Siemens Medical Solutions USA, Inc., Ultrasound Group

SONOLINE Antares Product Platform
DICOM Conformance Statement

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1.0 Purpose

This document describes the conformance to the ACR-NEMA DICOM 3.0 Standard by the SONOLINE® Antares ultrasound system software version 2.0 from Siemens Medical Solutions, Inc. Ultrasound Division. It shall establish the conformance specifications for this system only, and does not apply to other products offered by Siemens Medical Solutions, or its affiliates.

The SONOLINE Antares system is a device that generates ultrasound images that can be sent using DICOM standard protocols and definitions to other DICOM compliant devices that support the SOP classes defined in Table 4 on Page 18.

1.1 Scope

The DICOM standard provides a well-defined set of structures and protocols that allow inter-operability of a wide variety of medical imaging devices. The SONOLINE Antares system provides support for essential services related to ultrasound scanning and connectivity to DICOM compliant devices. SONOLINE Antares system products will not support all features supported by the DICOM standard. This document clearly states the DICOM services and data classes that are supported by the applications included with the SONOLINE Antares. The intent of this document is to allow users and other vendors who also conform to the DICOM standard to exchange information within the specific context of those elements of the DICOM standard that SONOLINE Antares system supports.

This document is written with respect to the adopted portions of the DICOM standard, Version 3. The following sections of this document follow the outline specified in the DICOM Standard NEMA publication PS3.2 [1].

2.0 References

Specifications of the DICOM 3.0 standard may be obtained from ACR-NEMA for customers who require detailed information.

Table 1: References

Document Title	Location
[1] Second part of the DICOM standard: NEMA Standards Publication PS 3.2-2001, Digital Imaging and Communications in Medicine (DICOM), Part 2: Conformance	http://medical.nema.org/dicom/2001.html

3.0 Definitions

Table 2: Acronyms and Abbreviations

Acronym or Abbreviation	Definition
ACR-NEMA	American College of Radiology - National Electrical Manufacturer's Association
AE	Application Entity
Conformance Statement	A formal statement associated with a specific implementation of the DICOM Standard. It specifies the Service Classes, Information Objects, Communications Protocols and Media Storage Application Profiles supported by the implementation
DICOM 3.0	Digital Imaging and Communications in Medicine, Version 3.0.
DIMSE	DICOM Message Service Element
EBE	Explicit Big Endian transfer syntax
ELE	Explicit Little Endian transfer syntax
ILE	Implicit Little Endian transfer syntax
C-STORE	Composite Store
Ethernet	Network topology devised in 1976 by DIX (DEC/Intel/Xerox) which is the most common in practice today.
IOD	Information Object Definition
MWL	Modality Worklist
OOG	Object Oriented Graphics
PACS	Picture Archiving and Communications Systems
PDU	Protocol Data Unit
RWA	Real-World Activity
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
syngo	Siemens DICOM Application Framework - Common User SW
UID	Unique identifier

3.1 Support of Extended Character Sets

The Antares platform supports the ISO 8859 Latin 1 (ISO-IR 100) character set family and the same family with code extensions (ISO 2022 IR 100 Latin-1).

4.0 Implementation Model

SONOLINE Antares system users can store images directly on the system hard drive. Images can also be transferred to DICOM workstations and archive servers on a network. Storage Commitment can be used to insure that patient images and data is safely committed. The system is capable of querying a HIS/RIS, using DICOM Basic Worklist, for a list of scheduled patient procedures. Performed procedure status and other procedure information can be returned to the HIS/RIS using Modality Performed Procedure Step (MPPS).

SONOLINE Antares system real world activities are indicated by “Real World Activity” name while “Antares AE” indicates the invoked Application Entity. Similarly, the activities associated with service providers are indicated as “Real World Service Activity.”

4.1 Application Data Flow Diagrams

Figure 7 on page 14 illustrates the SONOLINE Antares system Application Entities (AE) in the context of the implementation model. Relationships between users invoked activities (in the circles at the left of the AEs) and the associated real-world activities provided by DICOM service providers (in the circles on the right side of the diagram) are shown.

4.1.1 Verification

Verification is available in the DICOM Network nodes, Print Devices and HIS/RIS Nodes configuration pages of the Local Service UI. Verification can be used for diagnostic purposes. When used as a diagnostic tool, Verification will return the following messages to the user:

- Application Entity Title “AE Name” is responding.
- Application Entity Title “AE Name” is not responding.

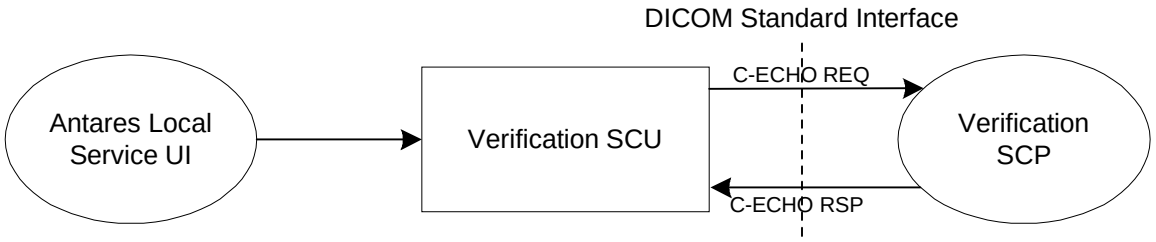

Figure 1: Verification Model

4.1.2 Storage

The Antares Storage Application Entity originates associations for transfer of DICOM Composite Information Objects to remote Application Entities. The Antares system acts as SCU for the C-STORE DICOM network service.

If configured, DICOM Store may be invoked by pressing a “Print/Store” key, which causes the image currently displayed on the system monitor screen to be captured to hard drive and transferred. Print/Store keys are configurable through the system presets function. Images may also be manually transferred through the Patient Browser UI screen.

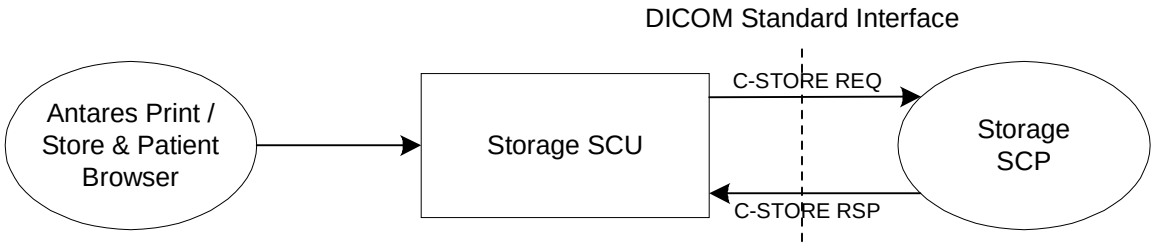

Figure 2: Store Model

4.1.3 Storage Commitment - Push Model

The Storage Commitment service class defines an application-level class of service which facilitates the commitment to storage. It performs an additional task of commitment of composite objects apart from the network based storage of images as defined by the Storage Service class.

Figure 3: Storage Commitment Model

4.1.4 Print

The Print Management Service Classes define an application-level class of services which facilitate the printing of images on a hardcopy medium. The print management SCU and print management SCP are peer DICOM print management application entities. The DICOM print application supports the print management DIMSE services as SCU.

.

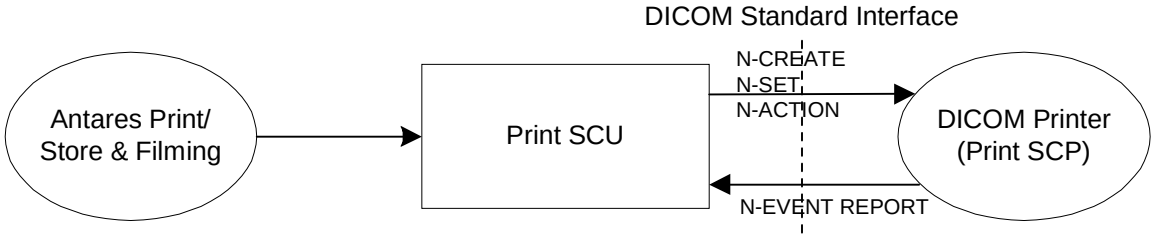

Figure 4: Print Model

4.1.5 Modality Worklist

The Modality Worklist service class defines an application-level class of service which facilitates the transfer of worklists from the information system to the imaging modality. The worklist is queried by the AE and supplies the SCU with the scheduled tasks which have to be performed on the modality. The Antares DICOM worklist application supports the worklist service as SCU.

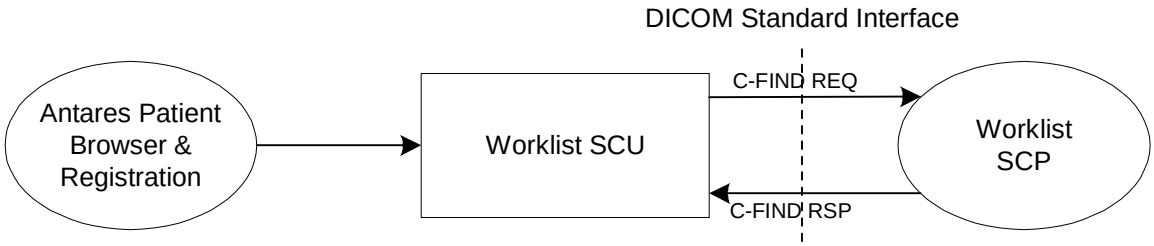

Figure 5: Modality Worklist Model

Note: It is configurable to get the worklist updates either automatically (in a configurable time interval) or manually (initiated by the user). The user can do a broad worklist query (all jobs for the own modality or own application entity)

4.1.6 Modality Performed Procedure Step

The Modality Performed Procedure Step service class defines an application-level class of service which facilitates the transfer of procedure status and billing information from the imaging modality to the information system. The performed procedure step is sent by the Antares AE and supplies the SCP with the performed tasks on the modality. The DICOM performed procedure step application supports the performed procedure step service as SCU.

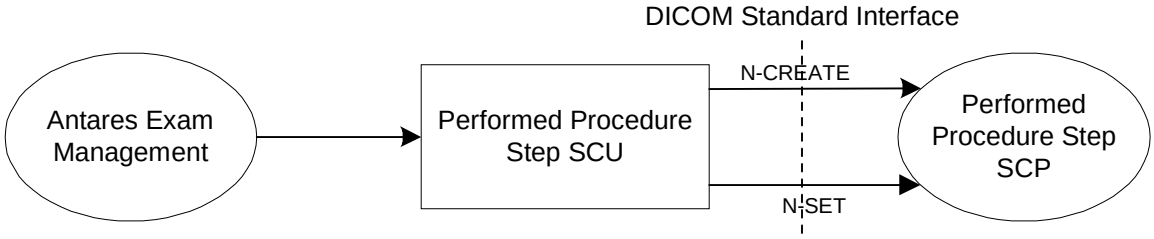

Figure 6: Modality Performed Procedure Step Model

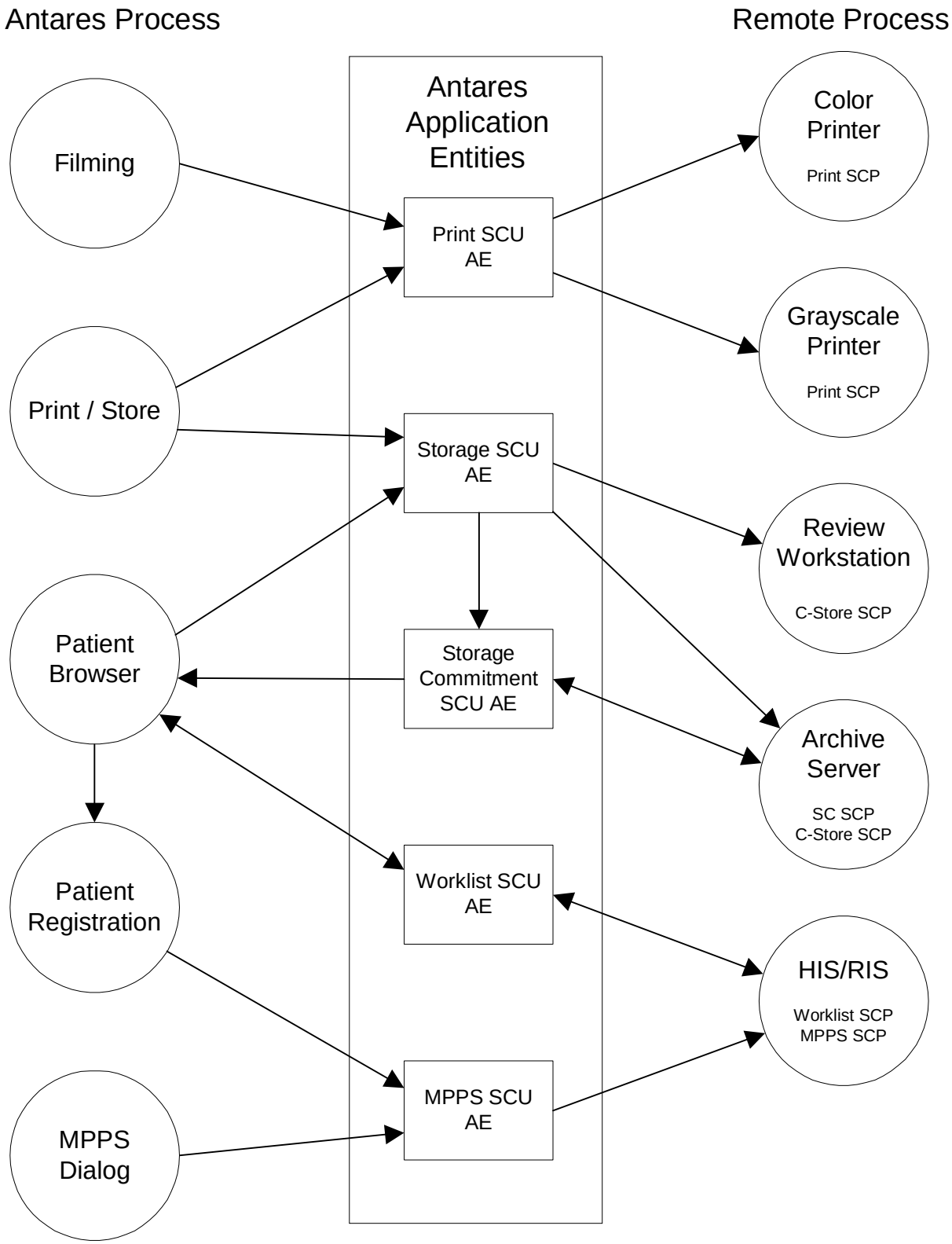

Figure 7: Implementation Model

4.2 AE Functional Definitions

4.2.1 Verification Real-World Activities

The Antares Verification application entity supports Verification Service Class as SCU thus allowing the operator to verify the ability of an application on a remote node to receive DICOM messages. (C-ECHO DIMSE)

