Ultrasonix Medical Corporation

DICOM CONFORMANCE STATEMENT

For SonixTablet, SonixTouch, 2010 SonixMDP/SP/OP and Legacy SonixMDP Diagnostic Ultrasound Systems (Software Version 6.0.3 and above)

Ultrasonix Medical Corporation
130 – 4311 Viking Way
Richmond, BC V6V 2K9
Canada

www.ultrasonix.com

1.866.437.9508
1.778.296.3860 (Support)

© 2013 Ultrasonix Medical Corporation
00.053.115, Revision E, September 9, 2013
All Rights Reserved. Printed in Canada.

US Patents: 6,216,029 - 6,325,759 - 6,558,326 - 6,911,008 - 7,274,325 - 8,088,070 - D654,178

CONFORMANCE STATEMENT OVERVIEW

Ultrasonix systems implement the necessary DICOM® services to store and/or print Ultrasound (US) images, Structured Reports and Search Worklists from the information systems.

The following table provides an overview of the network service (SOP) classes supported by Ultrasonix.

Table 1-1: Network Services

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
US Image Storage	Yes	No
US Multi-frame Image Storage	Yes	No
Comprehensive SR	Yes	No
Storage Commitment Push Model	Yes	No
Workflow Management		
Modality Worklist Information Model – FIND	Yes	No
Modality Performed Procedure Step (MPPS)	Yes	No
Print Management		
Basic Grayscale Print Management Meta	Yes	No
Basic Color Print Management Meta	Yes	No

The next table specifies the Supported Media Storage Application Profiles.

Table 1-2: Media Services

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Ultrasound Application Profile		
Image Display for Single & Multi-Frame	Yes / Yes	No
Compact Disk - Recordable		
General Purpose CD-R	Yes / Yes	No
DVD		
General Purpose DVD-RAM	Yes / Yes	No
General Purpose DVD with JPEG Compression	Yes / Yes	No
USB and Flash Memory		
General Purpose USB with JPEG Compression	Yes / Yes	No
General Purpose Multi Media Card with JPEG	Yes / Yes	No
General Purpose Compact Flash with JPEG	Yes / Yes	No
General Purpose Digital Card with JPEG	Yes / Yes	No

CONTENTS

ultrasonix

LIST OF TABLES

LIST OF FIGURES

REVISION HISTORY

Document Version	Date	Author	Description
A	March 16, 2010	Bill Zhang	Revised to include DICOM Structured Report and follow DICOM Standard PS3.2 ANNEX A "DICOM CONFORMANCE STATEMENT TEMPLATE". New DCO # 00.053.115.
B	May 25, 2010	Bill Zhang	Added Media Storage (DICOMDIR) support. Added US Region Calibration Support.
C	January 31, 2011	Alison Craig	Revised to include: SonixTABLET, SonixTOUCH, 2010 SonixMDP/SP/OP and Legacy SonixMDP
D	October 15, 2012	Bill Zhang	Added Modality Performed Procedure Steps (MPPS) support.
E	September 9, 2013	Bill Zhang	Corrected comments on attribute 'Photometric Interpretation'.

CHAPTER 1: INTRODUCTION

This document is the DICOM 3.0 Conformance Statement for the Sonix diagnostic ultrasound systems.

The system conforms to the DICOM 3.0 standard to share medical information with other digital imaging systems. The Sonix system, by means of the DICOM protocol, communicates with Storage, Storage Commitment, Print, Modality Worklist and Modality Performed Procedure Step Service Class Providers. The Sonix is capable of creating images and Structured Reports (SR) that conform to the Composite IOD.

CHAPTER 2: NETWORKING

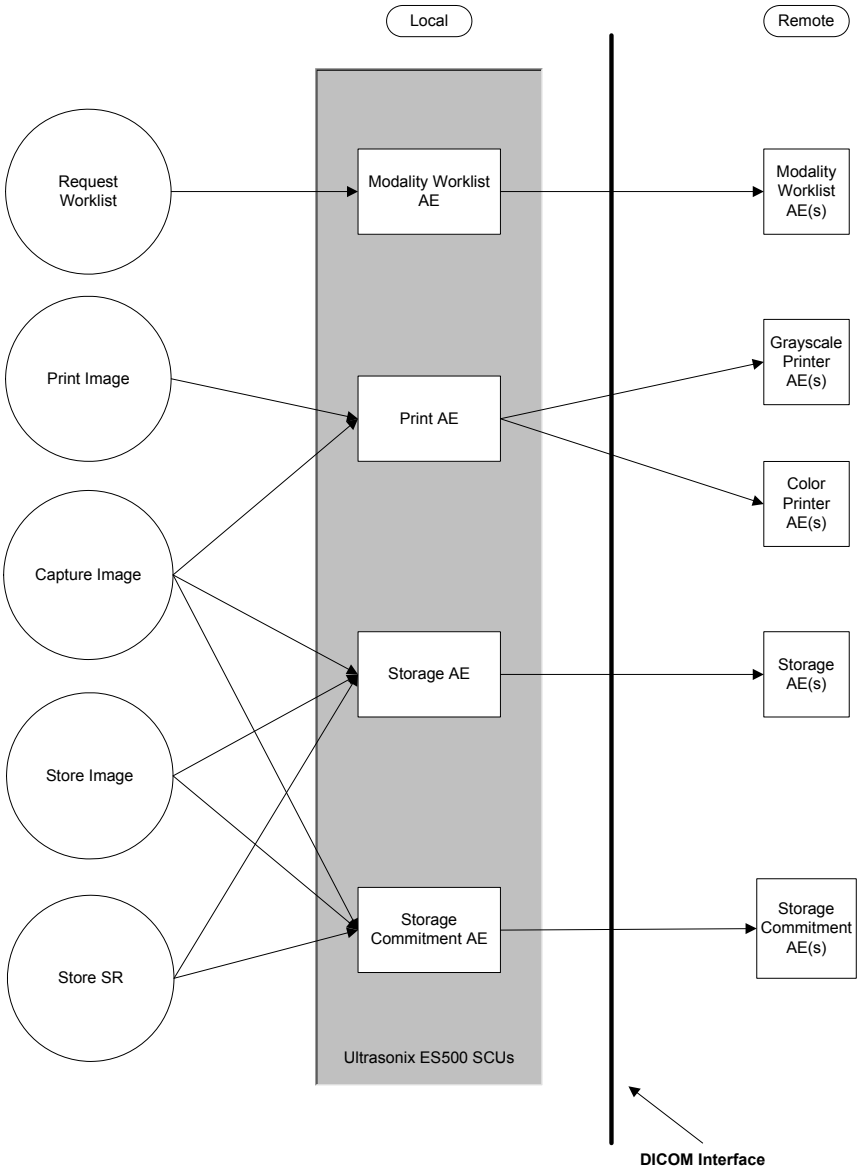
2.1 IMPLEMENTATION MODEL

The Sonix exposes the DICOM 3.0 standard as an Image and Comprehensive SR Storage SCU, a Storage Commitment SCU, an Image Printing SCU and a Modality Worklist SCU.

2.1.1 Application Data Flow

Figure 2-1 depicts the relationship between real-world activities and their corresponding local and remote Application Entities.

Figure 2-1: Implementation Model



2.1.1.1 Request Worklist

The Modality Worklist can be retrieved by entering the New Patient Window and initiating a search. A search is started by selecting the Search button which then brings up a Search Criteria Window. In the Search Criteria Window the user can specify the following search parameters:

- A range of Scheduled Exam Dates
- Patient Name (first and last)
- Patient ID
- Accession Number
- Modality
- Scheduled Station AE Title

These parameters are then used to query the Modality Worklist Server for matching patient records. All returned matching records are displayed in a selection list from which the user can select the patient to examine.

The patient list is limited to 200 records.

2.1.1.2 MPPS

The Modality Worklist Server creates and sends MPPS information to a remote AE when an exam starts. Completion of the MPPS is performed when the exam ends.

2.1.1.3 Print Image

Exams that have been completed can be printed at a later time by the user. In the Patient Archive Window the user can select which images from a selected study are to be sent to the DICOM Printer Server. From the Destination selection list DICOM Printer Server is selected. Once the Send button is clicked then the selected images are sent to the configured DICOM Printer Server(s).

