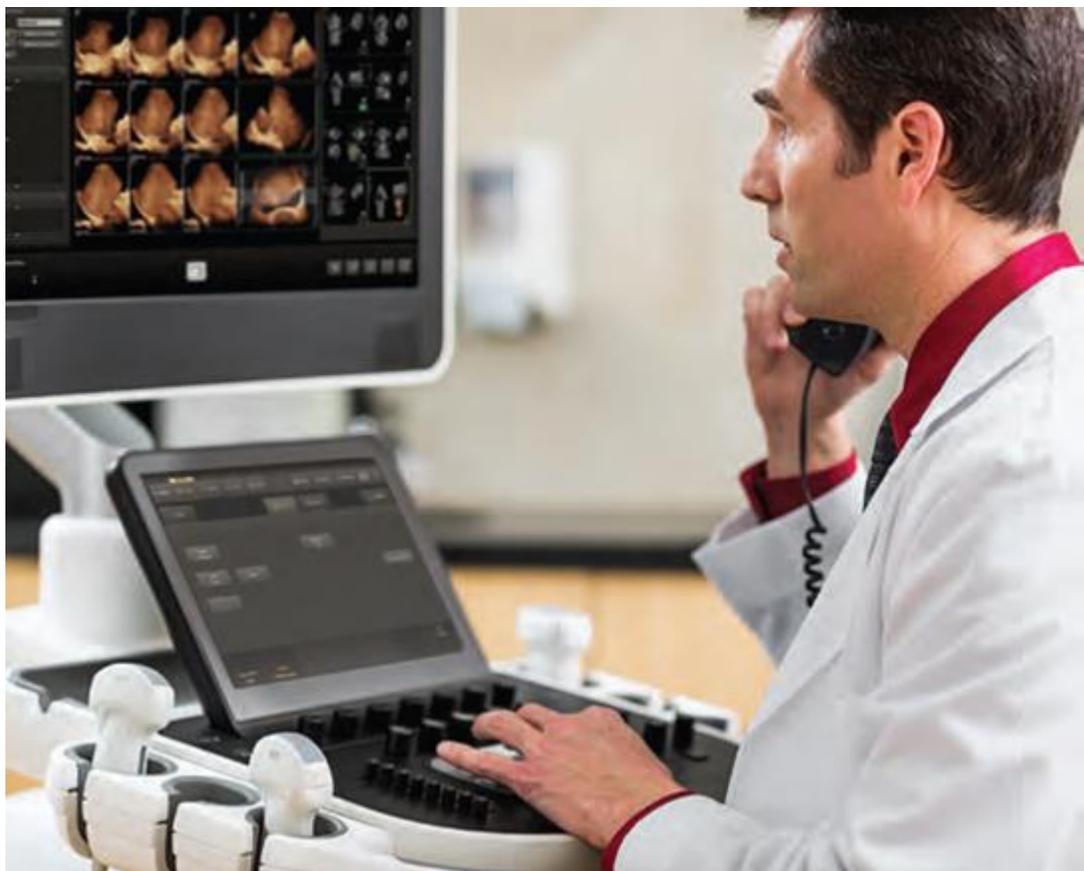# DICOM

Conformance Statement

EPIQ Elite, Elite Advanced, E7, E5, CVx, CVxi Release 7.0.x
Affiniti CVx, 70, 50 and 30 Release 7.0.x
000750000000118 Rev A
July 31, 2020

PHILIPS

0.1   Revision History

Document Version	Date of Issue	Authors	Description
A	July 31, 2020	ML, BG	Initial Release

1   CONFORMANCE STATEMENT OVERVIEW

Table 1.1 provides an overview of the supported network services.

Table 1.1
NETWORK SERVICES

Networking SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Ultrasound Image Storage	Yes*	Yes*
Ultrasound Image Storage (Retired)	Yes*	Yes*
Ultrasound Multiframe Image Storage	Yes*	Yes*
Ultrasound Multiframe Image Storage (Retired)	Yes*	Yes*
Secondary Capture Image Storage	Yes*	Yes*
Multi-frame True Color Secondary Capture Image Storage	Yes*	Yes*
CT Image Storage	Yes*	Yes*
Enhanced CT Image Storage	Yes*	Yes*
Digital Mammography X-Ray Image Storage – For Presentation	Yes*	Yes*
Digital Mammography X-Ray Image Storage – For Processing	Yes*	Yes*
MR Image Storage	Yes*	Yes*
Enhanced MR Image Storage	Yes*	Yes*
MR Spectroscopy Image Storage	Yes*	Yes*
Positron Emission Tomography Image Storage	Yes*	Yes*
X-Ray Angiographic Image Storage	Yes*	Yes*
Private 3D Presentation State Storage	Yes*	Yes*
Comprehensive SR Storage	Yes*	Yes***
Query/Retrieve		
Study Root Query/Retrieve-FIND	Yes**	No
Study Root Query/Retrieve-MOVE	Yes**	No
Workflow Management		
Storage Commitment Push Model	Yes*	No
Modality Worklist Information Model - FIND	Yes*	No
Modality Performed Procedure Step	Yes*	No
Print Management		
Basic Grayscale Print Management	Yes	No
Basic Color Print Management	Yes	No

— This DICOM Conformance Statement reports the implementation of nine ultrasound systems: The EPIQ and Affiniti families of products:

- EPIQ Elite, EPIQ Elite Advanced, EPIQ 7 and EPIQ 5, EPIQ CVx, EPIQ CVxi, Affiniti CVx, Affiniti 70, Affiniti 50 and Affinit 30. Also referred to as EPIQ Elite, EPIQ Elite Advanced, 7, 5, CVx and CVxi; A70, A50 and A30.

The Philips EPIQ and Affiniti Ultrasound systems implement the necessary DICOM® services to download worklists from an information system, store Images and Structured Reports to a network storage device, commit previously stored US images, store Images and Structured Reports to CD, DVD, or removable USB Media storage devices, print to a networked DICOM printer device, receive previously stored ultrasound and other modality images, and inform the information system about the work actually done.

* Purchasable option "Netlink DICOM 3.0". DICOM Printing does not require an option.
** Requires option "Ultrasound Query Retrieve" or "Multi-Modality Query Retrieve".

The SOP Classes are categorized as shown in Table 1.2:

Table 1.2
UID VALUES

UID Value	UID NAME	Category
1.2.840.10008.1.20.1	Storage Commitment Push Model SOP Class	Transfer
1.2.840.10008.3.1.2.3.3	Modality Performed Procedure Step SOP Class	Workflow Management
1.2.840.10008.5.1.1.9	Basic Grayscale Print Management Meta SOP Class	Print Management
1.2.840.10008.5.1.1.18	Basic Color Print Management Meta SOP Class	Print Management
1.2.840.10008.5.1.4.1.1.1.2	Digital Mammography X-Ray Image Storage – For Presentation	Transfer
1.2.840.10008.5.1.4.1.1.1.2.1	Digital Mammography X-Ray Image Storage – For Processing	Transfer
1.2.840.10008.5.1.4.1.1.2	CT Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.2.1	Enhanced CT Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.3.1	Ultrasound Multi-frame Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.3	Ultrasound Multi-frame Image Storage (Retired)	Transfer
1.2.840.10008.5.1.4.1.1.4	MR Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.4.1	Enhanced MR Image Storage	Transfer

UID Value	UID NAME	Category
1.2.840.10008.5.1.4.1.1.4.2	MR Spectroscopy Storage	Transfer
1.2.840.10008.5.1.4.1.1.6.1	Ultrasound Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.6	Ultrasound Image Storage (Retired)	Transfer
1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.7.4	Multi-frame True Color Secondary Capture Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.128	Positron Emission Tomography Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.12.1	X-Ray Angiographic Image Storage	Transfer
1.3.46.670589.2.5.1.1	Private 3D Presentation State Storage	Transfer
1.2.840.10008.5.1.4.1.1.88.33	Comprehensive SR Storage	Transfer
1.2.840.10008.5.1.4.1.2.2.1	Study Root Query/Retrieve Information Model – FIND	Query/Retrieve
1.2.840.10008.5.1.4.1.2.2.2	Study Root Query/Retrieve Information Model – MOVE	Query/Retrieve
1.2.840.10008.5.1.4.31	Modality Worklist Information Model – FIND	Workflow Management

Table 1.3 specifies the Media Storage Application Profiles supported.

Table 1.3
MEDIA SERVICES

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
STD-US-SC-SF&MF-CDR	Yes / Yes	Yes[1]
STD-US-SC-SF&MF-DVD	Yes / Yes	Yes[1]
STD-GEN-USB-JPEG	Yes / Yes	Yes[1]

This page intentionally left blank.

2 TABLE OF CONTENTS

3 INTRODUCTION

3.1 AUDIENCE

This document is intended for hospital staff, health care system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

3.2 REMARKS

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

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

The scope of this Conformance Statement is to facilitate communication between Philips equipment with non-Philips equipment. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [DICOM]. However, by itself it is not guaranteed to ensure the desired interoperability and successful interconnectivity.

The user should be aware of the following important issues:

— The comparison of different conformance statements is the first step towards assessing interconnectivity between Philips equipment and non-Philips quipment.
— Test procedures should be defined to validate the desired level of connectivity.
— The DICOM standard will evolve to meet the users' future requirements. Philips is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery. This document is based on the 2019 version of the Standard, as listed in Section 3.4 References.
     o Note: The Implementation Class UID and Implementation Version Name attribute contents may differ from the information in this document when a sustaining software release is done that does NOT change the DICOM features or functionality. This would be when the "x" portion of the version on the cover page changes.

3.3 DEFINITIONS, TERMS AND ABBREVIATIONS

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

Abbreviations and terms are as follows:

AE	Application Entity
AET	Application Entity Title
ASCE	Association Control Service Element
CD-R	Compact Disk Recordable
CID	Context ID. Reference to a DICOM code "context group" defined in DICOM PS3.16
CSE	Customer Service Engineer
DICOM	Digital Imaging and Communications in Medicine
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader

GSDF	Grayscale Standard Display Function
HIPAA	United States "Healthcare Insurance Portability and Accountability Act of 1996"
IOD	Information Object Definition
ISO	International Standard Organization
LOINC	Logical Observation Identifiers Names and Codes
MPPS	Modality Performed Procedure Step
MWL	Modality Worklist
R	Required Key Attribute
O	Optional Key Attribute
PDIR	Patient Directory screen on EPIQ/Affiniti
PDU	Protocol Data Unit
PDE	Patient Data Entry screen on EPIQ/Affiniti
PS3.x	Reference to part 'x' the DICOM 3.0 Standard
PSC	Philips Support Connect. It is the primary interface on EPIQ/Affiniti for configuring DICOM services. It is reached by pressing the "Support" key on the EPIQ/Affiniti control panel.
SCU	Service Class User (DICOM client)
SCP	Service Class Provider (DICOM server)
SOP	Service-Object Pair
SNOMED	Systematized Nomenclature of Medicine (SRT)
SPS	Scheduled Procedure Step
SR	Structured Report
TID	Template ID. Reference to a DICOM Structured Report "template" defined in DICOM PS3.16
U	Unique Key Attribute
US	Ultrasound
USB	Universal Serial Bus

The following upper-case abbreviations represent specific Attributes. Refer to PS3.3 Section 8 for a description:

CV	Code Value (0008,0100)
CSD	Coding Scheme Designator (0008,0102)
CM	Code Meaning (0008,0104)
CSV	Coding Scheme Version (0008,0103)

3.4 REFERENCES

[DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.20, 2019, available free at http://medical.nema.org/standard.html

Integrated Healthcare Enterprise (IHE) Radiology Technical Framework, Vol. 1, Integration Profiles, Revision 17.0 Final Text July 27, 2018

Integrated Healthcare Enterprise (IHE) Radiology Technical Framework, Vol. 2, Transactions, Revision 17.0 Final Text July 27, 2018

Integrated Healthcare Enterprise (IHE) Radiology Technical Framework, Vol. 3, Transactions continued, Revision 17.0 Final Text July 27, 2018

Integrated Healthcare Enterprise (IHE) Cardiology Technical Framework, Vol. 1, Integration Profiles, Revision 5.0, Final Text, August 29, 2013

Integrated Healthcare Enterprise (IHE) Cardiology Technical Framework, Vol. 2, Transactions, Revision 5.0, Final Text, August 29, 2013

Joint VA / DoD DICOM Conformance Requirements for Digital Acquisition Modalities, Version 3.0, September 28, 2005

4 NETWORKING

4.1 IMPLEMENTATION MODEL

4.1.1 Application Data Flow
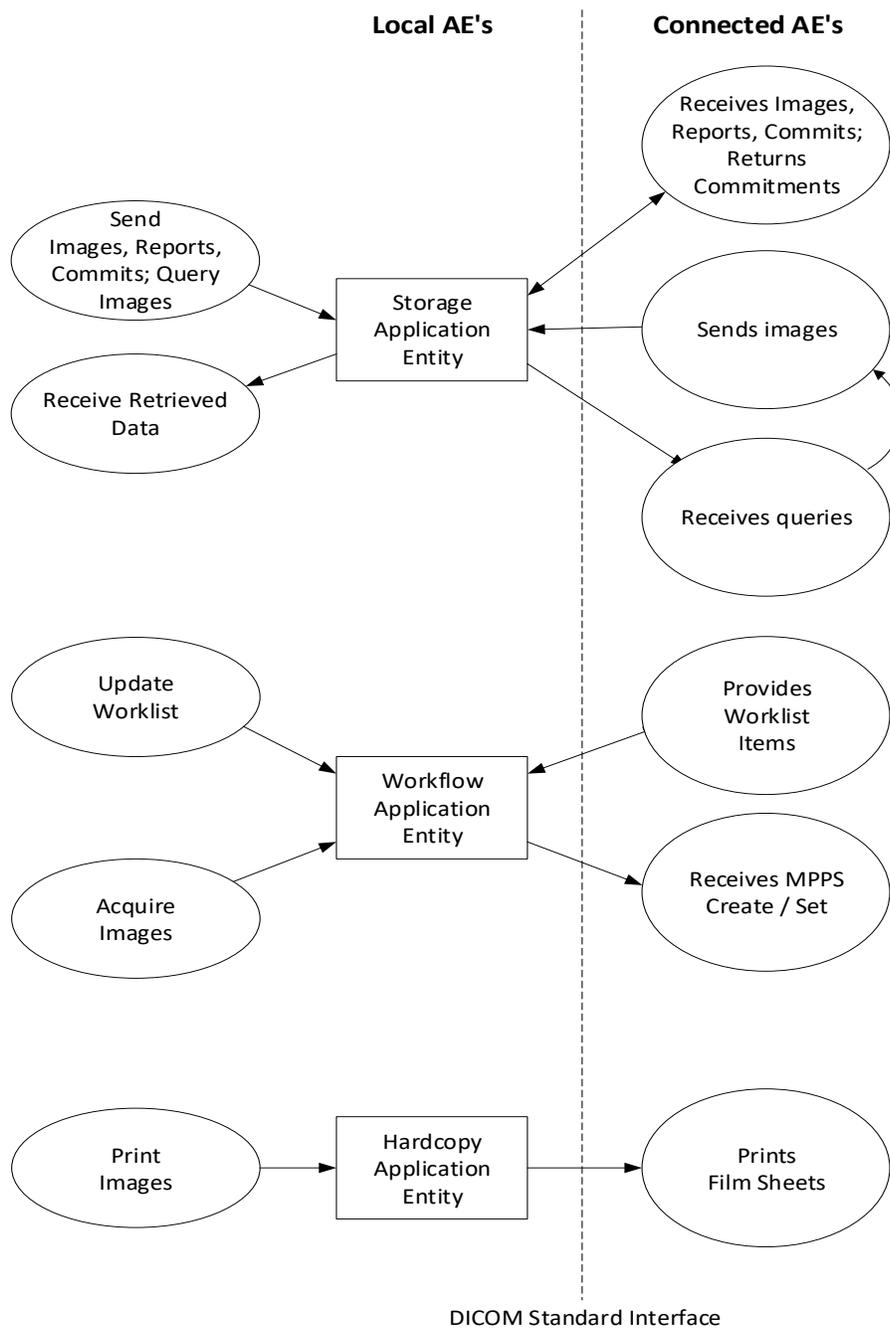
Figure 1: APPLICATION DATA FLOW DIAGRAM

Application Entities are:

- **Storage Application Entity:** Responsible for Storing images, Presentation States, and Structured Reports to remote Storage SCPs and media, request commitment of instances and receiving commit responses from a remote Storage Commitment SCP, performing Query and Retrieve requests to a remote Query/Retrieve SCP, and accepting imports of images from remote Storage SCUs or media.

- **Workflow Application Entity:** Responsible for Modality Worklist queries of a remote Modality Worklist SCP and Modality Performed Procedure Step notifications to a remote Modality Performed Procedure Step SCP.

- **Hardcopy Application Entity:** Responsible for making Print requests of remote Grayscale and Color Print Meta-SCPs.
  - **Note:** The ultrasound system uses one AE Title for all of its entities. See section 4.4.1.1 for where and how to configure the local system's AE Title.

Exam data is sent to all selected Store, Workflow, and Hardcopy destinations simultaneously in accordance with system configuration of send "After Each Print/Acquire" or "At End of Exam". If Send on Demand had been invoked, images and Structured Reports modified since the last Send on Demand are sent at End Exam.

4.1.2 Functional Definition of AEs

4.1.2.1   Functional Definition of Storage Application Entity

The **Storage Application Entity** sends Images, Presentation States, and Structured Reports to a remote AE. It is associated with the local real-world activity "Acquire" hardkeys and configured Touch Screen buttons on EPIQ/Affiniti. To configure for auto export, the Acquisition buttons must be associated with the destination device(s) by configuring in Touch screen "Utilities", Setups, Acquisition/Capture, Archive/Printer. If not selected, the exams may be sent from Review. Sending of images will occur automatically when configured to do so, either "After Each Print/Acquire" or "At End of Exam" with or without "Send on Demand". If configured to send "After Each Print/Acquire", images are transferred immediately after acquisition and Structured Reports are transferred when the exam is ended. If configured for send "At End Exam", images and Structured Reports are transferred when the exam is ended. Private Presentation States are always transferred when the exam is ended.

While configured for send "At End Exam", "Send on Demand" allows for sending acquired images and/or Structured Report during an active exam without ending the exam or in-progress MPPS. Print images will be sent without requiring a full print page to be filled. Send on Demand is invoked by clicking an icon located at the bottom center of the system display after acquiring the first image of the study. If Send on Demand is invoked during an exam, remaining images and the final Structured Report are transferred when the exam is ended.

The system can be configured to automatically end and send an exam after a specified time of system inactivity without the user hitting "End Exam".

An exam may be sent manually by user selection from the Patient Directory via "Review", including exams that have been imported or retrieved into EPIQ/Affiniti from other sources. Further, individually-selected images acquired on EPIQ/Affiniti may be sent manually from image review.

The existence of a Network Store queue with associated network destination will activate the Storage AE. An activated Network Store Queue will be represented by a green dot next to the Network Queue icon. An association request is sent to the destination AE and upon successful negotiation of a Presentation Context, then the image transfer is started. If certain transient network problems are detected, the Storage AE will automatically retry the storage job at 30-second intervals. Under other error conditions, the related queue is set to a "Failed" state, indicated by a Red dot on the Network Queue Icon, and can be restarted by the user via the queue management interface. The user may need to cancel the queue, and then restart manually. When configured for "Send at End Exam", instances are not necessarily sent in the order they are acquired. Typically, Structured Reports are sent first, followed by multi-frame (loop) images, and then single frame images. When "Image Export Format" is selected as "Monochrome", single frame images that have color content (such as Color Flow, CPA, TDI, or elastography, or with Chroma applied), will export as grayscale using Monochrome2 Photometric Interpretation. If the non-active region of a 2D/scrolling image has a chroma map, it will be sent as monochrome.

If the remote AE is configured for **Storage Commitment** and a selection is made to associate it with the appropriate Storage Server, Storage Commitment N-ACTION requests are normally sent at the end of the exam. If instances are sent during the exam, either by selecting send "After Each Print/Acquire" or by using "Send on Demand", the "Storage Commit image-by-image" selection determines when the associated Storage Commit N-ACTION requests are sent:

- If "Storage Commit image-by-image" is enabled, a storage association is initiated for C-STORE requests and then released, followed by the initiation of a storage commit association for the associated N-ACTION requests which is then released. This sequence is repeated for each storage event.

- If "Storage Commit image-by-image" is disabled, Storage Commit N-ACTION requests are sent at the end of the exam after all C-STORE requests are sent to the Storage SCP associated with the Storage Commitment SCP.

If a Storage Commitment N-EVENT-REPORT is successfully obtained for all instances acquired in the exam, this information is recorded in the local database, placing a checkmark in the commit portion of the Patient Directory display and signaling the Auto-delete function that the exam qualifies for deletion, if configured for Auto-Delete after Commit. If not, no auto delete will occur even after successful commit notification is received.

Note: Storage Commitment will only complete successfully if **all objects of the study** are sent to the Storage device associated with the Storage Commit Server. If other destinations are designated for storage of specific objects in the study, the Commit checkmark and auto delete will not occur.

The Storage AE is also responsible for accepting images for storage in EPIQ/Affiniti, through any of the following mechanisms:

- Import from removable media
- Retrieve using the Query/Retrieve service
- Unsolicited push from a Storage SCU to EPIQ/Affiniti acting as a Storage SCP. This mechanism requires that the Storage SCU AE Title and IP Address to have previously been configured as an acceptable DICOM Storage Device.

The Storage Application Entity also support **Query Retrieve** functionality. See details in section 4.2.1.3.4, Query and Request Retrieval of Studies. The functionality is found when an appropriate set of configurations is completed:

- A "DICOM Storage Server" device type is used to configure the AE Title, Port and IP Address of the server that supports Study-Level Query Retrieve Find and Move.
- A second "DICOM Storage Server" device on the ultrasound system must be used to add the server's sending AE Title for the C-Store association initiated by the C-Move request sent to the Query Retrieve server. Without this second device, the query will be succesful, but retrieve will fail because the ultrasound system will reject any association request from an "unknown" AE Title.

To perform a query, the user selects the "Review" button on the touchscreen. Under "Source" – select the "Hard Drive" selection to get the list of configured storage servers for the Query Retrieve server. That will open the query page. Query options including automatic searching to each Series level or also to Image Level for each matching Study. Note that Image level query for many studies will take longer.

4.1.2.2 Functional Definition of Workflow Application Entity

The **Workflow Application Entity** receives **Modality Worklist (MWL)** information from and sends **Modality Performed Procedure Step (MPPS)** information to remote AEs. It is associated with the local real-world activities "Update Worklist", "Patient Search" and "Acquire Images".

When either the "Update Worklist" or "Patient Search", equivalent to IHE terms "Broad" and "Patient-based" queries in local real-world activity is performed, the Workflow Application Entity queries a remote AE for worklist items and provides the set of worklist items matching the query request.

- **"Update Worklist"** is performed as a result of an operator request or can be is performed automatically at specific time intervals or at the end of each exam. Default query criteria are **Modality** of **US** (ultrasound) and **Scheduled Procedure Step Start Date** of the **current date**. Additional changes to Modality Worklist search

include customizing to search for a different AE Title, Station Name, System Location and Custom Modality. These configuration options are found in the Advance settings for the MWL Device in DICOM Device setup.

- **"Patient Search"** is manually initiated. The user may search by **Patient Last Name**, **Patient ID**, **Accession #**, **Exam Date or Date Range**, and/or **Requested Procedure ID**. A wildcard patient query can be performed by entering a * in the Patient Name field. These critera are located in the Worklist Tab, Patient Search.

    o **Note:** These two query options send messages to the Modality Worklist server which will provide all matches for the query parameters. After a list from the worklist is displayed, the "Find" dialog will seach only within the returned results. It is not another query.

If the Workflow AE establishes an Association to a remote AE, the server will transfer all matching worklist items via the open Association. The results of a successful Worklist Update will overwrite the data in the Worklist display. There is no queue management for Modality Worklist.

Modality Performed Procedure Steps are created and updated with the following real-world events:

- MPPS N-Create, Status = IN PROGRESS:

    o Acquisition of images will result in automated creation of an MPPS Instance managed by a remote AE.

- MPPS N-Set, Status = COMPLETE

    o Completion of the MPPS is performed as the result of an operator action of ending the exam.

- MPPS N-Set, Status = DISCONTINUED

    o "Cancel Exam" causes the "Discontinued" status to be sent.

    o Note: A "Paused" exam does not initiate an MPPS event.

    Note: If the MPPS messages were not received by the MPPS server, they may be "re-sent" by selecting the study in Review and selecting "Export". In Export, select the MPPS server. The MPPS messages associated with that study will be resent.

The Workflow AE performs the creation of a **Modality Performed Procedure Step (MPPS)** instance automatically when the first image of a study is acquired. MPPS message queues are listed along with Image and Structured Report queues in the Network status window.

The user may also change patient identification information while a MPPS is in progress. If this is done, the previous MPPS is discontinued and a new MPPS is created with the changed patient information. The Storage AE is informed, and if images acquired under the previous patient information have already been transferred (because send "After Each Print/Acquire" or "Send On Demand") the images are regenerated and sent again with updated patient information and new DICOM UID's.

Additional exams may be appended to an existing study. There are two fundamental methods to perform append:

- Append from Patient Directory: Select an Ended study from the Patient Directory and press choose "Append." Two options are available:

    o "Add" (if less than 24 hours old), allows images to be added to the original Study, using the same Study Instance UID, and a new Performed Procedure Step SOP Instance UID. If more than 24 hours old, only "Create" will be available.

    o "Create", which will create a new Study Instance UID.

- Append from Image Review: Open the Study in Review from the Patient Directory and acquire an image. Default behavior is selectable via a configuration screen for Append from Image Review – Create Study Instance UID, either:

- o "Add" (if less than 24 hours old), allows images to be added to the original Study using the same Study Instance UID and a new Performed Procedure Step SOP Instance UID. If the Study being appended is greater than 24 hours old, a new Study Instance UID is created.
- o "Create", which will create a new Study Instance UID.

For Exams appended by creating the image from Image Review and changing visualization of the existing images, for example, changing chroma map, added images would have the same Acquisition DateTime value of the original images in which the images were acquired. This is not the case for append from Patient Directory, which creates completely new images with the current date and time.

Study Date on the Report page refers to the date of the Study in which the evidences were acquired. This is exported as Study Date (0008,0020). This includes all Appended and Non-Appended exams. Refer to Study Date (0008,0020) to determine the date of the original exam in which the evidences were acquired and refer to DICOM Performed Procedure Step Start Date (0040,0244) for the date of Appended exam.

For Exams appended from Image Review, the Report footer has the statement "Appended: "followed by the date in which the exam is started for Appending/Appended exams from Image Review.

The preceding append functions differ from the IHE Schedule Workflow Profile's "Append Case". In this case, a study selected from a Modality Worklist Scheduled Procedure step is re-selected from the worklist. The same Study Instance UID is used, but new Series Instances are created as well as new MPPS messages.

4.1.2.3 Functional Definition of Hardcopy Application Entity

The **Hardcopy Application Entity** prints images to a remote AE (Printer or print server). It is associated with the "Acquire" local real-world activity, depending on configuration. The user action creates a Film Session containing one or more Film Boxes and Image Boxes composed from images acquired by the user. The AE creates and sends fully rendered pages according to the user's selected formatting choices in a single Image Box per page. This Image Box is rather large compared to sending individual Image Boxes to the printer.

If the user has both BW and Color DICOM printers configured and selected, and "Automatic Printer Choice" is enabled, images containing color content (such as Color Flow, CPA, TDI, or elastography, or with Chroma applied) are sent to the Color printer, and all others are sent to the BW printer. If both printers are configured and selected and "Automatic Printer Choice" is disabled, each image will be printed to both printers.

The existence of a print queue will activate the Hardcopy AE. An association is established with the printer(s) and the printer's status determined. If the printer is operating normally, the film sheets will be printed. If the printer is not operating normally, the print queue will set to a "Failed" state and can be restarted by the user via the queue management interface.

