

Philips Medical Systems

DICOM

CONFORMANCE STATEMENT



iU22

SW Version 1.1.2.x

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0.1

REVISION HISTORY

Document Version	Date of Issue	Author	Description
A	January 27, 2004	M. Leif	Initial Release
B	August 18, 2004	M. Leif	DCS Release supporting 1.1.x.x software Adds Monochrome image support for most single frame and Uncompressed RGB for Multiframe images, added VOI LUT for Window Center and Level; various updates throughout document
C	September 30, 2004	M. Leif	DCS Release supporting 1.1.2.x software Association does not require successful Ping response for operation, Association Retry behavior expanded for associations dropped by SCP or by topology failure, Added ability to Auto Select between BW and Color printers, if both are attached during exam with Send After Each Image, Added Study Description field in UI and added tag mapping support for Scheduled Procedure Step Description from MWL to C-Store objects, Added the ability to select sending C-Store image objects using Retired US Image or US Multiframe image SOP Classes, added user selectable Export Map Configuration curves for optimal image quality on softcopy review. Added printer configuration controls and tags. Cleaned up several sections.

1 CONFORMANCE STATEMENT OVERVIEW

iU22 implements the necessary DICOM services to download worklists from an information system, save acquired US images and associated Structured Reports to a network storage device, CD or DVD, print to a networked hardcopy device and inform the information system about the work actually done.

Table 1 provides an overview of the supported network services.

**Table 1
NETWORK SERVICES**

Networking SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Image Transfer		
Ultrasound Image Storage	Yes	No
Ultrasound Multiframe Image Storage	Yes	No
Storage Commitment Push Model	Yes	No
Structured Report Transfer		
Comprehensive SR	Yes	No
Workflow		
Modality Worklist	Yes	No
Modality Performed Procedure Step	Yes	No
Print		
Basic Grayscale Print Management	Yes	No
Basic Color Print Management	Yes	No
General		
Verification	Yes	Yes

Table 2 specifies the Media Storage Application Profiles supported.

**Table 2
MEDIA SERVICES**

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
DVD-Rewriteable		
STD-US-SC-SF-DVD	Yes / Yes	Yes
STD-US-SC-MF-DVD	Yes / Yes	Yes

2 TABLE OF CONTENTS

0.1	REVISION HISTORY	2
1	CONFORMANCE STATEMENT OVERVIEW.....	3
2	TABLE OF CONTENTS	4
3	INTRODUCTION	8
3.1	AUDIENCE	8
3.2	REMARKS.....	8
3.3	DEFINITIONS, TERMS AND ABBREVIATIONS	8
3.4	REFERENCES.....	9
4	NETWORKING.....	10
4.1	IMPLEMENTATION MODEL.....	10
4.1.1	Application Data Flow.....	10
4.1.2	Functional Definition of AEs	11
4.1.2.1	Functional Definition of Storage Application Entity.....	11
4.1.2.2	Functional Definition of Workflow Application Entity	11
4.1.2.3	Functional Definition of Hardcopy Application Entity	11
4.1.3	Sequencing of Real-World Activities	12
4.2	AE SPECIFICATIONS.....	14
4.2.1	Storage Application Entity Specification.....	14
4.2.1.1	SOP Classes	14
4.2.1.2	Association Establishment Policy	14
4.2.1.2.1	General 14	
4.2.1.2.2	Number of Associations	14
4.2.1.2.3	Asynchronous Nature	14
4.2.1.2.4	Implementation Identifying Information	14
4.2.1.3	Association Initiation Policy	15
4.2.1.3.1	Activity – Store Images, Loops and Structured Reports.....	15
4.2.1.3.1.1	Description and Sequencing of Activities.....	15
4.2.1.3.1.2	Proposed Presentation Contexts	16
4.2.1.3.1.3	SOP Specific Conformance for Image and Comprehensive Structured Report Storage SOP Classes.....	18
4.2.1.3.1.4	SOP Specific Conformance for Storage Commitment Push Model SOP Class 18	
4.2.1.3.1.4.1	Storage Commitment Operations (N-ACTION).....	18
4.2.1.3.1.4.2	Storage Commitment Notifications (N-EVENT-REPORT)19	
4.2.1.4	Association Acceptance Policy.....	19
4.2.1.4.1	Activity – Receive Storage Commitment Response	19
4.2.1.4.1.1	Description and Sequencing of Activities.....	19
4.2.1.4.1.2	Accepted Presentation Contexts.....	19
4.2.1.4.1.3	SOP Specific Conformance for Storage Commitment Push Model SOP Class 20	
4.2.1.4.1.3.1	Storage Commitment Notifications (N-EVENT-REPORT)20	
4.2.2	Workflow Application Entity Specification.....	20
4.2.2.1	SOP Classes	20
4.2.2.2	Association Establishment Policy	20
4.2.2.2.1	General 20	
4.2.2.2.2	Number of Associations	20
4.2.2.2.3	Asynchronous Nature	21
4.2.2.2.4	Implementation Identifying Information.....	21
4.2.2.3	Association Initiation Policy	21
4.2.2.3.1	Activity – Worklist Update	21

4.2.2.3.1.1	Description and Sequencing of Activities	21
4.2.2.3.1.2	Proposed Presentation Contexts	22
4.2.2.3.1.3	SOP Specific Conformance for Modality Worklist	22
4.2.2.3.2	Activity –Acquire Images.....	25
4.2.2.3.2.1	Description and Sequencing of Activities	25
4.2.2.3.2.2	Proposed Presentation Contexts	26
4.2.2.3.2.3	SOP Specific Conformance for MPPS	27
4.2.2.4	Association Acceptance Policy	29
4.2.3	Hardcopy Application Entity Specification	29
4.2.3.1	SOP Classes	29
4.2.3.2	Association Establishment Policy	29
4.2.3.2.1	General 29	
4.2.3.2.2	Number of Associations	29
4.2.3.2.3	Asynchronous Nature	30
4.2.3.2.4	Implementation Identifying Information.....	30
4.2.3.3	Association Initiation Policy	30
4.2.3.3.1	Activity – Film Images.....	30
4.2.3.3.1.1	Description and Sequencing of Activities	30
4.2.3.3.1.2	Proposed Presentation Contexts	31
4.2.3.3.1.3	Common SOP Specific Conformance for all Print SOP Classes ..	32
4.2.3.3.1.4	SOP Specific Conformance for the Printer SOP Class.....	32
4.2.3.3.1.4.1	Printer SOP Class Operations (N-GET)	32
4.2.3.3.1.4.2	Printer SOP Class Notifications (N-EVENT-REPORT)	33
4.2.3.3.1.5	SOP Specific Conformance for the Film Session SOP Class.....	33
4.2.3.3.1.5.1	Film Session SOP Class Operations (N-CREATE).....	33
4.2.3.3.1.7	SOP Specific Conformance for the Film Box SOP Class	34
4.2.3.3.1.7.1	Film Box SOP Class Operations (N-CREATE)	34
4.2.3.3.1.7.2	Film Box SOP Class Operations (N-ACTION)	35
4.2.3.3.1.8	SOP Specific Conformance for the Image Box SOP Class	35
4.2.3.3.1.8.1	Image Box SOP Class Operations (N-SET).....	36
4.2.3.4	Association Acceptance Policy	37
4.2.4	Verification Application Entity specification	37
4.2.4.1	SOP Class	37
4.2.4.2	Association Establishment Policy	37
4.2.4.2.1	General 37	
4.2.4.2.2	Number of Associations	37
4.2.4.2.3	Asynchronous Nature	37
4.2.4.2.4	Implementation Identifying Information.....	37
4.2.4.3	Association Initiation Policy	38
4.2.4.3.1	Activity – Verify as SCU and SCP	38
4.2.4.3.2	Description and Sequencing of Activities.....	38
4.2.4.3.3	Proposed Presentation Contexts	39
4.2.4.3.4	SOP Specific Conformance for Verification	39
4.2.4.3.4.1	Verification SOP Class Operations (C-ECHO)	40
4.2.4.3.5	Association Acceptance Policy	40
4.2.4.3.5.1	Verification SOP Class Notifications	40
4.3	PHYSICAL NETWORK INTERFACES	40
4.3.1	Supported Communication Stacks	40
4.3.1.1	TCP/IP Stack	40
4.3.2	Physical Network Interface	40
4.4	CONFIGURATION	40
4.4.1	AE Title/Presentation Address Mapping.....	40
4.4.1.1	Local AE Title.....	41
4.4.1.2	Remote AE Title/Presentation Address Mapping	41
4.4.1.2.1	Storage 41	
4.4.1.2.2	Workflow 41	
4.4.1.2.3	Hardcopy 41	
5	MEDIA STORAGE.....	42

5.1	IMPLEMENTATION MODEL.....	42
5.1.1	Application Data Flow.....	42
5.1.2	Functional Definition of AEs	42
5.1.2.1	Functional Definition of Media Application Entity.....	42
5.1.3	Sequencing of Real-World Activities	42
5.1.4	File Meta Information Options	43
5.2	AE SPECIFICATIONS.....	43
5.2.1	Media Application Entity Specification.....	43
5.2.1.1	File Meta Information for the Application Entity	43
5.2.1.2	Real-World Activities.....	43
5.2.1.2.1	Activity – Export to DVD.....	43
5.2.1.2.2	Activity – Read from DVD	43
5.2.1.2.3	Activity – Update to DVD	43
5.2.1.2.3.1	Media Storage Application Profiles	44
5.2.1.2.3.2	Options	44
6	SUPPORT OF CHARACTER SETS	44
7	SECURITY.....	44
8	ANNEXES.....	45
8.1	CREATED IOD INSTANCES	45
8.1.1	US or US Multiframe Image IOD	45
8.1.2	Comprehensive Structured Report IOD	46
8.1.3	Common Modules	46
8.1.4	US or Multiframe Image Modules.....	49
8.1.5	Comprehensive Structured Report Modules	52
8.2	USED FIELDS IN RECEIVED IOD BY APPLICATION	53
8.3	ATTRIBUTE MAPPING.....	54
8.4	COERCED/MODIFIED FIELDS	55
8.5	CONTROLLED TERMINOLOGY	55
8.6	GRAYSCALE IMAGE CONSISTENCY.....	55
8.7	EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS	55
8.7.1	Standard Extended / Specialized / Private SOPs	55
8.8	PRIVATE TRANSFER SYNTAXES	55
APPENDIX A – Structured Report Templates		56
A.1	OB-GYN STRUCTURED REPORTS (SR) TEMPLATE	56
A.1.1	Introduction	56
A.1.2	Clinical Scope	56
A.1.3	Measurements	56
A.1.3.1	Fetal Biometry Ratios	57
A.1.3.2	Fetal Biometry Measurements.....	58
A.1.3.3	Long Bones Measurements.....	59
A.1.3.4	Fetal Cranium	59
A.1.3.5	Early Gestation Biometry Measurements.....	59
A.1.3.6	Multiple Fetus and Fetal Observation Context	60
A.1.3.6.1	Structure Example of Multiple Fetus and Fetal Observation	60
A.1.3.7	BIOPHYSICAL PROFILE.....	60
A.1.3.8	AMNIOTIC SAC	60
A.1.3.9	OB-GYN Ultrasound Ovary Measurements.....	60
A.1.3.10	Uterus Measurements	61
A.1.3.11	Follicles.....	61
A.1.3.12	Data not Exported in Structured Report	62
A.2	VASCULAR STRUCTURED REPORT TEMPLATE	63
A.2.1	Extracranial Cerebral Arteries	63
A.2.1.1	Carotid Arteries.....	63

A.2.2	Intracranial Cerebral Arteries.....	64
A.2.3	Peripheral Vascular	64
A.2.3.1	Lower Extremities	64
A.2.4	Abdominal Arteries	66
A.2.5	Abdominal Veins.....	66
A.2.6	Renal Vessels.....	66
APPENDIX B – 3D IMAGE PRIVATE SOP CLASS		68
B.1 3D IMAGE MEDIA PRIVATE TAG DESCRIPTION		68

3 INTRODUCTION

3.1 AUDIENCE

This document is intended for hospital staff, health 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 with Philips Medical Systems and other vendors' Medical 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 a 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 Medical Systems and non - Philips Medical Systems equipment.
- Test procedures should be defined to validate the desired level of connectivity.
- The DICOM standard will evolve to meet the users' future requirements. Philips Medical Systems is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

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	DICOM Application Entity
AET	Application Entity Title
ASCE	Association Control Service Element
CD-R	Compact Disk Recordable
CSE	Customer Service Engineer
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
GSDf	Grayscale Standard Display Function
IOD	(DICOM) Information Object Definition
ISO	International Standard Organization
MPPS	Modality Performed Procedure Step
MSPS	Modality Scheduled Procedure Step

MWL	Modality Worklist
R	Required Key Attribute
O	Optional Key Attribute
PDU	DICOM Protocol Data Unit
PDE	Patient Data Entry
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair
U	Unique Key Attribute

3.4 REFERENCES

[DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.16, 2003

Integrated Healthcare Enterprise (IHE) Technical Framework, version 5.5 04-07-2003