4.2.2 Storage Real-World Activities

The Antares Storage application entity performs all of the functions necessary to transmit ultrasound images and associated data to DICOM network archive servers and/or workstations. The Antares Storage AE supports the Ultrasound Image Storage SOP class as SCU. The Antares Storage AE also supports the Secondary Capture SOP class, as SCU, for devices that do not support the US Image SOP. The Antares Storage AE initiates separate associations to the storage SCP servers, each time the user selects “Store/Print” or “Send/Archive To Destination”.

4.2.3 Storage Commitment Real-World Activities

The Storage Commitment Push Model SCU (SC-SCU) uses the Storage Commitment Service Class to request commitment for one or more composite objects from the Storage Commitment Push Model SCP (SC-SCP). SC-SCU issues an N-ACTION to SC-SCP containing a list of references to composite objects, requesting that the SC-SCP takes responsibility for storage commitment of the composite objects. If the SC-SCP has determined that all the composite objects exist and it has successfully completed storage commitment for the set of composite objects, it issues an N-EVENT-REPORT with status successful and the list of stored images. SC-SCU now knows that the composite objects have been committed by SC-SCP and can delete its copies of composite objects. The information from the N_EVENT-REPORT is propagated back to the user interface.

If committed storage cannot be done for some reason for any of the list of composite objects the SC_SCP issues an N-EVENT-REPORT with a status of completed-failures exist and would include both the successful and failed list. The Antares SCU can be configured to receive the N_EVENT_REPORT on the same association on which N_ACTION was sent or on a different association.

4.2.4 Print Real-World Activities

The Antares Print AE provides all aspects of the Print Management SCU. The AE initiates separate associations to the print servers, verifying their on-line status when the user selects “Print/Store” or “Expose Film Job.” The Antares Print AE accommodates both grayscale and color print servers.

To invoke the Print “REAL WORLD ACTIVITY” the user selects a “Print/Store” key. Film sheets can be transferred immediately after being filled, at the end of exam, or queued to hard disk for transfer later.

After an imaging exam is complete, the user has the ability to Print images stored on the hard drive using the Filming UI. Invoking the “Expose Film Job” Real World activity invokes the DICOM Print activity for selected exams or individual images. “Expose Film Job” is available through the Filming UI function

4.2.5 Worklist Real-World Activity

Patient registration can be automated by using the ‘Worklist’ Real World Activity.

Double clicking the ‘Scheduler’ icon in the patient browser UI initiates a manual Worklist query. If no matches are found, a message will be presented to the operator indicating so. If one or more patients are found, the scheduler list will be updated with the scheduled procedures. The Worklist feature can be configured to query for either the procedures scheduled for the Local Site (Antares Worklist SCU AE Title) or for Ultrasound scheduled procedures (Modality = US). Queries can be made for today’s scheduled procedures, or a user specified range of scheduled procedure dates and times. The system can also be configured to perform automatic Worklist queries at user specified intervals.

Patient based queries are not supported in the Antares 2.0 release.

Selection of a patient from the list will cause all demographic information for that patient to be loaded in to the patient data fields in the Patient Registration screen. The following patient registration fields will be populated with matching Worklist attributes:

Table 3: Patient Registration fields populated from Worklist

Data Field	DICOM Attribute	DICOM Tag
Name	Patient's Name	(0010,0010)
ID	Patient ID	(0010,0020)
Date of Birth	Patient's Birth Date	(0010,0030)
Sex	Patient's Sex	(0010,0040)
Height	Patient's Size	(0010,1020)
Weight	Patient's Weight	(0010,1030)
Institution name	Institution name	(0008,0080)
Performing Physician	Performing Physicians’ Name	(0008,1050)
Referring Physician	Referring Physician's Name	(0008,0090)
Operator	Operators' Name	(0008,1070)
Accession No	Accession Number	(0008,0050)
Indication	Admitting Diagnoses Description	(0008,1080)
Request ID	Requested Procedure ID	(0040,1001)
Requested Procedure	Requested Procedure Description	(0032,1060)
	Scheduled Procedure Step Description	(0040,0007)
Additional Info	Additional Patient’s History	(0010,21B0)

4.2.6 Modality Performed Procedure Step Real-World Activity

The Antares supports the DICOM Modality Performed Procedure Step Service as SCU. The modality performed procedure step SCU informs the performed procedure step SCP about the procedure performed at the modality in the N-CREATE and N-SET DIMSE service.

Immediately after a new patient, study or scheduled procedure is registered (via Patient Registration) the Antares automatically performs an MPPS N-CREATE operation with a status of IN-PROGRESS for the newly created Performed Procedure Step. When the current patient procedure ends, (either with a End Exam, or new Patient / Study / Procedure) the Antares automatically performs an MPPS N-SET final operation with a status of COMPLETED. The user may also manually complete or discontinue the current Performed Procedure Step through the MPPS dialog. An MPPS N-SET final operation is performed with the appropriate status of COMPLETED or DISCONTINED.

The modality performed procedure step SCP responds to the N-CREATE and N-SET and confirms that it received the information from the modality.

4.2.7 Sequencing of Real-World Activities

In order for any of the remote processes to be able to provide the SCP services which the SONOLINE Antares system has requested, the appropriate associations must first be opened. This initiation occurs with the following activities:

1. When a “Send To Destination” operation occurs.
2. When one or more Storage SCP devices are configured for transfer “During the exam” and the associated Print/Store key(s) are pressed. The current image displayed on the system screen in captured and transferred.
3. When one or more Storage SCP devices are configured for transfer at “End of exam” and the current patient exam ends (e.g. New Patient, Study or End Exam button is pressed). All images in the current performed procedure are transferred.
4. When configured, Storage Commitment trigger is automatically derived from the successful completion of a Send Job.
5. When an “Expose Film Job” print operation occurs.
6. When one or more Print SCP devices are configured for transfer “During the exam” and the associated Print/Store key(s) are pressed. The current film sheet is transferred after becoming filled.
7. When one or more Print SCP devices are configured for transfer at “End of exam” and the patient procedure ends (e.g. New Patient, Study or End Exam button is pressed). All film sheets in the current performed procedure are transferred.
8. When user initiated or automatic Worklist query operations occur.
9. When configured, MPPS N-CREATE (status = IN PROGRESS) operation is automatically performed when a patient is successfully registered. An MPPS N-SET (status = COMPLETED) operation is automatically performed when the patient exam ends.

5.0 AE Specifications

The following specifications apply to the AE as depicted in Figure 7 on page 14. The Antares AE provides conformance to the following DICOM Service SOP Classes as an SCU.

Table 4: Supported SOP Classes

Service SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Ultrasound Multi-frame Image Storage †	1.2.840.10008.5.1.4.1.1.3.1
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18
Print Job SOP Class	1.2.840.10008.5.1.1.14
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31
Storage Commitment - Push Model	1.2.840.10008.1.20.1
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3

† The Ultrasound Multi-frame Image Storage SOP is used to transfer Antares Ultrasound 3D volumetric data sets. Each frame represents a single slice from the 3D volume. These 3D images may be viewed as Cine images.

5.1 Verification AE Specification

5.1.1 Association Initiation by Real-World Activity

The Antares DICOM Service Tool application attempts to initiate a new association for DIMSE C-ECHO service related operations.

5.1.1.1 Real-World Activity - Verification SCU

5.1.1.1.1 Associated Real-World Activity - Verification SCU

The associated Real-World activity is a C-ECHO request initiated by the DICOM Service Tool application. If the process successfully establishes an association to a remote Application Entity, it will send the C-ECHO-Request via the open association to verify that the remote Application Entity is responding to DICOM messages.

5.1.1.1.2 Proposed Presentation Contexts - Verification SCU

The Antares DICOM application will propose Presentation Contexts as shown in the following table.

Table 5: Verification Presentation Context Table

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

5.1.1.1.3 SOP Specific Conformance Statement - Verification SCU

The Application conforms to the definition of a Verification SCU in accordance to the DICOM Standard.

5.2 Storage AE Specification

The Antares DICOM system provides Standard Conformance to the following DICOM V3.0 SOP Classes as an SCU.

Table 6: Supported Storage SOP Classes

Service SOP Class Name	SOP Class UID
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1

This is accomplished using the DIMSE C-STORE Service to whom the SCU issues a service request with a SOP instance that meets the requirements of the desired ultrasound IOD.

5.2.1 Association Establishment Policies

5.2.1.1 General

The configuration of the Antares DICOM application defines the Application Entity Titles, the port numbers, the host names and IP addresses.

5.2.1.2 Number of Associations

The Antares DICOM application initiates several associations at a time, one for each destination to which a transfer request is being processed in the active job queue list.

5.2.1.3 Asynchronous Nature

The Antares DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

5.2.1.4 Implementation Identifying Information

The Antares DICOM software provides a single Implementation Class UID of

- <“1.3.12.2.1107.5.9.20000101”>

and an Implementation Version Name of

- <“SIEMENS_SWFVB10A”>.

5.2.1.5 Maximum PDU Size offered

- The maximum PDU size offered by the Antares is configurable with default set to 28672 Bytes

5.2.1.6 DICOM Application Context

- DICOM Application context name: 1.2.840.10008.3.1.1.1

5.2.2 Association Initiation by Real-World Activity

The Antares DICOM application attempts to initiate a new association for DIMSE C-STORE operation.

5.2.2.1 Real World Activity - Storage SCU

The user selects “New Patient” at the start of each new patient examination. The user saves images to the Antares hard disk with the “Store / Print” button.

5.2.2.1.1 Associated Real World Activities - Storage SCU

An association is established when the user initiates an “Archive to...” or “Send to...” destination operation from the Patient browser screen. Individual images or entire exams can be transferred to the selected DICOM Store device (C-STORE request). The association is opened when the first image of each exam is transferred and closed when the last image transfer is completed.

An association is also established when auto transfer has been configured and the user initiates a “Print/Store” operation. If transfer “during the exam” has been configured, an association is opened for each image acquired during the exam and closed when the image transfer is completed. If transfer at “end of exam” has been configured, an association is opened when the exam is completed (I.e. a new Patient / Study is registered or End Exam is performed). The association is closed when the last image transfer is completed.

If the C-STORE Response from the remote application contains an error status, the association is aborted.

5.2.2.1.2 Proposed Presentation Context

The following Presentation Context(s) is presented to the SCP in an A-Associate request for DIMSE C-STORE storage services. The storage services utilize C-STORE services, whose parameters are defined in PS 3.7.

Table 7: Store Presentation Context Table

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Lossy (Baseline)	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70	SCU	None

Table 7: Store Presentation Context Table

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Lossy (Baseline)	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Lossy (Baseline)	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70	SCU	None

5.2.2.1.3 SOP Specific Conformance to Storage Service SOP Classes

The DICOM images created by the Antares DICOM application conform to the DICOM IOD definitions (Standard extended IODs). But they will contain additional private elements that may be discarded by a DICOM system when modifying the image.

Table 8 denotes the attributes included in the Ultrasound Image Object as implemented on the Antares system. Attributes not listed are not used.