2.1.1.4 Capture Image

During an Exam the user can capture images by using the Print Button on the System Console. Pressing the button causes the displayed image to be captured. This image is sent, if configured, to the DICOM Storage and DICOM Print Servers. The captured image is also stored locally on the hard disk so that it may be stored or printed at a later time.

2.1.1.5 Store Image

Exams that have been completed can be stored at a later time by the user. In the Patient Archive Window the user can select which images from a selected study are to be sent to the DICOM Storage Server. From the Destination selection list DICOM Storage Server is selected. Once the Send button is clicked then the selected images are sent to the configured DICOM Storage Server(s).

2.1.1.6 Store SR

Structured Report is sent to the configured DICOM Storage Server(s) at the end of exam. Exams that have been completed can also be stored at a later time by the user. In the Patient Archive Window when the user selects studies for a specified patient, the SR's for the selected studies are to be sent to the DICOM Storage Server. From the Destination selection list DICOM Storage Server is selected. Once the Send button is clicked then those SR's along with the selected images are sent to the configured DICOM Storage Servers.

2.1.2 Functional Definitions of AE's

2.1.2.1 Storage

The Storage AE supports the DICOM Store Service as an SCU. This AE manages the transmission of DICOM ultrasound images and SR's to a DICOM Storage Server.

2.1.2.2 Print

The Print AE supports the DICOM Print Service as an SCU. This AE manages the transmission of DICOM ultrasound images to a DICOM Print Server.

2.1.2.3 Worklist

The Worklist AE supports the DICOM Basic Worklist Management Service as an SCU. This AE manages the retrieval of a Worklist from a DICOM Worklist Server. A Worklist satisfying a user specified query is retrieved from the server.

2.1.2.4 MPPS

The Worklist AE performs the creation of a MPPS Instance automatically with status "IN PROGRESS" whenever an exam is started. The MPPS "COMPLETED" states will be sent upon ending of the study.

2.1.2.5 Storage Commitment

The Storage Commitment AE supports the DICOM Storage Commitment Service as an SCU. This AE manages the issuance of Storage Commitment Requests and the resulting Storage Commitment Status Responses. After each stored ultrasound image or SR a corresponding Storage Commitment Request is also issued if the Storage Commitment is turned on.

2.1.3 Sequencing of Real-World Activities

Not applicable.

2.2 AE SPECIFICATIONS

2.2.1 Image Printing AE - Specification

The Image Printing AE provides conformance to the following DICOM SOP Classes as an SCU:

Table 2-1: Image Printing AE SOP Class Conformance as SCU

SOP Class Name	SOP Class UID	Conformance Level
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Standard
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Standard
Basic Film Session	1.2.840.10008.5.1.1.1	Standard
Basic Film Box	1.2.840.10008.5.1.1.2	Standard
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	Standard
Basic Color Image Box	1.2.840.10008.5.1.1.4.1	Standard
Printer	1.2.840.10008.5.1.1.16	Standard

2.2.1.1 Association Establishment Policies

The Image Printing AE shall initiate an association when the user captures a full page of images. If an incomplete page of images exists when the user selects a new patient then an association is initiated. Also an association is initiated when the user manually print images.

After each page of images is printed then the association is immediately closed.

2.2.1.1.1 General

The default PDU size is 16,384 bytes. The PDU size is fully configurable by the user.

2.2.1.1.2 Number of Associations

The Image Printing AE only supports one open association at a time. Associations belonging to other active Application Entities may be open simultaneously with the association belonging to the Image Printing AE.

2.2.1.1.3 Asynchronous Nature

The Image Printing AE does not perform any asynchronous operations.

2.2.1.1.4 Implementation Identifying Information

Implementation Class UID: 2.16.124.113577.1

Implementation Version name: *major.minor.build*

Where *major* equals the major version number of the Sonix Software, *minor* equals the minor version number of the Sonix Software and *build* equals the build number of the Sonix Software.

2.2.1.2 Association Initiation by: Real-World Activity

The Image Printing AE opens an association to a Print Server (Gray or Color) when the user manually selects images to be printed, a full page of images is ready to be printed or a new patient is selected.

2.2.1.2.1 Association Initiation by: Manual Print

The user can manually select previously acquired images and send them to a Print Server which invokes the opening of an association.

2.2.1.2.2 Association Initiation by: Full Image Page Acquired

Once the user has acquired a full page of images a new association is opened upon which the full image page is sent to the Print Server.

2.2.1.2.3 Association Initiation by: Select Patient

If the user selects a new patient (end study) and an incomplete sheet, exists then a new association is opened upon which the incomplete image sheet is sent to the Print Server.

2.2.1.3 Proposed Presentation Context to a Grayscale Print Server

The following list applies when Sonix is configured to print to a Grayscale Print Server:

Table 2-2: Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax			
Name	**UID**	**Name**	**UID**	**Role**	**Extended Negotiation**
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Explicit VR Little Endian, Explicit VR Big Endian, Implicit VR Little Endian	1.2.840.10008.1.2.1, 1.2.840.10008.1.2.2, 1.2.840.10008.1.2	SCU	None

2.2.1.3.1 SOP Specific Conformance to Basic Grayscale Print Management Meta SOP Class

Standard conformance is provided to the Basic Grayscale Print Management Meta SOP Classes as an SCU. Additionally the following SOP Classes are also supported:

Table 2-3: Grayscale Supported SOP Classes

SOP Class Name	SOP Class UID	Conformance Level
Basic Film Session	1.2.840.10008.5.1.1.1	Standard
Basic Film Box	1.2.840.10008.5.1.1.2	Standard
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	Standard
Printer	1.2.840.10008.5.1.1.16	Standard

All mandatory elements of these SOP Classes are supported.

2.2.1.3.2 SOP Specific Conformance: Basic Film Session SOP Class

Note: *All attributes not listed are not supported.*

Table 2-4: Optional Attributes Set for the Film Session SOP Class

Name	Tag	Range	Comment
Number of Copies	(2000,0010)	N	Any positive integer
Print Priority	(2000,0020)	HIGH MED LOW	
Medium Type	(2000,0030)	PAPER CLEAR FILM BLUE FILM	
Film Destination	(2000,0040)	MAGAZINE PROCESSOR	

2.2.1.3.3 SOP Specific Conformance: Basic Film Box SOP Class

Note: *All attributes not listed are not supported.*

Table 2-5: Optional Attributes Set for the Film Box SOP Class

Name	Tag	Range	Comment
Film Orientation	(2010,0040)	PORTRAIT LANDSCAPE	
Film Size ID	(2010,0050)	8INX10IN 10INX12IN 10INX14IN 11INX14IN 14INX14IN 14INX17IN 24CMX30CM 24CMX24CM	
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	
Smoothing Type	(2010,0080)	Printer specific	
Border Density	(2010,0100)	BLACK WHITE *n*	*n* represents the image density in hundredths of OD
Empty Image Density	(2010,0110)	BLACK WHITE *n*	*n* represents the image density in hundredths of OD
Min Density	(2010,0120)	*n*	*n* represents any positive integer
Max Density	(2010,0130)	*n*	*n* represents any positive integer
Trim	(2010,0140)	YES NO	
Configuration Information	(2010,0150)	Printer specific	

2.2.1.3.4 SOP Specific Conformance: Basic Grayscale Image Box SOP Class

Note: *All attributes not listed are not supported.*

Table 2-6: Optional Attributes Set for the Image Grayscale Box SOP Class

Name	Tag	Range	Comment
Image Position	(2020,0010)	*n*	*n* represents any positive integer
Basic Grayscale Image Sequence	(2020,0110)		
>Samples Per Pixel	(0028,0002)	1	
>Photometric Interpretation	(0028,0004)	MONOCHROME2	
>Rows	(0028,0010)	*n*	*n* represents any positive integer
>Columns	(0028,0011)	*n*	*n* represents any positive integer
>Bits Allocated	(0028,0100)	8	
>Bits Stored	(0028,0101)	8	
>High Bit	(0028,0102)	7	
>Pixel Representation	(0028,0103)	0	Unsigned integer.
>Pixel Data	(7FE0,0010)		
Polarity	(2020,0020)	NORMAL REVERSE	
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	This is always the same value as the Film Box's copy of the Magnification Type
Smoothing Type	(2010,0080)	Printer specific	This is always the same value as the Film Box's copy of the Smoothing Type
Requested Image Size	(2020,0030)	Printer specific	

2.2.1.3.5 SOP Specific Conformance: Printer SOP Class

All attributes not listed are not supported. The Sonix does not set these attributes; instead the Printer Server sets them and these are the attributes used by the Sonix.

