



Multi-Modality Archive Manager DICOM Conformance Statement for Release 6

TABLE OF CONTENTS

SECTION 1	INTRODUCTION.....	1
1.1	Scope.....	1
1.2	Applicable Documents.....	1
1.2.1	DICOM Documents.....	1
1.2.2	Industry Standards Documents	1
1.2.3	Internet Engineering Task Force Documents	1
1.3	Functional Overview and Use of DICOM	1
1.4	Organization of This Document.....	2
1.5	Caveats.....	2
SECTION 2	IMPLEMENTATION MODEL.....	4
2.1	Application Data Flow Diagram.....	4
2.2	Functional Definition of AEs.....	5
2.2.1	Modality Interface AEs.....	5
2.2.2	Client AE	6
2.2.3	Media Import AE	6
2.3	Sequencing of Real World Activities	6
SECTION 3	ARM AE SPECIFICATIONS.....	7
3.1	Implementation Identifying Information	7
3.2	Modality Interface AEs.....	7
3.2.1	Association Establishment Policies	8
3.2.1.1	General	8
3.2.1.2	Number of Associations.....	9
3.2.1.3	Asynchronous Nature	9
3.2.2	Association Initiation	9
3.2.3	Association Acceptance Policy.....	9
3.2.3.1	Verification	9
3.2.3.1.1	Associated Real-World Activity.....	9
3.2.3.1.2	Acceptable Presentation Contexts	10
3.2.3.1.2.1	Specific Conformance Statement for Verification SOP Class	10
3.2.3.1.3	Presentation Context Acceptance Criteria	10
3.2.3.1.4	Transfer Syntax Selection Policies	10
3.2.3.2	Archive Storage.....	10
3.2.3.2.1	Associated Real-World Activity.....	10
3.2.3.2.2	Acceptable Presentation Contexts	10
3.2.3.2.2.1	Specific Conformance Statement for Storage SOP Classes	12
3.2.3.2.3	Presentation Context Acceptance Criteria	13
3.2.3.2.4	Transfer Syntax Selection Policies	13
3.2.3.3	Storage Commitment.....	13
3.2.3.3.1	Associated Real-World Activity.....	13
3.2.3.3.2	Acceptable Presentation Contexts	14
3.2.3.3.2.1	Specific Conformance Statement for Storage Commitment SOP Class	14
3.2.3.3.3	Presentation Context Acceptance Criteria	14
3.2.3.3.4	Transfer Syntax Selection Policies	15
3.2.3.4	Query/Retrieve	15

L-3 COMMUNICATIONS

REV A

3.2.3.4.1	Associated Real-World Activity	15
3.2.3.4.2	Acceptable Presentation Contexts	15
3.2.3.4.2.1	Specific Conformance Statement for Query (C-FIND) SOP Classes	15
3.2.3.4.2.2	Specific Conformance Statement for Retrieve (C-MOVE) SOP Classes	19
3.2.3.4.3	Presentation Context Acceptance Criteria	19
3.2.3.4.4	Transfer Syntax Selection Policies	20
3.2.3.5	Study Migration	20
3.2.3.5.1	Associated Real-World Activity	20
3.2.3.5.2	Acceptable Presentation Contexts	20
3.2.3.5.2.1	Specific Conformance Statement for Migration SOP Class	20
3.2.3.5.3	Presentation Context Acceptance Criteria	20
3.2.3.5.4	Transfer Syntax Selection Policies	20
3.3	ARM Client AE.....	21
3.3.1	Association Establishment Policies	21
3.3.1.1	General	21
3.3.1.2	Number of Associations.....	22
3.3.1.3	Asynchronous Nature	22
3.3.2	Association Initiation	22
3.3.2.1	Verification	22
3.3.2.1.1	Associated Real-World Activity	22
3.3.2.1.2	Proposed Presentation Contexts	22
3.3.2.1.2.1	Specific Conformance Statement for Verification SOP Class	23
3.3.2.1.3	Association Termination.....	23
3.3.2.2	Image Send	23
3.3.2.2.1	Associated Real-World Activity	23
3.3.2.2.2	Proposed Presentation Contexts	23
3.3.2.2.2.1	Specific Conformance Statement for Storage SOP Classes	24
3.3.2.2.3	Association Termination.....	24
3.3.2.3	Storage Commitment.....	24
3.3.2.3.1	Associated Real-World Activity	24
3.3.2.3.2	Proposed Presentation Contexts	25
3.3.2.3.2.1	Specific Conformance Statement for Storage Commitment SOP Class	25
3.3.2.3.3	Association Termination.....	25
3.4	Media Import AE	25
3.4.1	File Meta Information for the Media Import AE	26
3.4.2	Real-World Activities.....	26
3.4.2.1	Media Import Real-World Activity	26
3.4.2.1.1	Application Profiles.....	26
3.4.2.2	Image Storage Real-World Activity	26
3.4.2.2.1	Application Profiles.....	26
3.4.3	Augmented and Private Application Profiles.....	26
SECTION 4	COMMUNICATION PROFILE	27
4.1	Supported Communication Stacks	27
4.2	TCP/IP Stack.....	27
4.2.1	Physical Media Support.....	27
4.2.1.1	ATM.....	27
4.2.1.2	Ethernet	27

L-3 COMMUNICATIONS

REV A

SECTION 5	EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS	28
5.1	Standard Extended/Specialized/Private SOPs	28
5.1.1	Standard Extended Storage SOP Classes	28
5.1.2	Standard Extended Query SOP Class.....	28
5.1.2.1	Icon Image Attribute.....	28
5.1.2.2	Private Key Attributes	28
5.1.3	Migration SOP Class	29
5.2	Private Transfer Syntaxes	29
SECTION 6	CONFIGURATION	30
6.1	AE Title/Presentation Address Mapping.....	30
6.2	Auto-Routing.....	30
6.3	Configurable Parameters	30
SECTION 7	SUPPORT OF EXTENDED CHARACTER SETS	31
SECTION 8	CODES AND CONTROLLED TERMINOLOGY	31
ANNEX D	MIGRATION SERVICE CLASS.....	32
D.1	DIMSE Service Groups	32
D.2	Operations.....	32
D.2.1	Action Information	32
D.2.2	Service Class User Behavior	33
D.2.3	Service Class Provider Behavior	33
D.3	Migration SOP Class UID and SOP Instance UID	33

REV A

REVISION HISTORY

REV	DATE	REASON FOR CHANGE
-	22 February 2000	Initial MultiModality Release
A	21 June 2000	Minor update for general publication release

LIST OF EFFECTIVE PAGES

PAGE	REV
i-iv	-
1-34	-

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SECTION 1 INTRODUCTION

1.1 Scope

This Conformance Statement specifies the manner in which the Multi-Modality Archive Manager (ARM) complies with the DICOM Standard (NEMA PS3). This document is written in conformance with DICOM Part 2 (PS3.2). It details the Information Objects, Service Classes, Transfer Syntaxes, network technologies, and roles and operations of the ARM for DICOM standard interactions.

It is assumed that readers of this document are familiar with the DICOM Standard and with the terminology and concepts used in that Standard.

The DICOM Standard contains many optional components. This document allows the reader to determine which specific parts of the DICOM Standard the ARM supports. It also allows the reader to determine whether and to what extent communications might be supported between the ARM and another entity, which may implement a different set of DICOM components.