Table 8: US Image IOD Attributes

Module:	Attribute:	Tag:	Type:	Notes:
Patient	Patient's Name	(0010,0010)	2	from MWL or user input
	Patient ID	(0010,0020)	2	from MWL or user input
	Patient's Birth Date	(0010,0030)	2	from MWL or user input
	Patient's Sex	(0010,0040)	2	from MWL or user input
	Other Patient IDs	(0010,1000)	3	from MWL
	Other Patient Names	(0010,1001)	3	from MWL
	Ethnic Group	(0010,2160)	3	from MWL
	Patient Comments	(0010,4000)	3	from MWL
General Study	Study Instance UID	(0020,000D)	1	created
	Study Date	(0008,0020)	2	created
	Study Time	(0008,0030)	2	created
	Referring Physician's Name	(0008,0090)	2	from MWL or user input
	Study ID	(0020,0010)	2	created
	Accession Number	(0008,0050)	2	from MWL or user input
	Study Description	(0008,1030)	3	from MWL (requested procedure description or scheduled procedure step description) or user selected
	Referenced Study Sequence	(0008,1110)	3	from MWL or zero length
	>Referenced SOP Class UID	(0008,1150)	1C	-
	>Referenced SOP Instance UID	(0008,1155)	1C	-
	Procedure Code Sequence	(0008,1032)	3	from MWL (from Requested Procedure Code Sequence) or zero length
	>Include ‘Code Sequence Macro’		3	-
Patient Study	Admitting Diagnoses Description	(0008,1080)	3	from MWL or user input
	Patient's Age	(0010,1010)	3	calculated or user input
	Patient's Size	(0010,1020)	3	from MWL or user input
	Patient's Weight	(0010,1030)	3	from MWL or user input
	Additional Patient’s History	(0010,21B0)	3	from MWL or user input

Table 8: US Image IOD Attributes

General Series	Modality	(0008,0060)	1	Set to US
	Series Instance UID	(0020,000E)	1	created
	Series Number	(0020,0011)	2	Set to 1...n
	Laterality	(0020,0060)	2C	Set to Zero length
	Series Date	(0008,0021)	3	created
	Series Time	(0008,0031)	3	created
	Performing Physicians' Name	(0008,1050)	3	from MWL or user input
	Protocol Name	(0018,1030)	3	user input or set to "unknown"
	Series Description	(0008,103E)	3	user input
	Operators' Name	(0008,1070)	3	user input
	Referenced Study Component Sequence	(0008,1111)	3	created
	>Referenced SOP Class UID	(0008,1150)	1C	1.2.840.10008.3.1.2.3.3 (MPPS SOP Class)
	>Referenced SOP Instance UID	(0008,1155)	1C	created
	Body Part Examined	(0018,0015)	3	user selected
	Request Attributes Sequence	(0040,0275)	3	from MWL or zero length
	>Requested Procedure ID	(0040,1001)	1C	-
	>Scheduled Procedure Step ID	(0040,0009)	1C	-
	>Scheduled Procedure Step Description	(0040,0007)	3	-
	>Scheduled Protocol Code Sequence	(0040,0008)	3	-
	>>Include 'Code Sequence Macro		3	-
	Performed Procedure Step ID	(0040,0253)	3	created
	Performed Procedure Step Start Date	(0040,0244)	3	created
	Performed Procedure Step Start Time	(0040,0245)	3	created
	Performed Procedure Step Description	(0040,0254)	3	from MWL (scheduled procedure description) or user input
	Performed Protocol Code Sequence	(0040,0260)	3	from MWL Scheduled Protocol Code sequence, if performed
	>Include 'Code Sequence Macro		3	from MWL
	Comments on the Performed Procedure Step	(0040,0280)	3	user input
General Equipment	Manufacturer	(0008,0070)	2	Set to "Siemens Medical Solutions - Ultrasound Division"
	Institution Name	(0008,0080)	3	from MWL or user selected
	Institution Address	(0008,0081)	3	from MWL
	Station Name	(0008,1010)	3	Set to the computer's host name
	Manufacturer's Model Name	(0008,1090)	3	Set to "Antares"
	Device Serial Number	(0018,1000)	3	Set to system serial number
	Software Versions	(0018,1020)	3	Set to 2.0
General Image	Instance Number	(0020,0013)	2	1...n
	Patient Orientation	(0020,0020)	2C	Set to Zero length
	Acquisition Date	(0008,0022)	2	created
	Content Date	(0008,0023)	2C	created
	Acquisition Time	(0008,0032)	3	created
	Content Time	(0008,0033)	2C	created
	Derivation Description	(0008,2111)	3	Compress BN JPEG Lossy (xx/xxx.xx)
	Source Image Sequence	(0008,2112)	3	Used by 3D rendering to reference3D Volume.
	>Referenced SOP Class UID	(0008,1150)	1C	
	>Referenced SOP Instance UID	(0008,1155)	1C	
	Image Comments	(0020,4000)	3	user input
	Lossy Image Compression Ratio	(0028,2112)	3	Only used with JPEG Lossy compression
Image Pixel	Rows	(0028,0010)	1	Set to 600
	Columns	(0028,0011)	1	Set to 800
	Pixel Data	(7FE0,0010)	1	...

Table 8: US Image IOD Attributes

US Region Calibration	Sequence of Ultrasound Regions	(0018,6011)	1	one created for each US region displayed
	>Region Location Min x0	(0018,6018)	1	-
	>Region Location Min y0	(0018,601A)	1	-
	>Region Location Max x1	(0018,601C)	1	-
	>Region Location Max y1	(0018,601E)	1	-
	>Physical Units X Direction	(0018,6024)	1	-
	>Physical Units Y Direction	(0018,6026)	1	-
	>Physical Delta X	(0018,602C)	1	-
	>Physical Delta Y	(0018,602E)	1	-
	>Reference Pixel x0	(0018,6020)	3	-
	>Reference Pixel y0	(0018,6022)	3	-
	>Ref. Pixel Physical Value X	(0018,6028)	3	-
	>Ref. Pixel Physical Value Y	(0018,602A)	3	-
	>Region Spatial Format	(0018,6012)	1	-
	>Region Data Type	(0018,6014)	1	-
	>Region Flags	(0018,6016)	1	-
	>Transducer Frequency	(0018,6030)	3	-
	>Pulse Repetition Frequency	(0018,6032)	3	Color Flow and Doppler only
	>Doppler Correction Angle	(0018,6034)	3	Doppler only
US Image Module	Samples Per Pixel	(0028,0002)	1	Set to 3
	Photometric Interpretation	(0028,0004)	1	Set to RGB
	Bits Allocated	(0028,0100)	1	Set to 8
	Bits Stored	(0028,0101)	1	Set to 8
	High Bit	(0028,0102)	1	Set to 7
	Planar Configuration	(0028,0006)		Set to 0 (color-by-pixel)
	Ultrasound Color Data Present	(0028,0014)	1C	Set to 1 if Color Flow or Pseudo Color in image
	Pixel Representation	(0028,0103)	1	Set to 0 (unsigned integer)
	Image Type	(0008,0008)	2	...
	Lossy Image Compression	(0028,2110)	1C	If JPEG lossy compressed
	Transducer Data	(0018,5010)	3	Probe name (e.g. C5-2)
	Mechanical Index	(0018,5022)	3	B-mode only
	Bone Thermal Index,	(0018,5024)	3	Doppler, M-Mode & Color Flow only
	Cranial Thermal Index	(0018,5026)	3	Cranial Doppler only
	Soft Tissue Thermal Index	(0018,5027)	3	Doppler, M-Mode & Color Flow only
Overlay Plane (not included if burned in graph-ics is selected)	Overlay Rows	(60xx,0010)	1	Set to 600
	Overlay Columns	(60xx,0011)	1	Set to 800
	Overlay Type	(60xx,0040)	1	Set to G
	Overlay Origin	(60xx,0050)	1	Set to 1\1
	Overlay Bits Allocated	(60xx,0100)	1	Set to 1
	Overlay Bit Position	(60xx,0102)	1	Set to 0
	Overlay Data	(60xx,3000)	1C	...
	Overlay Description	(60xx,0022)	3	Set to “Siemens MedCom Object Graphics”
SOP Common	SOP Class UID	(0008,0016)	1	1.2.840.10008.5.1.4.1.1.6.1
	SOP Instance UID	(0008,0018)	1	created
	Specific Character Set	(0008,0005)	1C	From MWL or set to ISO_IR 100
	Instance Creation Date	(0008,0012)	3	created
	Instance Creation Time	(0008,0013)	3	created
Standard Extended SOP Class - Standard and Private Attributes				
Patient Demographic	Military Rank	(0010,1080)	3	from MWL

Table 8: US Image IOD Attributes

Patient Medical	Medical Alerts	(0010,2000)	3	from MWL
	Contrast Allergies	(0010,2110)	3	from MWL
	Smoking Status	(0010,21A0)	3	from MWL
	Last Menstrual Date	(0010,21D0)	3	from MWL or input by user
	Special Needs	(0038,0050)	3	from MWL
	Patient State	(0038,0500)	3	from MWL
Image Plane	Pixel Spacing	(0028,0030)	3	This attribute is not included in images that contain Doppler or M-Mode data, or images that contain more than one 2D tissue region.
Study Scheduling	Requesting Physician	(0032,1032)	3	from MWL
	Requesting Service	(0032,1033)	3	from MWL
Study Classification	Study Comments	(0032,4000)	3	input by user
Multi-Frame Overlay	Number of Frames in Overlay	(60xx,0015)	3	Set to 1 (only used if overlay is present)
	Image Frame Origin	(60xx,0051)	3	Set to 1 (only used if overlay is present)

Table 8: US Image IOD Attributes

Antares Private Attributes	Private Creator	(0019,00xx)	3	SIEMENS MED SMS USG ANTARES
	Private Creator Version	(0019,xx00)	3	1.0
	Frame Rate	(0019,xx03)	3	in fps
	Burned in Graphics	(0019,xx0C)	3	0 = Overlay, 1 = Graphics burned into pixel data
	SieClear Index	(0019,xx0D)	3	Off, 1, 2, 3, 4
	B-Mode Submode	(0019,xx20)	3	GEN, THI, etc.
	B-Mode Dynamic Range	(0019,xx21)	3	in dB
	B-Mode Overall Gain	(0019,xx22)	3	in dB
	B-Mode Res/Speed Index	(0019,xx23)	3	Resolution Vs. Speed
	B-Mode Edge Enhance Index	(0019,xx24)	3	
	B-Mode Persistence Index	(0019,xx25)	3	
	B-Mode Map Index	(0019,xx26)	3	
	B-Mode Tint Type	(0019,xx2A)	3	Grayscale = 0, Color Balance = 1, Pseudo Color = 2
	B-Mode Tint Index	(0019,xx2D)	3	
	Image Flag	(0019,xx3A)	3	1 = flagged image, 0 (or not present) = not flagged
	Color Flow state	(0019,xx40)	3	Low, Gen, High
	Color Flow Wall Filter Index	(0019,xx41)	3	
	Color Flow Submode	(0019,xx42)	3	Power, CDV, CDE
	Color Flow Overall Gain	(0019,xx43)	3	in dB
	Color Flow Res/Speed Index	(0019,xx44)	3	
	Color Flow Smooth Index	(0019,xx46)	3	
	Color Flow Persistence Index	(0019,xx47)	3	
	Color Flow Map Index	(0019,xx48)	3	
	Color Flow Priority Index	(0019,xx49)	3	
	Color Flow Maximum Velocity	(0019,xx54)	3	in cm/sec
	Doppler Dynamic Range	(0019,xx60)	3	in dB
	Doppler Overall Gain	(0019,xx61)	3	in dB
	Doppler Wall Filter	(0019,xx62)	3	in Hz
	Doppler Gate Size	(0019,xx63)	3	in mm
	Doppler Map Index	(0019,xx65)	3	
	Doppler Submode	(0019,xx66)	3	PW, CW, etc.
	Doppler Time/Freq Res Index	(0019,xx69)	3	
	Doppler Trace Inverted	(0019,xx6A)	3	0, 1
	Doppler Tint Type	(0019,xx6C)	3	Grayscale = 0, Color Balance = 1, Pseudo Color = 2
	Doppler Tint Index	(0019,xx72)	3	
	M-Mode Dynamic Range	(0019,xx80)	3	in dB
	M-Mode Overall Gain	(0019,xx81)	3	in dB
	M-Mode Edge Enhance Index	(0019,xx82)	3	
	M-Mode Map Index	(0019,xx83)	3	
	M-Mode Tint Type	(0019,xx86)	3	Grayscale = 0, Color Balance = 1, Pseudo Color = 2
	M-Mode Submode	(0019,xx87)	3	GEN
	M-Mode Tint Index	(0019,xx88)	3	

Table 8: US Image IOD Attributes

MedCom Private Attributes †	MedCom Header Info - Private Creator	(0029,00xx)	3	SIEMENS MEDCOM HEADER
	MedCom Header data	(0029,xx20)	3	
	PMTF Information 1	(0029,xx31)	3	
	PMTF Information 2	(0029,xx32)	3	
	PMTF Information 3	(0029,xx33)	3	
	PMTF Information 4	(0029,xx34)	3	DB TO DICOM
	MedCom OOG - Private Creator	(0029,00xx)	3	SIEMENS MEDCOM OOG
	MedCom OOG Type	(0029,xx08)	3	MEDCOM OOG 2
	MedCom OOG Version	(0029,xx09)	3	VC10D
	MedCom OOG Info	(0029,xx10)	3	

† The SONOLINE Antares system uses syngo MedCom private elements These private elements are used between the Antares AE and other syngo based AE's to describe Object Oriented Graphics (OOG). This module is used when object graphics are drawn on the image and stores the properties of the graphics objects. (Line, Circle, Rectangle, Arrows etc.) The graphics objects will remain re-animate-able even if such an image is transferred via the DICOM C-Store SOP Class. The graphics objects may also be stored in a single image overlay plane for compatibility with other products which don't support the OOG module These private elements have to be discarded by non syngo based DICOM application entities when modifying the image overlay data

Table 9 denotes the attributes included in the Ultrasound Multi-Frame Image Object as implemented on the Antares. Attributes not listed are not used. The Ultrasound Multi-frame Image Storage SOP is used to transfer Antares Ultrasound 3D volumetric data sets. Each frame represents a single slice from the 3D volume. 3D images may be viewed as Cine images.