4 NETWORKING

4.1 IMPLEMENTATION MODEL

4.1.1 Application Data Flow

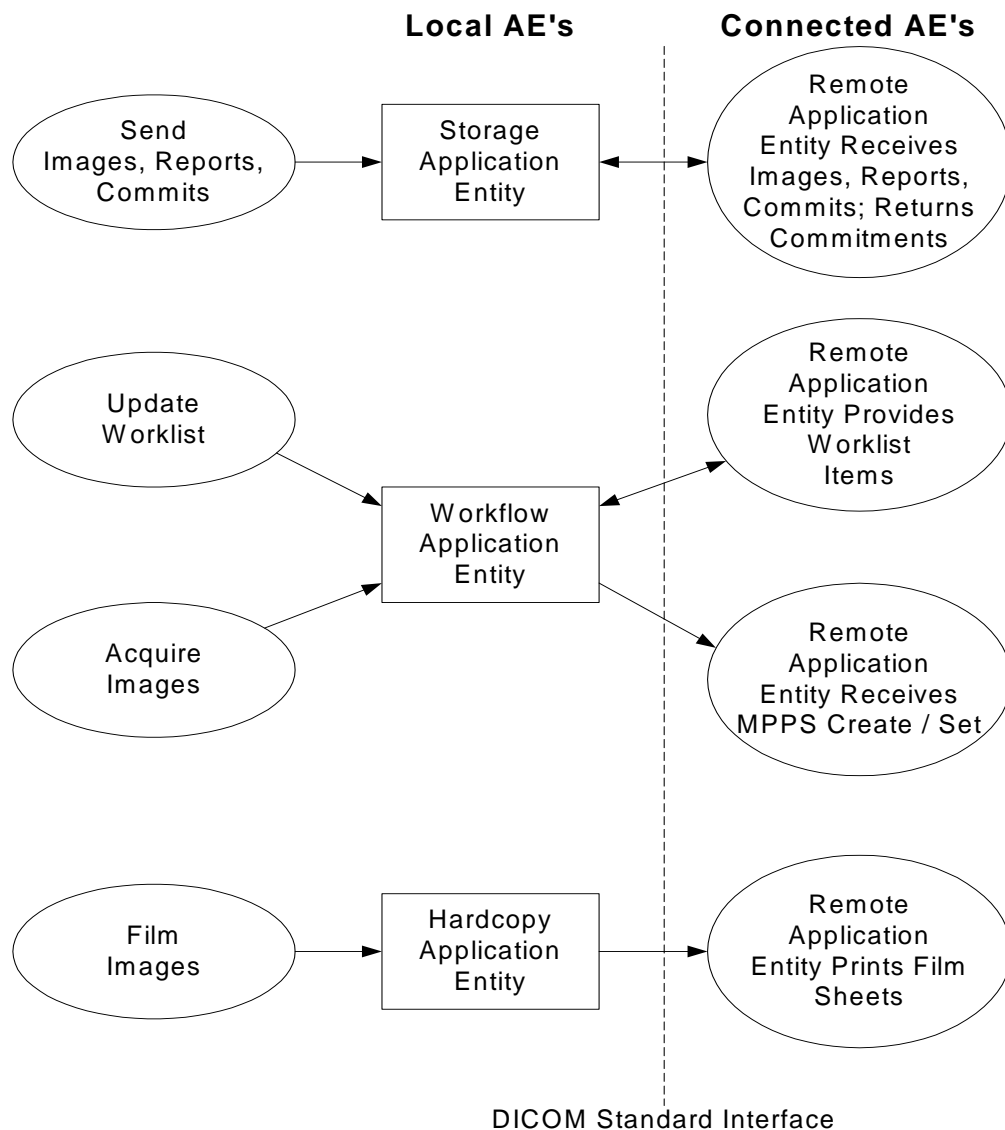


Figure 1
APPLICATION DATA FLOW DIAGRAM

- The Storage Application Entity sends images and Structured Reports to a remote AE. It is associated with the local real-world activity "Print" for single frame and "Capture" for Multiframe or Cineloops. Sending of images depends on user configuration, either "After Each Print/Capture" or "At End of Exam." Sending Structured Reports occurs only at End of Exam. An exam may be sent by user selection from the Patient Directory using "Review". If configured for After Each, images are transferred immediately after acquisition, and the association is closed. If

the remote AE is configured as an archive device, the Storage AE will request Storage Commitment and if a commitment is successfully obtained, will record this information in the local database, signaling the Auto-delete function that the exam qualifies for deletion.

- The Workflow Application Entity receives Worklist information from and sends MPPS information to a remote AE. It is associated with the local real-world activities “Update Worklist” and “Acquire Images”. When the “Update Worklist” 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 performed automatically at specific time intervals. . Acquisition of images using “Print” or “Capture” will result in automated creation of an MPPS Instance managed by a remote AE. Completion of the MPPS is performed as the result of an operator action of ending the exam. A “Paused” exam does not initiate an MPPS event.
- The Hardcopy Application Entity prints images on a remote AE (Printer). It is associated with the local real-world activity “Print”. “Print” creates a print queue containing one or more virtual film sheets composed from images acquired by the user. It creates and sends fully rendered pages already containing the user’s selected formatting choices. Only a single image per sheet is sent to the printer. This print object is rather large compared to other methods of DICOM printing. If the user has both a BW and Color DICOM printer configured and selected, and is using “After Each Print/Capture”, the images containing no Color Flow or Chroma data will be sent to the BW printer, all others will be sent to the Color printer.
- Exam data is sent to all selected Store, Print and media destinations simultaneously in accordance with system configuration of “After Each Print/Capture” or “At End of Exam”, with the exception of Structured Reports, which only are sent at End of Exam.

4.1.2 Functional Definition of AEs

4.1.2.1 Functional Definition of Storage Application Entity

The existence of a Network Store queue with associated network destination will activate the Storage AE. An association request is sent to the destination AE and upon successful negotiation of a Presentation Context the image transfer is started. If the association cannot be opened, the related queue is set to a “Failed” state, indicated by a Red dot on the Network Icon, and can be restarted by the user via the queue management interface. Multiframe (loop) objects may be transferred as uncompressed using RGB Photometric Interpretation. When “Image Export Format” is selected as “monochrome”, single frame images that have no Color Flow Doppler or Chroma maps applied, will export as grayscale using Monochrome2 Photometric Interpretation. Single frame images that include Color Flow Doppler will be sent as RGB. If the non-active region of a 2D/scrolling image has a chroma map, it will be sent as monochrome. The “Image Export Format” selection has no effect on loop images.

4.1.2.2 Functional Definition of Workflow Application Entity

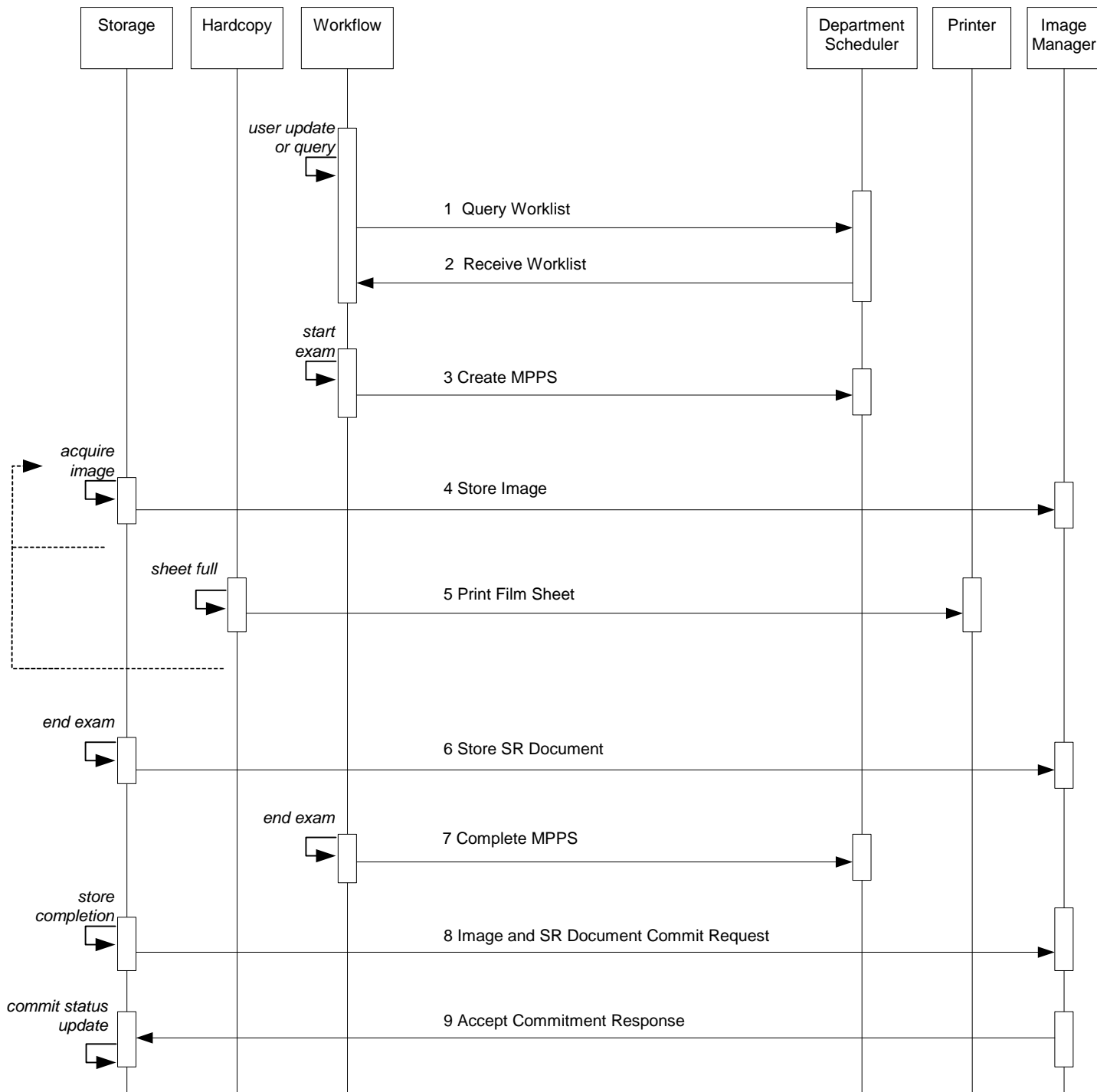
Update Worklist attempts to download a Modality Worklist from a Modality Worklist server with studies matching US for ultrasound and the current date. If the Workflow AE establishes an Association to a remote AE, it will transfer all worklist items via the open Association. The results of a successful Worklist Update will overwrite the data in the Worklist display. Specific queries for Patient Last Name, Patient ID, Accession #, Date, and Requested Procedure ID may be performed using the Patient Search. There is no queue management for Worklist.

The Workflow AE performs the creation of a MPPS Instance automatically when the first image of a study is acquired. MPPS status is displayed in the Network queue management Icon.

4.1.2.3 Functional Definition of Hardcopy Application Entity

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. In the case that a user has both a BW and a Color DICOM printer configured, during an exam with “After Each Print/Capture” selected, the images that contain color data, i.e., Color Flow Doppler or Chroma, will be sent to the Color printer only, and all other images sent only to the BW printer.

4.1.3 Sequencing of Real-World Activities



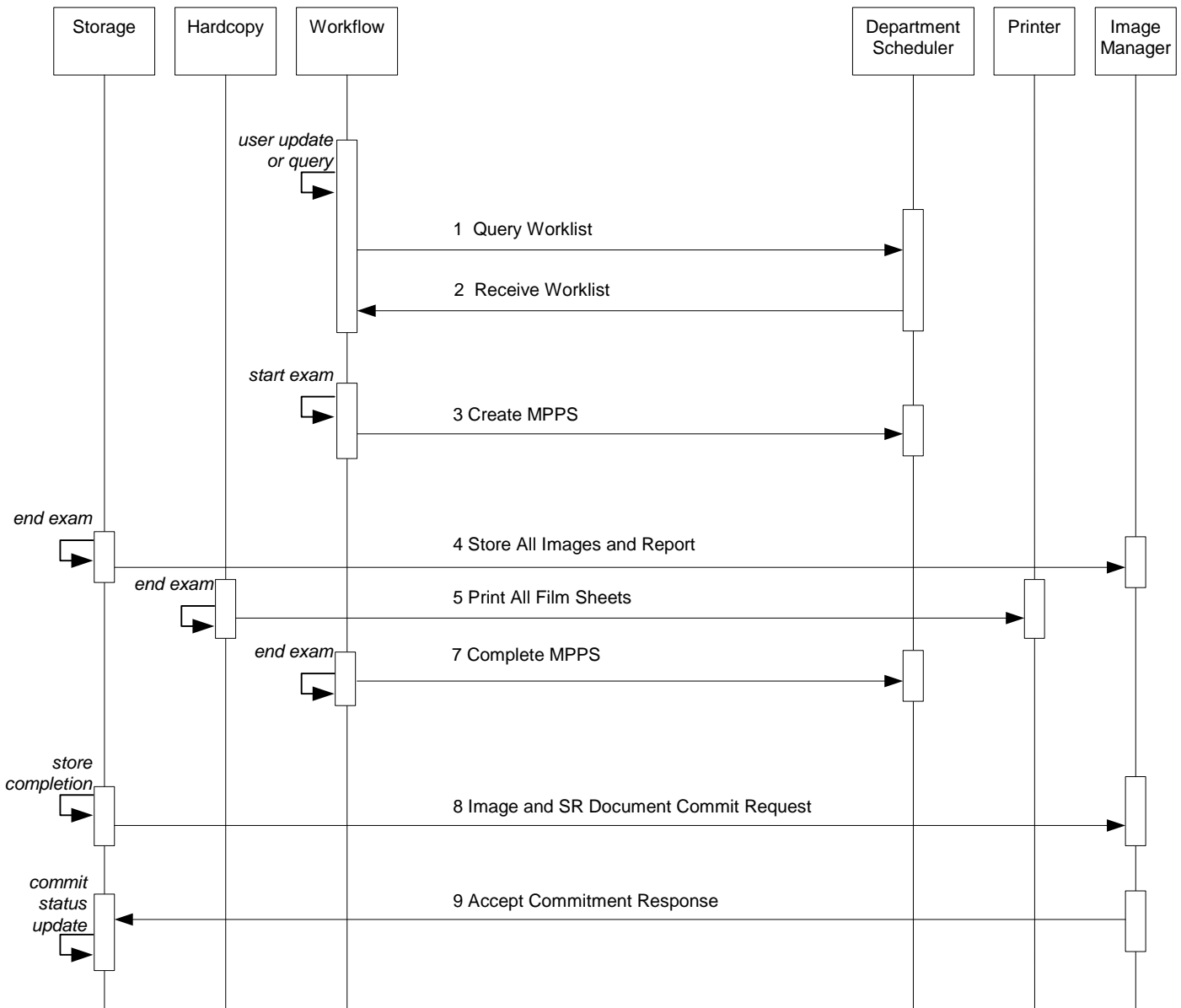
**Figure 2a:
SEQUENCING CONSTRAINTS – AFTER EACH CONFIGURATION**

Figures 2a and 2b illustrate normal scheduled workflow conditions.

Notes:

- Printing to DICOM printers may occur independent of any other DICOM activity.
- All selected store, print and DVD devices will be sent data during the exam when configured for “Send After Each Print/Capture” or at “At End of Exam.”
- Selecting a study from Review for export will send to all selected devices.

Other workflow situations (e.g. unscheduled procedure steps) will have other sequencing constraints. Printing or storage could equally take place after image acquisition. Printing could be omitted completely if no printer is connected or hardcopies are not required.



**Figure 2b:
SEQUENCING CONSTRAINTS – END EXAM CONFIGURATION**

4.2 AE SPECIFICATIONS

4.2.1 Storage Application Entity Specification

4.2.1.1 SOP Classes

iU22 provides Standard Conformance to the following SOP Classes:

Table 3
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	No
US Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	No
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No

4.2.1.2 Association Establishment Policy

4.2.1.2.1 General

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

Table 4
DICOM APPLICATION CONTEXT FOR AE STORAGE

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

4.2.1.2.2 Number of Associations

iU22 initiates one Association at a time for each destination to which a transfer request is being processed in the active job queue list. Three 'Archive' destinations 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 5
NUMBER OF ASSOCIATIONS INITIATED FOR AE STORAGE

Maximum number of simultaneous Associations	5, 1 for each configured storage device
---	---

1 for each store destination, 1 Structured Report and 1 Storage Commitment

iU22 accepts Associations for N-EVENT-REPORT notifications for the Storage Commitment Push Model SOP Class.