1.2 Applicable Documents

1.2.1 DICOM Documents

NEMA PS3 Digital Imaging and Communications in Medicine (DICOM)

1.2.2 Industry Standards Documents

IEEE Std 802 Local and Metropolitan Area Networks
ATMF UNI ATM Forum User Network Interface

1.2.3 Internet Engineering Task Force Documents

RFC 791 Internet Protocol (IP)
RFC 793 Transmission Control Protocol (TCP)
RFC 1042 Transmission of IP Datagrams over IEEE 802 Networks
RFC 1577 Classical IP and ARP over ATM

1.3 Functional Overview and Use of DICOM

The Multi-Modality Archive Manager (ARM) is a combined hardware and software platform which provides high performance short term and archival storage for digital medical images. It provides immediate high speed access to images in active review (recently stored or retrieved), and automatic long term archival mass storage for permanent image retention. The ARM provides associated services for managing and retrieving the stored images, including automatic retrieval from mass storage libraries.

The ARM is designed for the high performance requirements of X-ray angiography, with uncompressed real-time data rates of 7.5-MB/s and data volumes of up to 1500 MB per study, and echocardiography, with uncompressed data rates of up to 20 MB/s.

The ARM is an open system, with all its interfaces defined by international and industry standards. DICOM is the fundamental standard through which the ARM communicates with other devices. DICOM protocols are used for sending image data to the ARM for storage and archiving, for querying the image database, and for retrieving images.

1.4 Organization of This Document

This document follows the general outline of Conformance Statements specified in DICOM Part 2. However, the numbering of sections may be slightly different, as allowed by the standard.

1.5 Caveats

The use of this Conformance Statement, in conjunction with the DICOM Standard and the Conformance Statements of other equipment, is intended to facilitate open system interoperability with the ARM. However, these documents by themselves are not sufficient to ensure that system operation will be successful or will meet the user's needs. Among the issues which the potential user must consider are:

- **Interchange Semantics** - The DICOM Standard in general does not specify the higher level semantics associated with image data interchange. For example, an application which receives an image via the DICOM protocol is not constrained as to what it does with it - it may store it to disk, display it, or process the pixel data - with exactly the same protocol interface with the sender. In general, the DICOM image sender has no way of explicitly specifying or determining the "meaning" of the image transaction or the concomitant action of the receiver, which might even vary over time dependent on the state of the system. (Note, however, that DICOM Storage Commitment asserts the meaning of storage for subsequent retrieval, but does not assure the duration of storage.) Construction of a DICOM-based system requires careful selection of components and their functions as claimed in their conformance statements.
- **Network Design** - Implementation of a high performance network infrastructure and its lower level protocols is not trivial. The network requirements and design are beyond the scope of this document and of the DICOM Standard.
- **Clinical Validation** - A medical imaging system constructed of components supplied by multiple vendors must be validated as a whole before any clinical use (diagnosis or treatment) is performed. Issues such as end-to-end image quality, especially when the acquisition and display systems are from different manufacturers, must be evaluated.
- **Application Interaction** - Although a standard such as DICOM enables interoperability of equipment from diverse manufacturers, it does not fully constrain the manner in which functions are implemented. There may be functional interactions between applications, fully conformant to the Standard, which nevertheless limit the effectiveness of total system operation and which would not be apparent from their conformance statements. Indeed, one application's implementation may inhibit another from performing its functions altogether. The range of possible interactions between devices should be tested before a system is declared operational.

- Performance - The DICOM Standard focuses on functionality, not performance. Achieving the requisite performance for a particular clinical function, especially with high data rates or volumes, is a system issue beyond the scope of this document and of the DICOM Standard.
- Evolution - The DICOM Standard will continue to evolve to meet the growing requirements of the medical imaging community. L-3 Communications is an active participant in the continuing development of DICOM. The ARM will incorporate new features based on evolution of the DICOM Standard, and other connected devices may need to be similarly updated.

L-3 Communications reserves the right to discontinue or make changes to the ARM product, or features thereof, which may make it inconsistent with previous revisions of this document. The potential user is advised to check and obtain the current version of this document.

SECTION 2

IMPLEMENTATION MODEL

2.1 Application Data Flow Diagram

Illustration 1 is a graphical depiction of the relationships between the Archive Manager Application Entities (ARM AEs) and various Real-World Activities, as interrelated by DICOM.

ILLUSTRATION 1
APPLICATION DATA FLOW DIAGRAM

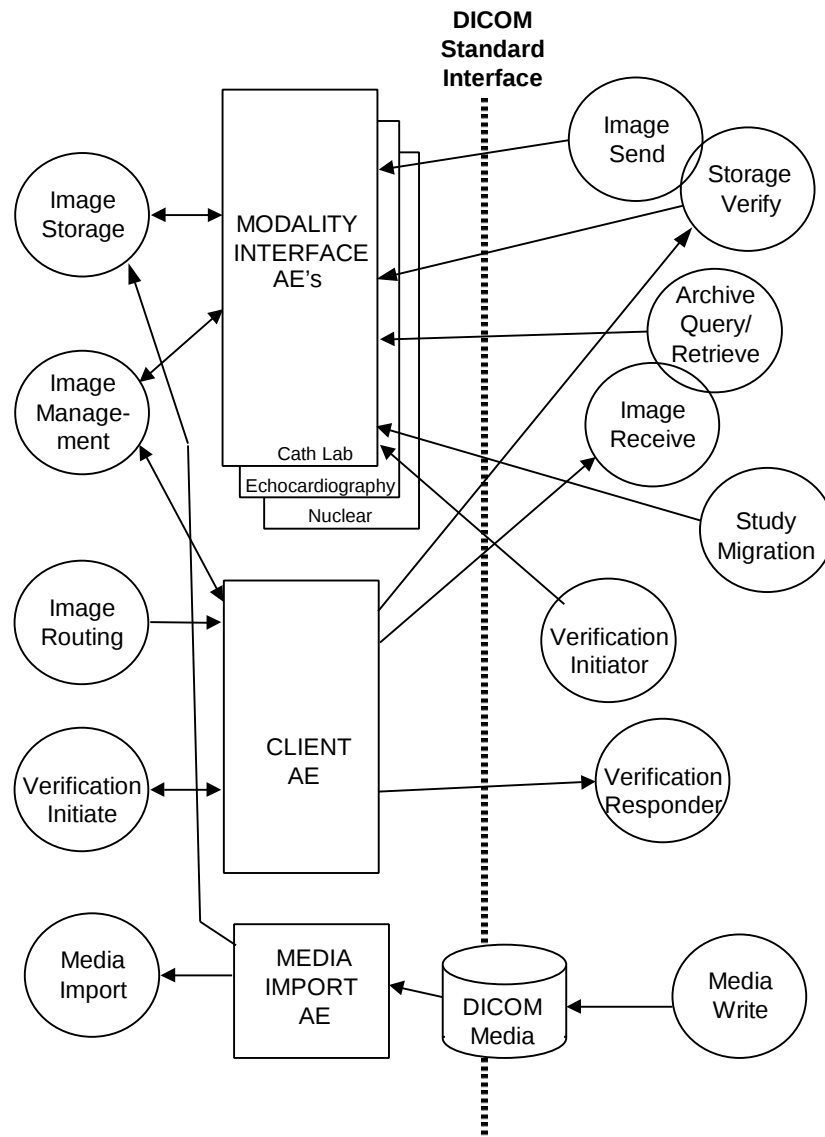


Image Send is an external activity which sends one or more images to the ARM to be archived. Image Storage, Image Management, and Image Routing are local automatic activities triggered by the DICOM transfer of images to the ARM for archive.

