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**VetPACS TruDR™ DICOM
Conformance Statement**



Version 1.4

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picture|archival|communication|system



Table of Contents

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- 1. Introduction 1
- 2. Implementation Model..... 1
 - 2.1 Application Data Flow Diagram..... 1
 - 2.2 Functional Definition of AE’s..... 2
 - 2.3 Sequencing of Real-World Activities 2
- 3. AE Specifications..... 3
 - 3.1 Association Establishment Policies 5
 - 3.1.1 General..... 5
 - 3.1.2 Number of Associations..... 5
 - 3.1.3 Asynchronous Nature 5
 - 3.1.4 Implementation Identifying Information 5
 - 3.2 Association Acceptance Policy..... 5
 - 3.2.1 Related Real-World Activity 5
- 4. Communication Profiles 6
 - 4.1 Supported Communication Stack..... 6
 - 4.2 TCP/IP Stack 6
 - 4.3 Physical Media Support 6
- 5. Extension / Specialization / Privatization 6
- 6. Configurable Parameters 6
- 7. Support of Extended Character Sets 6
- 8. Entity..... 7
 - 8.1 IOD Modules 7
 - 8.2 TruDR DICOM Library 9
 - 8.2.1 Part 10 Group Header (if file based) 9
 - 8.2.2 VetPACS Private Block Summary Module 11
 - 8.2.3 VetPACS Private Block 1 Module..... 11
 - 8.2.4 VetPACS Private Block 2 Module..... 12
 - 8.2.5 SOP Common Module 13
 - 8.2.6 Patient Module 13
 - 8.2.7 General Study Module 14
 - 8.2.8 General Series Module 14
 - 8.2.9 General Equipment Module 15
 - 8.2.10 DX Detector Module..... 15

8.2.11 DX Positioning Module.....	16
8.2.12 General Image Module.....	16
8.2.13 DX Image Module.....	17
8.2.14 VOI LUT Module	17
8.2.15 X-Ray Generation Module.....	18
8.2.16 X-Ray Filtration Module	18
8.2.17 X-Ray Grid Module	18
8.3 VetPACS DICOM Print Library.....	19
8.3.1 Printer Module	19
8.3.2 Basic Film Presentation Module	19
8.3.3 Basic Film Box.....	19
8.3.4 Basic Image Box.....	20
8.3.5 Annotation List Module.....	20
8.3.6 Modality LUT Basic Film Session	21
8.4 Retrieve a Modality Worklist From a Remote System	21
8.4.1 Scheduled Procedure Step Module	21
8.4.2 Requested Procedure.....	21
8.4.3 Patient Identification	22
8.4.4 Patient Demographic.....	22
8.4.5 Imaging Service Request.....	22
9. Mapping From Dicom Tags To VetPACS Database For Import.....	22
9.1 Mapping From Dicom Tags To Patients Table	22
9.2 Mapping From Dicom Tags To Exams (Studies) Table.....	24
9.3 Mapping From Dicom Tags To Series Table.....	25
9.4 Mapping From Dicom Tags To Captures (Images) Table.....	25

Version History

Date	Version	Person	Description
3/21/2005	0.2	Robert Powell	Initial release
3/23/2005	0.9	Wesley Snell	DX Tags. Add specific TruDR and v.3.5 Release
3/23/2005	1.0	Kevin Wilson	
4/1/2005	1.1	Robert Powell	
11/22/2005	1.2	Dan Blanchard	Added Modality Worklisting SCU.
5/20/2005	1.3	Dan Blanchard	Updated for VetPACS 2006, added additional private tags
7/05/2006	1.4	Dan Blanchard	Added Section 9 on mapping

DICOM Conformance Statements and Version Histories are released regularly. For additional assistance with our product's latest DICOM and interconnectivity statements, in addition to or beyond the scope of what is stated herein, please contact Sound Technologies at support@soundvet.com or (800) 268-5354.

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VetPACS TruDR™ DICOM Conformance Statement

NOTE: Some settings must be changed by the service person in order to use or change the function marked with a “*”.

1. Introduction

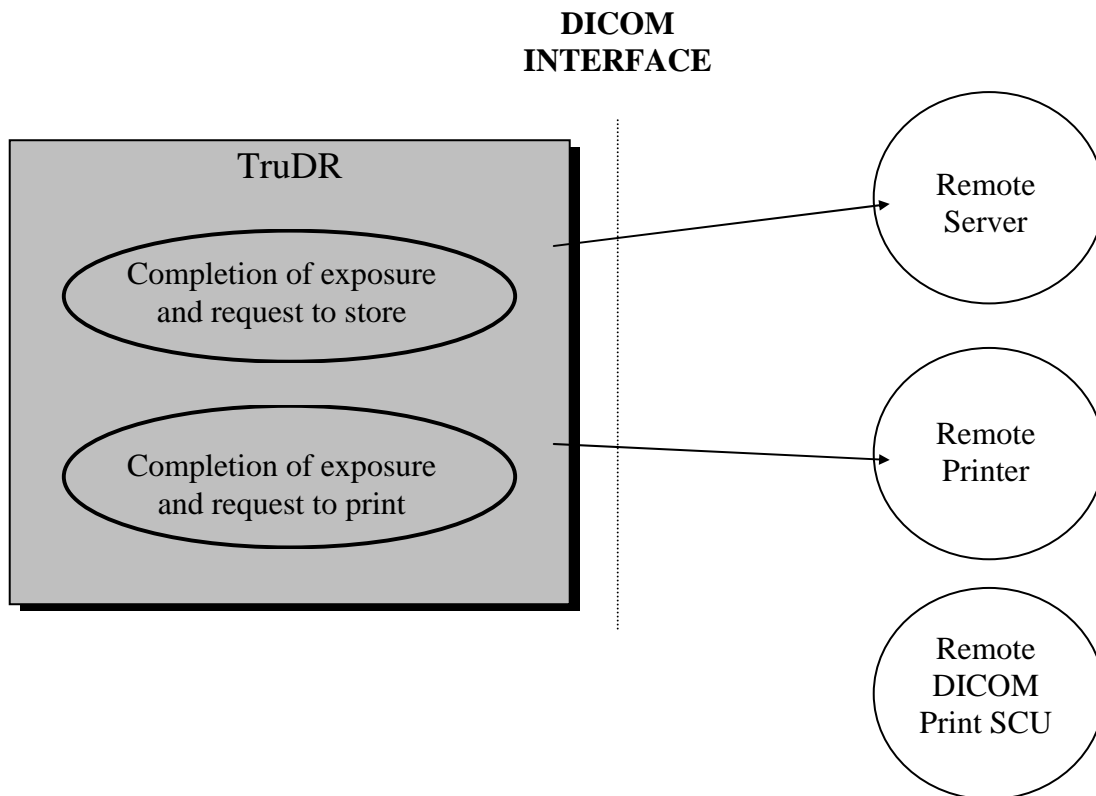
This Conformance Statement specifies the Sound Technologies TruDR compliance to DICOM V3.0.