Table 9: US-MF Image IOD Attributes

Module:	Attribute:	Tag:	Type:	Notes:
Patient	Patient's Name	(0010,0010)	2	from MWL or user input
	Patient ID	(0010,0020)	2	from MWL or user input
	Patient's Birth Date	(0010,0030)	2	from MWL or user input
	Patient's Sex	(0010,0040)	2	from MWL or user input
	Other Patient IDs	(0010,1000)	3	from MWL
	Other Patient Names	(0010,1001)	3	from MWL
	Ethnic Group	(0010,2160)	3	from MWL
	Patient Comments	(0010,4000)	3	from MWL
General Study	Study Instance UID	(0020,000D)	1	created
	Study Date	(0008,0020)	2	created
	Study Time	(0008,0030)	2	created
	Referring Physician's Name	(0008,0090)	2	from MWL or user input
	Study ID	(0020,0010)	2	created
	Accession Number	(0008,0050)	2	from MWL or user input
	Study Description	(0008,1030)	3	from MWL (requested procedure description or scheduled procedure step description) or user selected
	Referenced Study Sequence	(0008,1110)	3	from MWL or zero length
	>Referenced SOP Class UID	(0008,1150)	1C	-
	>Referenced SOP Instance UID	(0008,1155)	1C	-
	Procedure Code Sequence	(0008,1032)	3	from MWL (from Requested Procedure Code Sequence) or zero length
	>Include 'Code Sequence Macro'		3	-

Table 9: US-MF Image IOD Attributes

Patient Study	Admitting Diagnoses Description	(0008,1080)	3	from MWL or user input
	Patient's Age	(0010,1010)	3	calculated or user input
	Patient's Size	(0010,1020)	3	from MWL or user input
	Patient's Weight	(0010,1030)	3	from MWL or user input
	Additional Patient's History	(0010,21B0)	3	from MWL or user input
General Series	Modality	(0008,0060)	1	Set to US
	Series Instance UID	(0020,000E)	1	created
	Series Number	(0020,0011)	2	Set to 1
	Laterality	(0020,0060)	2C	Set to Zero length
	Series Date	(0008,0021)	3	created
	Series Time	(0008,0031)	3	created
	Performing Physicians' Name	(0008,1050)	3	from MWL or user input
	Protocol Name	(0018,1030)	3	user input or set to "unknown"
	Series Description	(0008,103E)	3	user input
	Operators' Name	(0008,1070)	3	user input
	Referenced Study Component Sequence	(0008,1111)	3	created
	>Referenced SOP Class UID	(0008,1150)	1C	1.2.840.10008.3.1.2.3.3 (MPPS SOP Class)
	>Referenced SOP Instance UID	(0008,1155)	1C	created
	Body Part Examined	(0018,0015)	3	user selected
	Request Attributes Sequence	(0040,0275)	3	from MWL or zero length
	>Requested Procedure ID	(0040,1001)	1C	-
	>Scheduled Procedure Step ID	(0040,0009)	1C	-
	>Scheduled Procedure Step Description	(0040,0007)	3	-
	>Scheduled Protocol Code Sequence	(0040,0008)	3	-
	>>Include 'Code Sequence Macro		3	-
	Performed Procedure Step ID	(0040,0253)	3	created
	Performed Procedure Step Start Date	(0040,0244)	3	created
	Performed Procedure Step Start Time	(0040,0245)	3	created
	Performed Procedure Step Description	(0040,0254)	3	from MWL (scheduled procedure description) or user input
	Performed Protocol Code Sequence	(0040,0260)	3	from MWL Scheduled Protocol Code sequence, if performed
	>Include 'Code Sequence Macro		3	from MWL
	Comments on the Performed Procedure Step	(0040,0280)	3	user input
General Equipment	Manufacturer	(0008,0070)	2	Set to "Siemens Medical Solutions - Ultrasound Division"
	Institution Name	(0008,0080)	3	from MWL or user selected
	Institution Address	(0008,0081)	3	from MWL
	Station Name	(0008,1010)	3	Set to the computer's host name
	Manufacturer's Model Name	(0008,1090)	3	Set to "Antares"
	Device Serial Number	(0018,1000)	3	Set to system serial number
	Software Versions	(0018,1020)	3	Set to 2.0
General Image	Instance Number	(0020,0013)	2	1...n
	Patient Orientation	(0020,0020)	2C	Set to Zero length
	Acquisition Date	(0008,0022)	3	created
	Acquisition Time	(0008,0032)	3	created
	Derivation Description	(0008,2111)	3	US_3D_VOLUME_DATA
	Image Comments	(0020,4000)	3	user input
	Lossy Image Compression Ratio	(0028,2112)	3	Only used with JPEG Lossy compression
Image Pixel	Rows	(0028,0010)	1	Set to 600
	Columns	(0028,0011)	1	Set to 800
	Pixel Data	(7FE0,0010)	1	...

Table 9: US-MF Image IOD Attributes

US Image Module	Samples Per Pixel	(0028,0002)	1	Set to 1
	Photometric Interpretation	(0028,0004)	1	Set to MONOCHROME2
	Bits Allocated	(0028,0100)	1	Set to 8
	Bits Stored	(0028,0101)	1	Set to 8
	High Bit	(0028,0102)	1	Set to 7
	Frame Increment Pointer	(0028,0009)	1C	Set to 0018,1063 (Frame Time attribute)
	Pixel Representation	(0028,0103)	1	Set to 0 (unsigned integer)
	Image Type	(0008,0008)	2	Value 1&2 = DERIVED / PRIMARY
	Lossy Image Compression	(0028,2110)	3	If JPEG lossy compressed
	Transducer Data	(0018,5010)	3	Probe name (e.g. C5-2)
SOP Common	SOP Class UID	(0008,0016)	1	1.2.840.10008.5.1.4.1.1.6.1
	SOP Instance UID	(0008,0018)	1	created
	Specific Character Set	(0008,0005)	1C	from MWL or set to ISO_IR 100
	Instance Creation Date	(0008,0012)	3	created
	Instance Creation Time	(0008,0013)	3	created
Cine	Frame Time	(0018,1063)	1C	created
Multi-Frame	Number of Frames	(0028,0008)	1	created
Frame Pointers	Representative Frame Number	(0028,6010)	3	Frame number used as pictorial representation of the 3D Volume.
Standard Extended SOP Class - Standard and Private Attributes				
Patient Demographic	Military Rank	(0010,1080)	3	from MWL
Patient Medical	Medical Alerts	(0010,2000)	3	from MWL
	Contrast Allergies	(0010,2110)	3	from MWL
	Smoking Status	(0010,21A0)	3	from MWL
	Last Menstrual Date	(0010,21D0)	3	from MWL or input by user
	Special Needs	(0038,0050)	3	from MWL
	Patient State	(0038,0500)	3	from MWL
Study Scheduling	Requesting Physician	(0032,1032)	3	from MWL
	Requesting Service	(0032,1033)	3	from MWL
Study Classification	Study Comments	(0032,4000)	3	input by user
Antares Private Attributes	Private Creator	(0039,00xx)	3	SIEMENS MED SMS USG ANTARES 3D VOLUME
	Release Version	(0039,xx00)	3	Set to 1.0
	Voxel Spacing	(0039,xx01)	3	x, y, and z spacing in mm
	Accuracy Flag	(0039,xx02)	3	0 = NOT accurate for measurements. 1 = Accurate for measurements
	Volume Acquisition Duration	(0039,xx03)	3	in mSec

5.2.2.1.4 Error Handling

Table 10 indicates the possible response status codes, which a SCP may return following the SCU's C-STORE-RSP command. Only those status responses that indicate some form of error condition are presented to the user.

A successful C-STORE operation will allow the AE to continue to the next action desired by the user.

Table 10: C-STORE Status Responses

Service Status	Further Meaning	Protocol Codes	Related Fields
Refused	Out of resources.	A7xx	None
Error	Data set does not match SOP Class. Cannot understand.	A9xx Cxxx	None
Warning	Coercion of data Elements .Data set does not match SOP Class. Elements discarded.	B000 B007 B006	None
Success		0000	None

5.3 Storage Commitment AE Specification

The Antares Storage Commitment AE provide Standard Conformance to the following DICOM SOP Classes as an SCU.

Table 11: Standard SOP Classes as Storage Commitment Push Model

SOP Class Name	SOP Class UID
Storage Commitment Push Model	1.2.840.10008.1.20.1

5.3.1 Association Establishment Policies

5.3.1.1 General

The configuration of Antares Storage Commitment AE defines the Application Entity Titles, the port numbers, the host names and IP addresses.

5.3.1.2 Number of Associations

The Antares Storage Commitment AE initiates several associations at a time, one for each storage commitment request being processed.

5.3.1.3 Asynchronous Nature

The Antares Storage Commitment AE does not support asynchronous communication (multiple outstanding transactions over a single association).

5.3.1.4 Implementation Identifying Information

The Antares Storage Commitment AE provides a single Implementation Class UID of

- "1.3.12.2.1107.5.9.20000101"

and an Implementation Version Name of

- "SIEMENS_SWFVB10A".

5.3.2 Association Initiation by Real-World Activity

The Antares Storage Commitment AE initiates an association when acting as SCU, in order to send a request for storage commitment.

5.3.2.1 Real-World Activity - Send Storage Commitment Request

5.3.2.1.1 Associated Real-World Activity - Send Storage Commitment Request

The user has sent (or archived) images to another DICOM node, which is configured as storage commitment SCP. The Antares will automatically attempt to send a storage commitment request for this images.

5.3.2.1.2 Proposed Presentation Contexts - Send Storage Commitment Request

The Antares Storage Commitment AE will propose Presentation Contexts as shown in the following table:

Table 12: Initiation presentation context Storage Commitment Request

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

5.3.2.1.3 SOP Specific Conformance Statement - Send Storage Commitment Request

The SCU sends the N-ACTION-RQ message and waits for the N-ACTION-RSP. After receiving this, the transaction is marked as “waiting”.

When configured to automatically transfer images “During the Exam”, a separate Storage Commitment Request is made for each image transferred to a Storage SCP that is configured for storage commitment.

Depending on a configuration value, the association will be closed or kept open. In the first case, there is another configurable value giving the number of minutes (by default 60) to wait for the corresponding N_EVENT_REPORT. In the second case, this time is the (also configurable) time-out for the association. For both cases, if the N_EVENT_REPORT does not arrive during the configured time, the transaction will be marked as failed.

Storage Commitment is supported for all the Storage SOP class UIDs as listed in Table 6 on Page 20. The Referenced Study Component Sequence is not supported.

Storage Media File-Set ID and UID Attributes will not be supported in the N-ACTION primitive invoked by the Storage Commitment SCU.

5.3.3 Association Acceptance Policy

The Antares Storage Commitment AE accepts an association when acting as SCU if configured to receive N-EVENT-REPORT on a separate association. *Note: The Antare may be configured to accept results in the same or separate association as the Storage Commitment Request.*

5.3.3.1 Real World Activity - Receive Storage Commitment Response

5.3.3.1.1 Associated Real World Activity - Receive Storage Commitment Response

When configured to receive results on a separate association, the Antares Storage Commitment AE sends a Storage Commitment Request and then closes the association. The Antares Storage Commitment AE will then accept an association request from the Storage Commitment SCP that wants to send Storage Commitment results.

5.3.3.1.2 Accepted Presentation Contexts - Receive Storage Commitment Response

The Antares Storage Commitment AE will accept Presentation Contexts as shown in the following table:

Table 13: Presentation context accepted for Storage Commitment

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model SOP class	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

5.3.3.1.3 SOP Specific Conformance Statement - Receive Storage Commitment Response

If the N_EVENT_REPORT received has the status of “Complete - Failure Exists”, the transaction is marked as failed, otherwise the transaction is marked as “completed”. In both cases, a message is shown to the user. The committed images are marked in the local database.

The Antares automatically re-sends images and Storage Commitment Requests for failed storage commitment results with the following failure codes:

- 0112H - No such object instance.
- 0131H - Duplicate transaction UID.

The Antares does not re-send images from a failed storage commitment result with the following failure codes:

- 0110H - Processing failure
- 0213H - Resource limitation
- 0122H - Referenced SOP Class not supported
- 0119H - Class / Instance conflict

The storage commitment status is displayed at the image level in the Patient Browser. Statuses are:

- S?/A? = Send/Archive Storage Commitment Waiting for result.
- Sf/Af = Send/Archive Storage Commitment Failed.
- SC/AC = Send/Archive Storage Commitment Succeeded.

When all images in a series are successfully committed, a corresponding “S” or “A” is displayed at the series level of the Patient Browser.

When all series in a study are successfully committed, a corresponding “S” or “A” is displayed at the study level of the Patient Browser.

5.4 Print AE Specification

The print management SCU invokes print management DIMSE services to transfer images from the local AE to the remote SCP AE to print the images with the defined film format and size on a selected network DICOM hardcopy printer. See DICOM part 4 annex H.

