	REV	REVISION STATUS	
REVISION STATUS	A	Initial Release DVS (Digital Video Streaming) Module with DICOM 3 1/2" and 5 1/4" MO Media output.	SEE PIMS FOR EFFECTIVITY,
	B	Add DICOM Network Storage Add DICOM Ultrasound Regions Scaling	
	C	**Add Modality Worklist (MWL)**	

DOCUMENT TITLE

HDI 5000 with DVS DICOM Conformance Statement

DOCUMENT PURPOSE:

The purpose of this document is to specify the DICOM conformance of the ATL HDI 5000 Software Version 195.xx configured with DVS Device, Software Version 3.xx

APPROVALS

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0   INTRODUCTION

This DICOM Conformance Statement is for the DICOM Implementation in the DVS (Digital Video Streaming) module as used on an appropriately configured ATL HDI 5000. This statement incorporates both network and media-based DICOM transfers.

1   IMPLEMENTATION MODEL: DVS Device

For network storage, the DVS Device will batch-transfer selected data to one DICOM Storage SCP at a time, provided it supports Verification, Ultrasound Store and Ultrasound Multiframe Store. DVS supports the Modality Worklist SOP Class to allow for querying PACS brokers or other sources of scheduled exam data.

For media storage, the DVS Device creates, updates and/or reads either 3 ½" (90mm) MOD and 5 ¼" (130mm) MOD media, depending on configuration, with DICOM Ultrasound Store and/or Ultrasound Multiframe Store SOP instances and a DICOMDIR file.

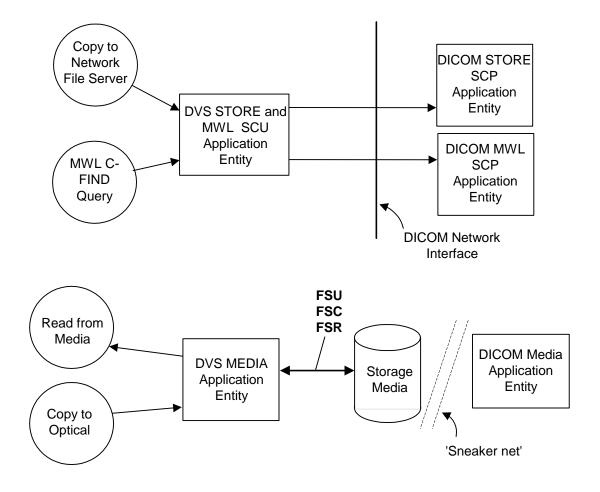## 1.1   Application Data Flow Diagram: DVS Device Real-World relationship

Figure 1-1   Real-World Relationships to Application Data Flow

1.1.1 Network Data Flow

The DVS Store SCU will make an association request with one Storage SCP when one or more Patient(s) studies, series or images are selected, and "Copy to the "Network File Server" is selected.

Up to three Association Negotiations may take place when storing from DVS. One association is used to perform a DICOM Verification function using ILE, ELE or EBE Transfer Syntax, one for uncompressed images using ILE, ELE or EBE Transfer Syntax, and one for Lossy JPEG Compressed images, using the default Lossy JPEG Baseline compression transfer syntax.

The system will always perform verification prior to Store SOP Class association. Then depending on the actual data, Abstract Syntaxes for image store will be negotiated. Uncompressed images, if contained in the selected data set for transfer, will be negotiated using uncompressed transfer syntaxes. If there are no uncompressed images, the system will instead negotiate the transfer syntax for the compressed images.

If the data selected for transfer contains both uncompressed and compressed data, verification will be negotiated and performed first. Then uncompressed transfer syntax will be negotiated and uncompressed data is transferred. After that is complete, the compressed transfer syntax is negotiated, followed by the transfer of compressed data.

To perform Modality Worklist C-Find queries, the user has the option to configure the system to query when the "Patient Data Entry" key is pressed, automatically initiated timed updates, or query for a specific patient, Accession Number, etc., or manually force an update.

1.1.2 Modality Worklist Data Flow

The DVS Modality Worklist (MWL) AE will send C-Find Requests to a MWL SCP. The default request contains the current date and Modality of US. The C-Find query may be modified by the "Advanced Search" dialog. All matching C-Find Responses will be displayed for the user to select an exam.

1.1.3 Media Data Flow

The DVS Media application reads from Removable Media acting as an **FSR** (File Set Reader) to read in SOP instances as selected by the user when the "Copy to Hard Drive" command is used. The DVS Media application will only load files that match the supported SOP Classes in the supported Application Profiles listed in Table 2.2-1.

The DVS Media application creates a DICOMDIR on Removable Media by acting as an **FSC** (File Set Creator) to create a new DICOM File-set on the Removable Media. The DICOM fileset is written to Removable media only when "Copy to Optical" is selected from the Patient Directory.

It initializes the DICOM File-set and writes the specified SOP instances onto the media. The SOP instances written will be limited to instances that match the criteria of one of the supported Application Profiles listed in Table 2.2-1.