Storage Verify is an external activity which requests a guarantee of long-term storage for specific images. This activity is supported by the local Image Management activity.

Study Migration is an external activity which notifies the ARM of a potential future request for image data, permitting the ARM to stage that data for rapid access. This activity is also supported by the local Image Management activity.

Archive Query/Retrieve and Image Receive are activities by which an external user can identify images stored by the ARM, and can retrieve specific images or sets of images. The ARM initiates the return DICOM Association to the external Image Receive activity for the transfer of the retrieved images. These activities are supported by the local Image Storage and Image Management activities.

The Image Routing activity also interacts with the external Image Receive activity for the automatic transfer of archived images. Similarly, the Image Send activity interacts with the external Image Receive activity for manually initiated transfer of archived images.

An external Verification Initiator activity may use a DICOM Association to verify the ability of an ARM AE to respond to DICOM messages. A similar internal Verification Initiate activity initiated by an ARM operator causes the Client AE to establish an Association to another Verification Responder AE and verify that it can respond to DICOM messages.

Media Write is an activity which sends one or more images to the ARM via DICOM Interchange Media to be archived. Media Import is a local manually initiated activity which selects these media-based images for storage by the Image Storage activity in the ARM archive.

2.2 Functional Definition of AEs

The Archive Manager contains several Application Entities, depending on the capabilities licensed and configured.

2.2.1 Modality Interface AEs

The Modality Interface AEs provide a general archival storage service for cardiology-related multiframe medical images, and associated services for managing and retrieving those images. A separate AE handles each of the major classes (modalities) of cardiac imaging – Catheterization Lab, Echocardiography Lab, and Nuclear Lab.

Standard DICOM network communications is used to send images to the ARM for storage (Storage Service), to guarantee their long-term storage (Storage Commitment Service), to query the ARM for information about stored images (Query Service), and to retrieve stored images (Retrieve Service).

Each Modality Interface AE responds to DICOM echo requests (Verification Service).

These AEs use extensions to standard DICOM services (in conformance with the the DICOM Standard) to provide additional system functionality. The ARM supports retrieval of image icons and storage related attributes as part of the query response (Standard Extended Query Service). It also supports remote image staging requests (Private Migration Service).

2.2.2 Client AE

Outgoing communications of the ARM use the Client AE. This is used to support the sending of retrieved images (Storage Service), notifications of guaranteed storage (Storage Commitment Service), and DICOM echo requests initiated by the ARM user (Verification Service).

2.2.3 Media Import AE

The Media Import AE supports standard DICOM media interchange used to send images to the ARM for storage (Media Storage Service).

2.3 Sequencing of Real World Activities

The only sequencing constraints are those which arise from the required existence of data prior to its access (e.g., images must be archived prior to their access through the Query/Retrieve activity, and prior to their guarantee of storage through the Storage Commitment activity).

SECTION 3

ARM AE SPECIFICATIONS

3.1 Implementation Identifying Information

All ARM AE's use an Implementation UID identifying the class of L3CS Archive Manager products:

TABLE 1
ARM AE IMPLEMENTATION UID

Implementation UID	1.2.840.113708.794.1.1.2.0
--------------------	----------------------------

3.2 Modality Interface AEs

All Modality Interface AEs provide the same sets of functions, and differ only in the specific Storage SOP Classes supported. They operate as SCPs only.

The Modality Interface AEs provide Standard Conformance to the following DICOM SOP Classes as an SCP:

TABLE 2
CATH LAB MODALITY INTERFACE AE SCP STANDARD CONFORMANCE

Service Class	Service-Object Pair Class	SOP Class Unique ID
Verification	Echo	1.2.840.10008.1.1
Storage	X-ray Angiography	1.2.840.10008.5.1.4.1.1.12.1
	Secondary Capture	1.2.840.10008.5.1.4.1.1.7
Storage Commitment	Storage Commitment - Push Model	1.2.840.10008.1.20.1
Query/Retrieve	Study Root Model FIND	1.2.840.10008.5.1.4.1.2.2.1
	Study Root Model MOVE	1.2.840.10008.5.1.4.1.2.2.2

TABLE 3
ECHOCARDIOGRAPHY MODALITY INTERFACE AE SCP STANDARD CONFORMANCE

Service Class	Service-Object Pair Class	SOP Class Unique ID
Verification	Echo	1.2.840.10008.1.1
Storage	Ultrasound Multi-frame	1.2.840.10008.5.1.4.1.1.3
	Ultrasound Multi-frame	1.2.840.10008.5.1.4.1.1.3.1
	Ultrasound	1.2.840.10008.5.1.4.1.1.6
	Ultrasound	1.2.840.10008.5.1.4.1.1.6.1
	Secondary Capture	1.2.840.10008.5.1.4.1.1.7
Storage Commitment	Storage Commitment - Push Model	1.2.840.10008.1.20.1
Query/Retrieve	Study Root Model FIND	1.2.840.10008.5.1.4.1.2.2.1
	Study Root Model MOVE	1.2.840.10008.5.1.4.1.2.2.2

TABLE 4
NUCLEAR MODALITY INTERFACE AE SCP STANDARD CONFORMANCE

Service Class	Service-Object Pair Class	SOP Class Unique ID
Verification	Echo	1.2.840.10008.1.1
Storage	Nuclear Medicine	1.2.840.10008.5.1.4.1.1.20
	Secondary Capture	1.2.840.10008.5.1.4.1.1.7
Storage Commitment	Storage Commitment - Push Model	1.2.840.10008.1.20.1
Query/Retrieve	Study Root Model FIND	1.2.840.10008.5.1.4.1.2.2.1
	Study Root Model MOVE	1.2.840.10008.5.1.4.1.2.2.2

The Modality Interface AEs provide Standard Extended Conformance to the supported DICOM Storage SOP Classes as an SCP, to the extent that the Image Information Object sources add Type 3 data elements to the objects. The ARM does not validate or delete supplementary data elements within the information objects stored in and retrieved from its image storage.

The Modality Interface AEs provide Standard Extended Conformance to the DICOM Query/Retrieve SOP Classes as an SCP, in accordance with Section 5.1.2.

The Modality Interface AEs provide Conformance to the following Private SOP Class as an SCP, in accordance with Section 5.1.5:

TABLE 5
MODALITY INTERFACE AE'S PRIVATE SOP CLASS CONFORMANCE

Service-Object Pair Class	SOP Class Unique ID
Migration	1.2.840.113619.4.10

3.2.1 Association Establishment Policies

3.2.1.1 General

The Modality Interface AEs accept Associations only under the standard DICOM Application Context Name (ACN):

TABLE 6
MODALITY INTERFACE AE'S APPLICATION CONTEXT NAME

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

The Modality Interface AEs propose a Maximum Length Protocol Data Unit (PDU) during Association establishment as follows:

TABLE 7
MODALITY INTERFACE AE'S MAXIMUM LENGTH PDU

Maximum Length PDU	32,768 bytes
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3.2.1.2 Number of Associations

The Modality Interface AEs support a varying number of simultaneous Associations, depending on the product model:

TABLE 8
MODALITY INTERFACE AE'S MAXIMUM SIMULTANEOUS ASSOCIATIONS

Product Model	Number of Simultaneous Associations Accepted
ARM-2000	32

Within these limits, the Modality Interface AEs do not restrict the number of simultaneous Associations from or to any single other AE.