The Antares system provides Standard Conformance to the following DICOM V3.0 Basic Grayscale Print Management Meta SOP Class, Basic Color Print Management Meta SOP Class and the optional Print Job SOP Class as an SCU.

Table 14: Basic Gray Scale Print Management Meta SOP Classes

SOP Class Name	SOP Class UID	Usage
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Standard
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Standard
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Standard
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Standard
Printer SOP Class	1.2.840.10008.5.1.1.16	Standard
Print Job SOP Class	1.2.840.10008.5.1.1.14	Standard
Basic Color Print Management Meta SOP Classes	1.2.840.10008.5.1.1.18	Standard

Table 15: Basic Color Print Management Meta SOP Classes

SOP Class Name	SOP Class UID	Usage
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Standard
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Standard
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Standard
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Standard
Printer SOP Class	1.2.840.10008.5.1.1.16	Standard
Print Job SOP Class	1.2.840.10008.5.1.1.14	Standard

All mandatory elements of these classes are supported.

5.4.1 Association Establishment Policies

5.4.1.1 General

The configuration of the Antares DICOM print management application defines the Application Entity Titles, the port numbers, the host names and IP addresses.

5.4.1.2 Number of Associations

The Antares DICOM application initiates one/several association(s) at a time, one for each transfer request being processed.

5.4.1.3 Asynchronous Nature

The Antares DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

5.4.1.4 Implementation Identifying Information

The Antares DICOM software provides a single Implementation Class UID of

- <“1.3.12.2.1107.5.9.20000101”>

and an Implementation Version Name of

- <“SIEMENS_SWFVB10A”>.

5.4.2 Association Initiation by Real-World Activity

The Print Management SCU and SCP establish an association by using the DICOM association services. During association establishment the Print Management application entities negotiate the supported SOP classes to exchange the capabilities of the SCU and the SCP. If the SCU supports only mandatory SOP classes, the negotiation of optional capabilities is not necessary.

5.4.2.1 Real World Activity - Print

The system has three possible print configurations in the “Print/Store” preset page.

When “during exam” is selected, an association is opened with the destination printer after the last image on the film sheet is acquired and is closed at the end of film sheet transfer.

If transfer at “end of exam” has been configured, an association is opened with the destination printer(s) when the exam is completed (I.e. a new Patient / Study is registered or End Exam is performed). All film sheets are then transferred. An association is opened for each of the film sheets transferred.

When auto transfer is “disabled” the system copies images onto the film sheet, but auto transfer does not occur.

Printing of Multi-frame Images is not supported.

5.4.2.1.1 Associated Real World Activities - Print

An association is established when the user initiates an “Expose Film Job” operation from the Filming UI screen. Individual images or entire exams can be transferred to the selected DICOM Print device. All formats (images) are converted to Standard\1-1 format then transferred to the destination printer. The association is opened when the first sheet of each selected exam is transferred and closed when the last sheet transfer is completed.

5.4.2.1.2 Proposed Presentation Contexts

Table 16: Presentation Context Table

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Basic Grayscale Print Management Meta SOP Class	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
Basic Color Print Management Meta SOP Class	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
Basic Film Session SOP Class	1.2.840.10008.5.1.1	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
Basic Film Box SOP Class	1.2.840.10008.5.1.2	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
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	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
Printer SOP Class	1.2.840.10008.5.1.1.16	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
Print Job SOP Class	1.2.840.10008.5.1.1.14	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

5.4.2.1.2.1 SOP Specific Conformance Statement

The Print AE provides standard conformance to the Basic Grayscale Print Management Meta SOP Class and Basic Color Print Management Meta SOP Class as an SCU.

The application uses a setting platform to define the properties of the connected DICOM SCP. For example,

- Maximum number of print jobs in the queue.
- Maximum number of print copies.
- Supported film sizes of the connected DICOM SCP.
- Supported film formats of the DICOM SCP.
- Lookup table definition.

5.4.2.1.2.1.1 SOP Specific Conformance to Basic Film Session SOP Class

The Basic Film Session information object definition describes all the user-defined parameters, which are common for all the films of a film session. The Basic Film Session refers to one or more Basic Film Boxes that are printed on one hardcopy printer.

The Antares DICOM Print application supports the following DIMSE Service Elements for the Basic Film session SOP Class as SCU:

- N-CREATE
- N-DELETE

The Basic Film Session SOP Class SOP Class N_CREATE_RQ (SCU) uses the following attributes described in Table 17.

Table 17: Basic Film Session N_CREATE_RQ attributes

Attribute Name	AttributeTag	Usage	Range	Description
Number of Copies	(2000,0010)	U	1 to 99	Number of requested film copies.
Medium Type	(2000,0030)	U	PAPER CLEAR FILM BLUE FILM	Media used for hardcopy; may be further limited by print vendor/server
Film Destination	(2000,0040)	U	MAGAZINE PROCESSOR	May be further limited by print vendor, and/or print server

The affected SOP Instance UID received in the N_CREATE_RSP message from the SCP will be saved internally and used for later requests like N_DELETE_RQ on the Basic Film Session SOP Class.

Table 18: Attributes of the N_DELETE_RQ - Basic Film Session SOP Class

Attribute Name	AttributeTag	Source of Information
Requested SOP Instance UID	(0008,0018)	Affected SOP Instance UID of N_CREATE_RSP on Basic Film Session.

The N_DELETE_RQ on the Basic Film Session SOP Class is used to delete the complete Basic Film Session SOP Instance hierarchy.

The Basic Film Session SOP Class interprets the status codes in Table 19 from (NCREATE_RSP, N_DELETE_RSP messages).

Table 19: Basic Film Session SOP status

Service Status	Meaning	Protocol Codes
Failure	Film Session SOP Instances hierarchy does not contain film box SOP instances	C600
	Unable to create print job, print queue is full	C601
	Image size is larger than images box size	C603

Table 19: Basic Film Session SOP status

Service Status	Meaning	Protocol Codes
Warning	Memory allocation not supported	B600
	Film session printing is not supported	B601
Warning	Film box does not contain image box (empty page)	B602
Success	Film belonging to the film session are accepted for printing	0000

5.4.2.1.2.1.2 SOP Specific Conformance to Basic Film Box SOP Class

The Basic Film Box Information object definition describes all the user-defined parameters of one film of the film session. The Basic Film Box information description defines the presentation parameters, which are common for all images on a given sheet of film. The Basic Film Box refers to one or more Image Boxes.

Supported as SCU are:

Table 20: Supported DIMSE Services for Basic Film Box SOP Class

Name	Usage	Description
N-Create	M	Creates the Film Box.
N-Set	U	Not used.
N-Delete	U	Deletes the Film Box. Issued after each film is printed.
N-Action	M	PRINT. Sent after each Film Box is filled, and at the end of the exam to force a print of partially filled Film Box.

The Basic Film Box SOP Class N_CREATE_RQ message uses the attributes in Table 21. The used values for each attribute depend on how the DICOM printer is configured within the SONOLINE Antares product.

Table 21: Used Basic Film Box N_CREATE_RQ attributes

Attribute Name	Attribute Tag	Usage	Range	Description
Image Display Format	(2010,0010)	M	STANDARD\1,1	Always STANDARD\1,1
Film Orientation	(2010,0040)	M	PORTRAIT	Always set to PORTRAIT
Film Size ID	(2010,0050)	M	8INX10IN 10INX12IN 10INX14IN 11INX14IN 14INX14IN 14INX17IN 24CMX24CM 24CMX30CM	Valid Film sheet Sizes

Table 21: Used Basic Film Box N_CREATE_RQ attributes

Attribute Name	Attribute Tag	Usage	Range	Description
Magnification Type	(2010,0060)	M	REPLICATE BILINEAR CUBIC NONE	Used.
Min. Density	(2010,0120)	U	0-999	Used - printer specific
Max Density	(2010,0130)	U	0-999	Used - printer specific
Referenced Film Session Sequence	(2010,0500)	M	1.2.840.10008.5.1.1.1	
Referenced SOP Class UID	(0008,1150)	M		
Referenced SOP Instance UID	(0008,1155)	M		

The N_CREATE_RSP message from the SCP then contains the References Image Box Sequence with its SOP Class and Instance UID's, which is stored internally and then used for the Basic Image Box SOP Class N-SET RQ messages.

After all parameters for the Image boxes on the film sheet have been sent then the Antares DICOM Print application SCU will issue a N_ACTION_RQ message with the SOP Instance UID of the Basic Film Box (returned in the N_CREATE_RSP of the Basic Film Box SOP Class) and the Action Type ID set to 1.

The affected SOP Instance UID received in N_CREATE_RSP message from the SCP will be saved internally and can be used later for the N_DELETE_RQ request on the Basic Film Box SOP Class (see Table 22).

Table 22: Attributes of the N_DELETE_RQ on the Basic Film Session SOP Class

Attribute Name	Tag	Source of Information
Requested SOP Instance UID	(0008,0018)	Affected SOP Instance UID of N_CREATE_RSP on Basic Film Box

The Basic Film Box SOP class interprets the status codes Table 23 from the N_CREATE_RSP, N_DELETE_RSP and N_ACTION_RSP messages.

Table 23: Basic Film Box SOP status

Service Status	Meaning	Protocol Codes
Failure	Unable to create print job; print queue is full	C602
	Image size is larger than image box size	C603

Table 23: Basic Film Box SOP status

Service Status	Meaning	Protocol Codes
Warning	Film box does not contain image box (empty page)	B603
	Requested MinDensity or MaxDensity outside of printer's operating range	B605
Success	Film accepted for printing	0000

5.4.2.1.2.1.3 SOP Specific Conformance to Basic Grayscale Image Box SOP Class

The Basic Grayscale Image Box information object definition is the presentation of an image and image related data in the image area of a film. The Basic Image Box information describes the parameters and image pixel data, which apply to a single image of a sheet of film.

The printing is only suspended in the case of a failure return status of the SCP

The Grayscale Image Box SOP Class uses only the N_SET_RQ with the attributes in Table 24.

Table 24: Used Basic Grayscale Image Box N-Set attributes

Name	Attribute	Usage SCU	Supported Values
Image Position	(2020,0010)	M	1
Basic Grayscale Image Sequence	(2020,0110)	M	
>Samples Per Pixel	(0028,0002)	M	1
>Photometric Interpretation	(0028,0004)	M	MONOCHROME2 for Grayscale images
>Rows	(0028,0010)	M	
>Columns	(0028,0011)	M	
>Pixel Aspect Ratio	(0028,0034)	M	
>Bits Allocated	(0028,0100)	M	8
>Bits Stored	(0028,0101)	M	8
>High Bit	(0028,0102)	M	7
>Pixel Representation	(0028,0103)	M	0
>Pixel Data	(7FE0, 0010)	M	

The Grayscale Image Box SOP Class interprets the following status codes:

Table 25: Basic Grayscale Image Box SOP status

Service Status	Meaning	Protocol Codes
Failure	Image contains more pixels than printer can print in Image Box	C603
	Insufficient memory in printer to store the image	C605
Success		0000

5.4.2.1.2.1.4 SOP Specific Conformance to Basic Color Image Box SOP Class

The Basic Color Image Box information object definition is the presentation of an image and image related data in the image area of a film. The Basic Image Box information describes the presentation parameters and image pixel data, which apply to a single image of a sheet of film.

The Color Image Box SOP Class uses only the N_SET_RQ with the attributes in Table 26.

Table 26: Used Basic Color Image Box N-Set attributes

Name	Attribute	Usage SCU	Supported Values
Image Position	(2020,0010)	M	1
Basic Color Image Sequence	(2020,0111)	M	
>Samples Per Pixel	(0028,0002)	M	3
>Photometric Interpretation	(0028,0004)	M	RGB
>Planar Configuration	(0028,0006)	M	0
>Rows	(0028,0010)	M	
>Columns	(0028,0011)	M	
>Pixel Aspect Ratio	(0028,0034)	M	
>Bits Allocated	(0028,0100)	M	8
>Bits Stored	(0028,0101)	M	8
>High Bit	(0028,0102)	M	7
>Pixel Representation	(0028,0103)	M	0
>Pixel Data	(7FE0, 0010)	M	

The Color Image Box SOP Class interprets the status codes in Table 27.

Table 27: Basic Color Image Box SOP status

Service Status	Meaning	Protocol Codes
Warning	Image size larger than image box size	B604
Failure	Image contains more pixels than printer can print in Image Box	C603
	Insufficient memory in printer to store the image	C605
Success		0000

5.4.2.1.2.1.5 SOP Specific Conformance to Printer SOP Class

The Printer SOP Class has the possibility to monitor the status of the hardcopy printer in a synchronous and asynchronous way.

The Antares DICOM Print application uses the mandatory N-EVENT Report DIMSE service to monitor the changes of the printer status in an asynchronous way.

It can directly ask the Print SCP for it’s status or can receive Events from the Print SCP asynchronously:

- N-GET as SCU
- N-EVENT-REPORT as SCU

In both cases the following information is supported

.