Table 6
NUMBER OF ASSOCIATIONS ACCEPTED FOR AE STORAGE

Maximum number of simultaneous Associations	1
---	---

4.2.1.2.3 Asynchronous Nature

iU22 does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 7
ASYNCHRONOUS NATURE AS A SCU FOR AE STORAGE

Maximum number of outstanding asynchronous transactions	1
---	---

4.2.1.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 8
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE STORAGE

Implementation Class UID	1.3.46.670589.5.2.10
Implementation Version Name	ACP1.1L4

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity – Store Images, Loops and Structured Reports

4.2.1.3.1.1 Description and Sequencing of Activities

A user can select exams or individual images from Review and request them to be sent to multiple destinations (up to 3). Reports may not be selected individually, but are sent when “End Exam” is pressed, and when an entire study is selected from the Review Directory. Each object (single frame, Multiframe, 3D, report) is entered into the job queue. When the “Send After Each Print/Capture” option is active, the queue is serviced continuously during the exam. There is a default 10-minute timeout for “Send After Each,” after which the association is closed. Any additional images acquired during the exam will be sent on a subsequent association.

The Network Status icon reports the status of the job, Green is ok, Yellow is paused, and Red is failed. If the C-STORE Response from the remote Application contains a status other than Success or Warning, 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. Each network status Icon will be Yellow with status of “Pending” for each study acquired while the network was not connected. When returning from portable, reconnecting the network cable will initiate transfer beginning again.

If a device is configured for Storage Commitment service, the Storage AE will, after all images and reports have been sent, transmit a single Storage Commitment request (N-ACTION) over a separate Association. The Storage AE can only receive an N-EVENT-REPORT request in a subsequent association initiated by the SCP.

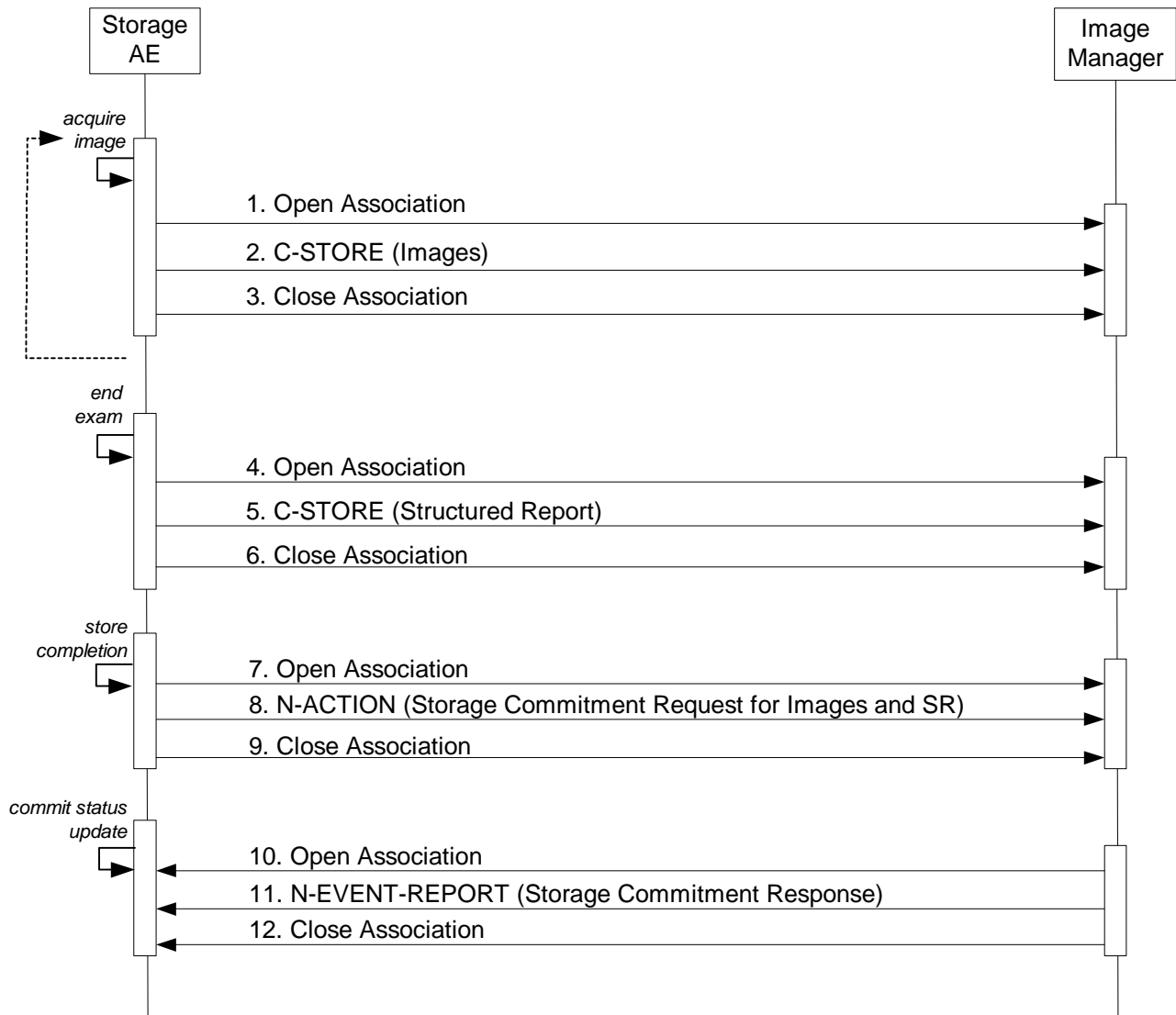


Figure 3
SEQUENCING OF ACTIVITY – SEND IMAGES

The sequence of interactions between the Storage AE and an Image Manager is illustrated in Figure 3 for the “Store” configuration option “After Each.” The alternative option, “End Exam” differs only in the removal of the loop symbol on the ‘acquire images’ activity

NOTE: Message sequences vary depending on the relative time of the SCP AE’s. The N-EVENT-REPORT must be sent over a separate association initiated by the Image Manager (see Section 4.2.1.4.1 on Activity – Receive Storage Commitment Response).

4.2.1.3.1.2 Proposed Presentation Contexts

iU22 is capable of proposing the Presentation Contexts shown in the following table:

**Table 9
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY SEND IMAGES**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
US Image Storage*	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
US Image Storage* (Retired)	1.2.840.10008.5.1.4.1.1.6	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	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	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50	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	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50	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

* All single frame images are RGB unless Image Export option "Monochrome" is selected in setups. The following table describes which images will be exported in Monochrome2 and which will be in RGB. Same behavior for Chroma.

Imaging Mode	Monochrome2	RGB
2D Only	x	
2D – MLine	x	
2D/MMode	x	
2D – DopplerLine	x	
2D- PDop Active	x	
2DCF		x
2DCF – DopplerLine		x
2DCF – PDop Active		x
2DCF Active - PDop		x
2DCF – PDop Simul		x

NOTE: If 'Full Screen' is selected, all images RGB.

** Loops will be YBR_FULL_422 unless "Uncompressed" is selected in setups, which will produce RGB loops.

All Presentation Contexts are proposed for all Archive devices. Storage Commitment N-Action Requests are only sent to devices that are also configured as the Storage Commitment server, and a target archive is selected that images are sent to.

“Target Archive” is one of the three possible archives that images are sent to. “Commit Server” may be the same device but must be configured in Global Config/Devices.

4.2.1.3.1.3 SOP Specific Conformance for Image and Comprehensive Structured Report Storage SOP Classes

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 10 describes C-Store response behavior.

**Table 10
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 11.

**Table 11
STORAGE COMMUNICATION FAILURE BEHAVIOR**

Exception	Behavior
Timeout	Same as Service Status “Refused” in Table 10 above.
Association aborted by the SCP or network layers	Same as Service Status “Refused” in Table 10 above.

An Association that is broken due to SCP Timeout or a broken and reestablished network topology will automatically retry connection 25 times with a 10 second delay before reporting a connection failure. Connection retry is initiated when a queue exists, and when a new image is acquired.

A green dot on the Network Transfer Icon indicates a successful transfer or an active queue. A red dot indicates failure. By using the Queue Manager, the user can restart a failed transfer. Open the Queue Manager by clicking on the Network Transfer Icon. Select the failed transfer and click Resume.

The contents of US Image, US Multiframe Storage and Comprehensive Structured Report Storage SOP Instances conform to the DICOM IOD definitions described in Section 8.1.

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 Operations (N-ACTION)

The Storage AE will request storage commitment for the configured device.

Table 12 summarizes the behavior of Storage AE when receiving response status codes.

**Table 12
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 incomplete for all objects.

Table 13 summarizes the behavior of Storage AE during communication failure.

**Table 13
STORAGE COMMITMENT COMMUNICATION FAILURE BEHAVIOR**

Exception	Behavior
Timeout	Same as non-success status in Table 12.
Association aborted by the SCP or network layers	Same as non-success status in Table 12.

4.2.1.3.1.4.2 Storage Commitment Notifications (N-EVENT-REPORT)

The Storage AE can receive an N-EVENT-REPORT notification received from the SCP via Reverse-role negotiation.

Table 14 summarizes the behavior of Storage AE when receiving Event Types within the N-EVENT-REPORT.

**Table 14
STORAGE COMMITMENT N-EVENT-REPORT BEHAVIOUR**

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 a N-EVENT-REPORT response are summarized in Table 15.

**Table 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.

4.2.1.4 Association Acceptance Policy

4.2.1.4.1 Activity – Receive Storage Commitment Response

4.2.1.4.1.1 Description and Sequencing of Activities

The Storage AE accepts associations for pending responses to a Storage Commitment Request only using SCP/SCU Role Negotiation; explicitly stating the association is initiated by the SCP to the SCU. Any other will be rejected.

4.2.1.4.1.2 Accepted Presentation Contexts

Table 17 summarizes Presentation Contexts that the Storage AE accepts.

**Table 17
ACCEPTABLE PRESENTATION CONTEXTS FOR
ACTIVITY RECEIVE STORAGE COMMITMENT RESPONSE**

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

4.2.1.4.1.3 SOP Specific Conformance for Storage Commitment Push Model SOP Class

4.2.1.4.1.3.1 Storage Commitment Notifications (N-EVENT-REPORT)

Upon receipt of a N-EVENT-REPORT the timer associated with the Transaction UID will be canceled.

Table 14 summarizes the behavior of Storage AE when receiving Event Types within the N-EVENT-REPORT.

Table 15 summarizes the reasons for returning specific status codes in a N-EVENT-REPORT response.

4.2.2 Workflow Application Entity Specification

4.2.2.1 SOP Classes

iU22 provides Standard Conformance to the following SOP Classes:

**Table 18
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 Establishment Policy

4.2.2.2.1 General

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

**Table 19
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

iU22 initiates one Association at a time for a Worklist request.

**Table 20
NUMBER OF ASSOCIATIONS INITIATED FOR AE WORKFLOW**

Maximum number of simultaneous Associations	1
---	---

4.2.2.2.3 Asynchronous Nature

iU22 does not support asynchronous communication.

Table 21
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:

Table 22
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE WORKFLOW

Implementation Class UID	1.3.46.670589.5.2.10
Implementation Version Name	ACP1.1L4

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

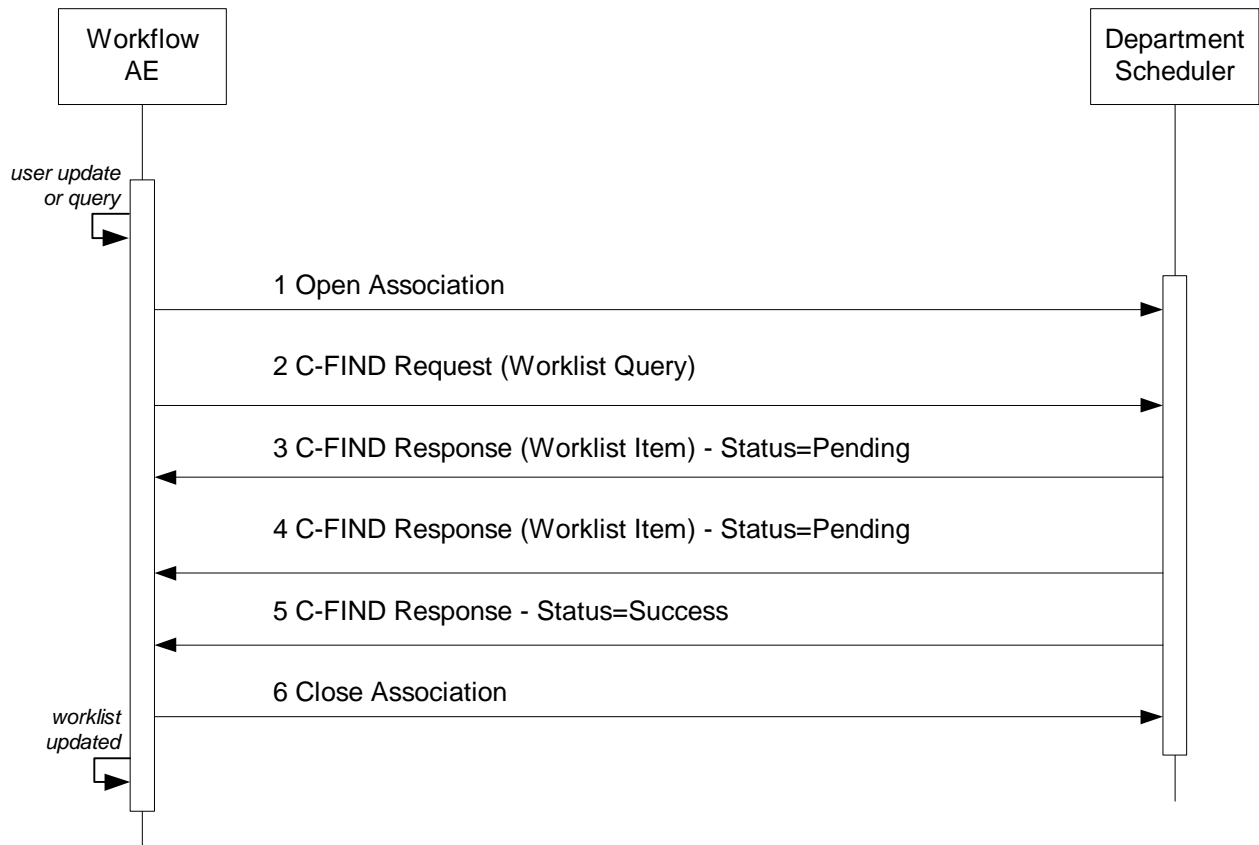
Two events may initiate worklist queries for Modality (US) only:

- User may key “Update Worklist” or “Patient Search...” and enter matching fields to start a query: Patient Name, Patient ID, Accession #, Exam Date or Requested Procedure ID
- The system may periodically update with a configurable time interval (between 15 and 120 minutes at 15 minute increments) and configured query fields: System AE Title, Station Name, Current Date, System Location

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

“Update Worklist” sends:
Modality = US and Current Date

“Patient Search,,,” sends:
Modality = US and any combination of
Last Name (Wild Card (*) or Matching
Leading Letters)
Patient ID (Exact Match)
Accession # (Exact Match)
Exam Date (Exact Match)
Procedure ID (Exact Match)



**Figure 5
SEQUENCING OF ACTIVITY – WORKLIST UPDATE**

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:

4.2.2.3.1.2 Proposed Presentation Contexts

iU22 will propose Presentation Contexts as shown in the following table:

**Table 23
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY WORKLIST UPDATE**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

4.2.2.3.1.3 SOP Specific Conformance for Modality Worklist

Table 24 summarizes the behavior of iU22 when encountering status codes in a MWL C-FIND response.