2. Implementation Model

Sound Technologies TruDR directly digitizes the X-ray image data (DX image) by using the flat panel sensor, and sends the Digital Radiography image data by using DICOM Storage Service Class or DICOM Print Management Service Class.

2.1 Application Data Flow Diagram

Sound Technologies TruDR sends acquired image data (DX image) to the server by using Storage Service Class, or to the printer by using Print Management Service Class.



2.2 Functional Definition of AE's

Sound Technologies TruDR captures an image and processes the image by the operation from the LCD touch panel monitor of the operation unit. After image data (DX image) is captured, it may be sent to the server by using Storage Service Class, or it is sent to the printer by using Print Management Service Class.

Sound Technologies TruDR also retrieve a Modality Worklist from an external Modality Worklist Provider.

The Application Entity of Sound Technologies TruDR also acts as an SCU for the Verification SOP classes.

2.3 Sequencing of Real-World Activities

Not applicable.

3. AE Specifications

Sound Technologies TruDR generates a single association establishment request and operates as an application entity. Sound Technologies TruDR is defined by the following SOP:

SOP Class as SCU	
UID Name	UID Value
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15
Verification (Echo)	1.2.840.10008.1.1
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31
* Unknown IOD Storage	* See note

NOTE: This will initiate outgoing DICOM C-STORE requests masquerading as any stored IOD module. The behavior of this outgoing association link will be like the DICOM defined SCU role: Storage Service Class.

Also, the SOP Class of the above Basic Grayscale Print Management Meta is defined as follows:

Basic Grayscale Print Management Meta SOP Class		
SOP Class Name	SOP Class UID	Comment
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	
Printer SOP Class	1.2.840.10008.5.1.1.16	Used for collecting printer information when DICOM Printer Service is used.

Sound Technologies TruDR supports the following Transfer Syntaxes for saving acquired images:

Transfer Syntax		
UID Name	UID Value	Comment
Implicit VR Little Endian	1.2.840.10008.1.2	No compression
JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression.	1.2.840.10008.1.2.4.70	This is the default setting. Settings need to be changed by the service person when they are going to be used in DICOM Storage Service.
JPEG 2000 Lossless	1.2.840.10008.1.2.4.90	JPEG 2000 lossless (but not supported by all DICOM readers).

Sound Technologies TruDR supports the following Transfer Syntax and Compression Modes when executing a C-Store: (compression setting can be changed in the Dicom Servers tab in Application Settings)

Compression Modes		
Configuration	Proposed Transfer Syntaxes	Name
0 (Uncompressed)	1.2.840.10008.1.2	Implicit Little Endian
1 (Send As Is)	<Transfer syntax in image>	<Transfer syntax in image>
	1.2.840.10008.1.2	Implicit Little Endian
2 (Send As Is With Default Transfer Syntax)	1.2.840.10008.1.2	Implicit Little Endian
	1.2.840.10008.1.2.4.70	JPEG Lossless sv1
3 (Jpeg Lossless)	1.2.840.10008.1.2	Implicit Little Endian
	1.2.840.10008.1.2.4.51	JPEG extended (12 bits)
4 (Jpeg Lossy)	1.2.840.10008.1.2	Implicit Little Endian

Note: The transfer syntaxes are listed in order of priority. I.e., if a host is configured as 3 (Jpeg Lossless) and it accepts JPEG lossless, the image will be lossless JPEG compressed before transmission, even if it was not stored in that way. If the host does not accept Jpeg Lossless, it will send it out Uncompressed with Default Transfer Syntax (Implicit Little Endian)

- 0 (Uncompressed). Images will be decompressed prior to transmission and sent with default transfer syntax (ImplicitLittleEndian, 1.2.840.10008.1.2).
- 1 (Send As Is) Sends image with the transfer syntax specified in the file. It is recommended that the host be configured to receive all possible transfer syntaxes.
- 2 (Send As Is With Default Transfer Syntax). The configuration “as” will transmit images as-is. Independent of how images are stored on disk (with JPEG or NKI compression), they will be transmitted over an ImplicitLittleEndian connection. This behavior does not conform to the DICOM standard and for many hosts this may therefore not work. NKI clients will work, though.
- 3 (Jpeg Lossless). Will attempt to send with Jpeg Lossless (1.2.840.10008.1.2.4.70) if the host accepts it, otherwise, it will send it as configuration 0 (Uncompressed)
- 4 (Jpeg Lossy). Will attempt to send with Jpeg Extended Lossy (1.2.840.10008.1.2.4.71) if the host accepts it, otherwise, it will send it as configuration 0 (Uncompressed)

Jpeg compression is performed by utility from the OFFIS DICOM toolkit DCMTK version 3.5.3. This executable is called by Nucleus to compress DICOM images in jpeg format. Copyright (C) 1994-2004, OFFIS. This software and supporting documentation were developed by Kuratorium OFFIS e.V. Healthcare Information and Communication Systems Escherweg 2 D-26121 Oldenburg, Germany. This software is made available, as is, and OFFIS makes no warranty regarding the software, its performance, its merchantability or fitness for any particular use, freedom from any computer diseases or its conformity to any specification. The entire risk as to

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3.1 Association Establishment Policies

3.1.1 General

Sound Technologies TruDR generates association establishment request for the server or the printer when image data (DX image) to be sent is acquired. Maximum size of PDU which is used is 128K*.