Table 28: Used Printer N-Event reports

Event type name	Event	Attributes	Tag	Usage SCU
Normal	1	0000		
Warning	2	Printer status info	(2110,0020)	U
Failure	3	Printer status info	(2110,0020)	U

Table 29: Mandatory Printer N_GET_RSP, N_EVENT_REPORT_RQ attributes

Attribute Name	Tag	Usage SCP	Supported Values
Printer Status	(2110,0010)	M	NORMAL FAILURE WARNING
Printer Status Info	(2110,0020)	M	SUPPLY EMPTY SUPPLY LOW RECEIVER FULL NO RECEIVE MGZ FILM JAM

5.4.2.1.2.1.6 SOP Specific Conformance to Print Job SOP Class

The Print Job SOP Class has the possibility to monitor the execution of the print process. The Antares DICOM Print application supports the optional N-EVENT-REPORT DIMSE service to receive the changes of the print job status in an asynchronous way.

The following information is supported.

Table 30: Used Print Job N-Event reports

Event type name	Event	Attributes	Tag	Usage SCU
Normal	1	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	Print Queue Management SOP Class not supported
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Printing	2	Exception Status Info	(2100,0030)	U
		Print Job ID	(2110,0020)	Print Queue Management SOP Class not supported
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Done	3	Exception Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	Print Queue Management SOP Class not supported
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U

Table 30: Used Print Job N-Event reports

Event type name	Event	Attributes	Tag	Usage SCU
Failure	4	Exception Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	Print Queue Management SOP Class not supported
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U

5.5 Modality Worklist AE Specification

The Modality Worklist SCU requests that the remote SCP performs a match of all keys specified in the query against the information in its worklist database. The Antares system provides Standard Conformance to the following DICOM V3.0 SOP Class as an SCU:

Table 31: SOP Classes as an SCU

SOP Class Name	SOP Class UID
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31

5.5.1 Association Establishment Policies

5.5.1.1 General

The configuration of the Antares DICOM modality worklist application defines the Application Entity Title, the port number, the host name and IP address.

5.5.1.2 Number of Associations

The Antares DICOM application initiates one worklist association at a time, one for each transfer request being processed.

5.5.1.3 Asynchronous Nature

The Antares DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

5.5.1.4 Implementation Identifying Information

The Antares DICOM software provides a single Implementation Class UID of

- <“1.3.12.2.1107.5.9.20000101”>

and an Implementation Version Name of

- <“SIEMENS_SWFVB10A”>.

5.5.2 Association Initiation by Real-World Activity

The Modality Worklist SCU establishes an association by using the DICOM association services.

The following DIMSE-C operation is supported as SCU: C-FIND

5.5.2.1 Real World Activity—Worklist

A separate Network association is established by the AE for each Worklist query operation, with only one active query at a time. The association is closed at completion of the query.

5.5.2.1.1 Proposed Presentation Context

Table 32: Worklist Presentation Context Table

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.1.2	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

The SONOLINE Antares system will always act as an SCU and be the client in a client-server model.

5.5.2.1.2 SOP Specific Conformance to Modality Worklist Service SOP Class

The Antares Worklist AE provides conformance to the following DICOM Service SOP Classes as an SCU all at a standard extended level of conformance:

Table 33 provides the list of user configurable matching attributes requested in the Modality Worklist Query (C-FIND).

Table 33: Modality Worklist Matching Key Attributes

Module	Attribute name	Tag	Match Type	Query Value
Scheduled Procedure Step	Scheduled Procedure Step Sequence	(0040,0100)	R	
	>Scheduled Station AE Title	(0040,0001)	R	Antares HIS/RIS SCU AE Title or “*”
	>Scheduled Procedure Step Start Date	(0040,0002)	R	Today’s date or user specified date range
	>Scheduled Procedure Step Start Time	(0040,0003)	R	Current time - 23:59:59 or User specified time range or zero length
	>Modality	(0008,0060)	R	“US” or “*”

Return Key Attributes used from the Worklist C_FIND_RSP

The Antares DICOM worklist SCU supports worklist queries with return key attributes of all types. The following table describes the return keys that the SCU supports. Most attributes can be shown in the User Interface; Patient Registration or Patient Browser. Attributes displayed in the Patient Browser are configurable.

Table 34: Modality Worklist C_FIND_RSP Return Key Attributes

Attribute name	Tag	Return Key Type	displayed in User Interface
SOP Common			

Table 34: Modality Worklist C_FIND_RSP Return Key Attributes

Attribute name	Tag	Return Key Type	displayed in User Interface
Specific Character Set	(0008,0005)	1C	-
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	1	-
>Scheduled Station AE Title	(0040,0001)	1	yes
>Scheduled Procedure Step Start Date	(0040,0002)	1	yes
>Scheduled Procedure Step Start Time	(0040,0003)	1	yes
>Scheduled Procedure Step End Date	(0040,0004)	3	-
>Scheduled Procedure Step End Time	(0040,0005)	3	-
>Modality	(0008,0060)	1	yes
>Scheduled Performing Physician's Name	(0040,0006)	2	yes
>Scheduled Procedure Step Description	(0040,0007)	1C	yes
>Scheduled Station Name	(0040,0010)	2	yes
>Scheduled Procedure Step Location	(0040,0011)	2	yes
>Scheduled Action Item Code Sequence	(0040,0008)	1C	-
>>Code Value	(0008,0100)	1C	yes
>>Coding Scheme Designator	(0008,0102)	1C	yes
>>Coding Scheme Version	(0008,0103)	3	yes
>>Code Meaning	(0008,0104)	3	yes
>Pre-Medication	(0040,0012)	2C	yes
>Scheduled Procedure Step ID	(0040,0009)	1	yes
>Requested Contrast Agent	(0032,1070)	2C	yes
>Scheduled Procedure Step Status	(0040,0020)	3	yes
>Comments on the Scheduled Procedure Step	(0040,0400)	3	-
Requested Procedure			
Requested Procedure ID	(0040,1001)	1	yes
Requested Procedure Description	(0032,1060)	1C	yes
Requested Procedure Code Sequence	(0032,1064)	1C	-
>Code Value	(0008,0100)	1C	yes
>Code Scheme Designator	(0008,0102)	1C	yes
>Code Scheme Version	(0008,0103)	3	yes
>Code Meaning	(0008,0104)	3	yes
Study Instance UID	(0020,000D)	1	-
Referenced Study Sequence	(0008,1110)	2	-
>Referenced SOP Class UID	(0008,1150)	1C	-
>Referenced SOP Instance UID	(0008,1155)	1C	-
Requested Procedure Priority	(0040,1003)	2	yes
Patient Transport Arrangements	(0040,1004)	2	-

Table 34: Modality Worklist C_FIND_RSP Return Key Attributes

Attribute name	Tag	Return Key Type	displayed in User Interface
Reason for the Requested Procedure	(0040,1002)	3	-
Confidentiality Code	(0040,1008)	3	-
Reporting Priority	(0040,1009)	3	-
Names of Intended Recipients of results	(0040,1010)	3	-
Requested Procedure Comments	(0040,1400)	3	yes
Requested Procedure Location	(0040,1005)	3	-
Imaging Service Request			
Accession Number	(0008,0050)	2	yes
Requesting Physician	(0032,1032)	2	yes
Referring Physician's Name	(0008,0090)	2	yes
Reason for the Imaging Service Request	(0040,2001)	3	-
Imaging Service Request Comments	(0040,2400)	3	yes
Requesting Service	(0032,1033)	3	yes
Issuing Date of Imaging Service Request	(0040,2004)	3	-
Issuing Time of Imaging Service Request	(0040,2005)	3	-
Placer Order Number / Imaging Service Request	(0040,2016)	3	-
Filler Order Number / Imaging Service Request	(0040,2017)	3	-
Order entered by...	(0040,2008)	3	-
Order Enterer's Location	(0040,2009)	3	-
Order Callback Phone Number	(0040,2010)	3	-
Visit Identification			
Admission ID	(0038,0010)	2	yes
Issuer of Admission ID	(0038,0011)	3	-
Visit Status			
Current Patient Location	(0038,0300)	2	yes
Visit Relationship			
Referenced Patient Sequence	(0008,1120)	2	-
>Referenced SOP Class UID	(0008,1150)	2	-
>Referenced SOP Instance UID	(0008,1155)	2	-
Visit Admission			
Institution Name	(0008,0080)	3	yes
Admitting Diagnoses Description	(0008,1080)	3	yes
Patient Identification			
Patient's Name	(0010,0010)	1	yes
Patient ID	(0010,0020)	1	yes
Patient Demographic			
Patients Birth Date	(0010,0030)	2	yes

Table 34: Modality Worklist C_FIND_RSP Return Key Attributes

Attribute name	Tag	Return Key Type	displayed in User Interface
Patient's Sex	(0010,0040)	2	yes
Patient's Size	(0010,1020)	3	yes
Patient's Weight	(0010,1030)	2	yes
Confidentiality constraint on patient data	(0040,3001)	2	-
Patient's Address	(0010,1040)	3	-
Military Rank	(0010,1080)	3	yes
Ethnic Group	(0010,2160)	3	yes
Patient Comments	(0010,4000)	3	yes
Patient Medical			
Patient State	(0038,0500)	2	yes-
Pregnancy Status	(0010,21C0)	2	yes
Medical Alerts	(0010,2000)	2	yes
Contrast Allergies	(0010,2110)	2	yes
Special Needs	(0038,0050)	2	yes
Smoking Status	(0010,21A0)	3	yes
Last Menstrual Date	(0010,21D0)	3	yes
Additional Patient History	(0010,21B0)	3	yes

5.5.2.1.3 Error Handling

Table 35 indicates the possible response status codes, which a SCP may return following the SCU's C-FIND command. Only those status responses that indicate some form of error condition are presented to the user.

Table 35: C-FIND Status Responses

Service Status	Further Meaning	Protocol Codes
Refused	Out of resources	A700
Failed	Identifier does not match SOP Class	A900
	Unable to process	Cxxx
Cancel	Matching terminated due to Cancel request	FE00
Success	Matching is complete - No final Identifier is supplied.	0000
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	FF00
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or for this Identifier.	FF01

5.6 Modality Performed Procedure Step AE Specification

The Modality Performed Procedure Step SCU informs the remote SCP about the performed examinations at the modality. The SONOLINE Antares system provides Standard Conformance to the following DICOM V3.0 SOP Class as an SCU:

Table 36: SOP Classes as an SCU

SOP Class Name	SOP Class UID
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3

5.6.1 Association Establishment Policies

5.6.1.1 General

The configuration of the Antares DICOM Performed Procedure Step application defines the Application Entity Title, the port number, the host name and IP address.

5.6.1.2 Number of Associations

The Antares DICOM application initiates one/several association(s) at a time, one for each transfer request being processed.

5.6.1.3 Asynchronous Nature

The Antares DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

5.6.1.4 Implementation Identifying Information

The Antares DICOM software provides a single Implementation Class UID of

- "1.3.12.2.1107.5.9.20000101"

and an Implementation Version Name of

- "SIEMENS_SWFVB10A".

5.6.2 Association Initiation by Real-World Activity

The Modality Performed Procedure Step SCU establishes an association by using the DICOM association services.

The following DIMSE-N operations are supported as SCU:

- N-CREATE
- N-SET

5.6.2.1 Real World Activity

5.6.2.1.1 Associated Real-World Activity

The associated Real-World activity is to send examination information to an SCP by using the DICOM Modality Performed Procedure Step Service.

5.6.2.1.2 Proposed Presentation Contexts

The Antares DICOM application will propose Presentation Contexts as shown in the following table:

Table 37: Proposed presentation contexts

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

5.6.2.1.3 SOP Specific Conformance Statement

Attributes used for the Performed Procedure Step N-CREATE

The Antares DICOM performed procedure step SCU informs the remote SCP when the examination of a scheduled procedure step will be performed. The N-CREATE message is sent when the examination is started. The following table describes the supported attributes for a N-CREATE message.