3.2.1.3 Asynchronous Nature

Asynchronous Operations are not supported by the Modality Interface AEs.

3.2.2 Association Initiation

The Modality Interface AEs do not initiate the establishment of an association.

3.2.3 Association Acceptance Policy

The Modality Interface AEs will accept an Association at any time, consistent with the maximum number of Associations described in Section 3.2.1.2.

The Modality Interface AEs accept the establishment of an association in these cases of real-world activity:

- to support a remote Application Entity verifying the responsiveness of the AE,
- to receive images for archive from a remote AE,
- to receive a request for guarantee of storage (storage commitment) from a remote AE,
- to support a remote image staging (migration) request, and
- to handle query/retrieval requests from a remote AE against the ARM archive image storage.

The Modality Interface AE may terminate an Association (A-ABORT) if there is no activity for a parameterized length of time.

3.2.3.1 Verification

3.2.3.1.1 Associated Real-World Activity

The Modality Interface AEs will accept an Association from a remote Application Entity to verify the ability of the AE to respond to DICOM messages (Verification Initiator Real-World Activity).

3.2.3.1.2 Acceptable Presentation Contexts

The Modality Interface AEs will accept a single Presentation Context for the Verification activity as shown in Table 9. A single Association may be used both for this activity and for any of the other activities for which the Modality Interface AE is the Association Acceptor.

TABLE 9
ACCEPTABLE PRESENTATION CONTEXTS FOR MODALITY INTERFACE AE VERIFICATION

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

3.2.3.1.2.1 Specific Conformance Statement for Verification SOP Class

The Modality Interface AEs conform to the definition of an SCP of the Verification SOP Class in accordance with the DICOM standard.

3.2.3.1.3 Presentation Context Acceptance Criteria

The Modality Interface AEs will unconditionally accept a Presentation Context for the Verification association.

3.2.3.1.4 Transfer Syntax Selection Policies

Only a single Transfer Syntax is acceptable, the DICOM Default Transfer Syntax.

3.2.3.2 Archive Storage**3.2.3.2.1 Associated Real-World Activity**

The Modality Interface AEs will accept an Association from a remote Application Entity to transfer images to the ARM for archival storage. This Association supports the Real-World Activity Image Archive.

3.2.3.2.2 Acceptable Presentation Contexts

The Modality Interface AEs will accept multiple Presentation Contexts for the Archive Storage activity as shown in Table 11 through Table 11. A single Association may be used both for this activity and for any of the other activities for which the AE is the Association Acceptor.

L-3 COMMUNICATIONS

REV A

**TABLE 10
ACCEPTABLE PRESENTATION CONTEXTS FOR CATH LAB MODALITY INTERFACE AE STORAGE**

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
X-ray Angiographic Storage	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		JPEG Lossless	1.2.840.10008.1.2.4.70	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Secondary Capture Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		JPEG Lossless	1.2.840.10008.1.2.4.70	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

**TABLE 11
ACCEPTABLE PRESENTATION CONTEXTS FOR ECHOCARDIOGRAPHY MODALITY INTERFACE AE STORAGE**

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Ultrasound Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		JPEG Lossy	1.2.840.10008.1.2.4.50	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Ultrasound Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		JPEG Lossy	1.2.840.10008.1.2.4.50	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Ultrasound Storage	1.2.840.10008.5.1.4.1.1.6	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Ultrasound Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Secondary Capture Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

**TABLE 12
ACCEPTABLE PRESENTATION CONTEXTS FOR NUCLEAR MEDICINE MODALITY INTERFACE AE
STORAGE**

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Nuclear Medicine Storage	1.2.840.10008.5.1.4.1.1.20	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Secondary Capture Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

3.2.3.2.2.1 Specific Conformance Statement for Storage SOP Classes

The ARM provides Level 2 (Full) conformance as an SCP of the Storage SOP Classes. All received Attributes are stored and may be subsequently accessed, including Private and other Type 3 Attributes included in Standard Extended SOP Instances.

Stored SOP Instances may be accessed using the DICOM standard Query/Retrieve SOP Classes (see Section 3.2.3.3). Stored SOP Instances may be accessed from the local user interface for transmission to another network node.

Stored SOP Instances are permanently accessible (long term archive).

The ARM will return an unsuccessful or warning C-STORE response in accordance with Table 13. In all error cases, the SOP Instance is not stored, and the source system must retransmit the image.

L-3 COMMUNICATIONS

REV A

**TABLE 13
UNSUCCESSFUL/WARNING STORAGE RESPONSES**

Response Code	Meaning	Corrective Action
A703	Out of Resources (database update error)	Correct hardware or software fault in ARM
A704	Out of Resources (file formatting error)	Correct hardware or software fault in ARM
A705	Out of Resources (memory allocation error)	Correct hardware or software fault in ARM
A710	Out of Resources (disk full)	Force data migration to secondary storage, and allow system to reclaim disk space
A712	Out of Resources (file system error)	Correct hardware or software fault in ARM
A907	Data Set does not match SOP Class (required elements missing)	Correct error in source system
C001	Cannot Understand (error parsing input image object)	Correct error in source system, or hardware or software fault in ARM
C002	Cannot Understand (pixel data length does not correspond to pixel data attributes)	Correct error in source system
C006	Cannot Understand (SOP class not negotiated)	Correct error in source system
C111	Cannot Understand (duplicate image SOP Instance UID)	If the image stored in the ARM is to be replaced, a service engineer can override the rejection of duplicate objects

The ARM performs no automatic coercion of any Attribute values within the stored SOP Instances. However, the ARM local user may manually edit and update patient and study attribute values in the stored SOP Instances.

3.2.3.2.3 Presentation Context Acceptance Criteria

The Modality Interface AEs will accept the Presentation Contexts for the SOP Classes associated with Archive Storage only if a minimum amount of storage space (default 500 MB) is available on the online disk. If such space is not available, the ARM will return a Result/Reason “No-reason (provider rejection)” for all Presentation Contexts proposed for Storage SOP Classes.

3.2.3.2.4 Transfer Syntax Selection Policies

Within each Presentation Context, the first proposed Transfer Syntax which is supported by the ARM will be accepted.

3.2.3.3 Storage Commitment

3.2.3.3.1 Associated Real-World Activity

The Modality Interface AEs will accept an Association from a remote Application Entity to send the ARM requests for guarantee of image storage (storage commitment). This Association supports the external Real-World Activity Storage Verify, and is supported by the internal Image Management Real-World Activity.

3.2.3.3.2 Acceptable Presentation Contexts

The Modality Interface AEs will accept one Presentation Context for the Storage Commitment activity as shown in Table 14. A single Association may be used both for this activity and for any of the other activities for which the Modality Interface AE is the Association Acceptor.

**TABLE 14
ACCEPTABLE PRESENTATION CONTEXTS FOR MODALITY INTERFACE AE STORAGE COMMITMENT**

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
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	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

3.2.3.3.2.1 Specific Conformance Statement for Storage Commitment SOP Class

The Modality Interface AEs conforms to the definition of an SCP of the Storage Commitment SOP Class. Note that the N-EVENT-REPORT functionality is provided through the ARM Client AE. See also Section 3.3.2.3.2.1.

The ARM does not support Storage Commitment based on Storage Media File-Set ID/UID. The ARM does not take any action based on the Referenced Study Component Sequence, whether present or absent.

The Modality Interface AEs will not return the N-EVENT-REPORT on the same Association as the N-ACTION request.

