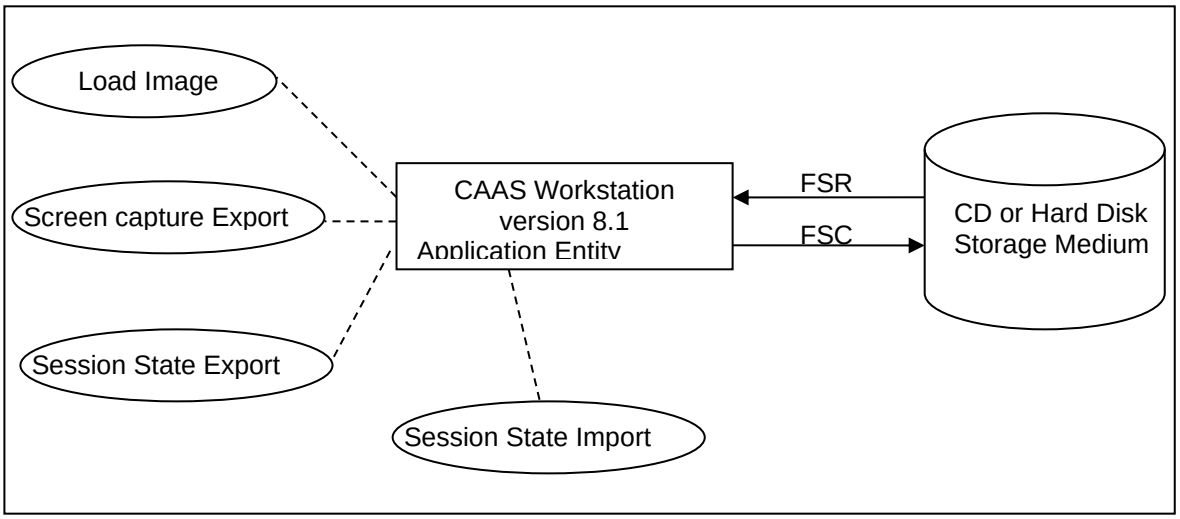
[DICOM] Digital Imaging and Communications in Medicine, Part 1 – 18
(NEMA PS 3.1– PS 3.18),
National Electrical Manufacturers Association (NEMA)
Publication Sales 1300 N. 17th Street, Suite 1847
Rosslyn, Virginia. 22209, United States of America
Internet: http://medical nema.org/
Note that at any point in time the official standard consists of the most recent yearly edition of the base standard (currently 2016) plus all the supplements and correction items that have been approved as Final Text.

2 Media Interchange

2.1 Implementation Model

CAAS Workstation version 8.2 is intended for Quantitative analysis of medical diagnostic Angiographic images of the human heart and peripheral vessels. It partly implements a DICOM Media Storage Service as a File-set Reader (FSR) and File-set Creator (FSC) at the DICOM file format level on CD-R, DVD, Hard disk or Network file shares. It does not support creation of media formats on specific physical media, or creation or interpretation of a DICOMDIR.

2.1.1 Application Data Flow



2.1.2 Functional Definitions of AE's

CAAS Workstation version 8.2 implements the following Real-World Activities (Functions):

- Existing DICOM File-sets can be loaded as FSR from Hard Disk, Media and network shares. These (multi-frame) images can be selected by the user through a file selection user interface. These files should be PS 3.10 compliant.
  Each file read is then displayed in a thumbnail view where instances may be selected for analysis.
- The AE can export screen captures as FSC of images under analysis on media. These files will be DICOM Datasets compliant to PS3.10.
- The AE can export session states as FSC in files on media. These files will be DICOM Datasets compliant to PS3.10.
- Existing session states can be loaded as FSR from Hard Disk, Media and network shares. These can be selected by the user through a file selection user interface. These files should be PS 3.10 compliant. Each file read results in a restored session state.

2.1.3 Sequencing of Real-World Activities

Images are selected by the user for import, or pushed to the application by means of a command-line interface. These images are then displayed and can be selected and analyzed.
During the analysis Screen captures can be saved to a storage medium in the form of DICOM Secondary Capture instances.
The analysis results can be saved as a multi-frame Screen capture of the on-screen report in the form of a DICOM Secondary Capture

2.2 AE Specifications

2.2.1 CAAS Workstation version 8.2

CAAS Workstation version 8.2 provides standard conformance to the Media Storage Service Class.

Application Profiles, Activities, and Roles for MEDIA-FSR

Application Profiles Supported	Real World Activity	Role
STD-GEN-CD	Load Image	FSR
	Screen Capture Export	FSC

Note: The application is media neutral and dependent on the underlying hardware. Any (non-secure) General Purpose Profile can be supported.

The following table specifies all supported SOP Classes and Transfer Syntaxes in the STD-GEN-CD profile.