3.1.2 Number of Associations

Sound Technologies TruDR generates association establishment request.

3.1.3 Asynchronous Nature

Asynchronous mode is not supported.

3.1.4 Implementation Identifying Information

Implementation Class UID for Sound Technologies TruDR is:
1.2.840.114387.GUID, where GUID is the unique image ID that is generated from the VetPACS system.

3.2 Association Acceptance Policy

Sound Technologies TruDR establishes association by sending establishment request to the server or printer when image data (DX image) to be sent is acquired.

3.2.1 Related Real-World Activity

Storage Service Class:

When the study is completed, AE sends C-STORE request for sending image.

Print Service Class:

When the study is completed, AE sends N-CREATE request for making film session and film box.

Then, it sends N-SET request for sending image data.

Finally, it sends N-ACTION request for printing the image on film, and N-DELETE for deleting the film session.

4. Communication Profiles

4.1 Supported Communication Stack

Sound Technologies TruDR provides DICOM V3.0 TCP/IP network communication support as stated in DICOM Standard Part 8.

4.2 TCP/IP Stack

Sound Technologies TruDR inherits TCP/IP stack.

4.3 Physical Media Support

Sound Technologies TruDR supports 10BASE-T, 100BASE-TX, 10BASE-2 (option) and 10BASE-5 (option) of ETHERNET™¹.

5. Extension / Specialization / Privatization

Not applicable.

6. Configurable Parameters

Following environmental configuration information can be set from the LCD touch panel monitor of the Sound Technologies TruDR: CALLED APP TITLE HOST NAME PORT #.

7. Support of Extended Character Sets

Sound Technologies TruDR supports extended character sets. Defined terms for single-byte character sets without code extensions:

Character Set Description	Defined Term	ISO registration number	Number of characters	Code element	Character Set
Default repertoire	None	ISO-IR 6	94	G0	ISO 646:
Latin alphabet No.1	ISO_IR 100	ISO-IR 100	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:
Latin alphabet No.2	ISO_IR 101	ISO-IR 101	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:
Cyrillic	ISO_IR 144	ISO-IR 144	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:

¹ Ethernet is a trademark of Xerox Corporation

8. Entity

8.1 IOD Modules

Sound Technologies TruDR uses the following IOD modules for DX modality DICOM files:

Information Entities	Module
SOP	SOP Common
Patient	Patient
Study	General Study
Series	General Series
Equipment	General Equipment
	DX Detector
Image	General Image
	DX Image
	Pixel Image
	VOI LUT
Acquisition	X-Ray Generation
	X-Ray Filtration
	X-Ray Grid
	DX Positioning

Sound Technologies TruDR uses the following VR (Value Representation) definitions as follows:

VR	Format	Data Length (Byte)
AS (Age String)	nnnY, nnnM, nnnW, nnnD	4
AE (Application Entity)		16 (max.)
CS (Code String)		16 (max.)
DA (Date)	YYYYMMDD	8
DS (Decimal String)	+xxx.xxxx, -xxx.xxxxx, etc	16 (max.)
DT (Date Time)	YYYYMMDDHHMMSS.FFFFFFFF	26 (max.)
FL (Floating Point Single)		4
FD (Floating Point Double)		8
IS (Integer String)		12 (max.)
LO (Long String)		64 (max.)
LT (Long Text)		10,240 (max.)
OB (Other Byte String)		Differs according to the transfer syntax.
OW (Other Word String)		Differs according to the transfer syntax.
PN (Person Name)		64 (max.) / component
SH (Short String)		16 (max.)
ST (Short Text)		1,024 (max.)
TM (Time)	HHMMSS.FFFFFFFF	16 (max.)
UI (Unique Identifier)		64 (max.)
UL (Unsigned Long)		4
US (Unsigned Short)		2

8.2 TruDR DICOM Library

Each element in this system for TYPE will be handled as follows:

Type	Handling
1	Value is always sent with Tag.
1C	Value is sent with Tag under a certain condition.
2	Value is sent with Tag. However, when Value is unknown, it will be sent as a text string of length 0.
2C	It will be handled in the same way as TYPE2 under a certain condition.
3	Value is sent with Tag. However, when Value is unknown, it will be sent as a text string of length 0, or the element itself will not be sent.

8.2.1 Part 10 Group Header (if file based)

Attribute Name	Tag	VR	Type	Value
File preamble	No tag or length field	-	1	A fixed 128 byte field available for Application Profile or implementation specified use. Currently set to all zeroes.
DICOM Prefix	No tag or length field	-	1	Four bytes containing the character string "DICM". This Prefix is intended to be used to recognize that this File is or not a DICOM File.
Group Length	(0002,0000)	-	1	Number of bytes following this File Meta Element (end of the Value field) up to and including the last File Meta Element of the Group 2 File Meta Information
File Meta Information Version	(0002,0001)	OB	1	Array of the values: "00", "01"
Media Storage SOP Class UID	(0002,0002)	UI	1	Uniquely identifies the SOP Class associated with the Data Set. SOP Class UIDs allowed for media storage are specified in PS 3.4 of the DICOM Standard - Media Storage Application Profiles.
Meta storage SOP Instance UID	(0002,0003)	UI	1	Uniquely identifies the SOP Instance associated with the Data Set placed in the file and following the File Meta Information. SOP Instance (same as tag 0008,0018)
Transfer Syntax UID	(0002,0010)	UI	1	Uniquely identifies the Transfer Syntax used to encode the following Data Set. This Transfer Syntax does not apply to the File Meta Information. Note: It is recommended to use one of the DICOM Transfer Syntaxes supporting explicit Value Representation encoding to facilitate interpretation of File Meta Element Values (See PS 3.5 of the DICOM Standard).

