



CardioPACS 5.0

Revision 10.0

DICOM Conformance Statement

CPS10DCS001BS Rev. 1, 03/21/2008



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REVISION HISTORY

Revision	Date	Notes
1	03/21/2008	First Document Release

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1. OVERVIEW

This DICOM Conformance Statement describes the conformance to the ACR-NEMA DICOM 3.0 standard for the CardioPACS suite of products, Revision 10. The scope of the document is to facilitate data exchange between CardioPACS products and other medical devices in a medical environment by providing the necessary technical information about the data exchange capabilities of the products. The document should be read in conjunction with the DICOM standard and its addenda.

OVERVIEW OF THE MAIN COMPONENTS

This suite of products is divided into two main groups of components that, where appropriate, will be treated separately in this document:

- CardioPACS Workstation components, briefly *CardioPACS Workstation*.
- CardioPACS Server components, briefly *CardioPACS Server*.

NETWORK SERVICES

SOP Classes	CardioPACS Server		CardioPACS Workstation	
	SCU	SCP	SCU	SCP
Stored Print Storage	Yes	Yes	Yes	Yes
Hardcopy Grayscale Image Storage	Yes	Yes	Yes	Yes
Hardcopy Color Image Storage	Yes	Yes	Yes	Yes
Computed Radiography Image Storage	Yes	Yes	Yes	Yes
Digital X-Ray Image Storage – For Presentation	Yes	Yes	Yes	Yes
Digital X-Ray Image Storage – For Processing	Yes	Yes	Yes	Yes
Digital Mammography X-Ray Image Storage – For Presentation	Yes	Yes	Yes	Yes
Digital Mammography X-Ray Image Storage – For Processing	Yes	Yes	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	Yes	Yes	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	Yes	Yes	Yes	Yes
CT Image Storage	Yes	Yes	Yes	Yes
Enhanced CT Image Storage	Yes	Yes	Yes	Yes
Ultrasound Multi-frame Image Storage	Yes	Yes	Yes	Yes
US Multi-frame Storage (Retired)	Yes	Yes	Yes	Yes
MR Image Storage	Yes	Yes	Yes	Yes
Enhanced MR Image Storage	Yes	Yes	Yes	Yes
MR Spectroscopy Storage	Yes	Yes	Yes	Yes
Ultrasound Image Storage	Yes	Yes	Yes	Yes
US Image Storage (Retired)	Yes	Yes	Yes	Yes
Secondary Capture Image Storage	Yes	Yes	Yes	Yes

SOP Classes	CardioPACS Server		CardioPACS Workstation	
	SCU	SCP	SCU	SCP
Multi-frame Single Bit Secondary Capture Image Storage	Yes	Yes	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	Yes	Yes	Yes	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	Yes	Yes	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	Yes	Yes	Yes	Yes
12-lead ECG Waveform Storage	Yes	Yes	Option ¹	Option ¹
General ECG Waveform Storage	Yes	Yes	Option ¹	Option ¹
Ambulatory ECG Waveform Storage	Yes	Yes	Option ¹	Option ¹
Hemodynamic Waveform Storage	Yes	Yes	Yes	Yes
Cardiac Electrophysiology Waveform Storage	Yes	Yes	Yes	Yes
Basic Voice Audio Waveform Storage	Yes	Yes	Yes	Yes
Standalone Modality LUT Storage	Yes	Yes	Yes	Yes
Standalone VOI LUT Storage	Yes	Yes	Yes	Yes
Grayscale Softcopy Presentation State Storage	Yes	Yes	Yes	Yes
Color Softcopy Presentation State Storage	Yes	Yes	Yes	Yes
Pseudo-Color Softcopy Presentation State Storage	Yes	Yes	Yes	Yes
Blending Softcopy Presentation State Storage	Yes	Yes	Yes	Yes
X-Ray Angiographic Image Storage	Yes	Yes	Yes	Yes
Enhanced XA Image Storage	Yes	Yes	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	Yes	Yes	Yes	Yes
Enhanced XRF Image Storage	Yes	Yes	Yes	Yes
X-Ray Angiographic Bi-Plane Image Storage (Retired)	Yes	Yes	Yes	Yes
Nuclear Medicine Image Storage	Yes	Yes	Yes	Yes
Raw Data Storage	Yes	Yes	Yes	Yes
Spatial Registration Storage	Yes	Yes	Yes	Yes
Spatial Fiducials Storage	Yes	Yes	Yes	Yes
Deformable Spatial Registration	Yes	Yes	Yes	Yes
Segmentation	Yes	Yes	Yes	Yes
Real World Value Mapping Storage	Yes	Yes	Yes	Yes
VL Image Storage (Retired)	Yes	Yes	Yes	Yes
VL Multi-frame Image Storage (Retired)	Yes	Yes	Yes	Yes
VL Endoscopic Image Storage	Yes	Yes	Yes	Yes
Video Endoscopic Image Storage	Yes	Yes	Yes	Yes
VL Microscopic Image Storage	Yes	Yes	Yes	Yes
Video Microscopic Image Storage	Yes	Yes	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	Yes	Yes	Yes	Yes
VL Photographic Image Storage	Yes	Yes	Yes	Yes
Video Photographic Image Storage	Yes	Yes	Yes	Yes
Ophthalmic Photography 8 Bit Image Storage	Yes	Yes	Yes	Yes
Ophthalmic Photography 16 Bit Image Storage	Yes	Yes	Yes	Yes

SOP Classes	CardioPACS Server		CardioPACS Workstation	
	SCU	SCP	SCU	SCP
Stereometric Relationship Storage	Yes	Yes	Yes	Yes
Encapsulated PDF Storage	Yes	Yes	Yes	Yes
Positron Emission Tomography Image Storage	Yes	Yes	Yes	Yes
Standalone PET Curve Storage	Yes	Yes	Yes	Yes
RT Image Storage	Yes	Yes	Yes	Yes
RT Dose Storage	Yes	Yes	Yes	Yes
RT Structure Set Storage	Yes	Yes	Yes	Yes
RT Beams Treatment Record Storage	Yes	Yes	Yes	Yes
RT Plan Storage	Yes	Yes	Yes	Yes
RT Brachy Treatment Record Storage	Yes	Yes	Yes	Yes
RT Treatment Summary Record Storage	Yes	Yes	Yes	Yes

Query / Retrieve	SCU	SCP	SCU	SCP
Patient Root Q/R – FIND	No	Yes	Yes	No
Patient Root Q/R – MOVE	No	Yes	Yes	No
Study Root Q/R – FIND	No	Yes	Yes	No
Study Root Q/R – MOVE	No	Yes	Yes	No
Patient Study Only – FIND	No	Yes	Yes	No
Patient Study Only – MOVE	No	Yes	Yes	No

Notes, Reports, Measurements Transfer	SCU	SCP	SCU	SCP
Basic Text SR	Yes	Yes	Option ²	Option ²
Enhanced SR	Yes	Yes	Option ²	Option ²
Comprehensive SR	Yes	Yes	Option ²	Option ²
Mammography CAD SR	Yes	Yes	Option ²	Option ²
Procedure Log Storage	Yes	Yes	Option ²	Option ²
Key Object Selection Document	Yes	Yes	Option ²	Option ²
Chest CAD SR	Yes	Yes	Option ²	Option ²
X-Ray Radiation Dose SR	Yes	Yes	Option ²	Option ²

¹ CardioPACS ECG component needs to be installed.

² CardioPACS Reporting and/or Analysis modules need to be installed.

MEDIA SERVICES

The following Media Services apply to CardioPACS Workstation only and they are limited in relation to the specific hardware on which the software is being used.

Media Storage Application Profile	CardioPACS Workstation		
	FSC	FSU	FSR
Compact Disk – Recordable			
General Purpose CD-R	Option ⁴	No	Yes
Magneto-Optical Disk			
General Purpose 90 mm 128 Mb MOD	Option ⁴	No	Yes
General Purpose 90 mm 230 Mb MOD	Option ⁴	No	Yes
General Purpose 90 mm 540 Mb MOD	Option ⁴	No	Yes
General Purpose 90 mm 2.3 Gb MOD	Option ⁴	No	Yes
General Purpose 130 mm 650 Mb MOD	Option ⁴	No	Yes
General Purpose 130 mm 1.2 Gb MOD	Option ⁴	No	Yes
General Purpose 130 mm 2.3 Gb MOD	Option ⁴	No	Yes
General Purpose 130 mm 4.1 Gb MOD	Option ⁴	No	Yes
General Purpose 640 Mb MOD	Option ⁴	No	Yes
General Purpose 1.3 Gb MOD	Option ⁴	No	Yes
DVD			
General Purpose 120 mm DVD-RAM	Option ⁴	No	Yes
General Purpose 120 mm DVD	Option ⁴	No	Yes
Other			
USB Connected Removable Devices	Option ⁴	No	Yes
Compact Flash Removable Devices	Option ⁴	No	Yes
Multimedia card Removable Devices	Option ⁴	No	Yes

³ CardioPACS Workstation core components are required for the above media services to be supported.

2. INTRODUCTION

This document describes the conformance to the ACR-NEMA DICOM 3.0 standard for the CardioPACS suite of products, Revision 10.

This suite of products is divided into two main groups of components which, where appropriate, will be treated separately in this document:

- CardioPACS Workstation components, briefly *CardioPACS Workstation*.
- CardioPACS Server components, briefly *CardioPACS Server*.

AUDIENCE

This document is intended for:

- Customers or potential customers.
- Hospital staff,
- Health system integrators.
- Software designers and implementers of DICOM interfaces.
- Sales and marketing staff.

It is assumed that the reader is familiar with the DICOM standard and has a working understanding of DICOM.

REMARKS

DICOM Conformance Statement follows the contents and structuring requirements of DICOM PS3. This statement by itself does not guarantee successful interoperability of LUMEDX equipment with non-LUMEDX equipment. However it 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 LUMEDX products and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM Standard.

The user should be aware of the following important issues:

The comparison of different conformance statements is the first step towards assessing interconnectivity between LUMEDX and non-LUMEDX equipment.

Test procedures should be defined to validate the desired level of connectivity.

The DICOM standard will evolve to meet the users' future requirements. LUMEDX is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery. The user should ensure that any non-LUMEDX provider linking to LUMEDX equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into LUMEDX equipment may lead to loss of connectivity and/or incompatibility.

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:

ACR	American College of Radiology
ACSE	Association Control Service Element
AE	Application Entity
ANSI	American National Standards Institute
AP	Application Profile
API	Application Programming Interface
ASCII	American Standard Code for Information Interchange
CEN TC251	Comite Europeen de Normalisation-Technical Committee 251- Medical Informatics
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DICOM Message Service Element-Composite
DIMSE-N	DICOM Message Service Element-Normalized
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
HISPP	Healthcare Informatics Standards Planning Panel
HL7	Health Level 7
IE	Information Entity
IEEE	Institute of Electrical and Electronics Engineers
IOD	Information Object Definition
ISO	International Standards Organization
ISP	International Standardized Profile
JIRA	Japanese Industry Radiology Apparatus
MSDS	Healthcare Message Standard Developers Sub-Committee
NEMA	National Electrical Manufacturers Association
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
RWA	Real-World Activity
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
UML	Unified Modeling Language

REFERENCES

NEMA PS3 Digital Imaging and Communications in Medicine (DICOM) Standard, available free at <http://medical.nema.org/>