SUPPORTED STD-GEN-CD SOP CLASSES AND TRANSFER SYNTAXES for X-Ray Read

Abstract Syntax		**Transfer Syntax**		
SOP Class	SOP Class UID	Name List	UID List	Role
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	FSR
		Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	FSR
		Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2	FSR
		Lossy JPEG image compression for 8-bit images.	1.2.840.10008.1.2.4.50	FSR
		Lossy JPEG image compression for 12-bit images.	1.2.840.10008.1.2.4.51	FSR
		JPEG Lossless, Non-Hierarchical compression	1.2.840.10008.1.2.4.57	FSR
		JPEG Lossless, Non-Hierarchical First-Order Prediction compression	1.2.840.10008.1.2.4.70	FSR
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	FSR
		Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	FSR
		Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2	FSR
		Lossy JPEG image compression for 8-bit images.	1.2.840.10008.1.2.4.50	FSR
		JPEG Lossless, Non-Hierarchical compression	1.2.840.10008.1.2.4.57	FSR

Abstract Syntax		**Transfer Syntax**		
SOP Class	SOP Class UID	Name List	UID List	Role
		Lossy JPEG image compression for 12-bit images.	1.2.840.10008.1.2.4.51	FSR
		JPEG Lossless, Non-Hierarchical First-Order Prediction compression	1.2.840.10008.1.2.4.70	FSR
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	FSR
		Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	FSR
		Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2	FSR
		Lossy JPEG image compression for 8-bit images.	1.2.840.10008.1.2.4.50	FSR
		Lossy JPEG image compression for 12-bit images.	1.2.840.10008.1.2.4.51	FSR
		JPEG Lossless, Non-Hierarchical compression	1.2.840.10008.1.2.4.57	FSR
		JPEG Lossless, Non-Hierarchical First-Order Prediction compression	1.2.840.10008.1.2.4.70	FSR

SUPPORTED STD-GEN-CD SOP CLASSES AND TRANSFER SYNTAXES for X-Ray Write

Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1	FSC
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Explicit VR Little Endian	1.2.840.10008.1.2.1	FSC

SUPPORTED STD-GEN-CD SOP CLASSES AND TRANSFER SYNTAXES for IVUS Read

IVUS Image Storage	1.2.840.10008.5.1.4.1.1.3.2	Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	FSR
		Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	FSR
		Lossy JPEG image compression for 8-bit images.	1.2.840.10008.1.2.4.50	FSR
		Lossy JPEG image compression for 12-bit images.	1.2.840.10008.1.2.4.51	FSR

		JPEG Lossless, Non-Hierarchical compression	1.2.840.10008.1.2.4.57	FSR
		JPEG Lossless, Non-Hierarchical First-Order Prediction compression	1.2.840.10008.1.2.4.70	FSR
Ultrasound Multi Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	FSR
		Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	FSR
		Lossy JPEG image compression for 8-bit images.	1.2.840.10008.1.2.4.50	FSR
		Lossy JPEG image compression for 12-bit images.	1.2.840.10008.1.2.4.51	FSR
		JPEG Lossless, Non-Hierarchical compression	1.2.840.10008.1.2.4.57	FSR
		JPEG Lossless, Non-Hierarchical First-Order Prediction compression	1.2.840.10008.1.2.4.70	FSR
Ultrasound Retired Multi Frame Image Storage	1.2.840.10008.5.1.4.1.1.3	Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	FSR
		Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	FSR
		Lossy JPEG image compression for 8-bit images.	1.2.840.10008.1.2.4.50	FSR
		Lossy JPEG image compression for 12-bit images.	1.2.840.10008.1.2.4.51	FSR
		JPEG Lossless, Non-Hierarchical compression	1.2.840.10008.1.2.4.57	FSR
		JPEG Lossless, Non-Hierarchical First-Order Prediction compression	1.2.840.10008.1.2.4.70	FSR
Multiframe True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	FSR
		Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	FSR

		Lossy JPEG image compression for 8-bit images.	1.2.840.10008.1.2.4.50	FSR
		Lossy JPEG image compression for 12-bit images.	1.2.840.10008.1.2.4.51	FSR
		JPEG Lossless, Non-Hierarchical compression	1.2.840.10008.1.2.4.57	FSR
		JPEG Lossless, Non-Hierarchical First-Order Prediction compression	1.2.840.10008.1.2.4.70	FSR

2.2.1.1 File Meta Information for the Application Entity

DICOM IMPLEMENTATION CLASS AND VERSION

Implementation Class UID	1.3.76.2.5
Implementation Version Name	DCM_GEN 3.45

2.2.1.2 Real World Activities

2.2.1.2.1 Activity – Load Image

The File Load activity is activated through the user interface or command line interface.

2.2.1.2.1.1 Application Profile Specific Conformance

There are no extensions or specializations.

2.2.1.2.2 Activity – Screen capture Export

The screen capture export is activated through the user interface.

2.2.1.2.2.1 Application Profile Specific Conformance

There are no extensions or specializations.

2.2.1.2.3 Activity – Report Export

The report export is activated through the user interface, a secondary capture containing a rendering of the results.

2.2.1.2.3.1 Application Profile Specific Conformance

There are no extensions or specializations.

