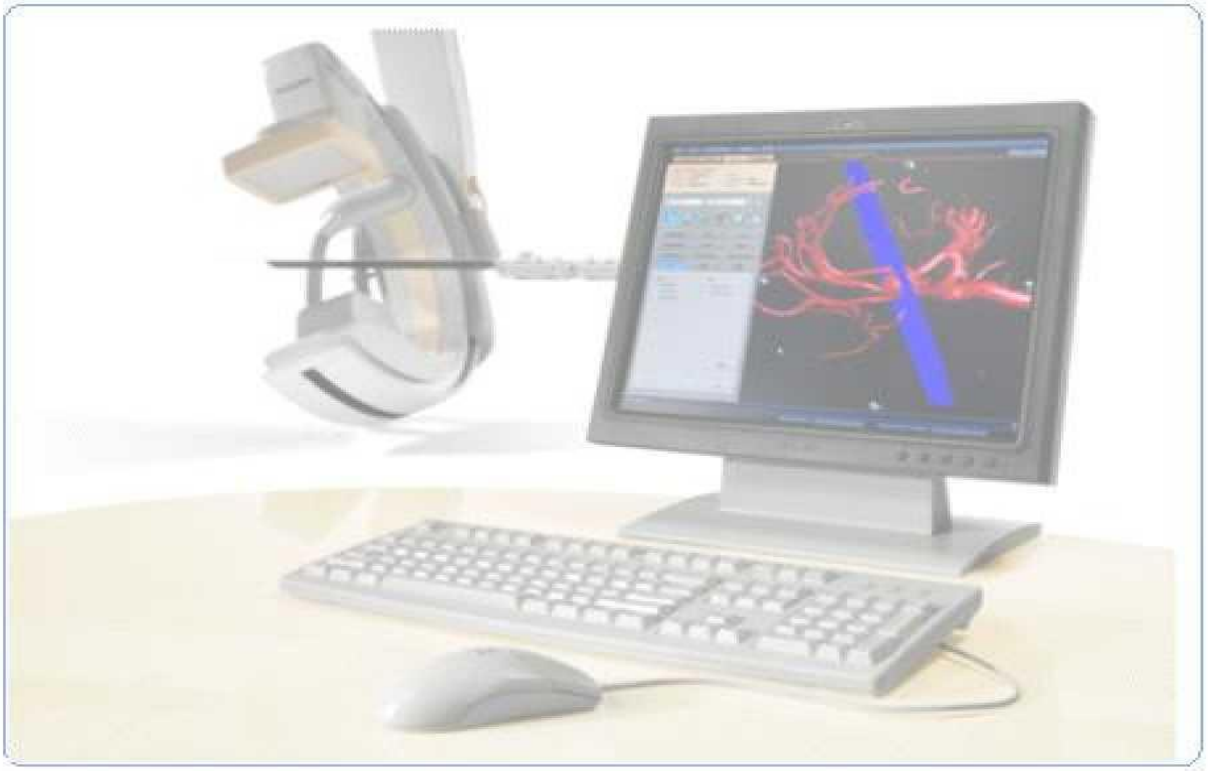
DICOM Conformance Statement

Application Annex:

AneurysmFlow R1.0

On Interventional Workspot R1.4



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1. Introduction

This DICOM Conformance Statement annex is applicable to the AneurysmFlow R1.0 for Interventional Workspot hosting platform, later referred to as AneurysmFlow

AneurysmFlow is a software tool intended to provide relevant information to the intervention list during cerebral aneurysm embolization treatment, based on quantification of blood flow changes.

AneurysmFlow is a software medical device and is intended to be used in combination with a Philips interventional X-ray system and 3DRA data

AneurysmFlow is a software product (Interventional Tool) that provides color coded and vector field representation of a digital subtraction angiography (DSA). It can quantify blood flow rates in the artery based on DSA and 3DRA data. It can visualize blood flow patterns in an aneurysm based on DSA data. It can also provide a side by side visual and quantitative comparison between two acquisitions.

1.1. Revision History

The revision history below provides dates and differences among individual document versions.

Table 1: Revision History

Document Version	Date of Issue	Status	Description
00	01-Mar-2016	Authorized	Initial Version for AneurysmFlow R1.0 on Interventional Workspot R1.4.x where x is 0 or higher
01	17-Nov-2016	Authorized	Editorial changes
02	10-Jan-2017	Authorized	Updated value for Manufacturer (0008, 0070) from “Philips Medical Systems” to “Philips”.