Table 38: Performed Procedure Step N-CREATE Attributes

Attribute name	Tag	Required Type	Value
SOP Common			
Specific Character Set	(0008,0005)	1C	from MWL or created
Performed Procedure Step Relationship			
Scheduled Step Attribute Sequence	(0040,0270)	1	
>Study Instance UID	(0020,000D)	1	from MWL or created
>Referenced Study Sequence	(0008,1110)	2	from MWL or zero length
>>Referenced SOP Class UID	(0008,1150)	1C	
>>Referenced SOP Instance UID	(0008,1155)	1C	
>Accession Number	(0008,0050)	2	from MWL or user input
>Placer Order Number / Imaging Service Request	(0040,2016)	3	from MWL or zero length
>Filler Order Number / Imaging Service Request	(0040,2017)	3	from MWL or zero length
>Requested Procedure ID	(0040,1001)	2	from MWL or user input
>Requested Procedure Description	(0032,1060)	2	from MWL or zero length
>Scheduled Procedure Step ID	(0040,0009)	2	from MWL or zero length
>Scheduled Procedure Step Description	(0040,0007)	2	from MWL or zero length

Table 38: Performed Procedure Step N-CREATE Attributes

Attribute name	Tag	Required Type	Value
>Scheduled Action Item Code Sequence	(0040,0008)	2	from MWL or zero length
>>Code Value	(0008,0100)	1C	-
>>Coding Scheme Designator	(0008,0102)	1C	-
>>Code Scheme Version	(0008,0103)	3	-
>>Code Meaning	(0008,0104)	3	-
Patient's Name	(0010,0010)	2	from MWL or user input
Patient ID	(0010,0020)	2	from MWL or user input or created
Patients Birth Date	(0010,0030)	2	from MWL or user input
Patient's Sex	(0010,0040)	2	from MWL or user input
Referenced Patient Sequence	(0008,1120)	2	from MWL or zero length
>Referenced SOP Class UID	(0008,1150)	1C	-
>Referenced SOP Instance UID	(0008,1155)	1C	-
Performed Procedure Step Information			
Performed Procedure Step ID	(0040,0253)	1	from SPS ID or created
Performed Station AE Title	(0040,0241)	1	own AE Title
Performed Station Name	(0040,0242)	2	own hostname
Performed Location	(0040,0243)	2	from SPS Location or zero length
Performed Procedure Step Start Date	(0040,0244)	1	created
Performed Procedure Step Start Time	(0040,0245)	1	created
Performed Procedure Step Status	(0040,0252)	1	IN PROGRESS
Performed Procedure Step Description	(0040,0254)	2	from SPS Description or zero length
Performed Procedure Type Description	(0040,0255)	2	zero length
Procedure Code Sequence	(0008,1032)	2	from Requested Procedure Code or zero length
>Code Value	(0008,0100)	1C	-
>Code Scheme Designator	(0008,0102)	1C	-
>Code Scheme Version	(0008,0103)	3	-
>Code Meaning	(0008,0104)	3	-
Performed Procedure Step End Date	(0040,0250)	2	zero length
Performed Procedure Step End Time	(0040,0251)	2	zero length
Image Acquisition Results			
Modality	(0008,0060)	1	US
Study ID	(0020,0010)	2	from Requested Procedure ID or created
Performed Action Item Code Sequence	(0040,0260)	2	from Scheduled Action Item Code SQ or zero length
>Code Value	(0008,0100)	1C	-

Table 38: Performed Procedure Step N-CREATE Attributes

Attribute name	Tag	Required Type	Value
>Code Scheme Designator	(0008,0102)	1C	-
>Code Scheme Version	(0008,0103)	3	-
>Code Meaning	(0008,0104)	3	-
Performed Series Sequence	(0040,0340)	2	
>Performing Physicians's Name	(0008,1050)	2C	from MWL or user input
>Protocol Name	(0018,1030)	1C	set to "unknown"
>Operator's Name	(0008,1070)	2C	user input
>Series Instance UID	(0020,000E)	1C	created
>Series Description	(0008,103E)	2C	zero length
>Retrieve AE Title	(0008,0054)	2C	zero length
>Referenced Image Sequence	(0008,1140)	2C	zero length
>Referenced Standalone SOP Instance Sequence	(0040,0220)	2C	zero length

Status Codes of the Performed Procedure Step N-CREATE

The Performed Procedure Step SCU interprets the following status values:

Table 39: N-SET Response Status

Service Status	Meaning	Status Codes (0000,0900)
Failure	Processing Failure	0110
	No such attribute	0105
	Invalid attribute value	0106
	Duplicate SOP Instance	0111
	No such SOP Instance	0112
	No such SOP class	0118
	Class instance conflict	0119
	Missing attribute	0120
	Missing attribute value	0121
	Resource limitation	0213
Success	Successful Operation	0000

Attributes used for the Performed Procedure Step N-SET

The Antares DICOM performed procedure step SCU informs the remote SCP about the performed examination and its status. The N-SET message is only sent once when the exam is ended with status “COMPLETED” or when the examination could not be completed with status “DISCONTINUED”. The following table describes the supported attributes for a N-SET message.

Table 40: Performed Procedure Step N-SET Attributes

Attribute name	Tag	Required Type	Value
Performed Procedure Step Information			
Performed Procedure Step Status	(0040,0252)	3	COMPLETED or DISCONTINUED
Performed Procedure Step Description	(0040,0254)	3	from SPS Description or user input
Performed Procedure Type Description	(0040,0255)	3	user input
Procedure Code Sequence	(0008,1032)	3	from Requested Procedure Code,
>Code Value	(0008,0100)	1C	-
>Code Scheme Designator	(0008,0102)	1C	-
>Code Scheme Version	(0008,0103)	3	-
>Code Meaning	(0008,0104)	3	-
Performed Procedure Step End Date	(0040,0250)	3	created
Performed Procedure Step End Time	(0040,0251)	3	created
Image Acquisition Results			
Performed Action Item Code Sequence	(0040,0260)	3	from Scheduled Action Item Code SQ.
>Code Value	(0008,0100)	1C	-
>Code Scheme Designator	(0008,0102)	1C	-
>Code Scheme Version	(0008,0103)	3	-
>Code Meaning	(0008,0104)	3	-
Performed Series Sequence	(0040,0340)	3	
>Performing Physicians’s Name	(0008,1050)	2C	from MWL or user input
>Protocol Name	(0018,1030)	1C	user input or set to “unknown”
>Operator’s Name	(0008,1070)	2C	user input
>Series Instance UID	(0020,000E)	1C	created
>Series Description	(0008,103E)	2C	user input
>Retrieve AE Title	(0008,0054)	2C	from Storage Commitment RSP or zero length
>Referenced Image Sequence	(0008,1140)	2C	created
>>Referenced SOP Class UID	(0008,1150)	1C	-
>>Referenced SOP Instance UID	(0008,1155)	1C	-
>Referenced Standalone SOP Instance Sequence	(0040,0220)	2C	zero length
All other attributes from Billing and Material Code Module		3	user input

Status Codes of the Performed Procedure Step N-SET

The Performed Procedure Step SCU interprets the following status values:

Table 41: N-SET Response Status

Service Status	Meaning	Status Codes (0000,0900)
Failure	Processing Failure: Performed Procedure Step Object may no longer be updated	0110
	No such attribute	0105
	Invalid attribute value	0106
	No such SOP Instance	0112
	Invalid object instance	0117
	No such SOP class	0118
	Class instance conflict	0119
	Missing attribute value	0121
	Resource limitation	0213
Success	Successful Operation	0000

6.0 Communication Profiles

All SONOLINE Antares system application entities utilize the DICOM 3.0 TCP/IP communication support as defined in PS3.8 (Part 8) of the DICOM 3.0 Standard.

6.1 TCP/IP Stack Supported

Each process inherits its TCP/IP stack from the SONOLINE Antares's operating system TCP/IP stack. Port number 104 is used for DICOM communication with the Antares.

6.1.1 Physical Media Supported

Standard representations of IEEE 802.3 (10 Base-T and 100 Base-T is supported)

7.0 Extensions/Specializations/Privatizations

7.1 Standard extended/specialized/private Syntaxes

The SONOLINE Antares includes standard extended and private attributes in the US Image and US-MF Image IODs. All standard extended and private attributes are type 3. Support for these attributes by receiving SCPs is not required. See Table 8: "US Image IOD Attributes" and Table 9: "US-MF Image IOD Attributes" for more information.

7.2 Private Transfer Syntaxes

.None

8.0 Configuration

SONOLINE Antares Networking and DICOM parameters can be configured through the Antares Service configuration UI screens. The following configuration is supported:

- Network (local and remote)
- DICOM Store & Storage Commitment
- DICOM Print
- DICOM Worklist & MPPS

8.1 Basic System Configuration

The following system parameters can be configured via the Antares System Presets Basic Menu screens. These parameters are configured in the form of pick lists and are available to the user when registering a patient or correcting patient data. When selected, these parameters are mapped to DICOM image attributes:

- Institution Name (0008, 0080)
- Operators Name (0008,1070)
- Referring Physician (0008,0090)
- Performing Physician (0008,1050)
- Requesting Physician (0032,1032)

8.2 DICOM Network Configuration

DICOM and networking parameters can be configured for both the local Antares device and remote DICOM Service Class Providers through the Local Service Configuration User Interface.

8.2.1 Local Host - TCP/IP and General

The SONOLINE Antares local network parameters are configurable. The following network parameters can be configured for Antares device:

- Host Name
- IP address
- Network IP mask
- Router/Gateway IP addresses
- DICOM Storage, Print and HIS/RIS SCU Application Entity Titles

8.3 DICOM Storage Configuration

Remote DICOM Storage and Storage Commitment Service Class Providers are configured through the DICOM - Network Nodes Configuration menu. The following parameters can be configured for each device:

- Host name
- IP address
- AET - Application Entity Title
- Port number
- Proposed transfer syntaxes - (ILE, ELE, EBE, JPEG Lossy, JPEG Lossless)
- Storage Commitment Results in same association as Storage Commitment Request.
- Storage Commitment Results time-out

8.4 DICOM HIS/RIS Configuration

Remote DICOM Worklist and Modality Performed Procedure Step Service Class Providers are configured through the DICOM - HIS/RIS Configuration menu. The following parameters can be configured for each Worklist/MPPS server:

- Host name
- IP address
- AET - Application Entity Title
- Port number
- Query waiting time (in seconds)
- Maximum number of matching results

- Automatic Worklist query interval (in minutes)

8.5 DICOM Print Configuration

For each DICOM Print server, the following data is configurable by the user using the Hardcopy Devices page of the Service User Interface The user can change the page layout and the destination printer at any time during the operation of the Antares. The effect of changing parameters of the DICOM Print server will be seen at the next film sheet. The current film sheet is not affected by changing these parameters.

Table 42: User Configurable Printer parameters

Parameter	Description
Host name	
IP Address	
AE Title	Application Entity Title
Port number	
Color Appearance	Color or monochrome
Print Priority	HIGH= Urgent
Medium Type	CLEAR FILM, BLUE FILM, and Paper
Film Destination	MAGAZINE, PROCESSOR
Max. Density	Used to define the Black value - printer specific
Min. Density	Used to define the White value - printer specific
Transformation	replicate, bilinear, cubic, none
Smoothing	0, 2, 3, 4
Background	Black or White

8.6 “Print/Store” Key Configuration

The Antares user can configure “Print/Store” hard keys to “Output Device” mapping through the System Presets - Print/Store Configuration menu. Images are acquired and sent to the assigned device when the user presses the associated key. The following configuration is supported.

8.6.1 Multiple Destinations - Auto Transfer

The Antares “Print/Store” keys may be individually configured to transfer images to multiple DICOM Storage devices with a single key press. The system can be configured to automatically transfer images during the exam (with each Print/Store key press) or at the end of the exam (with an End Exam button press or a New Patient or Study). Configuration is on a per destination storage SCP basis.

8.6.2 Overlay or Burned in graphics

By default the Antares system burns all text and graphics into the image pixel data. Alternatively the Antares may be configured to store image text and graphics using the DICOM Overlay module.

8.6.3 Secondary Capture Image Storage SOP Class

By default the Antares system stores all static images to the local database using the Ultrasound Image Storage SOP Class. The Antares may be configured to store all static images as Secondary Capture (Secondary Capture Image Storage SOP Class). This is done to allow image transfer to remote Storage SCPs that do not support the Ultrasound Image Storage SOP Class.

8.6.4 Auto Retry

Auto retry allows images to be automatically resent to destination Storage SCP devices when certain failures have occurred, or if the destination device is offline. The user can configure the retry interval (5 - 60 minutes) and the maximum number of retries (0 - 512). Auto Retry is configured through the Advanced - Transfer Configuration Menu. These are global setting and apply to all configured Storage SCP devices.

8.6.5 Compression

The user may configure the desired compression type (transfer syntax) for image transfer through the Advanced - Transfer Configuration Menu. Configuration is on a per Storage SCP device basis. Choices are:

- None (uses preferred ELE, ILE, EBE transfer syntax)
- JPEG Lossless (Non-Hierarchical, First-Order Prediction - UID = 1.2.840.10008.1.2.4.70)
- JPEG Lossy (JPEG Baseline, Process 1 - UID = 1.2.840.10008.1.2.4.50)

When JPEG Lossy is selected the use can also enter a compression Quality Factor, in percent.

Note: JPEG Quality factor below 100% may lead to insufficient diagnostic quality of transferred image.

8.6.6 Print Routing - Auto Transfer

The Antares “Print/Store” keys may be individually configured to transfer images to DICOM Printers, or Local OEM Printers. The “Print/Store” keys may also be individually configured to automatically route images to either a B/W or Color printer based on image content. Routing is determined by the following image types:

1. **B&W**—The image only contains only B&W (grayscale) data.
2. **Color Doppler**—The image contains Color Doppler data.
3. **Tinted**—The image contains only B&W (grayscale) data that is pseudo color tinted.
4. **2D Ref.**—The 2D reference image contains Color Doppler data.
5. **Misc.**—Miscellaneous images. This includes GUI screen captures, external video captures such as VCR, and image review screens containing multiple images.

The user assigns the desired network grayscale or color printer or print server using the “Print/Store” Configuration presets function. Print media size, format and orientation for the selected Printer device can also be configured through the “Print/Store” Presets function.

9.0 Media Storage

The SONOLINE Antares system is a device that generates ultrasound images that can be saved to CD-R (CD-Recordable) media using DICOM standard protocols and definitions. The applications described refer to the Antares DICOM off-line media storage implementation acting as FSC for the specific application profiles and the related SOP Class instances. The SONOLINE Antares system acts as a File Set Reader and Updater only for CD-R discs that were created on an SONOLINE Antares system.

9.1 Implementation Model

SONOLINE Antares system users can store images directly on the system hard disk.

