

DICOM Conformance Statement

Application Annex:

VMS+

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1. Overview

The following DICOM Conformance Statement describes VentriPoint Medical System (VMS) operation with respect to DICOM implementation for inter-operability with other DICOM based systems.

1.1. Network Services

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Secondary Capture Image Storage	YES	NO
Encapsulated Pdf Storage	YES	NO
Ultrasound Multi Frame Image Storage	YES	NO

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2. Introduction

VMS is a Windows client application platform composed of Software and Hardware sub-systems. It attaches to 2D ultrasound machines; records cine loops and produces 3D reconstruction results. It is connected to VentriPoint web service off site for study state management and 3D reconstruction processing. VMS can be configured to operate at different capacities as follows:

- Hardware Integrated primary workstation for image acquisition (and analysis).
- Software only (review workstation) to be installed in review rooms to continue analysis and submit results.

Installations may be configured optionally to permit export proprietary encoded VMS studies to Hospital PACS servers (via DICOM encoding) for further inspection.

Consequentially, VMS studies that were analyzed in VMS may be re-encoded in DICOM and sent to the PACS server. End-users may review the VMS-exported studies on 3rd Party generic DICOM viewers connected to the hospital PACS network.

VMS does not support import at this time. Thus studies sent to PACS from within VMS shall be treated as Read-Only. Following further analysis in VMS, the study must be re-exported and sent to PACS as a new study instance.

2.1. Intended Audience

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM Standards and with the terminology and concepts.

2.2. Remarks

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication between VentriPoint, Inc. and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. However, by itself it is not guaranteed to ensure the desired interoperability and successful interconnectivity.

2.3. Definitions, Terms and Abbreviations

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Abbreviations and terms are as follows:

AE	DICOM Application Entity
AET	Application Entity Title

ASCE	Association Control Service Element
DICOM	Digital Imaging and Communications in Medicine
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
GUI	Graphical User Interface
IOD	Information Object Definition
ISO	International Standard Organization
LOINC	Logical Observation Identifiers Names and Codes
MAC Address	Ethernet address of NIC
NIC	Network Interface Card
PACS	Picture Archiving and Communication System
PDF	Adobe Acrobat PDF Document
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair
US	Ultrasound
VMS	VentriPoint Medical System
VWS	VentriPoint Web Services
VMS-IS	VMS Integrated System
VMS-LW	VMS Light Workstation (review workstation)
VP	VentriPoint, Inc.
VP Archive	A Windows file share storage assigned and configured for VMS usage.
UI	User Interface
UX	User Experience

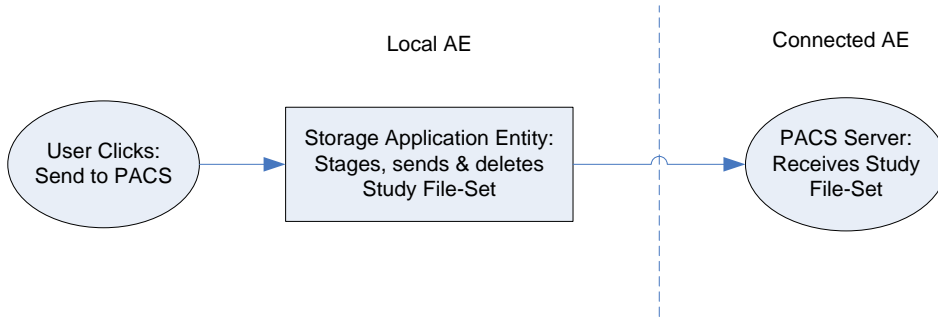
2.4. References

- [DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.18, 2006

3. Networking

3.1. Implementation Model

3.1.1. Application Data Flow



VMS operator initiates a “Send to PACS” command for a specific study in the study list in VMS GUI application. As a result, VMS Local AE stages, sends the corresponding study to the configured PACS server; and finally cleans up the staged file-set files.

3.1.2. Functional Definition of AEs

When VMS is configured to enable “Send to PACS”, VMS will expose the corresponding button on the Study List. The following sequence describes the set of actions associated with “Send to PACS” command:

- *Initial condition:* VMS stores studies on the computer hard-disk in native format.
- Upon end-user request to “Send To PACS” a selected study:
 - VMS Sends and receives an C-ECHO Verification command to PACS to ensure connectivity. Operation is aborted if failure is detected and a message is presented to the user.
 - The requested study is converted to DICOM according to this specification.
 - The DICOM-encoded study is stored on the hard-disk in a staging area.
 - The staged DICOM study folder file-set is sent to the configured PACS server.
 - The staged directory is deleted.