3. NETWORKING

IMPLEMENTATION MODEL

3.1.1 Application Data Flow

3.1.1.1. CardioPACS Workstation

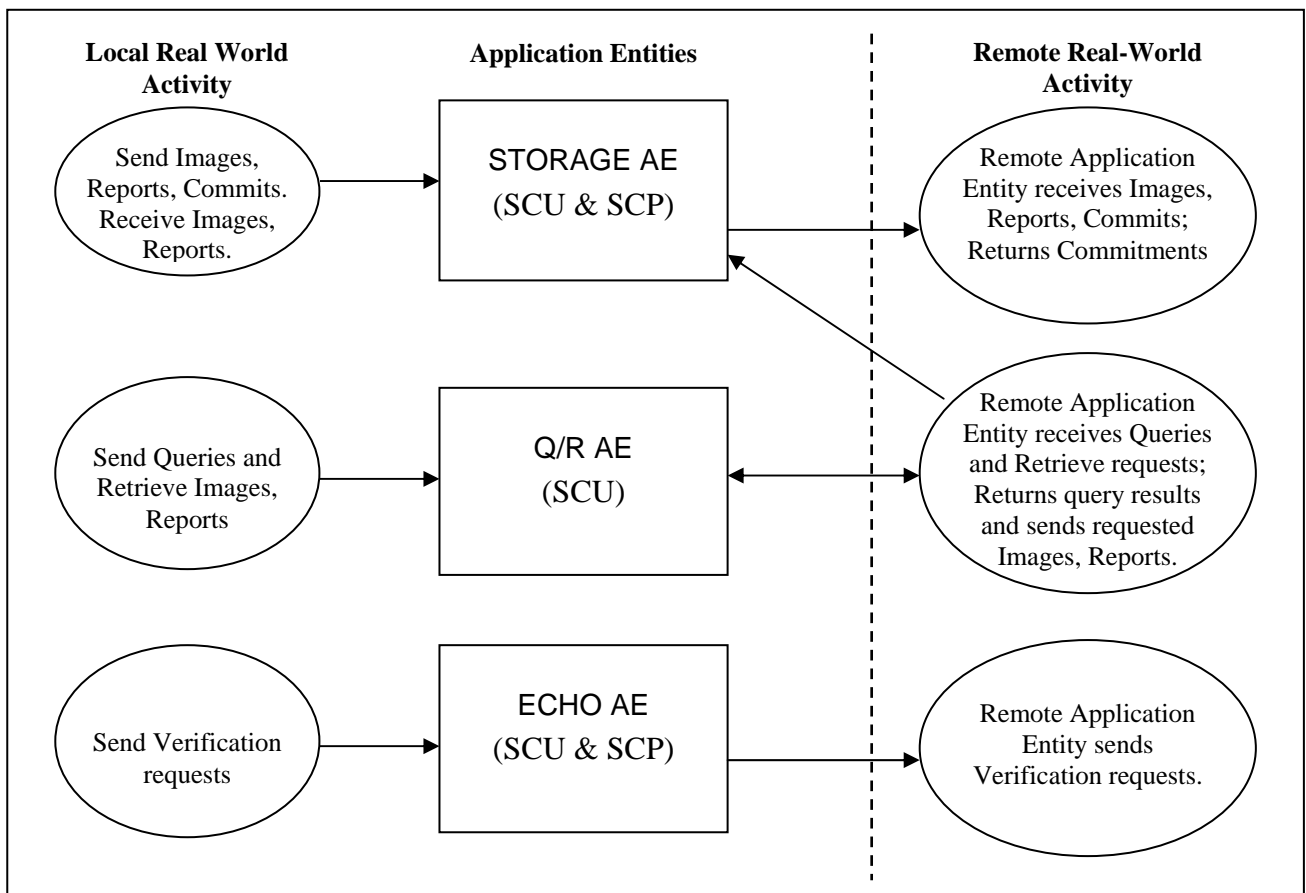


Figure 3.1.1.1-A CardioPACS Workstation – Application Data Flow

Conceptually the network services may be modeled as the following separate AEs, though in fact all the AEs share a single (configurable) AE Title.

STORAGE AE which sends outbound images and other composite instances as well as Storage Commitments requests and receives images and other composite instances requested by the Q/R AE.

Q/R AE, which queries remote AEs for lists of studies, series and instances and retrieves selected studies, series or instances in conjunction with STORAGE AE.

ECHO AE which send or responds to verification requests.

3.1.1.2. CardioPACS Server

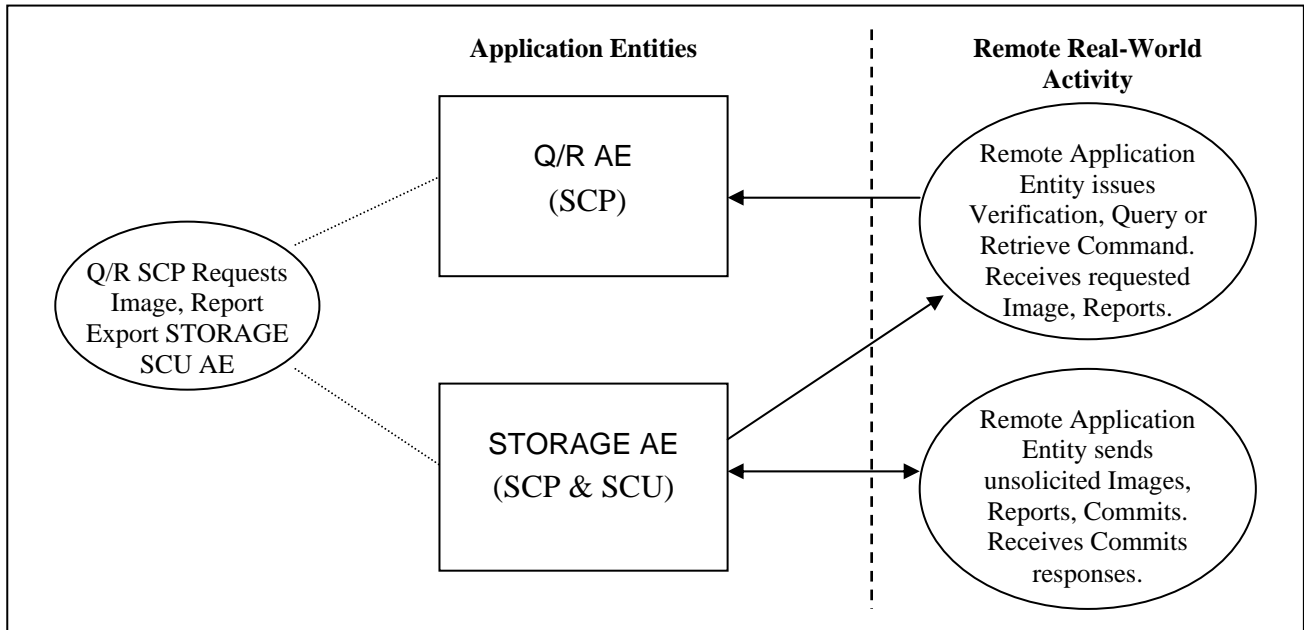


Figure 3.1.1.2-A CardioPACS Server – Application Data Flow

The STORAGE AE can send Composite SOP Instances. It handles requests from the Q/R AE to transmit Images to a specific DICOM destination. It can also receive incoming DICOM Composite SOP Instances and add them to the CardioPACS database. It can respond to external Storage and Verification Requests as a Service Class Provider (SCP) for C-STORE and C-ECHO requests. The STORAGE AE can also handle Storage Commitment Push Model Requests. It can thus be used to query whether the CardioPACS Server will confirm ownership and responsibility for specific Composite SOP Instances.

The Q/R AE can handle incoming query and retrieve requests. It can handle external queries for Patient, Study, Series, and Image data, and also handle Image retrieval requests. The Q/R AE handles retrieval requests by issuing a command to the STORAGE AE to send the requested Images to the destination specified by the Remote AE. The Q/R AE functions as an SCP for C-FIND and C-MOVE requests.

3.1.2 Functional Definition of AE's

3.1.2.1. CardioPACS Workstation

3.1.2.1.1. ECHO AE

ECHO AE SCU is activated through the user interface when a user selects a remote AE and requests a verification of the network connectivity.

ECHO AE SCP waits in the background for connections, will accept associations with Presentation Contexts for SOP Class of the Verification Service Class, and will respond successfully to echo requests.

3.1.2.1.2. STORAGE AE

STORAGE AE SCU is activated through the user interface when a user selects instances from a connected local & remote archive or an external DICOM media and requests that they be sent to a remote AE (selected from a pre-configured list).

STORAGE AE SCP waits in the background for connections, will accept associations with Presentation Contexts for SOP Classes of the Storage Service Class. It will store the received instances, limited to the C-MOVE requests issued, to a temporary cache and allow their display and management throughout the user interface.

3.1.2.1.3. Q/R AE

Q/R AE SCU query function is activated through the user interface when a user selects a remote AE to query (from a pre-configured list), then initiates a query. The system will issue a C-FIND command to the remote AE. Queries are performed recursively from the patient/study through the series and instance levels until all matching instances have been listed.

Q/R AE SCU retrieve function is activated through the user interface when a user selects a patient, study, series or instance for retrieval. A connection to the remote AE is established to initiate and monitor the retrieval by sending a C-MOVE command and the STORAGE AE receives the retrieved instances.

3.1.2.2. CardioPACS Server

3.1.2.2.1. Q/R AE

The Q/R AE SCP waits for another application to connect at the presentation address configured for its Application Entity Title. Q/R AE SCP will accept Associations with Presentation Contexts for SOP Classes of the DICOM Query-Retrieve Service Class, and Verification Service Class. It will handle query and retrieve requests on these Presentation Contexts and respond with data objects with values corresponding to the contents of the CardioPACS database. For C-MOVE requests the destination for the image objects is determined from the Destination AE Title contained in the C-MOVE request. When a retrieval request is received, the Q/R AE SCP issues a command to the STORAGE AE to send the specified images to the C-MOVE Destination AE.

3.1.2.2.2. STORAGE AE

The STORAGE AE SCU can be invoked by the Q/R AE to trigger the transfer of specific images to a remote destination AE. The CardioPACS Database must be correctly configured with the host and port number of any external DICOM AE's that is to be C-MOVE retrieval destinations. The Presentation Contexts to use are determined from the headers of the DICOM files to be transferred.

The STORAGE AE SCP waits for another application to connect at the presentation address configured for its Application Entity Title. The STORAGE AE SCP will accept Associations with Presentation Contexts for SOP Classes of the Verification, Storage, and Storage Commitment Service Classes. Any images received on such Presentation Contexts will be added to the CardioPACS database. If a Storage Commitment Push Model N-ACTION Request is received then the STORAGE AE SCP will immediately check if the referenced Composite SOP Instances are in the CardioPACS database and return an N-EVENT-REPORT Notification. It will never 'cache' Storage Commitment Push Model Requests and wait for Composite SOP Instances to be received at a later time.

3.1.3 Sequencing of Real-World Activities

3.1.3.1. CardioPACS Workstation

All C-ECHO SCU (*ECHO AE*), C-STORE SCU (*STORAGE AE*) and C-FIND SCU (*Q/R AE*) activities are sequentially initiated in the user interface, and another activity may not be initiated until the prior activity has completed.

C-MOVE SCU (*Q/R AE*) activities are sequentially initiated in the user interface and queued so that only one command per DICOM Server can be active at one time.

C-ECHO SCP (*ECHO AE*) activities are performed asynchronously in the background and not dependent on any sequencing.

C-STORAGE SCP (*STORAGE AE*) activities are performed asynchronously in the background but the acceptance of the Composite SOP Instance depends on the activity of a C-MOVE SCU command issued by the Q/R AE.

3.1.3.2. CardioPACS Server

The main sequencing constraint that exists across all the CardioPACS Server Application Entities is the fact that a Composite SOP Instance must be received by the STORAGE AE before Storage Commitment Push Model or Query-Retrieve Requests related to this SOP Instance can be successfully handled.

AE SPECIFICATIONS

3.1.4 CardioPACS Workstation

3.1.4.1. ECHO AE

3.1.4.1.1. SOP Classes

ECHO AE provides Standard Conformance to the following SOP Class:

Table 3.1.4-A SOP Classes for ECHO AE

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

3.1.4.1.2. Association Policies

3.1.4.1.2.1. General

ECHO AE both accepts and initiates associations. The DICOM standard Application Context Name for DICOM 3.0 is always accepted and proposed.

Table 3.1.4-B DICOM Application Context for ECHO AE

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

3.1.4.1.2.2. Number of Associations

The ECHO AE can support multiple simultaneous Associations. Each time the ECHO AE receives an Association, a child thread will be spawned to process the Verification request. The maximum number of child threads, and thus the maximum number of simultaneous Associations is non-configurable and limited by the Operating System and available memory. The Maximum PDU size is also limited by the Operating System and available memory.

Table 3.1.4-C Number of Simultaneous Associations FOR ECHO AE

Maximum number of simultaneous Associations	Unlimited
---	-----------

Table 3.1.4-D Maximum PDU size FOR ECHO AE

Maximum PDU size received	Unlimited
---------------------------	-----------

4.2.1.1.2.3. Asynchronous Nature

The ECHO AE does not support asynchronous communication (multiple outstanding transactions over a single Association). All Association requests must be completed and acknowledged before a new operation can be initiated.

Table 3.1.4-E Asynchronous Nature for ECHO AE

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

4.2.1.1.2.4. Implementation Identifying Information

The implementation information for the Application Entity is:

Table 3.1.4-F DICOM Implementation Class and Version for ECHO AE

Implementation Class UID	1.2.840.114236.0.900.100
Implementation Version Name	CPS_10.0

3.1.4.1.3. Association Initiation Policy

ECHO AE attempts to initiate a new association for each verification request activated in the user interface.

3.1.4.1.3.1. Activity – Send Echo Request**3.1.4.1.3.1.1. Description and Sequencing of Activities**

For each verification request activated from the user interface, a single attempt will be made to perform such verification on the selected remote AE. If the verification fails, for whatever reason,

no retry will be performed. A message informing about the result of the operation and the possible errors encountered is displayed.