4.1.3 Sequencing of Real-World Activities

The following sequence diagrams illustrate the order of network operations during a number of imaging scenarios. If Modality Worklist is not being used, the user enters patient identification manually at the start of exam and the Query/Receive Worklist steps do not occur.
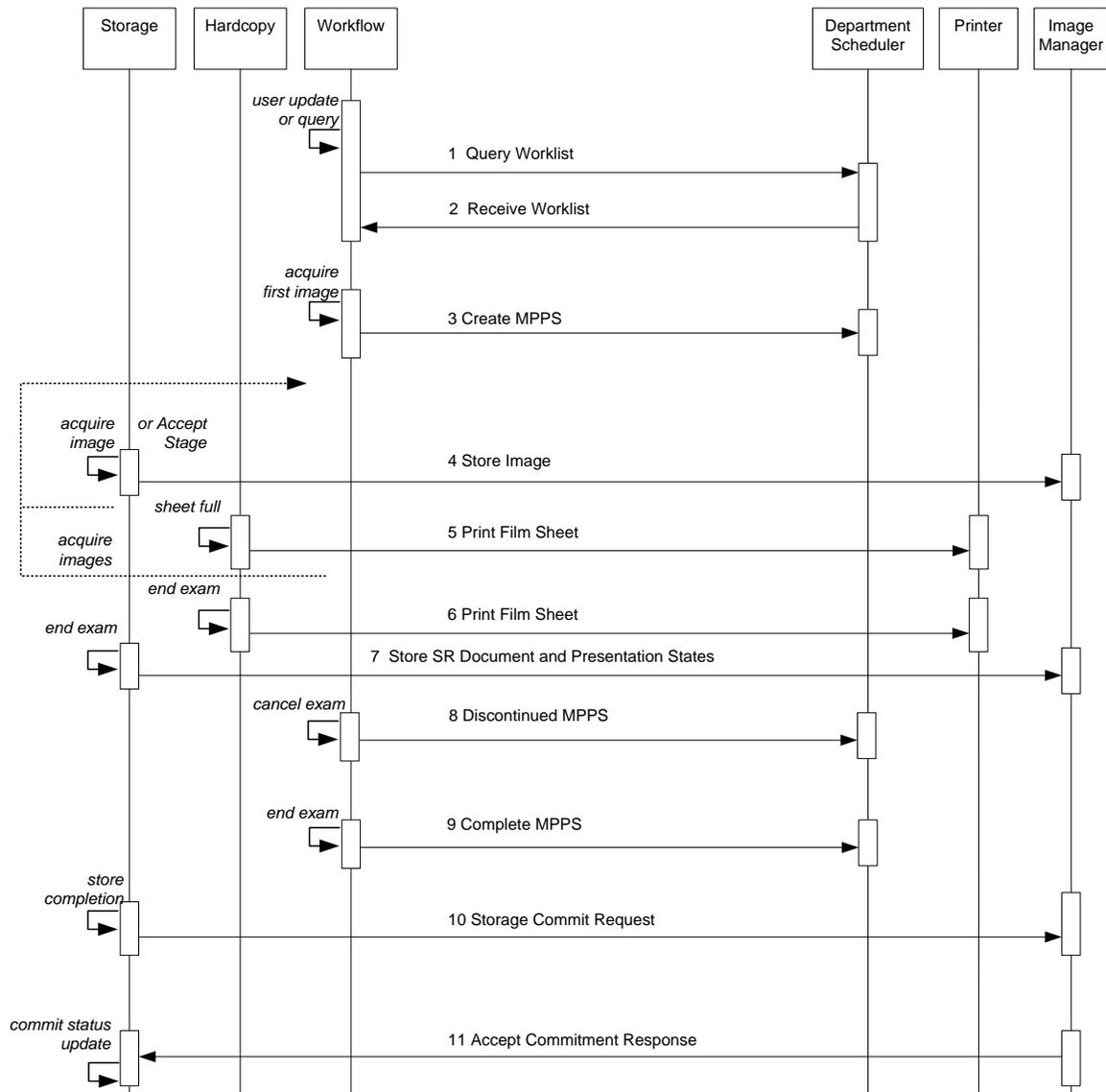
FIGURE 2A:
SEND AFTER EACH PRINT/ACQUIRE, IMAGE-BY-IMAGE COMMIT DISABLED

Figures 2A through 2C illustrate exam acquisition with send "After Each Print/Acquire", "At End Exam", and "At End Exam" with "Send on Demand", respectively, with "Storage Commit image-by-image" <u>disabled</u>.
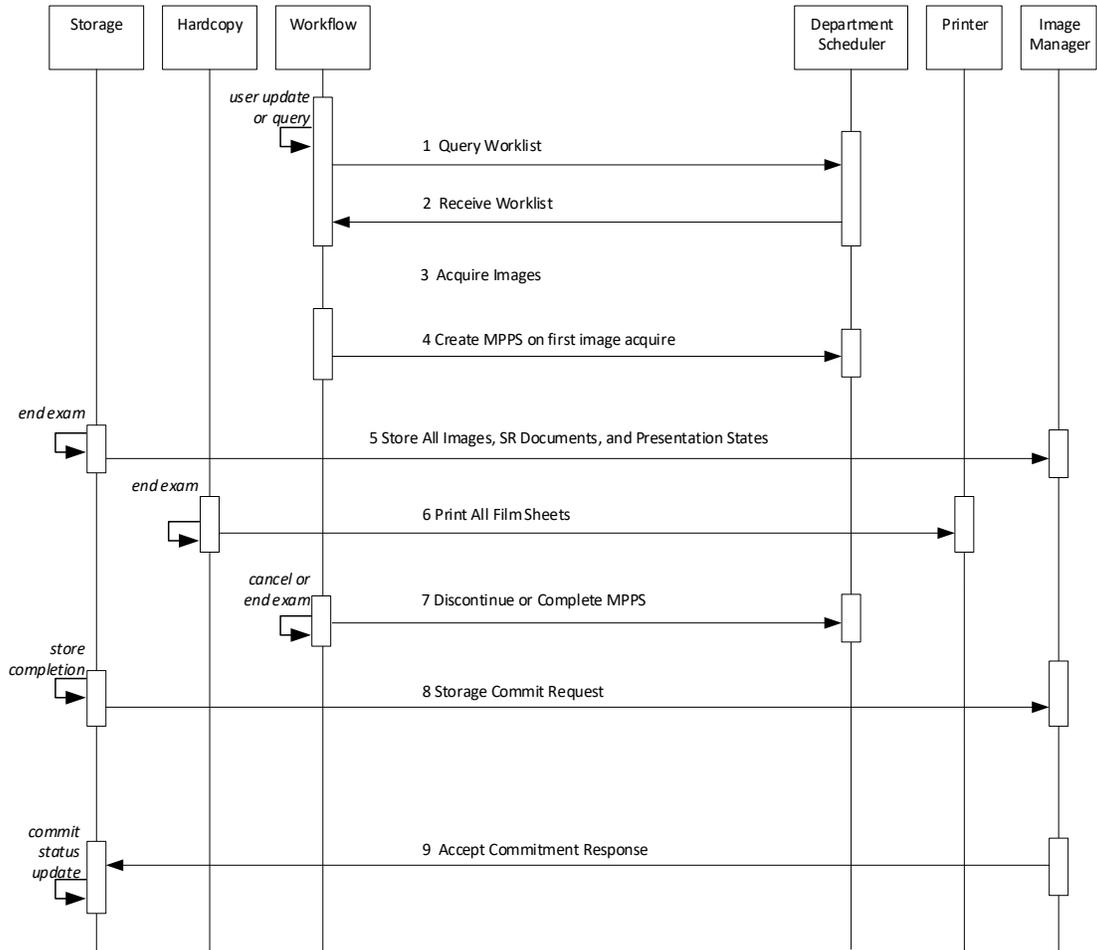
FIGURE 2B:
SEND AT END EXAM
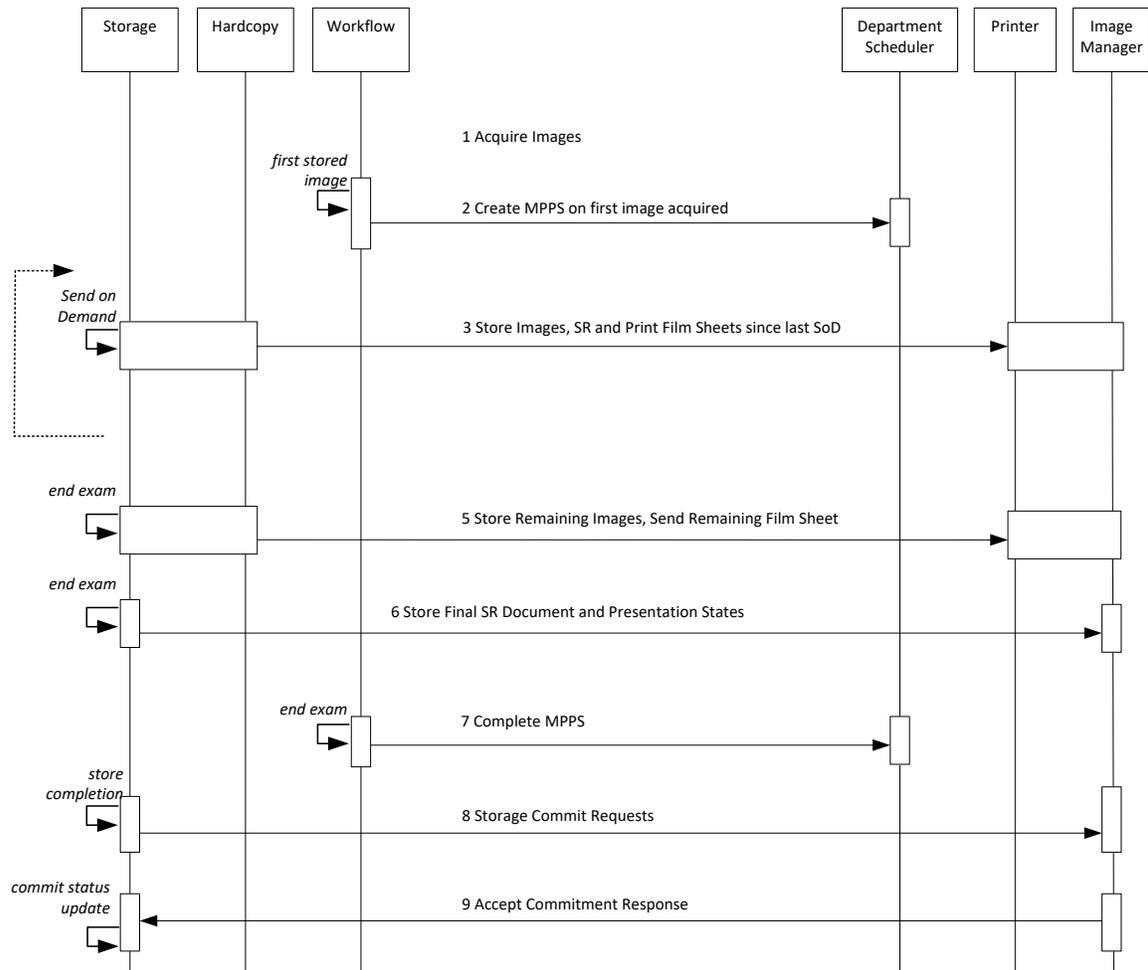
FIGURE 2C:
SEND ON DEMAND, IMAGE-BY-IMAGE COMMIT DISABLED

Figures 2D and 2E illustrate exam acquisition with send "After Each Print/Acquire" and "At End Exam" with "Send on Demand", respectively, with "Storage Commit image-by-image" enabled.
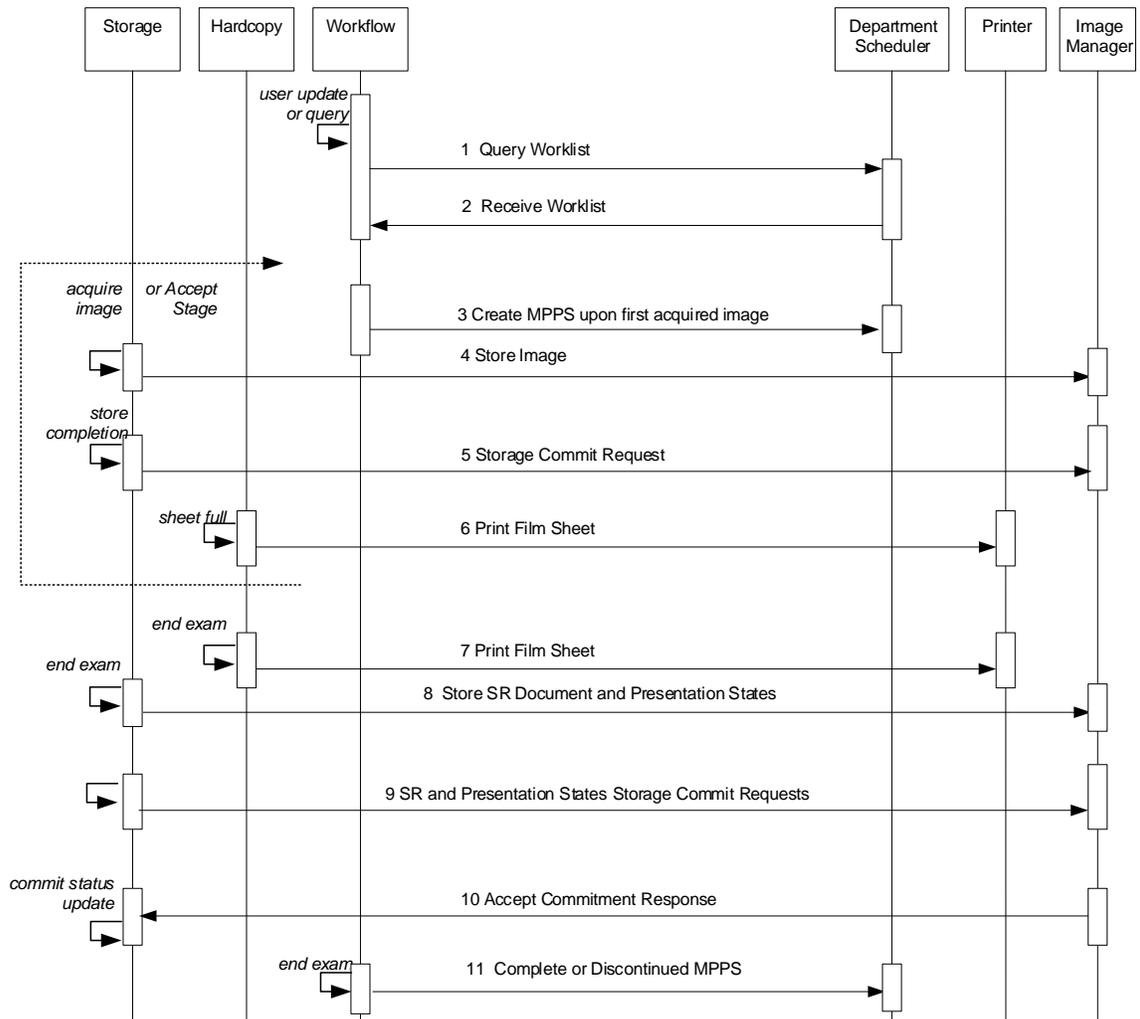
FIGURE 2D:
SEND AFTER EACH PRINT/ACQUIRE, IMAGE-BY-IMAGE COMMIT ENABLED
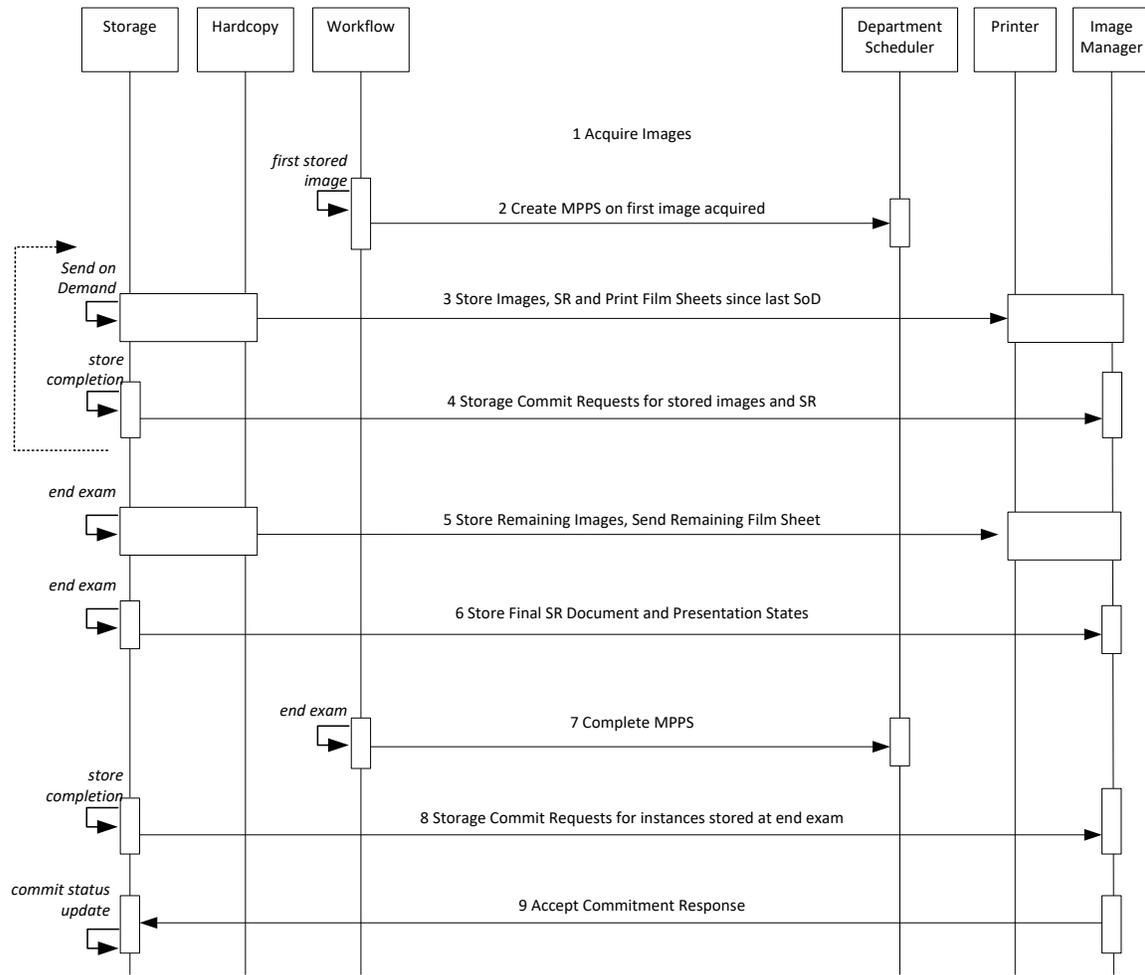
FIGURE 2E:
SEND ON DEMAND, IMAGE-BY-IMAGE COMMIT ENABLED

4.2 AE SPECIFICATIONS

4.2.1 Storage Application Entity Specification

4.2.1.1 SOP Classes

EPIQ/Affiniti provides Standard Extended[1] Conformance to the following SOP Classes:

Table 4.1
SOP CLASSES FOR AE STORAGE

SOP Class Name	SOP Class UID	SCU	SCP
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
US Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	Yes	Yes
US Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
US Multiframe Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	Yes
MR Spectroscopy Image Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
Private 3D Presentation State Storage	1.3.46.670589.2.5.1.1	Yes	Yes
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes*
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No
Study Root Query/Retrieve – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Query/Retrieve – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

Note: Use of Retired SOP Classes only is user configurable for the system on the PSC – Network/DICOM – DICOM Settings – DICOM Storage Device – Advanced Settings configuration page. Image storage will use Retired SOP Classes only when selected.

---

[1] See section 9.5 for information on the Standard Extended SOP Class

4.2.1.1.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 4.2
DICOM APPLICATION CONTEXT FOR AE STORAGE

Application Context Name	1.2.840.10008.3.1.1.1

4.2.1.1.2 Number of Associations

EPIQ/Affiniti initiates one Association at a time for each destination to which a transfer request is being processed in the active job queue list. Five storage destinations, one Structured Report storage destination, and one Storage Commitment destination may be selected simultaneously, but only one job will be active at a time; the other(s) remain pending until the active job is completed or failed.

Table 4.3
NUMBER OF ASSOCIATIONS INITIATED FOR AE STORAGE

Maximum number of simultaneous Associations	1

EPIQ/Affiniti accepts Associations for N-EVENT-REPORT notifications for the Storage Commitment Push Model SOP Class. EPIQ/Affiniti will also accept Associations for C-STORE messages for receiving data in response to Query/Retrieve C-MOVE requests or unsolicited images from a remote Storage SCU sending images to EPIQ/Affiniti.

Table 4.4
NUMBER OF ASSOCIATIONS ACCEPTED FOR AE STORAGE

Maximum number of simultaneous Associations	5

4.2.1.1.3 Asynchronous Nature

EPIQ/Affiniti does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4.5
ASYNCHRONOUS NATURE AS A SCU FOR AE STORAGE

Maximum number of outstanding asynchronous transactions	1

4.2.1.1.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 4.6
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE STORAGE

Implementation Class UID	1.3.46.670589.14.10000.700
Implementation Version Name	EPIQ-AFFIN_7.00

4.2.1.2 Association Initiation Policy

4.2.1.2.1 Activity – Store Images and Structured Reports

4.2.1.2.1.1 Description and Sequencing of Activities

A user may select exams or individual images from Review and request them to be sent to multiple destinations (up to five). Reports may not be selected individually, but are sent when "End Exam" is pressed, and when an entire exam is selected for export from the Review Directory and exported to a Storage device with "Export Structured Report" enabled. Each object (image, private presentation state, or structured report) is entered into the job queue. When send "After Each Print/Acquire" is enabled, the acquired images are sent to the selected destinations immediately after acquisition.

The Network Status icon reports the status of the job, Green is ok, Yellow exclamaition point is pending until a network connection is available, and Red X indicates failed.

If the C-STORE response from the remote Application Entity contains a status other than Success, the Association is aborted and the related Job is switched to a failed state. It can be restarted any time by user interaction. When a system configured with selected network destinations is used without the network connected, it is considered in "Portable" mode. Reconnecting the network cable will initiate transfer again.

If a device is configured for Storage Commitment service, the Storage AE will transmit a separate Storage Commitment N-ACTION request for images and one for the report. The Storage AE can only receive an N-EVENT-REPORT request in a separate subsequent association initiated by the SCP employing PDU 54H SCP/SCU Role Negotiation of "SCP" in the SCP's Association Request. It cannot receive N-EVENT-REPORT request messages on the same association as the N-ACTION request.

Structured Reports will contain all supported measurements and calculations created by EPIQ/Affiniti even if they are not selected for display in the on-system report. One Structured Report instance is created for each template that is used. In this context, "template" refers to the DICOM Structured Report templates listed in PS3.16 of the DICOM Standard.
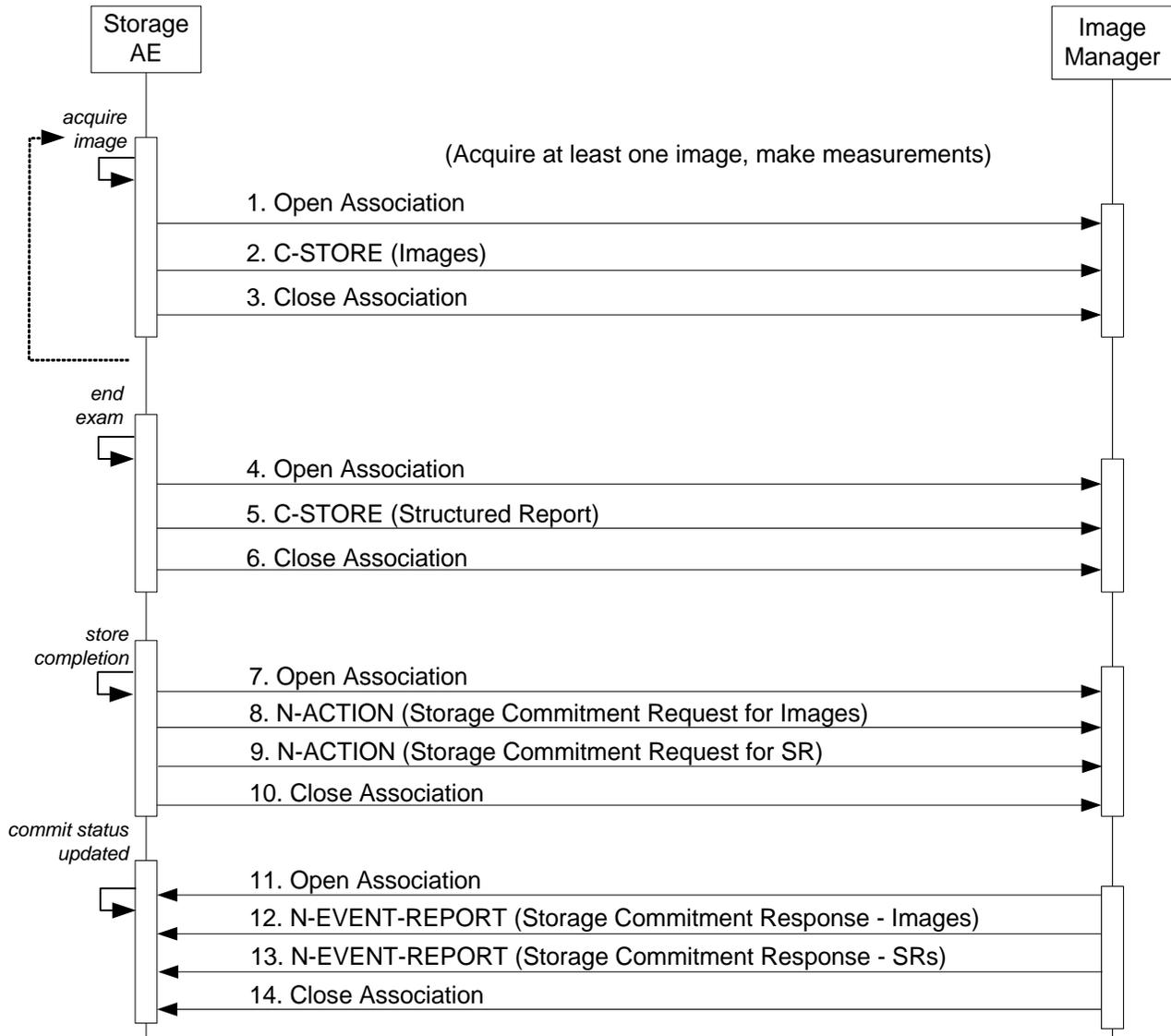
Figure 3
SEQUENCING OF ACTIVITY – SEND IMAGES AND STRUCTURED REPORT AFTER EACH PRINT/ACQUIRE

The sequence of interactions between the Storage AE and an Image Manager is illustrated in Figure 3 for the "Store" configuration option "After Each Print/Acquire". If the "At End Exam" configuration option is selected, no C-STORE is sent at the Acquire Image event and instead all image C-STOREs are sent after end exam.

NOTES: Pausing an exam will close the current association. A new association will be created when resumed.
Similar behavior when the association times out.
The N-EVENT-REPORT must be sent over a separate association initiated by the Image Manager (see Section 4.2.1.3.1.1 on Activity – Receive Storage Commitment Response).

4.2.1.2.1.2 Proposed Presentation Contexts

EPIQ/Affiniti is capable of proposing the Presentation Contexts shown in the following table:

Table 4.7
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY SEND IMAGES

Presentation Context Table					
Abstract Syntax		Transfer Syntax			
Name	UID	Name List	UID List	Role	Ext. Neg.
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCU	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCU	None
US Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.5	SCU	None
US Multiframe Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.5	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCU	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.5	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			
Name	**UID**	**Name List**	**UID List**	**Role**	**Ext. Neg.**
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.2.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
MR Spectroscopy Image Storage	1.2.840.10008.5.1.4.1.1.4.2	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70	SCU	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
Private 3D Presentation State*	1.3.46.670589.2.5.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

*Intended for use only on Q-Station workstations and anywhere QLAB is installed.

Presentation Contexts are proposed for each Storage device based on selected options. Contexts are proposed for images for all Storage devices, unless the user selects "Implicit Little Endian Only" in the Advanced Configuration tab for the configured device. Then only Implicit Little Endian is negotiated for that device, provided the study contains no JPEG Lossy compressed loops. The Implicit Little Endian Only selection will override the Single Frame Compression setting, resulting in only uncompressed export. RLE Lossless and JPEG Lossless are only negotiated for Image Presentation Contexts if configured for use by the user. JPEG Extended 12-bit Lossy will only be negotiated if images are present that require that transfer syntax, this is not selectable by the user.

Storage Commitment N-ACTION requests are only sent to the device that is configured as the Storage Commitment server. Storage Commitment always works in conjunction with a designated Storage SCP configured to receive storage of the objects to be committed.