3.1.2.1. DICOM Encoding Map for VMS Information

VMS Studies will be exported into DICOM format exposing VMS study information as follows. Users will have access to VMS study information as follows:

What	Where
Equipment	Native DICOM tags
Patient & study information	Native DICOM tags + in PDF*
Cine loops series	Native DICOM tags
Cine loops metadata: dimensions, annotations	Native DICOM tags
Frame markers (ED/ES) & 2D image dimensions	Native DICOM tags
2D and 3D snapshot images (w/ or w/o borders, annotations, & points per user capture action)	Native DICOM images** + in .PDF
All study metadata including analysis (ESV,EDV, EF, SV, CO, etc), points, calibration, server watermarks, etc – necessary for future inbound import feature.	DICOM private Tags

* PDF Report is stored as native SopClass.EncapsulatedPdfStorageUid.

** in one “snapshots” series

3.1.2.1.1. VMS-PACS Use Case

For example, a typical user experience would work as follows:

On Integrated-VMS:

- Scan patient
- Archive study to VP Archive

On Review VMS workstation:

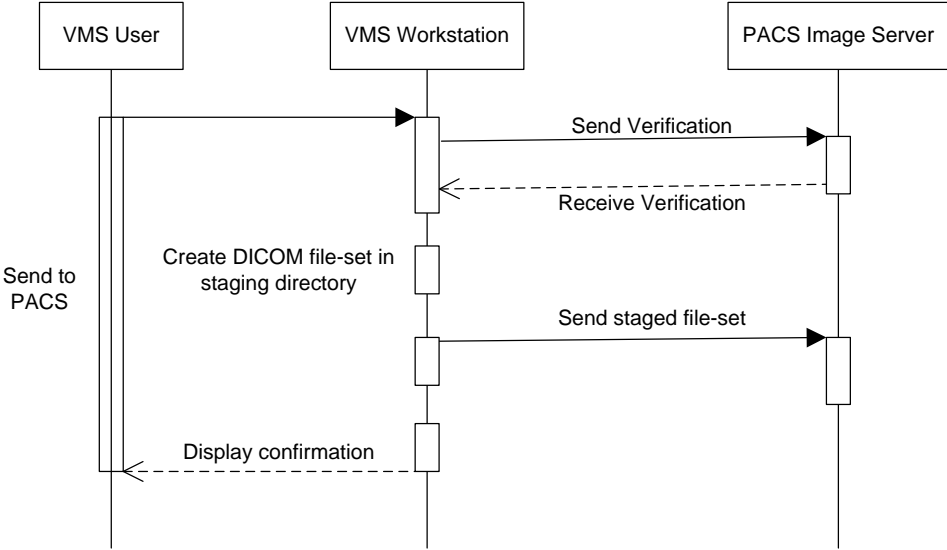
- Retrieve from VP Archive
- Analyze
- Capture snapshots
- Add annotations
- Add report comments
- Produce PDF report (by navigating to Report tab)
- Optional: approve
- Optional: Re-archive (to store snapshots, and latest .pdf report)
- Send (export) to PACS

On 3rd Party DICOM/PACS viewer:

- Download from PACS
- Review cine loops:
 - o Can use calipers for measurements (2D image dimensions are exported into DICOM).
 - o If viewer is capable, can zero in on the ED/ES frames from DICOM tags.
 - o Review cine loop annotations.
- Review snapshots with borders, points, 2D, 3D, and combined views in snapshot series.
- Review patient and study metadata (demographics, ID's, comments) - whatever was captured on review workstation
- Review completed PDF report

3.1.3. Sequencing of Real World Activities

The following sequence diagram illustrates the order of events resulting from “*Send to PACS*” user request.



3.2. AE Specifications

3.2.1. Storage Application Entity Specifications

3.2.1.1. SOP Classes

VMS utilizes the following SOP classes:

SOP CLASSES FOR AE STORAGE

SOP Class Name	SOP Class UID	SCU	SCP
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	No
Ultrasound Multi Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No

3.2.1.2. Association Policies

3.2.1.2.1. General

Application context name for AE Storage is always proposed as follows:

DICOM APPLICATION CONTEXT FOR AE STORAGE

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

3.2.1.2.2. Number of Associations

NUMBER OF ASSOCIATIONS INITIATED FOR AE STORAGE

Maximum number of simultaneous associations	1
---	---

NUMBER OF ASSOCIATIONS ACCEPTED FOR AE STORAGE

Maximum number of simultaneous associations	0
---	---

3.2.1.2.3. Asynchronous Nature

VMS does not support asynchronous communications.