3.1.4.1.3.1.2. Proposed Presentation Contexts

ECHO AE will propose the presentation contexts for the Verification SOP Class listed in the table below.

Table 3.1.4-G Proposed Presentation Contexts for ECHO AE

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

3.1.4.1.3.1.2.1. Extended Negotiation

No extended negotiation is performed.

3.1.4.1.3.1.3. SOP Specific Conformance

ECHO AE provides standard conformance to the Verification Service Class.

3.1.4.1.4. Association Acceptance Policy

When ECHO AE accepts an association, it will respond to C-ECHO requests. If the Called AE Title does not match the pre-configured AE Titles, the association will be rejected.

3.1.4.1.4.1. Activity – Receive Echo Request

3.1.4.1.4.1.1. Description and Sequencing of Activities

For each verification request received on a successful association, ECHO AE will issue a C-ECHO response message.

3.1.4.1.4.1.2. Accepted Presentation Contexts

Table 3.1.4-H Acceptable Presentation Contexts for ECHO AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	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

3.1.4.1.4.1.2.1. Extended Negotiation

No extended negotiation is performed.

3.1.4.1.4.1.3. SOP Specific Conformance

ECHO AE provides standard conformance to the Verification Service Class.

3.1.4.1.4.1.3.1. Presentation Context Acceptance Criterion

ECHO AE will always accept any Presentation Context for the supported SOP Classes with the supported Transfer Syntaxes. More than one proposed Presentation Context will be accepted for the

same Abstract Syntax if the Transfer Syntax is supported, whether or not it is the same as another Presentation Context.

3.1.4.1.4.1.3.2. Transfer Syntax Selection Policies

If offered a choice of Transfer Syntaxes in a Presentation Context, ECHO AE will apply the first encountered Transfer Syntax in the priority order indicated in Table 3.1.4-H.

ECHO AE will accept duplicate Presentation Contexts, that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same priority for selecting a Transfer Syntax for each.

3.1.4.2. STORAGE AE

3.1.4.2.1. SOP Classes

STORAGE AE provides Standard Conformance to the following SOP Classes:

Table 3.1.4-I SOP Classes supported by STORAGE AE

SOP Class Name	SOP Class UID	SCU	SCP
Stored Print Storage	1.2.840.10008.5.1.1.27	Yes	Yes
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29	Yes	Yes
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30	Yes	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	Yes
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes

SOP Class Name	SOP Class UID	SCU	SCP
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	Yes
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	Yes
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	Yes
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	Yes
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	Yes
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Yes	Yes
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	Yes	Yes
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	Yes	Yes
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	Yes	Yes
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Yes	Yes
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Yes	Yes
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Yes	Yes
Deformable Spatial Registration	1.2.840.10008.5.1.4.1.1.66.3	Yes	Yes
Segmentation	1.2.840.10008.5.1.4.1.1.66.4	Yes	Yes
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67	Yes	Yes
VL Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.1	Yes	Yes
VL Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.2	Yes	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	Yes
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	Yes
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes	Yes
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	Yes
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Yes	Yes
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Yes	Yes
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	Yes	Yes
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Yes	Yes
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes

SOP Class Name	SOP Class UID	SCU	SCP
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	Yes	Yes
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Yes	Yes
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.88.104	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129	Yes	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	Yes
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	Yes

3.1.4.2.2. Association Policies

3.1.4.2.2.1. General

STORAGE AE SCU is activated through the user interface when a user selects instances from a connected local & remote archive or an external DICOM media and requests that they be sent to a remote AE (selected from a pre-configured list).

STORAGE AE SCP waits in the background for connections, will accept associations with Presentation Contexts for SOP Classes of the Storage Service Class. It will store the received instances, limited to the C-MOVE requests issued, to a temporary cache and allow their display and management throughout the user interface.

The DICOM standard Application Context Name for DICOM 3.0 is always accepted and proposed.

Table 3.1.4-J DICOM Application Context for STORAGE AE

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

3.1.4.2.2.2. Number of Associations

The STORAGE AE can support multiple simultaneous Associations. Each time the STORAGE AE receives an Association, a child thread will be spawned to process the Storage request. The maximum number of child threads, and thus the maximum number of simultaneous Associations is non configurable and limited by the Operating System and available memory. The Maximum PDU size is also limited by the Operating System and available memory.

Table 3.1.4-K Number of Simultaneous Associations AS A SCU FOR STORAGE AE

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

Table 3.1.4-L Number of Simultaneous Associations AS A SCP FOR STORAGE AE

Maximum number of simultaneous Associations	Unlimited
---	-----------

Table 3.1.4-M Maximum PDU size FOR STORAGE AE

Maximum PDU size received	Unlimited
---------------------------	-----------

3.1.4.2.2.3. Asynchronous Nature

The STORAGE AE does not support asynchronous communication (multiple outstanding transactions over a single Association). All Association requests must be completed and acknowledged before a new operation can be initiated.

Table 3.1.4-N Asynchronous Nature for STORAGE AE

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

4.2.1.1.2.4. Implementation Identifying Information

The implementation information for the Application Entity is:

Table 3.1.4-O DICOM Implementation Class and Version for STORAGE AE

Implementation Class UID	1.2.840.114236.0.900.100
Implementation Version Name	CPS_10.0

3.1.4.2.3. Association Initiation Policy

STORAGE AE attempts to initiate a new association for each series of instance it attempts to transfer.

3.1.4.2.3.1. Activity – Send Storage Request

3.1.4.2.3.1.1. Description and Sequencing of Activities

For each instance selected from the user interface to be transferred, a single attempt will be made to transmit it to the selected remote AE. If the send fails, for whatever reason, no retry will be performed, and an attempt will be made to send the next instance.

3.1.4.2.3.1.2. Proposed Presentation Contexts

STORAGE AE will propose Presentation Contexts only for the SOP Class(s) of the instances in the series that is to be transferred. For such Sop Class(s), STORAGE AE will propose a single Presentation Context for the Transfer Syntax in which the instance is stored in the remote or local archive.

Table 3.1.4-P Possible Proposed Presentation Contexts for STORAGE AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 3.1.4-l	See Table 3.1.4-l	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCU	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
		JPEG Baseline (Process 2 & 4)	1.2.840.10008.1.2.4.51	SCU	None
		JPEG Lossless, Non Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCU	None
		JPEG Lossless, Non Hierarchical, First Order Prediction (Process 14, Selection Value 1)	1.2.840.10008.1.2.4.70	SCU	None
		RLE Lossless	1.2.840.10008.1.2.5	SCU	None

3.1.4.2.3.1.2.1. Extended Negotiation

No extended negotiation is performed.

3.1.4.2.3.1.3. **SOP Specific Conformance**

STORAGE AE provides standard conformance to the Storage Service Class. It will behave as described in the Table below in response to the status returned in the C-STORE response command message.

Table 3.1.4-Q STORAGE AE BEHAVIOUR WHEN RECEIVING RESPONSE STATUS

Service Status	Further Meaning	Status Codes	Behavior
Refused	Out of Resources	A7xx	Error Message Displayed
Error	Data Set does not match SOP Class	A9xx	Error Message Displayed
	Cannot understand	Cxxx	Error Message Displayed
Warning	Coercion of Data Elements	B000	Warning Message Displayed
	Data Set does not match SOP Class	B007	Warning Message Displayed
	Elements Discarded	B006	Warning Message Displayed
Success		0000	Success Message Displayed

3.1.4.2.4. **Association Acceptance Policy**

When STORAGE AE accepts an association, it will respond to storage requests. If the Called AE Title does not match the pre-configured AE Title shared by all the SCPs of the application, the association will be rejected.

3.1.4.2.4.1. **Activity – Receive Storage Request**

3.1.4.2.4.1.1. **Description and Sequencing of Activities**

As instances are received they are copied to the local file system in a temporary cache for review in the workstation. If the received instance is a duplicate of a previously received instance, the old file in cache will be overwritten with the new one.

3.1.4.2.4.1.2. Accepted Presentation Contexts

Table 3.1.4-R Acceptable Presentation Contexts for STORAGE AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 3.1.4-l	See Table 3.1.4-l	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
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCP	None
		JPEG Baseline (Process 2 & 4)	1.2.840.10008.1.2.4.51	SCP	None
		JPEG Lossless, Non Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCP	None
		JPEG Lossless, Non Hierarchical, First Order Prediction (Process 14, Selection Value 1)	1.2.840.10008.1.2.4.70	SCP	None
		RLE Lossless	1.2.840.10008.1.2.5	SCP	None

3.1.4.2.4.1.2.1. Extended Negotiation

No extended negotiation is performed, though STORAGE AE:

- is a Level 2 Storage SCP (Full – does not discard any data elements)
- does not support digital signatures
- does not coerce any received data elements

3.1.4.2.4.1.3. SOP Specific Conformance

STORAGE AE provides standard conformance to the Storage Service Class.

When displaying an image in the viewing application. Grayscale Softcopy Presentation State and Mask Subtraction transformation is not supported by this implementation.

For the purposes of image display the system supports the following photometric interpretations: MONOCHROME1, MONOCHROME2, RGB, PALETTE COLOR, YBR FULL 422, and YBR FULL.

It is expected that optimal Window Center and Width values are specified in the DICOM Image Objects if they have greater than 8 bits of image data stored per sample. If optimal Window Center and Width values are not provided, then the CardioPACS Server is capable of estimating values using histogram analysis.

For multi-frame image SOP Instances sent using JPEG compression Transfer Syntax, sending a fully specified offset table increases performance, because the entire file does not have to be parsed to find the individual frame offsets. However, the inclusion of an offset table is not required for archiving or viewing of such SOP Instances.

If an image SOP Instance specifies an aspect ratio that is not one-to-one then the image data will be automatically resized when displayed on the system monitor so that they are always displayed in a one-to-one aspect ratio.

3.1.4.2.4.1.3.1. Presentation Context Acceptance Criterion

STORAGE AE will always accept any Presentation Context for the supported SOP Classes with the supported Transfer Syntaxes. More than one proposed Presentation Context will be accepted for the same Abstract Syntax if the Transfer Syntax is supported, whether or not it is the same as another Presentation Context.

3.1.4.2.4.1.3.2. Transfer Syntax Selection Policies

STORAGE AE allows the configuration of acceptable Transfer Syntaxes. If offered a choice of Transfer Syntaxes in a Presentation Context, STORAGE AE will apply the first encountered Transfer Syntax in the configured list.

STORAGE AE will accept duplicate Presentation Contexts, that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same priority for selecting a Transfer Syntax for each.

3.1.4.2.4.1.3.3. Response Status

STORAGE AE will behave as described in the Table below when generating the C-STORE response command message.

Table 3.1.4-S Response Status for STORAGE AE

Service Status	Further Meaning	Status Codes	Reason
Refused	Out of Resources	A7xx	Storage error if storage space is not sufficient or if it cannot interpret the stored data.
Error	Data Set does not match SOP Class	A9xx	Never sent – data set is not checked prior to storage
	Cannot understand	Cxxx	Never sent
Warning	Coercion of Data Elements	B000	Never sent - no coercion is ever performed
	Data Set does not match SOP Class	B007	Never sent - data set is not checked prior to storage
	Elements Discarded	B006	Never sent – all elements are always stored
Success		0000	

3.1.4.3. Q/R AE

3.1.4.3.1. SOP Classes

Q/R AE provides Standard Conformance to the following SOP Classes:

Table 3.1.4-T SOP CLASSES SUPPORTED BY Q/R AE

SOP Class Name	SOP Class UID	SCU	SCP
Patient Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	No
Patient Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	No
Study Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

SOP Class Name	SOP Class UID	SCU	SCP
Patient/Study Only Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	Yes	No
Patient/Study Only Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2	Yes	No

3.1.4.3.2. Association Policies

3.1.4.3.2.1. General

Q/R AE initiates but never accepts associations. Q/R AE SCU is activated through the user interface when a user queries or retrieves from a remote DICOM AE (selected from a pre-configured list) from the archive window. The DICOM standard Application Context Name for DICOM 3.0 is always accepted and proposed.

Table 3.1.4-U DICOM Application Context for Q/R AE

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

3.1.4.3.2.2. Number of Associations

Table 3.1.4-V Number of Simultaneous Associations FOR Q/R AE

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

Table 3.1.4-W Maximum PDU size FOR Q/R AE

Maximum PDU size received	Unlimited
---------------------------	-----------

3.1.4.3.2.3. Asynchronous Nature

The Q/R AE does not support asynchronous communication (multiple outstanding transactions over a single Association). All Association requests must be completed and acknowledged before a new operation can be initiated.