The DVS Media application updates DICOM Media by writing SOP instances to Removable Media by acting as an **FSU** (File Set Updater), and by writing and updating the DICOMDIR file on that media to reflect additions of various SOP instances to the media. The DICOMDIR file will contain Directory Records of PATIENT, STUDY, SERIES and IMAGE corresponding to the Information Objects in the Fileset.

1.2 Functional Definition of Application Entities

This device has three Application Entities: Network Store SCU, Modality Worklist SCU, and Media Update Application.

1.2.1 Network Store SCU

The Store SCU AE handles sending ultrasound images to a storage server using the DICOM DIMSE C-Store Services. The remote SCP must support Verification, however, the Verification association is separate from the store association(s).

1.2.2 Modality Worklist (MWL) SCU

The MWL SCU AE handles sending C-Find Requests to a MWL SCP and handling the returning C-Find Responses.

1.2.3 Media Roles and Operations Supported

The DVS Media Application can perform these functions:

- it can **initialize** a piece of media, writing a new DICOM File-set onto the media;

- it can **update** a piece of media by adding new SOP instances to an already existing DICOM File-set;

- it can **display** a directory listing of the File-set on a piece of media;

- it can **copy** SOP instances from the media onto local storage.

The DVS Media application shall act as **File-set Updater**, **File-set Creator** and **File-set Reader**. Table 2.2-1 lists the operations supported by these roles. FSC and FSU functions are identical except for FSC will be used when no DICOMDIR exists.

1.3   Sequencing Requirements

Network:
The network Store SCU will batch transfer an entire data set, negotiating and sending any uncompressed images before negotiating and sending compressed images. There are no other sequencing requirements.

The Modality Worklist SCU will always search for any exam scheduled for Modality = US, and the current date, unless a specific query is defined using "Advanced Search". There are no sequencing requirements.

Media:
The updating function can only be performed on a piece of media that has already had a DICOM File-set created. There are no other sequencing requirements.

1.4   File Meta Information Options

Media:
Implementation Class UID = 1.2.840.113663.1298
Implementation Version Name = None

2   AE SPECIFICATIONS

2.1   Network Store SCU AE

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

SOP Class Name	SOP Class UID	Conformance Level
Verification SOP Class	1.2.840.10008.1.1	Standard
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Standard
Ultrasound MultiFrame Image SOP Class	1.2.840.10008.5.1.4.1.1.3.1	Standard

2.1.1 Association Establishment Policies

The system will only attempt association negotiation after selection of data is made in the system directory and the "Copy to... Network File Server" destination is OK'd. The system will then make an association to perform verification using ELE, ILE or EBE transfer syntaxes, then close the association. An association will be started for transferring image data, initially sending uncompressed images using ELE, ILE or EBE transfer syntaxes, then closing the association. If there are no uncompressed images, or after uncompressed images, an association is made to establish use of Lossy JPEG Baseline transfer syntax for JPEG compressed images. After transferring the compressed images, the association is closed.

2.1.1.1   General

Maximum PDU size offered: 32,768 bytes
Minimum PDU size accepted: 1,024 bytes

2.1.1.2   Number of Associations

Number of simultaneous associations: 1

2.1.1.3   Asynchronous Nature

The Network Store SCU AE will not use asynchronous operations

2.1.1.4   Implementation Identifying Information

Implementation Class UID = 2.16.840.1.113669.2.1.1
Implementation Version Name = MERGECOM3_241

2.1.2 Association Initiation by Real-World Activity

The Network Store SCU AE will open the associations to the storage server when the user selects the "Network File Server" destination from the "Copy to.." dialog. The destination is configured in the Network configuration screen.

2.1.3 Proposed Presentation Context to a Storage Server

The DVS system is capable of storing single frame and multiframe image objects in either uncompressed (RGB) form or JPEG Lossy compressed form. The format for the images is user selectable during "Freeform" capture of "Frames" (Single frame images) and "Clips" (Multiframe images). To minimize the number of association negotiations, images will be transferred on the network grouped by their transfer syntax: Uncompressed images – ELE, ILE or EBE, and then Compressed images using JPEG Lossy Baseline transfer syntax. All transfer syntax selections are made automatically.

Table 2.1.3-1   Network Store SCU AE Proposed Presentation Contexts to a Storage Server

SOP Class Name	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Ultrasound Image Store	1.2.840.10008.5.1.4.1.1.6.1	See Table 2.1.3-2 or 2.1.3-3	See Table 2.1.3-2 or 2.1.3-3
Ultrasound Multiframe Image Store	1.2.840.10008.5.1.4.1.1.3.1	See Table 2.1.3-2 or 2.1.3-3	See Table 2.1.3-3 or 2.1.3-3
Verification	1.2.840.10008.1.1	See Table 2.1.3-3	See Table 2.1.3-3

Table 2.1.3-2   Transfer Syntaxes and UIDs for Network, JPEG Compressed Images

JPEG Baseline	1.2.840.10008.1.2.4.50

Table 2.1.3-3   Transfer Syntaxes and UIDs for Network, Verification and Uncompressed Images

Transfer Syntax	Transfer Syntax UID
Explicit VR Little Endian	1.2.840.10008.1.2.1
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Big Endian	1.2.840.10008.1.2.2

2.1.3.1 SOP Specific Conformance to Verification SOP Class

The Network Store AE provides standard conformance to the Verification SOP Class as an SCU.