Attribute Name	Tag	VR	Type	Value
Implementation class UID	(0002,0012)	UI	1	Uniquely identifies the implementation which wrote this file and its content. It provides an unambiguous identification of the type of implementation which last wrote the file in the event of interchange problems. It follows the same policies as defined by PS 3.7 of the DICOM Standard (association negotiation). The value is set to: "1.2.840.114387.3"
Implementation Version Name	(0002,0013)	SH	3	Identifies a version for an Implementation Class UID (0002,0012) using up to 16 characters of the repertoire identified in Section 8.5. It follows the same policies as defined by PS 3.7 of the DICOM Standard (association negotiation). The value is set to: "Sound Tech"
Source application entity title	(0002,0016)	AE	3	The DICOM Application Entity (AE) Title of the AE which wrote this file's content (or last updated it). If used, it allows the tracing of the source of errors in the event of media interchange problems. The policies associated with AE Titles are the same as those defined in PS 3.8 of the DICOM Standard. The value is set to: "VetPACS"

8.2.2 VetPACS Private Block Summary Module

Attribute Name	Tag	VR	Type	Value
Private block 1 reservation	(F001,00F1)	LO	1	"Sound Technologies", reserved block f001:f100-f1ff (used for various private tags)
Private block 2 reservation	(F001,00F2)	LO	1	"Sound Technologies", reserved block f002:f200-f2ff (used for embedded annotations)

8.2.3 VetPACS Private Block 1 Module

Attribute Name	Tag	VR	Type	Value
Patient Species	(F001,F100)	CS	2	Patient species (e.g. CANINE, FELINE, EQUINE)
Patient Breed	(F001,F101)	CS	2	Patient breed (e.g. BOXER, DALMATIAN, TABY)
Patient Category Size	(F001,F102)	CS	2	Patient category size (SMALL, LARGE, EQUINE)
Patient Sex Extended (including spay/neuter)	(F001:F103)	CS	2	Patient sex extended: <null>=unknown, M=male, F=female, N=neutered, S=spayed
Image View	(F001:F104)	CS	2	Image view: UNKNOWN, LAT LEFT, LAT RIGHT, VD, DV, PA, AP, DP, MEDIAL LAT, MEDIAL OBL, SKYLINE LAT, SKYLINE OBL, FRONT, HIND
Anatomy Imaged	(F001,F105)	CS	2	Anatomy imaged: UNKNOWN, THORAX, ABDOMEN, HIP, SPINE, EXTREMITY, SKULL, HOOF, STIFLE, FETLOCK, PASTER, TARSUS
Image enhancements	(F001,F106)	CS	2	Image enhancements applied in sequence (e.g. "SLUT='PseudoFilm', SLUT='S-Curve100.lut', GOPXR='s10-c10-l20.par")
Detector Settings	(F001,F107)	CS	2	Detector settings (e.g. ""Serialnumber:1234-56, Offset correction: True, Gain correction: True, Defect correction: True, Line noise correction: True")
Application Version	(F001,F108)	CS	2	Application version: (e.g. "App=3.0.50 (Vp3_Acquisition.exe), Dll=3.0.50")
Image Laterality Extended	(F001,F109)	LO	3	
Client Name	(F001,F10A)	PN	3	
Reference Study Instance Uid	(F001,F10B)	UI	3	
Reference Series Instance Uid	(F001,F10C)	UI	3	
Exam Ref Id	[F001,F10D]	LO	3	
Physician Of Record Address	[F001,F10E]	ST	3	

Attribute Name	Tag	VR	Type	Value
Physician Of Record Phone Numbers	[F001,F10F]	SH	3	
Reason For Study	[F001,F110]	LT	3	
Protocol	[F001,F111]	LO	3	
CaptureInputType	[F001,F112]	LO	3	
Exam Complaint	[F001,F113]	LT	3	
Exam Web Code	[F001,F114]	LO	3	
Exam Category	[F001,F115]	LO	3	
Exam Diagnosis	[F001,F116]	SH	3	
Exam Created By	[F001,F117]	PN	3	
Exam Created By Group	[F001,F118]	LO	3	
Exam Required By DateTime	[F001,F119]	DT	3	
Capture Type	[F001,F11A]	LO	3	
Telemed Exam ID	[F001,F11B]	IS	3	
Exam Created By Guid	[F001,F11C]	LO	3	
Client Name Guid	[F001,F11D]	LO	3	

8.2.4 VetPACS Private Block 2 Module

Attribute Name	Tag	VR	Type	Value
Private tags	(F001,00F2)	LO	3	"Sound Technologies", used for embedded annotations

8.2.5 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	"1.2.840.114387.12345678.1234.1234.1234.123456.123456" This value is composed of our base SOP base UID and appended GUID for the referenced item instance.
SOP Instance number	(0020,0013)	IS	2	Sequence number (?)
Instance Creation Date	(0008,0012)	DA	3	Date captured
Instance Creation Time	(0008,0013)	TM	3	Time captured

8.2.6 Patient Module

Attribute Name	Tag	VR	Type	Value
Patient ID	(0010,0020)	LO	2	Patient's ID
Patient Name	(0010,0010)	PN	2	Patient's name (e.g. "JOHN^SMITH")
Patient Birth Date	(0010,0030)	DA	2	Patient's birth date (e.g. "YYYYMMDD")
Patient Sex	(0010,0040)	CS	2	Patient's sex: (M=Male, F=Female or <null>=Unknown)
Patient Age	(0010,1010)	AS	3	Patient age in years
Patient Size	(0010,1020)	DS	3	Patient size/height (length in meters)
Patient Weight	(0010,1030)	DS	3	Patient weight (in kilograms)
Patient Comments	(0010,4000)	LT	3	Patient comments