A message “query failed” will appear on the user interface if iU22 receives any other SCP response status than “Success” or “Pending.”

**Table 24
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.
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 25 summarizes the behavior of iU22 during communication failure.

**Table 25
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 26 describes the iU22 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 26
WORKLIST MATCHING KEYS**

Module Name Attribute Name	Tag	VR	M	R	Q	D	IOD
SOP Common Specific Character Set	(0008,0005)	CS		x			x
Scheduled Procedure Step Scheduled Procedure Step Sequence > Scheduled Station AE Title ¹ > Scheduled Procedure Step Start Date ² > Scheduled Procedure Step Start Time > Scheduled Procedure Step End Date > Scheduled Procedure Step End Time > Modality ³ > Scheduled Performing Physician's Name > Scheduled Procedure Step Description > Scheduled Procedure Code Sequence > Scheduled Station Name ⁴ > Scheduled Procedure Step Location ⁵ > Scheduled Protocol Code Sequence > Scheduled Procedure Step ID > Scheduled Procedure Step Status	(0040,0100) (0040,0001) (0040,0002) (0040,0003) (0040,0004) (0040,0005) (0008,0060) (0040,0006) (0040,0007) (0040,0008) (0040,0010) (0040,0011) (0040,0008) (0040,0009) (0040,0020)	SQ AE DA TM DA TM CS PN LO SQ SH SH SQ SH CS	(S) S, (S) S S (S) (S)	x x x x x x x x x x x x x x x x	x x x 	x x x 	x x (x) (x) (x) (x) (x) x x (x)
Requested Procedure Requested Procedure ID ⁶ Requested Procedure Description Study Instance UID Referenced Study Sequence Requested Procedure Code Sequence Names of Intended Recipients of Results Requested Procedure Comments Requested Contrast Agent	(0040,1001) (0032,1060) (0020,000D) (0008,1110) (0032,1064) (0040,1010) (0040,1400) (0032,1070)	SH LO SH SQ SQ PN LT LO	S	x x x x x x x x	(x)		x* x x x x x x
Imaging Service Request Accession Number ⁷ Requesting Physician Requesting Service Referring Physician's Name Imaging Service Request Comments	(0008,0050) (0032,1032) (0032,1033) (0008,0090) (0040,2400)	SH PN LO PN LT	S	x x x x x	x	x	x x x x
Visit Admission Admitting Diagnosis Description Current Patient Location	(0008,1080) (0038,0300)	LO LO		x			x
Patient Identification Patient's Name ⁸ Patient ID ⁹ Other Patient IDs	(0010,0010) (0010,0020) (0010,1000)	PN LO LO	S S	x x x	x x	x x	x x x
Patient Demographic Patient's Birth Date Patient's Sex Patient Size Ethnic Group Patient's Weight Patient Comments Referenced Patient Sequence	(0010,0030) (0010,0040) (0010,1020) (0010,2160) (0010,1030) (0010,4000) (0008,1120)	DA CS DS SH DS LT SQ		x x x x x x x		x x x x x x	x x x x x x x

Patient Medical							
Medical Alerts	(0010,2000)	LO					
Additional Patient's History	(0010,21B0)	LT		x			x
Pregnancy Status	(0010,21C0)	US		x			x
Last Menstrual Date	(0010,21D0)	DA					

X* = 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 iU22 Worklist Request Identifier.

Tag: DICOM tag for this attribute.

VR: DICOM VR for this attribute.

M: Matching keys for (automatic) Worklist Update. An "S" indicates that iU22 supplies an attribute value for Single Value Matching or additional specific tags indicated by "(S)". See ¹ below.

R: Return keys. An "x" indicates that iU22 supplies this attribute as a Return Key with zero length for Universal Matching.

Q: Interactive Query Key. An "x" indicates that iU22 supplies this attribute as matching key, if entered in the Patient Search dialog.

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

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

¹ Entered in Global Configuration – System tab, "AE Title", selected in Device Selection – Worklist tab, Define Query section

² From Patient Search tab in Patient Data Entry – "Exam Date" field

³ Fixed at "US"

⁴ From Global Configuration – System tab, "Station Name", selected in Device Selection – Worklist tab, Define Query section

⁵ From Global Configuration – System tab, "System Location", selected in Device Selection – Worklist tab, Define Query section

⁶ From Patient Search tab in Patient Data Entry – "Procedure ID" field.

⁷ From Patient Search tab in Patient Data Entry – "Accession #" field

⁸ From Patient Search tab in Patient Data Entry – "Last Name" field

⁹ From Patient Search tab in Patient Data Entry – "Patient ID" field

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.

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

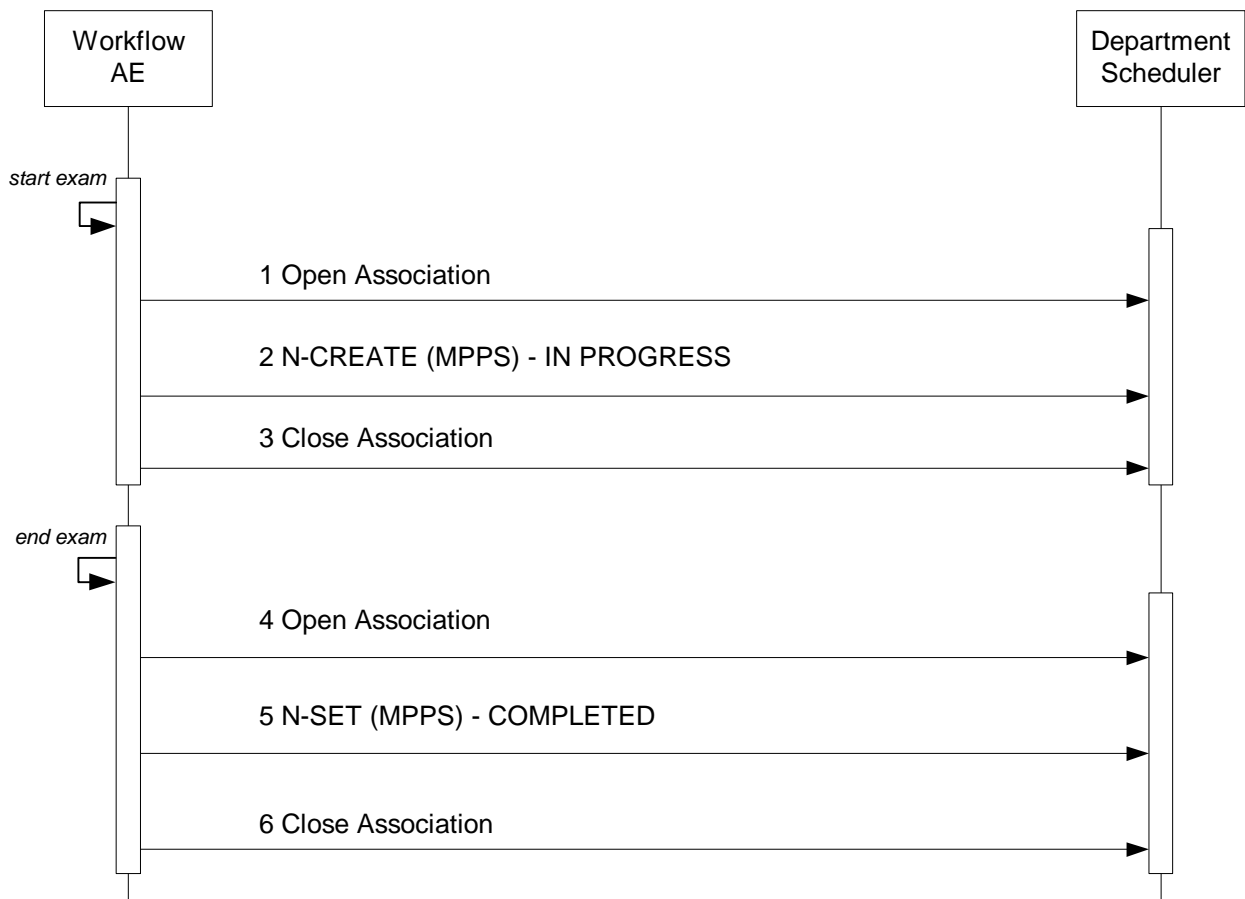
The system will support creation of "unscheduled cases" by allowing MPPS Instances to be communicated for locally registered Patients.

The system only supports a 0-to-1 relationship between Scheduled and Performed Procedure Steps.

iU22 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:

4.2.2.3.2.2 Proposed Presentation Contexts

iU22 will propose Presentation Contexts as shown in the following table:

**Table 27
PROPOSED PRESENTATION CONTEXTS FOR REAL-WORLD ACTIVITY ACQUIRE IMAGES**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian Explicit VR Little Endian	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 28 summarizes the behavior of iU22 when encountering status codes in an MPPS N-CREATE or N-SET response.

The message “MPPS update failed” will appear in the Network Queue Management when and the Icon’s dot turns red, if iU22 receives any other SCP response status than “Success” or “Warning”.

**Table 28
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 29 summarizes the behavior of iU22 during communication failure.

**Table 29
MPPS COMMUNICATION FAILURE BEHAVIOR**

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

Table 30 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 30
MPPS N-CREATE / N-SET REQUEST IDENTIFIER**

Attribute Name	Tag	VR	N-CREATE	N-SET
Specific Character Set	(0008,0005)	CS	Not Sent, unless replacement character set is used.	
Modality	(0008,0060)	CS	US	
Referenced Patient Sequence	(0008,1120)	SQ		
> Referenced SOP Class UID	(0008,1150)	UI	1.2.840.10008.3.1.2.1.1	
>Referenced SOP Instance UID	(0008,1155)	UI		
Patient’s Name	(0010,0010)	PN	As received from MWL or entered in PDE.	
Patient ID	(0010,0020)	LO	From Modality Worklist or user input. MWL value may be edited.	
Patient’s Birth Date	(0010,0030)	DA	Same as above.	
Patient’s Sex	(0010,0040)	CS	Same as above.	
Study ID	(0020,0010)	SH	From Requested Procedure ID from MWL, else System	

			Generated <yyyymmdd.hhmmss>	
Performed Station AE Title	(0040,0241)	AE	AE Title from configuration	
Performed Station Name	(0040,0242)	SH	From Ultrasound System Configuration	
Performed Location	(0040,0243)	SH	From Ultrasound System Configuration	
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	As received from MWL	As received from MWL
>Code Value	(0008,0100)	SH	As received from MWL	As received from MWL
>Coding Scheme Designator	(0008,0102)	SH	As received from MWL	As received from MWL
>Coding Scheme Version	(0008,0103)	SH	As received from MWL	As received from MWL
>Code Meaning	(0008,0104)	LO	As received from MWL	As received 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
Performed Procedure Step ID	(0040,0253)	SH	Auto generated	
Performed Procedure Step Description	(0040,0254)	LO	MWL Scheduled Procedure Step Description (0040,0007) or PDE input if any.	
Performed Protocol Code Sequence	(0040,0260)	SQ	Zero length	Zero or more items
Scheduled Step Attributes Sequence	(0040,0270)	SQ		
> Accession Number	(0008,0050)	SH	From MWL or user PDE input. 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 auto 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		One item per acquired series
> Performing Physician's Name	(0008,1050)	PN	See Table 74	See Table 74
> Operator's Name	(0008,1070)	PN	See Table 74	See Table 74
> Referenced Image Sequence	(0008,1140)	SQ		One item per referenced 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 74
> Series Instance UID	(0020,000E)	UI		See Table 74

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

iU22 provides Standard Conformance to the following SOP Classes:

**Table 31
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 Establishment Policy

4.2.3.2.1 General

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

**Table 32
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

iU22 initiates one Association at a time for each configured hardcopy device. Multiple hardcopy devices can be configured.

**Table 33
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

iU22 does not support asynchronous communication (multiple outstanding transactions over a single Association).

**Table 34
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 35
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE HARDCOPY**

Implementation Class UID	1.3.46.670589.5.2.10
Implementation Version Name	ACP1.1L4

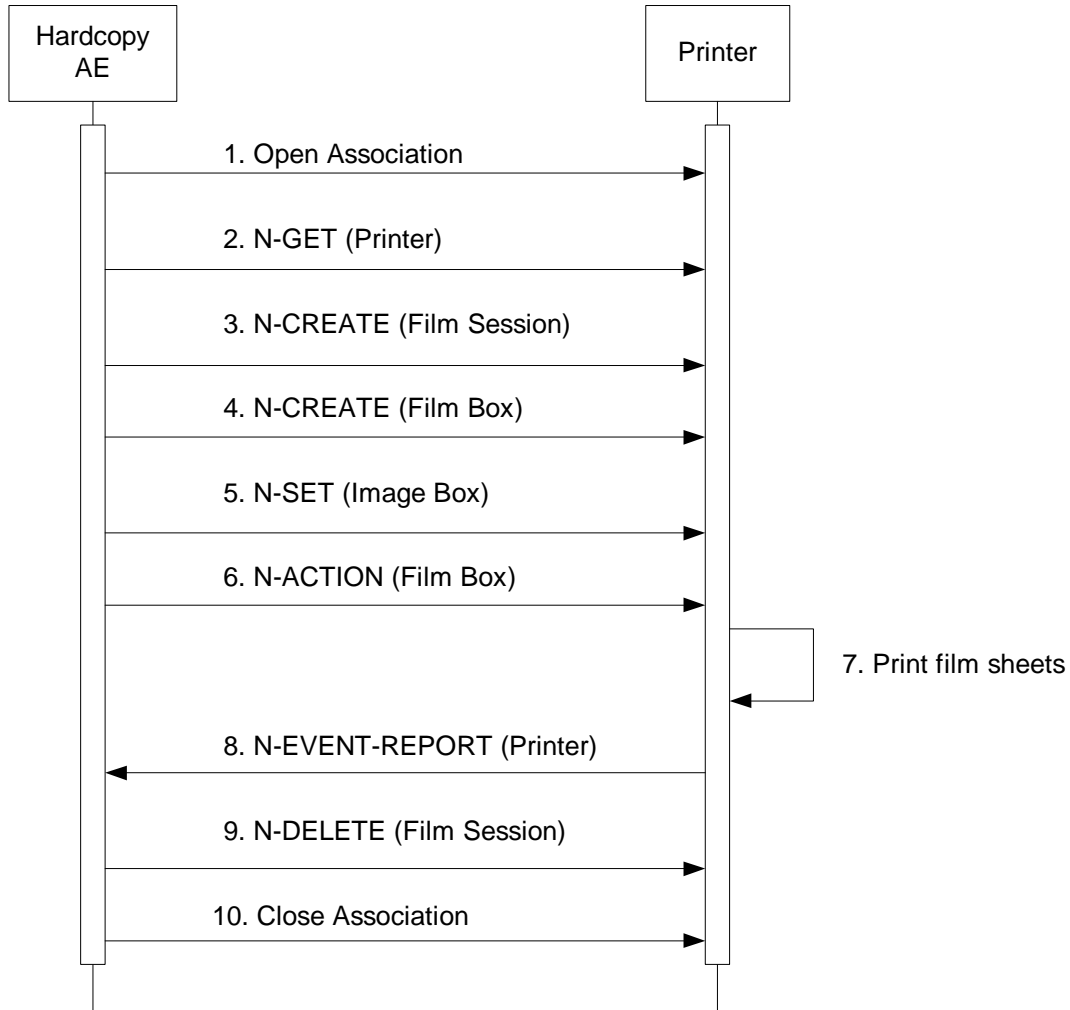
4.2.3.3 Association Initiation Policy

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 illustrates the print sequence.