Table 3.1.4-X Asynchronous Nature for Q/R AE

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

4.2.1.1.2.4. Implementation Identifying Information

The implementation information for the Application Entity is:

Table 3.1.4-Y DICOM Implementation Class and Version for Q/R AE

Implementation Class UID	1.2.840.114236.0.900.100
Implementation Version Name	CPS_10.0

3.1.4.3.3. Association Initiation Policy

Q/R AE attempts to initiate a new association when the user performs the query or retrieve action from the user interface. If this involves recursive queries for lower query levels in the hierarchy, these will be performed on the same association.

3.1.4.3.3.1. Activity – Query Remote AE

3.1.4.3.3.1.1. Description and Sequencing of Activities

A single attempt will be made to query the remote AE. If the query fails, for whatever reason, no retry will be performed.

3.1.4.3.3.1.2. Proposed Presentation Contexts

Q/R AE will propose one or multiple C-FIND Presentation Contexts each with the transfer syntaxes listed in the Table below. The proposed presentation contexts depend on the type of query performed (i.e. at which level).

Table 3.1.4-Z Proposed Query Presentation Contexts for Q/R AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 3.1.4-T	See Table 3.1.4-T	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None

3.1.4.3.3.1.2.1. Extended Negotiation

No extended negotiation is performed. In particular, relational queries are not supported.

3.1.4.3.3.1.3. SOP Specific Conformance

Q/R AE provides standard conformance to the supported C-FIND SOP Classes.

All queries are initiated at the highest level of the information model and then for each response received, recursively repeated at the next lower levels supported by the information model, in order to elucidate as deep as possible the “tree” of instances available on the remote AE (from which the user may subsequently request retrieval at any level).

If the user selects a different item in the response window and the current query has not yet completed, such query is cancelled before the new query is performed. Unexpected attributes returned in a C-FIND response (those not requested) are ignored. Requested return attributes not returned by the SCP are ignored. Non-matching responses returned by the SCP due to unsupported (hopefully optional) matching keys are not filtered locally by the Q/R AE and thus will still be presented in the browser. Duplicate responses are instead filtered.

The different information models are supported with the query parameters as specified in the tables below. Specific Character Set will always be included at every query level. If present in the response, Specific Character Set will be used to identify character sets other than the default character set for display of strings in the browser.

Table 3.1.4-AA Query Request Identifier for Q/R AE

Name	Tag	Types of Matching
PATIENT Level (or STUDY LEVEL in Study Root)		
Patient’s ID	(0010,0020)	S,*,U
Patient’s Name	(0010,0010)	S,*,U

Name	Tag	Types of Matching
Patient's Birth Date	(0010,0030)	S,*,U,R
Patient's Sex	(0010,0040)	S,*,U
STUDY Level		
Study ID	(0020,0010)	S,*,U
Study Description	(0008,1030)	S,*,U
Modalities In Study	(0008,0061)	S,*,U
Study Date	(0008,0020)	S,*,U,R
Study Time	(0008,0030)	S,*,U,R
Referring Physician's Name	(0008,0090)	S,*,U
Accession Number	(0008,0050)	S,*,U
Patient's Age	(0010,1010)	NONE
Patient's Size	(0010,1020)	NONE
Patient's Weight	(0010,1030)	NONE
Study Instance UID	(0020,000D)	UNIQUE
SERIES Level		
Series Number	(0020,0011)	S,*,U
Series Description	(0008,103E)	S,*,U
Modality	(0008,0060)	S,*,U
Series Date	(0008,0021)	S,*,U
Series Time	(0008,0031)	S,*,U
Performing Physician's Name	(0008,1050)	S,*,U
Protocol Name	(0018,1030)	S,*,U
Operator's Name	(0008,1070)	S,*,U
Laterality	(0020,0060)	S,*,U
Body Part Examined	(0018,0015)	S,*,U
Series Instance UID	(0020,000E)	UNIQUE
IMAGE Level		
Instance Number	(0020,0013)	NONE
Image Comments	(0020,4000)	NONE
Image Type	(0008,0008)	NONE
Content Date	(0008,0023)	NONE
Content Time	(0008,0033)	NONE
Acquisition Date	(0008,0022)	NONE
Acquisition Time	(0008,0032)	NONE
Acquisition Date Time	(0008,002A)	NONE
Lossy Image Compression	(0028,2110)	NONE
Samples Per Pixel	(0028,0002)	NONE
Photometric Interpretation	(0028,0004)	NONE
Number of Frames	(0028,0008)	NONE
Rows	(0028,0010)	NONE
Columns	(0028,0011)	NONE

Name	Tag	Types of Matching
Bits Allocated	(0028,0100)	NONE
Stage Name	(0008,2120)	NONE
Stage Number	(0008,2122)	NONE
Number of Stages	(0008,2124)	NONE
View Name	(0008,2127)	NONE
View Number	(0008,2128)	NONE
Number of Views in Stage	(0008,212A)	NONE
Contrast/Bolus Agent	(0018,0010)	NONE
Positioner Primary Angle	(0018,1510)	NONE
Positioner Secondary Angle	(0018,1511)	NONE
Completion Flag	(0040,A491)	NONE
Completion Flag Description	(0040,A492)	NONE
Verification Flag	(0040,A493)	NONE
Concept Name Code Sequence	(0040,A043)	NONE
Document Title	(0042,0010)	NONE
Content Label	(0070,0080)	NONE
Content Description	(0070,0081)	NONE
Content Creator's Name	(0070,0084)	NONE
Icon Image Sequence	(0088,0200)	NONE
Manufacturer	(0008,0070)	NONE
Institution Name	(0008,0080)	NONE
SOP Instance UID	(0008,0018)	UNIQUE
SOP Class UID	(0008,0016)	NONE
Common to all query levels		
Specific Character Set	(0008,0005)	S,*,U

Types of Matching:

Types of Matching supported by the Q/R AE are. An "S" indicates the identifier attribute uses Single Value Matching, an "R" indicates Range Matching, an "*" indicates wildcard matching, a "U" indicates Universal Matching, and an "L" indicates that UID lists are sent. "NONE" indicates that no matching is supported, but that values for this Element are requested to be returned (i.e. universal matching), and "UNIQUE" indicates that this is the Unique Key for that query level, in which case Universal Matching or Single Value Matching is used depending on the query level.

3.1.4.3.3.1.3.1. Presentation Context Acceptance Criterion

Q/R AE does not accept associations.

3.1.4.3.3.1.3.2. Transfer Syntax Selection Policies

If offered a choice of Transfer Syntaxes in a Presentation Context, Q/R AE will apply the first encountered Transfer Syntax in the priority order indicated in Table 3.1.4-Z.

Q/R AE will accept duplicate Presentation Contexts, that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same priority for selecting a Transfer Syntax for each.

3.1.4.3.3.1.3.3. Response Status

Q/R will behave as described in the table below in response to the status returned in the C-FIND response command message(s).

Table 3.1.4-BB Response Status for Q/R AE Query Request

Service Status	Further Meaning	Status Codes	Behavior
Refused	Out of Resources	A700	Current query is terminated; remaining queries continue
Error	Identifier does not match SOP Class	A900	Current query is terminated; remaining queries continue
	Unable to process	Cxxx	Current query is terminated; remaining queries continue
Cancel	Matching terminated due to Cancel request	FE00	Current query closed; remaining queries continue
Success	Matching is complete - No final Identifier is supplied	0000	Current query is terminated; remaining queries continue
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier used to populate browser and trigger recursive lower level queries
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	FF01	Identifier used to populate browser and trigger recursive lower level queries

3.1.4.3.3.2. Activity – Retrieve From Remote AE

3.1.4.3.3.2.1. Description and Sequencing of Activities

For the entity (patient, study, series or instance) selected from the user interface to be retrieved, a single attempt will be made to retrieve it from the selected remote AE. If the retrieve fails, for whatever reason, no retry will be performed.

3.1.4.3.3.2.2. Proposed Presentation Contexts

Q/R AE will propose one or multiple C-MOVE Presentation Contexts each with the transfer syntaxes listed in the Table below. The proposed presentation contexts depend on the type of retrieve performed (i.e. at which level).

Table 3.1.4-CC Proposed Retrieve Presentation Contexts for Q/RAE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table	See Table 3.1.4-T	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
3.1.4-T		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None

3.1.4.3.3.2.2.1. Extended Negotiation

No extended negotiation is performed. In particular, relational retrievals are not supported.

3.1.4.3.3.2.3. SOP Specific Conformance

Q/R AE provides standard conformance to the supported C-MOVE SOP Classes. Retrieval will be performed at the PATIENT, STUDY, SERIES or IMAGE level depending on what level of entity has been selected by the user in the browser. If a patient is closed while the retrieve is in progress, a CANCEL requests is issued.

The retrieval is performed from the AE that was specified in the Retrieve AE attribute returned from the query performed by Q/R AE. The instances are retrieved to the current application's local temporary cache by specifying the destination as the AE Title of the STORAGE AE of the local application. This implies that the remote C-MOVE SCP must be preconfigured to determine the presentation address corresponding to the STORAGE AE. The STORAGE AE will accept storage from all configured Retrieve AEs.

Table 3.1.4-DD Retrieve Request Identifier for Q/R AE

Name	Tag	Unique, Matching or Return Key
PATIENT level		
Patient ID	(0010,0020)	U
STUDY level		
Study Instance UID	(0020,000D)	U
SERIES level		
Series Instance UID	(0020,000E)	U
IMAGE level		
SOP Instance UID	(0008,0018)	U

3.1.4.3.3.2.3.1. Presentation Context Acceptance Criterion

Q/R AE does not accept associations.

3.1.4.3.3.2.3.2. Transfer Syntax Selection Policies

If offered a choice of Transfer Syntaxes in a Presentation Context, Q/R AE will apply the first encountered Transfer Syntax in the priority order indicated in Table 3.1.4-CC.

Q/R AE will accept duplicate Presentation Contexts, that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same priority for selecting a Transfer Syntax for each.

3.1.4.3.3.2.3.3. Response Status

Q/R AE will behave as described in the Table below in response to the status returned in the C-MOVE response command message(s).

Table 3.1.4-EE Response Status for Q/R AE Query Request

Service Status	Further Meaning	Status Codes	Related Fields	Behavior
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)	Retrieval is terminated
	Out of Resources - Unable to perform sub-operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is terminated
	Move Destination unknown	A801	(0000,0902)	Retrieval is terminated
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)	Retrieval is terminated
	Unable to process	Cxxx	(0000,0901) (0000,0902)	Retrieval is terminated
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is terminated
Warning	Sub-operations Complete - One or more Failures	B000	(0000,1020) (0000,1022) (0000,1023)	Retrieval is terminated
Success	Sub-operations Complete - No Failures	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is terminated
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval continues

3.1.4.3.3.2.3.4. Sub-operation dependent behavior

Since the C-MOVE operation is dependent on completion of C-STORE sub-operations that are occurring on a separate association, the question of failure of operations on the other association(s) must be considered.

Q/R AE completely ignores whatever activities are taking place in relation to the STORAGE-SCP AE that is receiving the retrieved instances. Once the C-MOVE has been initiated it runs to completion (or failure) as described in the C-MOVE response command message(s). There is no attempt by Q/R AE to confirm that instances have actually been successfully received or locally stored.

Whether or not completely or partially successfully retrievals are made available in the local cache to the user is purely dependent on the success or failure of the C-STORE sub-operations, not on any explicit action by Q/R AE. Whether or not the remote AE attempts to retry any failed C-STORE sub-operations is beyond the control of Q/R AE.

If the association on which the C-MOVE was issued is aborted for any reason, whether or not the C-STORE sub-operations continue is dependent on the remote AE; the local STORAGE AE will continue to accept associations and storage operations regardless.

3.1.4.3.4. Association Acceptance Policy

Q/R AE does not accept associations.

3.1.5 CardioPACS Server

3.1.5.1. Q/R AE

3.1.5.1.1. SOP Classes

The Q/R AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

Table 3.1.5-A SOP Classes for Q/R AE

SOP Class Name	SOP Class UID	SCU	SCP
Patient Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	No	Yes
Patient Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	No	Yes
Study Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	No	Yes
Study Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	No	Yes
Patient/Study Only Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	No	Yes
Patient/Study Only Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2	No	Yes

3.1.5.1.2. Association Policies

3.1.5.1.2.1. General

The Q/R AE will never initiate Associations; it only accepts Association Requests from external DICOM AEs. The Q/R AE will accept Associations for Verification, C-FIND, and C-MOVE requests. In the case of a C-MOVE request, the Q/R AE will issue a command to the STORAGE AE to initiate an Association with the Destination DICOM AE to send images as specified by the originator of the C-MOVE Request. The DICOM standard Application Context Name for DICOM 3.0 is always accepted.