ASYNCHRONOUS NATURE AS A SCU FOR AE STORAGE

Maximum number of outstanding asynchronous transactions	0
---	---

3.2.1.2.4. Implementation Identifying Information

The implementation information for this Application Entity is as follows:

DICOM IMPLEMENTATION CLASS AND VERSION FOR AE STORAGE

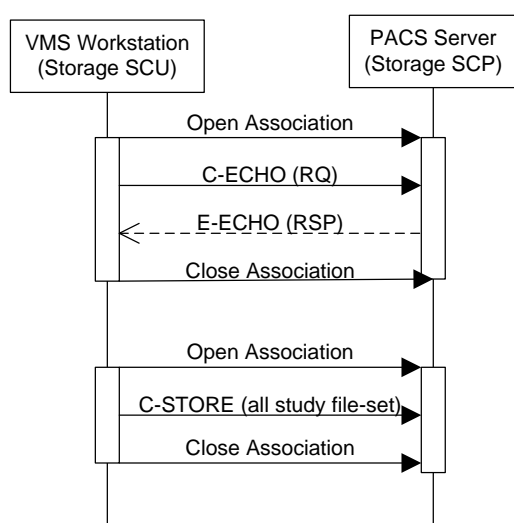
Implementation Class UID	1.2.826.0.1.3680043.8.1288.1111.10
Implementation Version Name	VMS DICOM 1.1

3.2.1.3. Association Initiation Policy

3.2.1.3.1. Activity – Store Study File-Set

3.2.1.3.1.1. Description and Sequencing of Activities

VMS Initiates two associations: one for Verification (C-ECHO) to ensure connectivity to PACS server followed upon success by Storage association for transmitting complete study file-set data (C-STORE).



3.2.1.3.1.2. Proposed Presentation Contexts

VMS is capable of proposing the presentation contexts shown in the following table.

PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY “STORE STUDY FILE-SET”

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2 .1	SCU	None
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.10 4.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2 .1	SCU	None

Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2 .1	SCU	None
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3.2.1.3.1.3. SOP Specific Conformance for SOP Class File-Set Storage

The following table describes C-STORE response behavior.

STORAGE C-STORE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP successfully stored the SOP Instances. Export is considered complete
.	.	Any other status code	The association is aborted using A-ABORD and the transfer fails. The status is logged and the user is notified of the failure.

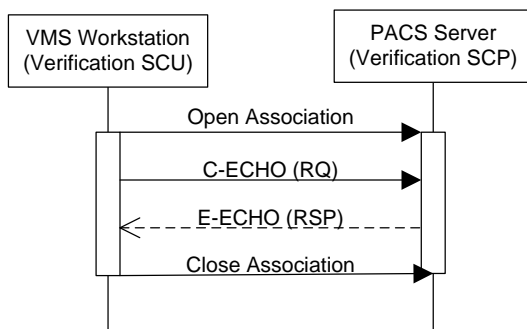
STORAGE COMMUNICATIONS FAILURE BEHAVIOR

Exception	Behavior
Timeout	Same as failure description in previous table
Association aborted by the SCP or network layers	Same as failure description in previous table

3.2.1.3.2. Activity – Verify PACS Server availability

3.2.1.3.2.1. Description and Sequencing of Activities

User may select to verify connectivity to the PACS server from the options dialog thereby issuing C-ECHO request/response roundtrip.



3.2.1.3.2.2. Proposed Presentation Contexts

VMS is capable of proposing the presentation contexts shown in the following table.

PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY “VERIFY PACS SERVER
AVAILABILITY”

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

3.2.1.3.2.3. SOP Specific Conformance for SOP Class Verify PACS Server Availability

The following table describes C-STORE response behavior.

VERIFICATION C-ECHO RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP successfully stored the SOP Instances. Export is considered complete
.	.	Any other status code	The association is aborted using A-ABORT and the transfer fails. The status is logged and the user is notified of the failure.