**Figure 7
SEQUENCING OF ACTIVITY – FILM IMAGES**

Figure 7 illustrates a typical sequence of DIMSE messages sent over an association between Hardcopy AE and a Printer.

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 or Warning, 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 36 shows the Presentation Contexts iU22 is capable of proposing.

**Table 36
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY FILM IMAGES**

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

4.2.3.3.1.3 Common SOP Specific Conformance for all Print SOP Classes

Table 37 summarizes the general behavior of Hardcopy AE during communication failure. This behavior is common for all SOP Classes supported by Hardcopy AE.

**Table 37
HARDCOPY 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.

4.2.3.3.1.4 SOP Specific Conformance for the Printer SOP Class

Hardcopy AE supports the following DIMSE operations and notifications for the Printer SOP Class:

- N-GET

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

4.2.3.3.1.4.1 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 38 lists the attributes obtained via N-GET.

**Table 38
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 39 summarizes the behavior of Hardcopy AE when encountering status codes in a N-GET response.

**Table 39
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.

4.2.3.3.1.4.2 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 40 summarizes the behavior of Hardcopy AE when receiving Event Types within the N-EVENT-REPORT.

**Table 40
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 41 summarizes the reasons for returning specific status codes in a N-EVENT-REPORT response.

**Table 41
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).

4.2.3.3.1.5 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.

4.2.3.3.1.5.1 Film Session SOP Class Operations (N-CREATE)

Table 42 lists the attributes supplied in an N-CREATE Request.

**Table 42
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
Medium Type	(2000,0030)	CS	BLUE FILM, CLEAR FILM or PAPER*	ALWAYS	USER
Film Destination	(2000,0040)	CS	MAGAZINE or PROCESSOR*	ALWAYS	USER

* Dependent on the specific printer selected

Table 43 summarizes the behavior of Hardcopy AE when encountering status codes in a N-CREATE response.

**Table 43
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.

4.2.3.3.1.7 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.

4.2.3.3.1.7.1 Film Box SOP Class Operations (N-CREATE)

Table 47 lists the attributes supplied in an N-CREATE Request.

**Table 47
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 or CUSTOM\xxx depending on printer. Default is displayed, and is user editable. Use only when 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	ALWAYS	AUTO
Border Density	(2010,0100)	CS	BLACK	ALWAYS	AUTO
Empty Image Density	(2010,0110)	CS	BLACK	ALWAYS	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
Configuration Information	(2010,0150)	ST	Default value displayed, user editable	ALWAYS	AUTO/USER

Table 48 summarizes the behavior of Hardcopy AE when encountering status codes in a N-CREATE response.

**Table 48
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.

4.2.3.3.1.7.2 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 49 summarizes the behavior of Hardcopy AE when encountering status codes in an N-ACTION response.

**Table 49
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.

4.2.3.3.1.8 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.

4.2.3.3.1.8.1 Image Box SOP Class Operations (N-SET)

Table 50 lists the attributes supplied in an N-SET Request.

**Table 50
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	(0020,0020)	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 Color	ALWAYS	AUTO
>Photometric Interpretation	(0028,0004)	CS	MONOCHROME2 or RGB	ALWAYS	AUTO
Planar Configuration	(0028,0006)	US	Always "00", only used in Color print.	ANAP	AUTO
>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 51 summarizes the behavior of Hardcopy AE when encountering status codes in a N-SET response.

**Table 51
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

iU22 provides Standard Conformance to the following SOP Class:

**Table 51.1
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 Establishment Policy

4.2.4.2.1 General

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

**Table 51.2
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

iU22 initiates one Association at a time for a Verification request.

**Table 51.31
NUMBER OF ASSOCIATIONS INITIATED FOR AE VERIFICATION**

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

**Table 51.32
NUMBER OF ASSOCIATIONS ACCEPTED FOR AE VERIFICATION**

Maximum number of simultaneous Associations	Unlimited, however, calling AE must be already configured in iU22.
---	--

4.2.4.2.3 Asynchronous Nature

iU22 does not support asynchronous communication (multiple outstanding transactions over a single Association).

**Table 51.4
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 51.5
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE VERIFICATION**

Implementation Class UID	1.3.46.670589.5.2.10
Implementation Version Name	ACP1.1L4

4.2.4.3 Association Initiation Policy

4.2.4.3.1 Activity – Verify as SCU and SCP

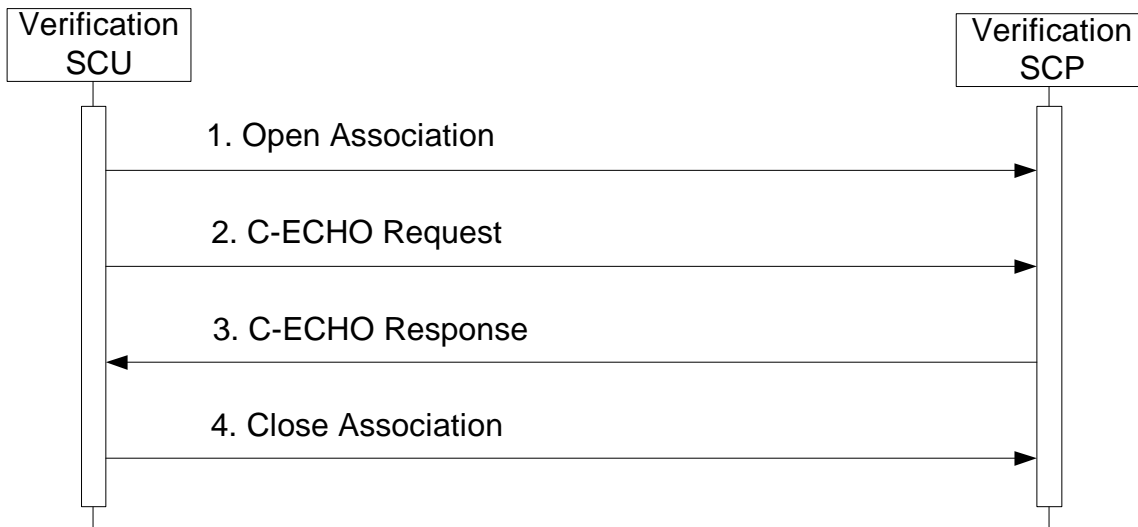
4.2.4.3.2 Description and Sequencing of Activities

SCU: 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 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. See note in 4.2.4.3.5.1 Verification SOP Class Notifications.

SCP: 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 order for iU22 to respond.

iU22 initiates an Association in order to issue:

- C-ECHO request according to the Verification SOP Class.



**Figure 8a
SEQUENCING OF ACTIVITY – ISSUE VERIFY**

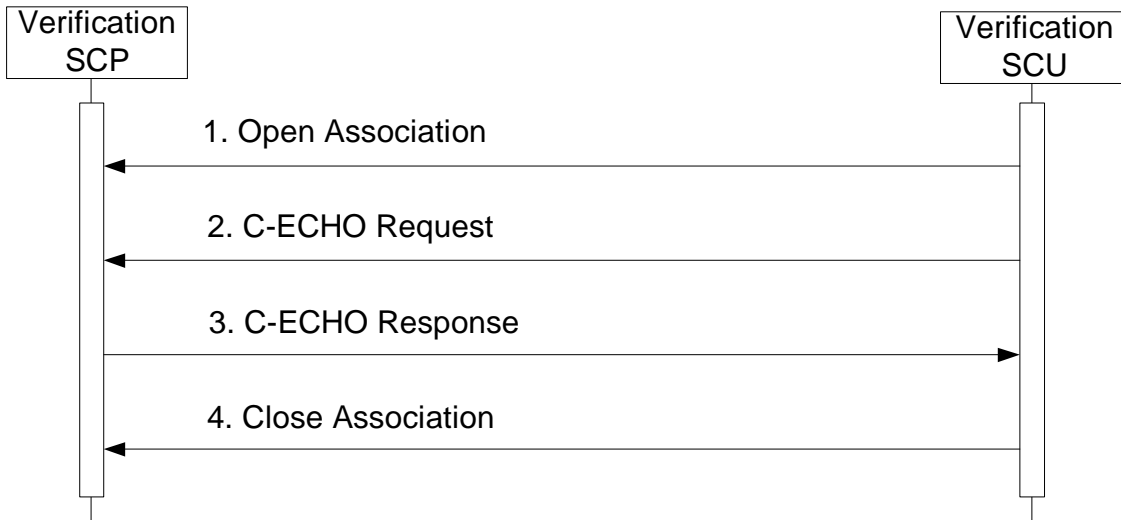


Figure 8b
SEQUENCING OF ACTIVITY – RECEIVE VERIFY

4.2.4.3.3 Proposed Presentation Contexts

iU22 will propose Presentation Contexts as shown in the following table:

Table 51.6
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY VERIFICATION

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
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 /SCP	None

4.2.4.3.4 SOP Specific Conformance for Verification

Table 51.7 summarizes the behavior of iU22 when encountering status codes in a Verification C-ECHO response.

A message will appear on the user interface if iU22 receives any other SCP response status than “Success.”

Table 51.7
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	Same as “Refused” above.
*	*	Any other status code.	Same as “Refused” above.

4.2.4.3.4.1 Verification SOP Class Operations (C-ECHO)

4.2.4.3.5 Association Acceptance Policy

4.2.4.3.5.1 Verification SOP Class Notifications

Possible Responses:

Device Verification Succeeded	Device Verification Failed
{SOP Class(es)}: Verified	{SOP Class(es)}: Not Verified
Verification: Verified	

Note: A given "Archive" server may not support all of the SOP Classes requested in the Verification request. Receiving failures ("Not Verified") responses for SOP Classes outside the scope or capability of the server will not result in a communications failure. For example, if the correct Image Store SOP Classes are supported and Structured Report is not, then Image Storage will work successfully, and SRs will not be sent to the server. If multiframe is not supported and loops are acquired, the transfer will fail. In this case however, the single frame images will transfer.

4.3 PHYSICAL NETWORK INTERFACES

4.3.1 Supported Communication Stacks

4.3.1.1 TCP/IP Stack

All iU22 DICOM applications provide DICOM TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.3.2 Physical Network Interface

iU22 supports a single network interface. The following physical network interface is available:

Table 52
SUPPORTED PHYSICAL NETWORK INTERFACES

Ethernet 10/100BaseT, RJ-45, UTP, STP; AutoDetect Duplex, Full or Half Duplex

4.4 CONFIGURATION

4.4.1 AE Title/Presentation Address Mapping

The Devices Configuration section allows the following device types to be configured:

Device Type	Supported SOPs
DICOM Archive Server	Ultrasound Store Ultrasound Multiframe Store Comprehensive Structured Report Store* Storage Commitment Push Model**
DICOM Commit Server	Storage Commitment Push Model**
DICOM PPS Server	Modality Performed Procedure Step
DICOM Worklist Server	Modality Work List
DICOM Structured Report Server	Comprehensive Structured Report Store*
DICOM BW Printer	Basic Grayscale Print Meta
DICOM Color Printer	Basic Color Print Meta

* See section 4.4.1.2.1 below.

** Storage Commitment must only be configured if supported by the Archive Server or a stand-alone server. In either case, the "Commit Server" and "Target Archive Server" must ONLY be configured if commitment is used.

To configure a single server that supports image store, commitment and PPS, then a separate Device must be configured using the appropriate AE Title, IP Address and Port data.

4.4.1.1 Local AE Title

All local AEs use the AE Title and TCP/IP Port configured via the Global Configuration Screen. All local AEs use the same AE Title. The system listens for Verification requests and Storage Commitment reports on the configured Port. All devices also support Verification as an SCU, allowing the use of the Verify button.

4.4.1.2 Remote AE Title/Presentation Address Mapping

The AE Titles, IP Addresses and Port numbers of remote applications are configured using the Devices Configuration Screen.

4.4.1.2.1 Storage

The New Device button on the Global Config Setup screen opens the Add Device dialog that allows configuration of the AE Titles, Port numbers, and IP Addresses for the remote Storage SCPs. Multiple remote Storage SCPs can be defined.

* Structured Reports will be sent to an Archive device if SR support is confirmed using Verify. If the Archive does not support SR, configure the DICOM Structured Report Server. If SR support is confirmed using verify and measurements are made during the exam, a Structured Report will be sent to the archive. OB and Gyn measurements generate an OB SR report; Vascular and Abdominal measurements generate a Vascular SR report.

Custom or User Defined measurements will not be sent in an SR. No SR is sent for Small Parts or Breast measurements. If no separate SR server is configured and the SOP Class fails negotiation on the Archive, then no SR objects will be created.

4.4.1.2.2 Workflow

Setup is used to set the AE Title, port-number and IP Address the remote MWL SCP. Multiple MWL SCPs may be defined, but only a single remote MWL SCP can be selected at a time.

All MWL queries use Modality = US. This cannot be changed.

Automated queries may be set for a specific time interval, Startup and every 15, 30, 45, 60, 75, 90, 105 or 120 minutes, or at End of Exam. Automated queries use the current data and Modality = US. They may additionally use "Station Name", "System Location" and "AE Title" to further refine the search.

Setup is used to set the AE Title, port-number and IP Address of the remote MPPS SCP. Multiple MPPS SCPs may be defined, but only a single remote MPPS SCP can be selected at a time.

4.4.1.2.3 Hardcopy

Setup is used to set the AE Titles, Port numbers and IP Addresses for the remote Print SCPs.

Multiple remote Print SCPs can be defined, but up to one Grayscale and one Color Print SCP may be selected at a time.