The ARM provides Storage Commitment for SOP Instances which have been reliably stored to archival media. These SOP Instances will be permanently available for DICOM Standard Query/Retrieve access. Latency of access will be negligible while the SOP Instances remain in online storage, typically for two weeks; latency will be approximately 1½ - 2½ minutes while they remain on media in the library; and will be indeterminate (contingent on manual restoration) when their archival media has been removed from the library. Library storage is typically configured for 1 – 3 years of capacity, although there is no specific limit.

SOP Instances may be deleted by action of service personnel, but if they have been written to archival media they may be recoverable.

Upon receiving a Storage Commitment N-ACTION request, the ARM will determine if the identified SOP Instances have been reliably stored to archival media. When all SOP Instances have been so stored, the ARM will return the N-EVENT-REPORT. After a configurable timeout (default value 24 hours), if a Request Successful N-EVENT-REPORT has not yet been sent, a Failures Exist N-EVENT-REPORT will be returned indicating the SOP Instances which have and have not been stored to archival media.

3.2.3.3.3 Presentation Context Acceptance Criteria

There are no special criteria for accepting Storage Commitment Presentation Contexts.

3.2.3.3.4 Transfer Syntax Selection Policies

Within each Presentation Context, the first proposed Transfer Syntax which is supported by the AE will be accepted.

3.2.3.4 Query/Retrieve

3.2.3.4.1 Associated Real-World Activity

The Modality Interface AEs will accept an Association from a remote Application Entity to query the ARM for information about stored images, and/or to retrieve images from the ARM archival storage. This Association supports the Archive Query/Retrieve Real-World Activity.

3.2.3.4.2 Acceptable Presentation Contexts

The Modality Interface AEs will accept multiple Presentation Contexts for the Archive Query/Retrieve activity as shown in Table 15. A single Association may be used both for this activity and for any of the other activities for which the AE is the Association Acceptor.

**TABLE 15
ACCEPTABLE PRESENTATION CONTEXTS FOR ARM AE QUERY/RETRIEVE**

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root FIND	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Study Root MOVE	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

3.2.3.4.2.1 Specific Conformance Statement for Query (C-FIND) SOP Classes

The ARM conforms to the definition of an SCP of the Query (C-FIND) Service in accordance with the DICOM standard. The ARM supports queries against the Study Root Information Model.

The ARM does not support Priority processing. The ARM does not support Relational-queries.

The attribute values returned by the ARM in the Query Service for the stored SOP Instances may differ from the values actually in the stored SOP Instances in the following ways:

- Attributes with Value Representation PN are truncated to a maximum total length of 64 bytes, although multiple values are supported within that total length limit;
- Modality is truncated to a maximum of four bytes;
- the Series Date and Time are replaced by the Study Date and Time; and
- Referenced Image Sequence is truncated to a maximum of one Item.

In the following Tables, the values in the Matching column have these meanings:

Matching Value	Meaning
U/M	Unique Key / Key Matching supported
M	Key Matching supported
E	Key Existence supported (no matching)

The ARM supports queries at the STUDY level in the Study Root FIND SOP Class using the keys in Table 16.

TABLE 16
STUDY LEVEL KEYS FOR STUDY ROOT QUERY

Attribute	Tag	Matching
Study Instance UID	(0020,000D)	U/M
Study Date	(0008,0020)	M
Study Time	(0008,0030)	M
Accession Number	(0008,0050)	M
Modalities in Study	(0008,0061)	M
Referring Physician's Name	(0008,0090)	M
Physician of Record	(0008,1048)	E
Performing Physician's Name	(0008,1050)	M
Patient ID	(0010,0020)	M
Patient's Name	(0010,0010)	M
Study ID	(0020,0010)	M
Study Description	(0008,1030)	E
Patient's Birth Date	(0010,0030)	E
Patient's Sex	(0010,0040)	E
Number of Study Related Images	(0020,1208)	E
Study Status	(0032,000A)	E
Private Creator	(0087,00xx)	M
Media Location	(0087,xx20)	E
Size in MB	(0087,xx40)	E
Estimated Retrieve Time	(0087,xx50)	E

The ARM supports Range Matching for Study Date and Study Time as independent keys. That is, if both date range and time range are specified in the Request Identifier, the matching studies' dates will be strictly within the requested key date range, and their times will be strictly within the requested key time range. The ARM does not treat the combination of specified matching ranges in these two fields as a datetime range (study datetime between date1time1 and date2time2).

The ARM supports Performing Physician's Name as a matching attribute at the Study level, even though it is formally defined in the DICOM Information Model as an attribute at the Series level.

At the Study level, the ARM recognizes and returns the Private Key Attributes Media Location (0087,xx20), Size in MB (0087,xx40), and Estimated Retrieve Time (0087,xx50)

in accordance with the Extension to the Standard C-FIND SOP Classes as described in Section 5.1.2.

The ARM supports queries at the SERIES level using the keys in Table 17.

TABLE 17
SERIES LEVEL KEYS FOR QUERY

Attribute	Tag	Matching
Modality	(0008,0060)	U/M
Series Instance UID	(0020,000E)	M
Series Number	(0020,0011)	M
Series Date	(0008,0021)	E
Series Time	(0008,0031)	E
Series Description	(0008,103E)	E
Station Name	(0008,1010)	E
Operator Name	(0008,1070)	E
Performing Physician's Name	(0008,1050)	E
Body Part Examined	(0018,0015)	E

The ARM supports queries at the IMAGE level using the keys in Table 18.

TABLE 18
IMAGE LEVEL KEYS FOR QUERY

Attribute	Tag	Matching
SOP Instance UID	(0008,0018)	U/M
Instance Number	(0020,0013)	M
SOP Class UID	(0008,0016)	E
Referenced Image Sequence	(0008,1140)	E
Positioner Primary Angle	(0018,1510)	E
Positioner Secondary Angle	(0018,1511)	E
Number of Frames	(0028,0008)	E
Private Creator	(0087,00xx)	M
Media Type	(0087,xx10)	E
Media Location	(0087,xx20)	E
Size in MB	(0087,xx40)	E
Storage Media ID	(0088,0130)	E
Icon Image Sequence	(0088,0200)	E
Image Type	(0008,0008)	E
Image Comments	(0020,4000)	E
Lossy Image Compression	(0028,2110)	E
Source Image Sequence	(0008,2112)	E

At the Image level, the ARM recognizes and returns the Private Key Attributes Media Type (0087,xx10), Media Location (0087,xx20) and Size in MB (0087,xx40) in accordance with the Extension to the Standard C-FIND SOP Classes as described in Section 5.1.2.

The ARM does not support Sequence Matching for the Referenced Image Sequence or the Source Image Sequence attribute. If either of these Sequences is requested in an IMAGE level C-FIND Identifier with a single zero-length Item, the ARM supports Universal Matching, and returns zero or one Items for the Sequence in accordance with Table 19.

TABLE 19
REFERENCED IMAGE SEQUENCE ITEM ATTRIBUTES

Attribute	Tag
Referenced Image Sequence or Source Image Sequence	(0008,1140) or (0008,2112)
>SOP Class UID	(0008,1150)
>SOP Instance UID	(0008,1155)

The ARM does not support Sequence Matching for the Icon Image Sequence attribute. If this Sequence is requested in an IMAGE level C-FIND Identifier with a single zero-length Item, the ARM supports Universal Matching, and returns zero or one Items for the Sequence in accordance with Table 20.