VERIFICATION COMMUNICATIONS FAILURE BEHAVIOR

Exception	Behavior
Timeout	Same as failure description in previous table
Association aborted by the SCP or network layers	Same as failure description in previous table

3.2.1.4. Association Acceptance Policy

VMS does not accept any incoming association requests.

3.3. Network Interfaces

VMS operates on top of the TCP/IP stack provided by Windows Operating System (XP SP3, Vista, and Windows 7).

3.3.1. Physical Network Interface

VMS supports standard PC Network interface. On VMS-IS the supported physical network interface is specified below. On VMS-LW, the network interface is as provided by the hardware platform on which it is installed provided that it is running on the Windows Operating System as specified above.

SUPPORTED PHYSICAL NETWORK INTERFACE

Ethernet 10/100/1000 Mb/s, RJ-45; AutoDetect Speed, Full or Half Duplex

3.4. Configuration

VMS configuration is controlled by the standard .NET Framework application configuration framework. The “*Vms.exe.config*” configuration file contains the following configuration parameters that control VMS DICOM/PACS capabilities. Only installation or service engineer or VP assigned IT personnel are qualified to configure VMS.

VMS CONFIGURATION PARAMETERS

Name	Values	Meaning
PacsEnabled	True False	Determines if feature is enabled

3.4.1. AE Title/Presentation Address Mapping

3.4.1.1. Local AE Titles

The Local AE Title is automatically constructed by the VMS software as follows:

```
LocalAETitle ::= "VPSD" {MACAddress}
MACAddress ::= Primary NIC MAC address
```

For example,

```
If for computer running VMS
    MACAddress = 1C659E3868D8
Then
    LocalAETitle = VPSD1C659E3868D8
```

3.4.1.2. Remote AE Title/Presentation Address Mapping

VMS CONFIGURATION PARAMETERS

Name	Values	Meaning
PacsAE	String	Name of PACS Application Entity
PacsHost	String	DNS Address of PACS Server
PacsPort	Integer String	Port number of PACS Server

3.4.2. Parameters

In addition to the parameters described above, the following table describes parameters per DICOM Supplement 64 specifications.

CONFIGURATION PARAMETERS TABLE

Parameter Configurable	(Yes/No)	Default Value ¹
General Parameters		
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	No	1 hour
General DIMSE level time-out values	No	30 seconds
Time-out waiting for response to TCP/IP connect request. (Low-level timeout)	No	

¹ Default value is as specified by underlying platform.

Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	No	10 seconds
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	No	30 seconds
Any changes to default TCP/IP settings, such as configurable stack parameters.	No	--
Other configurable parameters	--	--
AE Specific Parameters		
Size constraint in maximum object size	No	None
Maximum PDU size the AE can receive	No	116794 bytes
Maximum PDU size the AE can send	No	116794 bytes
AE specific DIMSE level time-out values	No	30 seconds
Number of simultaneous Associations by Service and/or SOP Class	No	--
SOP Class support	No	As specified in 1.1.Network Services
Transfer Syntax support	No	As specified in 1.1.Network Services
General Parameters		
Other parameters that are configurable	--	--

4. Media Interchange

VMS does not support any media exchange; only staging and transmission to assigned server per specifications in the sections above.

5. Support of Character Sets

VMS supports character set per ISO_IR 100 specifications for DICOM. Specifically VMS is only approved to be used in English, French, or German. VentrifPoint is a Windows .NET Framework Unicode based application. VMS is not approved to operate in any other environment and the behavior with other character sets is unspecified.

6. Security Profiles

VMS does not support any DICOM specific security profiles.

7. Annexes

7.1. Created SOP Instances

The following tables use a number of abbreviations. The abbreviations used in the —Presence of ... column are:

VNAP	Value Not Always Present
ANAP	Attribute Not Always Present
ALWAYS	Always Present

ALWAYSUA Always present, unless anonymized
 EMPTY Attribute is sent without a value

The abbreviations used in the —Source column:

MWL the attribute value source Modality Worklist
 USER the attribute value source is from User input
 AUTO the attribute value is generated automatically
 MPPS attribute value is the same as the Modality Performed Procedure Step service
 CONFIG the attribute value source is a configurable parameter

7.1.1. Information-Entity Modules Created VMS Study File-Set

VMS creates the following principal IOD content packages.

SOP Classes	Transfer Purpose
Secondary Capture Image Storage	Snapshots; Private study metadata
Encapsulated Pdf Storage	PDF Report
Multi Frame Grayscale Byte Secondary Capture Image Storage	Cine loops

The IODs are using the Information Entities and modules as specified below.