8.2.7 General Study Module

Attribute Name	Tag	VR	Type	Value
Study ID	(0020,0010)	SH	2	Internal study number.
Study Instance UID*	(0020,000D)	UI	1	1.2.392.200046.100.2.1.(S/N).(Internal study No.)(Year, month, date and time of study exposure)
Study Date	(0008,0020)	DA	2	Date (YYYYMMDD) when study was performed.
Study Time	(0008,0030)	TM	2	Time (HHMMSS.000000) when study was performed.
Study Description	(0008,1030)	LO	2	Institution-generated description or classification of the study performed.
Accession Number	(0008,0050)	SH	2	A RIS or a HIS generated number which identifies the order for the study.
Referring Physician's Name	(0008,0090)	PN	2	Physician's name to refer to. (Physician in charge of the patient)

8.2.8 General Series Module

Attribute Name	Tag	VR	Type	Value
Modality	(0008,0060)	CS	1	Modality of digital x-ray "DX "
Series Number	(0020,0011)	IS	2	A number that identifies this Series.
Series Instance UID	(0020,000E)	UI	1	1.2.392.200046.100.2.1.(S/N).(Internal study No.)(Year, month, date and time of study exposure).(Series No.)
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.

8.2.9 General Equipment Module

Attribute Name	Tag	VR	Type	Value
Institution Name	(0008,0080)	LO	3	Institution where the equipment is located, (e.g. "Emergency Animal Hospital")
Manufacturer	(0008,0070)	LO	2	Sound Technologies Inc.
Manufacturer's Model Name	(0008,1090)	LO	3	"TruDR"
Station Name	(0008,1010)	SH	3	Machine name of computer that produced the image. (e.g. "ACQUISITION1")
Device Serial Number	(0018,1000)	LO	3	Serial number (e.g. "1234-05")
Software Version	(0018,1020)	LO	3	Vx.x.xx (x indicates version number)
Pixel Padding	(0028,0120)	US		Value=0 for black (if MONOCHROME2)
Date of Last Calibration	(0018,1200)	DA	3	Date (YYYYMMDD) when the last calibration was performed.
Time of Last Calibration	(0018,1201)	TM	3	Time (HHMMSS.000000) when the last calibration was performed.

8.2.10 DX Detector Module

Attribute Name	Tag	VR	Type	Value
Detector Type	(0018,7004)	CS	2	Detector Type (SCINTILLATOR)
Detector Configuration	(0018,7005)	CS	3	"AREA"
Detector Description	(0018,7006)	LT	3	"TruDR"
Detector Mode	(0018,7008)	LT	3	"0"
Detector Serial Number	(0018,700A)	SH	3	"1234-05"
Detector Last Calibration Date	(0018,7010)	DA	3	Date of last calibration "20051101"
Detector Last Calibration Time	(0018,7011)	TM	3	Time of last calibration "111213"
Detector Time Since Last Exposure	(0018,7012)	DS	3	Time in Seconds since an exposure was last made on this detector prior to the acquisition of this image (e.g. "60").
Detector Samples Per Pixels	(0028,0002)	US	1	"1"
Detector Pixel Aspect Ratio	(0028,0034)	IS	1C	Array (X/Y)
Detector Binning	(0018,701A)	DS	3	Array (X/Y)
Detector Imaging Pixel Spacing	(0018,1164)	DS	1	Array (0.127/0.127) for TruDR panel

8.2.11 DX Positioning Module

Attribute Name	Tag	VR	Type	Value
Laterality	(0020,0062)	CS	2C	Laterality of (paired) body part examined. Required if the body part examined is a paired structure. Enumerated Values: R=right, L=left

8.2.12 General Image Module

Attribute Name	Tag	VR	Type	Value
Image Number	(0020,0013)	IS	2	A number that identifies the internal image.
Image Comments	(0020,4000)	LT	3	Comments on Images.
Pixel Data ²	(7FE0,0010)	OW	1	A data stream of the pixel samples that comprise the Image. See C.7.6.3.1.4 for further explanation. Pixel data is an array (could be raw pixels, or an embedded JPEG or J2K image). The order of pixels sent for each image plane is left to right, top to bottom, i.e., the upper left pixel. The VR is generally OW or OB for > 8 bit data or OB for 8 bit or less).
Rows	(0028,0010)	US	1	Number of pixels in rows in the image data.
Columns	(0028,0011)	US	1	Number of pixels in columns in the image data.
Bits Allocated	(0028,0100)	US	1	16
Bits Stored	(0028,0101)	US	1	12 (but may vary with future hardware)
High Bits	(0028,0102)	US	1	11 (one less than bits stored)
Pixel Representation	(0028,0103)	US	1	0

² Planar Configuration (0028,0006) shall not be present for grayscale images

8.2.13 DX Image Module

Attribute Name	Tag	VR	Type	Value
Image Type	(0008,0008)	CS	1C	Array: Value1: ORIGINAL or DERIVED, Value2: PRIMARY or SECONDARY
Photometric Interpretation	(0028,0004)	CS	1	Grayscale color map: MONOCHROME2 (black to white), MONOCHROME1 (white to black). Note we currently only create MONOCHROME2 images.
Samples Per Pixel	(0028,0002)	US	1	Sample per pixel: "1"
Pixel Intensity Relationship	(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" (unspecified)
Presentation LUT Shape	(2050,0020)	CS	1C	"IDENTITY"
Tag Burned In Image	(0028,0301)	CS	1	"NO" Since we currently do not burn in tags to our raw images.