4.2.1.2.1.3 SOP Specific Conformance

4.2.1.2.1.3.1   Image and Comprehensive Structured Report Storage SOP Classes

4.2.1.2.1.3.1.1   Storage (C-STORE)

All Image and Comprehensive Structured Report Storage SOP Classes supported by the Storage AE exhibit the same behavior, except where stated, and are described together in this section.

Table 4.8 describes C-Store response behavior.

Table 4.8
STORAGE C-STORE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP successfully stored the SOP Instance. If all SOP Instances succeed, the job is marked as complete.
*	*	Any other status code.	The Association is aborted using A-ABORT and the transfer fails. The status is logged.

The behavior of Storage AE during communication failure is summarized in Table 4.9.

Table 4.9
STORAGE COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The Association is aborted using A-ABORT and the transfer fails. The status is logged.
Association aborted by the SCP or network layers	The Association is aborted using A-ABORT and the transfer fails. The status is logged.

A green dot on the Network Queue Icon indicates an active queue. A red x indicates failure. A yellow asterisk indicates network connection lost. By using the Queue Manager, the user can restart a failed transfer. Open the Queue Manager by clicking on the Network Queue Icon. Select the failed transfer and click Retry.

The contents of US Image, US Multiframe Storage and Comprehensive Structured Report Storage SOP Instances conform to the DICOM IOD definitions described in Section 9.1.

4.2.1.2.1.3.2   SOP Specific Conformance for Storage Commitment Push Model SOP Class

4.2.1.2.1.3.2.1   Storage Commitment Notifications (N-ACTION)

The Storage AE will request storage commitment for the configured device. If "Storage Commit image-by-image" is selected, Storage Commitment is requested automatically by the system immediately after the instance is stored (but not necessarily one-to-one with each storage request).

Table 4.10 summarizes the behavior of Storage AE when receiving response status codes.

Table 4.10
STORAGE COMMITMENT N-ACTION RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The system waits for the N-Event-Report.
*	*	Any other status code.	The commit status remains unchanged for all objects.

Table 4.11 summarizes the behavior of Storage AE during communication failure.

Table 4.11
STORAGE COMMITMENT N-ACTION COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	Same as non-success status in Table 4.10.
Association aborted by the SCP or network layers	Same as non-success status in Table 4.10.

The Storage AE will request storage commitment using the attributes described in Table 4.12.

Table 4.12
STORAGE COMMITMENT N-ACTION-REQUEST MESSAGE CONTENTS

Action Type Name	Action Type ID	Attribute	Tag	Requirement Type SCU
Request Storage Commitment	1	Transaction UID	(0008,1195)	1
		Storage Media File-Set ID	(0088,0130)	3
		Storage Media File-Set UID	(0088,0140)	3
		Referenced SOP Sequence	(0008,1199)	1
		>Referenced SOP Class UID	(0008,1150)	1
		>Referenced SOP Instance UID	(0008,1155)	1
		>Storage Media File-Set ID	(0088,0130)	3
		>Storage Media File-Set UID	(0088,0140)	3

If Storage Commit Auto-Retry is enabled, the N-ACTION request is retried if the N-ACTION has completed successfully but no N-EVENT-RESPONSE received within the configured "no-response" period. Further, the N-ACTION request is retried if N-EVENT-RESPONSE is received with one or more instances that fail commit; in that case, C-STORE requests are also resent for all instances that failed to commit.

4.2.1.3   Association Acceptance Policy

4.2.1.3.1.1   Activity – Receive Storage Commitment Response

4.2.1.3.1.2   Description and Sequencing of Activities

The Storage AE accepts associations for pending responses to a Storage Commitment Request only using SCP/SCU Role Negotiation of "SCP" explicitly stating that the association is initiated by the SCP to the SCU.

4.2.1.3.1.3   Accepted Presentation Contexts

Table 4.13 summarizes Presentation Contexts that the Storage AE accepts.

Table 4.13
ACCEPTABLE PRESENTATION CONTEXTS FOR
ACTIVITY RECEIVE STORAGE COMMITMENT RESPONSE

Presentation Context Table					
Abstract Syntax		Transfer Syntax			
Name	UID	Name List	UID List	Role	Ext. Neg.
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

4.2.1.3.1.4 SOP Specific Conformance for Storage Commitment Push Model SOP Class

4.2.1.3.1.4.1   Storage Commitment Notifications (N-EVENT-REPORT)

The Storage AE can receive an N-EVENT-REPORT notification received from the SCP via an association requested by the SCP with reverse-role negotiation.

Upon receipt of an N-EVENT-REPORT the timer associated with the Transaction UID will be canceled. Table 4.14 summarizes the behavior of Storage AE when receiving Event Types within the N-EVENT-REPORT.

Table 4.14
STORAGE COMMITMENT N-EVENT-REPORT BEHAVIOR

Event Type Name	Event Type ID	Behavior
Storage Commitment Request Successful	1	The commit status is set to complete for each object.
Storage Commitment Request Complete – Failures Exist	2	The commit status remains incomplete. The commit comment for each object is logged.

The reasons for returning specific status codes in an N-EVENT-REPORT response are summarized in Table 4.15.

Table 4.15
STORAGE COMMITMENT N-EVENT-REPORT RESPONSE STATUS REASONS

Service Status	Further Meaning	Error Code	Reasons
Success	Success	0000	The storage commitment result has been successfully received.

4.2.1.3.1.4.2   Storage Commitment Attributes (N-EVENT-REPORT)

Table 4.16 lists the attributes that are supported within the N-EVENT-REPORT.

Table 4.16
STORAGE COMMITMENT N-EVENT-REPORT MESSAGE CONTENTS

Event Type Name	Event Type ID	Attribute	Tag	Requirement Type SCU
Storage Commitment Request Successful	1	Transaction UID	(0008,1195)	None
		Retrieve AE Title	(0008,0054)	None
		Storage Media File-Set ID	(0088,0130)	None
		Storage Media File-Set UID	(0088,0140)	None
		Referenced SOP Sequence	(0008,1199)	None
		>Referenced SOP Class UID	(0008,1150)	None
		>Referenced SOP Instance UID	(0008,1155)	None
		>Retrieve AE Title	(0008,0054)	None
		>Storage Media File-Set ID	(0088,0130)	None
		>Storage Media File-Set UID	(0088,0140)	None
Storage Commitment Request Complete – Failures Exist	2	Transaction UID	(0008,1195)	None
		Retrieve AE Title	(0008,0054)	None
		Storage Media File-Set ID	(0088,0130)	None
		Storage Media File-Set UID	(0088,0140)	None
		Referenced SOP Sequence	(0008,1199)	None
		>Referenced SOP Class UID	(0008,1150)	None
		>Referenced SOP Instance UID	(0008,1155)	None
		>Retrieve AE Title	(0008,0054)	None
		>Storage Media File-Set ID	(0088,0130)	None
		>Storage Media File-Set UID	(0088,0140)	None
		Failed SOP Sequence	(0008,1198)	None
		>Referenced SOP Class UID	(0008,1150)	None
		>Referenced SOP Instance UID	(0008,1155)	None
		>Failure Reason	(0008,1197)	None

4.2.1.3.2 Activity – Query and Request Retrieval of Studies

4.2.1.3.2.1 Description and Sequencing of Activities

The user may set a filter in Review when selecting a configured Query Retrieve device in the "Source" dropdown, to specify the criteria used in querying the Query/Retrieve SCP. When the user initiates the query, the system sends a Study Root C-FIND request using the filter parameters set by the user. The user may then select from the query results one or more of the studies to initiate a Study Root C-MOVE request for the selected exam(s).

Additional Query options are user selectable for the initial query and after query results are displayed.

The initial query is only at the Study level. The user may select Series level to be automatically performed for each Study level returned. The user may also select that each series is automatically queried for contents as well.

Each additional level of query selected at the main query page will increase the time required for result display.

See section 4.4 Configuration for details on configuring EPIQ and Affiniti systems to support Query Retrieve.
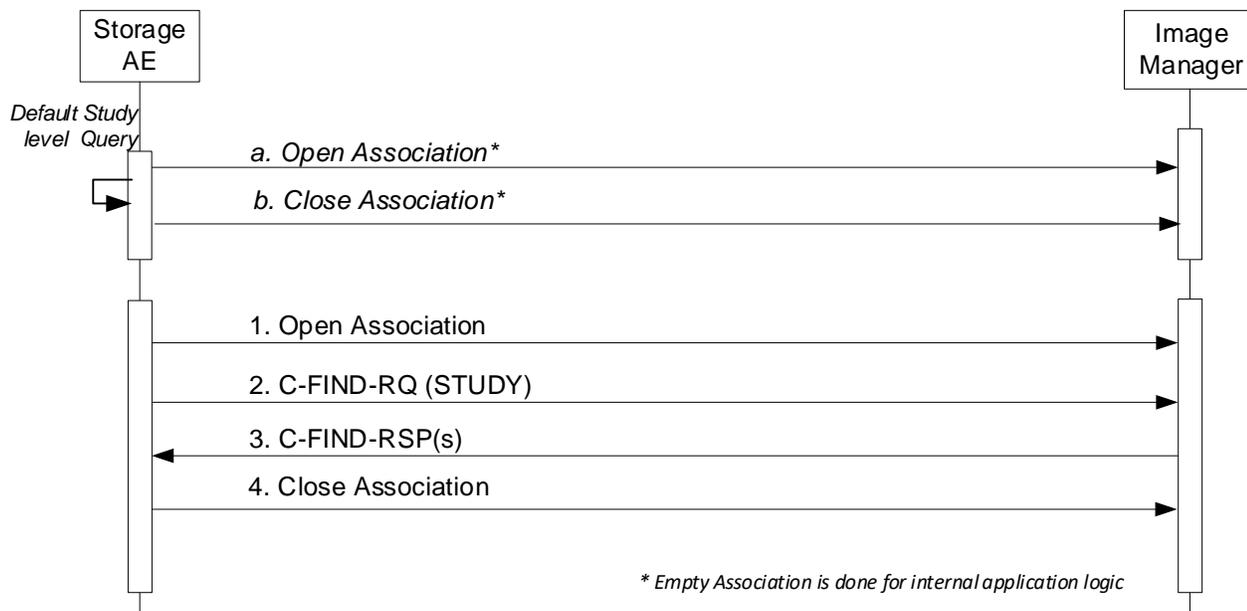
Figure 4a
DEFAULT STUDY LEVEL QUERY SEQUENCE DIAGRAM

The Default Query, at Study Level, settings are for Any Patient Name, indicated by the "*" wildcard in the "Last Name" field and the "Date Range" left with no entered values, in the "Query Retrieve Filter Parameters"

The result will be all Patient's for any date, up to the displayable limit.

The query parameters that may be selected for Study level queries are:

- Patient Last Name and First Name
- Patient ID
- Accession Number
- Date Range
- Today and 1-7 days before.

```
   Storage                                                                      Image
     AE                                                                        Manager
Plus sign on
 a Patient              a. Open Association*
 Response
                       b. Close Association*


                       1. Open Association

                       2. C-FIND-RQ (STUDY, for selected Study UID)

                       3. C-FIND-RSP

                       4. C-FIND-RQ (SERIES – for the Study UID in the response)

                       5. C-FIND-RSP (including Series Instance UID)

                       6. C-FIND-RQ (IMAGE – for each image in the Series)

                       7. C-FIND-RSP(s)

                       8. Close Association


                                    * Empty Association is done for internal application logic
```

Figure 4b
PLUS SIGN QUERY SEQUENCE DIAGRAM

The list of returned Patient Names includes a "+" plus sign next to it. If the plus sign is clicked for a patient, the result will be to send additional Queries for all Series for that patient, and all Image objects associated with that patient.

When completed, the entry in the display will show the Modality, Number of Images, number of Series and Series Description.

This feature allows for immediate display of information for a single patient to determine the appropriateness of the study for Retrieval to the system.

The net effect of using the Plus sign is to query to the image level directly, and only for one selected result. If not the correct study, re-perform the Study level query.
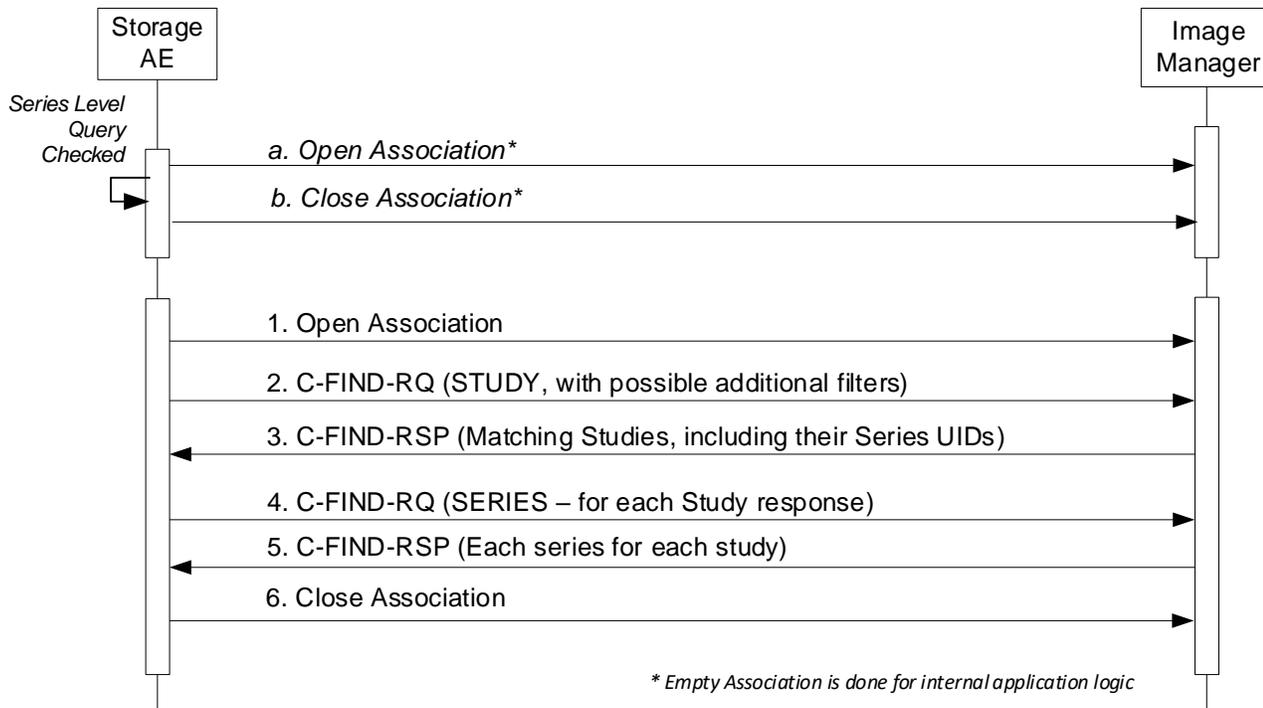
Figure 4c
SERIES LEVEL QUERY SEQUENCE DIAGRAM

When the "Series Level Query" box is checked, the system performs Study and Series level queries automatically for each response matching the query parameters.

In addition to the query filter parameters listed for Default Study Level query, the user may make the following choices for Modality:

- All [2]
- Ultrasound
- CT
- MR
- Mammography
- PET
- X-Ray Angiography

---

[2] The "All" selection will return all available modality data associated with the patient. However, the system will only allow import of the list of modality images listed here. A study that contains an unsupported modality will fail to import.
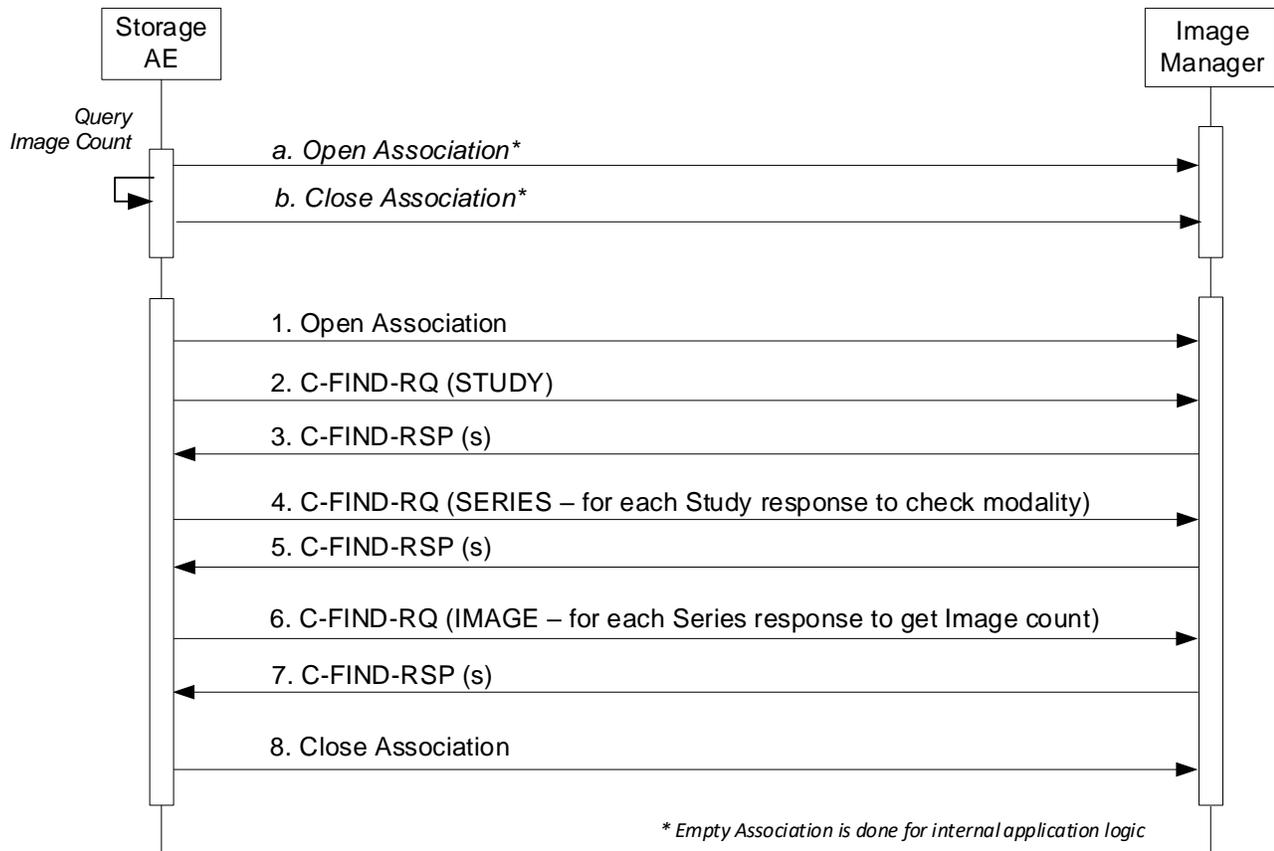
Figure 4d
QUERY IMAGE COUNT QUERY SEQUENCE DIAGRAM

When "Query Image Count" is selected, the query behavior is like previous versions of Query Retrieve. For each Study response, each series contained in each series will be queried for all Images in each Series response.

Notes:

1. This behavior will take more time depending on the number of Study responses.
2. Structured Reports will not be included in the Series counts. Structured Reports are not imported into the system.
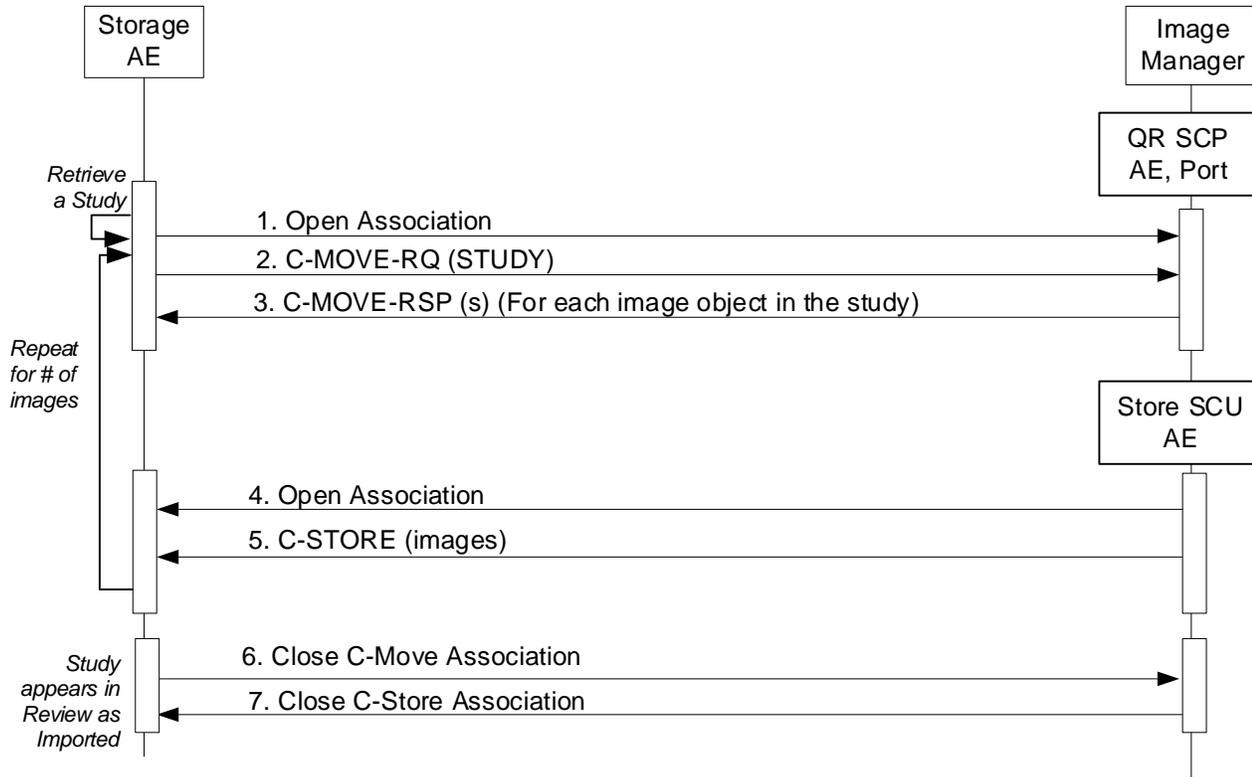
Figure 4e
STUDY LEVEL RETRIEVE SEQUENCE DIAGRAM

Pressing "Retrieve" for a Default Study Level query will result in sending a C-MOVE-RQ message for that Study to the Image Manager. It will respond with the matching C-MOVE-RSP messages for that Study, and will close the association.

The Image Manager will then open an association with the ultrasound system to perform C-STORE operations to store the images to the system for the images listed in the C-MOVE-RSP messages.

Once the transfers are completed, the study will appear in "Review" on the system's "Hard Drive" selection under "Source" and have the status "IMPORTED".

Note again, Structured Reports are included in the Import but will not be displayed with the studies in Review. They will be included in a subsequent export of the study.
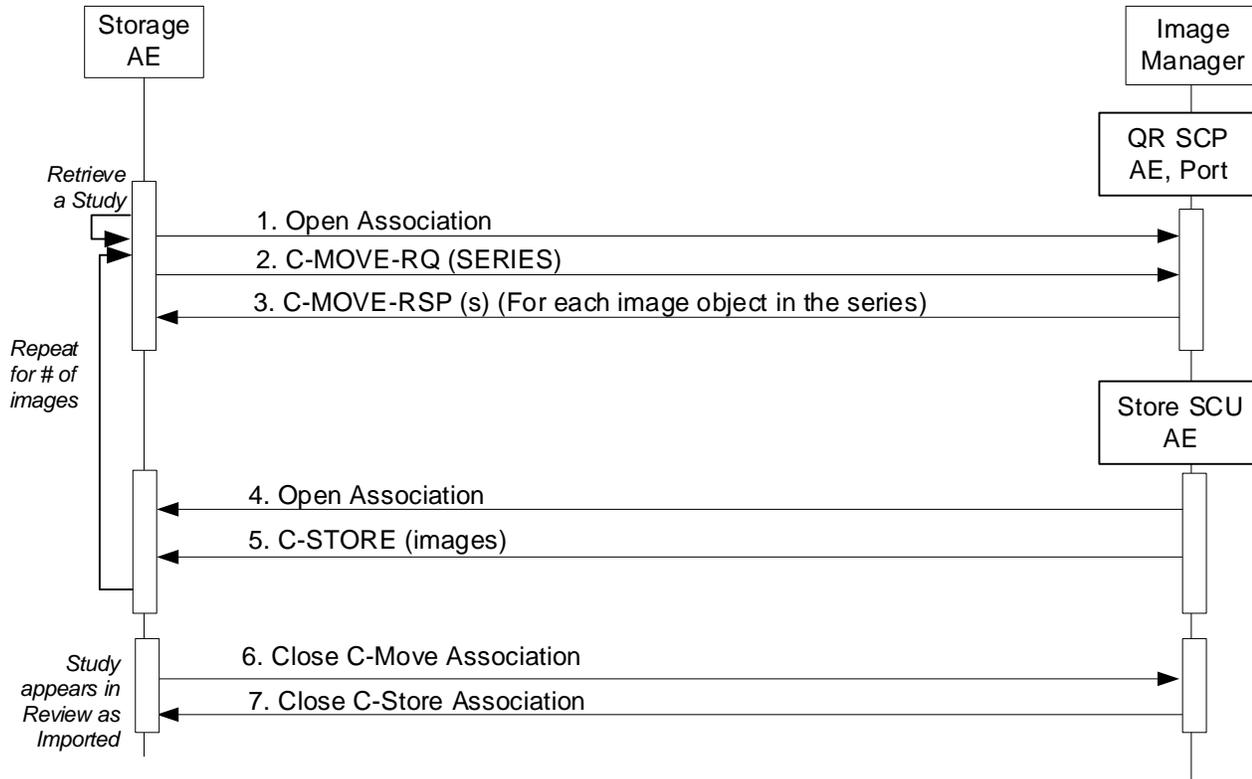
After completing a Series Level query, not pressing the "plus" sign, and selecting Retrieve, the system will send a C-MOVE-RQ message containing the SERIES for retrieval. A C-MOVE-RSP for each image in that series will be returned identifying each object for the Image Manager to send to the system using C-STORE-RQ messages.

As with Study Level Retrieve, the study will appear on the system in "Review" when Source is "Hard Drive" with Status of IMPORTED.

Figure 4f
SERIES LEVEL RETRIEVE SEQUENCE DIAGRAM

4.2.1.3.2.2 Proposed Presentation Contexts

Table 4.17
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY QUERY AND RETRIEVE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**	**Role**	
Study Root Query/Retrieve (C-FIND)	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Study Root Query/Retrieve (C-MOVE)	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

4.2.1.3.2.3 SOP Specific Conformance for SOP Classes

4.2.1.3.2.3.1   Study Root Query Retrieve – FIND SOP Class

Table 4.18
QUERY/RETRIEVE MESSAGE CONTENTS

Request Type	Attribute	Tag	Value
C-FIND	Query/Retrieve Level	(0008,0052)	STUDY, SERIES, IMAGE
	Modality	(0008,0060)	User Set, US by default
	Patient Name	(0010,0010)	User Set, Wildcard ('*') by default
	Patient ID	(0010,0020)	User Set or empty
	Accession Number	(0008,0050)	User Set or empty
	Study Date	(0008,0020)	User Set, available as date range

The system actually performs a number of C-FIND requests at multiple levels in the DICOM object hierarchy to get the data it requires to display a study. The "message" displayed above is the effective combination of the C-FIND requests that are made to get the data in the next table (below).

Table 4.19
C-FIND MESSAGE RESULTS (ATTRIBUTES) REQUESTED

Attribute	Tag
Study Date	(0008,0020)
Study Time	(0008,0030)
Accession Number	(0008,0050)
Modality	(0008,0060)
Patient Name	(0010,0010)
Patient ID	(0010,0020)
Study Instance UID	(0020,000D)
Series Instance UID	(0020,000E)
Study ID	(0020,0010)

4.2.1.3.2.3.2   Study Root Query Retrieve – MOVE SOP Class

After examining the results of the user-initiated Query, the user may select one or more Studies from the query results list and request that the contents of the selected Studies be retrieved. A C-MOVE message is sent to the Query/Retrieve SCP requesting that the selected items be stored back to this system.