TABLE 20
ICON IMAGE SEQUENCE ITEM ATTRIBUTES

Attribute	Tag
Icon Image Sequence	(0088,0200)
>Samples per Pixel	(0028,0002)
>Photometric Interpretation	(0028,0004)
>Rows	(0028,0010)
>Columns	(0028,0011)
>Bits Allocated	(0028,0100)
>Bits Stored	(0028,0101)
>High Bit	(0028,0102)
>Pixel Representation	(0028,0103)
>Red Lookup Table Descriptor	(0028,1101)
>Green Lookup Table Descriptor	(0028,1102)
>Blue Lookup Table Descriptor	(0028,1103)
>Red Lookup Table Data	(0028,1201)
>Green Lookup Table Data	(0028,1202)
>Blue Lookup Table Data	(0028,1203)
>Pixel Data	(7FE0,0010)

The C-FIND Response Identifier returned by the ARM may include the attributes shown in Table 21 under the conditions indicated.

TABLE 21
OTHER RESPONSE IDENTIFIER ATTRIBUTES

Attribute	Tag	Conditions
Specific Character Set	(0008,0005)	If used in input images
Retrieve AE Title	(0008,0054)	Always returned

L-3 COMMUNICATIONS

REV A

The ARM will return status in the C-FIND response in accordance with the DICOM standard. In particular, the ARM will return Refused or Failed status responses in accordance with Table 22.

**TABLE 22
C-FIND REFUSED/FAILED STATUS RESPONSES**

Response Code	Meaning	Conditions
A700	Out of Resources	maximum number of responses returned
A900	Identifier does not match SOP Class (improper query level value)	Query level value not defined for SOP Class
C001	Unable to Process (error parsing identifier)	Hardware or software fault in ARM, or invalid input
C003	Unable to Process (internal ARM error)	Hardware or software fault in ARM
C004	Unable to Process (ARM database error)	Hardware or software fault in ARM
C006	Unable to Process (SOP class not negotiated)	Hardware or software fault in ARM
C902	Unable to Process (missing required study UID or patient ID)	Required higher level UID missing
C906	Unable to Process (improper attribute in identifier for SOP class)	Attributes for another query level present

The ARM limits the maximum number of Query responses returned with status of Pending (response code FF00 or FF01) to the value of a parameter set in a configuration file. The default Maximum Number of Query Responses value is 200. After the maximum number of Pending responses, the ARM returns a response with status Refused - Out of Resources (response code A700).

3.2.3.4.2.2 Specific Conformance Statement for Retrieve (C-MOVE) SOP Classes

The ARM conforms to the definition of an SCP of the Retrieve (C-MOVE) Service in accordance with the DICOM standard. The ARM supports retrievals against the Study Root Information Model.

The ARM does not support Priority processing. The ARM does not support Relational-retrieves.

The ARM uses the Storage SOP Classes defined in Section 3.2.2.2 to support the C-STORE sub-operations of the Retrieve SOP Classes.

If the Destination AE Title in the C-MOVE request is an AE Title of the ARM, the ARM will move the requested images to its online disk (staging) for rapid subsequent retrieval via another C-MOVE.

3.2.3.4.3 Presentation Context Acceptance Criteria

There are no special criteria for accepting Query/Retrieve Presentation Contexts.

3.2.3.4.4 Transfer Syntax Selection Policies

Within each Presentation Context, the first proposed Transfer Syntax which is supported by the ARM will be accepted.

3.2.3.5 Study Migration**3.2.3.5.1 Associated Real-World Activity**

The Modality Interface AEs will accept an Association from a remote Application Entity to send the ARM requests to manage the storage of studies. This Association supports the external Real-World Activity Study Migration, and is supported by the internal Image Management Real-World Activity.

3.2.3.5.2 Acceptable Presentation Contexts

The Modality Interface AEs will accept one Presentation Context for the Study Migration activity as shown in Table 23. A single Association may be used both for this activity and for any of the other activities for which the AE is the Association Acceptor.

TABLE 23

ACCEPTABLE PRESENTATION CONTEXTS FOR MODALITY INTERFACE AE STUDY MIGRATION

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Migration	1.2.840.113619.4.10	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

3.2.3.5.2.1 Specific Conformance Statement for Migration SOP Class

The ARM conforms to the definition of an SCP of the Migration SOP Class in accordance with the definition in Section 5.1.3.

The ARM supports Migration N-ACTION Action Type ID (0000,1008) value 1 (Migrate to Online) only. Other values of this ID in the N-ACTION request will result in N-ACTION response status 0135H (No Such Action).

The ARM supports Migration N-ACTION Query/Retrieve Level attribute (0008,0052) value "STUDY" only. Other values of this attribute in the N-ACTION request will result in N-ACTION response status 0115H (Invalid Argument Value).

3.2.3.5.3 Presentation Context Acceptance Criteria

There are no special criteria for accepting Study Migration Presentation Contexts.

3.2.3.5.4 Transfer Syntax Selection Policies

Within each Presentation Context, the first proposed Transfer Syntax which is supported by the ARM will be accepted.

REV A

3.3 ARM Client AE

The ARM Client AE provides Standard Conformance to the following DICOM SOP Classes as an SCU:

TABLE 24
ARM CLIENT AE SCU STANDARD CONFORMANCE

Service Class	Service-Object Pair Class	SOP Class Unique ID
Verification	Echo	1.2.840.10008.1.1
Storage	X-ray Angiography	1.2.840.10008.5.1.4.1.1.12.1
	Ultrasound Multi-frame	1.2.840.10008.5.1.4.1.1.3
	Ultrasound Multi-frame	1.2.840.10008.5.1.4.1.1.3.1
	Ultrasound	1.2.840.10008.5.1.4.1.1.6
	Ultrasound	1.2.840.10008.5.1.4.1.1.6.1
	Nuclear Medicine	1.2.840.10008.5.1.4.1.1.20
	Secondary Capture	1.2.840.10008.5.1.4.1.1.7

The ARM Client AE provides Standard Conformance to the following DICOM SOP Classes as an SCP:

TABLE 25
ARM CLIENT AE SCP STANDARD CONFORMANCE

Service Class	Service-Object Pair Class	SOP Class Unique ID
Storage Commitment	Storage Commitment - Push Model	1.2.840.10008.1.20.1

3.3.1 Association Establishment Policies

3.3.1.1 General

The ARM Client AE initiates Associations only under the standard DICOM Application Context Name (ACN):

TABLE 26
ARM CLIENT AE APPLICATION CONTEXT NAME

Application Context Name	1.2.840.10008.3.1.1.1
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The ARM AE proposes a Maximum Length Protocol Data Unit (PDU) during Association establishment as follows:

TABLE 27
ARM CLIENT AE MAXIMUM LENGTH PDU

Maximum Length PDU	32,768 bytes
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3.3.1.2 Number of Associations

The ARM Client AE supports a varying number of simultaneous Associations, depending on the product model:

TABLE 28
ARM CLIENT AE MAXIMUM SIMULTANEOUS ASSOCIATIONS

Product Model	Number of Simultaneous Associations Initiated
ARM-2000	32

Within these limits, the ARM Client AE does not restrict the number of simultaneous Associations to any single other AE.

3.3.1.3 Asynchronous Nature

Asynchronous Operations are not supported by the ARM Client AE.

3.3.2 Association Initiation

The ARM AE initiates the establishment of an association in these cases of real-world activity:

- to verify the responsiveness of a remote Application Entity,
- to handle the storage sub-operations in response to a retrieval request,
- to handle the storage operation of an image routing activity,
- to handle the storage operation of an image send activity, and
- to provide results of a storage commitment operation to the requesting remote AE.