8.2.14 VOI LUT Module

Attribute Name	Tag	VR	Type	Value
Window Center	(0028,1050)	DS	3	Window center for display, (e.g. 2048)
Window Width	(0028,1051)	DS	1C	Window width for display, (e.g. 4096)
Window Description	(0028,1052)	CS		Window description: "Image Windows Level"
Imager Pixel Spacing*	(0018,1164)	DS	3	Pixel pitch of sensor.

8.2.15 X-Ray Generation Module

Attribute Name	Tag	VR	Type	Value
KVP	(0018,0060)	DS	3	Peak KVP X-ray generator voltage
X-ray Tube Current	(0018,1151)	IS	3	X-ray tube current, in mA.
Exposure Time	(0018,1150)	IS	3	Time of X-ray exposure, in mSec.
Exposure	(0018,1152)	IS	3	The product of exposure time and X-ray tube current expressed in mAs.
Distance Source to Detector	(0018,1110)	DS	3	Distance in mm from source to detector center, also known as SID.
Acquisition Device Processing	(0018,1400)	LO	3	Method of processing the image.

8.2.16 X-Ray Filtration Module

Attribute Name	Tag	VR	Type	Value
Filter Type	(0018,1160)	SH	3	Filter type (NONE, STRIP, WEDGE, BUTTERFLY, MULTIPLE)
Filter Material	(0018,7050)	CS	3	Filter material (MOLYBDENUM, ALUMINUM, COPPER, RHODIUM, NIOBIUM, EUROPIUM, LEAD)
Filter Thickness Min	(0018,7052)	DS	3	Filter thickness min in mm
Filter Thickness Max	(0018,7054)	DS	3	Filter thickness max in mm

8.2.17 X-Ray Grid Module

Attribute Name	Tag	VR	Type	Value
Grid Type	(0018,1166)	CS	3	Grid type (NONE, FIXED, PARALLEL, CROSSED, RECIPROCATING, FOCUSED)
Grid Ratio	(0018,7046)	IS	3	Grid ratio X/Y
Grid Pitch	(0018,7044)	DS	3	Grid pitch: Array (X/Y)
Grid focal distance	(0018,704c)	DS	3	Grid focal distance
Grid period	(0018,7048)	DS	3	Grid period

8.3 VetPACS DICOM Print Library

8.3.1 Printer Module

Attribute Name	Tag	VR	Type	Value
Printer Status	(2110,0010)	LO	3	Printer device status: NORMAL WARNING FAILURE
Printer Status Info	(2110,0020)	CS	3	Information on printer status.
Printer Name	(2110,0030)	LO	3	User defined identifying the printer.
Manufacturer	(0008,0070)	LO	3	Manufacturer of the printer.
Manufacturer Model Name	(0008,1090)	LO	3	Model name of the printer.
Device Serial Number	(0018,1000)	LO	3	Serial number of the printer.
Software Version	(0018,1020)	LO	3	Software version of the printer.
Date of Last Calibration	(0018,1200)	DA	3	Date(YYYYMMDD) when the last calibration was performed.
Time of Last Calibration	(0018,1201)	TI	3	Time(HHMMSS.000000) when the last calibration was performed.

8.3.2 Basic Film Presentation Module

Attribute Name	Tag	VR	Type	Value
Number of Copies	(2000,0010)	IS	3	Number of copies to be printed for each film of the film session.
Print Priority	(2000,0020)	CS	3	Specifies the priority of the print job. (HIGH or LOW)
Medium Type	(2000,0030)	CS	3	Medium Type. (PAPER,CLEAR FILM,BLUE FILM)
Film Destination	(2000,0040)	CS	3	Film Destination. (MAGAZINE or PROCESSOR)
Film Session Label	(2000,0050)	LO	3	Human readable label that identifies the film session.

8.3.3 Basic Film Box

Attribute Name	Tag	VR	Type	Value
Image Display Format	(2010,0010)	ST	1	Format specified by the user.
Film Orientation	(2010,0040)	CS	3	Direction of the film specified by the user. (PORTRAIT or LANDSCAPE)
Film Size ID	(2010,0050)	CS	1	Film size identification. 8IN X 10IN, 10IN X 12IN, 10IN X 14IN, 11IN X 14IN, 14IN X 14IN, 14IN X 17IN, 24CM X 24CM, 24CM X 30CM
Magnification Type	(2010,0060)	CS	3	One of the following interpolation types: REPLICATE BILINEAR CUBIC NONE

Attribute Name	Tag	VR	Type	Value
Smoothing Type	(2010,0080)	CS	3	Further specifies the type of the interpolation function; values are defined in Conformance Statement; only valid for Magnification Type (2010,0060)=CUBIC
Border Density	(2010,0100)	CS	3	Density of border.
Min Density	(2010,0120)	US	3	Minimum density of the image.
Max Density	(2010,0130)	US	3	Maximum density of the image.
Trim	(2010,0140)	CS	3	Specifies whether a Trim box shall be printed surrounding each image on the film (ON/OFF).
Configuration Information	(2010,0150)	ST	3	Character string that contains either the ID of the printer configuration table that contains a set of values for implementation specific print parameters or one or more configuration data values, encoded as characters.

8.3.4 Basic Image Box

Attribute Name	Tag	VR	Type	Value
Image Position	(2020,0010)	US	1	Position of the image on the film.
Polarity	(2020,0020)	CS	3	Specifies whether minimum pixel values are to be printed black or white.
Requested Image Size	(2020,0030)	DS	3	Width of the image to be printed, in mm.
Preformatted Grayscale Image Sequence	(2020,0110)	SQ	1	Sequence of image.
>Photometric Interpretation	(0028,0004)	US	1	Refer to Image Pixel.
>Samples Per Pixel	(0028,0002)	US	1	Refer to Image Pixel.
>Rows	(0028,0010)	US	1	Refer to Image Pixel.
>Columns	(0028,0011)	US	1	Refer to Image Pixel.
>Bits Allocated	(0028,0100)	US	1	Refer to Image Pixel.
>Bits Stored	(0028,0101)	US	1	Refer to Image Pixel.
>High Bit	(0028,0102)	US	1	Refer to Image Pixel.
>Pixel Representation	(0028,0103)	US	1	Refer to Image Pixel.
>Pixel Data	(7FE0,0010)	OW	1	Image data.