Table 4.20
QUERY/RETRIEVE MESSAGE CONTENTS

Request Type	Attribute	Tag	Value
C-MOVE	**Command Set**		
	Move Destination	(0000,0600)	AE of system

Request Type	Attribute	Tag	Value
	Data Set		
	Query/Retrieve Level	(0008,0052)	STUDY, SERIES
	Study Instance UID	(0020,000D)	(Study UID to Send)
	Series Instance UID	(0020,000E)	(Series UID to Send)

4.2.1.3.2.4 Activity – Storage from a Remote Storage SCU

4.2.1.3.2.5 Description and Sequencing of Activities

The Storage AE accepts associations for storage from remote Storage SCUs. There are two distinct scenarios in which images are transferred from a remote Storage SCU to EPIQ/Affiniti:

- Fulfillment of a Query/Retrieve C-MOVE request by the Query/Retrieve SCP
- Unsolicited push of images from a remote Storage SCU

In order for EPIQ/Affiniti to accept associations from a remote Storage SCU, the AE Title of the remote Storage SCU must be configured as a "Storage device" in EPIQ/Affiniti. Studies of images that are received through this mechanism will appear in the Patient Directory, marked as "Imported".

Note: A device may store an image per association – separate associations for each image.
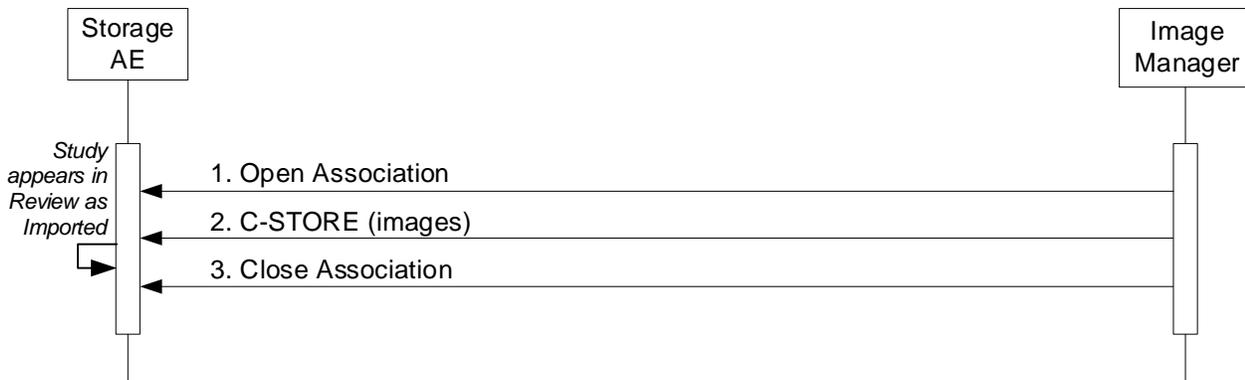
Figure 4g
STORAGE FROM REMOTE STORAGE SCU SEQUENCE DIAGRAM

Accepted Presentation Contexts

Table 4.21 summarizes Presentation Contexts that the Storage AE accepts for this activity.

<div align="center">

Table 4.21
ACCEPTABLE PRESENTATION CONTEXTS FOR
ACTIVITY STORAGE FROM A REMOTE SCU

</div>

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			
Name	**UID**	**Name List**	**UID List**	**Role**	**Ext. Neg.**
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
US Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
US Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
US Multiframe Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			
Name	**UID**	**Name List**	**UID List**	**Role**	**Ext. Neg.**
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
MR Spectroscopy Image Storage	1.2.840.10008.5.1.4.1.1.4.2	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline RLE Lossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP*	None
Private 3D Presentation State	1.3.46.670589.2.5.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

4.2.2 Workflow Application Entity Specification

4.2.2.1   SOP Classes

EPIQ/Affiniti provides Standard Conformance to the following SOP Classes:

Table 4.13
SOP CLASSES FOR AE WORKFLOW

SOP Class Name	SOP Class UID	SCU	SCP
MWL Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	No
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Yes	No

4.2.2.2   Association Policies

4.2.2.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 4.23
DICOM APPLICATION CONTEXT FOR AE WORKFLOW

Application Context Name	1.2.840.10008.3.1.1.1

4.2.2.2.2 Number of Associations

EPIQ/Affiniti initiates one Association at a time for a Worklist request.

Table 4.24
NUMBER OF ASSOCIATIONS INITIATED FOR AE WORKFLOW

Maximum number of simultaneous Associations	1

4.2.2.2.3 Asynchronous Nature

EPIQ/Affiniti does not support asynchronous communication.

Table 4.25
ASYNCHRONOUS NATURE AS A SCU FOR AE WORKFLOW

Maximum number of outstanding asynchronous transactions	1

4.2.2.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

<div align="center">

Table 4.26
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE WORKFLOW

</div>

Implementation Class UID	1.3.46.670589.14.10000.700
Implementation Version Name	EPIQ-AFFIN_7.00

4.2.2.3 Association Initiation Policy

4.2.2.3.1 Activity – Worklist Update

4.2.2.3.1.1 Description and Sequencing of Activities

The Worklist Update activity is capable of updating the modality worklist using either a Broad Query or a Patient Query, as described later in this section. A possible sequence of interactions between the Workflow AE and a Departmental Scheduler (e.g. a device such as a RIS or HIS which supports the MWL SOP Class as an SCP) is illustrated in Figure 5:

<div align="center">
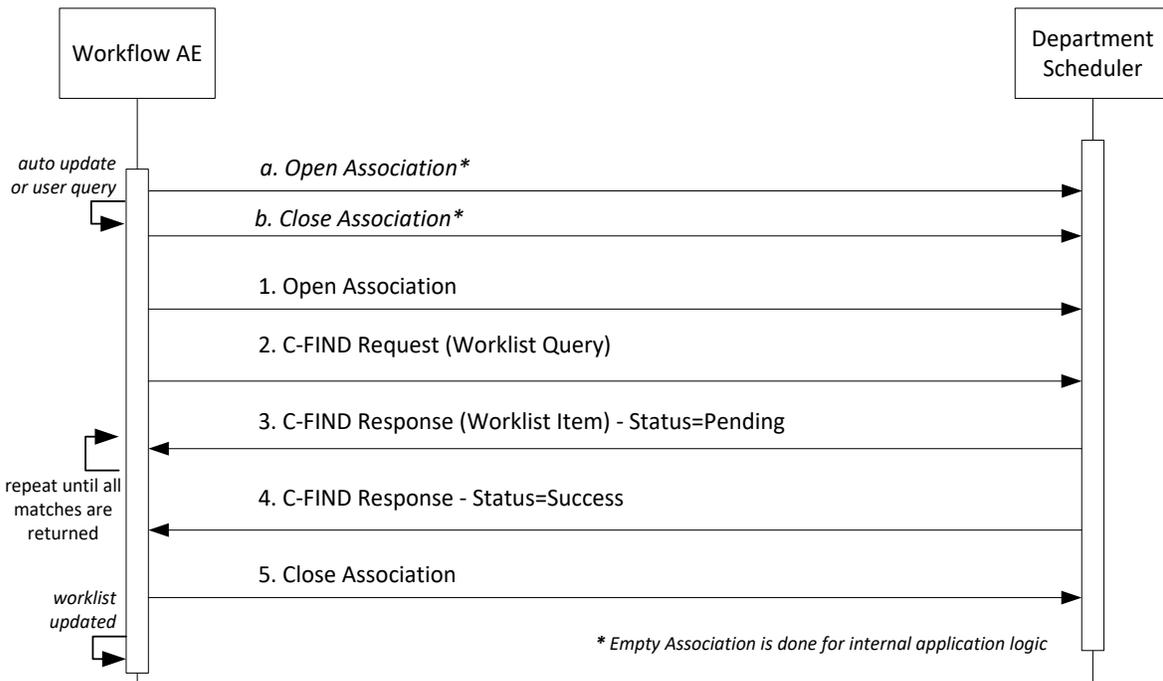
Figure 5
SEQUENCING OF ACTIVITY – WORKLIST UPDATE

</div>

4.2.2.3.1.1.1 Worklist Update using Broad Query – using "Update Worklist"

In Broad Query, the Modality Worklist SCP is queried based on a set of pre-defined query attributes (see Table 4.30 Column "BQ" for DICOM Attributes corresponding to each parameter):

- Scheduled Date = today's date
- Station Name = this system's name or a user-specified value
- Station Location = this system's location or a user-specified value
- AE Title = this system's AE Title or a user-specified value
- Modality = "US" or a user- specified value

The user may configure one of the following schemes for updating the worklist using Broad Query:
- The worklist may be updated when the user presses "Update Worklist" on the patient data entry screen
- The worklist may be updated automatically each time an exam is ended
- The worklist may be updated periodically at a configurable time interval between 15 and 120 minutes in 15 minute increments

The user at may cancel a worklist update anytime between sending the update request and receiving the final response.

4.2.2.3.1.1.2   Worklist Update using Patient Query – using "Search"

In Patient Query, the Modality Worklist SCP is queried based on a set of query attributes provided by the user at the time of the query (see Table 4.30 Column "PQ" for DICOM Attributes corresponding to each parameter):

- Modality = "US" or the custom value defined for Broad Query
- Any combination of
  - Patient Last Name   = wildcard or matching leading letters
  - Patient ID   = exact match
  - Accession Number   = exact match *(no wildcard per VA specialization)*
  - Requested Procedure ID   = exact match *(no wildcard per VA specialization)*
  - Scheduled Date   = exact match or matching a date range around today

Patient Query is performed manually when specifically requested by the user. The user may cancel a worklist update anytime between sending the update request and receiving the final response.

4.2.2.3.1.2 Proposed Presentation Contexts

EPIQ/Affiniti will propose Presentation Contexts as shown in the following table:

Table 4.27
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY WORKLIST UPD

<table>
<tr><th colspan="6">Presentation Context Table</th></tr>
<tr><th colspan="2">Abstract Syntax</th><th colspan="2">Transfer Syntax</th><th rowspan="2">Role</th><th rowspan="2">Ext. Neg.</th></tr>
<tr><th>Name</th><th>UID</th><th>Name List</th><th>UID List</th></tr>
<tr><td>Modality Worklist Information Model – FIND</td><td>1.2.840.10008.5.1.4.31</td><td>Implicit VR Little Endian
Explicit VR Little Endian</td><td>1.2.840.10008.1.2
1.2.840.10008.1.2.1</td><td>SCU</td><td>None</td></tr>
</table>

4.2.2.3.1.3 SOP Specific Conformance for Modality Worklist

Table 4.28 summarizes the behavior of EPIQ/Affiniti when encountering status codes in a MWL C-FIND response.

A message "query failed" will appear on the user interface if EPIQ/Affiniti receives any other SCP response status than "Success" or "Pending."

Table 4.28
MODALITY WORKLIST C-FIND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Matching is complete	0000	The system replaced the worklist from the response.

Service Status	Further Meaning	Error Code	Behavior
Refused	Out of Resources	A700	The Association is aborted using A-ABORT. The worklist is not replaced.
Failed	Identifier does not match SOP Class	A900	Same as "Refused" above.
Failed	Unable to Process	C000 – CFFF	Same as "Refused" above.
Cancel	Matching terminated due to Cancel request	FE00	The retrieved items are ignored.
Pending	Matches are continuing	FF00	Continue.
Pending	Matches are continuing – Warning that one or more Optional Keys were not supported	FF01	Continue.
*	*	Any other status code.	Same as "Refused" above.

Table 4.29 summarizes the behavior of EPIQ/Affiniti during communication failure.

Table 4.29
MODALITY WORKLIST COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	Same as Service Status "Refused" in the table above.
Association aborted by the SCP or network layers	Same as Service Status "Refused" in the table above.

Table 4.30 describes the EPIQ/Affiniti Worklist Matching Keys and requested attributes. Unexpected attributes returned in a C-FIND response are ignored.

Non-matching responses returned by the SCP due to unsupported optional matching keys are ignored.

Table 4.30
WORKLIST MATCHING KEYS

Module Name / Attribute Name	Tag	VR	BQ	PQ	R	D	IOD	M	SD
SOP Common									
Specific Character Set	(0008,0005)	CS			x				
Scheduled Procedure Step									
Scheduled Procedure Step Sequence	(0040,0100)	SQ			x				
> Scheduled Station AE Title	(0040,0001)	AE	(S)		x				
> Scheduled Procedure Step Start Date	(0040,0002)	DA	S	x	x	x			
> Scheduled Procedure Step Start Time	(0040,0003)	TM			x	x			
> Modality	(0008,0060)	CS	S, (S)	x	x	x	x	x	
> Scheduled Procedure Step Description	(0040,0007)	LO			x	x	x	x	2
> Scheduled Protocol Code Sequence	(0040,0008)	SQ			x		x	x	
>>Code Value	(0008,0100)	SH			x		x	x	
>>Coding Scheme Designator	(0008,0102)	SH			x		x	x	
>>Code Meaning	(0008,0104)	LO			x	x	x	x	3
> Scheduled Station Name	(0040,0010)	SH	(S)		x				
> Scheduled Procedure Step Location	(0040,0011)	SH	(S)		x				
> Pre-Medication	(0040,0012)	LO			x		x		
> Scheduled Procedure Step ID	(0040,0009)	SH			x		x	x	
> Requested Contrast Agent	(0032,1070)	LO			x		x		
Requested Procedure									
Requested Procedure ID	(0040,1001)	SH		x	x	x	x[note3]	x[note3]	
Requested Procedure Priority	(0040,1003)	SH			x		x		
Patient Transport Arrangements	(0040,1004)	LO			x		x		
Requested Procedure Description	(0032,1060)	LO			x	x[note1]	x	x	1
Study Instance UID	(0020,000D)	UI			x		x	x	
Referenced Study Sequence	(0008,1110)	SQ			x		x	x	
>Referenced SOP Class UID	(0008,1150)	UI			x		x	x	
>Referenced SOP Instance UID	(0008,1155)	UI			x		x	x	
Requested Procedure Code Sequence	(0032,1064)	SQ			x		x[note2]	x[note2]	
>>Code Value	(0008,0100)	SH			x		x	x	
>>Coding Scheme Designator	(0008,0102)	SH			x		x	x	
>>Code Meaning	(0008,0104)	LO			x	x	x	x	
Names of Intended Recipients of Results	(0040,1010)	PN			x	x	x		
Imaging Service Request									
Accession Number	(0008,0050)	SH		x	x	x	x	x	
Requesting Physician	(0032,1032)	PN			x		x		
Visit Relationship									
Referenced Patient Sequence	(0008,1120)	SQ			x		x		
>Referenced SOP Class UID	(0008,1150)	UI			x		x		
>Referenced SOP Instance UID	(0008,1155)	UI			x		x		
Visit Admission									
Referring Physician's Name	(0008,0090)	PN			x	x	x		
Admitting Diagnosis Description	(0008,1080)	LO			x		x		
Patient Identification									
Patient's Name	(0010,0010)	PN		x	x	x	x	x	
Patient ID	(0010,0020)	LO		x	x	x	x	x	
Other Patient IDs	(0010,1000)	LO			x	x	x		
Patient Demographic									
Patient's Birth Date	(0010,0030)	DA			x	x	x	x	
Patient's Sex	(0010,0040)	CS			x	x	x	x	
Patient Size	(0010,1020)	DS			x	x	x		
Ethnic Group	(0010,2160)	SH			x		x		
Patient's Weight	(0010,1030)	DS			x	x	x		
Patient Comments	(0010,4000)	LT			x	x	x		
Patient Medical									
Medical Alerts	(0010,2000)	LO			x		x		
Allergies	(0010,2110)	LO			x		x		

Module Name Attribute Name	Tag	VR	BQ	PQ	R	D	IOD	M	SD
Additional Patient's History	(0010,21B0)	LT			x		x		
Pregnancy Status	(0010,21C0)	US			x		x		
Special Needs	(0038,0050)	LO			x		x		

Note 1: If present, Requested Procedure Description (0032,1060) is displayed as Study Description.

Note 2: Requested Procedure Code Sequence (0032,1064) is exported as Procedure Code Sequence (0008,1032)

Note 3: Additionally mapped to "Study ID" (0020,0010) in Composite Objects

The above table should be read as follows:

Module Name: The name of the associated module for supported worklist attributes.

Attribute Name: Attributes supported to build a Worklist Request Identifier.

Tag: DICOM tag for this attribute.

VR: DICOM VR for this attribute.

BQ: Matching keys for Broad Query Worklist Update. An "S" indicates that EPIQ/Affiniti supplies an attribute value for Single Value Matching or additional specific attributes indicated by "(S)". Criteria are specified in PSC - Network/DICOM - DICOM Settings - Worklist device - Advanced Settings dialog.

PQ: Interactive Query Key for Patient Query Worklist Update. An "x" indicates that EPIQ/Affiniti supplies this attribute as matching key. Criteria are specified in the Search dialog accessed from Patient Data Entry screen Worklist tab.

R: Return keys. An "x" indicates that EPIQ/Affiniti supplies this attribute as a Return Key with zero length for Universal Matching.

D: Displayed keys. An "x" indicates that this worklist attribute is displayed to the user in the Patient Data Entry screen or Worklist Directory.

IOD: An "x" indicates that this Worklist attribute is included into all Object Instances created during performance of the related Procedure Step.

M: An "x" indicates that this Worklist attribute is included in MPPS N-CREATE and/or N-SET requests.

SD: A numeric value in this column indicates the attribute is a possible value of Study Description (0008,1030). Starting with attribute marked "1", the first non-empty attribute value found becomes the value of Study Description in exported objects. See Study Description (0008,1030) in Table 9.6.

4.2.2.3.2 Activity – Acquire Images

4.2.2.3.2.1 Description and Sequencing of Activities

An Association to the configured MPPS SCP system is established immediately after the first image is acquired to send the MPPS N-CREATE message with status of "IN PROGRESS".

The "End Exam" button causes a "COMPLETED" status in the N-SET message. An exam for which an MPPS Instance is sent with a status of "COMPLETED" can no longer be updated. The only exception is when a scheduled study is reselected from Modality Worklist to append additional images. A new set of MPPS messages will be generated for the append study.

The "Cancel Exam" button causes a "DISCONTINUED" message. An exam for which an MPPS Instance is sent with a state of "DISCONTINUED" can also no longer be updated.

The system supports creation of "unscheduled cases" by allowing MPPS Instances to be communicated for locally registered Patients.

The system performs a single Performed Procedure Step at a time per Scheduled Procedure Step.

EPIQ/Affiniti will initiate an Association to issue an:

— N-CREATE request according to the Create Modality Performed Procedure Step SOP Instance operation or a

— N-SET request to finalize the contents and state of the MPPS according to the Set Modality Performed Procedure Step Information operation.
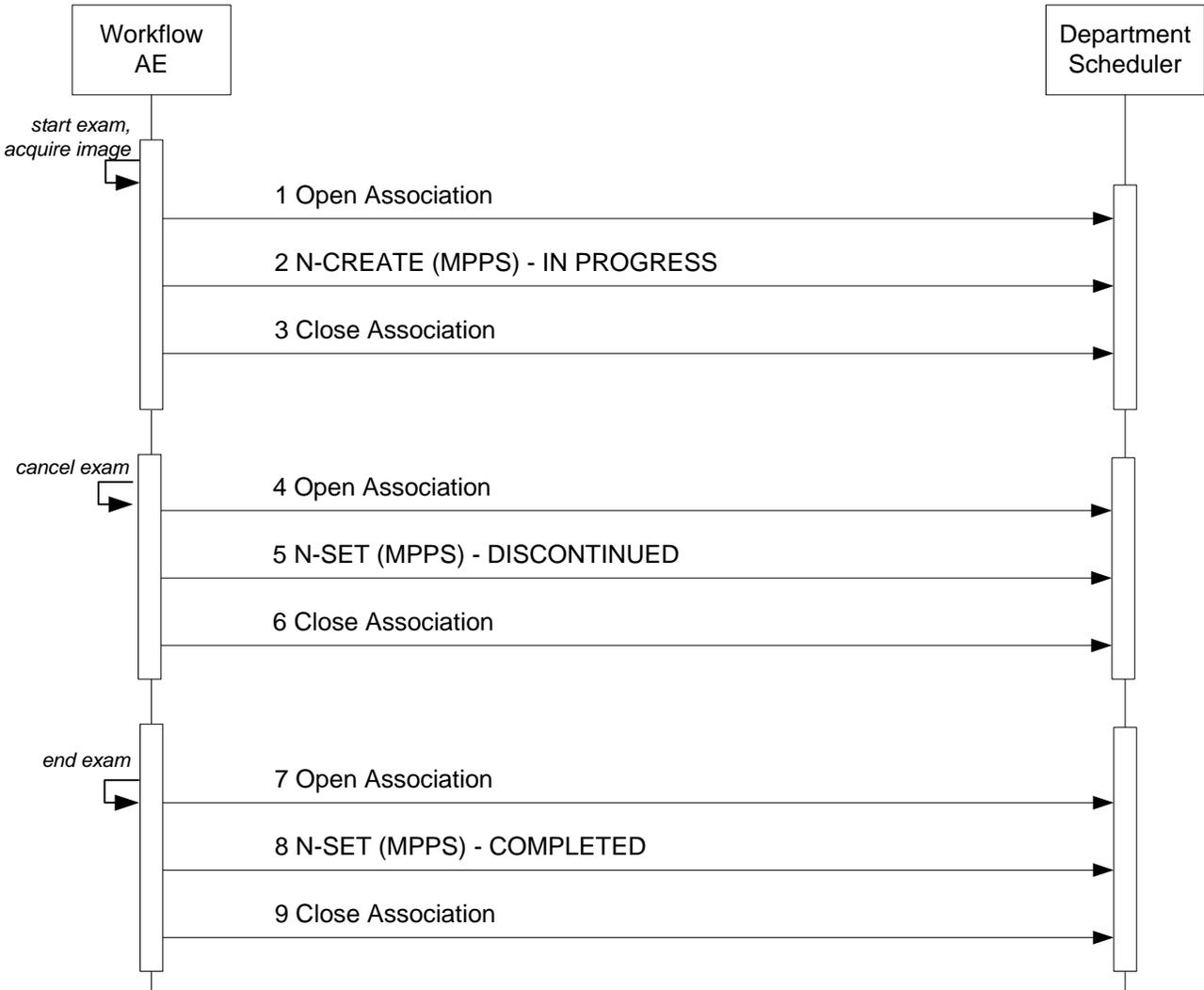
Figure 6
SEQUENCING OF ACTIVITY – ACQUIRE IMAGES

A possible sequence of interactions between the Workflow AE and a Departmental Scheduler (e.g. a device such as a RIS or HIS which supports the MPPS SOP Class as an SCP) is illustrated in Figure 6.

Note: The Cancel and End Exam commands are mutually exclusive. They are both represented here for illustration purposes only. Actual workflow uses one or the other for a given exam. No PPS message for "Paused" exam.

4.2.2.3.2.2 Proposed Presentation Contexts

EPIQ/Affiniti will propose Presentation Contexts as shown in the following table:

Table 4.31
PROPOSED PRESENTATION CONTEXTS FOR REAL-WORLD ACTIVITY ACQUIRE IMAGES

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			
Name	**UID**	**Name List**	**UID List**	**Role**	**Ext. Neg.**
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

4.2.2.3.2.3 SOP Specific Conformance for MPPS

Table 4.32 summarizes the behavior of EPIQ/Affiniti when encountering status codes in an MPPS N-CREATE or N–SET response.

Table 4.32
MPPS N-CREATE / N-SET RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Failure	Processing Failure – Performed Procedure Step Object may no longer be updated	0110	The Association is aborted.
Warning	Attribute Value Out of Range	0116H	The error message is displayed.
*	*	Any other status code.	Same as "Failure" above.

Table 4.33 summarizes the behavior of EPIQ/Affiniti during communication failure.

Table 4.33
MPPS COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	Same as "Failure" above.
Association aborted by the SCP or network layers	Same as "Failure" above.

Table 4.34 provides a description of the MPPS N-CREATE and N-SET request identifiers. Empty cells in the N-CREATE and N-SET columns indicate that the attribute is not sent.

Table 4.14
MPPS N-CREATE / N-SET REQUEST IDENTIFIER

Attribute Name	Tag	VR	N-CREATE	N-SET
Specific Character Set	(0008,0005)	CS	Sent only if replacement character set is used.	Sent only if replacement character set is used.
Modality	(0008,0060)	CS	US	
Referenced Patient Sequence	(0008,1120)	SQ	Zero length	

Attribute Name	Tag	VR	N-CREATE	N-SET
Patient's Name	(0010,0010)	PN	From Modality Worklist or user input.	
Patient ID	(0010,0020)	LO	From Modality Worklist or user input.	
Patient's Birth Date	(0010,0030)	DA	From Modality Worklist or user input.	
Patient's Sex	(0010,0040)	CS	From Modality Worklist or user input.	
Study ID	(0020,0010)	SH	From Requested Procedure ID from MWL, else System Generated <yyyymmdd.hhmmss>	
Performed Station AE Title	(0040,0241)	AE	From Ultrasound System Configuration; see 4.4.2	
Performed Station Name	(0040,0242)	SH	From Ultrasound System Configuration; see 4.4.2	
Performed Location	(0040,0243)	SH	From Ultrasound System Configuration; see 4.4.2	
Performed Procedure Step Start Date	(0040,0244)	DA	Actual start date	
Performed Procedure Step Start Time	(0040,0245)	TM	Actual start time	
Procedure Code Sequence	(0008,1032)	SQ	Mapped from Requested Procedure Code Sequence (0032,1064) from MWL	Mapped from Requested Procedure Code Sequence (0032,1064) from MWL
Performed Procedure Step End Date	(0040,0250)	DA	Zero length	Actual end date
Performed Procedure Step End Time	(0040,0251)	TM	Zero length	Actual end time
Performed Procedure Step Status	(0040,0252)	CS	IN PROGRESS	COMPLETED or DISCONTINUED
Performed Procedure Step ID	(0040,0253)	SH	Auto generated <yyyymmdd.hhmmss>	
Performed Procedure Step Description	(0040,0254)	LO	Mapped from Scheduled Procedure Description (0040,0007) from MWL or user entered	Same
Performed Procedure Type Description	(0040,0255)	LO	Zero length	
Performed Protocol Code Sequence	(0040,0260)	SQ	Zero length OR corresponding to built-in Staged Protocols OR mapped from MWL Scheduled Protocol Code Sequence (0040,0008)	Same

Attribute Name	Tag	VR	N-CREATE	N-SET
Scheduled Step Attributes Sequence	(0040,0270)	SQ		
> Accession Number	(0008,0050)	SH	From MWL or user entered. MWL value may be edited.	
> Referenced Study Sequence	(0008,1110)	SQ	One item per item in the MWL Reference Study Sequence. Absent if unscheduled.	
>> Referenced SOP Class UID	(0008,1150)	UI	Same value as in of the Reference Study Sequence in the MWL	
>> Referenced SOP Instance UID	(0008,1155)	UI	Same value as in of the Reference Study Sequence in the MWL	
> Study Instance UID	(0020,000D)	UI	Same value as in MWL attribute or system generated	
> Requested Procedure Description	(0032,1060)	LO	Same value as in MWL attribute	
> Scheduled Procedure Step Description	(0040,0007)	LO	Same value as in MWL attribute	
> Scheduled Protocol Code Sequence	(0040,0008)	SQ	Same value as in MWL attribute	
> Scheduled Procedure Step ID	(0040,0009)	SH	Same value as in MWL attribute	
> Requested Procedure ID	(0040,1001)	SH	Same value as in MWL attribute	
Performed Series Sequence	(0040,0340)	SQ	Zero length	One item per acquired series
> Retrieve AE Title	(0008,0054)	AE		
> Series Description	(0008,103E)	LO		Study Description derived from MWL or user entered
> Performing Physician's Name	(0008,1050)	PN		Empty
> Operator's Name	(0008,1070)	PN		MWL Scheduled Performing Physician's Name (0040,0006) From PDE "Exam Performed By" field
> Referenced Image Sequence	(0008,1140)	SQ		One item per referenced image instance
>> Referenced SOP Class UID	(0008,1150)	UI		SOP Class UID of acquired instance
>> Referenced SOP Instance UID	(0008,1155)	UI		SOP Instance UID of acquired instance
> Protocol Name	(0018,1030)	LO		See Table 9.9

Attribute Name	Tag	VR	N-CREATE	N-SET
> Series Instance UID	(0020,000E)	UI		System generated
> Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)	SQ		One item per referenced non-image instance
>> Referenced SOP Class UID	(0008,1150)	UI		SOP Class UID of acquired instance
>> Referenced SOP Instance UID	(0008,1155)	UI		SOP Instance UID of acquired instance

4.2.2.4 Association Acceptance Policy

The Workflow Application Entity does not accept Associations.