INFORMATION ENTITY MODULE OF VMS STUDY

IE	Module	Presence
Patient	Patient	ALWAYS
Study	General Study	ALWAYS
	Patient Study	ALWAYS
Series	General Series	ALWAYS
	Encapsulated Document Series	PDF Report only
Equipment	General Equipment	ALWAYS
	SC Equipment	ALWAYS
Image	General Image	Multi-Frame and Secondary Image Only
	SC Image	Secondary Image
	Image Pixel	Multi-Frame and Secondary Frame
	SOP Common	Multi-Frame and SC Image
	Multi-Frame	Multi-Frame only
	Frame Pointers	Multi-Frame
	Private tags	Private study metadata

Encapsulated Document	Encapsulated Document	PDF Report and private Raw Data
	SOP Common	PDF Report

7.1.2. IOD Modules Attributes Definitions

7.1.2.1. Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	Patient's full name. As entered in VMS.	ALWAYS	USER
Patient's ID	(0010,0020)		Hospital identification for the patient. As entered in VMS.	ALWAYS	USER
Issuer of Patient ID	(0010,0021)	LO	Hospital name as configured at installation.	ALWAYS	AUTO
Patient's Birth Date	(0010,0030)	DA	As entered in VMS.	ALWAYS	USER
Patient's Sex	(0010,0040)	CS	Enumerated Values: M = male F = female O = other	ALWAYS	USER
Patient's Size	(0010,1020)	DS	As entered in VMS.	ALWAYS	USER
Patient's Weight	(0010,1030)	DS	As entered in VMS.	ALWAYS	USER

7.1.2.2. General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	Auto Generated in VP UID Space	ALWAYS	AUTO
Study Date	(0008,0020)	DA	Generated at creation	ALWAYS	AUTO
Study Time	(0008,0030)	TM	Generated at creation	ALWAYS	AUTO
Referring Physician's Name	(0008,0090)	PN	As entered, all in family name component	VNAP	USER
Study ID	(0020,0010)	SH	VMS study ID	ALWAYS	AUTO
Accession Number	(0008,0050)	SH	Set to empty	EMPTY	AUTO
Study Description	(0008,1030)	LO	Entered by user as comments	VNAP	USER
Name of Physician(s) Reading Study	(0008,1060)	PN	Only last name field as entered in VMS	VNAP	USER

7.1.2.3. Patient Study

Attribute Name	Tag	VR	Value	Presence of Value	Source
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Admitting Diagnoses Description	(0008,1080)	LO	Admitting diagnoses VP code name. Derived from user selection and software configuration. Possible values: TetralogyOfFalot SystemicRV SystemicRVMirror Conduit PulmonaryArterialHypertension	ALWAYS	USER
Patient's Size	(0010,1020)	DS	Height entered by user	ALWAYS	USER
Patient's Weight	(0010,1030)	DS	Weight entered by user	ALWAYS	USER

7.1.2.4. General Series

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	One of: US – Multi-Frame DOC – PDF OT – Snapshots, Metadata	ALWAYS	AUTO
Series Instance UID	(0020,000e)	UI	Generated in VP UID space	ALWAYS	AUTO
Series Number	(0020,0011)	UI	Generated in VP UID space	ALWAYS	AUTO
Laterality	(0020,0060)	CS	Always 'R' for Right Ventricle	ALWAYS	AUTO
Series Date	(0008,0021)	DA	Date of study creation	ALWAYS	AUTO
Series time	(0008,0031)	TM	Time of study creation	ALWAYS	AUTO
Performing Physician's Name	(0008,1050)	PN	Performing sonographer	VNAP	USER
Protocol Name	(0008,1030)	LO	VMS	ALWAYS	AUTO
Series Description	(0008,103e)	LO	Cine loop identifier string of the form "Scan<number>" where the number is sequential count of captured scans.	ALWAYS	AUTO
Study Instance UID	(0020,000d)	UI	Instance UID of Study to which the related Series belongs	ALWAYS	AUTO
Series Instance UID	(0020,000d)	UI	Instance UID of Related Series	ALWAYS	AUTO
Smallest Image Pixel Value	(0028,0106)	XS	Auto-specified for image types. In MONOCHROME2, always 0.		
Largest Image Pixel Value	(0028,0107)	XS	Auto-specified for image types. In	ANAP	AUTO