8.3.5 Annotation List Module

Attribute Name	Tag	VR	Type	Value
Annotation Position	(2030,0010)	US	1	Position of the annotation box.
Text String	(2030,0020)	LO	3	Text string.

8.3.6 Modality LUT Basic Film Session

Attribute Name	Tag	VR	Type	Value
Rescale Intercept	(0028,1052)	DS	1C	Rescale Intercept. 200
Rescale Slope	(0028,1053)	DS	1C	Rescale Slope. 7.326007E-1
Rescale Type	(0028,1054)	LO	1C	Rescale Type. OD

8.4 Retrieve a Modality Worklist From a Remote System

8.4.1 Scheduled Procedure Step Module

Attribute Name	Tag	VR	Type	Value
Scheduled Procedure Step Sequence	(0040,0100)	DS	2C	
Scheduled Procedure Step ID	(0040,0009)	SH	2C	
Scheduled Station AE Title	(0040,0001)	AE	2C	
Scheduled Procedure Step Start Date	(0040,0002)	DA	2C	
Scheduled Procedure Step Start Time	(0040,0003)	TM	2C	
Modality	(0008,0060)	CS	2C	
Scheduled Performing Physician's Name	(0008,0060)	PN	2C	
Scheduled Procedure Step Description	(0040,0006)	LO	2C	
Scheduled Station Name	(0040,0007)	SH	2C	
Scheduled Procedure Step Location	(0040,0010)	SH	2C	
Scheduled Procedure Step Status	(0040,0011)	CS	2C	
Comments on the Scheduled Procedure Step	(0040,0020)	LT	2C	

8.4.2 Requested Procedure

Attribute Name	Tag	VR	Type	Value
Requested Procedure ID	(0040,1001)	SH	2C	
Requested Procedure Description	(0032,1060)	LO	2C	
Study Instance UID	(0020,000D)	UI	2C	
Reason for the Requested Procedure	(0040,1002)	LO	2C	
Requested Procedure Comments	(0040,1400)	LT	2C	
Requested Procedure Priority	(0040,1003)	SH	2C	

8.4.3 Patient Identification

Attribute Name	Tag	VR	Type	Value
Patient's Name	(0010,0010)	PN	2C	
Patient ID	(0010,0020)	LO	2C	

8.4.4 Patient Demographic

Attribute Name	Tag	VR	Type	Value
Patient's Birth Date	(0010,0030)	DA	2C	
Patient's Sex	(0010,0040)	CS	2C	
Patient's Weight	(0010,0030)	DS	2C	

8.4.5 Imaging Service Request

Attribute Name	Tag	VR	Type	Value
Imaging Service Request Comments	(0040,2400)	LT	2C	
Requesting Physician	(0032,1032)	PN	2C	
Referring Physician's Name	(0008,0090)	PN	2C	
Accession Number	(0008,0050)	SH	2C	

9. Mapping From Dicom Tags To VetPACS Database For Import

There is an internal XML file in Nucleus (DefaultMapping.xml) that defines the mapping from Dicom Tags to VetPACS database tables.

For each database column there is a mapping type. Here is a description of them:

Mapping Type	Description
Application Setting	Application Setting.
Client User Mapping	Special mapping for the Patient's Client User
Dicom Tag	Simple mapping from Dicom Tag to Database value.
CodeTableLookup	Lookup to VetPACS Codes table
Constant	Constant value
Other Table Mapping	Value from column in another table.

9.1 Mapping From Dicom Tags To Patients Table

Database Column	Mapping Type	Tag Name or Value	Element Tag	Type	Notes
ClinicGuid	Application Setting	ClinicGuid	N/A	R	Application Setting
PatientID	Dicom Tag	Patient ID	(0010,0020)	R	PatientID
PatientName	Dicom Tag	Patient Name	(0010,0010)	R	See Note 1
ClientGuid / Client Name	Client User Mapping	Patient Name	(0010,0010)	R	See Note 2
		ClientName*	(F001,F10A)	O	
		ClientNameGuid*	(F001,F11D)	O	
PatientBirthDate	Dicom Tag	Patient Birth Date	(0010,0030)	O	VetPACS Patient BirthDate is a datetime, combines both dicom tags
		Patient Birth Time	(0010,0032)	O	
PatientSize	Dicom Tag	Patients Size	(0010,1020)	O	
Weight	Dicom Tag	Patients Weight	(0010,1030)	O	Convert from KG to lbs.
PatientComments	Dicom Tag	Patient Comments	(0010,4000)	O	
SexCode	CodeTableLookup	Patient Sex Extended*	(F001:F103)	O	Use extended private tag if it exists, otherwise standard tag
		Patient Sex	(0010,0040)	O	
SpeciesCode	CodeTableLookup	PatientSpecies*	(F001,F100)	O	
CategorySizeCode	CodeTableLookup	Patient Category Size*	(F001,F102)	O	
BreedCode	CodeTableLookup	Patient Breed*	(F001,F102)	O	
Hide	Constant	1			Ensures that Patient is visible from VetPACS

* Denotes Sound Technologies Private Tags

Note 1: For PatientName, this is parsed from the PatientName (0010,0010) Dicom Tag. If this value is formatted with the DICOM Person Name VR (in format LastName^FirstName^MiddleName^NamePrefix^NameSuffix) then PatientName will be the FirstName part. If the value is not formatted in Person Name VR, then the PatientName will be the entire value. NOTE: if this patient ID already exists in the database, the patient Name will NOT be updated, because there is a good chance that it has been edited because there is no standard PatientName and ClientName dicom tags.