4.2.3 Hardcopy Application Entity Specification

4.2.3.1 SOP Classes

EPIQ/Affiniti provides Standard Conformance to the following SOP Classes:

Table 4.35
SOP CLASSES FOR AE HARDCOPY

SOP Class Name	SOP Class UID	SCU	SCP
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Yes	No
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Yes	No

4.2.3.2 Association Policies

4.2.3.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 4.36
DICOM APPLICATION CONTEXT FOR AE HARDCOPY

Application Context Name	1.2.840.10008.3.1.1.1

4.2.3.2.2 Number of Associations

EPIQ/Affiniti initiates one Association at a time for each configured hardcopy device. Multiple hardcopy devices can be configured.

Table 4.37
NUMBER OF ASSOCIATIONS INITIATED FOR AE HARDCOPY

Maximum number of simultaneous Associations	2 (number of configured hardcopy devices)

4.2.3.2.3 Asynchronous Nature

EPIQ/Affiniti does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4.38
ASYNCHRONOUS NATURE AS A SCU FOR AE HARDCOPY

Maximum number of outstanding asynchronous transactions	1

4.2.3.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 4.39
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE HARDCOPY

Implementation Class UID	1.3.46.670589.14.10000.700
Implementation Version Name	EPIQ-AFFIN_7.00

4.2.3.3 Association Initiation Policy

4.2.3.3.1 Activity – Film Images

4.2.3.3.1.1 Description and Sequencing of Activities

The system composes images onto film sheets and sends print requests to job queue.
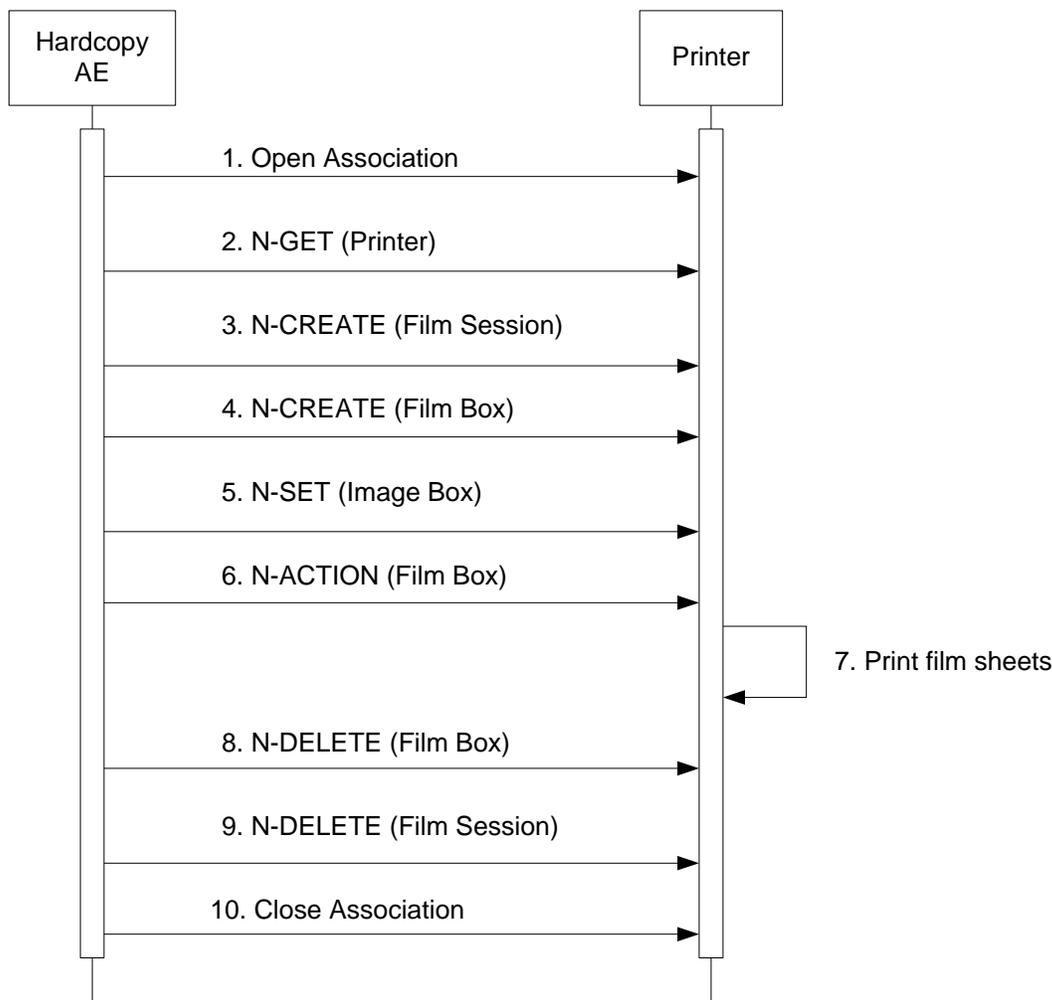
Figure 7
SEQUENCING OF ACTIVITY – PRINT IMAGES

Figure 7 illustrates a typical sequence of DIMSE messages sent over an association between Hardcopy AE and a Printer. Two DICOM Printers may be simultaneously configured, one for BW and one for Color prints.

If both BW and Color printers are configured and selected, the user may choose to automatically send BW prints only to the BW printer and color prints only to the color printer. This feature may only be used while configured for "After Each Print/Acquire".

When using the "Send on Demand" feature with print, page(s) that have not been exported will be sent, according to the formatting configuration. If less than a full page is sent, then the remaining space on the page will be left blank.

Status of the print-job is reported through the Printer Queue Manager icon. Only one job will be active at a time for each separate hardcopy device. If any Response from the remote Application contains a status other than Success, the Association is aborted and the related Job is switched to a failed state. It can be restarted any time by user interaction.

4.2.3.3.1.2 Proposed Presentation Contexts

Table 4.40 shows the Presentation Contexts EPIQ/Affiniti is capable of proposing.

Table 4.40
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY FILM IMAGES

Presentation Context Table					
Abstract Syntax		Transfer Syntax			
Name	UID	Name List	UID List	Role	Ext. Neg.
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

4.2.3.3.1.3 SOP Specific Conformance for all Print SOP Classes

Table 4.41 summarizes the general behavior of all Hardcopy AE during communication failure. This behavior is common for all SOP Classes supported by Hardcopy AE.

Table 4.41
COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	The Association is aborted and reported as "Failed."
Association aborted by the SCP or network layers	"Network Communication Failure" is reported.

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.3.3.1.3.1   Printer SOP Class Operations (N-GET)

Hardcopy AE uses the Printer SOP Class N-GET operation to obtain information about the current printer status. Table 4.42 lists the attributes obtained via N-GET.

Table 4.42
PRINTER SOP CLASS N-GET RESPONSE ATTRIBUTES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Printer Status	(2110,0010)	CS	Provided by Printer	ALWAYS	Printer
Printer Status Info	(2110,0020)	CS	Provided by Printer	ALWAYS	Printer

The Printer Status information is evaluated as follows:

1. If Printer status (2110,0010) is NORMAL, the print-job continues to be printed.

2. If Printer status (2110,0010) is FAILURE, the print-job is marked as failed.

3. If Printer status (2110,0010) is WARNING, the print-job continues to be printed.

Table 4.43 summarizes the behavior of Hardcopy AE when encountering status codes in an N-GET response.

Table 4.43
PRINTER SOP CLASS N-GET RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The request to get printer status information was success.
*	*	Any other status code.	Same as Timeout above.

4.2.3.3.1.3.2 Printer SOP Class Notifications (N-EVENT-REPORT)

Hardcopy AE is capable of receiving an N-EVENT-REPORT request at any time during an association.

Table 4.44 summarizes the behavior of Hardcopy AE when receiving Event Types within the N-EVENT-REPORT.

Table 4.44
PRINTER SOP CLASS N-EVENT-REPORT BEHAVIOUR

Event Type Name	Event Type ID	Behavior
Normal	1	The print-job continues to be printed.
Warning	2	The print-job. For user-recoverable warnings, the job fails and a 1-hour retry period starts, retrying every 20 seconds.
Failure	3	The print-job is marked as failed.
*	*	Status code of 0113H

Table 4.45 summarizes the reasons for returning specific status codes in an N-EVENT-REPORT response.

Table 4.45
PRINTER SOP CLASS N-EVENT-REPORT RESPONSE STATUS REASONS

Service Status	Further Meaning	Error Code	Reasons
Success	Success	0000	The notification event has been successfully received.
Failure	No Such Event Type	0113H	An invalid Event Type ID was supplied in the N-EVENT-REPORT request.
Failure	Processing Failure	0110H	An internal error occurred during processing of the N-EVENT-REPORT. A short description of the error will be returned in Error Comment (0000,0902).

4.2.3.3.1.3.3 SOP Specific Conformance for the Film Session SOP Class

Hardcopy AE supports the following DIMSE operations for the Film Session SOP Class:

— N-CREATE

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.3.3.1.3.4   Film Session SOP Class Operations (N-CREATE)

Table 4.46 lists the attributes supplied in an N-CREATE Request.

Table 4.46
FILM SESSION SOP CLASS N-CREATE REQUEST ATTRIBUTES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Copies	(2000,0010)	IS	Default 1. User defined in Device Configuration.	ALWAYS	USER
Print Priority	(2000,0020)	CS	HIGH	ALWAYS	AUTO
Medium Type	(2000,0030)	CS	BLUE FILM, CLEAR FILM or PAPER*	ALWAYS	USER
Film Destination	(2000,0040)	CS	MAGAZINE or PROCESSOR*	ALWAYS	USER
Film Session Label	(2000,0050)	LO	Philips Medical Systems	ALWAYS	AUTO

*Dependent on the specific printer selected

Table 4.47 summarizes the behavior of Hardcopy AE when encountering status codes in an N-CREATE response.

Table 4.47
FILM SESSION SOP CLASS N-CREATE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Warning	Attribute Value Out of Range	0116H	System continues operations.
Warning	Attribute List Error	0107H	Same as above.
*	*	Any other status code.	The Association is aborted and the print-job fails.

4.2.3.3.1.4 SOP Specific Conformance for the Film Box SOP Class

Hardcopy AE supports the following DIMSE operations for the Film Box SOP Class:

— N-CREATE
— N-ACTION

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.3.3.1.4.1   Film Box SOP Class Operations (N-CREATE)

Table 4.48 lists the attributes supplied in an N-CREATE Request.

Table 4.48
FILM BOX SOP CLASS N-CREATE REQUEST ATTRIBUTES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Display Format	(2010,0010)	ST	STANDARD\1,1 [3] or CUSTOM\xxx depending on printer. Default is displayed, and is user editable. Edit only when a valid substitute value is known.	ALWAYS	AUTO/USER
Referenced Film Session Sequence	(2010,0500)	SQ		ALWAYS	AUTO
>Referenced SOP Class UID	(0008,1150)	UI	1.2.840.10008.5.1.1.1	ALWAYS	AUTO
>Referenced SOP Instance UID	(0008,1155)	UI	From created Film Session SOP Instance	ALWAYS	AUTO
Film Orientation	(2010,0040)	CS	PORTRAIT or LANDSCAPE	ALWAYS	USER
Film Size ID	(2010,0050)	CS	Depends on configuration file selected. DICOM Defined Terms plus US_LETTER.	ALWAYS	USER
Magnification Type	(2010,0060)	CS	Default Value = NONE, depending on printer	ANAP	AUTO
Min Density	(2010,0120)	US	Default value displayed, user editable	ALWAYS	AUTO/USER
Max Density	(2010,0130)	US	Default value displayed, user editable	ALWAYS	AUTO/USER
Trim	(2010,0140)	CS	NO	ALWAYS	AUTO
Configuration Information	(2010,0150)	ST	Default value displayed, user editable. Edit only when a valid substitute value is known.	ALWAYS	AUTO/USER

Table 4.49 summarizes the behavior of Hardcopy AE when encountering status codes in an N-CREATE response.

Table 4.49
FILM BOX SOP CLASS N-CREATE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Warning	Requested Max Density outside of printer's operating range	B605H	The N-CREATE operation is considered successful but the status meaning is logged.
*	*	Any other status code.	The Association is aborted and the job failed.

---

[3] EPIQ/Affiniti performs page compositing of n-up prints (i.e., 2x2, 2,3, etc.) internally and prints the pages as a single Image Box per page; hence STANDARD\1,1

4.2.3.3.1.4.2   Film Box SOP Class Operations (N-ACTION)

The Hardcopy AE issues an N-ACTION Request to instruct the Print SCP to print the contents of the Film Box.

Table 4.50 summarizes the behavior of Hardcopy AE when encountering status codes in an N-ACTION response.

Table 4.50
FILM BOX SOP CLASS N-ACTION RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. The film has been accepted for printing.
Warning	Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page)	B603H	The Association is aborted and the job is failed.
Failure	Unable to create Print Job SOP Instance; print queue is full.	C602	Same as B603H above.
*	*	Any other status code.	Same as B603H above.

4.2.3.3.1.5 SOP Specific Conformance for the Image Box SOP Class

Hardcopy AE supports the following DIMSE operations for the Image Box SOP Class:

— N-SET

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.3.3.1.5.1   Image Box SOP Class Operations (N-SET)

Table 4.51 lists the attributes supplied in an N-SET Request.

Table 4.51
IMAGE BOX SOP CLASS N-SET REQUEST ATTRIBUTES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Position	(2020,0010)	US	1	ALWAYS	AUTO
Polarity	(2020,0020)	CS	NORMAL	ALWAYS	AUTO
Basic Grayscale Image Sequence	(2020,0110)	SQ	Used for BW (Monochrome2) print	ALWAYS*	AUTO
Basic Color Image Sequence	(2020,0111)	SQ	Used for Color (RGB) print	ALWAYS*	AUTO
>Samples Per Pixel	(0028,0002)	US	1 for Monochrome2 3 for RGB	ALWAYS	AUTO
>Photometric Interpretation	(0028,0004)	CS	MONOCHROME2 RGB	ALWAYS	AUTO
Planar Configuration	(0028,0006)	US	Always "01", only used for RGB print.	ANAP	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
>Rows	(0028,0010)	US	Depends on film size, number of rows for entire sheet of film	ALWAYS	Printer Configuration File
>Columns	(0028,0011)	US	Depends on film size, number of columns for entire sheet of film	ALWAYS	Printer Configuration File
>Bits Allocated	(0028,0100)	US	8	ALWAYS	AUTO
>Bits Stored	(0028,0101)	US	8	ALWAYS	AUTO
>High Bit	(0028,0102)	US	7	ALWAYS	AUTO
>Pixel Representation	(0028,0103)	US	0	ALWAYS	AUTO
>Pixel Data	(7FE0,0010)	OW	Pixels of rendered film sheet.	ALWAYS	AUTO

* Mutually exclusive attributes

Table 4.52 summarizes the behavior of Hardcopy AE when encountering status codes in an N-SET response.

Table 4.52
IMAGE BOX SOP CLASS N-SET RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Failure	Insufficient memory in printer to store the image.	C605	The Association is aborted and the job is failed.
*	*	Any other status code.	Same as C605 above.

4.2.3.4   Association Acceptance Policy

The Hardcopy Application Entity does not accept Associations.

4.2.4 Verification Application Entity specification

4.2.4.1   SOP Class

EPIQ/Affiniti provides Standard Conformance to the following SOP Class:

Table 4.53
SOP CLASSES FOR AE VERIFICATION

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	Yes

4.2.4.2 Association Policies

4.2.4.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 4.54
DICOM APPLICATION CONTEXT FOR AE VERIFICATION

Application Context Name	1.2.840.10008.3.1.1.1

4.2.4.2.2 Number of Associations

EPIQ/Affiniti initiates one Association at a time for a Verification request.

Table 4.55
NUMBER OF ASSOCIATIONS INITIATED FOR AE VERIFICATION

Maximum number of simultaneous Associations	Up to 10, one for each configured remote device

Table 4.56
NUMBER OF ASSOCIATIONS ACCEPTED FOR AE VERIFICATION

Maximum number of simultaneous Associations	Unlimited, however, calling AE must be already configured in EPIQ/Affiniti.

4.2.4.2.3 Asynchronous Nature

EPIQ/Affiniti does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4.57
ASYNCHRONOUS NATURE AS A SCU FOR AE VERIFICATION

Maximum number of outstanding asynchronous transactions	1

4.2.4.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 4.58
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE VERIFICATION

Implementation Class UID	1.3.46.670589.14.10000.700
Implementation Version Name	EPIQ-AFFIN_7.00

4.2.4.3   Association Initiation Policy

4.2.4.3.1   Activity – Verify Remote SCP

4.2.4.3.1.1   Description and Sequencing of Activities

The user selecting the "Verify" button on the Device configuration page initiates the verification request to the device whose data has just been configured. This tool allows the user to ensure all data (AE Title, Port and IP Address) was correctly entered and the remote device may be contacted. It uses C-Echo and verifies the remote device supports all configured SOP Classes. Any SOP Classes requested that are not supported will report "failed". Operations may continue, but objects of the type that are not supported will not be exported.

EPIQ/Affiniti initiates an Association in order to issue:

— C-ECHO request according to the Verification SOP Class.
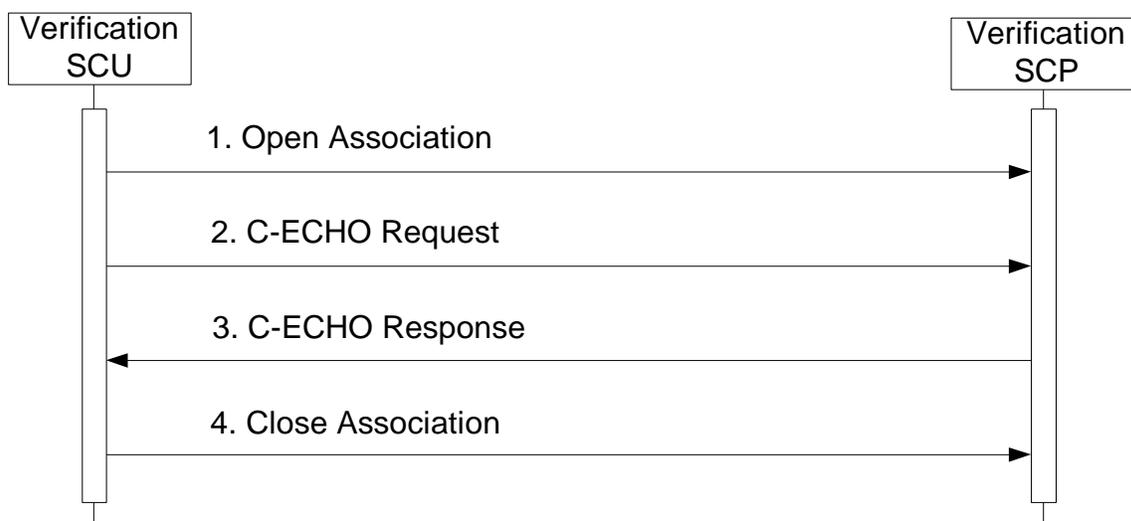
Figure 8a
SEQUENCING OF ACTIVITY – ISSUE VERIFY

4.2.4.3.1.2   Proposed Presentation Contexts

EPIQ/Affiniti will propose Presentation Contexts as shown in the following table:

Table 4.59
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY VERIFICATION

Presentation Context Table					
Abstract Syntax		Transfer Syntax			
Name	UID	Name List	UID List	Role	Ext. Neg.
Verification	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

4.2.4.3.1.3 SOP Specific Conformance for Verification

When Verification of a remote AE is requested in PSC – Network/DICOM – DICOM Settings, the Association Negotiation Request message contents for each DICOM device will include Presentation Contexts for the following SOP Classes:

Table 4.60
SOP CLASS VERIFICATION BY DICOM DEVICE

Device Type	SOP Classes Requested	Additional Notes
DICOM Storage Server	Storage SOP Classes from Table 4.7 Study Root Query/Retrieve – FIND Study Root Query/Retrieve – MOVE An additional "Storage Server" entry is needed to allow the ultrasound system to "know" the AE Title of the Q/R Servers "sending" SCU. Otherwise, storage associations from the QR server will be rejected. Verification	If SR export to a Storage Server is desired & supported, select Export SR before in Advanced settings. Storage Commitment requires configuration of both a Storage server and a Storage Commitment server, and association of the Storage server to the Storage Commitment server in the PSC – Network/DICOM – DICOM Selection page.
DICOM Commit Server	Storage Commitment Push Model Verification	Storage Commitment requires configuration of both a Storage server and a Storage Commitment server, and association of the Storage server to the Storage Commitment server in the PSC – Network/DICOM – DICOM Selection page.
DICOM PPS Server	Modality Performed Procedure Step Verification	To activate this server, it must be selected in the PSC – Network/DICOM – DICOM Selection page.
DICOM Worklist Server	Modality Worklist Verification	To activate this server, it must be selected in the PSC – Network/DICOM – DICOM Selection page.

Device Type	SOP Classes Requested	Additional Notes
DICOM Structured Report Server	Comprehensive Structured Report Storage Verification	Configuration of this device is only required if SRs are to be exported to a dedicated Structured Report Server Storage SCP. To activate this server, it must be selected in the PSC – Network/DICOM – DICOM Selection page. Note: SR exports to this configured server ONLY occur at End of the Exam.
DICOM BW Printer	Basic Grayscale META Print Verification	All BW printers configure this entry. If the printer supports both BW and Color, then this must be configured to allow BW on that printer.
DICOM Color Printer	Basic Color META Print Verification	May be the same printer if color is also supported.

Table 4.61 summarizes the behavior of EPIQ/Affiniti when receiving status codes in a C-ECHO response.

Table 4.61
VERIFICATION C-ECHO RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success		0000	Device Status is set to: Verified
Refused	Out of Resources	A700	Device Status is set to: Not Verified
Failed	Unable to Process	C000 – CFFF	Device Status is set to: Not Verified
*	*	Any other status code.	Device Status is set to: Not Verified

Results of a user-initiated Verify are reported as one of three outcomes:

- Successfully Verified – All SOP Classes proposed by EPIQ/Affiniti were accepted

- Verify Failed – Server could not be reached OR remote AE is not running OR no SOP Classes proposed by EPIQ/Affiniti were accepted OR C-ECHO did not return "Success"

- Partially Verified – Verification SOP Class and at least one other proposed SOP Class were accepted AND C-ECHO returned "Success" AND at least one proposed SOP Class was not accepted

4.2.4.4   Association Acceptance Policy

4.2.4.4.1 Activity – Verification By Remote AE

4.2.4.4.1.1 Description and Sequencing of Activities

The system listens on the port configured on the Global System Configuration screen for Verification requests initiated by other remote devices. The calling device AE must already be configured as a remote device in EPIQ/Affiniti or the association is rejected.
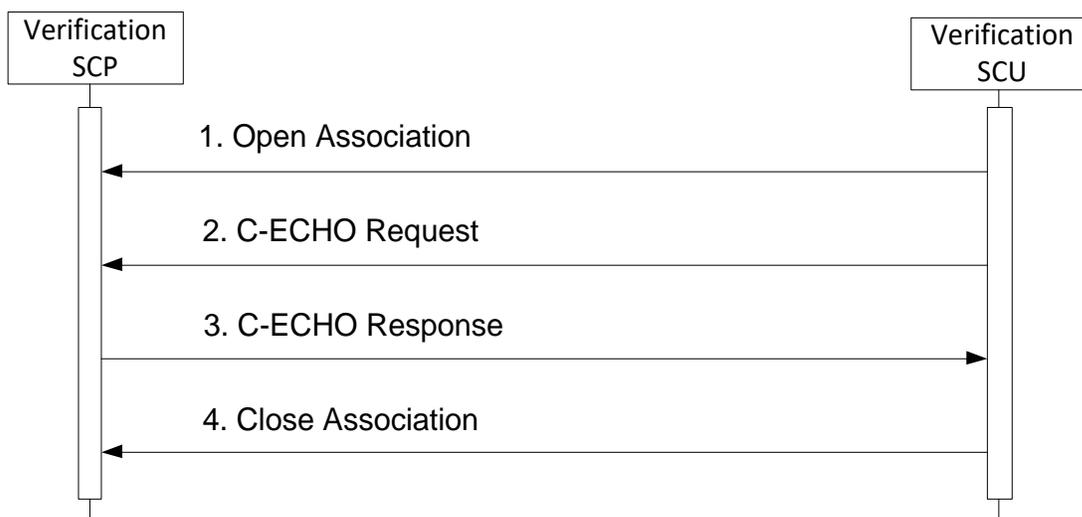
Figure 8b
SEQUENCING OF ACTIVITY – VERIFICATION BY REMOTE AE

4.2.4.4.1.2 Accepted Presentation Contexts

EPIQ/Affiniti will accept Presentation Contexts as shown in the following table:

Table 4.62
ACCEPTABLE PRESENTATION CONTEXTS FOR
ACTIVITY VERIFICATION BY REMOTE AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			
Name	**UID**	**Name List**	**UID List**	**Role**	**Ext. Neg.**
Verification	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

4.2.4.4.1.3 SOP Specific Conformance for Verification

The association request will be rejected if the remote AE is not configured on EPIQ/Affiniti

4.3   NETWORK INTERFACES

4.3.1 Physical Network Interface

EPIQ/Affiniti supports both wired and wireless network interface as follows:

Table 4.63
SUPPORTED PHYSICAL NETWORK INTERFACES

Ethernet 10/100/1000 BaseT, RJ-45; Manual or AutoDetect Speed, Full or Half Duplex
Wireless 802.11 g/n/ac using optionally provided wireless adapter or internal wireless adapter.

If both wired and wireless networks are configured, EPIQ/Affiniti will select the best available network automatically as followed:

- The Wired network has priority and it will be used if available
- The Wireless network will be automatically used if the wired network is not available.

4.3.2 Additional Protocols

EPIQ/Affiniti supports the following additional protocols:

- Dynamic Host Configuration Protocol (DHCP): If enabled by the user, DHCP is used to acquire network configuration parameters, such as IP address, subnet mask, gateway address, and DNS server addresses from the DHCP server.

- Domain Name System (DNS): If configured, DNS is used to lookup server network addresses specified by hostname

- Wi-Fi Protected Access II (WPA2) Personal (PSK): Wireless encryption method with shared-key authentication. Provides reasonable wireless security in small to medium wireless network environments.

- Wi-Fi Protected Access II (WPA2) Enterprise: Wireless encryption method with centralized authentication. Provides very good wireless security in medium to large wireless network environments with centralized authentication server support.

4.3.3 IPv4 and IPv6 Support

EPIQ/Affiniti supports IPv4 and IPv6 internet protocols.

When IPv4 is used
- EPIQ/Affiniti's network address may be specified as either static IP addresses or DHCP
- Remote servers' network addresses may be specified as either IP address or DNS hostname

When IPv6 is used
- EPIQ/Affiniti's network address must be generated automatically as link local address, router discovery address, or assigned by DHCP. Static IPv6 address entry is not supported.
- Remote server's network addresses must be specified by DNS hostname; fixed IPv6 address entry is not supported.
- IPv6 versions of DHCP client, DNS client, ICMP, etc. are supported while IPv6 is being used.
- IPv6 may be disabled if name resolution to an IPv4 device is problematic in a dual-protocol IPv4/IPv6 network.

4.4   CONFIGURATION

4.4.1 AE Title/Presentation Address Mapping

Philips Support Connect, or PSC, is the primary interface on EPIQ/Affiniti for configuring DICOM services. It is reached by pressing the "Support" key on the EPIQ/Affiniti control panel.

Additional acquisition and export settings are configured in the Setups interface. This interface is found on the touchsceen by selecting Utilities – Setups – Acquisition/Capture. Ensure correct settings are made in "Archive/Print" to associate the selected Acquisition Button(s) to the selected configured devices and continue to the Touchscreen button selections as well. Please note to check each touchscreen button individually.

4.4.1.1   Local AE Title

All local AEs use the same AE Title and TCP/IP Port configured via the PSC – Network/DICOM – DICOM Settings, "This System" screen. The system listens on the configured Port for Verification requests from remote AE's, Storage

Commitment N-Event reports, and images received from remote Storage SCP's. In addition, TLS security for incoming DICOM communication may be enabled, optional encryption enabled/disabled, and certificates imported, selected, or removed from this interface.