9.2 Application Data Flow Diagram

Figure 8 illustrates the SONOLINE Antares system's Application Entity (AE) Data Flow Diagram. All relationships between user invoked activities and the associated real-world activities provided by the DICOM archive application are depicted.

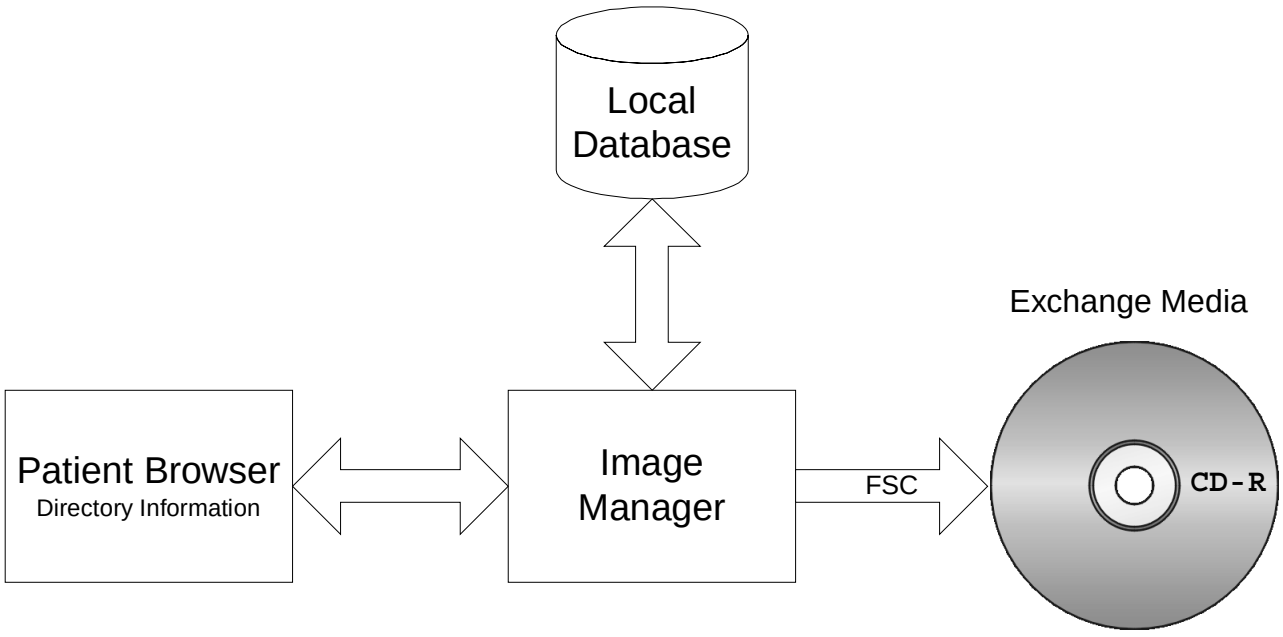

Figure 8: Media Storage Application Data Flow Diagram

10.0 Media Storage AE Functional Definition

The SONOLINE Antares DICOM offline media storage application consists of the DICOM Image Manager application entity serving all interfaces to access offline media. The DICOM application is capable of:

- Creating a new File set onto an unwritten medium (FSC)
- Updating an existing File set by writing new SOP Instances onto the medium This is only supported on media that was created on the Antares system.
- Reading the File set's DICOMDIR and displaying the information. This is only supported on media that was created on the Antares system.
- Copying SOP Instances from the medium onto local storage. This is only supported on media and SOP Instances that were created on the Antares system.

10.1 Real-World Activities for Media Storage

10.1.1 Browse Directory Information—Real World Activity

The Antares application entity is capable of browsing CD DICOM Exchange media and displaying the contents of the DICOMDIR. This is only supported on media that was created on the Antares system.

10.1.2 Import into Local Storage—Real-World Activity

The Antares application entity acts as a FSR using the interchange option when requested to import SOP Instances from the CD media into local storage.

The SOP Instance selected from the media directory will be copied into the local storage.This is only supported on media and SOP Instances that were created on the Antares system.

10.1.3 Export to Local Archive Media—Real-World Activity

The Antares application acts as a FSC (media not initialized) using the interchange option when requested to copy SOP Instances from the local database to the local archive media (CD-R).

10.1.4 Sequencing of Real World Activities

The DICOM Archive application will not perform updates before the Directory information of the DICOMDIR is completely read.

10.2 AE Specifications

10.3 Antares Media Storage AE Specification

The Antares AE provides conformance to the following DICOM SOP Classes as an FSC. The following specifications apply to the AE as depicted in Figure 8.

When configuring an uncompressed Transfer Syntax the STD-US and STD-GEN application profile classes will be extended to store instances of the following SOP classes in compressed format

Table 43: Application profiles, Activities, and Roles for DICOM Exchange Media

Application Profiles Supported	Real World Activity	Role	SC Option
STD-GEN-CDR STD-US-SC-SF-CDR STD-US-ID-SF-CDR	Create CD-R	FSC †	Interchange
	Update CD-R	n/a †	Interchange
	Display Directory	n/a †	Interchange
	Copy to Local Storage	n/a †	Interchange

† The SONOLINE Antares system acts as a File Set Reader (FSR) and File Set Updater (FSU) for CD-R discs that were created on an SONOLINE Antares system.

10.3.1 File Meta Information Options

The Implementation Class UID is:

- <“1.3.12.2.1107.5.9.20000101”>

and an Implementation Version Name of

- <“SIEMENS_SWFVB10A”>.

10.4 Media Storage Application Profile

10.4.1 DICOMDIR keys

The DICOMDIR file will contain the following attributes for the levels Patient - Study - Series - Image (valid for all Application profiles described in this section):

Table 44: DICOMDIR keys

Attribute Name	Tag	Type	Notes
File-Set identification			
File-set ID	(0004,1130)	2	volume label of media
Directory information			
Offset of the First Directory Record of the Root Directory Entry	(0004,1200)	1	
Offset of the Last Directory Record of the Root Directory Entity	(0004,1202)	1	
File-set Consistency Flag	(0004,1212)	1	0000H
Directory Record Sequence	(0004,1220)	2	
> Offset of the Next Directory Record	(0004,1400)	1C	
> Record In-use flag	(0004,1410)	1C	FFFFH
> Offset of Referenced Lower-Level Directory Entity	(0004,1420)	1C	
> Directory Record Type	(0004,1430)	1C	PATIENT, STUDY, SERIES, IMAGE
> Referenced File ID	(0004,1500)	1C	contains the filename on media for the Directory Records of Type IMAGE
> Referenced SOP Class UID in File	(0004,1510)	1C	for the Directory Records of Type IMAGE
> Referenced SOP Instance UID in File	(0004,1511)	1C	for the Directory Records of Type IMAGE
> Referenced Transfer Syntax UID in File	(0004,1512)	1C	for the Directory Records of Type IMAGE
> Record Selection Keys	see below		
Patient Keys			**Directory Record Type PATIENT**
Specific Character Set	(0008,0005)	1C	
Patient’s Name	(0010,0010)	2	
Patient ID	(0010,0020)	1	
Date Of Birth	(0010,0030)	3	
Patient’s Sex	(0010,0040)	3	
Study Keys			**Directory Record Type STUDY**
Specific Character Set	(0008,0005)	1C	
Study Date	(0008,0020)	1	
Study Time	(0008,0030)	1	

Table 44: DICOMDIR keys

Attribute Name	Tag	Type	Notes
Accession Number	(0008,0050)	2	
Study Description	(0008,1030)	2	
Study Instance UID	(0020,000D)	1C	
Study ID	(0020,0010)	1	Will be generated automatically, if not present. Value = "-"
Series Keys			**Directory Record Type SERIES**
Specific Character Set	(0008,0005)	1C	
Series Date	(0008,0021)	3	
Series Time	(0008,0031)	3	
Modality	(0008,0060)	1	
Institution name	(0008,0080)	3	
Institution Address	(0008,0081)	3	
Series Description	(0008,103E)	3	
Performing Physician	(0008,1050)	3	
Series Instance UID	(0020,000E)	1	
Series Number	(0020,0011)	1	
Image Keys			**Directory Record Type IMAGE**
Specific Character Set	(0008,0005)	1C	
Image Type	(0008,0008)	3	
SOP Class UID	(0008,0016)	3	
SOP Instance UID	(0008,0018)	3	
Image Date	(0008,0023)	3	
Image Time	(0008,0033)	3	
Image Number	(0020,0013)	1	
Rows	(0028,0010)	3	
Columns	(0028,0011)	3	
Icon Image Sequence	(0088,0200)	3	
> Samples per Pixel	(0028,0002)		1
> Photometric Interpretation	(0028,0004)		MONOCHROME2
> Rows	(0028,0010)		64
> Columns	(0028,0011)		64
> Bits Allocated	(0028,0100)		8
> Bits Stored	(0028,0101)		8
> High Bit	(0028,0102)		7
> Pixel Representation	(0028,0103)		0 (unsigned)
> Pixel Data	(7FE0,0010)		Icon Image pixel data

The SONOLINE Antares conforms to the STD-GEN-CDR profile. The following SOP Classes will be supported as an FSC

Table 45: STD-GEN-CDR Supported SOP Classes

IOD	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian 1.2.840.10008.1.2.1	Yes	No †	No †

The following Photometric Interpretations are supported by FSC:

- RGB

10.4.2 Compliance to STD-US-SC-SF-CDR

For media conforming to the STD-US-SC-SF-CDR profiles the following SOP Classes and transfer syntaxes will be supported as an FSC

Table 46: STD-US-SC-SF-CDR Supported SOP Classes

IOD	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian 1.2.840.10008.1.2.1	Yes	No †	No †

The following Photometric Interpretations are supported by FSC:

- RGB

10.4.3 Compliance to STD-US-ID-SF-CDR

For media conforming to the STD-US-ID-SF-CDR profiles the following SOP Classes and transfer syntaxes will be supported as an FSC.

Table 47: STD-US-ID-SF-CDR Supported SOP Classes

IOD	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian 1.2.840.10008.1.2.1	Yes	No †	No †

The following Photometric Interpretations are supported by FSC:

- MONOCHROME2

Note: The Ultrasound Multi-frame Image Storage SOP is used to transfer Antares Ultrasound 3D volumetric data sets. Each frame represents a single slice from the 3D volume. These 3D images may be viewed as Cine images.

† The SONOLINE Antares system acts as a File Set Reader (FSR) and File Set Updater (FSU) only for CD-R discs that were created on an SONOLINE Antares system.

10.5 Augmented and Private Profiles

10.5.1 Augmented Application Profiles

When configuring a compressed Transfer Syntax the STD-US and STD-GEN application profile classes will be extended to store instances of the following SOP classes in compressed format

Table 48: Augmented Application profiles, Activities, and Roles for DICOM Exchange Media

Application Profiles Supported	Real World Activity	Role	SC Option
AUG-GEN-CDR AUG-US-SC-SF-CDR AUG-US-ID-SF-CDR	Create CD-R	FSC †	Interchange
	Update CD-R	n/a †	Interchange
	Display Directory	n/a †	Interchange
	Copy to Local Storage	n/a †	Interchange

10.5.1.1 AUG-GEN-CDR, AUG-US-SC-SF-CDR, AUG-US-ID-SF-CDR

For media conforming to the AUG-GEN-CDR, AUG-US-SC-SF-CDR and AUG-US-ID-SF-CDR Profile the following SOP classes will be supported as an FSC.

Table 49: AUG-GEN-CDR, AUG-US-SC-SF-CDR and AUG-US-ID-SF-CDR Supported SOP Classes

Information Object Definitions	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
US-MF image	1.2.840.10008.5.1.4.1.1.3.1	JPEG Lossless Process 14 1.2.840.10008.1.2.4.70	yes	no †	no †
US-MF image	1.2.840.10008.5.1.4.1.1.3.1	JPEG lossy (baseline) 1.2.840.10008.1.2.4.50	yes	no †	no †
US Image	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian 1.2.840.10008.1.2.1	yes	no †	no †
US Image	1.2.840.10008.5.1.4.1.1.6.1	JPEG Lossless Process 14 1.2.840.10008.1.2.4.70	yes	no †	no †
US Image	1.2.840.10008.5.1.4.1.1.6.1	JPEG lossy (baseline) 1.2.840.10008.1.2.4.50	yes	no †	no †
SC Image	1.2.840.10008.5.1.4.1.1.7	JPEG Lossless Process 14 1.2.840.10008.1.2.4.70	yes	no †	no †
SC Image	1.2.840.10008.5.1.4.1.1.7	JPEG lossy (baseline) 1.2.840.10008.1.2.4.50	yes	no †	no †

† The SONOLINE Antares system acts as a File Set Reader (FSR) and File Set Updater (FSU) only for CD-R discs that were created on an SONOLINE Antares system.

10.5.2 Private Application Profiles

None.

10.6 Extensions, Specializations and Privatizations of SOP Classes and Transfer Syntaxes

None.

10.7 Configuration

10.7.1 AE Title Mapping

10.7.1.1 DICOM Media Storage AE Title

The DICOM Media Storage application (Image Manager) provides the application entity title: CsaImageManager

10.8 Support of Extended Character Sets

The Antares system supports the ISO 8859 Latin 1 (ISO-IR 100) character set family and the same family with code extensions (ISO 2022 IR 100 Latin-1).