2.1.3.2 SOP Specific Conformance to Ultrasound Image Storage SOP Classes

See section 2.4

2.2 Modality Worklist AE - Specification

The Modality Worklist SOP Class in the Basic Worklist Service Class identifies the Modality Worklist Information Model, and the DIMSE-C operations supported. The following Standard SOP Class is used here:

SOP Class Name	SOP Class UID	Conformance Level
Modality Worklist Information Model – C-FIND	1.2.840.100008.5.1.4.31	Standard

2.2.1 Association Establishment Policies

The Modality Worklist AE will initiate an association under several conditions. The user may manually initiate a Worklist Update that will use the settings of the Automatic Query to determine the search criteria, and then issue the C-FIND command to the Modality Worklist server. After the requested data is returned, the association is closed.

The system may be set for an automatic query to occur at intervals set by the user in the configuration screens.

The user may also select Update List, which will force the system to perform a C-Find using the current date and Modality US.

2.2.1.1 General

Maximum PDU size offered: 32,768 bytes

Minimum PDU size accepted: 1,024 bytes

2.2.1.2 Number of Associations

Number of simultaneous associations for the Modality Worklist AE:

   1 for Modality Worklist - FIND

Note that the other Application Entities in this device may be simultaneously active and thus other associations may be open simultaneously with this.

2.2.1.3 Asynchronous Nature

The Modality Worklist AE will not use asynchronous operations.

2.2.1.4 Implementation Identifying Information

Implementation Class UID = 2.16.840.1.113669.2.1.1
Implementation Version Name = MERGECOM3_241

2.2.2 Association Initiation by Real-World Activity

The Modality Worklist AE will open an association to the selected Modality Worklist Server when the real-world activity occurs corresponding to the user invocation of Update List, New Patient Data Entry and Advanced Search.

2.2.2.1 Association Initiation by: Update List

To use Update List, the user must enter the Patient Data Entry screen, and press "Worklist". The user invocation of Update List will cause an association to be initiated to the Worklist Server. This action results in a C-Find Request being sent which contains Modality=US and Scheduled Procedure Step Start Date = Current System Date. This association will remain active as long as required to return the requested matches from the Worklist server, then close.

2.2.2.2 Association Initiation by: New Patient Data Entry Panel

Use the Patient Data Entry (PDE) hardkey to open the Patient Data Entry screen. If the system is set to perform worklist query on using the PDE key, the Worklist AE will perform a C-FIND based on the parameters set in the configuration panel and return the matching procedures.

2.2.2.3 Association Initiation by: Advanced Search

To use Advanced Search, the user must enter the Patient Data Entry screen, and press "Worklist". Pressing the "Advanced Search" button opens a dialog box which allows the user to specify a Patient Name, ID, Accession Number, Date or Procedure ID. When the "Search" button is pressed, an association is initiated with the Worklist Server. This association will remain active as long as required to return the requested matches from the Worklist server, then close.

2.2.3 Proposed Presentation Context to a Modality Worklist Server

Table 2.2.3-1   Modality Worklist AE Proposed Presentation Contexts to a Worklist Server

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Modality Worklist Information Model – FIND	1.2.840.100008. 5.1.4.31	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2	SCU	None

2.2.3.2 System Query Configuration Options

Table 2.2.3.2-1 System Query Configuration Options

Query Action	Location of Entry	Settings
Auto Query	Image Management / Network Configuration / Worklist Server / Define Query	On / Off
Query Interval	Image Management / Network Configuration / Worklist Server / Define Query	15 min. default (minimum = 15, maximum = 120 minutes in 15 min. increments)
When selecting "New	Patient Data Entry Screen	Query criteria set in Define

Patient"		Query
Upon User Request (Search)	Patient Data Entry Screen. After Worklist is present, and Patient Name, ID, Accession #, or specific date.	Query criteria set in Patient Data Entry.

2.2.3.2.1   System Query Functions

Table 2.2.3.2.1-1   Data used for different system or user queries.

Query Type	Data Used	Located in:
• Auto Query • New Patient • Update List	• Uses current system date • System AE Title • Station Name • Station Location	• Setups / Display • Define Query Screen and Host Table • Define Query Screen • Define Query Screen
• Search (User Request)	• Patient Name (auto-appends (*)) • Patient ID (must be exact) • Accession Number (must be exact) • Date (must be exact) • Requested Procedure ID	• All in Patient Data Entry screen

2.2.4 Modality Worklist AE Attributes

The system will match a query for studies using the tags that are listed below with an (*) asterisk in the Matching Key Type field. The system will allow all keys listed to be returned, except for those listed as "Not used."