Table 3.1.5-B DICOM Application Context for Q/R AE

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

3.1.5.1.2.2. Number of Associations

The Q/R AE can support multiple simultaneous Associations. Each time the Q/R AE receives an Association, a child thread will be spawned to process the Verification, Query, or Retrieval request. The maximum number of child threads, and thus the maximum number of simultaneous Associations that can be processed, is set by configuration and limited by the Operating System and available memory. The default maximum is 10 in total.

The maximum number of simultaneous Associations is an absolute number.

Table 3.1.5-C Number of Simultaneous Associations as a SCP for Q/R AE

Maximum number of simultaneous Associations	10 (Configurable)
---	-------------------

3.1.5.1.2.3. Asynchronous Nature

The Q/R AE does not support asynchronous communication (multiple outstanding transactions over a single Association). All Association requests must be completed and acknowledged before a new operation can be initiated.

Table 3.1.5-D Asynchronous Nature as a SCP for Q/R AE

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

3.1.5.1.2.4. Implementation Identifying Information

The implementation information for the Application Entity is:

Table 3.1.5-E DICOM Implementation Class and Version for Q/R AE

Implementation Class UID	1.2.840.114236.0.900.100
Implementation Version Name	CPS_10.0

Note that the STORAGE AE, and Q/R AE use the same Implementation Class UID. All CardioPACS Server AE's use the same Implementation Version Name. This Version Name is updated with each new release of the product software, as the different AE versions are never released independently.

3.1.5.1.3. Association Initiation Policy

The Q/R AE does not initiate Associations.

3.1.5.1.4. Association Acceptance Policy

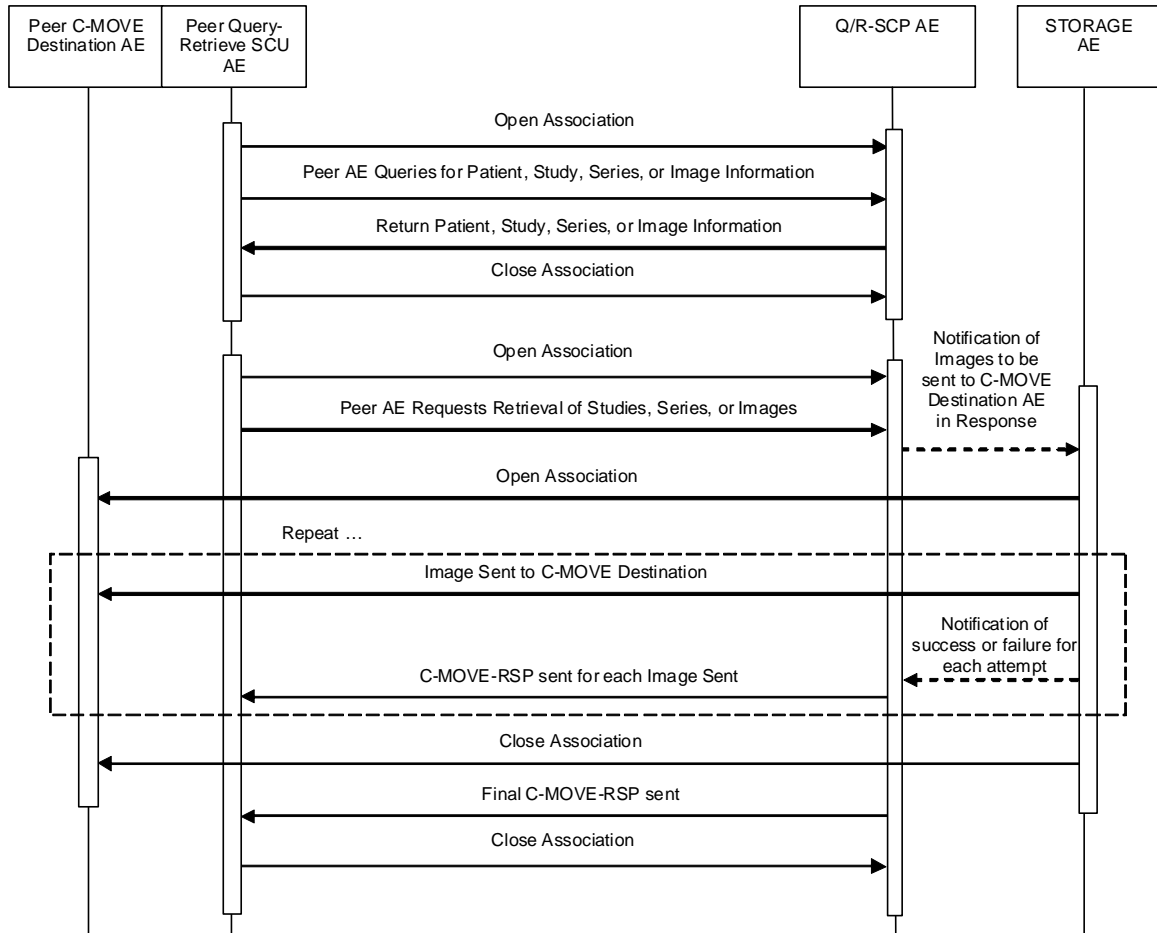
3.1.5.1.4.1. Activity – Handling Query and Retrieval Requests

The Q/R AE accepts Associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted then the Association Request itself is rejected. It can be configured to only accept Associations with certain Application Entity Titles.

If Q/R AE receives a query (C-FIND) request then the response(s) will be sent over the same Association used to send the C-FIND-Request.

If Q/R AE receives a retrieval (C-MOVE) request then the responses will be sent over the same Association used to send the C-MOVE-Request. The Q/R AE will notify the STORAGE AE to send the requested SOP Instances to the C-MOVE Destination. The STORAGE AE notifies the Q/R AE of the success or failure of each attempt to send a Composite SOP Instance to the peer C-MOVE Destination AE. The Q/R AE then sends a C-MOVE Response indicating this status after each attempt. Once the STORAGE AE has finished attempting to transfer all the requested SOP Instances, the Q/R AE sends a final C-MOVE Response indicating the overall status of the attempted retrieval.

Figure 3.1.5.1-A Sequencing of Activity – Handling Query and Retrieval Requests



The following sequencing constraints illustrated in Figure 4.2.2.1.2-1 apply to the Q/R AE for handling queries (C-FIND-Requests):

1. Peer AE opens an Association with the Q/R AE.
2. Peer AE sends a C-FIND-RQ Message
3. Q/R AE returns a C-FIND-RSP Message to the peer AE with matching information. A C-FIND-RSP is sent for each entity matching the identifier specified in the C-FIND-RQ. A final C-FIND-RSP is sent indicating that the matching is complete.
4. Peer AE closes the Association. Note that the peer AE does not have to close the Association immediately. Further C-FIND or C-MOVE Requests can be sent over the Association before it is closed.

The following sequencing constraints illustrated in Figure 4.2.2.1.2-1 apply to the Q/R AE for handling retrievals (C-MOVE-Requests):

1. Peer AE opens an Association with the Q/R AE.
2. Peer AE sends a C-MOVE-RQ Message
3. Q/R AE notifies the STORAGE AE to send the Composite SOP Instances to the peer C-MOVE Destination AE as indicated in the C-MOVE-RQ.
4. After attempting to send a SOP Instance, the STORAGE AE indicates to the Q/R AE whether the transfer succeeded or failed. The Q/R AE then returns a C-MOVE-RSP indicating this success or failure.

5. Once the STORAGE AE has completed all attempts to transfer the SOP Instances to the C-MOVE Destination AE, or the first failure occurred, the Q/R AE sends a final C-MOVE-RSP indicating the overall success or failure of the retrieval.
6. Peer AE closes the Association. Note that the peer AE does not have to close the Association immediately. Further C-FIND or C-MOVE Requests can be sent over the Association before it is closed.

The Q/R AE may reject Association attempts as shown in the table below. The Result, Source and Reason/Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU. The following abbreviations are used in the Source column:

- a. 1 – DICOM UL service-user
- b. 2 – DICOM UL service-provider (ASCE related function)
- c. 3 – DICOM UL service-provider (Presentation related function)

Table 3.1.5-F Association Rejection Reasons

Result	Source	Reason/Diag	Explanation
2 – rejected-transient	c	2 – local-limit-exceeded	The (configurable) maximum number of simultaneous Associations has been reached. An Association request with the same parameters may succeed at a later time.
2 – rejected-transient	c	1 – temporary-congestion	No Associations can be accepted at this time due to the real-time requirements of higher priority activities (e.g. during image acquisition no Associations will be accepted) or because insufficient resources are available (e.g. memory, processes, threads). An Association request with the same parameters may succeed at a later time.
1 – rejected-permanent	a	2 – application-context-name-not-supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will not succeed at a later time.
1 – rejected-permanent	a	7 – called-AE-title-not-recognized	The Association request contained an unrecognized Called AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association initiator is incorrectly configured and attempts to address the Association acceptor using the wrong AE Title.
1 – rejected-permanent	a	3 – calling-AE-title-not-recognized	The Association request contained an unrecognized Calling AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association acceptor has not been configured to recognize the AE Title of the Association initiator.
1 – rejected-permanent	b	1 – no-reason-given	The Association request could not be parsed. An Association request with the same format will not succeed at a later time.

3.1.5.1.4.1.1. Accepted Presentation Contexts

Q/R AE will accept Presentation Contexts as shown in the following table.

Table 3.1.5-G Accepted Presentation Contexts by the Q/R AE

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

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Patient Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Patient Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

3.1.5.1.4.1.2. SOP Specific Conformance for Query SOP Class

Q/R AE supports hierarchical queries and not relational queries. There are no attributes always returned by default. Only those attributes requested in the query identifier are returned. Query responses always return values from the CardioPACS Server database. Exported SOP Instances are always updated with the latest values in the database prior to export. Thus, a change in Patient demographic information will be contained in both the C-FIND Responses and any Composite SOP Instances exported to a C-MOVE Destination AE.

Patient Root Information Model

All required search keys on each of the four levels (Patient, Study, Series, and Image) are supported.

Study Root Information Model

All the required search keys on each of the three levels (Study, Series, and Image) are supported.

Patient/Study Only Information Model

All the required search keys on each of the two levels (Patient, Study) are supported.

Table 3.1.5-H Patient Root C-FIND SCP Supported Elements

Level Name Attribute Name	Tag	Types of Matching
SOP Common Specific Character Set	0008,0005	NONE
Patient Level (Study Level in Study Root)		
Patient's Name	0010,0010	S,*,U
Patient ID	0010,0020	S,*,U
Patient's Birth Date	0010,0030	S,R,U
Patient's Sex	0010,0040	S,U
Number of Patient Related Studies	0020,1200	NONE
Number of Patient Related Series	0020,1202	NONE
Number of Patient Related Instances	0020,1204	NONE
Study Level		

Level Name Attribute Name	Tag	Types of Matching
Study Date	0008,0020	S,R,U
Study Time	0008,0030	NONE
Accession Number	0008,0050	S,*,U
Study ID	0020,0010	S,*,U
Study Instance UID	0020,000D	S,U
Referring Physician's Name	0008,0090	S,*,U
Study Description	0008,1030	S,*,U
Patient's Size	0010,1020	NONE
Patient's Height	0010,1030	NONE
Modalities in Study	0008,0061	S,U,L
SOP Classes in Study	0008,0062	S,U,L
Number of Study Related Series	0020,1206	NONE
Number of Study Related Instance	0020,1208	NONE
Series Level (Patient Root or Study Root)		
Modality	0008,0060	S,U
Series Number	0020,0011	NONE
Series Instance UID	0020,000E	S,U
Operator's Name	0008,1070	S,*,U
Laterality	0020,0060	S,U
Performing Physician's Name	0008,1050	S,*,U
Operator's Name	0008,1070	S,*,U
Series Description	0008,103E	S,*,U
Series Date	0008,0021	S,R,U
Series Time	0008,0031	NONE
Body Part Examined	0018,0015	NONE
Protocol	0018,1030	NONE
Scheduled Procedure Step ID	0040,0009	NONE
Performed Procedure Step ID	0040,0253	NONE
Performed Procedure Step Start Date	0040,0244	NONE
Performed Procedure Step Start Time	0040,0245	NONE
Performed Procedure Step End Date	0040,0250	NONE
Performed Procedure Step End Time	0040,0251	NONE
Number of Series Related Instances	0020,1209	NONE
Instance Number	0020,0013	NONE
Image Comments	0020,4000	NONE
Image Type	0008,0008	NONE
Content Date	0008,0023	NONE
Content Time	0008,0033	NONE
Acquisition Date	0008,0022	NONE
Acquisition Time	0008,0032	NONE
Acquisition Date Time	0008,002A	NONE
Lossy Image Compression	0028,2110	NONE
Samples Per Pixel	0028,0002	NONE
Photometric Interpretation	0028,0004	NONE
Number of Frames	0028,0008	NONE
Rows	0028,0010	NONE
Columns	0028,0011	NONE
Bits Allocated	0028,0100	NONE
Stage Name	0008,2120	NONE

Level Name Attribute Name	Tag	Types of Matching
Stage Number	0008,2122	NONE
Number of Stages	0008,2124	NONE
View Name	0008,2127	NONE
View Number	0008,2128	NONE
Number of Views in Stage	0008,212A	NONE
Contrast/Bolus Agent	0018,0010	NONE
Positioner Primary Angle	0018,1510	NONE
Positioner Secondary Angle	0018,1511	NONE
Completion Flag	0040,A491	NONE
Completion Flag Description	0040,A492	NONE
Verification Flag	0040,A493	NONE
Concept Name Code Sequence	0040,A043	NONE
Document Title	0042,0010	NONE
Content Label	0070,0080	NONE
Content Description	0070,0081	NONE
Content Creator's Name	0070,0084	NONE
Icon Image Sequence	0088,0200	NONE
Manufacturer	0008,0070	NONE
Institution Name	0008,0080	NONE
SOP Instance UID	0008,0018	S,U
SOP Class UID	0008,0016	NONE

The tables should be read as follows:

- Attribute Name: Attributes supported for returned C-FIND Responses.
- Tag: Appropriate DICOM tag for this attribute.
- VR: Appropriate DICOM VR for this attribute.
- Types of Matching: The types of Matching supported by the C-FIND SCP. A "S" indicates the identifier attribute can specify Single Value Matching, a "R" will indicate Range Matching, a "*" will denote wildcard matching, an "U" will indicate universal matching, and "L" will indicate that UID lists are supported for matching. "NONE" indicates that no matching is supported, but that values for this Element in the database can be returned.