			MONOCHROME2, always 255.		
--	--	--	-----------------------------	--	--

7.1.2.5. Encapsulated Document Series

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	DOC – PDF	ALWAYS	AUTO
Series Instance UID	(0020,000e)	UI	Generated in VP UID space	ALWAYS	AUTO
Series Number	(0020,0011)	UI	Generated in VP UID space	ALWAYS	AUTO
Series Description	(0008,103e)	LO	Pdf file name in VMS in the form of “Report_<ddd>.pdf” where <ddd> is 3 digit report number	ALWAYS	AUTO
Instance Number	(0020,0013)	IS	Corresponding incremented number of generated instance in study file-set	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Date of document creation	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Time of document creation	ALWAYS	AUTO
Acquisition Date Time	(0008,002a)	DT	Time of study creation	ALWAYS	AUTO
Burned In Annotation	(0028,0301)	CS	YES	ALWAYS	AUTO
Document Title	(0042,0010)	ST	VMS Report	ALWAYS	AUTO
Concept Name Code Sequence	(0040,a043)	SQ	Sequence ² of Code Value, Coding Scheme Designator, and Code Meaning	ALWAYS	AUTO
Code Value	(008,0100)	SH	1089.1.5 – Fragment of complete ISO_OID UID (omitting 1.2.826.0 prefix)	ALWAYS	AUTO
Coding Scheme Designator	(0008,0102)	SH	ISO_OID	ALWAYS	AUTO
Code Meaning	(0008,0104)	LO	Adobe Acrobat PDF (1.2.826.0.1089.1.5)	ALWAYS	AUTO
MIME Type of Encapsulated Document	(0042,0012)	LO	application/pdf	Always	AUTO
Encapsulated Document	(0042,0011)	OB	Contents of pdf document	ALWAYS	AUTO

² Issue: For Pdf document, it is not clear what the correct values are in concept name code sequence field values. For now, values are set to ISO_OID (1.2.826.0.1089.1.5).

7.1.2.6. General Equipment

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	VentriPoint	ALWAYS	AUTO
Institution Name	(0008,0080)	LO	As configured at installation	ALWAYS	AUTO
Station Name	(0008,1010)	SH	VID:<facility-id>.<station-id> where ID's are specified in VP ID space. Generated at installation.	ALWAYS	AUTO
Manufacturer's Model Name	(0008,1090)	LO	VMS	ALWAYS	AUTO
Software Version(s)	(0018,1020)	LO	Full software build version number (e.g. 1.1.5019.1274)	ALWAYS	AUTO

7.1.2.7. SC Equipment [DEPRECATED]

The following IE was deprecated. Ventripoint will report the multi-frame as an original/

Attribute Name	Tag	VR	Value	Presence of Value	Source
Conversion Type	(0008,0064)	CS	WSD	ALWAYS	AUTO
Modality	(0008,0060)	CS	US	ALWAYS	AUTO
Secondary Capture Device ID	(0018,1010)	LO	VID:<facility-id>.<station-id> where ID's are specified in VP ID space. Generated at installation.	ALWAYS	AUTO
Secondary Capture Device Manufacturer	(0018,1016)	LO	VentriPoint	ALWAYS	AUTO
Secondary Capture Device Software Versions	(0018,1019)	LO	Full software build version number (e.g. 1.1.5019.1274)	ALWAYS	AUTO

7.1.2.8. General Image

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Corresponding incremented number of generated instance in study file-set	ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS	<Empty>	EMPTY	AUTO
Content Date	(0008,0023)	DA	Date of image creation	ALWAYS	AUTO

Content Time	(0008,0033)	TM	Time of image creation	ALWAYS	AUTO
Image Type	(0008,0008)	CS	DERIVED\PRIMARY for multi-frame and DERIVED\SECONDARY for snapshot SC Image	ALWAYS	AUTO
Acquisition Date Time	(0008,002a)	DT	Study creation time	ALWAYS	AUTO
Derivation Description	(0008,2111)	DT	For multi-frame: VMS real-time image capture For SC image: VMS Analysis Snapshot	ALWAYS	AUTO
Images in Acquisition	(0020,1002)	IS	Number of frames in multi-frame. Not present in SC image	ANAP	AUTO
Burned In Annotation	(0028,0301)	CS	YES	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	CS	00	ALWAYS	AUTO
Presentation LUT Shape	(2050,0020)	CS	IDENTITY	ALWAYS	AUTO