Table 2.2.4-1   Attributes For The Modality Worklist Information Model

Description / Module	Tag	Matching Key Type	Return Key Type	Remark/Matching Type
SOP Common				
Specific Character Set	0008,0005	O	1C	Not used
Scheduled Procedure Step				
Scheduled Procedure Step Sequence	0040, 0100	R *	1	Shall contain only a single Item.
>Scheduled Station AE Title	0040, 0001	R *	1	Single Value Matching only.
>Scheduled Procedure Step Start Date	0040, 0002	R *	1	Single Value. Typically the current system date, but may be set to query for a specific date.
>Scheduled Procedure Step Start Time	0040, 0003	R	1	
>Modality	0008, 0060	R *	1	US Only
>Scheduled Performing Physician's Name	0040, 0006	R	2	
>Scheduled Procedure Step Description	0040, 0007	O	1C	
>Scheduled Station Name	0040, 0010	O *	2	
>Scheduled Procedure Step Location	0040, 0011	O *	2	
>Scheduled Action Item Code Sequence	0040, 0008	O	1C	Not used
>>Code Value	0008, 0100	O	1C	Not used
>>Coding Scheme Version	0008, 0103	O	3	Not used.
>>Coding Scheme Designator	0008, 0102	O	1C	Not used
>>Code Meaning	0008, 0104	O	3	Not used
>Pre-Medication	0040, 0012	O	2C	Not used
>Scheduled Procedure Step ID	0040, 0009	O	1	
>Requested Contrast Agent	0032, 1070	O	2C	Not used
>Scheduled Procedure Step Status	0040, 0020	O	3	Not used

Requested Procedure				
Requested Procedure ID	0040, 1001	O *	1	Single Value matching
Requested Procedure Description	0032, 1060	O	1C	
Requested Procedure Code Sequence	0032, 1064	O	1C	Not used
>Code Value	0008, 0100	O	1C	Not used
>Coding Scheme Designator	0008, 0102	O	1C	Not used
>Coding Scheme Version	0008, 0103	O	3	Not used
>Code Meaning	0008, 0104	O	3	Not used
Study Instance UID	0020, 000D	O	1	
Referenced Study Sequence	0008, 1110	O	2	Not used
>Referenced SOP Class UID	0008, 1150	O	1C	Not used
>Referenced SOP Instance UID	0008, 1155	O	1C	Not used
Requested Procedure Priority	0040, 1003	O	2	Not used
Patient Transport Arrangements	0040, 1004	O	2	Not used
Name of Intended Recipients of Results	0040, 1010	O	3	
Imaging Service Request				
Accession Number	0008, 0050	O *	2	Single Value matching
Requesting Physician	0032, 1032	O	2	Not used
Referring Physician's Name	0008, 0090	O	2	
Visit Identification				
Admission ID	0038, 0010	O	2	Not used
Visit Status				
Current Patient Location	0038, 0300	O	2	
Visit Relationship				
Referenced Patient Sequence	0008, 1120	O	2	Not used
>Referenced SOP Class UID	0008, 1150	O	2	Not used
>Referenced SOP Instance UID	0008, 1155	O	2	Not used
Visit Admission				
Admitting Diagnosis Description	0008, 1080	O	3	
Patient Identification				
Patient's Name	0010, 0010	R *	1	Single Value or Wild Card Matching.
Patient ID	0010, 0020	R *	1	Single Value Matching.
Other Patient Ids	0010, 1000	O	3	
Patient Demographic				
Patients Birth Date	0010, 0030	O	2	
Patient's Sex	0010, 0040	O	2	
Patient's Weight	0010, 1030	O	2	
Confidentiality constraint on patient data	0040, 3001	O	2	Not used
Patient's Size	0010, 1020	O	3	
Ethnic Group	0010, 2160	O	3	
Patient Comments	0010, 4000	O	3	
Patient Medical				
Patient State	0038, 0500	O	2	Not used
Pregnancy Status	0010, 21C0	O	2	
Medical Alerts	0010, 2000	O	2	Not used
Contrast Allergies	0010, 2110	O	2	Not used
Special Needs	0038, 0050	O	2	Not used
Additional Patient History	0010, 21b0	O	3	
Last Menstrual Date	0010, 21d0	O	3	

Table 2.2.4-2   Worklist Attributes added to the standard DICOM image header for C-STORE