Table 2-7: Optional Attributes Set for the Printer SOP Class

Name	Tag	Range	Comment
Printer Status	(2110,0010)	NORMAL WARNING FAILURE	
Printer Status Info	(2110,0020)	Printer specific	
Printer Name	(2020,0030)	Printer specific	
Manufacturer	(0008,0070)	Printer specific	
Manufacturer Model Name	(0008,1090)	Printer specific	
Device Serial Number	(0018,1000)	Printer specific	
Software Versions	(0018,1020)	Printer specific	
Date of Last Calibration	(0018,1200)	Printer specific	
Time of Last Calibration	(0018,1201)	Printer specific	

2.2.1.4 Proposed Presentation Context to a Color Print Server

The following list applies when Sonix is configured to print to a Color Print Server:

Table 2-8: Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax			
Name	**UID**	**Name**	**UID**	**Role**	**Extended Negotiation**
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Explicit VR Little Endian, Explicit VR Big Endian, Implicit VR Little Endian	1.2.840.10008.1.2.1, 1.2.840.10008.1.2.2, 1.2.840.10008.1.2	SCU	None

2.2.1.4.1 SOP Specific Conformance to Basic Color Print Management Meta SOP Class

Standard conformance is provided to the Basic Color Print Management Meta SOP Classes as an SCU. Additionally the following SOP Classes are also supported:

Table 2-9: Grayscale Supported SOP Classes

SOP Class Name	SOP Class UID	Conformance Level
Basic Film Session	1.2.840.10008.5.1.1.1	**Standard**
Basic Film Box	1.2.840.10008.5.1.1.2	**Standard**
Basic Color Image Box	1.2.840.10008.5.1.1.4.1	**Standard**
Printer	1.2.840.10008.5.1.1.16	**Standard**

The Basic Film Session, Basic Film Box and Printer SOP Classes used by the Color SOP Class are the same as those used by the Grayscale SOP Class. Only the Image Box SOP Class differs and its attributes are shown below.

2.2.1.4.2 SOP Specific Conformance: Basic Color Image Box SOP Class

Note: *All attributes not listed are not supported.*

Table 2-10: Optional Attributes Set for the Image Color Box SOP Class

Name	Tag	Range	Comment
Image Position	(2020,0010)	*n*	*n* represents any positive integer
Basic Color Image Sequence	(2020,0111)		
>Samples Per Pixel	(0028,0002)	3	
>Photometric Interpretation	(0028,0004)	RGB	
>Planar Configuration	(0028,0006)	0	
>Rows	(0028,0010)	*n*	*n* represents any positive integer
>Columns	(0028,0011)	*n*	*n* represents any positive integer
>Bits Allocated	(0028,0100)	8	
>Bits Stored	(0028,0101)	8	
>High Bit	(0028,0102)	7	
>Pixel Representation	(0028,0103)	0	Unsigned integer.
>Pixel Data	(7FE0,0010)		
Polarity	(2020,0020)	NORMAL REVERSE	
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	This is always the same value as the Film Box's copy of the Magnification Type
Smoothing Type	(2010,0080)	Printer specific	This is always the same value as the Film Box's copy of the Smoothing Type
Requested Image Size	(2020,0030)	Printer specific	

2.2.2 Storage AE - Specification

The Storage AE provides conformance to the following DICOM SOP Classes as an SCU:

Table 2-11: SOP Class Conformance as SCU

SOP Class Name	SOP Class UID	Conformance Level
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	**Standard**
US Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	**Standard**
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	**Standard**
US Multi-Frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	**Standard**
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	**Standard**

2.2.2.1 Association Establishment Policies

After an image is captured an association shall be initiated to transfer the image. Once the image has been transferred then the association is closed. If the image is unsuccessfully transferred then attempts to initiate and transfer the image shall be made periodically. The user can also manually select images to transfer to a Storage Server; an association is initiated when the user transfers these images.

SR is sent at the end of an exam. Similar to images, once the SR has been transferred then the association is closed and attempts are made periodically to re-transmit in case of failure. SR(s) are also sent when the user manually select studies from Exam Review interface to send to DICOM Storage Server.

2.2.2.1.1 General

The default PDU size is 16 384 bytes. The PDU size is fully configurable by the user.

SR(s) will contain all supported measurements and calculations created on Sonix systems. Question/Answer worksheet will be included if applicable (for some application such as EMED etc.). There is only one report per study which might include multiple different applications though.

2.2.2.1.2 Number of Associations

The Storage AE only supports one open association at a time. Associations belonging to other active Application Entities may be open simultaneously with the association belonging to the Image Storage AE.

2.2.2.1.3 Asynchronous Nature

The Storage AE does not perform any asynchronous operations.

2.2.2.1.4 Implementation Identifying Information

Implementation Class UID: 2.16.124.113577.1

Implementation Version name: *major.minor.build*

Where *major* equals the major version number of the Sonix Software, *minor* equals the minor version number of the Sonix Software and *build* equals the build number of the Sonix Software.

2.2.2.2 Association Initiation by: Real-World Activity

The Storage AE initiates an association to a Storage Server when the user acquires an ultrasound image or a multi-frame ultrasound image, ends the exam or the user manually selects images to be sent to the Storage Server. Associations are initiated periodically to transfer images that were previously unsuccessfully transferred.

2.2.2.2.1 Association Initiation by: Manual Store

The user can manually select previously acquired images and send them to configured Storage Servers sequentially which invoke the opening of an association.

SR(s) are also transferred for those selected studies.

2.2.2.2.2 Association Initiation by: Image Acquired

Once the user has acquired an image or a multi-frame image a new association is opened upon which the image is sent to the Storage Servers.

2.2.2.2.3 Association Initiation by: End Exam

When an exam is being ended, a new association is opened to send the SR to the Storage Servers.

2.2.2.2.4 Association Initiation by: Storage Retry

Attempts to send images/SR's that were previously unsuccessfully transferred to a Storage Server are periodically made. Each attempt initiates an association.

2.2.2.3 Proposed Presentation Context to a Storage Server

The following list applies when Sonix is configured to store images/SR's to Storage Servers:

Table 2-12: Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax			
Name	**UID**	**Name**	**UID**	**Role**	**Extended Negotiation**
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	See **Table 2-13**		SCU	None
US Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	See **Table 2-13**		SCU	None
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	See **Table 2-13**		SCU	None
US Multi-Frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	See **Table 2-13**		SCU	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	See **Table 2-13**		SCU	None

Table 2-13: Storage AE Supported Transfer Syntaxes

Name	UID
DICOM Implicit VR Little Endian	1.2.840.10008.1.2
DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1
JPEG Baseline (Process 1): Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
JPEG Lossless (Process 14)	1.2.840.10008.1.2.4.57
JPEG Lossless (Process 14 [Selection Value 1])	1.2.840.10008.1.2.4.70
RLE Lossless	1.2.840.10008.1.2.5

2.2.2.3.1 SOP Specific Conformance to Ultrasound Storage SOP Class

All images and SR's Storage SOP classes supported by the Storage AE exhibit the same behavior unless stated explicitly in this section.

A Patient Object retrieved by means of a Modality Worklist is used to fill specific Ultrasound Image IOD attributes. The attributes mapped from a Modality Worklist to an Ultrasound Image IOD are listed in **Table 2-29** – **Table 2-35**.