Table 3.1.5-I Q/R AE C-FIND Response Status Return Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Matching is complete. No final identifier is supplied.
Refused	Out of Resources	A700	System reached the limit in disk space or memory usage. Error message is output to the Service Log.
Failed	Identifier does not match SOP Class	A900	The C-FIND query identifier contains invalid Elements or values, or is missing mandatory Elements or values for the specified SOP Class. Error message is output to the Service Log.
	Unable to process	C001	The C-FIND query identifier is valid for the specified SOP Class but cannot be used to query the database.
Cancel	Matching terminated due to Cancel Request	FE00	The C-FIND SCU sent a Cancel Request. This has been acknowledged and the search for matches has been halted.

Service Status	Further Meaning	Error Code	Behavior
Pending	Matches are continuing and current match is supplied.	FF00	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming. This status code is returned if all Optional keys in the query identifier are actually supported.
	Matches are continuing but one or more Optional Keys were not supported.	FF01	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming. This status code is returned if there are Optional keys in the query identifier that are not supported.

3.1.5.1.4.1.3. SOP Specific Conformance for Retrieval SOP Class

The Q/R AE will convey to the STORAGE AE that an Association with a DICOM Application Entity named by the external C-MOVE SCU (through a MOVE Destination AE Title) should be established. It will also convey to the STORAGE AE to perform C-STORE operations on specific images requested by the external C-MOVE SCU.

The Q/R AE supports a single UID in the C-MOVE Request at the Study, Series, and Image Levels. The UID must be at the Level of the C-MOVE Request. For example, if the C-MOVE Request is for Series Level retrieval but the identifier contains a Study UID then the C-MOVE Request will be rejected, and the A900 Failed Status Code will be returned in the C-MOVE Response.

An initial C-MOVE Response is always sent after confirming that the C-MOVE Request itself can be processed. After this, the Q/R AE will return a response to the C-MOVE SCU after the STORAGE AE has attempted to send each image. This response reports the number of remaining SOP Instances to transfer, and the number transferred having a successful, failed, or warning status. If the Composite SOP Instances must be retrieved from long-term archive prior to export there may be quite a long delay between the first C-MOVE Response and the next one after the attempt to export the first image. The maximum length of time for this delay will depend on the particular type of archive used.

Table 3.1.5-J Q/R AE C-MOVE Response Status Return Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Sub-operations complete – No Failures	0000	All the Composite SOP Instances have been successfully sent to the C-MOVE Destination AE.
Warning	Sub-operations complete – With Failures	B000	Some Composite SOP Instances have not been successfully sent to the C-MOVE Destination AE.
Refused	Out of Resources – Unable to perform sub-operations	A702	C-STORE sub-operations cannot be performed due to failure to access Composite SOP Instances in archive, or failure of a C-STORE Request. For example, this Status will be returned if the required SOP Instances are determined to be off-line. Error message is output to the Service Log.
	Move destination unknown	A801	The Destination Application Entity named in the C-MOVE Request is unknown to Query-Retrieve SCP AE. Error message is output to the Service Log.

Service Status	Further Meaning	Error Code	Behavior
	Matching terminated due to Cancel Request	FE00	The C-MOVE SCU sent a Cancel Request. This has been acknowledged and the export of Composite SOP Instances to the C-MOVE Destination AE has been halted.
Cancel	Sub-operations are continuing	FF00	A Response with this Status Code is sent every time a Composite SOP Instance has been successfully sent to the C-MOVE Destination AE.
Pending			

Table 3.1.5-K Q/R AE Communication Failure Behavior

Exception	Behavior
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout). i.e. The Q/R AE is waiting for the next C-FIND or C-MOVE Request on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log. If the STORAGE AE is still exporting Composite SOP Instances as a result of an earlier C-MOVE Request received on this Association, it will continue attempting to complete the entire C-MOVE Request.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout). i.e. The Q/R AE is waiting for the next message PDU but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log. If the STORAGE AE is still exporting Composite SOP Instances as a result of an earlier C-MOVE Request received on this Association, it will continue attempting to complete the entire C-MOVE Request.
Association aborted by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	Error message is output to the Service Log. If the STORAGE AE is still exporting Composite SOP Instances as a result of an earlier C-MOVE Request received on this Association, it will continue attempting to complete the entire C-MOVE Request.

3.1.5.2. STORAGE AE

3.1.5.2.1. SOP Classes

The STORAGE AE provides Standard Conformance to the following SOP Classes:

Table 3.1.5-L SOP Classes supported by STORAGE AE

SOP Class Name	SOP Class UID	SCU	SCP
Stored Print Storage	1.2.840.10008.5.1.1.27	Yes	Yes
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29	Yes	Yes
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30	Yes	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes

SOP Class Name	SOP Class UID	SCU	SCP
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	Yes
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	Yes
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	Yes
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	Yes
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	Yes
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	Yes
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Yes	Yes
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	Yes	Yes
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	Yes	Yes
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	Yes	Yes
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Yes	Yes
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Yes	Yes
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Yes	Yes
Deformable Spatial Registration	1.2.840.10008.5.1.4.1.1.66.3	Yes	Yes
Segmentation	1.2.840.10008.5.1.4.1.1.66.4	Yes	Yes
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67	Yes	Yes
VL Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.1	Yes	Yes
VL Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.2	Yes	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	Yes

SOP Class Name	SOP Class UID	SCU	SCP
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	Yes
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	Yes
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes	Yes
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	Yes
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Yes	Yes
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Yes	Yes
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	Yes	Yes
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Yes	Yes
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	Yes	Yes
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Yes	Yes
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.88.104	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129	Yes	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	Yes
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	Yes

STORAGE AE can be configured to use retired US Image objects if the external Storage SCP AE does not support the SOP Instance's original SOP Class. By altering the configuration it is also possible to support additional or fewer SOP Classes per each accepted external Storage SCP AE.

3.1.5.2.2. Association Policies

3.1.5.2.2.1. General

The STORAGE AE can both accept and propose Association Requests. The STORAGE AE will accept Association Requests for the Verification, Storage, and Storage Commitment Push Model Services. It will propose Associations for the Storage Commitment Push Model Service and when requested to do so by the Q/R AE.

The DICOM standard Application Context Name for DICOM is always proposed:

Table 3.1.5-M DICOM Application Context for STORAGE AE

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

3.1.5.2.2.2. Number of Associations

The STORAGE AE can support multiple simultaneous Associations requested by peer AEs. Each time the STORAGE AE receives an Association, a child thread will be spawned to process the Verification, Storage, or Storage Commitment Push Model Service requests. The default maximum number is 10 in total. This maximum number of simultaneous Associations is an absolute number.

The STORAGE AE initiates one Association at a time for sending Storage Commitment Push Model N-EVENT-REPORTs to peer AEs.

The STORAGE AE initiates a single Association at a time to a given C-MOVE request from the Q/R AE. If the first attempt to open an Association fails then the STORAGE AE will report such failure to the C-MOVE request and shall not repeat the operation.

Table 3.1.5-N Number of Simultaneous Associations as an SCP for STORAGE AE

Maximum number of simultaneous Associations requested by peer AEs	10
Maximum number of simultaneous Associations proposed by STORAGE AE	1 (Non Configurable) for N-EVENT Reports 1 (Non Configurable) for each Destination AE of a C-MOVE request.

3.1.5.2.2.3. Asynchronous Nature

The STORAGE AE does not support asynchronous communication (multiple outstanding transactions over a single Association). All Association requests must be completed and acknowledged before a new operation can be initiated.

The STORAGE AE does however permit an SCU to send multiple Storage Commitment Push Model Requests before it has sent back any N-EVENT-REPORT Notifications. However, the STORAGE AE must send an N-ACTION Response before permitting another N-ACTION Request to be received so the DICOM communication itself is not truly asynchronous.

Table 3.1.5-O Asynchronous Nature for STORAGE AE

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

There is no limit on the number of outstanding Storage Commitment Push Model Requests that can be received and acknowledged before the STORAGE AE has responded with the corresponding N-EVENT-REPORT Notifications.

Table 3.1.5-P Outstanding Storage Commitment Push Model Requests

Maximum number of outstanding Storage Commitment Requests for which no N-EVENT Notification has been sent	No Maximum Limit
---	------------------

3.1.5.2.2.4. Implementation Identifying Information

The implementation information for the Application Entity is:

Table 3.1.5-Q DICOM Implementation Class and Version for STORAGE AE

Implementation Class UID	1.2.840.114236.0.900.100
Implementation Version Name	CPS_10.0

Note that the STORAGE AE, and Q/R AE use the same Implementation Class UID. All CardioPACS Server AE's use the same Implementation Version Name. This Version Name is updated with each new release of the product software, as the different AE versions are never released independently.

3.1.5.2.3. Association Initiation Policy

3.1.5.2.3.1. Activity – Send Images Requested by an External Peer AE

The STORAGE AE will initiate a new Association when the Q/R AE invokes the STORAGE AE to transmit images. The Q/R AE will issue such a command whenever it receives a valid C-MOVE Request. An Association Request is sent to the specified C-MOVE Destination AE and upon successful negotiation of the required Presentation Context the image transfer is started. In all cases an attempt will be made to transmit all the indicated images in a single Association, but this may not always be possible. The Association will be released when all the images have been sent. If an error occurs during transmission over an open Association then the image transfer is halted. The STORAGE AE will not attempt to independently retry the image export.

Note that the STORAGE AE does not support the unsolicited sending of SOP Instances using the DICOM Storage Service Class. It will only send SOP Instances in response to a C-MOVE Request from a peer AE.