Attribute Name	Tag	Comments

Study Description	0008, 0030	Mapped from Scheduled Procedure Step Description (0040,0007)	
Accession Number	0008, 0050		
Referring Physician Name	0008, 0090		
Series Description	0008, 103E	Mapped from Scheduled Procedure Step Description (0040,0007)	
Operator's Name	0008, 1070	If returned from Modality Worklist query, the Operator's Name field is mapped from Scheduled Performing Physician Name (0040,0006). Otherwise it is derived from the "SONOGRAPHER" field in the edit panel.	
Admitting Diagnosis Description	0008, 1080		
Patient's Name	0010, 0010		
Patient ID	0010, 0020		
Patient's Birth Date	0010, 0030		
Patient's Sex	0010, 0040		
Other Patient IDs	0010, 1000		
Patient's Size	0010, 1020	Patient's height or length in meters	
Patient's Weight	0010, 1030	Weight of the patient in kilograms	
Ethnic Group	0010, 2160		
Additional Patient History	0010, 21B0	Data may be added in the edit field.	
Pregnancy Status	0010, 21C0		
Last Menstrual Date	0010, 21D0		
Patient Comments	0010, 4000		
Study Instance UID	0020, 000D		
Scheduled Procedure Step Description	0040, 0007		
Scheduled Procedure Step ID	0040, 0009		
Requested Procedure ID	0040, 1001		

2.2.5 Modality Worklist AE Behavior to SCP Status (C-FIND Response)

Table 2.2.5-1   Modality Worklist AE Behavior to Status Returned from SCP

StatusValue	Meaning	Related Fields	Description	Modality Worklist AE Behavoir
0000	Success	None	Matching is Complete. No final Identifier is supplied.	Upon successfully connecting to a Modality Worklist server, and retrieving the requested data, the Modality Worklist AE will continue operation without user notification.
A700	Refused	0000, 0902	Out of resources	The association is terminated. The user is notified of the failure.
A900	Failed	0000, 0901 0000, 0902	Identifier does not match SOP class	Same as A7xx.
Cxxx	Failed	0000, 0901 0000, 0902	Unable to Process	Same as A7xx.
FE00	Cancel	None	Matching is Terminated due to Cancel request	Terminated due to a Cancel Request.
FF00	Pending	Identifier	Matches are continuing.	Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.
FF01	Pending	Identifier	Matches are continuing.	Warning that one or more Optional Keys were not supported for existence for this Identifier.

2.3   Media Update AE

The Media Update application provides standard conformance to DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed in Table 2.2-1. This application has the ability to support the DICOM Media Roles as listed in the previous section. Therefore it is capable of being the **FS-Creator** when the media is un-initialized, **FS-Updater** when the media already has a DICOMDIR file and is having filesets added to it, and as **FS-Reader** when copying from removable media to system hard drive, or displaying media contents. The media may be of any format that the Windows NT 4 Operation System supports.

Table 2.3-1   Application Profiles, Activities, and Roles for Media Update

Application Profiles Supported	Real World Activity	Role	SC Option
90mm (3 1/2") media	Copy to HD	FSR	Interchange
STD-US-ID-MF-MOD540, 130mm (5 1/4") media	Copy to Optical	FSC	Interchange
for 2.6GB and 5.2GB MOD media	Copy to Optical	FSU	Interchange

The DVS Media Application will query the user before initializing media when a File-set is found on media and an initialize operation has been requested.

2.3.1   Real-World Activities for this Application Entity

2.3.1.1   Real-World Activity: Copy to Hard Drive

The DVS Media Application acts as an **FSR** using the Interchange option when requested to copy data from removable media to the system hard drive.

2.3.1.1.1   Application Profiles for FSR: Copy to Hard Drive

The list of Application Profiles that invoke this AE is on Table 2.3-1, Application Profiles, Activities, and Roles for Media Update. Only the SOP Classes and Transfer syntaxes listed in Table 2.4-1, Abstract and Transfer Syntaxes will be supported for FS-Reader functions. Initial release will only guarantee successful reading of ATL DVS generated media on the supported media types.

2.3.1.2   Real-World Activity: Copy to Optical

The DVS Media application acts as an **FSC / FSU** using the Interchange option if the installed media has **not / has** been initialized and the "Optical" is selected as the destination from the "Copy to..." dialog.

The DVS Media application as **FSC** will take the user provided list of SOP instances (which may be empty), and write those SOP Instances to the media and create a corresponding DICOMDIR.

If the selection list is empty, the **FSC** action results in the creation of an empty File-set.

The DVS Media application as **FSU** will copy new SOP Instances onto the media. Data may only be removed by re-formatting the media.

2.3.1.2.1   Application Profiles for FSC / FSU: Copy to Optical

For the list of Application Profiles that invoke this AE, see Table 2.3-1, Application Profiles, Activities, and Roles for Media Update. Only the SOP Classes and Transfer syntaxes listed in Table 2.4-1, Abstract and Transfer Syntaxes for media will be supported.

2.4   Abstract and Transfer Syntaxes

The following table contains the standard DICOM IOD, SOP Class UID and Transfer Syntaxes supported by the DVS Media application, and the Network Application. Note that Network transfers add ILE and EBE transfer syntaxes for Uncompressed Image and Verification SOP classes. JPEG compressed images will only negotiate Lossy JPEG Transfer Syntax.

Application Profiles in the classes listed in Table 2.3-1, STD-US, support the appropriate SOP Classes and Transfer Syntaxes for the Media Storage SOP Class in Table 2.4-1.