7.1.2.9. SC Image

Attribute Name	Tag	VR	Value	Presence of Value	Source
Date of Secondary Capture	(0018,1012)	DA	Image creation date	ALWAYS	AUTO
Time of Secondary Capture	(0018,1014)	TM	Image creation time	ALWAYS	AUTO

7.1.2.10. Image Pixel

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	MONOCHROME2	ALWAYS	AUTO
Rows	(0028,0010)	US	Number of rows in the image.	ALWAYS	AUTO
Columns	(0028,0011)	US	Number of columns in the image	ALWAYS	AUTO
Bits Allocated	(0028,0100)	US	8	ALWAYS	AUTO
Bits Stored	(0028,0100)	US	8	ALWAYS	AUTO
High Bit	(0028,0102)	US	7	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	0	ALWAYS	AUTO

Pixel Data	(7fe0,0010)	OW	A data stream of the pixel samples that comprise the Image.	ALWAYS	AUTO
Planar Configuration	(0028,0006)	US	0	ALWAYS	AUTO

7.1.2.11. SOP Common

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	One of supported SOP classes: 1.2.840.10008.5.1.4.1.1.7 1.2.840.10008.5.1.4.1.1.104.1 1.2.840.10008.5.1.4.1.1.66 1.2.840.10008.5.1.4.1.1.7.2	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Uniquely identifies the SOP Instance.	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	ISO_IR 100	ALWAYS	AUTO
Instance Creation Date	(0008,0012)	DA	Date of DIOCM export	ALWAYS	AUTO
Instance Creation Time	(0008,0013)	TM	Time of DICOM export	ALWAYS	AUTO
Operators' Name	(0008,1070)	PN	User name (default: logged in VMSNET domain)	VNAP	AUTO

7.1.2.12. Multi-Frame

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Frames	(0028,0008)	IS	Number of frames in a Multi-frame Image.	ALWAYS	AUTO
Frame Increment Pointer	(0028,0009)	AT	(0018,1063)	ALWAYS	AUTO
Pixel Spacing	(0028,0030)	DS	Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm.	ALWAYS	AUTO
Pixel Spacing Calibration Type	(0028,0a02)	CS	FIDUCIAL	ALWAYS	AUTO
Pixel Spacing Calibration Description	(0028,0a04)	LO	VentriPoint Medical System calibration	ALWAYS	AUTO

Frame Time	(0018,1063)	DS	Frame time in milliseconds	ALWAYS	AUTO

7.1.2.13. Frame Pointers

Attribute Name	Tag	VR	Value	Presence of Value	Source
Representative Frame Number	(0028,6010)	US	The ED Frame if identified by user	ANAP	AUTO
Frame Numbers of Interest (FOI)	(0028,6020)	US	Frame number of ED and ES if selected by user	ANAP	USER
Frame of Interest Description	(0028,6022)	LO	End Diastole\End Systole	ANAP	AUTO
Frame of Interest Type	(0028,6023)	CS	RWAVE\ENDSYSTOLE	ANAP	AUTO

7.1.2.14. Private Metadata

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Corresponding incremented number of generated instance in study file-set	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Date of study creation	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Time of study creation	ALWAYS	AUTO
Private Tag	(0F87,0010)	LO	VentriPoint Medical System	VNAP	AUTO
Private Tag	(0F87,1010)	SH	1.1	VNAP	AUTO
Private Tag	(0F87,1011)	OB	Private XML study summary	VNAP	AUTO
Private Tag	(0F78,1012)	OB	Private compressed XML VP study metadata	VNAP	AUTO
Private Tag	(0F87,1013)	SH	Snapshot filename	ANAP	AUTO

7.1.2.15. Encapsulated Document

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Corresponding incremented number of generated instance in study file-set	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Date of study creation	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Time of study creation	ALWAYS	AUTO
Acquisition Date Time	(0008,002a)	DT	Time of study creation	ALWAYS	AUTO

Burned Annotation In	(0028,0301)	CS	YES	ALWAYS	AUTO
Document Title	(0042,0010)	ST	VMS Metadata	ALWAYS	AUTO
Encapsulated Document	(0042,0011)	OB	Internal XML summary description of study	ALWAYS	AUTO
MIME Type of Encapsulated Document	(0042,0012)	LO	application/octet-stream	Always	AUTO

8 Revision History

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

DOCUMENT VERSION	DATE OF ISSUE	DESCRIPTION	STATUS
1	29-Nov-2017	Final Version.	Authorized