5 MEDIA STORAGE

5.1 IMPLEMENTATION MODEL

5.1.1 Application Data Flow

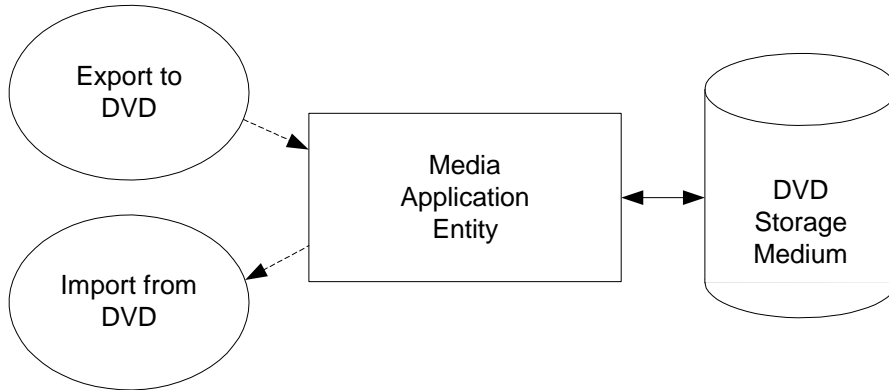


Figure 9
APPLICATION DATA FLOW DIAGRAM FOR MEDIA STORAGE

- The Media Application Entity exports images and Presentation States to a DVD Storage medium. It is associated with the local real-world activity “Export to DVD”. “Export to DVD” is performed upon user request for selected patients, studies, series or instances (images or structured reports).

Note: iU22 will support the use of most writable media including CD-R, CD-RW, DVD-R, DVD+R, DVD-RW and DVD+RW. DICOM structure will be the same regardless of media used. CD-R media will be initially formatted UDF, but will be ‘closed’ and converted to ISO-9660 format using “**Soft Eject**”, the eject button on the Review Directory screen. After formatting, CD-R media must be soft ejected and reinserted prior to use. The user must not use eject button on the DVD drive to eject media, only to insert. After using CD-R media, it may be returned to the system for further use if the media supports multi-session.

Note that although –R or +R media may be “formatted”, the media cannot be erased. If a –R or +R media is formatted, the previously written data is no longer available, and only the remaining unwritten space on the media is available after format. This restriction does not apply to +RW media. Formatting +RW media allows the entire disk space to be used.

Throughout the remainder of this section, the term “DVD” refers to any of the media listed above that is actually in use.

5.1.2 Functional Definition of AEs

5.1.2.1 Functional Definition of Media Application Entity

Activation of the “Export to DVD” icon or menu entry will pass the currently selected patients 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 a single DVD media.

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 a new DVD media at any time. The Media Application Entity will wait indefinitely for a media to be inserted

before starting to write to the DVD device. If no DVD media is available, the DVD 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 65
DICOM IMPLEMENTATION CLASS AND VERSION FOR MEDIA STORAGE**

Implementation Class UID	1.3.46.670589.5.2.10
Implementation Version Name	ACP1.1L4

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

**Table 66
APPLICATION PROFILES, ACTIVITIES AND ROLES FOR OFFLINE-MEDIA**

Application Profiles Supported	Real World Activity	Role	SC Option
STD-US-SC-SF-DVD	Export to DVD	FSC, R, U	Interchange
STD-US-SC-MF-DVD			

5.2.1.1 File Meta Information for the Application Entity

The File-Set Identifier included in the File Meta Header is "PHILIPS MIP".

5.2.1.2 Real-World Activities

5.2.1.2.1 Activity – Export to DVD

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

The contents of the export job will be written together with a corresponding DICOMDIR to a single-session DVD. Writing in multi-session mode is not supported. The user can cancel an export job in the job queue.

5.2.1.2.2 Activity – Read from DVD

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

The Patient directory UI presents the directory of the system or the offline media. Selected exams are transferred from the media to the system for review. Objects transferred to the system retain their original SOP Instance UIDs.

5.2.1.2.3 Activity – Update to DVD

The Media Application Entity acts as an FSU using the interchange option when requested to export SOP Instances from the local database to a DVD medium.

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

DVD media may be formatted at any time, removing all previously recorded data.

5.2.1.2.3.1 Media Storage Application Profiles

The Media Application Entity supports the STD-US-SC-SF-DVD and STD-US-SC-MF-DVD Application Profiles.

5.2.1.2.3.2 Options

The Media Application Entity supports the SOP Classes and Transfer Syntaxes listed in Table 67.

**Table 67
IODS, SOP CLASSES AND TRANSFER SYNTAXES FOR OFFLINEMEDIA**

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	1.2.840.10008.1.2.1
US Image Storage (Retired)*	1.2.840.10008.5.1.4.1.1.6	Explicit VR Little Endian	1.2.840.10008.1.2.1
US Multiframe Image Storage*	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		JPEG Baseline Lossy Compression	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	1.2.840.10008.1.2.1
		JPEG Baseline Lossy Compression	1.2.840.10008.1.2.4.50
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

* See details listed in Table 9

6 SUPPORT OF CHARACTER SETS

All iU22 DICOM applications support the

ISO_IR 100 (ISO 8859-1:1987 Latin Alphabet No. 1 supplementary set)

7 SECURITY

DICOM security is not implemented on the iU22 at this time.

iU22 incorporates an internal firewall that only accepts incoming traffic on the designated listening port, as configured in the System tab of the Global Configuration screen.

8 ANNEXES

8.1 CREATED IOD INSTANCES

Table 69 specifies the attributes of an Ultrasound Image transmitted by the iU22 storage application.

Table 70 specifies the attributes of a Comprehensive Structured Reports transmitted by the iU22 storage application.

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

VNAP	Value Not Always Present (attribute sent zero length if no value is present)
ANAP	Attribute Not Always Present
ALWAYS	Always Present
EMPTY	Attribute is sent without a value

The abbreviations used in the “Source” column:

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

NOTE: All dates and times are encoded in the local configured calendar and time. Date, Time and Time zone are configured using the Service/Installation Tool.

8.1.1 US or US Multiframe Image IOD

**Table 69
IOD OF CREATED US OR US MULTIFRAME SOP INSTANCES**

IE	Module	Reference	Presence of Module
Patient	Patient	Table 71	ALWAYS
Study	General Study	Table 72	ALWAYS
	Patient Study	Table 73	ALWAYS
Series	General Series	Table 74	ALWAYS
Equipment	General Equipment	Table 75	ALWAYS
Image	General Image	Table 76	ALWAYS
	Image Pixel	Table 77	ALWAYS
	Cine	Table 78	Only if Multi-frame
	Multi-frame	Table 79	Only if Multi-frame
	US Region Calibration	Table 80	ANAP
	US Image	Table 81	ALWAYS
	VOI LUT	Table 82	ALWAYS
	SOP Common	Table 83	ALWAYS

8.1.2 Comprehensive Structured Report IOD

**Table 70
IOD OF CREATED COMPREHENSIVE STRUCTURED REPORT SOP INSTANCES**

IE	Module	Reference	Presence of Module
Patient	Patient	Table 71	ALWAYS
Study	General Study	Table 72	ALWAYS
	Patient Study	Table 73	ALWAYS
Series	SR Document Series	Table 85	ALWAYS
Equipment	General Equipment	Table 75	ALWAYS
Document	SR Document General	Table 86	ALWAYS
	SR Document Content	Table 87	ALWAYS
	SOP Common	Table 88	ALWAYS

8.1.3 Common Modules

**Table 71
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	VNAP	USER

**Table 72
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).	ALWAYS	AUTO
Study Time	(0008,0030)	TM	Study's Start Time (0040,0245).	ALWAYS	AUTO
Referring Physician's Name	(0008,0090)	PN	Same value as in MWL or PDE input.	VNAP	MWL/ USER
Study ID	(0020,0010)	SH	MWL Requested Procedure ID (0040,1001) or auto-generated	ALWAYS	MWL/ AUTO

Accession Number	(0008,0050)	SH	Same attribute of MWL or user PDE input.	VNAP	MWL/ USER
Study Description	(0008,1030)	LO	MWL Scheduled Procedure Step Description (0040,0007) or PDE input	VNAP	MWL/ USER
Physician(s) of Record	(0008,1048)	PN	Same attribute as MWL	ANAP	MWL
Referenced Study Sequence	(0008,1110)	SQ	One item per item in the MWL Reference Study Sequence. Absent if unscheduled.	ANAP	MWL
>Referenced SOP Class UID	(0008,1150)	UI	Same value as in of the Reference Study Sequence in the MWL	VNAP	MWL
>Referenced SOP Instance UID	(0008,1155)	UI	Same value as in of the Reference Study Sequence in the MWL	VNAP	MWL
>Requested Procedure Description	(0032,1060)	LO	Same value as in of the Reference 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 73
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
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

**Table 74
GENERAL SERIES MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"US"	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.	ALWAYS	AUTO
Series Time	(0008,0031)	TM	Time of first image in series.	ALWAYS	AUTO

Performing Physician's Name	(0008,1050)	PN	MWL Scheduled Performing Physician's Name (0040,0006)	VNAP	MWL
Protocol Name	(0018,1030)	LO	"Free Form"	ALWAYS	AUTO
Series Description	(0008,103E)	LO	Same as Study Description when from MWL.	ANAP	MWL/USER
Operator's Name	(0008,1070)	PN	From PDE "Sonographer" field	VNAP	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
Request Attributes Sequence	(0040,0275)	SQ	Present if scheduled from MWL. One item.	VNAP	AUTO
>Requested Procedure ID	(0040,1001)	SH	Same value as MWL attribute.	ALWAYS	MWL
>Scheduled Procedure Step ID	(0040,0009)	SH	Same value as MWL attribute.	ALWAYS	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
Performed Procedure Step ID	(0040,0253)	SH	See Table 30	ALWAYS	MPPS
Performed Procedure Step Start Date	(0040,0244)	DA	See Table 30	ALWAYS	MPPS
Performed Procedure Step Start Time	(0040,0245)	TM	See Table 30	ALWAYS	MPPS
Performed Procedure Step Description	(0040,0254)	LO	See Table 30	VNAP	MPPS
Performed Protocol Code Sequence	(0040,0260)	SQ	See Table 30	VNAP	MWL

**Table 75
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	Setups configuration	VNAP	CONFIG
Station Name	(0008,1010)	SH	Setups configuration	VNAP	CONFIG
Manufacturer's Model Name	(0008,1090)	LO	iU22	ALWAYS	AUTO
Device Serial Number	(0018,1000)	LO		ALWAYS	AUTO
Software Version	(0018,1020)	LO	PMS2.1.4.1 Ultrasound Gemini1.1.2	ALWAYS	AUTO

8.1.4 US or Multiframe Image Modules

**Table 76
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 "0" in each series	ALWAYS	AUTO
Content Date	(0008,0023)	DA	<yyyymmdd>	ALWAYS	AUTO
Content Time	(0008,0033)	TM	<hhmmss>	ALWAYS	AUTO
Image Type	(0008,0008)	CS	ORIGINAL/PRIMARY for uncompressed, DERIVED/PRIMARY if compressed	ALWAYS	CONFIG
Burned In Annotation	(0028,0301)	CS	Set to "YES"	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	CS	Present "01" if image is lossy compressed, "00" if not.	ALWAYS	AUTO
Presentation LUT Shape	(2050,0020)	CS	"IDENTITY" Only if "Image Export Format" is GSDF.	ANAP	AUTO

**Table 77
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 81		
Photometric Interpretation	(0028,0004)	CS	See US Image Module Table 81		
Rows	(0028,0010)	US	Image height in pixels, 480*, 768**, 1024***	ALWAYS	CONFIG
Columns	(0028,0011)	US	Image width in pixels, 640*, 1024**, or 1280***	ALWAYS	CONFIG
Bits Allocated	(0028,0100)	US	8 Bits per pixel.	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	Number of info bits in pixel: "8" Color: 24; BW: 8.	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".	ALWAYS	AUTO

Image Size details: * = Multiframe images, ** = Single Frame Display Area only images and *** = Single Frame Full Screen images (no scaling data).

**Table 78
CINE MODULE OF CREATED US MULTIFRAME SOP**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame Time	(0018,1063)	DS	Frame time in milliseconds	ANAP	AUTO

Table 79
MULTI-FRAME MODULE OF CREATED US MULTIFRAME 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 80
US REGION CALIBRATION MODULE OF CREATED US OR US MULTIFRAME SOP INSTANCES

Not sent in Full Screen Single Frame images, or non-motorized 3D images. Motorized 3D images send scaling data for individual planes only.

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.	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
>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 X ₀	(0018,6020)	SL	The X pixel value of baseline	ANAP	AUTO
>Reference Pixel Y ₀	(0018,6022)	SL	The Y pixel value of baseline	ANAP	AUTO
>Region Spatial Format	(0018,6012)	US	A bit mask 0-5 if: none, 2d, Mmode, spectral Doppler. See DICOM PS3.3 C.8.5.5.1.1	ALWAYS	AUTO
>Region Data Type	(0018,6014)	US	Enumerated Value. See DICOM PS3.3 C.8.5.5.1.2	ALWAYS	AUTO
>Region Flags	(0018,6016)	UL	Bit mask. See DICOM PS3.3 C.8.5.5.1.3:	ALWAYS	AUTO

**Table 81
US IMAGE MODULE OF CREATED US OR US MULTIFRAME SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples Per Pixel	(0028,0002)	US	"1" for Monochrome2 "3" for RGB or YBR_FULL_422	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	Uncompressed: "Monochrome2" or "RGB" Compressed: "YBR_FULL_422"	ALWAYS	CONFIG
Bits Allocated	(0028,0100)	US	8 Bits per pixel.	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	Number of info bits in pixel: "8" Color: 24; BW: 8.	ALWAYS	AUTO
High Bit	(0028,0102)	US	High bit is 7	ALWAYS	AUTO
Planar Configuration	(0028,0006)	US	Include if not Monochrome2 image with value of "0".	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.	ANAP	AUTO
Image Type	(0008,0008)	CS	ORIGINAL/PRIMARY for uncompressed, DERIVED/PRIMARY if compressed	ALWAYS	CONFIG
Lossy Image Compression	(0028,2110)	CS	"01" if image is lossy compressed, "00" if not.	ALWAYS	AUTO
Ultrasound Color Data Present	(0028,0014)	US	01	ALWAYS	AUTO
Transducer Data	(0018,5010)	LO	Transducer name. Used in 3D images in media only.	ANAP	AUTO
Processing Function	(0018,5020)	LO	Imaging optimization name. Used in 3D images in media only.	ANAP	AUTO

**Table 82
VOI LUT MODULE OF CREATED US OR US MULTIFRAME SOP INSTANCES**

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

**Table 83
SOP COMMON MODULE OF CREATED US OR US MULTIFRAME SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
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>	ALWAYS	AUTO
Instance Creation Time	(0008,0013)	TM	<hhmmss>	ALWAYS	AUTO

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

8.1.5 Comprehensive Structured Report Modules

Table 84

SERIES MODULE OF CREATED COMPREHENSIVE SR SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	SR	ALWAYS	AUTO

Table 85

SR DOCUMENT SERIES MODULE OF CREATED COMPREHENSIVE SR SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Auto-generated	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 86

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 within PPS	ALWAYS	AUTO
Completion Flag	(0040,A491)	CS	PARTIAL	ALWAYS	AUTO
Verification Flag	(0040,A493)	CS	UNVERIFIED	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Date content created.	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Time content created.	ALWAYS	AUTO
>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, absent if unscheduled	ANAP	MWL

>>Referenced SOP Class UID	(0008,1150)	UI	Use not verified yet	ANAP	MWL
>>Referenced SOP Instance UID	(0008,1155)	UI	Use not verified yet	ANAP	MWL
>Accession Number	(0008,0050)	SH	Same attribute of MWL or user PDE input.	VNAP	MWL/USER
>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, absent if unscheduled	ANAP	MWL
Current Requested Procedure Evidence Sequence	(0040,A375)	SQ	Optional	ANAP	AUTO

Table 87
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
<i>Template Identification Macro'</i>			The Root Content Item identifies TID 5000 (OB-GYN) or 5100 (Vascular).	ALWAYS	AUTO
Content Sequence	(0040,A730)	SQ		ALWAYS	AUTO
>Relationship Type	(0040,A010)	CS	See Appendix A.1 for OB-GYN or A.2 for Vascular .	ALWAYS	AUTO
<i>Document Relationship Macro Table</i>			See Appendix A.1 for OB-GYN or A.2 for Vascular .	ANAP	AUTO
<i>Document Content Macro</i>			See Appendix A.1 for OB-GYN or A.2 for Vascular .	ALWAYS	AUTO

Table 88
SOP COMMON MODULE OF CREATED COMPOSITE SR SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	(0008,0005)	CS	"None", unless required by characters used	ALWAYS	CONFIG
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

8.2 USED FIELDS IN RECEIVED IOD BY APPLICATION

The iU22 storage application does not receive SOP Instances. The usage of attributes received via MWL is described in section 4.2.2.3.1.3 SOP Specific Conformance for Modality Worklist.