FS-Updater and FS-Creator roles will use the RGB or YBR_FULL_422 Photometric Interpretation **only** for all images. In the role of FS-Reader, DVS will support **only** these Photometric Interpretations.

Table 2.4-1   Abstract and Transfer Syntaxes

SOP Class Name	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Ultrasound Image Store	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		JPEG Baseline	1.2.840.10008.1.2.4.50
Ultrasound Multiframe Image Store	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		JPEG Baseline	1.2.840.10008.1.2.4.50
DICOM Media Storage Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1

2.5   Standard SOP Specific Conformance to Ultrasound Image Storage SOP Class

The Ultrasound Image Storage SOP uses the Ultrasound Image IOD Modules for both Ultrasound Image and Ultrasound Multiframe Image IODs as follows:

Ultrasound Image Storage Modules Used

Module Name	Usage	Description
Patient	M	Used
General Study	M	Used
Patient Study	U	Used
General Series	M	Used
Frame of Reference	U	Not used
US Frame of Reference	C	Not used
General Equipment	M	Used
General Image	M	Used
Image Pixel	M	Used
Palette Color Lookup Table	C	Not used
Contrast/bolus	C	Not used
Cine	C	Used (in Multiframe SOP only)
Multi-frame	C	Used (in Multiframe SOP only)
US Region Calibration	U	Used
US Image	M	Used
Overlay Plane	U	Not used
VOI LUT	U	Used
SOP Common	M	Used

Each module that is used by the Storing AE has a table below that indicates the elements supported.

Patient Module

Attribute Name	Tag	Type	Value	Description
Patient Name	0010, 0010	2	Name	Patient Name
Patient ID	0010, 0020	2	String	Patient's ID - 18 characters
Patient's Birth Date	0010, 0030	2	Date String	Patient's Birth Date
Patient's Sex	0010, 0040	2	M, F, or Null	Patient's Sex

General Study Module

Attribute Name	Tag	Type	Value	Description
Study Instance UID	0020, 000D	1	UID	Unique ID for the Study

Study Date	0008, 0020	2	YYYYMMDD	
Study Time	0008, 0030	2	HHMMSS	
Referring Physician's Name	0008, 0090	2	Short String	Mapped from "Referring" field. Limited to 32 characters.
Study ID	0020, 0010	2		ID Number for the Study
Accession Number	0008, 0050	2	Short String	Limited to 16 characters
Study Description	0008, 1030	3	String	Mapped from "Study Title" field. Limited to 32 characters.
Name of Physician(s) Reading Study	0008, 1060	3	Name	Mapped from "Reading Physician" field. Limited to 32 characters.

Patient Study Module

Attribute Name	Tag	Type	Value	Description
Admitting Diagnosis Description	0008, 1080	3	String	Mapped from "Indications" field. Limited to 64 characters.
Patient's Age	0010, 1010	3	Tag sent only if entered in Patient Data Entry	Patient's age
Patient's Size	0010, 1020	3	Tag sent only if entered in Patient Data Entry	Patient's height in metric units.
Patient's Weight	0010, 1030	3	Tag sent only if entered in Patient Data Entry	Patient's weight in metric units.
Additional Patient's History	0010, 21B0	3	String	Mapped from "Previous Surgeries" field. Limited to 255 characters.

General Series Module

Attribute Name	Tag	Type	Value	Description
Modality	0008, 0060	1	US	Always Ultrasound
Series Instance UID	0020, 000E	1	UID	Unique ID for the Series
Series Number	0020, 0011	2	N	Number of the series
Series Date	0008, 0021	3	YYYYMMDD	
Series Time	0008, 0031	3	HHMMSS	
Protocol Name	0018, 1030	3	String	User defined description under which the Series was performed.
Series Description	0008, 103E	3	String	Null
Operator's Name	0008, 1070	3	Name	Mapped from "Sonographer" field

Frame of Reference

Attribute Name	Tag	Type	Value	Description
Not supported				

US Frame of Reference

Attribute Name	Tag	Type	Value	Description
Not supported				

General Equipment Module

Attribute Name	Tag	Type	Value	Description
Manufacturer	0008, 0070	2	ATL	
Institution Name	0008, 0080	3	String, as entered in the "Setup" screen.	Hospital / Institution name
Manufacturer's Model Name	0008, 1090	3	HDI5000/DVS	System Type and DVS option

Software Versions	0018, 1020	3	String	DVS software version

General Image Module

Attribute Name	Tag	Type	Value	Description
Instance Number	0020, 0013	2	Integer	Number assigned to the image.
Image Date	0008, 0023	2C	YYYYMMDD	
Image Time	0008, 0033	2C	HHMMSS	
Image Type	0008, 0008	3	ORIGINAL\SECONDARY\\	Term 3 and Term 4 are left blank.
Image Comments	0020, 4000	3	String	Contains "Clip", "Frame", or View Name
Lossy Image Compression	0028, 2110	3	00 – No lossy compression 01 – Lossy Compression	Indicate use of compression
Lossy Image Compression Ratio	0028, 2112	3	Decimal String	Lossy compression ratio applied to the image