4.4.1.2   Remote AE Title/Presentation Address Mapping

Remote AE's may be configured on the PSC – Network/DICOM – **DICOM Settings** screen. The screen is organized into DICOM Devices, each specified by

- The Device Type which indicates the services for which the device is to be used
- A Device Name given by the user in order to reference the device elsewhere in the EPIQ/Affiniti user interface
- AE Title for the remote AE
- Port for the remote AE
- Network address, specified either by IPv4 IP address or a Hostname that is resolved by DNS
- TLS security for outgoing DICOM communication may be enabled, optional encryption enabled/disabled, and certificates imported, selected, or removed
- Additional settings specific to each device type

The following Device Types may be configured:

Table 4.64
CONFIGURABLE DICOM DEVICES

Device Type	Supported SOPs
DICOM Storage Server	Storage SOP Classes defined in Section 4.1.2.1 Study Root Query Retrieve-FIND See details in 4.4.1.2.3 Study Root Query Retrieve-MOVE **Note:** Used to make an entry for any Remote AE that will make an association with the system. Examples include: QR 'sending' AE, any system that will "Store" to the ultrasound system.
DICOM Commit Server	Storage Commitment Push Model
DICOM MPPS Server	Modality Performed Procedure Step
DICOM Worklist Server	Modality Worklist FIND
DICOM Structured Report Server	Comprehensive Structured Report Storage
DICOM BW Printer	Basic Grayscale Print Meta
DICOM Color Printer	Basic Color Print Meta

To configure a single server that supports multiple services, such as image store, storage commitment, and MPPS, a separate "Device" entry must be configured for each service using the correct device type, an appropriate AE Title, Port, and network address. Select the first completed entry and choose "Copy" then select the next "Service" and fill in the appropriate info. For clarity in the Export UI, use "Device Name" to indicate the function.

To configure Storage Commitment, define a Storage Server to which objects to be committed will be stored and a Storage Commitment server (which may or may not be the same physical computer). Then, on the **DICOM Selection** screen, associate this Storage Server with the associated Storage Commitment server. See section

Configuration specific to particular Device Types is described below.

4.4.1.2.1 Image Storage Configuration

Multiple remote Storage SCPs can be defined and up to five may be selected simultaneously for export. For automatic export of acquired images during an exam if set to send "After Each Print/Acquire" or at the end of an exam if set to send "At End of Exam", a destination device <u>must</u> be enabled in Setups – Acquisition/Capture – Archive/Print screen.

This screen allows each capture control to be separately configured for export destination. *If a destination device is not enabled for a capture control, any images acquired through that capture control will <u>not</u> be automatically sent to that destination device. However, all acquired images are saved and may be sent from Review.*

Each Storage Server includes a set of Advanced Settings allowing for device-specific control of the data to be stored to that device. These settings include:

- Compression to be used for single-frame images
- Compression to be used for multi-frame images
- Whether to send images in Monochrome or Color photometric interpretations
- Whether to limit export to Implicit VR Little Endian transfer syntax. Generally used only with devices that do not understand any other transfer syntax.
- Whether to send Structured Reports to this destination
- Whether to send Native Data of various imaging modes to this device. Native Data should not be selected unless the data will be displayed by a workstation using Philips' QLAB™ analysis software (or imported back to an EPIQ/Affiniti with similar subproduct configuration and licensed options) which is able to understand this data, as the datasets are large and could possibly affect data transfer performance.
- Whether to send Volume data and Philips Proprietary 3D Presentation State to this device. If not enabled, the device would still receive 2D representations of acquired volumes.
- Association Timeout settings (see 4.4.1.2.3)
- Whether to send Pixel Spacing (0028,0030) with single-mode images to this device. This is in addition to US Region Calibration that automatically sent with all images. Use for allowing measurements to be made on DICOM viewers that don't understand Ultrasound Region Calibration.

In addition, there is a global setting to use the retired Ultrasound SOP Classes 1.2.840.10008.5.1.4.1.1.3 and 1.2.840.10008.5.1.4.1.1.6 instead of the current standard Ultrasound SOP Classes 1.2.840.10008.5.1.4.1.1.3.1 and 1.2.840.10008.5.1.4.1.1.6.1.

4.4.1.2.2 Structured Report Storage Configuration

Most PACS, **DICOM <u>Storage Server</u> devices**, support Strutured Report. If so, and that PACS is where Stuctured Reports are intended to be sent, then select "Export Structured Reports" in Advanced Settings. If sending a Structured Report during an exam is needed, the also select "Export structured report with send on demand" needs to be selected.

For Structured Reports to be sent automatically at end exam, the storage destination must be selected for either the Acquire 1 or Acquire 2, (or Acquire 3 for Affiniti) keys in Setups – Acquisition/Capture – Archive/Print.

If SR support is confirmed using "Verify" and measurements are made during the exam, one or more Structured Reports will be sent to the device. In Support > Network/DICOM > DICOM Settings > Structured Report Global Settings, you may select which Structured Reports to send. Additionally, Link Measurements to Images allows for inclusion of coordinate data with the SR.

A **DICOM <u>Structured Report Server</u>** device is a Storage SCP that only supports and receives reports. To enable this method, create a Structured Report server in PSC – Network/DICOM – DICOM Settings and then select it as the active Structured Report server in PSC – Network/DICOM – DICOM Selection.

OB-GYN study types generate OB-GYN Ultrasound Procedure Reports, Vascular or Abdominal study measurements generate a Vascular Ultrasound Report, and the Adult Echo Study generates an Echocardiography Procedure Report. Two types of Pediatric Echo Reports are available depending on configuration: DICOM-standard Pediatric, Fetal, and Congenital Cardiac Ultrasound Report or Philips proprietary Pediatric Echo Report.

Note that there may be more than one report instance per exam, so long as they are from different study types. If no separate Structured Report server is configured and the SOP Class fails negotiation on the configured Storage server, then no SR objects will be created, however, a failed job will remain in the queue. This will need to be manually removed.

User Defined measurements will be sent in a Structured report. No Structured Report is sent for General measurements.

4.4.1.2.3 Query Retrieve Configuration

EPIQ and Affiniti ultrasound systems use the DICOM Device type of "DICOM Storage Server" to perform Query Retrieve configuration.

For the remote system that is performing the role of **Query Retrieve SCP**, a "Storage Device" entry is completed using the AE Title, IP Address/Hostname and Port for the QR server. When the configuration entry is complete and saved, the system will automatically perform a DICOM Verification. The results need to show support for the Query Retrieve Study Root – Find and Move SOP Classes, indicated by 'Passed'.

The Query Retrieve system will usually use a different AE Title when performing the resulting C-Store to the ultrasound system. In order for EPIQ and Affiniti to allow that connection to succeed, the SCU Client AE Title for the server needs to be added to the ultrasound system.

In order to accomplish this, an additional "Storage Device" entry is used. In this entry, the sending AE Title and IP Address/Hostname are required, but since the client will not use a specific port, the user may enter "9999" in order for the form to be completed. Since there is no verification required for a "sending" port, deselect the "Automatically perform DICOM Verification after Saving?" box. Or, if left checked, expect it to fail. That is not an error.

Now, when the retrieve of data is requested, the system is aware of the sending SCU's AE Title and will not reject the incoming storage association.

4.4.1.2.4 Advanced DICOM Device Association Configuration

Configuration Settings for all DICOM devices.

Max PDU (Protocol Data Unit) Size

- o   The maximum PDU size in bytes

ARTIM (Association Request/Reject/Release) Timeout

- o   as defined by DICOM PS 3.8

Network Reply Timeout

- o   If there is no response from the SCP within this time period, the Network/Reply timer expires. The system will send a DICOM A-RELEASE Request.

Idle Association Timeout

- o   Association inactivity timeout.

Storage Commit image-by-image

A configuration option is provided in Setups to control when Storage Commitment N-ACTION requests are issued relative to image acquisition:

- o   Storage Commit Image-by-Image enabled: Storage Commit N-ACTION requests are issued immediately after instances are stored to the Storage SCP associated with Storage Commit when using send "After Each Print/Acquire" or "Send on Demand". A consequence of this selection is that separate associations are initiated and released for C-STORE requests to the Storage SCP and N-ACTION requests to the Storage Commitment SCP.

- o   Storage Commit Image-by-Image disabled: Storage Commit N-ACTION requests are issued at end exam after storage is performed. This selection reduces the number of associations used for send "After Each Print/Acquire" and "Send on Demand".

Additional Configuration Settings for Storage Commit Devices.

There is an option provided for user if automatic retry of Commit job is required or not.

Number of retry attempts before abandoning storage commitment

- o   Maximum number of retries the system would perform before setting the job to failed state. Factory default value is provided.

Retry delay after failed storage commit (minutes)

- o   Time interval before a retry attempt when storage commit has failed. Factory default value is provided.

Retry delay after no response from storage commit server (hours)

- o   Time interval before a retry attempt when no response has been received from the storage commit server. Factory default value is provided.

4.4.1.2.5 Serial Structured Report Storage Configuration

Serial Report data is a non-DICOM representation of Structured Reports which may additionally be exported via a USB – RS-232 adapter cable to a null-modem RS-232 cable to a serial port configured for 115200 baud, 8 bits, No Parity, 1 Stop Bit and Xon-Xoff Flow Control. Output will be an XML representation of the DICOM Structured Report object.

4.4.1.2.6 Workflow Configuration

Multiple Worklist servers may be defined, but only a single Worklist server can be selected at a time on the PSC – Network/DICOM – **DICOM Selection** page. See 4.2.2.3.1 for the specification of query criteria for worklist queries.

Multiple MPPS servers may be defined, but only a single MPPS server can be selected at a time on the PSC – Network/DICOM – **DICOM Selection** page. No other configuration is required for MPPS servers.

4.4.1.2.7 Hardcopy

Multiple remote Print SCPs can be defined, but no more than one Grayscale and one Color Print SCP may be selected at a time.

Automatic sending of color images to the color printer and BW images to the BW printer is selectable in Setups – Acquisition/Capture – Acquisition/Capture – Send Images/Clips – Automatic Printer Choice.

4.4.2 Parameters

The following parameters apply to all local-system Application Entities. The system must be power-cycled after changing any of these values:

Table 4.65
Configuration Parameters Table

Parameter	Configurable (Yes/No)	Default Value
General Parameters		
AE Title for all AE's	Yes	AETitle

Parameter	Configurable (Yes/No)	Default Value
General Parameters		
Listening Port	Yes	104*
Station Name	Yes	<empty>
Station Location	Yes	<empty>
Hostname	Yes	<generatedName>
MAX PDU Size	Yes	32768
Max Simultaneous Associations	No	5
ARTIM Timeout	Yes	60

*If standard DICOM. If Secure DICOM, default port automatically changes to 2762.

5   MEDIA STORAGE

5.1   IMPLEMENTATION MODEL

5.1.1 Application Data Flow
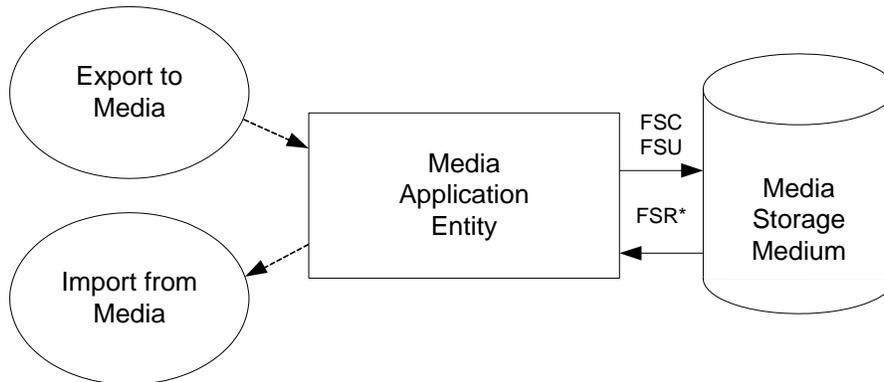
Figure 9
APPLICATION DATA FLOW DIAGRAM FOR MEDIA STORAGE

The Media Application Entity exports Images, 3D Presentation States and Structured Reports to a Storage medium. It is associated with the local real-world activity "Export to Media". "Export to Media" is performed upon user request for selected studies, performed procedures, or instances (images, 3D Volumes, 3D Presentation States, and Structured Reports).

Throughout this section, the term "Media" refers to any of the media listed below which is in use.

EPIQ/Affiniti will support the use of most writable media including CD-R, CD-RW, DVD-R, DVD+R, DVD-RW, DVD+RW and removable USB Storage Device. DICOM structure will be the same regardless of media used.

Note that although –R or +R media may be erased multiple times using "erase", the space may not be recovered. If a –R or +R media is "Erased", the previously written data is no longer available, and only the

remaining unwritten space on the media is available for use. This restriction does not apply to + / - RW media. Erasing + / - RW media allows the entire disk's space to be used.

If a –R or +R is erased, it is not usable again for DICOM exports due to reliability concerns associated with DVD media. Only DVD+RW/-RW can be erased and used again for DICOM export.

5.1.2 Functional Definition of AEs

5.1.2.1 Functional Definition of Media Application Entity

Using "Export to… Media" will pass the currently selected studies, exams, or individually selected images to the Media Application Entity. The SOP Instances associated with the selection will be collected into one or more export jobs. The contents of each export job will be written to the installed media. If the capacity of a disk is exceeded, the user is provided a dialog, stating capacity exceeded and to insert another disk.

5.1.3 Sequencing of Real-World Activities

At least one image must exist and be selected before the Media Application Entity can be invoked. The operator can insert new media at any time. If no writable media is available, the Media queue management Icon will be Yellow.

5.1.4 File Meta Information Options

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

Table 5.1
DICOM IMPLEMENTATION CLASS AND VERSION FOR MEDIA STORAGE

Implementation Class UID	1.3.46.670589.14.10000.700
Implementation Version Name	EPIQ-AFFIN_7.00

5.2   AE SPECIFICATIONS

5.2.1 Media Application Entity Specification

The Media Application Entity provides standard conformance to the DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed in DICOM PS 3.10 and PS 3.11.

Table 5.2
MEDIA APPLICATION PROFILES, ACTIVITIES, AND ROLES

Application Profiles Supported	Real World Activity	Roles	SC Option
STD-US-SC-SF&MF-CDR	Export to….Media	FSC	Interchange
STD-US-SC-SF&MF-DVD STD-GEN-USB-JPEG		FSC, FSU	
STD-US-SC-SF&MF-CDR STD-US-SC-SF&MF-DVD STD-GEN-USB-JPEG	Send to Hard Disk (import)	FSR	

5.2.1.1 File Meta Information for the Application Entity

The File-Set ID (0004,1130) included in the File Meta Header of the DICOMDIR is the same as the volume label of the media.

5.2.1.2 Real-World Activities

5.2.1.2.1 Activity – Export to Media

The Media Application Entity acts as an FSC using the interchange option when requested to export SOP Instances from the local database to media.

The contents of the export job will be written together with a corresponding DICOMDIR to media. The user can cancel an export job in the job queue. Writing in multi-session format to CDs and DVDs is not supported; any CD or DVD with DICOM data on it will be viewed as read-only and additional information will not be written to the media. USB media can be written many times.

5.2.1.2.2 Activity – Import from Media

The Media Application Entity acts as an FSR using the interchange option when requested to import SOP Instances from media to the local database.

The Patient Directory user interface displays the contents of removable media. Exams selected by the user are transferred from the media to the system for review. Objects transferred to the system retain their original SOP Instance UIDs. Patient Directory must be set to display the contents of the Hard Disk before the imported exam information may be displayed.

Note: Structured Reports may not be read back into EPIQ/Affiniti.

5.2.1.2.3 Activity – Update to Media

The Media Application Entity acts as an FSU using the interchange option when requested to export SOP Instances from the local database to media upon which DICOM data already resides.

The system user selects exams from the system's directory for transfer to media that already contains data. The DICOMDIR is updated allowing access to original and new data.

DVD/CD +RW media may be erased at any time, removing all previously recorded data.

5.2.1.2.3.1 Media Storage Application Profiles

See Table 5.2 for supported Application Profiles.

5.2.1.2.3.2 Options

The Media Application Entity supports the SOP Classes and Transfer Syntaxes listed in Table 5.3.

Table 5.3
IODS, SOP CLASSES AND TRANSFER SYNTAXES FOR REMOVABLE ¬MEDIA

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Media Storage Directory Storage	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
US Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian JPEG Baseline Lossy Compression	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50
US Multiframe Image Storage (Retired)*	1.2.840.10008.5.1.4.1.1.3	Explicit VR Little Endian JPEG Baseline Lossy Compression	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70
MR Spectroscopy Image Storage	1.2.840.10008.5.1.4.1.1.4.2	Explicit VR Little Endian JPEG Lossy Baseline JPEG Extended 12-bit Lossy JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Little Endian JPEG Lossy Baseline JPEG Lossless Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Little Endian	1.2.840.10008.1.2.1
Private 3D Presentation State**	1.3.46.670589.2.5.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1

** For import to Philips QLAB, Xcelera or IntelliSpace for CardioVascular workstations only.

6 TRANSFORMATION OF DICOM TO CDA

EPIQ/Affiniti exports a CDA file format which complies with the HL7 CDA-R2 schema.

7 SUPPORT OF CHARACTER SETS

All EPIQ/Affiniti DICOM applications support the following values of Specific Character Set (0008,0005):

ISO_IR 100	(Latin Alphabet No. 1 supplementary set)
ISO_IR 144	(Cyrillic)
GB18030	(Chinese)

8 SECURITY

8.1 GENERAL SECURITY

EPIQ/Affiniti incorporates an internal firewall that only accepts incoming traffic on the designated listening port, as configured in PSC – Network/DICOM – DICOM Settings. The port is only opened if one or more servers are defined.

8.2 SUPPORTED DICOM SECURITY PROFILES

8.2.1 TLS Secure Transport Connection Profiles

Basic TLS Secure Transport Connection Profile and the AES TLS Secure Transport Connection Profile are supported using Transport Layer Security Version 1.2 protocol with the following features:

Supported TLS Feature	Mechanism
Entity Authentication	RSA based certificates
Exchange of Master Secrets	RSA
Data Integrity	SHA-1 or SHA-2 based certificates
Privacy (Cyphersuite Options)	TLS_RSA_WITH_AES_128_CBC_SHA (preferred) TLS_RSA_WITH_3DES_EDE_CBC_SHA

TLS authentication may be used with or without TLS encryption – default is <u>with</u> TLS encryption.

For outgoing TLS requests where EPIQ/Affiniti acts as a TLS Client, the received server RSA certificate is validated by verifying its digital signature against a certificate in the local Trusted Certificate Authorities store whose Subject matches the Issuer of the received certificate. If requested by the TLS Server, EPIQ/Affiniti will then send the certificate configured for "This System" from the local Personal store.

For incoming TLS connection requests where EPIQ/Affiniti acts as a TLS Server, the certificate configured for "This System" is sent from the Personal store to the client as specified in the TLS protocol. EPIQ/Affiniti always requests a client certificate from the TLS Client.

Certificates are locally managed. The site administrator may import certificates from media to the Trusted Certificate Authority store for verifying incoming certificates; these may be either CA certificates or self-signed end-entity

certificates. The site administrator may also import certificates from media to the Personal store along with the certificates private key for certificates representing 'This System'. A wide variety of certificate file formats are supported, including

- Base 64 Text: PEM format (.pem, .crt), usually unencrypted but may be encrypted. If encrypted, the encryption password must be provided when importing.

- ASN.1 Binary: BER, DER, CER formats (.der, .cer, .crt)

- PKCS#12: Encrypted Container for certificates with private keys (.pfx, .p12). This format is used primarily for the "This System" certificate with corresponding private key. The encryption password must be provided when importing.

- PKCS#7: Container for multiple certificates. If there is only one certificate in the container, then the certificate is saved to the user-specified store name. If there are multiple certificates in the container, then the Issuer and Subject names of each certificate are compared; if the names are the same, the certificate is stored in the Trusted Certificate Authority store, else in the Intermediate Certificate Authority store.

The site administrator may also remove previously-imported certificates.

The incoming TCP port defaults to port 2762 when TLS security is enabled; this port may be changed by the user if desired.

9   ANNEXES

9.1   IOD CONTENTS

9.1.1 Created SOP Instances

Table 9.1 specifies the attributes of an Ultrasound or Ultrasound Multiframe Image transmitted by the EPIQ/Affiniti storage application.

Table 9.2 specifies the attributes of a Secondary Capture Image transmitted by the EPIQ/Affiniti storage application.

Table 9.3 specifies the attributes of a Multi-frame True Color Secondary Capture image transmitted by the EPIQ/Affiniti storage application.

Table 9.4 specifies the attributes of a Comprehensive Structured Report transmitted by the EPIQ/Affiniti storage application. Please note that there are differences between which Structured Report Templates are used in each product.

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

VNAP	Value Not Always Present
ANAP	Attribute Not Always Present
ALWAYS	Always Present
ALWAYSUA	Always Present, unless anonymized
EMPTY	Attribute is sent without a value

The abbreviations used in the "Source" column:

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

9.1.1.1   US or US Multiframe Image IOD

Table 9.1
IOD OF CREATED US OR US MULTIFRAME SOP INSTANCES

IE	Module	Reference	Presence of Module
Patient	Patient	Table 9.5	ALWAYS
Study	General Study	Table 9.6	ALWAYS
	Patient Study	Table 9.7	ALWAYS
Series	General Series	Table 9.9	ALWAYS
Equipment	General Equipment	Table 9.10	ALWAYS
Image	General Image	Table 9.11	ALWAYS
	Image Pixel	Table 9.12	ALWAYS
	Cine	Table 9.13	Only if Multi-frame
	Multi-frame	Table 9.14	Only if Multi-frame

IE	Module	Reference	Presence of Module
	US Region Calibration	Table 9.15	ANAP
	US Image	Table 9.16	ALWAYS
	VOI LUT	Table 9.17	Only if Single frame
	SOP Common	Table 9.18	ALWAYS

9.1.1.2 Secondary Capture IOD

Table 9.2
IOD OF CREATED SECONDARY CAPTURE SOP INSTANCES

IE	Module	Reference	Presence of Module
Patient	Patient	Table 9.5	ALWAYS
Study	General Study	Table 9.6	ALWAYS
	Patient Study	Table 9.7	ALWAYS
Series	General Series	Table 9.9	ALWAYS
Equipment	General Equipment	Table 9.10	ALWAYS
	SC Equipment	Table 9.21	ALWAYS
Image	General Image	Table 9.19	ALWAYS
	Image Pixel	Table 9.20	ALWAYS
	SC Image	N.A.	All attributes are optional and are not present
	SOP Common	Table 9.23	ALWAYS

9.1.1.3 Multi-Frame True Color Secondary Capture IOD

Table 9.3
IOD OF CREATED MULTI-FRAME TRUE COLOR SECONDARY CAPTURE SOP INSTANCES

IE	Module	Reference	Presence of Module
Patient	Patient	Table 9.5	ALWAYS
Study	General Study	Table 9.6	ALWAYS
	Patient Study	Table 9.7	ALWAYS
Series	General Series	Table 9.9	ALWAYS
Equipment	General Equipment	Table 9.10	ALWAYS
	SC Equipment	Table 9.21	ALWAYS
Image	General Image	Table 9.19	ALWAYS
	Image Pixel	Table 9.20	ALWAYS
	Cine	Table 9.13	ALWAYS
	Multi-frame	Table 9.14	ALWAYS
	SC Multi-frame Image	Table 9.22	ALWAYS
	SC Multi-frame Vector	N.A.	All attributes are conditional and are not present

IE	Module	Reference	Presence of Module
	SOP Common	Table 9.23	ALWAYS

9.1.1.4 Comprehensive Structured Report IOD

Table 9.4
IOD OF CREATED COMPREHENSIVE STRUCTURED REPORT SOP INSTANCES

IE	Module	Reference	Presence of Module
Patient	Patient	Table 9.5	ALWAYS
Study	General Study	Table 9.6	ALWAYS
	Patient Study	Table 9.7	ALWAYS
Series	SR Document Series	Table 9.24	ALWAYS
Equipment	General Equipment	Table 9.10	ALWAYS
Document	SR Document General	Table 9.25	ALWAYS
	SR Document Content	Table 9.26	ALWAYS
	SOP Common	Table 9.27	ALWAYS

9.1.1.5 Attribute Content by Module

9.1.1.5.1 Common Modules

Table 9.5
PATIENT MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	Same attribute of MWL or PDE input	ALWAYS	MWL/ USER
Patient ID	(0010,0020)	LO	From MWL, user input or system generated. Maximum 64 characters.	ALWAYS	MWL/ USER/ AUTO
Patient's Birth Date	(0010,0030)	DA	Same attribute of MWL or PDE input	VNAP	MWL/ USER
Patient's Sex	(0010,0040)	CS	Same attribute of MWL or PDE input*	VNAP	MWL/ USER
Other Patient IDs	(0010,1000)	LO	Same attribute of MWL	VNAP	MWL
Ethnic Group	(0010,2160)	SH	Same attribute of MWL	VNAP	MWL
Patient Comments	(0010,4000)	LT	Same attribute of MWL or PDE input MWL input limited to 3500 characters PDE input limited to 100 characters	VNAP	MWL/ USER

* In English

Table 9.6
GENERAL STUDY MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	Same value as in MWL or auto generated	ALWAYS	MWL/ AUTO
Study Date	(0008,0020)	DA	Study's Start Date (0040,0244).	ALWAYSUA	AUTO
Study Time	(0008,0030)	TM	Study's Start Time (0040,0245).	ALWAYS	AUTO
Referring Physician's Name	(0008,0090)	PN	Only Last, First and Middle names from MWL, or PDE input.	VNAP	MWL/ USER
Study ID	(0020,0010)	SH	MWL Requested Procedure ID (0040,1001) or auto-generated	ALWAYSUA	MWL/ AUTO
Accession Number	(0008,0050)	SH	Same attribute of MWL or user PDE input.	VNAP	MWL/ USER
Study Description	(0008,1030)	LO	The first available attribute (provided in the MWL response) from the following list: Requested Procedure Description (0032,1060) Scheduled Procedure Step Description (0040,0007) Scheduled Protocol Code Sequence >Code Meaning (0040,0008),(0008,0104) or user input	VNAP	MWL/ USER
Physician(s) of Record	(0008,1048)	PN	When user manually makes entry in "Physician of Record" in PDE.	ANAP	USER
Names of Intended Recipients of Results	(0040,1010)	PN	When present in MWL, displayed in PDE, "Physician of Record".	ANAP	MWL
Referenced Study Sequence	(0008,1110)	SQ	One item per item in the MWL Referenced Study Sequence. Absent if unscheduled.	ANAP	MWL
>Referenced SOP Class UID	(0008,1150)	UI	Same value as in of the Referenced Study Sequence in the MWL	VNAP	MWL
>Referenced SOP Instance UID	(0008,1155)	UI	Same value as in of the Referenced Study Sequence in the MWL	VNAP	MWL
Procedure Code Sequence	(0008,1032)	SQ	MWL Requested Procedure Code Sequence (0032,1064) Absent if unscheduled.	ANAP	MWL
>Code Value	(0008,0100)	SH	Same value as MWL attribute	VNAP	MWL
>Coding Scheme Designator	(0008,0102)	SH	Same value as MWL attribute	VNAP	MWL
>Coding Scheme Version	(0008,0103)	SH	Same value as MWL attribute	VNAP	MWL
>Code Meaning	(0008,0104)	LO	Same value as MWL attribute	VNAP	MWL

Table 9.7
PATIENT STUDY MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Admitting Diagnosis Description	(0008,1080)	LO	Same attribute as MWL attribute	VNAP	MWL
Patient Size	(0010,1020)	DS	Same value as MWL attribute or PDE input	VNAP	MWL/ USER
Patient's Weight	(0010,1030)	DS	Same value as MWL attribute or PDE input	VNAP	MWL/ USER

Table 9.8
PATIENT MEDICAL MODULE OF CREATED SOP INSTANCES*

Attribute Name	Tag	VR	Value	Presence of Value	Source
Medical Alerts	(0010,2000)	LO	Same value as MWL attribute	VNAP	MWL
Allergies	(0010,2110)	LO	Same value as MWL attribute	VNAP	MWL
Additional Patient's History	(0010,21B0)	LT	Same value as MWL attribute	VNAP	MWL
Pregnancy Status	(0010,21C0)	US	Same value as MWL attribute	ANAP	MWL
Special Needs	(0038,0050)	LO	Same value as MWL attribute	VNAP	MWL

*Note: These attributes extend the standard US Image and US Multiframe Image IODs