Note 2: For Client Name / Client Guid, if the ClientGuid (0010, 0040) and ClientName (F001,F10A) private tags exists, we use these for the Client Name. If these do not exist, then we parse the client name from the PatientName (0010, 0010) value. If PatientName value is in DICOM Person Name format (LastName^FirstName^MiddleName^NamePrefix^NameSuffix), then we use this mapping from the parts of Person Name VR:

- LastName = Client Last Name
- Middle Name = Client Middle Name
- Name Prefix = Client Name Prefix
- Name Suffix = Client Name Suffix

If the PatientName value is not in DICOM Person Name VR, then we will use the entire PatientName as the ClientLastName. It is expected that a VetPACS user will fix this data, so if

the patient ID already exists in the database, then the client name associated with it will not be updated.

9.2 Mapping From Dicom Tags To Exams (Studies) Table

Database Column	Mapping Type	Tag Name or Value	Element Tag	Type	Notes
ClinicGuid	Application Setting	ClinicGuid	N/A	R	Application Setting
StudyInstanceUid	Dicom Tag	Study Instance Uid	[0020,000D]	R	
StudyID	Dicom Tag	Study ID	[0020,0010]	R	
AccessionNumber	Dicom Tag	Accession Number	[0008,0050]	O	
CreateDate	Dicom Tag	Study Date	[0008,0020]	O	
		Study Time	[0008,0030]		
Complaint	Dicom Tag	Exam Complaint *	[F001,F113]	O	Use extended private tag if it exists, otherwise standard tag
		Study Description	[0008,1030]	O	
ExamVetGuid	UserColumnMapping	Physician Of Record	[0008,1048]	O	See Note 1
		Referring Physician's Name	[0008,0090]		
		DefaultExamVetGuid	AppSetting		
CreatedByGuid	UserColumnMapping	ExamCreatedBy*	[F001,F117]	O	
		ExamCreatedByGuid *	[F001,F117]		
		ExamCreatedByGroup*	[F001,F118]		
SOAP	Dicom Tag	ReasonForStudy *	[F001,F110]	O	
PatientGuid	Other Table Mapping	PatientGuid from record in Patients table			
ClientGuid	Other Table Mapping	ClientGuid from record in Patients table			
RefId	Dicom Tag	ExamRefId *	[F001,F10D]	O	
RequiredByDate	Dicom Tag	ExamRequiredByDateTime *	[F001,F119]	O	
DiagnosisCode	CodeTableLookup	ExamDiagnosis *	[F001,F116]	O	
ExamID	Dicom Tag	TelemedExamID *	[F001,F11B]	O	
WebCode	Dicom Tag	ExamWebCode *	[F001,F114]	O	
CategoryCode	CodeTableLookup	ExamCategory *	[F001,F115]	O	
FolderCode	Constant	0		R	
StateCode	Constant	0		R	
Hide	Constant	1		R	Ensures that Patient is visible from VetPACS

* Denotes Sound Technologies Private Tags

Note 1: ExamVetGuid is determined as follows: if we cannot find Physician of Record or Referring Physician's Name as an ExamVet in the Users table, we will use the configured Default Exam Vet Guid (Nucleus Server) the configured User (VetPACS Review or TruDR).

9.3 Mapping From Dicom Tags To Series Table

Database Column	Mapping Type	Tag Name or Value	Element Tag	Type	Notes
ModalityId	LookupTable	Modality	[0008,0060]	R	Lookup to Modalities table
SeriesInstanceUid	Dicom Tag	Series Instance UID	[0020,000E]	R	
SeriesNumber	Dicom Tag	Series Number	[0020,0011]	O	
SeriesDescription	Dicom Tag	Series Description	[0008,103E]	O	
CreateDate	Dicom Tag	Series Date	[0008,0021]	O	
		Series Time	[0008,0031]		
ProtocolName	Dicom Tag	Protocol Name	[0018,1030]	O	
ExamGuid	Other Table Mapping	Guid from record in Exams table			

9.4 Mapping From Dicom Tags To Captures (Images) Table

Database Column	Mapping Type	Tag Name or Value	Element Tag	Type	Notes
AbstractSyntaxId	LookupTable	SOP Class UID	[0008,0016]	R	Lookup to AbstractSyntaxes table
SopInstanceUid	Dicom Tag	SOP Instance UID	[0008,0018]	R	
FileSuffix	Application Setting	FileExtension		R	
Description	Dicom Tag	Accession Number	[0008,0050]	O	
CreateDate	Dicom Tag	Acquisition date	[0008,0022]	O	If Acq Date/Time doesn't exist, then use Content Date/Time
		Acquisition time	[0008,0032]		
		Content Date	(0008,0023)		
		Content Time	(0008,0033)		
TagBurnedInImage	Dicom Tag	Burned In Annotation	[0028,0301]	O	
ImageCompression Code	CodeTableLookup	Image Compression	[0028,2110]	O	
InputTypeCode	CodeTableLookup	CaptureInputType *	[F001,F112]	O	
CaptureTypeCode	Capture Type Lookup	CaptureType *	[F001,F11A]	O	See Note 1
OrderValue	Constant	0	N/A	R	See Note 2
FileExistsOnClient Code	Constant	1	N/A	R	
ExamGuid	Other Table Mapping	Guid from record in Exams table			
SeriesGuid	Other Table Mapping	SeriesGuid from record in Series table			

* Denotes Sound Technologies Private Tags

Note 1: If the CaptureType private tag does not exist, the Capture Type Code value will be determined by Modality tag value:

- "US" = 11
- "CT" = 7
- "MR" = 8
- "DX" = 9

- "CR" = 10

Note 2: OrderValue will be set to 0, so VetPACS database sets the next value for captures in the same exam.