Image Pixel Module

Attribute Name	Tag	Type	Value	Description
Samples per Pixel	0028, 0002	1	Always 3	No Monochrome2
Photometric Interpretation	0028, 0004	1	Either RGB Or YBR_FULL_422	RGB in color-by-pixel only not in color-by-plane
Rows	0028, 0010	1	232, 472, 480(476)	Quad, Half, Full Image height in pixels YBR Images are 480 (RGB Images are 476)
Columns	0028, 0011	1	320, 320, 640	Quad, Half, Full Image width in pixels
Bits Allocated	0028, 0100	1	8	
Bits Stored	0028, 0101	1	8	
High Bit	0028, 0102	1	7	
Pixel Representation	0028, 0103	1	0x0000	Unsigned Integer
Pixel Data	7FE0, 0010	1		Interpreted as sequence start for JPEG images.
Planar Configuration	0028, 0006	1C	0x0000	
Pixel Aspect Ratio	0028, 0034	1C	1\1	

Palette Color Lookup Table Module

Attribute Name	Tag	Type	Value	Description
Not supported				

Contrast/Bolus Module

Attribute Name	Tag	Type	Value	Description
Not supported				

Cine Module

Attribute Name	Tag	Type	Value	Description
Frame Time	0018, 1063	1C	Decimal String	Nominal time per frame in milliseconds
Recommended Display Frame Rate	0008, 2144	3	Integer String	Recommended display in frames per second

Multi-frame Module

Attribute Name	Tag	Type	Value	Description

Number of Frames	0028, 0008	1	Integer String	Number of frames in this cineloop
Frame Increment Pointer	0028, 0009	1C	Contains tag: 0018, 1063	This tag represents Sequencing by Frame Time

US Region Calibration Module

Attribute Name	Tag	Type	Value	Description
Sequence of Ultrasound Regions	0018, 6011	1		Full screen captures may have 1 to 3 sequences; 2D, scrolling and ECG. Quad and Half captures of 2D or 2D/ECG only will send scaling data. Half or quad captures of mmode or doppler images will NOT send scaling data.
Region Spatial Format	0018, 6012	1		Used
Region Data Type	0018, 6014	1		Used
Region Flags	0018, 6016	1		Used
Region Location Min X0	0018, 6018	1	("0" if image acquired using ROI box for Dual or Quad.)	Used
Region Location Min Y0	0018, 601A	1	("0" if image acquired using ROI box for Dual or Quad.)	Used
Region Location Max X1	0018, 601C	1		Used
Region Location Max Y1	0018, 601E	1		Used
Reference Pixel X	0018, 6020	3		Used
Reference Pixel Y	0018, 6022	3		Used
Physical Units X Direction	0018, 6024	1		Used
Physical Units Y Direction	0018, 6026	1		Used
Ref. Pixel Physical Value X	0018, 6028	3		Used
Ref. Pixel Physical Value Y	0018, 602A	3		Used
Physical Delta X	0018, 602C	1		Used
Physical Delta Y	0018, 602E	1		Used
Transducer Frequency	0018, 6030	3		Used, only in pw/cw doppler
Transducer Type		3		Not used
Pulse Repetition Frequency	0018, 6032	3		Used, null.
Doppler Correction Angle		3		Not used
Steering Angle	0018, 6036	3		Used, null.
Doppler Sample Volume X Position		3		Not used
Doppler Sample Volume Y Position		3		Not used
TM-Line Position X0		3		Not used
TM-Line Position Y0		3		Not used
TM-Line Position X1		3		Not used
TM-Line Position Y1		3		Not used
The following tags are present in the first scaling sequence for an image with scaling data and are to be ignored.				
Private Creator Data Element	*0009, 0010*	*3*	*ATL HDI V1.0*	*ATL Private Scaling Tags*
Private	*0009, 1010*	*3*		*Used*
Private	*0009, 1020*	*3*		*Used*
Private	*0009, 1030*	*3*		*Used*
Private	*0009, 1040*	*3*		*Used*
Private	*0009, 1050*	*3*		*Used*

Private	0009, 1060	3		Used
Private	0009, 1070	3		Used
Private	0009, 1080	3		Used
Private	0009, 1090	3		Used
Private	0009, 1100	3		Used
Private	0009, 1160	3		Used
Private	0009, 1170	3		Used
Private	0009, 1180	3		Used
Private	0009, 1190	3		Used
Private	0009, 1191	3		Used
Private	0009, 1200	3		Used
Private	0009, 1210	3		Used
Private	0009, 1220	3		Used
Private	0009, 1230	3		Used
Private	0009, 1250	3		Used