Table 9.9
GENERAL SERIES MODULE OF CREATED IMAGE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"US"	ALWAYS	AUTO
Presentation Intent Type	(0008,0068)	CS	This attribute is defined for the DX Series. It is added here as an extension to the General Series for Ultrasound. "FOR PRESENTATION" if this is Series 1, containing the standard ultrasound images. "FOR PROCESSING" if this is Series 4, containing Ultrasound Multiframe 3D volumes, intended only for processing by Philips 3D viewers.	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Auto-generated	ALWAYS	AUTO
Series Number	(0020,0011)	IS	A number unique within the Study.	ALWAYS	AUTO
Series Date	(0008,0021)	DA	Date of first image in series.	ALWAYSUA	AUTO
Series Time	(0008,0031)	TM	Time of first image in series.	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Protocol Name	(0018,1030)	LO	"Free Form" "Exercise 2 Stage" "Exercise 3 Stage" "Pharmacological 4 Stage" "Wall Motion and Contrast" "Quantitative 4 Stage" user defined	ALWAYS	AUTO
Series Description	(0008,103E)	LO	Same Source as Study Description (0008,1030) when from MWL.	ANAP	MWL/ USER
Operators' Name	(0008,1070)	PN	MWL Scheduled Performing Physician's Name (0040,0006) From PDE "Exam Performed By" field	VNAP	MWL/ USER
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	Identifies the MPPS SOP Instance this image is related to	ALWAYS	MPPS
>Referenced SOP Class UID	(0008,1150)	UI	PPS SOP Class = "1.2.840.10008.3.1.2.3.3"	ALWAYS	MPPS
>Referenced SOP Instance UID	(0008,1155)	UI	PPS Instance UID of the PPS generating this image	ALWAYS	MPPS
Requesting Physician	(0032,1032)	PN	Same value as MWL attribute	ANAP	MWL
Referenced Patient Sequence	(0008,1120)	SQ		ANAP	MWL
>Referenced SOP Class UID	(0008,1150)	UI	RETIRED Detached Patient Management SOP Class = "1.2.840.10008.3.1.2.1.1"	ALWAYS	MWL
>Referenced SOP Instance UID	(0008,1155)	UI	Instance UID of the generating this image	ALWAYS	MWL
>Requested Procedure Description	(0032,1060)	LO	Same value as MWL attribute	VNAP	MWL
>Requested Contrast Agent	(0032,1070)	LO	Same value as MWL attribute in Scheduled Procedure Step Sq	ANAP	MWL
>Requested Procedure ID	(0040,1001)	SH	Auto-generated=Study ID or value from MWL. One item.	ALWAYS	AUTO / MWL
>Requested Procedure Priority	(0040,1003)	SH	Same value as MWL attribute	ANAP	MWL
>Patient Transport Arrangements	(0040,1004)	LO	Same value as MWL attribute	ANAP	MWL
>Scheduled Procedure Step ID	(0040,0009)	SH	Auto-generated=Study ID or value from MWL. One item.	ALWAYS	AUTO / MWL
>Scheduled Procedure Step Description	(0040,0007)	LO	Same value as MWL attribute	VNAP	MWL
>Scheduled Protocol Code Sequence	(0040,0008)	SQ	Same value as MWL attribute	VNAP	MWL
>Pre-Medication	(0040,0012)	LO	Same value as MWL attribute	ANAP	MWL

Attribute Name	Tag	VR	Value	Presence of Value	Source
Performed Procedure Step ID	(0040,0253)	SH	Auto-generated=Study ID One item.	ALWAYSUA	AUTO
Performed Procedure Step Start Date	(0040,0244)	DA	See Table 9.6	ALWAYSUA	AUTO
Performed Procedure Step Start Time	(0040,0245)	TM	See Table 9.6	ALWAYS	AUTO
Performed Procedure Step Description	(0040,0254)	LO	MWL Scheduled Procedure Step Description (0040,0007) or PDE input if any.	VNAP	USER / MWL
Performed Protocol Code Sequence	(0040,0260)	SQ	Zero length, or mapped from MWL Scheduled Protocol Code Sequence (0040,0008)	VNAP	MWL
Comments on the Performed Procedure Step	(0040,0280)	ST	Mapped from MWL Requested Procedure Description (0032,1060)	ANAP	MWL

Table 9.10
GENERAL EQUIPMENT MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	Philips Medical Systems	ALWAYS	AUTO
Institution Name	(0008,0080)	LO	From Setups configuration* (requires power cycle after change)	VNAP	CONFIG
Station Name	(0008,1010)	SH	From Setups configuration	VNAP	CONFIG
Manufacturer's Model Name	(0008,1090)	LO	A string indicating the product, level, and clinical specialty. Example: EPIQ 7C	ALWAYS	AUTO
Device Serial Number	(0018,1000)	LO	Decimal representation of system "Chip ID" found in PSC>System Management>System Information. Also used as component of system generated private UIDs.	ALWAYS	AUTO
Software Version(s)	(0018,1020)	LO	A string indicating the model name and software build version. Example: EPIQ 7G_7.0.0.748	ALWAYS	AUTO

* Always cycle system power after changing Institution Name prior to sending data.

9.1.1.5.2 US or Multiframe Image Modules

Table 9.11
GENERAL IMAGE MODULE OF CREATED US SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number*	(0020,0013)	IS	Generated by device, increments from "1" in each series	ALWAYS	AUTO
Content Date	(0008,0023)	DA	<yyyymmdd>	ALWAYSUA	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Content Time	(0008,0033)	TM	<hhmmss>	ALWAYS	AUTO
Acquisition DateTime	(0008,002A)	DT	The date and time that the acquisition of data that resulted in this image started.	ALWAYSUA	AUTO
Derivation Description	(0008,2111)	ST	"Uncompressed" for US Image; Numeric value set from JPEG Quality Factor slider found in Utilities > Setups > Acquisition/Capture > Acquisition Compression	ALWAYS	AUTO
Source Image Sequence	(0008,2112)	SQ	This sequence will be present only for 3D images from motorized 3D transducers, or freehand acquisition from single-array transducers.	ANAP	AUTO
> Referenced SOP Class UID	(0008,1150)	UI	SOP Class UID of Ultrasound Multiframe Image	ANAP	AUTO
> Referenced SOP Instance UID	(0008,1155)	UI	The value is the SOP Instance UID of the associated 3D volume. This value links this image, intended for first-order presentation, to a US Multiframe image in Series 4, which is intended as source data for proprietary 3D viewing applications.	ANAP	AUTO
> Purpose of Reference Code Sequence	(0040,A170)	SQ		ANAP	AUTO
>> Coding Scheme Designator	(0008,0102)	SH	"DCM"	ANAP	AUTO
>> Code Value	(0008,0100)	SH	"121324"	ANAP	AUTO
>> Code Meaning	(0008,0104)	LO	"Source Image" (comment from DICOM PS 3.16: "image used as the source for a derived or compressed image")	ANAP	AUTO
Burned In Annotation	(0028,0301)	CS	Set to "NO". Set to "YES" if "Burn Patient Information Into Images" is set.	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	CS	"01" if image is lossy compressed, "00" if not.	ALWAYS	AUTO
Lossy Image Compression Ratio	(0028,2112)	DS	For Lossy Compressed images, the following Quality Factor value is sent: Uncompressed, Lossless, Lossy Low, = 100 Lossy Med = 95 Lossy High = 90	ANAP	AUTO
Lossy Image Compression Method	(0028,2114)	CS	For Lossy Compressed images, the attribute is set to "ISO_10918_1"	ANAP	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Presentation LUT Sequence	(2050,0010)	SQ	Provided as an extension to the Ultrasound Multiframe IOD. Present only for 3D volume objects in Series 4.	ANAP (Mutually exclusive with (2050,0020)	AUTO
> LUT Description	(0028,3002)	US or SS	[256 / 0 / 16]	ANAP	AUTO
> LUT Data	(0028,3006)	US or SS or OW	[P0 / P1 ... P255] Array of 256 16-bit values mapping the output range of the VOI LUT to P-values	ANAP	AUTO
Presentation LUT Shape	(2050,0020)	CS	"IDENTITY" only if "Image Export Format" is GSDF.	ANAP	AUTO

* Instance Number will be mapped to View Number when studies with General Imaging Protocol Images are configured to export shuffled. Images that are not part of the protocol will have the instance number offset by 10,000.

Table 9.12
IMAGE PIXEL MODULE OF CREATED US OR US MULTIFRAME SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	US	See US Image Module Table 9.16	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	See US Image Module Table 9.16	ALWAYS	AUTO
Rows	(0028,0010)	US	Image height in pixels. Varies with export resolution configuration, normal vs. quad size image, and full-screen vs. image area setting and Normal vs MaxVue setting.	ALWAYS	CONFIG
Columns	(0028,0011)	US	Image width in pixels. Varies with export resolution configuration, normal vs. quad size image, and full-screen vs. image area setting and Normal vs MaxVue setting.	ALWAYS	CONFIG
Bits Allocated	(0028,0100)	US	8 Bits per pixel.	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	8 Bits per pixel.	ALWAYS	AUTO
High Bit	(0028,0102)	US	High bit is 7	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	"0" pixels are Unsigned Integers	ALWAYS	AUTO
Pixel Data	(7FE0,0010)	OW / OB		ALWAYS	AUTO
Planar Configuration	(0028,0006)	US	Present when image is RGB. Value is "0".	ANAP	AUTO

Table 9.13
CINE MODULE OF CREATED MULTIFRAME US OR SC SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame Time	(0018,1063)	DS	Frame time in milliseconds	ANAP	AUTO
Recommended Display Frame Rate	(0008,2144)	IS	Display frame rate corresponding to Frame Time (0018,1063) value, in frames per second.	ANAP	AUTO
Cine Rate	(0018,0040)	IS	Display frame rate corresponding to Frame Time (0018,1063) value, in frames per second.	ANAP	AUTO

Table 9.14
MULTI-FRAME MODULE OF CREATED MULTIFRAME US OR SC SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Frames	(0028,0008)	IS	# of frames in object	ANAP	AUTO
Frame Increment Pointer	(0028,0009)	AT	(0018,1063) Frame Time only	ANAP	AUTO

Table 9.15
US REGION CALIBRATION MODULE OF CREATED US IMAGE OR US MULTIFRAME IMAGE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Sequence of Ultrasound Regions	(0018,6011)	SQ	A sequence is present for each region on the system display, except for ECG regions. Only when set for "Display Area". No scaling for "Full Screen" images, rendered 3D.	ANAP	AUTO
>Region Location Min x_0	(0018,6018)	UL	Top Left position of region.	ALWAYS	AUTO
>Region Location Min y_0	(0018,601A)	UL	Top Left position of region	ALWAYS	AUTO
>Region Location Max x_1	(0018,601C)	UL	Bottom Right position of region	ALWAYS	AUTO
>Region Location Max y_1	(0018,601E)	UL	Bottom Right position of region	ALWAYS	AUTO
>Physical Units X Direction	(0018,6024)	US	Enumerated Value. 2D Image = 0003H = CM Mmode / Doppler = 0004H = SEC	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
>Physical Units Y Direction	(0018,6026)	US	Enumerated Value. 2D Image = 0003H = CM Mmode = 0003H = CM Doppler = 0007H = CM / SEC	ALWAYS	AUTO
>Physical Delta X	(0018,602C)	FD	The physical value per pixel increment	ALWAYS	AUTO
>Physical Delta Y	(0018,602E)	FD	The physical value per pixel increment	ALWAYS	AUTO
>Reference Pixel X0	(0018,6020)	SL	The X pixel value of baseline, Doppler only	ANAP	AUTO
>Reference Pixel Y0	(0018,6022)	SL	The Y pixel value of baseline, Doppler only	ANAP	AUTO
>Region Spatial Format	(0018,6012)	US	Enumerated Value. 2D (tissue or flow) = 0001H M-Mode (tissue or flow) = 0002H Spectral (CW or PW Doppler) = 0003H	ALWAYS	AUTO
>Region Data Type	(0018,6014)	US	Enumerated Value. Tissue = 0001H PW Spectral Doppler = 0003H CW Spectral Doppler = 0004H	ALWAYS	AUTO
>Region Flags	(0018,6016)	UL	Bit mask. See DICOM PS3.3 C.8.5.5.1.3:	ALWAYS	AUTO

Table 9.16
US IMAGE MODULE OF CREATED US IMAGE OR US MULTIFRAME IMAGE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS	ORIGINAL/PRIMARY/ < Analysis Type* > for uncompressed, DERIVED/PRIMARY/ < Analysis Type* > if compressed ORIGINAL/PRIMARY/INVALID if non-image like the Patient Data Entry (PDE) screen.	ALWAYS	CONFIG
Samples Per Pixel	(0028,0002)	US	"1" for MONOCHROME2, only if "Export Monochrome" is selected, otherwise, "3" for RGB or YBR_FULL_422	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	Uncompressed: "MONOCHROME2" or "RGB" Lossy Compressed: "YBR_FULL_422" Lossless Compressed: "RGB"	ALWAYS	CONFIG
Bits Allocated	(0028,0100)	US	8 Bits per pixel.	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	8 Bits per pixel.	ALWAYS	AUTO
High Bit	(0028,0102)	US	High bit is 7	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Planar Configuration	(0028,0006)	US	Always "0", if color.	ANAP	AUTO
Pixel Representation	(0028,0103)	US	"0" Pixels are Unsigned integers	ALWAYS	AUTO
Frame Increment Pointer	(0028,0009)	AT	(0018,1063) "Frame Time" only; MF only.	ANAP	AUTO
Image Type	(0008,0008)	CS	See Table 9.11	ALWAYS	CONFIG
Lossy Image Compression	(0028,2110)	CS	"01" if image is lossy compressed, "00" if not.	ALWAYS	AUTO
Number of Stages	(0008,2124)	IS	1-n	ANAP	AUTO
Number of Views in Stage	(0008,212A)	IS	1-n	ANAP	AUTO
Ultrasound Color Data Present	(0028,0014)	US	0 or 1	ALWAYS	AUTO
Stage Name	(0008,2120)	SH	REST, PEAK, POST, IMPOST, BASE, LOW, user defined	ANAP	AUTO
Stage Code Sequence	(0040,000A)	SQ	Sequence of items describing the performed Ultrasound Protocol Stage(s). See Baseline Context ID 12002 for possible contents.	ANAP	AUTO
Stage Number	(0008,2122)	IS	1-n	ANAP	AUTO
View Name**	(0008,2127)	SH	LAX, SAX, AP4, AP2, AP3, user defined	ANAP	AUTO
View Number**	(0008,2128)	IS	1-n	ANAP	AUTO
Number of Event Timers	(0008,2129)	IS	1-n	ANAP	AUTO
Event Elapsed Time(s)	(0008,2130)	DS	nnn msec.	ANAP	AUTO
Event Timer Name(s)	(0008,2132)	LO	Timer	ANAP	AUTO
View Code Sequence	(0054,0220)	SQ	Sequence that describes the view of the patient anatomy in this image. Only a single Item shall be permitted in this Sequence.		
Acquisition DateTime	(0008,002A)	DT	The date and time that the acquisition of data that resulted in this image started.	ALWAYSUA	AUTO
Trigger Time	(0018,1060)	DS	nnn msec.	ANAP	AUTO
Heart Rate	(0018,1088)	IS	Beats per minute	ANAP	AUTO
Transducer Data	(0018,5010)	LO	Transducer name or code.	ALWAYS	AUTO
Processing Function	(0018,5020)	LO	Imaging optimization name.	ALWAYS	AUTO

* Analysis Type selection is determined by the analysis package associated with the transducer / preset selection.
** View name and View Number attributes are also in use by General Imaging Protocol

Table 9.17
VOI LUT MODULE OF CREATED US SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Window Center	(0028,1050)	DS	Fixed at 127	ANAP	AUTO
Window Width	(0028,1051)	DS	Fixed at 254	ANAP	AUTO

Table 9.18
SOP COMMON MODULE OF CREATED US IMAGE OR US MULTIFRAME IMAGE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.6.1 or 1.2.840.10008.5.1.4.1.1.6* for US Image 1.2.840.10008.5.1.4.1.1.3.1 or 1.2.840.10008.5.1.4.1.1.3* for US Multiframe Image	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Generated by device	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	Attribute only sent if an Extended or Replacement Character Set is used	ANAP	AUTO
Instance Creation Date	(0008,0012)	DA	<yyyymmdd>	ALWAYSUA	AUTO
Instance Creation Time	(0008,0013)	TM	<hhmmss>	ALWAYS	AUTO

*Only if "Export Retired SOP Classes" is selected in Acquisition/Capture>Image Export>Format in Setups.

9.1.1.5.3 Secondary Capture Image Modules

Table 9.19
GENERAL IMAGE MODULE OF CREATED SECONDARY CAPTURE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number*	(0020,0013)	IS	Generated by device, increments from "1" in each Secondary Capture series	ALWAYS	AUTO
Content Date	(0008,0023)	DA	<yyyymmdd>	ALWAYSUA	AUTO
Content Time	(0008,0033)	TM	<hhmmss>	ALWAYS	AUTO
Image Type	(0008,0008)	CS	DERIVED\SECONDARY	ALWAYS	AUTO
Acquisition DateTime	(0008,002A)	DT	The date and time of the image.	ALWAYSUA	AUTO
Derivation Description	(0008,2111)	ST	"0" for SC Image or Numeric value for USMF Image based on configuration setting	ALWAYS	AUTO
Burned In Annotation	(0028,0301)	CS	See SC Multi-Frame Image Module Table 9.22	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Lossy Image Compression	(0028,2110)	CS	"01" if image is lossy compressed, "00" if not.	ALWAYS	AUTO
Lossy Image Compression Ratio	(0028,2112)	DS	For Lossy Compressed images, the following Quality Factor value is sent: Uncompressed, Lossless, Lossy Low, = 100 Lossy Med = 95 Lossy High = 90	ANAP	AUTO
Lossy Image Compression Method	(0028,2114)	CS	For Lossy Compressed images, the attribute is set to "ISO_10918_1"	ANAP	AUTO

* Instance Number will be mapped to View Number when studies with General Imaging Protocol Images are configured to export shuffled. Images that are not part of the protocol will have the instance number offset by 10,000.

Table 9.20
IMAGE PIXEL MODULE OF CREATED SECONDARY CAPTURE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	US	Set to 1 or 3 for Secondary Capture Images, Set to 3 for Multi-frame True Color SC Images	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	Uncompressed: "MONOCHROME2" or "RGB" Lossy Compressed: "YBR_FULL_422" Lossless Compressed: "RGB"	ALWAYS	AUTO
Rows	(0028,0010)	US	Image height in pixels: 983 or 1050 for Secondary Capture Images 983 for Multi-frame True Color SC Images	ALWAYS	CONFIG
Columns	(0028,0011)	US	Image width in pixels: 1593 or 1920 for Secondary Capture Images 1593 for Multi-frame True Color SC Images	ALWAYS	CONFIG
Bits Allocated	(0028,0100)	US	8 Bits per pixel.	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	8 Bits per pixel.	ALWAYS	AUTO
High Bit	(0028,0102)	US	High bit is 7	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	"0" pixels are Unsigned Integers	ALWAYS	AUTO
Pixel Data	(7FE0,0010)	OW / OB		ALWAYS	AUTO
Planar Configuration	(0028,0006)	US	Present when image is RGB. Value is "0".	ANAP	AUTO

Table 9.21
SC EQUIPMENT MODULE OF CREATED SECONDARY CAPTURE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Conversion Type	(0008,0064)	CS	WSD = Workstation	ALWAYS	AUTO
Modality	(0008,0060)	CS	Determined by the image modality being viewed at the time of acquisition.	ALWAYS	AUTO

Table 9.22
SC MULTI-FRAME IMAGE MODULE OF CREATED SECONDARY CAPTURE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Burned In Annotation	(0028,0301)	CS	Set to "NO". Set to "YES" if "Burn Patient Information Into Images" is set.	ALWAYS	AUTO
Frame Increment Pointer	(0028,0009)	AT	(0018,1063) Frame Time only	ALWAYS	AUTO

Table 9.23
SOP COMMON MODULE OF CREATED SECONDARY CAPTURE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.7 for Secondary Capture Image 1.2.840.10008.5.1.4.1.1.7.4 for Multi-frame True Color Secondary Capture Image	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Generated by device	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	Attribute only sent if an Extended or Replacement Character Set is used	ANAP	AUTO
Instance Creation Date	(0008,0012)	DA	<yyyymmdd>	ALWAYSUA	AUTO
Instance Creation Time	(0008,0013)	TM	<hhmmss>	ALWAYS	AUTO

9.1.1.5.4 Comprehensive Structured Report Modules

Table 9.24
SR DOCUMENT SERIES MODULE OF CREATED COMPREHENSIVE SR SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"SR"	ALWAYS	AUTO
Series Date	(0008,0021)	DA	Date of series creation.	ALWAYS	AUTO
Series Time	(0008,0031)	TM	Time of series creation.	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Auto-generated	ALWAYS	AUTO
Series Number	(0020,0011)	IS	A number unique within the Study	ALWAYS	AUTO
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	Identifies the MPPS SOP Instance to which this image is related	ALWAYS	MPPS
>Referenced SOP Class UID	(0008,1150)	UI	PPS SOP Class = "1.2.840.10008.3.1.2.3.3"	ALWAYS	MPPS
> Referenced SOP Instance UID	(0008,1155)	UI	PPS Instance UID of the PPS generating this document	ALWAYS	MPPS

Table 9.25
SR DOCUMENT GENERAL MODULE OF CREATED COMPREHENSIVE SR SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Unique number	ALWAYS	AUTO
Completion Flag	(0040,A491)	CS	PARTIAL	ALWAYS	AUTO
Verification Flag	(0040,A493)	CS	UNVERIFIED	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Date content created.	ALWAYSUA	AUTO
Content Time	(0008,0033)	TM	Time content created.	ALWAYS	AUTO
Predecessor Documents Sequence	(0040,A360)	SQ	Used when Send of Demand is used and Send Structured Reports with Send on Demand is selected. Will indicate the preceding SR sent in the study.	ANAP	AUTO
>Study Instance UID	(0020,000D)	UI	Study's UID	ANAP	AUTO
>Referenced Series Sequence	(0008,1115)	SQ	Identifies the Series containing the referenced SR	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
>>Referenced SOP Sequence	(0008,1199)	SQ	SOP Instance UID for SR Series in the study	ALWAYS	AUTO
>>> Referenced SOP Class	(0008,1150)	UI	Comprehensive SR SOP Class 1.2.840.10008.5.1.4.1.1.88.33	ALWAYS	AUTO
>>> Referenced SOP Instance UID	(0008,1155)	UI	SOP Instance UID of the preceding SR in the study	ALWAYS	AUTO
Referenced Request Sequence	(0040,A370)	SQ	Identifies Requested Procedures being fulfilled (completely or partially) by creation of this Document.	ANAP	AUTO
>Study Instance UID	(0020,000D)	UI	Same value as in MWL or auto generated	ALWAYS	MWL/ AUTO
>Referenced Study Sequence	(0008,1110)	SQ	1 item per item in MWL, zero length if unscheduled	ANAPVNAP	MWL
>>Referenced SOP Class UID	(0008,1150)	UI	Identifies the Referenced SOP Class	ANAP	MWL
>>Referenced SOP Instance UID	(0008,1155)	UI	Instance UID	ANAP	MWL
>Accession Number	(0008,0050)	SH	Same attribute of MWL or user PDE input.	VNAP	MWL/ USER
>Placer Order Number/Imaging Service Request	(0040,2016)	LO	Order Number of Imaging Service Request assigned by placer	VNAP	MWL
>Filler Order Number/Imaging Service Request	(0040,2017)	LO	Order Number of Imaging Service Request assigned by filler	VNAP	MWL
>Requested Procedure ID	(0040,1001)	SH	1 item per item in MWL, absent if unscheduled	ANAP	MWL
>Requested Procedure Description	(0032,1060)	LO	1 item per item in MWL, absent if unscheduled	ANAP	MWL
>Requested Procedure Code Sequence	(0032,1064)	SQ	1 item per item in MWL, zero length if unscheduled	VNAP	MWL
Performed Procedure Code Sequence	(0040,A372)	SQ	Codes of the performed procedure, zero length if unscheduled	VNAP	AUTO/ MWL

Table 9.26
SR DOCUMENT CONTENT MODULE OF CREATED COMPREHENSIVE SR SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Content Template Sequence	(0040,A504)	SQ		ALWAYS	AUTO
>Template Identifier	(0040,DB00)	CS	The Root Content Item identifies TID 5000 (OB-GYN), 5100 (Vascular). 5200 (Echo), TID 5220 or 995300 (Ped Echo), TID 995400 (Small Parts)	ALWAYS	AUTO
>Mapping Resource	(0008,0105)	CS	DCMR	ALWAYS	AUTO
Content Sequence	(0040,A730)	SQ		ALWAYS	AUTO
>Relationship Type	(0040,A010)	CS	CONTAINS HAS CONCEPT MOD HAS PROPERTIES	ALWAYS	AUTO
Document Relationship Macro Table			See data at Philips Data Portal referenced in Section A.3.1	ANAP	AUTO
Document Content Macro			See data at Philips Data Portal referenced in Section A.3.1	ALWAYS	AUTO
Value Type	(0040,A040)	CS	CONTAINER, always first attribute of SR Additional values used: TEXT, NUM, DATE, CODE, IMAGE, SCOORD	ALWAYS	AUTO
Concept Name Code Sequence	(0040,A043)	SQ		ALWAYS	AUTO
>Code Value	(0008,0100)		125000, 125100, 125200, 125195, 995300, or 995400	ALWAYS	AUTO
>Coding Scheme Designator	(0008,0102)		DCM	ALWAYS	AUTO
>Code Meaning	(0008,0104)		"OB-GYN Ultrasound Procedure Report", "Vascular Ultrasound Procedure Report", "Adult Echocardiography Procedure Report" "Pediatric Ultrasound Procedure Report" "Pediatric Echocardiography Procedure Report" or "Small Parts Ultrasound Procedure Report"	ALWAYS	AUTO
Continuity of Content	(0040,A050)	CS	SEPARATE	ALWAYS	AUTO
Spatial Coordinates Macro			If and only if Value Type (0040,A040) = SCOORD	ANAP	AUTO
Graphic Data	(0070,0022)		Order set of Column \ Row pairs defining positions in a reference image	ANAP	AUTO
Graphic Type	(0070,0023)		Polyline	ANAP	AUTO
Numeric Measurement Macro			See data at Philips Data Portal referenced in Section A.3.1	ALWAYS	AUTO
Code Macro			See data at Philips Data Portal referenced in Section A.3.1	ALWAYS	AUTO

Table 9.27
SOP COMMON MODULE OF CREATED COMPOSITE SR SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.88.33	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Generated by device	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	"None", unless required by characters used	ALWAYS	CONFIG

9.1.2 Usage of Attributes from Received IOD's

The attributes of images imported to EPIQ/Affiniti are stored with Level 2 conformance, are used in the display of these images, and are exported if the imported images are exported from EPIQ/Affiniti.

The usage of attributes received via Modality Worklist C-FIND is described in Section 4.2.2.3.1.3.

9.1.3 Attribute Mapping

Table 9.28 summarizes the relationships between attributes received via MWL, stored in acquired images and communicated via MPPS. The format and conventions used in Table 9.28 relate to the corresponding table in IHE Technical Framework, Rev. 11.0 07-24-2012, vol. II: Transactions.

Table 9.28
ATTRIBUTE MAPPING BETWEEN MODALITY WORKLIST, IMAGE AND MPPS

Modality Worklist	Image IOD	MPPS IOD
Patient's Name	Patient's Name	Patient's Name
Patient ID	Patient ID	Patient ID
Patient's Birth Date	Patient's Birth Date	Patient's Birth Date
Patient's Sex	Patient's Sex	Patient's Sex
Patient's Weight	Patient's Weight	
Referring Physician's Name	Referring Physician's Name	
----	----	Scheduled Step Attributes Sequence
Study Instance UID	Study Instance UID	>Study Instance UID
Referenced Study Sequence	Referenced Study Sequence	>Referenced Study Sequence
Accession Number	Accession Number	>Accession Number
----	Request Attributes Sequence	----
Requested Procedure ID	>Requested Procedure ID	>Requested Procedure ID
Requested Procedure Description	>Requested Procedure Description	>Requested Procedure Description
Scheduled Procedure Step ID	>Scheduled Procedure Step ID	>Scheduled Procedure Step ID

Modality Worklist	Image IOD	MPPS IOD
Scheduled Procedure Step Description	>Scheduled Procedure Step Description > Series Description > Performed Procedure Step Description	>Scheduled Procedure Step Description > Performed Procedure Step Description
Scheduled Protocol Code Sequence	>Scheduled Protocol Code Sequence	----
----	Performed Protocol Code Sequence	Performed Protocol Code Sequence
----	Study ID – Requested Procedure ID from MWL, else generated	Study ID – Requested Procedure ID from MWL, else generated
----	Performed Procedure Step ID	Performed Procedure Step ID
----	Performed Procedure Step Start Date	Performed Procedure Step Start Date
----	Performed Procedure Step Start Time	Performed Procedure Step Start Time
----	Performed Procedure Step Description	Performed Procedure Step Description
----	----	Performed Series Sequence
Requested Procedure Code Sequence	Procedure Code Sequence	Procedure Code Sequence
----	Referenced Performed Procedure Step Sequence	----
----	>Referenced SOP Class UID	SOP Class UID
----	>Referenced SOP Instance UID	SOP Instance UID
----	Protocol Name	Protocol Name

9.1.4 Coerced/Modified Fields

The MWL AE will truncate attribute values received in the response to a MWL Query if the value length is longer than the maximum length permitted by the attribute's VR.