2.2.1.2.4 Activity – Session State Export

The session state export is activated through the user interface, a secondary capture is saved containing private binary data with all information to reconstruct a session state.

2.2.1.2.4.1 Application Profile Specific Conformance

There are no extensions or specializations.

2.2.1.2.5 Activity – Session State Import

The session state import is activated through the user interface or command line. The secondary capture is read containing private binary data with all information to reconstruct a session state.

2.2.1.2.5.1 Application Profile Specific Conformance

There are no extensions or specializations.

2.3 Augmented and Private Profiles

2.3.1 Augmented Profiles

None.

2.3.2 Private Profiles

None.

2.4 MEDIA Configuration

None.

3 SUPPORT OF CHARACTER SETS

3.1 Overview

CAAS Workstation version 8.2 supports the following character sets:

Supported Specific Character Set Defined Terms

Character Set Description	Defined Term
Latin alphabet No. 1	ISO_IR 100
Latin alphabet No. 2	ISO_IR 101
Latin alphabet No. 3	ISO_IR 109
Latin alphabet No. 4	ISO_IR 110
Cyrillic	ISO_IR 144
Arabic	ISO_IR 127
Greek	ISO_IR 126
Hebrew	ISO_IR 138
Latin alphabet No. 5	ISO_IR 148
Unicode UTF-8	ISO_IR 192
Japanese	ISO_IR 13
Simplified Chinese (4 Byte)	GB18030
Default repertoire	ISO 2022 IR 6
Latin alphabet No. 1	ISO 2022 IR 100
Latin alphabet No. 2	ISO 2022 IR 101
Latin alphabet No. 3	ISO 2022 IR 109
Latin alphabet No. 4	ISO 2022 IR 110
Cyrillic	ISO 2022 IR 144
Arabic	ISO 2022 IR 127
Greek	ISO 2022 IR 126
Hebrew	ISO 2022 IR 138
Latin alphabet No. 5	ISO 2022 IR 148
Japanese	ISO 2022 IR 13
Thai	ISO 2022 IR 166
Japanese	ISO 2022 IR 87
Japanese	ISO 2022 IR 159
Korean	ISO 2022 IR 149

If all imported DICOM images in the analysis use the ISO-IR100 character set, then all string values in Secondary Capture Image Storage are encoded according to the ISO-IR100 character set. In case of one or more Japanese character set(s) then all string values in Secondary Capture Image Storage are encoded according the input character set(s). In all other circumstances, all string values in Secondary Capture Image Storage are encoded according to Unicode UTF-8 - ISO IR 192.

4 SECURITY

4.1 Security Profiles

None supported.

4.2 Association level security

None supported.

4.3 Application level security

None supported.

5 ANNEXES

5.1 IOD contents

5.1.1 Created SOP Instances

The applied modules for all IODs that can be created by CAAS Workstation version 8.2 are listed in the following tables:

5.1.1.1 MULTI-FRAME GRAYSCALE WORD SC IMAGE IOD MODULES

IE	Module	Reference	Usage
Patient	Patient	C.7.1.1	M
Study	General Study	C.7.2.1	M
Series	General Series	C.7.3.1	M
Equipment	General Equipment	C.7.5.1	U
	SC Equipment	C.8.6.1	M
Image	General Image	C.7.6.1	M
	Image Pixel	C.7.6.3	M
	Cine	C.7.6.5	C - Required if Frame Increment Pointer (0028,0009) is Frame Time (0018,1063) or Frame Time Vector (0018,1065)
	Multi-frame	C.7.6.6	M
	SC Multi-frame Image	C.8.6.3	M
	SOP Common	C.12.1	M

5.1.1.2 MULTI-FRAME TRUE COLOR SC IMAGE IOD MODULES

IE	Module	Reference	Usage
Patient	Patient	C.7.1.1	M
Study	General Study	C.7.2.1	M
Series	General Series	C.7.3.1	M
Equipment	General Equipment	C.7.5.1	U
	SC Equipment	C.8.6.1	M
Image	General Image	C.7.6.1	M
	Image Pixel	C.7.6.3	M
	Cine	C.7.6.5	C - Required if Frame Increment Pointer (0028,0009) is Frame Time (0018,1063) or Frame Time Vector (0018,1065)
	Multi-frame	C.7.6.6	M
	SC Multi-frame Image	C.8.6.3	M
	SC Multi-frame Vector	C.8.6.4	C - Required if Number of Frames is greater than 1
	SOP Common	C.12.1	M

5.2 Data dictionary of private attributes.

This chapter describes the data dictionary of all private attributes added to the secondary capture in the export session state activity.

5.2.1 Table 1: PMI Private Session State version 1.0

Attribute name	TAG	Type	Vr	Vm	Attribute Description
Private creator code	(2121,00xx)	3	LO	1	PMI Session State version 1.0
> Session State ID	(2121,xx00)	1	LO	1	Contains the application and version of composite instance that created the session state.
> Session State	(2121,xx01)	1	OB	1	The session state.