US Image Module

Attribute Name	Tag	Type	Value	Description
Samples Per Pixel	0028, 0002	1	Always 3	No Monochrome2
Photometric Interpretation	0028, 0004	1	Either RGB Or YBR_FULL_422	RGB in color-by-pixel only not in color-by-plane
Bits Allocated	0028, 0100	1	8	
Bits Stored	0028, 0101	1	8	
High Bit	0028, 0102	1	7	
Planar Configuration	0028, 0006	1C	0x0000	
Pixel Representation	0028, 0103	1	0x0000	Constant
Frame Increment Pointer	0028, 0009	1C	Contains tag: (0018,1063)	This tag represents Sequencing by Frame Time
Image Type	0008, 0008	2	ORIGINAL\SECONDARY\\	Term 3 and Term 4 are left blank.
Lossy Image Compression	0028, 2110	1C	00 – No compression 01 – Lossy Compression	
Number of Stages	0008, 2124	2C	N	Number of stages in a protocol
Number of Views in Stage	0008, 212A	2C	N	Number of views in a stage
Stage Name	0008, 2120	3	String	Used in protocols
Stage Number	0008, 2122	3	N	Which stage in a protocol
View Number	0008, 2128	3	N	The image number in the stage
Number of Event Timers	0008, 2129	3	1, 2 or 3 Null if timers not used	Number of event timers used during acquisition
Event Elapsed Time(s)	0008, 2130	3	Decimal String Tag sent only if timers used	Time for each timer used is sent.
Event Timer Name(s)	0008, 2132	3	LO Tag sent only if timers used	Timer1, Timer2 or Timer3
Heart Rate	0018, 1088	3	Decimal String	Beats per minute

Overlay Plane Module

Attribute Name	Tag	Type	Value	Description
NOT SUPPORTED				

VOI LUT Module

Attribute Name	Tag	Type	Value	Description
Window Center	0028, 1050	3	128	
Window Width	0028, 1051	1C	256	Must be present if tag 0028,

				1050 is used.

SOP Common Module

Attribute Name	Tag	Type	Value	Description
SOP Class UID	0008, 0016	1	1.2.840.10008.5.1.4.1.1.3.1 or 1.2.840.10008.5.1.4.1.1.6.1	SOP Class UID
SOP Instance UID	0008, 0018	1	1.2.840.113663.1298.HDI_sn.3. n.yyyymmdd.1hhmmss	SOP Instance UID

3   AUGMENTED AND PRIVATE PROFILES

3.1   Augmented Profiles

None.

3.2   Private Profiles

None.

4   COMMUNICATION PROFILE

4.1   TCP/IP Stack Supported

The TCP/IP stack present in the NT WS 4.0 SRVPK 5 OS is used for network communications.

4.2   Physical Media Supported

Standard IEEE 802.x (Ethernet) is supported at 10 or 100 Mb/sec through a standard RJ-45 UTP (Unshielded Twisted Pair) connector. Full or Half Duplex may be configured automatically or manually. The destination Ethernet or Media Access Control (MAC) address is acquired through use of the Address Resolution Protocol (ARP). The Internet Protocol Address (IP) is configured via the Network Configuration screen (see section 6).

5   EXTENSIONS, SPECIALIZATIONS, PRIVATIZATIONS OF SOP CLASSES AND TRANSFER SYNTAXES

5.1   ATL Private Tags

Table 5.1-1   Private Tags used by DVS

Attribute Name	Tag	Value	Description
Private Creator Data Element	*0029, 0060*	*0029, 6000 – 60FF*	*Private*
Loop Mode	*0029, 6030*	*Private*	*Private*
Trigger mode	*0029, 6031*	*Private*	*Private*
Number of Loops	*0029, 6032*	*Private*	*Private*
Loop Indexes	*0029, 6033*	*Private*	*Private*
Loop Heart Rates	*0029, 6034*	*Private*	*Private*
Medications	*0029, 6035*	*Private*	*Private*

6   CONFIGURATION

IP Address Configuration for HDI 5000 with DVS
> The Network Configuration screen includes areas where information for both the source and destination addresses are configured.

DVS System:
> The system's AE Title, IP Address, Network Mask (Subnet Mask) and Gateway Address, Station Name and Station Location are entered under the column labeled "Local Network Configuration". Setting the system IP Address requires a power cycle.

Network Store Server:

> The storage server's AE Title, IP Address and receiving Port address are entered under the column titled "File Server Configuration". Only **one** destination device may be configured at a time. Setting this address does not require a power cycle.

Modality Worklist Server:

> The Modality Worklist server's AE Title, IP Address and receiving Port address are entered under the column titled "Worklist Server Configuration". Setting this address does not required a power cycle.

The 90mm (3 ½") MOD 540 MB media and the 130mm (5 ¼") media 2.6GB and 5.4GB media only are used in DVS. The disks are formatted in the native NT Workstation 4 partitioned file format.

7   CHARACTER SETS

The Network Store SCU Modality Worklist SCU and Media Update Device will only support SOP Instances containing the DICOM default character set as defined in PS 3.5.

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