9.1.5 Attribute Anonymization

The EPIQ/Affiniti supports basic anonymization in that a set of identifying DICOM attributes that are stored to media will be either removed or replaced with non-identifying data, according to the HIPAA guidelines for anonymization.

The option to de-identify is available at the time of export for the manual send to media workflows.

Table 9.29 contains a list of attributes containing patient identification and how EPIQ/Affiniti processing the attribute value when DICOM de-identification is selected on export. This table is derived from DICOM 2007 PS3.15 Annex E, Table E.1-1. Note most attributes are labeled 'Keep' because they are not classified as identifying by the United States Health Insurance Portability and Accountability Act of 1996 (HIPAA) Safe-Harbor De-Identification Guidelines.

Table 9.29
DICOM ATTRIBUTES CONTAINING PATIENT IDENTIFYING INFORMATION

Attribute Name	Tag	Delete / Replace?
Instance Creation Date	(0008,0012)	Delete
Instance Creation Time	(0008,0013)	Delete
SOP Instance UID	(0008,0018)	Replace
Study Date	(0008,0020)	Replace
Series Date	(0008,0021)	Delete
Content Date	(0008,0023)	Delete
Acquisition DateTime	(0008,002A)	Delete
Study Time	(0080,0030)	Replace
Series Time	(0008,0031)	Delete
Content Time	(0008,0033)	Delete
Accession Number	(0008,0050)	Delete
Institution Name	(0008,0080)	Delete
Referring Physician's Name	(0008,0090)	Delete
Code Meaning	(0008,0104)	Delete
Station Name	(0008,1010)	Delete
Study Description	(0008,1030)	Delete
Series Description	(0008,103E)	Delete
Physicians of Record	(0008,1048)	Delete
Operators' Name	(0008,1070)	Delete
Admitting Diagnosis Description	(0008,1080)	Delete
Referenced SOP Instance UID	(0008,1155)	Replace
Derivation Description	(0008,2111)	Delete
Patient's Name	(0010,0010)	Replace
Patient ID	(0010,0020)	Replace
Patient's Birth Date	(0010,0030)	Delete
Patient's Sex	(0010,0040)	Delete
Other Patient IDs	(0010,1000)	Delete
Patient's Size	(0010,1020)	Replace
Patient's Weight	(0010,1030)	Replace
Pregnancy Status	(0010,10C0)	Replace
Medical Alerts	(0010,2000)	Delete
Alergies	(0010,2110)	Delete

Attribute Name	Tag	Delete / Replace?
Ethnic Group	(0010,2160)	Delete
Additional Patient History	(0010,21B0)	Delete
Patient Comments	(0010,4000)	Delete
Device Serial Number	(0018,1000)	Delete
Protocol Name	(0018,1030)	Delete
Study Instance UID	(0020,000D)	Replace
Series Instance UID	(0020,000E)	Replace
Study ID	(0020,0010)	Delete
Requesting Physician	(0032,1032)	Delete
Scheduled Procedure Step Description	(0040,0007)	Delete
Performed Procedure Step Start Date	(0040,0244)	Delete
Performed Procedure Step Start Time	(0040,0245)	Delete
Performed Procedure Step ID	(0040,0253)	Delete
Performed Procedure Step Description	(0040,0254)	Delete
Comments on Performed Procedure Step	(0040,0280)	Delete
Names of Intended Recipients of Results	(0040,1010)	Delete

- o EPIQ/Affiniti will replace the Patient Name with an unidentifiable string composed of a prefix 'DeId-' and followed by a unique numeric sequence,

- o EPIQ/Affiniti will replace the Patient ID with a new generated unique ID.

- o All noted Instance UIDs are modified because the Voyager generated instance UID's are generated at the time of the start of the procedure and suffixed with a date/time string noting the current date and time. Because all manner of dates are considered identifying, the date and time portion of these strings is replaced with a new date and time at the time of export. In this way we can be sure that they cannot be linked back to the original date and time of the study. Referenced SOP instance UID links are maintained.

- o The Study ID and Performed Procedure Step ID on EPIQ/Affiniti include date strings, and thus must be removed.

9.2 DATA DICTIONARY OF PRIVATE ATTRIBUTES

Philips private attributes in groups 0x2001 and 0x200D may be included in objects created by EPIQ/Affiniti.

9.3 CODED TERMINOLOGY AND TEMPLATES

The Workflow AE is capable of supporting arbitrary coding schemes for Procedure and Protocol Codes. The contents of Requested Procedure Code Sequence (0032,1064) and Scheduled Protocol Code Sequence (0040,0008) supplied in Worklist Items will be mapped to Image IOD and MPPS attributes as described in Table 9.28.

Structured Reporting uses codes supplied by DCMR (DICOM Code Mapping Resource, PS 3-16), LOINC, SRT and 99PMSBLUS (Philips Private Codes for Ultrasound).

9.4 GRAYSCALE IMAGE CONSISTENCY

The high-resolution display monitor is calibrated according to the Grayscale Standard Display Function (GSDF).

9.5 STANDARD EXTENDED/SPECIALIZED/PRIVATE SOP CLASSES

9.5.1 Ultrasound Image and Multi-frame Image SOP Classes

The US or US Multiframe Image Storage SOP Classes are extended to create a Standard Extended SOP Class by addition of standard and private attributes to the created SOP Instances as documented in section 8.1 as well as the standard attributes listed in Table 9.30.

Table 9.30
ULTRASOUND IMAGE EXTENDED ATTRIBUTES

Tag	Attribute Name	Added to
(0028,0030)	Pixel Spacing	Images with a single 2D region or dual 2D with same depth
(0008,0068)	Presentation Intent Type	Indicates that Pixel Data (7FE0,0010) contains 3D volume data
(0008,2112)	Source Image Sequence	Extended to use codes from CID 7205. See Table 9.31.
(0032,1032)	Requesting Physician	Added to image IODs for consistency with Structured Reports.

Pixel Spacing (0028,0030) is added to the exported DICOM file when the user has configured this attribute to be included and the image contains only one 2D calibration region and no Doppler or M-Mode calibration regions. This attribute is system generated, if used:

- **Contain the Pixel Spacing attribute:** 2D still, 2D loop, 2D color still, 2D color loop, Mmode Preview Still, PW Preview Still, CW Preview still, and Dual with same calibration on both images.

- **Do NOT contain the Pixel Spacing attribute:** Mmode live trace, Mmode frozen trace, PW live trace, PW Frozen trace, CW live trace, CW frozen trace, Reports and dual images with different calibration on each image.

Ultrasound Multi frame Image instances may be used to store 3D and 4D ultrasound volume information. The presence of the Presentation Intent Type (0008,0068) value "FOR PRESENTATION" indicates that Pixel Data (7FE0,0010) contains spatially related frames of a 3D volume rather than the normal temporally related frames. 3D Temporal (a.k.a. 4D) volume information is stored using private attributes within a normal Ultrasound Multi frame Image object.

The private attributes that are sent via network or media are dependent on settings for the specific destination, as found in "Print/Network>Device Selection and either the "Media" tab or "Archive" tab and the "Advanced" button for the highlighted archive device.

Table 9.31
SOURCE IMAGE SEQUENCE ITEM EXTENDED ATTRIBUTES

Attribute Name	Tag	Type	VR	Description	Value
Source Image Sequence	(0008,2112)	3	SQ	The set of Image SOP Class/Instance pairs of the Images that were used to derive this image.	

Attribute Name	Tag	Type	VR	Description	Value
>Purpose of Reference Code Sequence	(0040,A170)	3	SQ	Describes the purpose for which the reference is made.	
>> Code Value	(0008,0100)	1	SH	Code Value	121324
>>Code Meaning	(0008,0104)	1	LO	Code Meaning	Source Image

9.5.2 3D Presentation State Private SOP Class

EPIQ Elite, Elite Advanced, 7, CVx (CVi) and some EPIQ 5 configurations may create instances of the following Private SOP Class:

Table 9.32
PRIVATE SOP CLASS FOR 3D PRESENTATION STATE

SOP Class Name	SOP Class UID	SCU	SCP
Private 3D Presentation State	1.3.46.670589.2.5.1.1	Yes	No

9.6 PRIVATE TRANSFER SYNTAXES

There are no Private Transfer Syntaxes.

**APPENDIX A – Structured Reports**

A.1 STRUCTURED REPORTS

A.1.1 Introduction

EPIQ/Affiniti implement DICOM Structured Report Templates TID 5000 (OB-GYN Ultrasound Procedure Report), TID 5100 (Vascular Ultrasound Report), TID 5200 (Echocardiography Procedure Report), TID 5220 (Pediatric, Fetal and Congenital Cardiac Ultrasound Reports), private TID 995300 (Ped Echo) based on supplement 78 version 2, May 8 2004, and private TID 995400 (Small Parts). See section A.2 for the DICOM Structured Report export capabilities for each EPIQ/Affiniti model.

DICOM PS 3.17 of the DICOM Standard includes tree diagrams showing graphic examples of the structure of each template.

Briefly, a Structured Report (SR) document will contain only the measurements, calculations and observations made during the exam. Its exact structure is therefore determined by two main components, the measurements that are available within the context of the template and its referenced Templates and Context groups, and those measurements and calculations that are implemented on the system creating the report. Supplementing these constraints are private and user defined measurements and calculations, which may be added if the Root Container Template is extensible.

In EPIQ/Affiniti, the calculation packages contain a combination of template and user defined measurements and calculations.
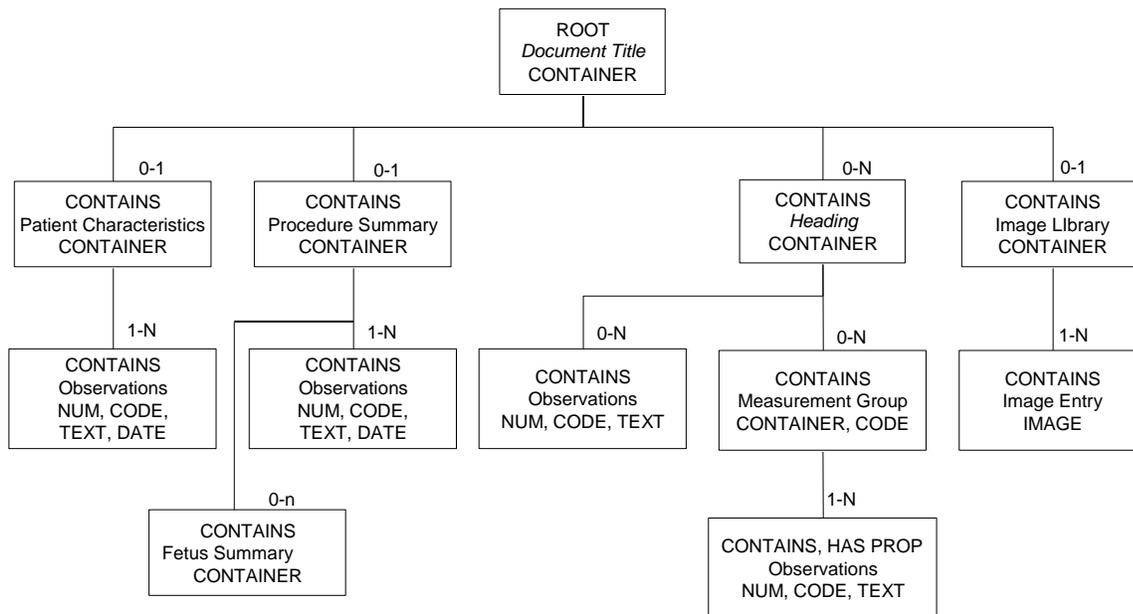
A.1.1.1 Measurements Linked to Images

Spatial Coordinates (as defined by TID 320 row 3) are included for measurement sub-results whose measurement tools have been captured in an image (as defined by TID 300 row 13).
There are three special cases in which the Value Multiplicity for DTID 320 shall be greater than one:

a. If more than one image is captured of the same measurement tool, the sub-result will reference each image.
b. For a complex measurement tool (the Simpson's Method of Disk Volume measurement) which with one user action creates 22 unique spatial coordinates, the first 20 spatial coordinates shall be the Chord values, the

21st spatial coordinate shall be the ventricular length measurement, and the 22nd spatial coordinate shall be the ventricular area measurement.

c. For Doppler velocity measurements made with a two-point or trace tool, there shall be two spatial coordinates per measurement. The first shall be the single point associated with the velocity measurement, and the second shall consist of all the points of the measurement tool.

A.1.2   Clinical Scope

The supported measurements are located in Calcs packages accessed with the "Measure" hard key on EPIQ/Affiniti. Measurements for a given SR section may come from several calcs sidebars/touch screens.

A.2   APPLICATIONS THAT EXPORT STRUCTURED REPORTS FROM EPIQ AND AFFINITI

The following table describes the DICOM Structured Report export capabilities by application for the EPIQ Affiniti families of ultrasound systems.

• "G", including "Elite" "Elite Advanced", is optimized for General Imaging, Shared Service, and Radiology use

• "C", including "CVx", "CVxi", is optimized for Cardiology use

• "W", is optimized for Women's Healthcare use

	OB/Gyn TID 5000	Vascular TID 5100	Abdominal TID 5100	TCD TID 5100	Adult Echo TID 5200	Pediatric Echo TID 5220	Fetal Echo 125196	Pediatric Echo TID 995300 (Private)	Small Parts TID 995400 (Private)
EPIQ *G EPIQ Elite* Affiniti *G	✔	✔	✔	✔	✔	✔	✔	✔	✔
EPIQ *C CVx* Affiniti *C		✔	✔	✔	✔	✔	✔	✔	
EPIQ *W Affiniti *W	✔						✔		✔
Affiniti 30	✔	✔	✔	✔	✔	✔	✔	✔	✔

*=Any model

A.3   DICOM STRUCTURED REPORT EXPORT SPECIFICATIONS

A.3.1   Philips Healthcare Ultrasound Data Portal Website

Rather than list the thousands of DICOM export encodings in this document, the Philips Healthcare Ultrasound Data Portal website (see link below) provides detailed DICOM export specifications for all Philips ultrasound products in a convenient downloadable spreadsheet format. These spreadsheets allow users to quickly filter for specific areas of interests such as application, template, label, or DICOM attribute. In addition to DICOM Structured Report specifications, the link also provides many DICOM Structured Report example files and images for import and display testing.

Welcome to the Philips Healthcare Ultrasound Data Portal.

Select a product of interest:

EPIQ ▼

Enter your email address to access:

Submit

To access the Philips Healthcare Ultrasound Data Portal,
- Using a browser, to navigate to the link below.
- Select the ultrasound product of interest.
- Provide an email address and press the submit button.
- Download "Philips_EPIQAffiniti_v7.0_DICOM_SR_Specification.xlsx"

Philip Ultrasound Data Portal Website Link: **http://www.UltrasoundDataPortal.net.philips.com/portal/index.asp?pid=us**

A.4   PRIVATE TEMPLATE EXTENSIONS

The PDE and Study Info data that is not already part of the DICOM templates is included using the following template extensions, per the appropriate application.

A.4.1   TID5001: OB-GYN Patient Characteristics

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
…	…	…	…	…	…	…	…	…
9	>	CONTAINS	TEXT or DATE or NUM	DCID (99002) General Study Info	1	U		
10	>	CONTAINS	TEXT or DATE or NUM	DCID (99003) OB Study Info	1	U		
11	>	CONTAINS	TEXT or DATE or NUM	DCID (99004) Gyn Study Info	1	U		

Line 4.1 is used only with a user-defined table or equation.

A.4.2 TID5008: Fetal Biometry Group

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
...	...	...	...	...	...	...	...	...
3	>	CONTAINS	NUM	EV (18185-9 , LN, "Gestational Age")	1	MC	At least one of row 2 and 3 shall be present	Units = EV (d, UCUM, days)
4	>>	INFERRED FROM	CODE	DCID (228) Equation or Table	1	U	IF row 4.1 is absent	DCID (12013) Gestational Age Equations and Tables
4.1	>>	INFERRED FROM	TEXT	DCID (228) Equation or Table	1	U	IF row 4 is absent	
5	>>	R-INFERRED FROM	NUM		1-n	U		

A.4.3 TID5101: Vascular Patient Characteristics

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
...	...	...	...	...	...	...	...	...
7	>	CONTAINS	TEXT or DATE or NUM	DCID (99002) General Study Info	1	U		
8	>	CONTAINS	TEXT or DATE or NUM	DCID (99005) Vascular Study Info	1	U		
9	>	CONTAINS	TEXT or DATE or NUM	DCID (99006) Abdominal Study Info	1	U		

A.4.4 TID5202: Echocardiography Patient Characteristics

|	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
...	...	...	...	...	...	...	...	...
9	>	CONTAINS	TEXT or DATE or NUM	DCID (99002) General Study Info	1	U		
10	>	CONTAINS	TEXT or DATE or NUM	DCID (99007) Adult Echo Study Info	1	U		

A.5 USER-DEFINED MEASUREMENTS AND CALCULATIONS

A.5.1 Description

EPIQ/Affiniti provides 2 different DICOM export formats for creating user defined measurements and calculations. The DICOM Encoding format provides a way to create and export user-defined measurements and calculations or user-defined OB authors to PACS using the existing DICOM SR templates. The Philips Generic export format allows users to create measurements and calculations without specifying complete DICOM encoding attributes and will be exported in a generic DICOM encoding format.

A.5.1.1 Philips Generic DICOM Export Format

For quickly creating exportable measurements and calculations without specific DICOM encodings, a generic structure was created that does not assign specific codes to the individual measurements, rather uses the label given by the user. This will allow all user-defined measurements to be treated in a uniform manner, without needing a per-site dictionary of user-defined codes.
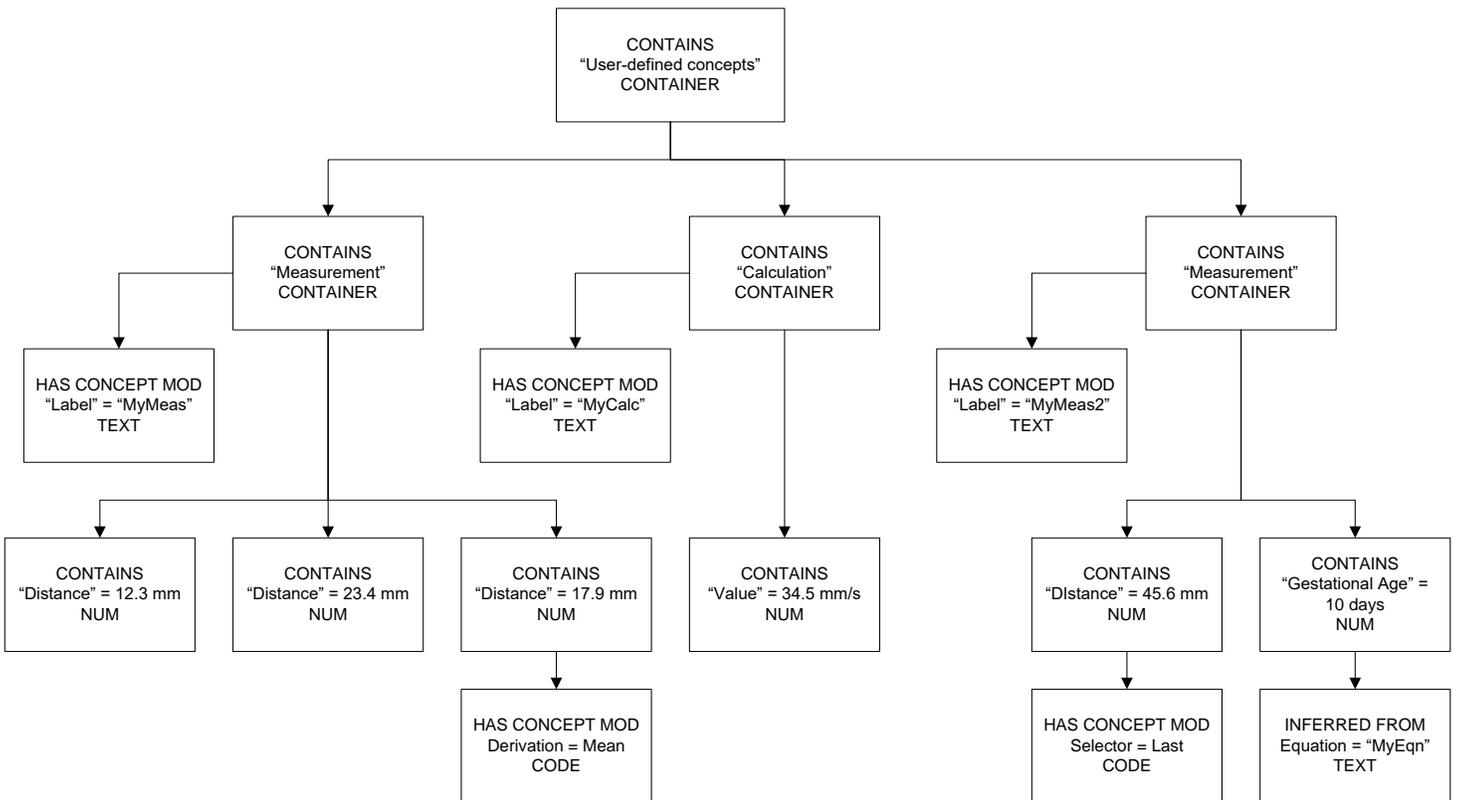
A.5.1.2 DICOM Template Compatible Export Format

EPIQ/Affiniti can also export user defined measurements, calculations and OB tables which are compatible with existing DICOM standard templates. These DICOM objects are created with user configurable attributes for the DICOM code scheme designator, code value and code meaning. For more information on the DICOM attributes supported, see the Analysis section in the EPIQ and Affiniti Setups menu.

A.5.1.3 Private Template and Template Extensions

A.5.1.3.1 TID5000: OB-GYN Ultrasound Procedure Report

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
…	…	…	…	…	…	…	…	…
25	>	CONTAINS	INCLUDE	TID (9902) Fetal Heart Section	1	U		
26	>	CONTAINS	INCLUDE	TID (9900) User-defined concepts	1	U		

A.5.1.3.2 TID5100: Vascular Ultrasound Report

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
…	…	…	…	…	…	…	…	…
31	>	CONTAINS	INCLUDE	TID (9900) User-defined concepts	1	U		

A.5.1.3.3 TID5200: Echocardiography Procedure Report

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
…	…	…	…	…	…	…	…	…
22	>	CONTAINS	INCLUDE	TID (9900) User-defined concepts	1	U		

A.5.1.3.4 TID995300: Pediatric Echocardiography Procedure Report

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
…	…	…	…	…	…	…	…	…
22	>	CONTAINS	INCLUDE	TID (9900) User-defined concepts	1	U		

A.5.1.3.5 TID9900: User-defined concepts

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	DT (T9900-01, 99PMSBLUS, "User-defined concepts")	1	M		
2	>	CONTAINS	INCLUDE	TID (9901) User-defined concept	1-n	MC	One of row 2 and 3 must be present	$Type = DT (T9900-02, 99PMSBLUS, "Measurement")
3	>	CONTAINS	INCLUDE	TID (9901) User-defined concept	1-n	MC	One of row 2 and 3 must be present	$Type = DT (T9900-03, 99PMSBLUS, "Calculation")

A.5.1.3.6 TID9901: User-defined concept

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	$Type	1	M		
2	>	HAS OBS CONTEXT	INCLUDE	DTID (1008) Subject Context, Fetus	1	MC	IF this template is invoked more than once to describe more than one fetus	
3	>	HAS CONCEPT MOD	TEXT	DT (T9900-04, 99PMSBLUS, "Label")	1	M		
4	>	HAS CONCEPT MOD	CODE	DT (G-C171, SRT, "Laterality")	1	U		DCID (244) Laterality
5	>	CONTAINS	INCLUDE	TID (300)	1	1-n	IFF $Type = "Measurement"	$Measurement = DCID (99008) Results $Derivation = DCID (3627) Measurement Type
6	>	CONTAINS	INCLUDE	TID (300)	1	1	IFF $Type = "Calculation"	$Measurement = DT (T9900-05, 99PMSBLUS, "Value")
7	>	CONTAINS	NUM	EV (18185-9, LN, "Gestational Age")	1	U		$Units = EV (d, 1.4, UCUM, days)
8	>	INFERRED FROM	TEXT	DCID (228) Equation or Table	1	U		

A.5.1.3.7 TID9902: Fetal Heart Section

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	DT (99999, 99PMSBLUS, "Fetal Heart")	1	M	…	…
2	>	HAS OBS CONTEXT	INCLUDE	DTID (1008) Subject Context. Fetus	1	MC	IF this template is invoked more than once to describe more than one fetus	
3	>	CONTAINS	INCLUDE	DTID (5008) Fetal Biometry Group	1-n	M		$Biometery Type=MemberOf (DCID (99001) Fetal Heart)

A.5.1.3.8 TID 5009: Fetal Biophysical Profile Section

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	DT 125006,DCM,"Biophysical Profile")	1	M		
2	>	HAS OBS CONTEXT	INCLUDE	DTID (1008) Subject Context. Fetus	1	MC	IF this template is invoked more than once to describe more than one fetus	
3	>	CONTAINS	NUM	EV (11631-9,LN, "Gross Body Movement")	1	MC	At least one of row 3-7 shall be present	Units = DT ("{0:2}", UCUM, "range 0:2")
4	>	CONTAINS	NUM	EV (11632-7,LN, "Fetal Breathing")	1	MC	At least one of row 3-7 shall be present	Units = DT ("{0:2}", UCUM, "range 0:2")
5	>	CONTAINS	NUM	EV (11635-0,LN, "Fetal Tone")	1	MC	At least one of row 3-7 shall be present	Units = DT ("{0:2}", UCUM, "range 0:2")
6	>	CONTAINS	NUM	EV (11635-5,LN, "Fetal Heart Reactivity")	1	MC	At least one of row 3-7 shall be present	Units = DT ("{0:2}", UCUM, "range 0:2")
7	>	CONTAINS	NUM	EV (11630-1,LN, "Amniotic Fluid Volume")	1	MC	At least one of row 3-7 shall be present	Units = DT ("{0:2}", UCUM, "range 0:2")
8	>	CONTAINS	NUM	DT (11634-3,LN, "Bipohysical Profile Sum Score")	1	U		

A.5.1.3.9 TID 5016: Pelvis and Uterus Section

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	DT 125011,DCM,"Pelvis and Uterus")	1	M		
2	>	CONTAINS	INCLUDE	DTID (5016) LWH Volume Group	1	U		$GroupName = EV (T-83000, SRT, "Uterus") $Width = EV (11865-3,LN," Uterus Width") $Length = EV (11842-2, LN," Uterus Length") $Height = EV (11859-6, LN," Uterus Height") $Volume = EV (33192-6, LN, "Uterus Volume")
3	>	CONTAINS	INCLUDE	DTID (300) Measurement	1-n	U		$Measurement = DCID (12011) Ultrasound Pelvis and Uterus $Derivation = DCID (3627) Measurement Type

B APPENDIX B – BULK PRIVATE TAGS

B.1 BULK PRIVATE ATTRIBUTES

The private attributes listed below are intended to provide awareness of large groups of private data from EPIQ/Affiniti datasets

Attribute Name	DICOM Tag	VR	Description
Private Data	(200D,300E)	OB	Bulk data
Private Data	(200D,300B)	OB	Bulk data
Private Data	(200D,3CF3)	OB	Bulk data

***** End of Document *****