8.3 ATTRIBUTE MAPPING

Table 89 summarizes the relationships between attributes received via MWL, stored in acquired images and communicated via MPPS. The format and conventions used in Table 89 are the same as the corresponding table in IHE Technical Framework, Rev. 5.5 04-07-2003, vol. II: Transactions.

**Table 89
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
Scheduled Procedure Step Description	>Scheduled Procedure Step Description > Study Description > Series Description > Performed Procedure Step Description	>Scheduled 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

8.4 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.

8.5 CONTROLLED TERMINOLOGY

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 89.

8.6 GRAYSCALE IMAGE CONSISTENCY

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

8.7 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

8.7.1 Standard Extended / Specialized / Private SOPs

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.

3D objects stored to network using the "Print" or "Save 3D" contain in Pixel Data (7FE0,0010) a 2D image of the screen being displayed. No 3D volume data is transferred. "Print" results in an image whose size is determined by the Print Format setting. "Save 3D" will always be a 640x480 'thumbnail' image.

3D objects stored to media include the same Pixel Data contents as above and 3D volume data in Private Tags solely for use by iU22 for redisplay of the volume information. Private tag ranges are:

2001,xxxx.
200D,xxxx.

8.8 PRIVATE TRANSFER SYNTAXES

There are no Private Transfer Syntaxes.

APPENDIX A – Structured Report Templates

A.1 OB-GYN STRUCTURED REPORTS (SR) TEMPLATE

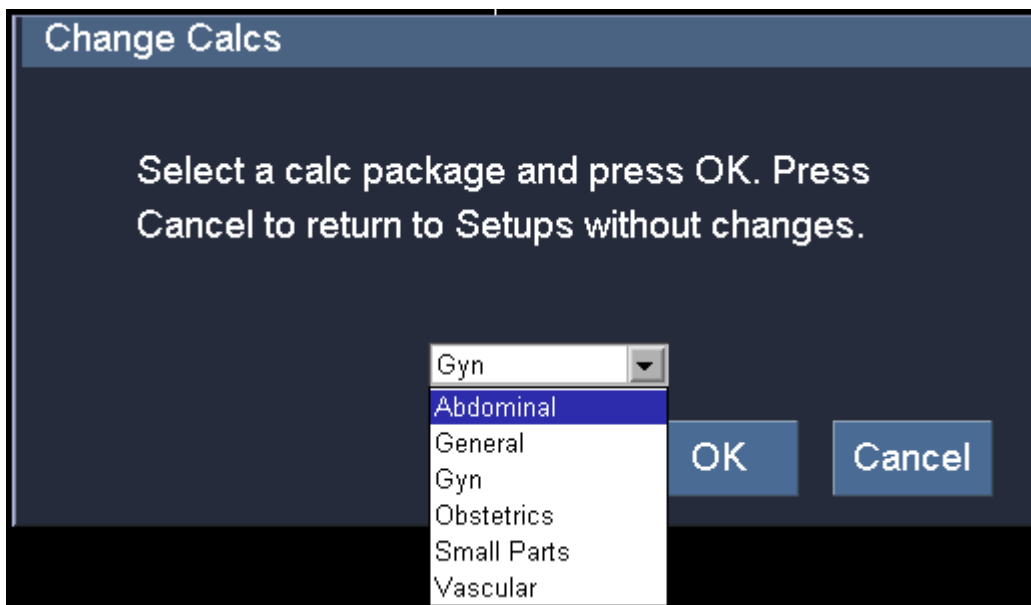
A.1.1 Introduction

iU22 implements the OB-GYN template (TID 5000) from DICOM Supplement 26. This appendix describes the scope and manner that iU22 measurements appear in DICOM reports.

The code tables of this Appendix follow the format convention of the DICOM Standard, Part 16 Annex C.

A.1.2 Clinical Scope

The supported measurements are in the Obstetrics and GYN Calcs packages accessed with the “Calc” hard key and selecting the calculations package with the “Change Calcs” dialog and report pages. Measurements for a given SR section may come from several calcs sidebars.



NOTE: OB and Gyn measurements generate an OB SR report; Vascular and Abdominal measurements generate a Vascular SR report. Custom or User Defined measurements will not be sent in an SR. No SR is sent for Small Parts or Breast measurements.

A.1.3 Measurements

The report contains select information entered and reported on the OB report and summary report pages.

- In the case of multiples fetuses the EDD exported is the earliest EDD.
- The comment originates from the comment on the GYN Report Page.
- The LMP comes from the Worklist or user entered from the Study Data entry form.
- EDD comes from the Worklist or user entered from the Study Data entry form.

Dates of the Summary section are from CID 12003 listed below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11955-2	LMP
LN	11778-8	EDD
LN	11779-6	EDD from LMP
LN	11781-2	EDD from average ultrasound age

Fetus-specific measurement codes are from CID 12002 listed below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11885-1	Gestational Age by LMP
LN	11888-5	Composite Ultrasound Age
LN	11727-5	Estimated Weight
LN	11948-7	Fetal Heart Rate

Equations from CID 12014 used for Estimated Fetal Body Weight

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11756-4	EFW by AC, Campbell 1975
LN	11735-8	EFW by AC, BPD, FL, Hadlock 1985
LN	11732-5	EFW by AC, BPD, FL, HC, Hadlock 1985
LN	11751-5	EFW by AC, FL, Hadlock 1985
LN	11746-5	EFW by AC, FL, HC, Hadlock 1985
LN	11739-0	EFW by AC and BPD, Shepard 1982

The following code identifies the fetus comments of the fetus summary template (TID 5003).

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
DCM	121106	Comment

Comments from GYN report page are included in the report summary (TID 5002) using (121106, DCM, "Comment").

A.1.3.1 Fetal Biometry Ratios

The biometry ratios from the report page use codes from CID 12004 listed below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11947-9	HC/AC
LN	11871-1	FL/AC
LN	11872-9	FL/BPD
LN	11823-2	Cephalic Index

A.1.3.2 Fetal Biometry Measurements

The measurement codes are from CID 12005 listed below. The report also includes the Mean indicated with a modifier of concept name (121401, DCM, "derivation") and value of (R-00317, SRT, "Mean")

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11979-2	Abdominal Circumference
LN	11820-8	Biparietal Diameter
LN	11824-0	BPD area corrected
LN	11963-6	Femur Length
LN	11984-2	Head Circumference
LN	11851-3	Occipital-Frontal Diameter
LN	33068-8	Thoracic Area
LN	11988-3	Thoracic Circumference

The code (18185-9, LN, "Gestational Age") identifies gestational age. The "Equation" or "Table of Values" concept modifier specifies the method of estimation from the list below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11892-7	AC, Hadlock 1984
LN	11902-4	BPD, Hadlock 1984
LN	33538-0	BPD, Hansmann 1986
LN	11905-7	BPD, Jeanty 1984
LN	11907-3	BPD, Sabbagha 1978
LN	11901-6	BPDa, Hadlock 1982
LN	33086-0	BPD-oi, Chitty 1997
LN	33087-8	BPD-oo, Chitty 1997
LN	33098-5	FL, Chitty 1997
LN	11920-6	FL, Hadlock 1984
LN	33541-4	FL, Hansmann 1986
LN	11922-2	FL, Hohler 1982
LN	11923-0	FL, Jeanty 1984
LN	11932-1	HC, Hadlock 1984
LN	33543-0	HC, Hansmann 1986
LN	11910-7	CRL, Hadlock 1992

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	33540-6	CRL, Hansmann 1986
LN	11913-1	CRL, Nelson 1981
LN	11914-9	CRL, Robinson 1975
LN	33107-4	GS, Nyberg 1992
LN	33110-8	HC measured, Chitty 1997
LN	33111-6	HC derived, Chitty 1997
LN	11936-2	Humerus, Jeanty 1984
LN	33132-2	TCD, Chitty 1994

A.1.3.3 Long Bones Measurements

The measurement codes are from CID 12006 listed below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11966-9	Humerus length
LN	11963-6	Femur Length
LN	11967-7	Radius Length

A.1.3.4 Fetal Cranium

The measurement codes corresponding to --*Nuch* and *Cereb* -- are from CID 12007 listed below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	12146-7	Nuchal Fold Thickness
LN	11863-8	Trans Cerebellar Diameter
LN	33069-6	Nuchal Translucency
LN	11860-4	Cisterna Magna
LN	12171-5	Lateral Ventricle width
LN	11629-3	Outer Orbital Diameter

A.1.3.5 Early Gestation Biometry Measurements

The measurement codes are from CID 12009 listed below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11957-8	Crown Rump Length
LN	11850-5	Gestational Sac Diameter

The gestational age is given by (18185-9, LN, "Gestational Age") with a modifier to identify the method of estimation. The codes from CID 12013 are shown below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11910-7	CRL, Hadlock 1992
LN	33540-6	CRL, Hansmann 1986
LN	11913-1	CRL, Nelson 1981
LN	11914-9	CRL, Robinson 1975
LN	33107-4	GS, Nyberg 1992

A.1.3.6 Multiple Fetus and Fetal Observation Context

A.1.3.6.1 Structure Example of Multiple Fetus and Fetal Observation

For twins there are multiple sections of Summary, Fetal Biometry Ratios, Fetal Biometry, Long Bones, and Early Gestation. The DICOM report segregates fetus measurements into separate sections, and uses the fetus subject context template, TID 1008, to identify the fetus with the user entered identifier.

In this case, the section heading has a modifier (11951-1, LN, "Fetus ID")

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11951-1	Fetus ID

A.1.3.7 BIOPHYSICAL PROFILE

Biophysical Profile measurements appear under the container of concept name (125006, DCM, "Biophysical Profile").

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11631-9	Gross Body Movement
LN	11632-7	Fetal Breathing
LN	11635-0	Fetal Tone
LN	11630-1	Amniotic Fluid Volume
LN	11634-3	Biophysical Profile Sum Score

A.1.3.8 AMNIOTIC SAC

The Amniotic Sac measurement appears under the container of concept name (121070, DCM, "Findings").

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11627-7	Amniotic Fluid Index

A.1.3.9 OB-GYN Ultrasound Ovary Measurements

The codes below identify the ovary measurements using codes from CID 12010

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	12164-0	Left Ovary Volume
LN	11840-6	Left Ovary Length
LN	11829-9	Left Ovary Width
LN	11857-0	Left Ovary Height
LN	12165-7	Right Ovary Volume
LN	11841-4	Right Ovary Length
LN	11830-7	Right Ovary Width
LN	11858-8	Right Ovary Height

A.1.3.10 Uterus Measurements

These measurements appear under the (125011, DCM, "Pelvis and Uterus") container.

Uterus size measurements appear under a subcontainer (T-83000, SRT, "Uterus").

Length, Height, and Width values of TID 5015 are used.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	33192-6	Uterus Volume
LN	11842-2	Uterus Length
LN	11859-6	Uterus Height
LN	11865-3	Uterus Width

Other measurements in the section include the following

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11961-0	Cervix Length
LN	12145-9	Endometrium Thickness

A.1.3.11 Follicles

Two Sections may be present, one for each laterality. Up to 15 content items may appear in each Follicles Section. Each group has

- an identifier of the follicle group
- a mean diameter and volume for each follicle

The following codes from TID 5014 are used.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
DCM	12510	Identifier
SRT	G-D705	Volume
LN	11793-7	Follicle Diameter

A.1.3.12 Data not Exported in Structured Report

- User-defined measurements not supported
- User-defined tables / equations not supported

A.2 VASCULAR STRUCTURED REPORT TEMPLATE

According to the DICOM Vascular Template (TID 5100), vascular measurements appear in a hierarchy of regional sections (e.g. Left Vein of Lower Extremity) that contain groups of anatomically specific containers (e.g. Common Femoral Vein). The groups contain the measurements or calculations that apply to that group. A group may contain measurement when it is an anatomically non-specific, such as a ratio of velocities from different vessels.

The table below specifies general measurement terms that appear in a vascular measurement group.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11726-7	Peak Velocity
LN	11653-3	End Diastolic Velocity
LN	12008-9	Pulsatility Index
LN	12023-8	Resistivity Index
LN	12144-2	Systolic to Diastolic Velocity Ratio
LN	20168-1	Acceleration Time

The table below specifies the laterality terms.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	G-A101	Left
SRT	G-A100	Right
SRT	G-A103	Unilateral

A.2.1 Extracranial Cerebral Arteries

A.2.1.1 Carotid Arteries

The Findings modifier that identifies the region is (T-45005, SRT, "Artery of neck"). The section appears for each laterality case: right and left. The table specifies the anatomy from Context Group 12104 and the longitudinal modifier for each measurement

The table below specifies the anatomy codes for the velocity measurements.