3.3.2.1 Verification

3.3.2.1.1 Associated Real-World Activity

The ARM Client AE will establish an Association upon initiation by a local operator to verify the ability of a remote Application Entity to respond to DICOM messages (Verification Initiate Real-World Activity).

3.3.2.1.2 Proposed Presentation Contexts

The ARM Client AE will propose a single Presentation Context for the association as shown in Table 29.

TABLE 29
PROPOSED PRESENTATION CONTEXTS FOR ARM CLIENT AE VERIFICATION

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		

L-3 COMMUNICATIONS

REV A

Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
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3.3.2.1.2.1 Specific Conformance Statement for Verification SOP Class

The ARM conforms to the definition of an SCU of the Verification SOP Class in Accordance with the DICOM standard.

3.3.2.1.3 Association Termination

The ARM Client AE will terminate the association upon receipt of the C-ECHO-RSP message.

3.3.2.2 Image Send

3.3.2.2.1 Associated Real-World Activity

The ARM Client AE will establish an Association in response to a Retrieve SOP Class (MOVE) request received from the Query/Retrieve Real-World Activity, or in response to a directive from the Image Routing Real-World Activity, or in response to a manually initiated directive from the Image Send Real-World Activity. The target Real-World Activity is an external Image Receive.

3.3.2.2.2 Proposed Presentation Contexts

The ARM AE will propose Presentation Contexts, each with a single Transfer Syntax, for all supported combinations of Abstract and Transfer Syntax, as shown in Table 30. All combinations will be proposed on each Association, regardless of the specific Abstract Syntax of the SOP Instances which are to be transmitted.

**TABLE 30
PROPOSED PRESENTATION CONTEXTS FOR ARM AE IMAGE SEND**

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
X-ray Angiographic Storage	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Nuclear Medicine Storage	1.2.840.10008.5.1.4.1.1.20	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		JPEG Lossy	1.2.840.10008.1.2.4.50	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

L-3 COMMUNICATIONS

REV A

Ultrasound Multi-frame Storage	1.2.840.10008.5.1. 4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		JPEG Lossy	1.2.840.10008.1.2.4.50	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Storage	1.2.840.10008.5.1. 4.1.1.6	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Storage	1.2.840.10008.5.1. 4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Storage	1.2.840.10008.5.1. 4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.3.2.2.2.1 Specific Conformance Statement for Storage SOP Classes

The ARM Client AE as an SCU of the Storage SOP Classes records any unsuccessful C-STORE operations in an error log, and places the SOP Instance in a Retry List for manually initiated retry of the C-STORE. The ARM takes no action upon the receipt of a C-STORE successful or warning response status.

The ARM Client AE does not support Storage SOP Class Extended Negotiation.

Image objects transferred under the Storage SOP Classes may have optional Type 3 data elements as implemented by the sources of those images, and included in the image objects archived in the ARM. Except for images stored JPEG Lossy Compressed, the ARM Client AE will send images using the Default Transfer Syntax if the SCP does not support the Transfer Syntax in which the SOP Instance was originally received by the ARM.

3.3.2.2.3 Association Termination

The ARM Client AE will use a single Association for all storage sub-operations of a C-MOVE retrieval. It will terminate the association upon receipt of the C-STORE-RSP message for the last image requested.

Upon command from a local user at the ARM, the ARM Client AE will abnormally terminate the Association, and all pending storage sub-operations will be canceled.

3.3.2.3 Storage Commitment

3.3.2.3.1 Associated Real-World Activity

The ARM Client AE will establish an Association to send the results of a requested action for guarantee of image storage (storage commitment). This Association supports the

external Real-World Activity Storage Verify, and is supported by the internal Image Management Real-World Activity.

3.3.2.3.2 Proposed Presentation Contexts

The ARM Client AE will propose a single Presentation Context for the Association as shown in Table 31.

**TABLE 31
PROPOSED PRESENTATION CONTEXT FOR ARM CLIENT AE STORAGE COMMITMENT**

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
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	SCP	Role (Initiator as SCP)
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

3.3.2.3.2.1 Specific Conformance Statement for Storage Commitment SOP Class

The ARM Client AE conforms to the definition of an SCP of the Storage Commitment SOP Class. Note that the N-ACTION functionality is provided through the Modality Interface AEs. See also Section 3.2.3.3.2.1.

The ARM Client AE does not return the N-EVENT-REPORT on the same Association as the N-ACTION request.

The ARM Client AE does not provide Storage Media File-Set ID/UID or Retrieve AE Title in the N-EVENT-REPORT.

3.3.2.3.3 Association Termination

The ARM Client AE will terminate the association upon receipt of the N-EVENT-REPORT-RSP message.

3.4 Media Import AE

The ARM Media Import AE provides Standard Conformance to the Media Storage Service Class using the following Media Interchange DICOM Application Profiles and options:

**TABLE 32
MEDIA IMPORT AE APPLICATION PROFILE CONFORMANCE**

Supported Application Profiles	Real-World Activities	Roles	Service Class Option
STD-XABC-CD Basic Cardiac, STD-XA1K-CD 1024 X-ray Angiographic, STD-US-ID-MF-MOD230 Ultrasound Image Display Single and Multiframe 230MB MOD, STD-US-SC-MF-MOD230 Ultrasound Spatial Calibration Single and Multiframe 230MB MOD, STD-US-CC-MF-MOD230 Ultrasound Combined Calibration Single and Multiframe 230MB MOD	Media Import	FSR	Interchange

	Image Storage	FSR	Interchange
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3.4.1 File Meta Information for the Media Import AE

As a File Set Reader only, the Media Import AE does not create File Meta Information.

3.4.2 Real-World Activities

The Media Import AE is activated upon initiation of the Media Import Real-World Activity by a local operator. The Media Import AE uses the automatic Image Storage Real-World Activity for SOP Instance archival storage.

3.4.2.1 Media Import Real-World Activity

The Media Import Real-World Activity allows a local operator to manage the selection and importation of SOP Instances from the interchange media to archival storage. It supports browsing of the DICOMDIR file database, and user selection of SOP Instances for import.

3.4.2.1.1 Application Profiles

The Application Profiles utilized by the Media Import RWA are listed in Table 32, without specializations or restrictions.

3.4.2.2 Image Storage Real-World Activity

The Image Storage Real-World Activity is a local automatic activity triggered by user selection of SOP Instances for import to the archive (via the Media Import RWA).

3.4.2.2.1 Application Profiles

The Application Profiles utilized by the Image Storage RWA are listed in Table 32, without specializations or restrictions.

3.4.3 Augmented and Private Application Profiles

The Media Import AE does not specifically support any Augmented or Private Application Profiles.

SECTION 4 COMMUNICATION PROFILE

4.1 Supported Communication Stacks

The ARM provides TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard. The ARM does not support an OSI network protocol stack.

4.2 TCP/IP Stack

The ARM supports all network communication on a TCP/IP protocol stack. The ARM posts its TCP connection Open for each AE on a separate TCP Port, as shown in Table 33.

**TABLE 33
MODALITY INTERFACE AE PORTS**

Modality Interface AE	TCP Port
Cath Lab	4006
Echocardiography	4007
Nuclear Medicine	4008

4.2.1 Physical Media Support

Network physical media is configurable in the product.