1.2. Terminology

DICOM	Digital Imaging and Communications in Medicine
IOD	Information Object Definition
UID	Unique Identifier
VR	Value Representation
DSA	Digital Subtraction Angiography
MAFA	Mean Aneurysm Flow Amplitude

2. Data Specifications

2.1. Supported IOD's

This section specifies each IOD accepted and / or created by AneurysmFlow.

ACCEPTED The applicable IOD is accepted for storage in the repository of the hosting platform and supported for import in AneurysmFlow 1.0 for viewing and analysis.

CREATED The AneurysmFlow 1.0 supports generation of derived data by using the applicable IOD and is able to store this data in the repository of the hosting platform.

Table 2: Supported IOD's

IOD		Support	
Name	**UID**	**ACCEPTED**	**CREATED**
X-Ray Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes

2.1.1. Acceptance Criteria

This section specifies the acceptance criteria applied by AneurysmFlow 1.0 to which a dataset should adhere before it can be imported into the application. This can be criteria on the highest level (e.g. data from a certain manufacturer or system model) or certain DICOM attributes mandatory to be present into the dataset holding a specific value. In case one or more Philips private attributes are required, then a list of supported Philips system models will be mentioned.

Table 3: Accepted system models

Manufacturer	Modality	System Model Name(s)
Not applicable	Not applicable	Not applicable

Table 4: Accepted transfer syntaxes per IOD

IOD		Transfer Syntax	
Name	**UID**	**Name**	**UID**
X-Ray Angiographic Image Storage SOP 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 2000 Image Compression JPEG 2000 Image Compression (Lossless Only) JPEG Baseline (Process 1) JPEG Extended (Process 2 & 4) JPEG Lossless, Non-Hierarchical, FOP (Process 14) RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5

Table 5: Accepted attribute values

Attribute Name	Attribute Number	Values / Comments
Not applicable	Not applicable	Not applicable

2.1.2. Contents of Created IOD's

This section specifies in detail the attribute contents of created data objects. Attributes are grouped together by its corresponding module as specified by DICOM standard. Philips private attributes are excluded for specification.

Abbreviations used in the Module table for the column "Presence of Value" are:

ALWAYS	The attribute is always present with a value
EMPTY	The attribute is always present without any value (attribute sent zero length)
VNAP	The attribute is always present and its Value is Not Always Present (attribute sent zero length if no value is present)
ANAP	The attribute is present under specified condition – if present then it will always have a value

The abbreviations used in the Module table for the column "Source" are:

AUTO	The attribute value is generated automatically
CONFIG	The attribute value source is a configurable parameter
COPY	The attribute value source is another SOP instance
FIXED	The attribute value is hard-coded in the application
IMPLICIT	The attribute value source is a user-implicit setting
MPPS	The attribute value is the same as that use for Modality Performed Procedure Step
MWL	The attribute value source is a Modality Worklist
USER	The attribute value source is explicit user input

2.1.2.1. List of created SOP Classes

Table 6: List of created SOP Classes

SOP Class Name	SOP Class UID
X-Ray Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7

2.1.2.1. X-Ray Angiographic Image Storage SOP Class

Table 7: IOD of Created X-Ray Angiographic Image Storage Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	General Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Image	General Image Module	ALWAYS
	Image Pixel Module	ALWAYS
	Cine Module	ALWAYS
	Multi-Frame Module	ALWAYS
	Display Shutter Module	ALWAYS
	X-Ray Image Module	ALWAYS
	X-Ray Acquisition Module	ALWAYS
	X-Ray Table Module	ALWAYS
	XA Positioner Module	ALWAYS
	DX Detector Module	ALWAYS
	VOI LUT Module	ALWAYS
	SOP Common Module	ALWAYS
	Extended DICOM and private attributes	OPTIONAL

Table 8: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP		
Patient ID	0010,0020	LO		VNAP		
Patient's Birth Date	0010,0030	DA		VNAP		
Patient's Sex	0010,0040	CS		VNAP		

Table 9: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP		
Study Time	0008,0030	TM		VNAP		
Accession Number	0008,0050	SH		VNAP		
Referring Physician's Name	0008,0090	PN		VNAP		
Study Instance UID	0020,000D	UI		ALWAYS		
Study ID	0020,0010	SH		VNAP		

Table 10: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Date	0008,0021	DA		ANAP		
Series Time	0008,0031	TM		ANAP		
Modality	0008,0060	CS		ALWAYS		
Series Description	0008,103E	LO		ANAP		
Performing Physician's Name	0008,1050	PN		ANAP		
Related Series Sequence	0008,1250	SQ		ANAP		
>Study Instance UID	0020,000D	UI		ALWAYS		
>Series Instance UID	0020,000E	UI		ALWAYS		
>Purpose of Reference Code Sequence	0040,A170	SQ		VNAP		
Series Instance UID	0020,000E	UI		ALWAYS		
Series Number	0020,0011	IS		VNAP		
Performed Procedure Step Start Date	0040,0244	DA		ANAP		
Performed Procedure Step Start Time	0040,0245	TM		ANAP		
Performed Procedure Step ID	0040,0253	SH		ANAP		