The Image Storage AE creates Ultrasound Image and Ultrasound Multi-Frame IODs as follows:

Note: *All attributes not listed are not supported.*

Table 2-14: Significant Patient Module Attributes

Attribute Name	Tag ID	Comment
Patient Name	(0010,0010)	Always specified. Names are set using carat, '^', delimiters. Provided by MWL Server or manually entered by user.
Patient ID	(0010,0010)	Always specified. Provided by MWL Server or manually entered by user.
Patient's Birth Date	(0010,0030)	Always specified. Provided by MWL Server or manually entered by user.
Patient's Sex	(0010,0040)	Always specified. 'M', 'F', 'O' or null. Provided by MWL Server or manually entered by user.
Other Patient IDs	(0010,1000)	Provided by MWL Server, otherwise set to null. Not set for non-Worklist.
Ethnic Group	(0010,2160)	Provided by MWL Server, otherwise set to null. Not set for non-Worklist.
Patient Comments	(0010,4000)	Provided by MWL Server, otherwise set to null. Not set for non-Worklist.

Table 2-15: Significant General Study Module Attributes

Attribute Name	Tag ID	Comment
Study Instance UID	(0020,000D)	Always Specified. Provided by MWL Server. Generated by system for non-Worklist.
Study Date	(0008,0020)	Always specified.
Study Time	(0008,0030)	Always specified.
Referring Physician's Name	(0008,0090)	Always specified. Provided by MWL Server, otherwise set to null. Manually entered by user for non-Worklist, otherwise set to null.
Study ID	(0020,0010)	Always specified.
Accession Number	(0008,0050)	Always specified. Provided by MWL Server, otherwise set to null. Manually entered by user for non-Worklist, otherwise set to null.
Study Description	(0008,1030)	Always specified. Provided by MWL Server [Scheduled Procedure Step Description (0040,0007)], otherwise set to null. Manually entered by user for non-Worklist, otherwise set to null.
Physician(s) of Record	(0008,1048)	Provided by MWL Server from Names of Intended Recipients of Results (0040,1010). Not set for non-Worklist.

Table 2-16: Significant Patient Study Module Attributes

Attribute Name	Tag ID	Comment
Admitting Diagnosis Description	(0008,1080)	Provided by MWL Server, otherwise set to *null*. Not set for non-Worklist.
Patient's Age	(0010,1010)	Calculated from Patient's Birth Date
Patient's Size	(0010,1020)	Always specified. Provided by MWL Server, otherwise set to *null*. Manually entered by user for non-Worklist, otherwise set to *null*.
Patient's Weight	(0010,1030)	Always specified. Provided by MWL Server, otherwise set to *null*. Manually entered by user for non-Worklist, otherwise set to *null*.
Additional Patient History	(0010,21B0)	Provided by MWL Server, otherwise set to *null*. Not set for non-Worklist.

Table 2-17: Significant General Series Module Attributes

Attribute Name	Tag ID	Comment
Modality	(0008,0060)	SR for Comprehensive SR and US for US images.
Series Instance UID	(0020,000E)	Always specified. One unique ID per study.
Series Number	(0020,0011)	Always specified.
Series Date	(0008,0021)	Always specified.
Series Time	(0008,0031)	Always specified.
Performing Physicians' Name	(0008,1050)	Always specified. Manually entered by user or provided by MWL Server from Scheduled Performing Physician's Name (0040,0006), otherwise set to *null*.
Series Description	(0008,103E)	Always specified. Provided by MWL Server [Scheduled Procedure Step Description (0040,0007)], otherwise set to *null*. Manually entered by user for non-Worklist, otherwise set to generated by system.
Operator's Name	(0008,1070)	Always specified. Manually entered by user or provided by MWL Server from Scheduled Performing Physician's Name (0040,0006), otherwise set to *null*.

Table 2-18: Significant General Equipment Module Attributes

Attribute Name	Tag ID	Comment
Manufacturer	(0008,0070)	Always specified as "Ultrasonix Medical Corp."
Institution Name	(0008,0080)	Always specified.
Station Name	(0008,1010)	Provided by MWL Server or configured by user for non-Worklist.
Manufacturer's Model Name	(0008,1090)	Always specified as SONIX01
Device Serial Number	(0008,1000)	Always specified.
Software Versions	(0018,1020)	Always specified.

Table 2-19: Significant General Image Module Attributes

Attribute Name	Tag ID	Comment
Image Instance	(0020,0013)	Always specified. Unique within its Series.
Patient Orientation	(0020,0020)	Always set to *null*.
Content Date	(0008,0023)	Always specified.
Content Time	(0008,0033)	Always specified.
Image Type	(0008,0008)	Always specified as ORIGINAL/PRIMARY.
Derivation Description	(0008,2111)	Specified if the image is compressed.

Table 2-20: Significant Image Pixel Module Attributes

Attribute Name	Tag ID	Comment
Samples per pixel	(0028,0002)	Always specified as 3 for RGB and 1 for MONOCHROME2
Photometric Interpretation	(0028,0004)	Always specified. The following photometric interpretations can be specified: MONOCHROME2 for mono or RGB for color.
Rows	(0028,0010)	Always specified.
Columns	(0028,0011)	Always specified.
Bits Allocated	(0028,0100)	Always specified as 8.
Bits Stored	(0028,0101)	Always specified as 8.
High bit	(0028,0102)	Always specified as 7.
Pixel Representation	(0028,0103)	Always specified as 0, unsigned integer.
Pixel Data	(7FE0,0010)	Always specified.
Planar Configuration	(0028,0006)	Present if RGB. Always specified as Color-by-pixel (0).

Table 2-21: Significant Cine Module Attributes

Attribute Name	Tag ID	Comment
Preferred Playback Sequencing	(0018,1244)	Always specified for a multi-frame image as 0.
Frame Time	(0018,1063)	Always specified for a multi-frame image.
Recommended Display Frame Rate	(0008,2144)	Always specified for a multi-frame image.
Cine Rate	(0018,0040)	Always specified for a multi-frame image.

Table 2-22: Significant Multi-Frame Module Attributes

Attribute Name	Tag ID	Comment
Number of Frames	(0028,0008)	Always specified for a multi-frame image.
Frame Increment Pointer	(0028,0009)	Always specified for a multi-frame image as 0018,1063.

Table 2-23: Significant US Region Calibration Module Attributes

Attribute Name	Tag ID	Comment
Sequence of Ultrasound Regions	(0018,6011)	Always specified. One sequence for each existing region.
Region Location Min x_0	(0018,6018)	Always specified.
Region Location Min y_0	(0018,601A)	Always specified.
Region Location Min x_1	(0018,601C)	Always specified.
Region Location Min y_1	(0018,601E)	Always specified.
Physical Units Y Direction	(0018,6024)	Always specified.
Physical Units X Direction	(0018,6026)	Always specified.
Physical Delta X	(0018,602C)	Always specified.
Physical Delta Y	(0018,602E)	Always specified.
Region Spatial Format	(0018,6012)	Always specified.
Region Data Type	(0018,6014)	Always specified.
Region Flags	(0018,6016)	Always specified.
Doppler Correction Angle	(0018,6034)	Present for Doppler Spectral

Table 2-24: Significant US Image Module Attributes

Attribute Name	Tag ID	Comment
Samples per pixel	(0028,0002)	Always specified as 3 for RGB and 1 for MONOCHROME2
Photometric Interpretation	(0028,0004)	Always specified. The following photometric interpretations can be specified: MONOCHROME2 for mono or RGB for color.
Bits Allocated	(0028,0100)	Always specified as 8.
Bits Stored	(0028,0101)	Always specified as 8.
High bit	(0028,0102)	Always specified as 7.
Planar Configuration	(0028,0006)	Present if RGB. Always specified as Color-by-pixel (0).
Pixel Representation	(0028,0103)	Always specified as 0.
Frame Increment Pointer	(0028,0009)	Always specified for a multi-frame image as 0018,1063.
Image Type	(0008,0008)	Always specified as ORIGINAL/PRIMARY.
Lossy Image Compression	(0028,2110)	Set to 00 if the image is lossless compressed, set to 01 if the image is lossy compressed and not set if no compression is used.

Table 2-25: Significant VOI LUT Module Attributes

Attribute Name	Tag ID	Comment
Window Center	(0028,1050)	Set to 127.5 if the image is monochrome otherwise it is not set.
Window Width	(0028,1051)	Set to 256 if the image is monochrome otherwise it is not set.
Window Center & Width Explanation	(0028,1055)	Set to null if the image is monochrome otherwise it is not set.