Report Label	Anatomy	Longitudinal Modifier
Subclav	T-48330, SRT, "Subclavian Artery"	<i>none</i>
PCCA	T-45100, SRT, "Common Carotid Artery"	G-A118, SRT, "Proximal"
MCCA	T-45100, SRT, "Common Carotid Artery"	G-A188, SRT, "Mid-longitudinal"
DCCA	T-45100, SRT, "Common Carotid Artery"	G-A119, SRT, "Distal"
Bulb	T-45170, SRT, "Carotid Bulb"	<i>none</i>
ECA	T-45200, SRT, "External Carotid Artery"	<i>none</i>
PICA	T-45300, SRT, "Internal Carotid Artery"	G-A118, SRT, "Proximal"
MICA	T-45300, SRT, "Internal Carotid Artery"	G-A188, SRT, "Mid-longitudinal"
DICA	T-45300, SRT, "Internal Carotid Artery"	G-A119, SRT, "Distal"
Vert	T-45700, SRT, "Vertebral Artery"	<i>none</i>

Note: Label "DICA" is equivalent to Label "ICA" in Intracranial Arteries

The ICA/CCA ratio appears directly under the section heading from the Group 121XX.

Report Label	Measurement
ICA/CCA	33868-1, LN, "ICA/CCA velocity ratio"

A.2.2 Intracranial Cerebral Arteries

The Intracranial Cerebral Arteries appear in the "Intracranial Cerebral Arteries" section heading of TID 5100. The section appears for each laterality case: right and left. The table specifies the anatomy from Context Group 12105 and the longitudinal modifier for each measurement

The table below specifies the anatomy codes for the velocity measurements.

Report Label	Anatomy	Longitudinal Modifier
Prox MCA	T-45600, SRT, "Middle Cerebral Artery"	G-A118, SRT, "Proximal"
Mid MCA	T-45600, SRT, "Middle Cerebral Artery"	G-A188, SRT, "Mid-longitudinal"
Dist MCA	T-45600, SRT, "Middle Cerebral Artery"	G-A119, SRT, "Distal"
Ant Cer	T-45540, SRT, "Anterior Cerebral Artery"	<i>none</i>
PCA	T-45900, SRT, "Posterior Cerebral Artery"	<i>none</i>
Vert A	T-45700, SRT, "Vertebral Artery"	<i>none</i>
Ophthal	T-45400, SRT, "Ophthalmic Artery"	<i>none</i>
Siphon	T-45308, SRT, "Carotid Siphon"	<i>none</i>

Note: Label "ICA" is equivalent to "DICA" in Extracranial Arteries and will appear in that report section.

The table below specifies the anatomy from Context Group 12106 in the "Intracranial Cerebral Arteries" section heading with a laterality of "unilateral."

Report Label	Anatomy	Longitudinal Modifier
Basilar	T-45800, SRT, "Basilar Artery"	<i>none</i>

A.2.3 Peripheral Vascular

A.2.3.1 Lower Extremities

The Findings modifier that identifies the region is (T-47040, SRT, "Artery of Lower Extremity"). The section appears for each laterality: left and right. The table specifies the anatomy from Context Group 12109 and the longitudinal modifier for each measurement

The table below specifies the anatomy codes for the velocity measurements.

Report Label	Anatomy	Longitudinal Modifier
Com Il	T-46710, SRT, "Common Iliac Artery"	<i>none</i>
Ext Il	T-46910, SRT, "External Iliac Artery"	<i>none</i>
Int IL	T-46740, SRT, "Internal Iliac Artery"	<i>none</i>
CFA	T-47400, SRT, "Common Femoral Artery"	<i>none</i>
Prof Fem	T-47440, SRT, "Profunda Femoris Artery"	G-A118, SRT, "Proximal"
Prox SFA	T-47403, SRT, "Superficial Femoral Artery"	G-A118, SRT, "Proximal"
Mid SFA	T-47403, SRT, "Superficial Femoral Artery"	G-A188, SRT, "Mid-longitudinal"
Dist SFA	T-47403, SRT, "Superficial Femoral Artery"	G-A119, SRT, "Distal"

Pop A	T-47500, SRT, "Popliteal Artery"	G-A118, SRT, "Proximal"
Prox PTA	T-47600, SRT, "Posterior Tibial Artery"	G-A118, SRT, "Proximal"
Mid PTA	T-47600, SRT, "Posterior Tibial Artery"	G-A188, SRT, "Mid-longitudinal"
Dist PTA	T-47600, SRT, "Posterior Tibial Artery"	G-A119. SRT, "Distal"
Prox Per	T-47630, SRT, "Peroneal Artery"	G-A118, SRT, "Proximal"
Mid Per	T-47630, SRT, "Peroneal Artery"	G-A188, SRT, "Mid-longitudinal"
Dist Per	T-47630, SRT, "Peroneal Artery"	G-A119. SRT, "Distal"
Prox ATA	T-47700, SRT, "Anterior Tibial Artery"	G-A118, SRT, "Proximal"
Mid ATA	T-47700, "SRT, Anterior Tibial Artery"	G-A188, SRT, "Mid-longitudinal"
Dist ATA	T-47700, SRT, "Anterior Tibial Artery"	G-A119. SRT, "Distal"
Dors Ped	T-47741, SRT, "Dorsalis Pedis Artery"	<i>none</i>

The Findings modifier that identifies the region is (T-49403, SRT, "Vein of Lower Extremity"). The section appears for each laterality: left and right. The table specifies the anatomy from Context Group 12110 and the longitudinal modifier for each measurement

The table below specifies the anatomy codes for the velocity measurements.

Report Label	Anatomy	Longitudinal Modifier
Com II	T-48920, SRT, "Common Iliac Vein"	<i>none</i>
Ext II	T-48930, SRT, "External Iliac Vein"	<i>none</i>
CFV	G-035B, SRT, "Common Femoral Vein"	<i>none</i>
SFJ	T-D930A, SRT, "Saphenofemoral Junction"	<i>none</i>
Prox GSV	T-49530, SRT, "Great Saphenous Vein"	G-A118, SRT, "Proximal"
Mid GSV	T-49530, SRT, "Great Saphenous Vein"	G-A188, SRT, "Mid-longitudinal"
Dist GSV	T-49530, SRT, "Great Saphenous Vein"	G-A119. SRT, "Distal"
Prof Fem	T-49660, SRT, "Profunda Femoris Vein"	G-A118, SRT, "Proximal"
Prox SFV	G-035A, SRT, "Superficial Femoral Vein"	G-A118, SRT, "Proximal"
Mid SFV	G-035A, SRT, "Superficial Femoral Vein"	G-A188, SRT, "Mid-longitudinal"
Dist SFV	G-035A, SRT, "Superficial Femoral Vein"	G-A119. SRT, "Distal"
Prox Pop	T-49640, SRT, "Popliteal Vein"	G-A118, SRT, "Proximal"
Dist Pop	T-49640, SRT, "Popliteal Vein"	G-A119. SRT, "Distal"
Prox PTV	T-49620, SRT, "Posterior Tibial Vein"	G-A118, SRT, "Proximal"
Mid PTV	T-49620, SRT, "Posterior Tibial Vein"	G-A188, SRT, "Mid-longitudinal"
Dist PTV	T-49620, SRT, "Posterior Tibial Vein"	G-A119. SRT, "Distal"
Prox Per	T-49650, SRT, "Peroneal Vein"	G-A118, SRT, "Proximal"
Mid Per	T-49650, SRT, "Peroneal Vein"	G-A188, SRT, "Mid-longitudinal"
Dist Per	T-49650, SRT, "Peroneal Vein"	G-A119, SRT, "Distal"
Prox ATV	T-49630, SRT, "Anterior Tibial Vein"	G-A118, SRT, "Proximal"

A.2.4 Abdominal Arteries

The Findings modifier that identifies the region is (T-46002, SRT, "Artery of Abdomen"). The section appears for each laterality: left, right or unilateral. The table below specifies the anatomy from Context Group 12112 in the "Abdominal Arteries" section heading with a laterality of "unilateral."

The table below specifies the anatomy codes for the velocity measurements.

Report Label	Anatomy	Longitudinal Modifier
Com Hep A	T-46421, SRT, "Common Hepatic Artery"	<i>none</i>
Inf Aorta	T-42520, SRT, "Infra-renal Aorta"	<i>none</i>
Supra Aorta	T-42510, SRT, "Supra-renal Aorta"	<i>none</i>
Inf Mes A	T-46520, SRT, "Inferior Mesenteric Artery"	<i>none</i>
Prox Sup Mes	T-46510, SRT, "Superior Mesenteric Artery"	SRT, G-A118, "Proximal"
Mid Sup Mes	T-46510 SRT, "Superior Mesenteric Artery"	SRT, G-A188, "Mid-longitudinal"
Dist Sup Mes	T-46510, SRT, "Superior Mesenteric Artery"	SRT, G-A119. "Distal"
Splenic A	T-46460, SRT, "Splenic Artery"	<i>none</i>
Celiac A	T-46400, SRT, "Celiac Axis"	<i>none</i>

A.2.5 Abdominal Veins

The Findings modifier that identifies the region is (T-487A0, SRT, " Vein of Abdomen"). The section appears for each laterality: left, right or unilateral. The table below specifies the anatomy codes for the velocity measurements in the "Abdominal Veins" section heading with a laterality of unilateral.

Report Label	Anatomy	Longitudinal Modifier	Branch Modifier
Inf Vena Ca	T-48710, SRT, "Inferior Vena Cava"	<i>none</i>	<i>none</i>
R.Hep V	T-48725, SRT, "Right Hepatic Vein"	<i>none</i>	<i>none</i>
M Hep V	T-48726, SRT, "Middle Hepatic Vein"	<i>none</i>	<i>none</i>
L Hep V	T-48727, SRT, "Left Hepatic Vein"	<i>none</i>	<i>none</i>
L Port V	T-4881F, SRT, "Left Main Branch of Portal Vein"	<i>none</i>	<i>none</i>
M Port V	T-48810, SRT, "Portal Vein"	<i>none</i>	<i>none</i>
R Port V	T-4882A SRT, "Right Main Branch of Portal Vein"	<i>none</i>	<i>none</i>
Super Mese	T-48840, SRT, "Super Mesenteric Vein"	<i>none</i>	<i>none</i>
Splenic V	T-48890, SRT, "Splenic Vein"	<i>none</i>	<i>none</i>

The table below specifies the anatomy codes for the velocity measurements in the "Abdominal Veins" section heading with a laterality of left or right.

Report Label	Anatomy	Longitudinal Modifier	Branch Modifier
Com Il	T-48920, SRT, "Common Iliac Vein"	<i>none</i>	<i>none</i>

A.2.6 Renal Vessels

The Findings modifier that identifies the region is (T-71019, SRT, "Vascular Structure Of Kidney"). The section appears for each laterality: left and right. The table below specifies the anatomy from Context Group 12115 and the longitudinal modifier and branch modifier for each velocity measurement.

Report Label	Anatomy	Longitudinal Modifier	Branch Modifier
Orig Ren	T-46600, SRT, "Renal Artery"	G-036A, SRT. "Origin of vessel"	<i>none</i>
Prox Ren	T-46600, SRT, "Renal Artery"	SRT, G-A118, "Proximal"	<i>none</i>
Mid Ren	T-46600, SRT, "Renal Artery"	SRT, G-A188, "Mid-longitudinal"	<i>none</i>
Dist Ren	T-46600, SRT, "Renal Artery"	SRT, G-A119. "Distal"	<i>none</i>
Hilar A	G-035C, SRT, "Hilar Artery"	<i>none</i>	<i>none</i>
Inf Seg	SRT, T-46659, "Segmental Artery"	<i>none</i>	G-A115, SRT, "Inferior"
Mid Seg	SRT, T-46659, "Segmental Artery"	<i>none</i>	G-A109, SRT, "Medial"
Sup Seg	SRT, T-46659, "Segmental Artery"	<i>none</i>	G-A116, SRT, "Superior"
Inf Arc	SRT, T-4668A, "Arcuate Artery of the Kidney"	<i>none</i>	G-A115 SRT,, "Inferior"
Mid Arc	SRT, T-4668A, "Arcuate Artery of the Kidney"	<i>none</i>	G-A109, SRT, "Medial"
Sup Arc	SRT, T-4668A, "Arcuate Artery of the Kidney"	<i>none</i>	G-A116, SRT, "Superior"

The table below lists the ratios for Renal velocities.

Report Label	Measurement
RA/Aorta	33869-9, LN, "Renal Artery/Aorta velocity ratio"

APPENDIX B – 3D IMAGE PRIVATE SOP CLASS

B.1 3D IMAGE MEDIA PRIVATE TAG DESCRIPTION

The private tags listed in this section are intended for internal use within the iU22 enabling continued analysis of iU22 3D datasets imported from media.

Tag	VR	Value
(2001,00FF)	LO	Philips Imaging DD 001
(2001,FF6E)	UN	Series
(200D,00FE)	LO	Philips US Imaging DD 017
(200D,00FD)	LO	Philips US Imaging DD 033
(200D,00FC)	LO	Philips US Imaging DD 034
(200D,00FB)	LO	Philips US Imaging DD 035
(200D,00FA)	LO	Philips US Imaging DD 036
(200D,00F9)	LO	Philips US Imaging DD 039
(200D,00F8)	LO	Philips US Imaging DD 040
(200D,FE05)	UN	3D
(200D,FD00)	UN	Private Data
(200D,FD01)	UN	Private Data
(200D,FD02)	UN	Private Data
(200D,FD03)	UN	Private Data
(200D,FD04)	UN	Private Data
(200D,FD05)	UN	Private Data
(200D,FD06)	UN	Private Data
(200D,FD07)	UN	Private Data
(200D,FD08)	UN	Private Data
(200D,FD09)	UN	Private Data
(200D,FD0A)	UN	Private Data
(200D,FD0B)	UN	Private Data
(200D,FC01)	UN	Private Data
(200D,FC02)	UN	Private Data
(200D,FC03)	UN	Private Data
(200D,FC04)	UN	Private Data
(200D,FC05)	UN	Private Data
(200D,FC06)	UN	Private Data
(200D,FC07)	UN	Private Data
(200D,FC08)	UN	Private Data
(200D,FC09)	UN	Private Data
(200D,FC0A)	UN	Private Data

(200D,FC0B)	UN	Private Data
(200D,FC0C)	UN	Private Data
(200D,FC0D)	UN	Private Data
(200D,FC0E)	UN	Private Data
(200D,FC0F)	UN	Private Data
(200D,FC10)	UN	Private Data
(200D,FB01)	UN	Private Data
(200D,FB02)	UN	Private Data
(200D,FB03)	UN	Private Data
(200D,FB04)	UN	Private Data
(200D,FB05)	UN	Private Data
(200D,FA01)	UN	Private Data
(200D,FA02)	UN	Private Data
(200D,FA03)	UN	Private Data
(200D,FA04)	UN	Private Data
(200D,F901)	UN	Private Data
(200D,F801)	UN	Private Data
(200D,F802)	UN	Private Data
(200D,F803)	UN	Private Data
(200D,F804)	UN	Private Data
(200D,F805)	UN	Private Data

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