Table 11: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	ALWAYS	FIXED	
Institution Name	0008,0080	LO		VNAP	AUTO	
Station Name	0008,1010	SH				
Manufacturer's Model Name	0008,1090	LO	Interventional Workspot	ALWAYS	CONFIG	
Device Serial Number	0018,1000					
Software Versions	0018,1020	LO	1.4.x	ALWAYS	CONFIG	where “x” is the detailed application SW version.

Table 12: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS		ANAP		
Acquisition Date	0008,0022	DA		ANAP		
Content Date	0008,0023	DA		VNAP		
Acquisition Time	0008,0032	TM		ANAP		
Content Time	0008,0033	TM		VNAP		
Instance Number	0020,0013	IS		VNAP		
Patient Orientation	0020,0020	CS		ANAP		
Lossy Image Compression	0028,2110	CS		ANAP		
Icon Image Sequence	0088,0200	SQ		ANAP		
>Samples per Pixel	0028,0002	US		ALWAYS		
>Photometric Interpretation	0028,0004	CS		ALWAYS		
>Rows	0028,0010	US		ALWAYS		
>Columns	0028,0011	US		ALWAYS		
>Bits Allocated	0028,0100	US		ALWAYS		
>Bits Stored	0028,0101	US		ALWAYS		
>High Bit	0028,0102	US		ALWAYS		
>Pixel Representation	0028,0103	US		ALWAYS		
>Pixel Data	7FE0,0010	OW/OB		ANAP		

Table 13: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Samples per Pixel	0028,0002	US		ALWAYS		
Photometric Interpretation	0028,0004	CS		ALWAYS		
Rows	0028,0010	US		ALWAYS		
Columns	0028,0011	US		ALWAYS		
Bits Allocated	0028,0100	US		ALWAYS		
Bits Stored	0028,0101	US		ALWAYS		
High Bit	0028,0102	US		ALWAYS		
Pixel Representation	0028,0103	US		ALWAYS		
Pixel Data	7FE0,0010	OB/OW		VNAP		

Table 14: Cine Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Cine Rate	0018,0040	IS		ANAP		
Frame Time	0018,1063	DS		ALWAYS		

Table 15: Multi-Frame Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Number of Frames	0028,0008	IS		ALWAYS		
Frame Increment Pointer	0028,0009	AT		ALWAYS		

Table 16: Display Shutter Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Shutter Shape	0018,1600	CS		ALWAYS		
Shutter Left Vertical Edge	0018,1602	IS		ALWAYS		
Shutter Right Vertical Edge	0018,1604	IS		ALWAYS		
Shutter Upper Horizontal Edge	0018,1606	IS		ALWAYS		
Shutter Lower Horizontal Edge	0018,1608	IS		ALWAYS		

Table 17: X-Ray Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS		ALWAYS		
Samples per Pixel	0028,0002	US		ALWAYS		
Photometric Interpretation	0028,0004	CS		ALWAYS		
Frame Increment Pointer	0028,0009	AT		ALWAYS		
Bits Allocated	0028,0100	US		ALWAYS		
Bits Stored	0028,0101	US		ALWAYS		
High Bit	0028,0102	US		ALWAYS		
Pixel Representation	0028,0103	US		ALWAYS		
Pixel Intensity Relationship	0028,1040	CS		ALWAYS		
Lossy Image Compression	0028,2110	CS		ALWAYS		

Table 18: X-Ray Acquisition Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
KVP	0018,0060	DS		VNAP		
Exposure Time	0018,1150	IS		VNAP		
Radiation Setting	0018,1155	CS		ALWAYS		
Imager Pixel Spacing	0018,1164	DS		ANAP		
Pixel Spacing	0028,0030	DS		ALWAYS		

Table 19: X-Ray Table Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Table Motion	0018,1134	DS		VNAP		
Table Angle	0018,1138	DS		ANAP		

Table 20: XA Positioner Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Distance Source to Patient	0018,1111	DS		ANAP		
Distance Source to Patient	0018,1111	DS		ANAP		
Positioner Motion	0018,1500	CS		VNAP		
Positioner Primary Angle	0018,1510	DS		VNAP		
Positioner Secondary Angle	0018,1511	DS		VNAP		
Positioner Primary Angle Increment	0018,1520	DS		VNAP		