Table 2-26: Significant SOP Common Module Attributes

Attribute Name	Tag ID	Comment

SOP Class UID	(0008,0016)	Always specified.
SOP Instance UID	(0008,0018)	Always specified. Globally unique image ID generated by the system.
Instance Creation Date	(0008,0012)	Always specified.
Instance Creation Time	(0008,0013)	Always specified.
Instance Creator UID	(0008,0014)	Always specified. Globally unique system ID.

2.2.3 Modality Worklist AE - Specification

The Modality Worklist AE provides conformance to the following DICOM SOP Classes as an SCU:

Table 2-27: SOP Class Conformance as SCU

SOP Class Name	SOP Class UID	Conformance Level
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	**Standard**

2.2.3.1 Association Establishment Policies

An association is initiated to retrieve a Worklist. This Association is initiated when the user chooses to initiate a new Worklist query through the user interface. The Association is closed after the Worklist is retrieved.

2.2.3.1.1 General

The default PDU size is 16 384 bytes. The PDU size is fully configurable by the user.

2.2.3.1.2 Number of Associations

The Worklist Modality AE only supports one open association at a time. Associations belonging to other active Application Entities may be open simultaneously with the association belonging to the Image Storage AE.

2.2.3.1.3 Asynchronous Nature

The Modality Worklist AE does not perform any asynchronous operations.

2.2.3.1.4 Implementation Identifying Information

Implementation Class UID: 2.16.124.113577.1

Implementation Version name: *major.minor.build*

Where *major* equals the major version number of the Sonix Software, *minor* equals the minor version number of the Sonix Software and *build* equals the build number of the Sonix Software.

2.2.3.2 Association Initiation by: Real-World Activity

The Modality Worklist AE initiates an association to Modality Worklist Server when the user issues a search using the Patient Management Dialog.

2.2.3.2.1 Association Initiation by: Worklist Search

From within the Patient Management Dialog the user can specify Worklist search parameters. The user then performs a search that initiates an association upon which a query built with these parameters is issued to the Modality Worklist Server. After receiving a Worklist the association is closed.

2.2.3.3 Proposed Presentation Context to a Modality Worklist Server

The following list applies when Sonix is configured to retrieve Worklist from a Worklist Server:

Table 2-28: Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax			
Name	**UID**	**Name**	**UID**	**Role**	**Extended Negotiation**
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.3.3.1 SOP Specific Conformance to Modality Worklist Service SOP Classes

The Modality Worklist AE makes use of the following attributes retrieved from a Modality Worklist Server. Also given below are the attributes that are mapped to an Ultrasound Image IOD.

Table 2-29: Significant Scheduled Procedure Step Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
>Scheduled Procedure Step Start Date	(0040,0002)	No	
>Modality	(0040,0060)	No	
>Scheduled Performing Physician's Name	(0040,0006)	Yes	Mapped to Performing Physicians' Name (0008,1050).
>Scheduled Procedure Step Description	(0040,0007)	Yes	Mapped to Series Description (0008,103E) and to Study Description (0008,1030).

Table 2-30: Significant Requested Procedure Step Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Study Instance UID	(0020,000D)	Yes	
Name of Intended Recipients of Results	(0040,1010)	Yes	Mapped to Physician(s) of Record (0008,1048).

Table 2-31: Significant Imaging Service Request Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Accession Number	(0008,0050)	Yes	
Referring Physician's Name	(0008,0090)	Yes	

Table 2-32: Significant Visit Admission Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Admitting Diagnosis Description	(0008,1080)	Yes	

Table 2-33: Significant Patient Identification Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Patient Name	(0010,0010)	Yes	
Patient ID	(0010,0020)	Yes	
Other Patient IDs	(0010,1000)	Yes	

Table 2-34: Significant Patient Demographic Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Patient Birth Date	(0010,0030)	Yes	
Patient Sex	(0010,0040)	Yes	
Patient Weight	(0010,1030)	Yes	
Patient Size	(0010,1020)	Yes	
Ethnic Group	(0010,2160)	Yes	
Patient Comments	(0010,4000)	Yes	

Table 2-35: Significant Patient Medical Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Pregnancy Status	(0010,21C0)	No	
Additional Patient History	(0010,21B0)	Yes	
Last Menstrual Date	(0010,21D0)	No	

The attributes that the Modality Worklist AE specifies in a Worklist query are as follows.

Table 2-36: Worklist Query Attributes

Attribute Name	Tag ID	Comment
>Scheduled Procedure Step Start Date	(0040,0002)	Single value matching or wildcard matching
>Modality	(0040,0060)	Single value matching or wildcard matching
Accession Number	(0008,0050)	Single value matching or wildcard matching
Patient Name	(0010,0010)	Single value matching or wildcard matching
Patient ID	(0010,0020)	Single value matching or wildcard matching

2.2.4 MPPS AE - Specification

The MPPS AE provides conformance to the following DICOM SOP Classes as an SCU:

Table 2-37: SOP Class Conformance as SCU

SOP Class Name	SOP Class UID	Conformance Level
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	**Standard**

2.2.4.1 Association Establishment Policies

An association is initiated every time an MPPS status is updated. An association is initiated when the user starts a new exam. The Association is closed after the MPPS “IN PROGRESS” status is sent to a remote AE. Another association is initiated when the exam ends and closed after the “COMPLETED” status is sent over.

The MPPS Application Entity does not accept Associations.

2.2.4.1.1 General

The default PDU size is 16,384 bytes. The PDU size is fully user-configurable.

2.2.4.1.2 Number of Associations

The MPPS AE only supports one open association at a time. Associations belonging to other active Application Entities may be open simultaneously with the association belonging to the other AE.

2.2.4.1.3 Asynchronous Nature

The MPPS AE does not perform any asynchronous operations.

2.2.4.1.4 Implementation Identifying Information

Implementation Class UID: 2.16.124.113577.1

Implementation Version name: *major.minor.build*

Where *major* equals the major version number of the Sonix Software, *minor* equals the minor version number of the Sonix Software and *build* equals the build number of the Sonix Software.

2.2.4.2 Association Initiation by: Real-World Activity

The MPPS AE initiates an association to Modality Worklist Server when the user starts an exam which could be either from Worklist records or locally generated exams. The MPPS AE also initiates an association to Modality Worklist Server when the exam ends.

A typical sequence of interactions between the MPPS AE and a Modality Worklist Server is illustrated as follows:

1. The MPPS AE opens an association with the Modality Worklist Server.
2. The MPPS AE sends an N-CREATE request to the Modality Worklist Server to create an MPPS instance with status of “IN PROGRESS” and all necessary attributes. The Server acknowledges the MPPS creation with an N-CREATE response (status success).
3. The MPPS AE closes the association with the Server.
4. All images are acquired.
5. Upon ending the exam, the MPPS AE opens an association with the Server.
6. The MPPS AE sends an N-SET request to the Server to update the MPPS instance with status of “COMPLETED” and set all necessary attributes. The Server acknowledges the MPPS update with an N-SET response (status success).
7. The MPPS AE closes the association with the Server.

2.2.4.2.1 Association Initiation When Exam Starts

Whenever a new study starts, the event triggers the MPPS AE to create and issue an N-CREATE command to send the MPPS status “IN PROGRESS” to the configured Worklist Modality Server(s) sequentially. The association is closed afterwards.

2.2.4.2.2 Association Initiation When Exam Ends

When user ends an exam, the MPPS AE is triggered to send an N-SET command to update the MPPS status “COMPLETED” to the configured Worklist Modality Server(s) sequentially. The association is closed afterwards.

2.2.4.3 Proposed Presentation Context to a Modality Worklist Server for MPPS

MPPS AE will propose Presentation Contexts as shown in the following table:

Table 2-38: Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax			
Name	**UID**	**Name**	**UID**	**Role**	**Extended Negotiation**
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	DICOM Implicit VR Little Endian DICOM Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

2.2.4.3.1 SOP Specific Conformance for MPPS

Any status code other than “Success” (0000) in an MPPS N-CREATE or N–SET results in a logged response.

Any communication failure is logged.

The following table provides a description of the MPPS N-CREATE and N-SET request identifiers sent by MPPS AE. Empty cells in the N-CREATE and N-SET columns indicate that the attribute is not sent. An “x” indicates that an appropriate value will be sent. A “Zero length” attribute will be sent with zero length.