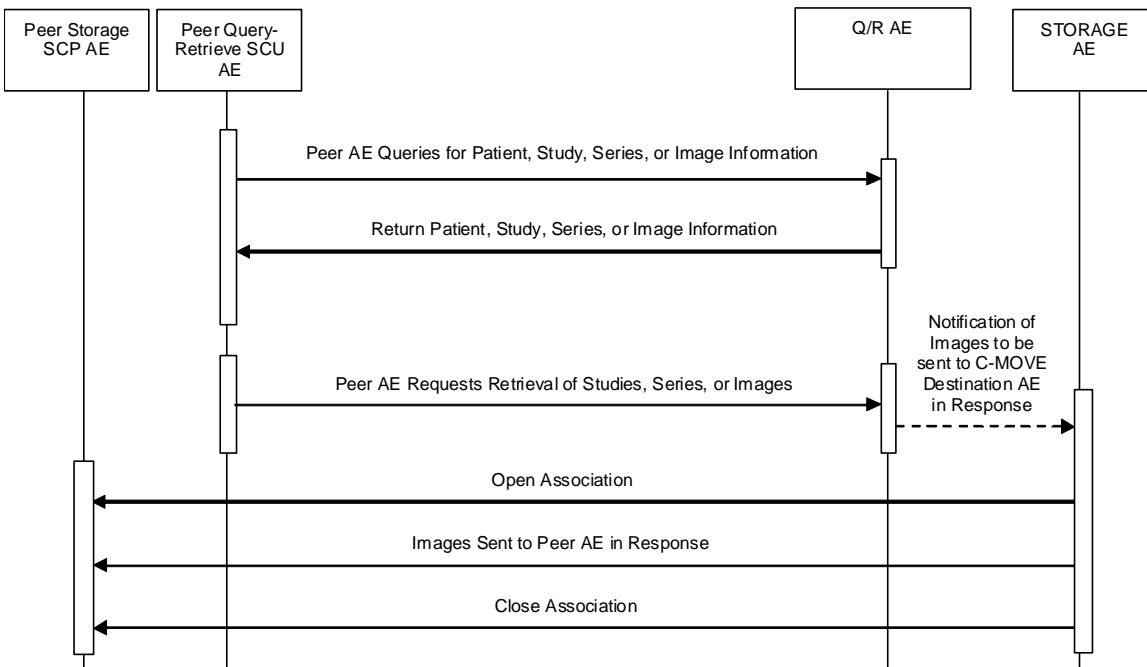


Figure 3.1.5.2-A Sequencing of Activity - Send Images Requested by External Peer AE

The following sequencing constraints illustrated in Figure 3.1.5.2-A apply to the STORAGE AE:

1. Peer AE requests retrieval of Study, Series, or Images from Q/R AE (C-MOVE-RQ).

2. Q/R AE signals STORAGE AE to send the image Composite SOP Instances indicated in the C-MOVE-RQ to the C-MOVE Destination AE.
3. STORAGE AE opens a new Association with the indicated C-MOVE Destination AE.
4. STORAGE AE sends the indicated Composite SOP Instances.
5. STORAGE AE closes the Association.
6. The Verification Service is only supported as a utility function for Service staff. It is used only as a diagnostic tool.

3.1.5.2.3.2. Activity – Send Storage Commitment Notification over new Association

The STORAGE AE will always initiate a new Association for Storage Commitment Push Model Notification (N-EVENT-REPORT). It will not use the original Association used to send the corresponding request. An Association Request is sent to the peer AE that sent the Storage Commitment Push Model request and upon successful negotiation of the required Presentation Context the outstanding N-EVENT-REPORT is sent. If there are multiple outstanding N-EVENT-REPORTs to be sent to a single peer AE then the STORAGE AE will attempt to send them all over a single Association rather than requesting a new Association for each one. The Association will be released when all the N-EVENT-REPORTs for the peer AE have been sent. If any type of error occurs during transmission (either a communication failure or indicated by a Status Code returned by the peer AE) over an open Association then the transfer of N-EVENT-REPORTs is halted. A new Association will be opened to retry sending outstanding N-EVENT-REPORTs. The maximum number of times the STORAGE AE will attempt to resend an N-EVENT-REPORT is 5 (five) and the amount of time to wait between attempts to resend is 10 (ten) seconds.

The following sequencing constraints illustrated in Figure 3.1.5.2-B apply to the STORAGE AE for handling Storage Commitment Push Model Requests using a new Association:

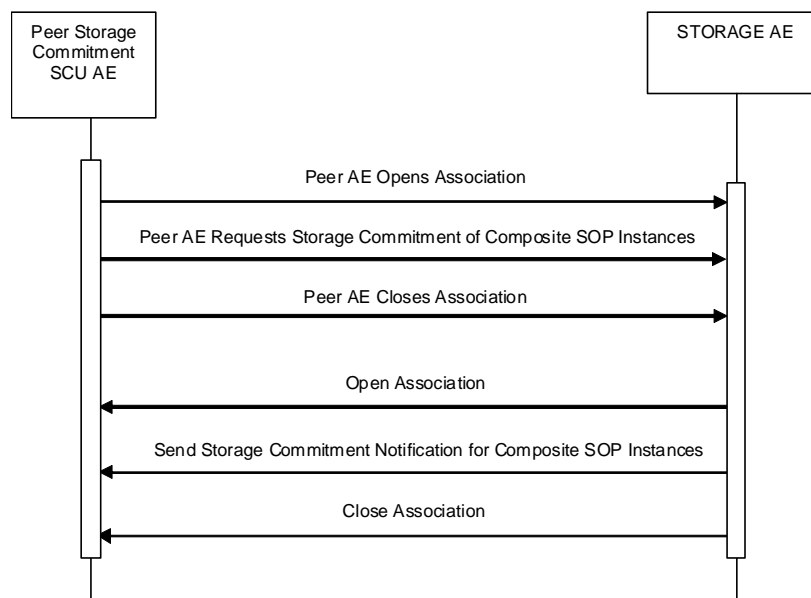


Figure 3.1.5.2-B Sequencing of Activity – Send Storage Commitment Notification over new Association

1. Peer AE opens an Association with the STORAGE AE.
2. Peer AE requests Storage Commitment of Composite SOP Instance(s) (peer sends N-ACTION-RQ and STORAGE AE responds with N-ACTION-RSP to indicate that it received the request).

3. Peer AE closes the Association.
4. STORAGE AE opens an Association with the peer AE.
5. STORAGE AE sends Storage Commitment Push Model Notification (N-EVENT-REPORT). More than one can be sent over a single Association if multiple Notifications are outstanding.
6. STORAGE AE closes the Association with the peer AE.

3.1.5.2.3.2.1. Proposed Presentation Contexts

STORAGE AE will propose Presentation Contexts only for the SOP Class(s) of the instances in the series that is to be transferred. For such Sop Class(s), STORAGE AE will propose a single Presentation Context for the Transfer Syntax in which the instance is stored in the remote or local archive.

Table 3.1.5-R Possible Proposed Presentation Contexts for STORAGE AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 3.1.5-L	See Table 3.1.5-L	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Baseline (Process 2 & 4)	1.2.840.10008.1.2.4.51	SCU	None
		JPEG Lossless, Non Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCU	None
		JPEG Lossless, Non Hierarchical, First Order Prediction (Process 14, Selection Value 1)	1.2.840.10008.1.2.4.70	SCU	None
		RLE Lossless	1.2.840.10008.1.2.5	SCU	None

3.1.5.2.3.2.1.1. Extended Negotiation

No extended negotiation is performed.

3.1.5.2.3.2.2. SOP Specific Conformance for Verification SOP Class

Standard conformance is provided to the DICOM Verification Service Class as an SCU. The Verification Service as an SCU is actually only supported as a diagnostic service tool for network communication issues. It can be used to test whether Associations can actually be opened with a peer AE.

3.1.5.2.3.2.3. SOP Specific Conformance for Storage SOP Classes

The associated Activity with the Storage Commitment Push Model service is the communication by the STORAGE AE to peer AEs that it has committed to permanently store Composite SOP Instances that have been sent to it. It thus allows peer AEs to determine whether the CardioPACS Server has taken responsibility for the archiving of specific SOP Instances so that they can be flushed from the peer AE system.

The STORAGE AE will initiate a new Association to a peer AE that sent a Storage Commitment Push Model request.

3.1.5.2.3.2.4. SOP Specific Conformance for Image SOP Class

Composite DICOM SOP Instances are maintained as DICOM Part 10 compliant files in the CardioPACS Server database. The entire set of tags received with the image will be saved in CardioPACS; this includes all Private and SOP Extended Elements. When a SOP Instance is selected for export from CardioPACS Server, its content will be exported as it was originally received except for a few possible exceptions. Some of the Patient demographic and Study information Elements whose values can have been altered due to changes administered on CardioPACS or changes to the state of the image data due to compression can be altered when the SOP Instance is exported.

The Patient demographic and Study information can be entered or altered by several means: manually, or from HL7 messaging. The replacement behavior depends on which specific DICOM and HL7 services are supported. Also, this behavior is configurable. Values can be altered without changing the SOP Instance UID unless otherwise noted.

The CardioPACS Server creates files called Service Logs that can be used to monitor their status and diagnose any problems that may arise. If any error occurs during DICOM communication then appropriate messages are always output to these Service Logs.

The STORAGE AE will exhibit the following Behavior according to the Status Code value returned in a C-STORE Response from a destination C-STORE SCP:

Table 3.1.5-S STORAGE AE BEHAVIOUR WHEN RECEIVING RESPONSE STATUS

Service Status	Further Meaning	Status Codes	Behavior
Refused	Out of Resources	A7xx	Error Message Logged
Error	Data Set does not match SOP Class	A9xx	Error Message Logged
	Cannot understand	Cxxx	Error Message Logged
Warning	Coercion of Data Elements	B000	Warning Message Logged
	Data Set does not match SOP Class	B007	Warning Message Logged
	Elements Discarded	B006	Warning Message Logged
Success		0000	Success Message Logged

All Status Codes indicating an error or refusal are treated as a permanent failure. The STORAGE AE never automatically resends images when an error Status Code is returned in a C-STORE Response. For specific behavior regarding Status Code values returned in C-MOVE Responses, refer to the Services Supported as an SCP by the Q/R AE.

3.1.5.2.4. Association Acceptance Policy

3.1.5.2.4.1. Activity – Receive Images and Storage Commitment Requests

The STORAGE AE accepts Associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted then the Association Request itself is rejected. It can be configured to only accept Associations with certain hosts (using TCP/IP address) and/or Application Entity Titles.

The default behavior of the STORAGE AE is to always attempt to send a Storage Commitment Push Model Notification (N-EVENT-REPORT) over a new Association.

The STORAGE AE has a configurable timeout value for the maximum amount of time that it will wait on an open Association for a new request from a peer AE. A peer AE can reset this timer by sending a Verification request (C-ECHO-RQ). This can act as a useful mechanism for a peer AE to maintain an active Association if the length of time between sending Storage or Storage Commitment requests can be long (such as when using a single Association to send images as they are acquired during an ultrasound exam).

The STORAGE AE may reject Association attempts as shown in the Table below. The Result, Source and Reason/Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU. The following abbreviations are used in the Source column:

- a. 1 – DICOM UL service-user
- b. 2 – DICOM UL service-provider (ASCE related function)
- c. 3 – DICOM UL service-provider (Presentation related function)

Table 4.2.2.2-10 ASSOCIATION REJECTION REASONS

Result	Source	Reason/Diag	Explanation
2 – rejected-transient	c	2 – local-limit-exceeded	The (configurable) maximum number of simultaneous Associations has been reached. An Association request with the same parameters may succeed at a later time.
2 – rejected-transient	c	1 – temporary-congestion	No Associations can be accepted at this time due to the real-time requirements of higher priority activities (e.g. during image acquisition no Associations will be accepted) or because insufficient resources are available (e.g. memory, processes, threads). An Association request with the same parameters may succeed at a later time.
1 – rejected-permanent	a	2 – application-context-name-not-supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will not succeed at a later time.
1 – rejected-permanent	a	7 – called-AE-title-not-recognized	The Association request contained an unrecognized Called AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association initiator is incorrectly configured and attempts to address the Association acceptor using the wrong AE Title.
1 – rejected-permanent	a	3 – calling-AE-title-not-recognized	The Association request contained an unrecognized Calling AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association acceptor has not been configured to recognize the AE Title of the Association initiator.
1 – rejected-permanent	b	1 – no-reason-given	The Association request could not be parsed. An Association request with the same format will not succeed at a later time.

3.1.5.2.4.1.1. Accepted Presentation Contexts

The STORAGE AE can be configured to accept a subset of the available Transfer Syntaxes without any mandatory item.

If multiple Transfer Syntaxes are proposed per Presentation Context then the first one in the proposed list is accepted. Any of the Presentation Contexts shown in the following table are acceptable to the STORAGE AE for receiving images.

Table 3.1.5-T Acceptable Presentation Contexts for STORAGE AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 3.1.5-L	See Table 3.1.5-L	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
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCP	None
		JPEG Baseline (Process 2 & 4)	1.2.840.10008.1.2.4.51	SCP	None
		JPEG Lossless, Non Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCP	None
		JPEG Lossless, Non Hierarchical, First Order Prediction (Process 14, Selection Value 1)	1.2.840.10008.1.2.4.70	SCP	None
		RLE Lossless	1.2.840.10008.1.2.5	SCP	None

3.1.5.2.4.1.1.1. Extended Negotiation

No extended negotiation is performed, though STORAGE AE:

3.1.5.2.4.1.2. SOP Specific Conformance for Verification SOP Class

The STORAGE AE provides standard conformance to the Verification SOP Class as an SCP.

3.1.5.2.4.1.3. SOP Specific Conformance for Storage SOP Class

The associated Activity with the Storage service is the storage of medical image data received over the network on a designated hard disk. The STORAGE AE will return a failure status if it is unable to store the images on to the hard disk.