Positioner Secondary Angle Increment	0018,1521	DS		VNAP		

Table 21: DX Detector Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Imager Pixel Spacing	0018,1164	DS		ALWAYS		
Pixel Spacing	0028,0030	DS		ALWAYS		

Table 22: VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Window Center	0028,1050	DS		ALWAYS		
Window Width	0028,1051	DS		ALWAYS		

Table 23: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Instance Creation Date	0008,0012	DA		ANAP		
Instance Creation Time	0008,0013	TM		ANAP		
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.12.1	ALWAYS		
SOP Instance UID	0008,0018	UI		ALWAYS		
Instance Number	0020,0013	IS		ANAP		

Table 24: Extended DICOM and private attributes for X-Ray Angiographic Image Storage SOP Class

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Conversion Type	0008,0064	CS	WSD	ANAP	AUTO	
Table Horizontal Rotation Angle	0018,9469	FL		ANAP		
Table Cradle Tilt Angle	0018,9471	FL		ANAP		
Application Version	0018,9525	LO		ANAP		
Frame Of Reference UID	0020,0013	UI		ANAP		
Position Reference Indicator	0020,1040	LO		ANAP		
Requested Procedure ID	0040,1001	SH		ANAP		

2.1.2.2. Secondary Capture Image Storage SOP class

Table 25: IOD of Created Secondary Capture Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	General Series Module	ALWAYS
Equipment	General Equipment Module	CONDITIONAL
	SC Equipment Module	ALWAYS

Image	General Image Module	ALWAYS
	Image Pixel Module	ALWAYS
	SOP Common Module	ALWAYS
	Extended DICOM and private attributes	CONDITIONAL

Table 26: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		ALWAYS	AUTO	
Patient ID	0010,0020	LO		ALWAYS	AUTO	
Patient's Birth Date	0010,0030	DA		ALWAYS	AUTO	
Patient's Sex	0010,0040	CS		ALWAYS	AUTO	

Table 27: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		ALWAYS	AUTO	
Study Time	0008,0030	TM		ALWAYS	AUTO	
Accession Number	0008,0050	SH		VNAP		
Referring Physician's Name	0008,0090	PN		VNAP	AUTO	
Study Instance UID	0020,000D	UI		ALWAYS	AUTO	
Study ID	0020,0010	SH		ALWAYS	AUTO	

Table 28: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Date	0008,0021	DA		ALWAYS	AUTO	
Series Time	0008,0031	TM		ALWAYS	AUTO	
Modality	0008,0060	CS		ALWAYS	AUTO	
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	
Series Number	0020,0011	IS		VNAP	AUTO	
Related Series Sequence	0008,1250	SQ		VNAP		
>Study Instance UID	0020,000D	UI		ALWAYS		
>Series Instance UID	0020,000E	UI		ALWAYS		
>Purpose of Reference Code Sequence	0040,A170	SQ		EMPTY		

Table 29: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	ALWAYS	FIXED	
Institution Name	0008,0080	LO		VNAP	AUTO	
Manufacturer's Model Name	0008,1090	LO	Interventional Workspot	ALWAYS	CONFIG	
Device Serial Number	0018,1000			ANAP		
Software Versions	0018,1020	LO	1.4.x	ALWAYS	CONFIG	where “x” is the detailed application SW version.

Table 30 : SC Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS		ANAP		

Conversion Type	0008,0064	CS	WSD	ALWAYS		

Table 31: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Instance Number	0020,0013	IS		ALWAYS		
Patient Orientation	0020,0020	CS		VNAP		

Table 32: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Samples per Pixel	0028,0002	US		ALWAYS		
Photometric Interpretation	0028,0004	CS		ALWAYS		
Planar Configuration	0028,0006	US		ALWAYS		
Rows	0028,0010	US		ALWAYS	AUTO	
Columns	0028,0011	US		ALWAYS	AUTO	
Bits Allocated	0028,0100	US	8	ALWAYS		
Bits Stored	0028,0101	US	8	ALWAYS		
High Bit	0028,0102	US	7	ALWAYS		
Pixel Representation	0028,0103	US	0000	ALWAYS	AUTO	
Pixel Data	7FE0,0010	OW/OB		ALWAYS	AUTO	

Table 33: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.7	ALWAYS	FIXED	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	
Instance Creation Date	0008,0012	DA		ANAP	AUTO	
Instance Creation Time	0008,0013	TM		ANAP	AUTO	
Instance Number	0020,0013	IS		ANAP	AUTO	

Table 34 : Extended DICOM and private attributes for Secondary Capture Image Storage SOP Class Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Requested Procedure ID	0040,1001	SH		ANAP		