Table 2-39: MPPS N-CREATE / N-SET REQUEST IDENTIFIER

Attribute Name	Tag	N-CREATE	N-SET
Specific Character Set	(0008,0005)	“ISO_IR 100”	
Performed Procedure Step Relationship			
Scheduled Step Attribute Sequence	(0040,0270)		
>Study Instance UID	(0020,000D)	From Modality Worklist or automatically created.	
>Referenced Study Sequence	(0008,1110)	Zero length	
>Accession Number	(0008,0050)	From Modality Worklist or user input	
>Requested Procedure ID	(0040,1001)	From Modality Worklist	
>Requested Procedure Description	(0032,1060)	From Modality Worklist	
>Scheduled Procedure Step ID	(0040,0009)	From Modality Worklist	
>Scheduled Procedure Step Description	(0040,0007)	From Modality Worklist	
>Scheduled Protocol Code Sequence	(0040,0008)	Zero length	
Patient’s Name	(0010,0010)	From Modality Worklist or user input	

Patient ID	(0010,0020)	From Modality Worklist or user input or automatically created	
Patient's Birth Date	(0010,0030)	From Modality Worklist or user input	
Patient's Sex	(0010,0040)	From Modality Worklist or user input	
Referenced Patient Sequence	(0008,1120)	Zero length	
Performed Procedure Step Information			
Performed Procedure Step ID	(0040,0253)	Same as automatically created local study ID	
Performed Station AE Title	(0040,0241)	Local MPPS AE Title	
Performed Station Name	(0040,0242)	From station name configuration	
Performed Location	(0040,0243)	From station name configuration	
Performed Procedure Step Start Date	(0040,0244)	Actual start date	
Performed Procedure Step Start Time	(0040,0245)	Actual start time	
Performed Procedure Step Status	(0040,0252)	IN PROGRESS	COMPLETED
Performed Procedure Step Description	(0040,0254)	From Modality Worklist or local exam type	
Performed Procedure Type Description	(0040,0255)	Local exam type	
Procedure Code Sequence	(0008,1032)	Zero length	
Performed Procedure Step End Date	(0040,0250)	Zero length	Actual end date
Performed Procedure Step End Time	(0040,0251)	Zero length	Actual end time
Image Acquisition Results			
Modality	(0008,0060)	US	
Study ID	(0020,0010)	Automatically created	
Performed Protocol Code Sequence	(0040,0260)	Zero length	
Performed Series Sequence	(0040,0340)	Zero length	One item
>Performing Physician's Name	(0008,1050)	x	x
>Protocol Name	(0018,1030)	Local exam type	Local exam type
>Operators' Name	(0008,1070)	x	x
>Series Instance UID	(0020,000E)	x	x
>Series Description	(0008,103E)	Local exam type	Local exam type
>Retrieve AE Title	(0008,0054)	Zero length	Zero length
>Referenced Image Sequence	(0008,1140)	Zero length	One or more items
>> Referenced SOP Class UID	(0008,1150)		x
>>Referenced SOP Instance UID	(0008,1155)		x
>Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)	Zero length	One or more items
>> Referenced SOP Class UID	(0008,1150)		x
>>Referenced SOP Instance UID	(0008,1155)		x

2.2.5 Storage Commitment AE - Specification

The Storage Commitment AE provides conformance to the following DICOM SOP Classes as an SCU:

Table 2-40: SOP Class Conformance as SCU

SOP Class Name	SOP Class UID	Conformance Level
Storage Commitment Push Model	1.2.840.10008.1.20.1	Standard

2.2.5.1 Association Establishment Policies

The Storage Commitment AE, in the following circumstances, initiates an association:

- When the system is started and the Storage Commitment AE has been activated
- After receiving a successful C-STORE response for a previously stored image or SR
- The Storage Commitment Server responds with an N-Event Report to convey the status of a previous storage commitment *

** **Note:** for this release, the N-Event Report should use the same association as the one for N-Action requested by SCU.*

2.2.5.1.1 General

The default PDU size is 16 384 bytes. The PDU size is fully configurable by the user.

2.2.5.1.2 Number of Associations

Up to two separate associations may be active at one time. One association may be used to generate an N-Action while another is used to listen for an N-Event Report.

Associations belonging to other active Application Entities may be open simultaneously with the association belonging to the Storage AE.

2.2.5.1.3 Asynchronous Nature

The Storage Commitment AE may listen for N-Event Reports on a different association than the one being used to generate an N-Action.

2.2.5.1.4 Implementation Identifying Information

Implementation Class UID: 2.16.124.113577.1

Implementation Version name: *major.minor.build*

Where *major* equals the major version number of the Sonix Software, *minor* equals the minor version number of the Sonix Software and *build* equals the build number of the Sonix Software.

2.2.5.2 Association Initiation by: Real-World Activity

The Storage Commitment AE initiates an association to Storage Commitment Server when the user acquires an ultrasound image that is stored to a Storage Server or a SR is sent. An association is also initiated when the Storage Commitment Server sends an N-Event Report, using role-reversal negotiation.

2.2.5.2.1 Association Initiation by: Image Acquisition

After the user acquires an image and it has successfully been stored to a Storage Server then an association is initiated with a Storage Commitment Server. A storage commitment request (N-Action Request) is issued and then the association is closed.

2.2.5.2.2 Association Initiation by: End Exam

After the exam is ended and SR has successfully been stored to a Storage Server then an association is initiated with a Storage Commitment Server. A storage commitment request (N-Action Request) is issued and then the association is closed.

2.2.5.2.3 Association Initiation by: Role-Reversal Negotiation

After the Storage Commitment AE has issued an N-Action Request the Storage Commitment Server may, at any time, respond with an N-Event Report using role-reversal negotiation. Upon reception of an N-Event Report an association is opened to receive the commitment status report.

2.2.5.3 Proposed Presentation Context to a Storage Commitment Server

Table 2-41: Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax			
Name	**UID**	**Name**	**UID**	**Role**	**Extended Negotiation**
Storage Commitment Push Model	1.2.840.10008.1.20.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.5.3.1 SOP Specific Conformance to Storage Commitment SOP Classes

The Storage Commitment AE makes use of the following attributes when issuing an N-Action Request to a Storage Commitment Server.

Table 2-42: Significant Request Storage Commitment Module Attributes

Attribute Name	Tag ID	Requirement Type SCU/SCP
Transaction UID	(0008,1195)	1/1
Referenced SOP Sequence	(0008,1199)	1/1
>Referenced SOP Class UID	(0008,1150)	1/1
>Referenced SOP Instance UID	(0008,1155)	1/1

The Storage Commitment AE makes use of the following attributes from a received N-Event Report from a Storage Commitment Server.

Table 2-43: Significant Storage Commitment Request Successful Module Attributes

Attribute Name	Tag ID	Requirement Type SCU/SCP
Transaction UID	(0008,1195)	-/1
Referenced SOP Sequence	(0008,1199)	-/1
>Referenced SOP Class UID	(0008,1150)	-/1
>Referenced SOP Instance UID	(0008,1155)	-/1

Table 2-44: Significant Storage Commitment Request Failed Module Attributes

Attribute Name	Tag ID	Requirement Type SCU/SCP
Transaction UID	(0008,1195)	-/1
Failed SOP Sequence	(0008,1198)	-/1
>Referenced SOP Class UID	(0008,1150)	-/1
>Referenced SOP Instance UID	(0008,1155)	-/1
>Failure Reason	(0008,1197)	-/1

2.3 COMMUNICATION PROFILES

2.3.1 Supported Communication Stacks

The Sonix AE provides DICOM 3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

2.3.2 TCP/IP

The Sonix AE inherits its TCP/IP stack from the Windows XP system upon which it executes.

2.3.2.1 Physical Media Support

The Sonix AE is indifferent to the physical medium over which TCP/IP executes as it inherits this support from the Windows XP system upon which it executes.

2.4 CONFIGURATION

2.4.1 AE Title/Presentation Address Mapping

The mapping from AE Title to TCP/IP addresses and ports is configurable and set at the time of installation by Ultrasonix Installation Personnel.