4.2.1.1 ATM

The ARM supports an Asynchronous Transfer Mode (ATM) OC-3c network interface using multimode fiber. It supports Classical IP over AAL5 in accordance with RFC-1577 and signaling in accordance with ATM Forum UNI 3.1.

4.2.1.2 Ethernet

The ARM supports a 100BASE-TX Ethernet network interface using Category 5 twisted pair copper cabling, and/or a 1000BASE-FX Ethernet network interface using multimode fiber.

SECTION 5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

5.1 Standard Extended/Specialized/Private SOPs

5.1.1 Standard Extended Storage SOP Classes

The ARM AEs provide Standard Extended Conformance to the supported DICOM Storage SOP Classes as SCU and SCP. The Standard SOP Classes are Extended in that the Image Information Object sources may add Type 3 data elements to the objects; the ARM AE does not validate nor delete these supplementary data elements within the information objects stored in and retrieved from its archival storage.

5.1.2 Standard Extended Query SOP Class

The Modality Interface AEs provide Standard Extended Conformance to the supported DICOM Query SOP Classes as an SCP. The extension occurs in two respects - support for the Icon Image attribute, and support for private attributes.

5.1.2.1 Icon Image Attribute

The Modality Interface AEs support the Icon Image Sequence attribute (0088,0200), as defined in DICOM Part 3 Section F.7, as a Query SOP Class key attribute at the IMAGE level.

5.1.2.2 Private Key Attributes

The Modality Interface AEs supports the private key attributes, as shown in Table 34, as Query SOP Class key attributes at the STUDY and IMAGE level.

L-3 COMMUNICATIONS

REV A

**TABLE 34
PRIVATE QUERY KEY ATTRIBUTES**

Attribute	Tag	VR	VM	Notes
Private Data Element Creator	(0087,00xx)	LO	1	Enumerated value: 1.2.840.113708.794.1.1.2.0
Media Type	(0087,xx10)	CS	1	Type of storage media. Supported at IMAGE query level only. Defined terms: DISK - image is on magnetic disk DLT - image is on DLT tape
Media Location	(0087,xx20)	CS	1	Defined terms: ONLINE - media is 1st tier magnetic disk NEARLINE - media is in automatic disk or tape library (jukebox) OFFLINE - media must be manually loaded into system
Size in MB	(0087,xx40)	DS	1	Size of study or image (depending on query level)
Estimated Retrieve Time	(0087,xx50)	IS	1	Estimated Retrieve Time in seconds; -1 indicates item is OFFLINE and time cannot be estimated. Supported at STUDY query level only.

5.1.3 Migration SOP Class

The Modality Interface AEs provide the Migration Service Class as an SCP, as described in Annex D.

5.2 Private Transfer Syntaxes

The ARM supports no Private Transfer Syntaxes.

SECTION 6 CONFIGURATION

6.1 AE Title/Presentation Address Mapping

The ARM resolves addresses of other applications and entities using a Network Stations table. The Network Stations table is maintained on the ARM by a system administrator using the ARM graphical user interface.

6.2 Auto-Routing

The ARM routes received images to other applications based on an Auto-Routing table. The Auto-Routing table is maintained on the ARM by a system administrator using the ARM graphical user interface.

6.3 Configurable Parameters

The following DICOM-related parameters are configurable by a field service engineer:

- Association Inactivity Abort Timeout Period
- Enable Auto-Routing
- C-STORE Retry Count and Retry Interval
- Enable Full Message Validation
- Maximum Number of Query Responses
- Enable Case-Insensitive Query
- Minimum available disk capacity to accept Association

**SECTION 7
SUPPORT OF EXTENDED CHARACTER SETS**

The ARM supports one Specific Character Set attribute (0008,0005) per patient. It will set the attribute value based on the first instance of the attribute among images received for archive for a patient, and if set will return it will all query responses for that patient (including subsidiary level queries).

The ARM supports local display of 8-bit characters using a single character set; the default is the Latin alphabet supplementary set No.1 (ISO 8859-1). Characters are displayed using this character set without regard to the selection of alternate sets in the Specific Character Set attribute.

**SECTION 8
CODES AND CONTROLLED TERMINOLOGY**

The ARM does not generate or display any coded entry sequences, and hence provides no support for codes and controlled terminology.

ANNEX D

MIGRATION SERVICE CLASS

The Migration Service Class allows for the request of the migration of SOP Instances from one storage level to another.

The Request Migration service allows the SCU to command the SCP to move a copy of a set of SOP Instances to a specified storage level (e.g. migrate to on-line, etc.). The scope of this service is a complete study. It includes unique identification information for the study (Study Instance UID) plus the destination storage level. A successful response to this request conveys that the SCP has successfully received the request, but does not indicate that the migration has taken place.

The migration levels are defined as follows:

- On-Line; the fastest level of accessibility for the SCP
- Off-line, corresponds to data outside of the repository of the SCP but its existence is tracked by the SCP. This information needs to be manually loaded for access.
- Near-line; corresponds to data inside the repository of the SCP and is accessed automatically and slower than the on-line storage (possibly a juke box).

D.1 DIMSE Service Groups

The DIMSE-N Services shown in Table 35 are applicable to the Migration SOP Class. The DIMSE-N Services and Protocol are specified in PS 3.7.

TABLE 35
MIGRATION DIMSE SERVICE GROUPS

DIMSE Service Element	Usage SCU/SCP
N-ACTION	M/M

D.2 Operations

D.2.1 Action Information

The DICOM AEs which claim conformance to this SOP Class as an SCU and/or an SCP shall support the Action Types and Action Information as specified in Table 36. The Attribute definitions shall be as specified in DICOM, unless otherwise defined.

The Query/Retrieve Level attribute conveys the information model level for which the migration is to occur.

**TABLE 36
REQUEST MIGRATION - ACTION INFORMATION**

Action Type Name	Action Type ID	Attribute	Tag	Req. Type SCU/SCP	Attribute Description
Migrate to On-line	1	Transaction UID	(0008,1195)	-/1	
		Query/Retrieve level	(0008,0052)	1/1	The level being requested for migration. It shall be set to STUDY
		Study Instance UID	(0020,000D)	1/1	
Migrate to Near-line	2	Transaction UID	(0008,1195)	1/1	
		Query/Retrieve level	(0008,0052)	1/1	The level being requested for migration. It shall be set to STUDY
		Study Instance UID	(0020,000D)	1/1	

D.2.2 Service Class User Behavior

The SCU shall use the N-ACTION primitive to request the SCP to migrate a set of SOP Instances to a specified storage level as defined in Table 36. The SCU shall supply the Transaction UID to uniquely identify each migration request.

The N-ACTION primitive shall contain the well-known Migration SOP Instance UID in its Requested SOP Instance UID parameter.

NOTE: In the usage described here, there is no explicit creation of a SOP Instance upon which an N-ACTION primitive may operate. Instead, the N-ACTION primitive operates upon a constant well-known SOP Instance. This SOP Instance is conceptually created during startup of each Application.

D.2.3 Service Class Provider Behavior

The SCP shall return, via the N-ACTION response primitive, the N-ACTION Response Status Code applicable to the associated request. A success status conveys that the SCP has successfully received the request and assumes responsibility for the request. A failure status conveys that the SCP is not processing the request.

No Service Class specific status values are defined for the N-ACTION Service. See PS 3.7 for the general response status codes.

D.3 Migration SOP Class UID and SOP Instance UID

The Migration SOP Class UID shall have the value "1.2.840.113619.4.10". The well-known Migration SOP Instance UID shall have the value "1.2.840.113619.7.2".



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