2.4.2 Configurable Parameters

Several parameters pertaining to the DICOM component of the Sonix are configurable.

2.4.2.1 Network Configuration

The configurable network parameters are:

- Hostname
- IP Address
- Subnet Mask
- Gateway

2.4.2.2 Local AE

The configurable local (SCU) network parameters common for all the DICOM Storage, Print and Worklist Modules are:

- Station Name
- Application Entity Title
- Network Speed
- Association Timeout
- Packet Data Unit (PDU) Size

Host Name/IP address and port number are not configurable by users.

The configurable local AE parameters specific to DICOM Storage Commitment modules are:

- Storage Commitment Port (Storage Commitment N-Action Request Issuer)
- Storage Commitment Listen Port (Storage Commitment N-Event Report Listener)

2.4.2.3 Image Printing Configuration

The configurable remote (SCP) network parameters for the DICOM Image Printing Module are:

- Application Entity Title
- Hostname/IP Address
- Port Number

The configurable settings for the DICOM Image Printing Module are:

- Print in Color: Yes (Color Printing)/No (Grayscale Printing) - depends on printer
- Reversed Brightness: Yes/No
- Columns: number of columns per page
- Rows: number of rows per page
- Number of Copies: number of copies to be printed
- Medium Type: PAPER, CLEAR FILM, BLUE FILM
- Print Priority: HIGH, MED, LOW
- Film Destination: PROCESSOR, MAGAZINE
- Orientation: PORTRAIT, LANDSCAPE
- Size: 8x10 Inches, 10x12 Inches, 10x14 Inches, 11x14 Inches, 14x14 Inches, 14x17 Inches, 24x30 cm, 24x24 cm
- Magnification: REPLICATE, BILENEAR, CUBIC, NONE
- Smoothing: printer specific
- Trim: YES/NO
- Border Density: WHITE, BLACK, image density in hundredths of OD
- Empty Density: WHITE, BLACK, image density in hundredths of OD
- Minimum Density: image density
- Maximum Density: image density
- Configuration Information: printer specific
- Polarity: NORMAL, REVERSE
- Image Size (mm): printer specific

2.4.2.4 Image Storage Configuration

The configurable remote (SCP) network parameters for the DICOM Storage Printing Module are:

- Application Entity Title
- Hostname/IP Address
- Port Number

The configurable settings for the DICOM Image Storage Module are:

- Lossy Compression Ratio: 1% - 100%
- Color/Grayscale: Send Color or Grayscale images to the Storage Server

2.4.2.5 Modality Worklist Configuration

The configurable remote (SCP) network parameters for the DICOM Modality Worklist Module and MPPS are:

- Application Entity Title
- Hostname/IP Address
- Port Number

2.4.2.6 Storage Commitment Configuration

The configurable remote (SCP) network parameters for the DICOM Storage Commitment Module are:

- Application Entity Title
- Hostname/IP Address
- Port Number

If the Storage Commitment service reside on the same host as the Storage module, then only the port number is required.

2.4.2.7 Miscellaneous Configuration Parameters

The following parameters can also be dynamically specified from within the system:

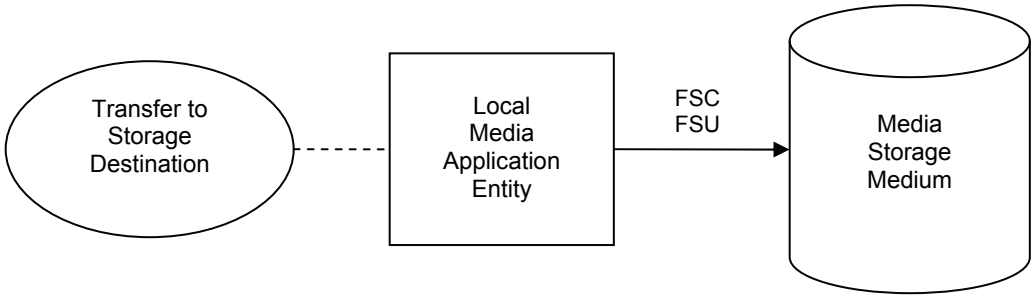
- Institution Name [mapped to Institution Name (0008,0080)]

CHAPTER 3: MEDIA INTERCHANGE

3.1 IMPLEMENTATION MODEL

3.1.1 Application Data Flow

Figure 3-1: Media Interchange Implementation Model



The Local Media Application Entity exports images and Structured Reports to a Storage medium. It is associated with the local real-world activity "Transfer" in Exam Review dialog. "Transfer" is performed upon user request for selected patients, studies or images.

Throughout this section, the term "Media" refers to any of the following physical media. DICOM structure will be the same regardless of the media in use.

Media supported: CD-R, CD-RW, DVD-R, DVD+R, DVD-RW, DVD+RW, general purpose USB and flash memory and local disk or mapped network drive.

Note: *–R or +R media may be erased for multiple times, the space however may not be recovered. If a –R or +R media is erased, the data written in previous sessions is no longer available and only the remaining blank space on the media is available.*

3.1.2 Functional Definition of AEs

3.1.2.1 Functional Definition of Local Media Application Entity

Activation of the "Transfer" will pass the currently selected patients, studies or images to the Local Media Application Entity. The SOP Instances associated with the selection will be collected into one export job. The contents of the export job will then be written to a single physical medium.

3.1.3 Sequencing of Real-World Activities

At least one image must exist and be selected before the Local Media Application Entity can be invoked.

The system will automatically detect all available media and show them for selection upon the activation of the "Transfer". After the target media (e.g. Storage Destination) has been selected and DICOMDIR is chosen as Image Format, the applicable Application Profiles are displayed. Once the "Send" button is pressed, the Media Application Entity will start to prepare the files and write to the destination media.

3.1.4 File Meta Information Options

The implementation information written to the File Meta Header in each file is:

Table 3-1: DICOM Implementation Class and Version for Media Storage

Implementation Class UID	2.16.124.113577.1
Implementation Version name	*major.minor.build*

3.2 AE SPECIFICATIONS

3.2.1 Local Media Application Entity Specification

The Media Application Entity provides standard conformance to the Media Storage Service Class.

The Application Profiles and roles are listed below:

Table 3-2: Application Profiles, Activities and Roles for Offline Media

Application Profile Supported	Real World Activity	Role
STD-GEN-CD	Transfer to CD-R	FSC
STD-GEN-DVD-RAM	Transfer to DVD	FSC/FSU*
STD-GEN-DVD-JPEG	Transfer to DVD	FSC/FSU*
STD-GEN-USB-JPEG	Transfer to USB	FSC/FSU
STD-GEN-MMC-JPEG	Transfer to MultiMedia Card	FSC/FSU
STD-GEN-CF-JPEG	Transfer to CompactFlash	FSC/FSU
STD-GEN-SD-JPEG	Transfer to Digital Card	FSC/FSU
STD-US-ID-SF/MF-xxxx	Transfer to any media	FSC/FSU*
STD-US-SC-SF/MF-xxxx	Transfer to any media	FSC/FSU*

* FSU requires DVD+RW for DVD media and not applicable for CD-R media.

Table 3-3: SOP Classes and Transfer Syntaxes for Media Interchange

Information Object Definition	SOP Class UID	Application Profile Applicable	Transfer Syntax	Transfer Syntax UID
DICOM Media Storage Directory	1.2.840.10008.1.3.10	All	Explicit VR Little Endian	1.2.840.10008.1.2.1
Comprehensive Structured Report	1.2.840.10008.5.1.4.1.1.88.33	All excluding STD-US-xxxx*	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	STD-GEN-CD STD-GEN-DVD-RAM	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
		STD-US-ID-SF/MF-xxxx STD-US-SC-SF/MF-xxxx	RLE Lossless Compression	1.2.840.10008.1.2.5
		All other Profiles with JPEG compression	JPEG Lossless (Process 14, SV1)	1.2.840.10008.1.2.4.70
Ultrasound Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	STD-GEN-CD STD-GEN-DVD-RAM	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
		STD-US-ID-SF/MF-xxxx STD-US-SC-SF/MF-xxxx	RLE Lossless Compression	1.2.840.10008.1.2.5
		All other Profiles with JPEG compression	JPEG Baseline Lossy Compression (process 1)	1.2.840.10008.1.2.4.50

* Structured Reports are not included in the STD-US-ID-SF/MF-xxxx or STD-US-SC-SF/MF-xxxx profiles.

3.2.1.1 File Meta Information for the Application Entity

The File-Set Identifier included in the File Meta Header is “SONIX_US_FSID”.

3.2.1.2 Real-World Activities

3.2.1.2.1 Activity – Transfer to Media

The Local Media Application Entity acts as an FSC when requested to transfer SOP Instances from the local system to a destination medium.

If the contents of the current selection do not fit on a single media the transfer will prompt user with an error message then exit. Otherwise, the contents will be written together with a corresponding DICOMDIR to the selected media.

Writing in multi-session mode is supported for CD-R or DVD. Each export job is written as one session. The user can cancel the transfer any time before it finishes.

3.2.1.2.2 Activity – Update to Media

The Media Application Entity acts as an FSU when requested to transfer SOP Instances from the local system to destination medium where the DICOM data already exists. In this case, the DICOMDIR is updated allowing access to both original and new data.

3.3 AUGMENTED AND PRIVATE APPLICATION PROFILES

Not applicable.

3.4 MEDIA CONFIGURATION

All local applications use the local AE settings.

CHAPTER 4: SUPPORT OF CHARACTER SETS

ISO_IR 100 (Latin No. 1) is always used.

No support for other Extended Character Sets is provided.

CHAPTER 5: SECURITY

DICOM security is not implemented on the 2010 SonixMDP/SP/OP and SonixTouch in this release.

APPENDIX A: ANNEXES

A.1 IOD CONTENTS

A.1.1 Created SOP Instance(s)

The following tables specify the attributes of IODs created by Sonix systems.

The tables use a number of abbreviations. The abbreviations used in the “Presence of …” column are:

VNAP	Value Not Always Present (attribute sent zero length if no value is present)
ANAP	Attribute Not Always Present
ALWAYS	Always Present
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	the attribute value is the same as that use for Modality Performed Procedure Step
CONFIG	the attribute value source is a configurable parameter

Note: *All attributes not listed are not supported.*

Note: *All dates and times are encoded in the local configured calendar and time.*

A.1.1.1 Image Printing IOD

The attributes of the created Image Printing IODs are described in the **2.2.1.3 Proposed Presentation Context to a Grayscale Print Server** and **2.2.1.4 Proposed Presentation Context to a Color Print Server**.

A.1.1.2 US or US Multi-frame Image Storage IOD

The attributes of the created Image Storage IODs are described in the section **2.2.2.3.1 SOP Specific Conformance to Ultrasound Storage SOP Class**.

A.1.1.3 Modality Worklist IOD

The attributes of the created Image Storage IODs are described in the section **2.2.3.3.1 SOP Specific Conformance to Modality Worklist Service SOP Classes**.

A.1.1.4 Storage Commitment IOD

The attributes of the created Image Storage IODs are described in the section **2.2.5.3.1 SOP Specific Conformance to Storage Commitment SOP Classes**.

A.1.1.5 Comprehensive Structured Report IOD

Table A-1: IOD of Created Comprehensive Structured Report SOP Instances

IE	Module	Reference	Presence of Module
Patient	Patient	Table 2-14	ALWAYS
Study	General Study	Table 2-15	ALWAYS
	Patient Study	Table 2-16	ALWAYS
Series	SR Document Series	Table 2-17	ALWAYS
Equipment	General Equipment	Table 2-18	ALWAYS
Document	SR Document General	Table A-2	ALWAYS
	SR Document Content	Table A-2	ALWAYS
	SOP Common	Table A-4	ALWAYS

Table A-2: SR Document General Module of Created Comprehensive SR SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Unique number	ALWAYS	AUTO
Completion Flag	(0040,A491)	CS	PARTIAL	ALWAYS	AUTO
Verification Flag	(0040,A493)	CS	UNVERIFIED	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Date content created.	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Time content created.	ALWAYS	AUTO
Predecessor Documents Sequence	(0040,A360)	SQ	Used when sent from Exam Review.	ANAP	AUTO
>Study Instance UID	(0020,000D)	UI	Study's UID	ANAP	AUTO
>Referenced Series Sequence	(0008,1115)	SQ	Identifies the Series containing the referenced SR	ALWAYS	AUTO
>>Referenced SOP Sequence	(0008,1199)	SQ	SOP Instance UID for SR Series in the study	ALWAYS	AUTO
>>> Referenced SOP Class	(0008,1150)	UI	Comprehensive SR SOP Class 1.2.840.10008.5.1.4.1.1.88.33	ALWAYS	AUTO
>>> Referenced SOP Instance UID	(0008,1155)	UI	SOP Instance UID of the preceding SR in the study	ALWAYS	AUTO
Referenced Request Sequence	(0040,A370)	SQ	Identifies Requested Procedures being fulfilled (completely or partially) by creation of this Document.	ANAP	AUTO
>Study Instance UID	(0020,000D)	UI	Same value as in MWL or auto generated	ALWAYS	MWL/ AUTO
>Referenced Study Sequence	(0008,1110)	SQ	1 item per item in MWL, zero length if unscheduled	VNAP	MWL
>>Referenced SOP Class UID	(0008,1150)	UI	Identifies the Referenced SOP Class	ANAP	MWL
>>Referenced SOP Instance UID	(0008,1155)	UI	Instance UID	ANAP	MWL
>Accession Number	(0008,0050)	SH	Same attribute of MWL or user PDE input.	VNAP	MWL/ USER

>Placer Order Number/Imaging Service Request	(0040,2016)	LO	Order Number of Imaging Service Request assigned by placer	VNAP	MWL
>Filler Order Number/Imaging Service Request	(0040,2017)	LO	Order Number of Imaging Service Request assigned by filler	VNAP	MWL
>Requested Procedure ID	(0040,1001)	SH	1 item per item in MWL, absent if unscheduled	ANAP	MWL
>Requested Procedure Description	(0032,1060)	LO	1 item per item in MWL, absent if unscheduled	ANAP	MWL
>Requested Procedure Code Sequence	(0032,1064)	SQ	1 item per item in MWL, zero length if unscheduled	VNAP	MWL
Performed Procedure Code Sequence	(0040,A372)	SQ	Codes of the performed procedure, zero length if unscheduled	VNAP	AUTO/MWL

The following table describes the Document Content Macro, Document Relationship Macro, Numeric Measurement Macro and Code Macro in the DICOM Standard.

Table A-3: SR Document Content Module of Created Comprehensive SR SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Value Type	(0040,A040)	CS	CONTAINER	ALWAYS	AUTO
Concept Name Code Sequence	(0040,A043)	SQ	Report Title	ALWAYS	AUTO
Continuity of Content	(0040,A050)	CS	SEPARATE	ALWAYS	AUTO
Content Sequence	(0040,A730)	SQ		ALWAYS	AUTO
>Relationship Type	(0040,A010)	CS	See PS 3.3 C.17.3.2.4 RELATIONSHIP TYPE DEFINITIONS for further explanation.	ALWAYS	AUTO
>Document Relationship Macro Table			See PS 3.3 Document Relationship Macro Table C.17-6 for details.	ANAP	AUTO
>Document Content Macro			See PS 3.3 Document Content Macro Table C.17-5 for details.	ANAP	AUTO

Table A-4: SR SOP Common Module of Created Composite SR SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.88.33	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Generated by device	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	ISO_IR 100 (Latin No. 1)	ALWAYS	CONFIG

A.2 DATA DICTIONARY OF PRIVATE ATTRIBUTES

The Sonix System reserves private attribute values in group 004n (n is an odd digit). The private attributes added to created SOP instances are listed in the following table:

Table A-5: Private Attributes

Attribute Name	Tag	VR	VM	Attribute Description
Not applicable	(0043,1050)	UT	1	Private study information.
Not applicable	(0047,1050)	UT	1	Private report information.

A.3 EXTENSIONS/SPECIALIZATIONS/PRIVATIZATIONS

A.3.1 Standard Extended/Specialized/Private SOPs

Not applicable.

A.4 PRIVATE TRANSFER SYNTAXES

Not applicable.