The STORAGE AE does not have any dependencies on the number of Associations used to send images to it. Images belonging to more than one Study or Series can be sent over a single or multiple Associations. Images belonging to a single Study or Series can also be sent over different Associations. There is no limit on either the number of SOP Instances or the maximum amount of total SOP Instance data that can be transferred over a single Association.

The STORAGE AE is configured to retain the original DICOM data in DICOM Part 10 compliant file format. The STORAGE AE is Level 2 (Full) conformant as a Storage SCP. In addition, all Private and SOP Class Extended Elements are maintained in the DICOM format files. In addition to saving all Elements in files, a subset of the Elements are stored in the CardioPACS Server database to support query and retrieval requests and also allow updating of Patient, Study, and Series information by user input, or demographic and Study related messages.

The Behavior for handling duplicate SOP Instances is configurable. The default Behavior is to assign a new SOP Instance UID to a received SOP Instance if it conflicts with an existing SOP Instance UID. An alternative configuration is possible that causes the original object with the

conflicting SOP Instance UID to be replaced by the new SOP Instance. The same behavior applies to Study UID, Series UID and Patient ID.

For multi-frame image SOP Instances sent using JPEG compression Transfer Syntax, sending a fully specified offset table increases performance, because the entire file does not have to be parsed to find the individual frame offsets. However, the inclusion of an offset table is not required for archiving or viewing of such SOP Instances.

STORAGE AE will behave as described in the Table below when generating the C-STORE response command message.

Table 3.1.5-U Response Status for STORAGE AE

Service Status	Further Meaning	Status Codes	Reason
Refused	Out of Resources	A7xx	Storage error if storage space is not sufficient or if it cannot interpret the stored data.
Error	Data Set does not match SOP Class	A9xx	Never sent – data set is not checked prior to storage
	Cannot understand	Cxxx	Never sent
Warning	Coercion of Data Elements	B000	Never sent - no coercion is ever performed
	Data Set does not match SOP Class	B007	Never sent - data set is not checked prior to storage
	Elements Discarded	B006	Never sent – all elements are always stored
Success		0000	

3.1.5.2.4.1.4. SOP Specific Conformance for Storage Commitment SOP Class

The associated Activity with the Storage Commitment Push Model service is the communication by the STORAGE AE to peer AEs that it has committed to permanently store Composite SOP Instances that have been sent to it. It thus allows peer AEs to determine whether the CardioPACS Server has taken responsibility for the archiving of specific SOP Instances so that they can be flushed from the peer AE system.

The STORAGE AE takes the list of Composite SOP Instance UIDs specified in a Storage Commitment Push Model N-ACTION Request and checks if they are present in the CardioPACS Server database. As long as the Composite SOP Instance UIDs are present in the database, the STORAGE AE will consider those Composite SOP Instance UIDs to be successfully archived. The STORAGE AE does not require the Composite SOP Instances to actually be successfully written to archive media in order to commit to responsibility for maintaining these SOP Instances.

Once the STORAGE AE has checked for the existence of the specified Composite SOP Instances, it will then attempt to send the Notification request (N-EVENT-REPORT-RQ). The default behavior is to attempt to send this Notification over a new Association. The STORAGE AE will not cache Storage Commitment Push Model N-ACTION Requests that specify Composite SOP Instances that have not yet been transferred to the CardioPACS Server . If a peer AE sends a Storage Commitment Push Model N-ACTION Request before the specified Composite SOP Instances are later sent over the same Association, the STORAGE AE will not commit to responsibility for such SOP Instances.

The STORAGE AE does not support the optional Storage Media File-Set ID & UID attributes in the N-ACTION.

The CardioPACS Server never automatically deletes Composite SOP Instances from the archive. The absolute persistence of SOP Instances and the maximum archiving capacity for such SOP Instances is dependent on the archiving media and capacity used by the CardioPACS Server and is dependent on the actual specifications of the purchased system. It is necessary to check the actual system specifications to determine these characteristics.

The STORAGE AE will support Storage Commitment Push Model requests for SOP Instances of any of the Storage SOP Classes that are also supported by the STORAGE AE.

The STORAGE AE will return the following Status Code values in N-ACTION Responses:

Table 3.1.5-V STORAGE AE Storage Commitment Push Model N-ACTION Response Status Return Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully received the Storage Commitment Push Model N-ACTION Request and can process the commitment request for the indicated SOP Instances.
Error	Processing Failure	0110	Indicates that the Storage Commitment Push Model N-ACTION Request cannot be parsed or fully processed due to a database or system failure.

The STORAGE AE will exhibit the following Behavior according to the Status Code value returned in an N-EVENT-REPORT Response from a destination Storage Commitment Push Model SCU:

Table 3.1.5-W STORAGE AE N-EVENT-REPORT Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCU has successfully received the Storage Commitment Push Model N-EVENT-REPORT Request.
Warning	Attribute List Error	0107	Transmission of Storage Commitment Push Model N-EVENT-REPORT Request is considered successful.
*	*	Any other status code.	This is treated as a permanent Failure.

All Status Codes indicating an error or refusal are treated as a permanent failure. The STORAGE AE can be configured to automatically reattempt the sending of Storage Commitment Push Model N-EVENT-REPORT Requests if an error Status Code is returned or a communication failure occurs. The maximum number of times to attempt sending as well as the time to wait between attempts is configurable.

NETWORK INTERFACES

This section depends on the underlying Operating System and Hardware and is applicable to both CardioPACS Workstation and CardioPACS Server.

3.1.6 Physical Network Interface

The application is indifferent to the physical medium over which TCP/IP executes; which is dependent on the underlying Operating System and Hardware.

3.1.7 Additional Protocols

When host names rather than IP addresses are used in the configuration properties to specify presentation addresses for remote AEs, the application is dependent on the name resolution mechanism of the underlying operating system.

DHCP can be used to obtain TCP/IP network configuration information (e.g. own TCP/IP address, net-mask, default gateway, DNS server, etc). Support for DHCP can be configured via the underlying Operating System tools. If DHCP is not in use, TCP/IP network configuration information can be manually configured via the underlying Operating System Tools.

DNS can be used for address resolution. If DHCP is not in use, the identity of a DNS server can be configured via the underlying Operating System tools. If a DNS server is not in use, local mapping between hostname and TCP/IP address can be manually configured via the underlying Operating System tools.

3.1.8 IPv4 and IPv6 Support

This product supports both IPv4 and IPv6. It does not utilize any of the optional configuration identification or security features of IPv6.

CONFIGURATION

3.1.9 AE Title/Presentation Address Mapping

The AE Title and port of CardioPACS Servers, CardioPACS Workstations and Remote AE Titles is configurable by the user from a GUI-based configuration application. The IP Address and port is picked by the site and may be changed by a Field Engineer. Please refer to the System Administrator's Manual for further information.

3.1.10 Parameters

CARDIOPACS configuration parameters related to DICOM communications are below. A blank cell under the 'Default Value' heading indicates that there is no default value for the specific configuration attribute.

**Table C.4.2-14
CONFIGURATION PARAMETERS TABLE**

Parameter	Configurable	Default Value
General Parameters		
Time-out waiting for acceptance or rejection Response to an Association Open Request	Yes	60 Seconds
Time-out waiting for response to TCP/IP connect() request.	Yes	60 Seconds

Parameter	Configurable	Default Value
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	Yes	60 Seconds
Debugging Capabilities		
Dump Association and DIMSE Messages	Yes	Off
CARDIOPACS Server Parameters		
Maximum Number of Simultaneous Associations	Yes	10
Maximum PDU size the AE can receive	Yes	65536 Bytes
Maximum PDU size the AE can send	No	The lower of the value above and the max PDU size specified by the Remote AE in the Association Request
Accepted Remote AEs	Yes	
Accepted Transfer Syntaxes per Remote AE	Yes	
Accepted Abstract Syntaxes per Remote AE	Yes	

4. MEDIA INTERCHANGE

IMPLEMENTATION MODEL

4.1.1 Application Data Flow Diagram

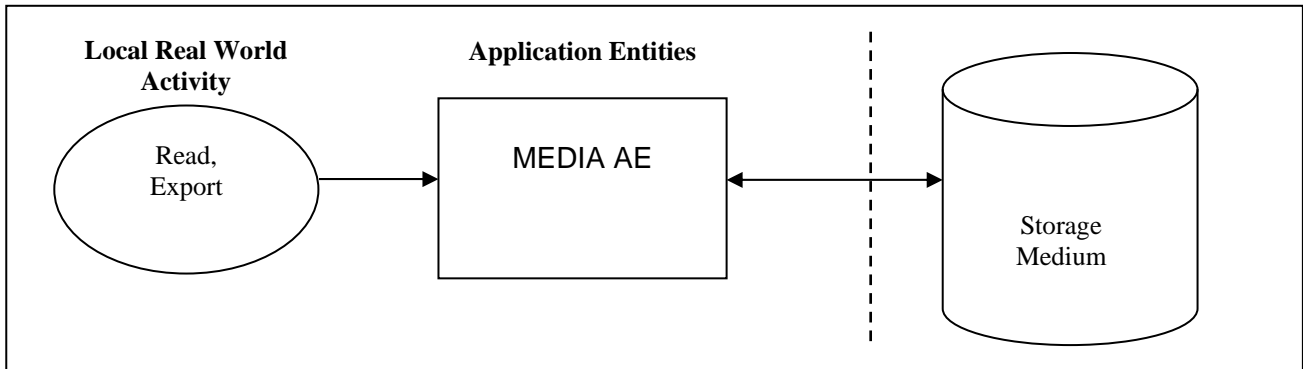


Figure 3.1.5.2-A CardioPACS Workstation – Media Interchange Application Data Flow

4.1.2 Functional Definition of AE's

4.1.2.1. MEDIA AE

The MEDIA AE is responsible of reading from media and writing to media.

Reading from Media is activated by the user in the CardioPACS Workstation interface or automatically activated when a media is inserted and detected by the operating system. The root directory of the media will be searched for the DICOMDIR file and, if present, the contents of the media displayed.

Activation of the “Export...” menu entry will pass the currently selected patients, studies, series or instances to the MEDIA AE. 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 one media or, if the content does not fit, spawned across multiple media.

4.1.3 Sequencing of Real World Activities

At least one object instance must be opened in CardioPACS Workstation and be selected before the MEDIA AE can be invoked for writing. The operator can insert a new media at any time before or after invocation of the MEDIA AE. The MEDIA AE will wait indefinitely for a media to be inserted before starting to write to the device. If no media is available the export job can be canceled.

4.1.4 File Meta Information for Implementation Class and Version

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

Table 4.1.4-A DICOM Implementation Class and Version for Q/R AE

Implementation Class UID	1.2.840.114236.0.800.100
Implementation Version Name	CPS_10.0

AE SPECIFICATIONS

4.1.5 MEDIA AE

The MEDIA AE provides standard conformance to the Media Storage Service Class. The Application Profiles and roles are listed below:

Table 4.1.5-A APPLICATION PROFILES, ACTIVITIES AND ROLES FOR MEDIA AE

Media Storage Application Profile	CardioPACS Workstation	
	FSC	FSR
Compact Disk – Recordable		
General Purpose CD-R	Yes	Yes
Magneto-Optical Disk		
General Purpose 90 mm 128 Mb MOD	Yes	Yes
General Purpose 90 mm 230 Mb MOD	Yes	Yes
General Purpose 90 mm 540 Mb MOD	Yes	Yes
General Purpose 90 mm 2.3 Gb MOD	Yes	Yes
General Purpose 130 mm 650 Mb MOD	Yes	Yes
General Purpose 130 mm 1.2 Gb MOD	Yes	Yes
General Purpose 130 mm 2.3 Gb MOD	Yes	Yes
General Purpose 130 mm 4.1 Gb MOD	Yes	Yes
General Purpose 640 Mb MOD	Yes	Yes
General Purpose 1.3 Gb MOD	Yes	Yes
DVD		
General Purpose 120 mm DVD-RAM	Yes	Yes
General Purpose 120 mm DVD	Yes	Yes
Other		
USB Connected Removable Devices	Yes	Yes
Compact Flash Removable Devices	Yes	Yes
Multimedia card Removable Devices	Yes	Yes

4.1.5.1. File Meta Information for the Application Entity

The Source Application Entity Title included in the File Meta Header is the AE title of the CardioPACS Workstation.

4.1.5.2. Real-World Activities

4.1.5.2.1. Activity – Read

The MEDIA AE acts as an FSR when requested to read a removable medium whether by automatic detection or by user activity. The root directory of the media will be searched for the DICOMDIR file and, if present, the contents of the media displayed. The user can then select the patient, study, series or instance and open it for review and further processing.

4.1.5.2.1.1. Media Storage Application Profiles

The MEDIA AE supports the Application Profiles listed in Table 4.1.5-A.

4.1.5.2.1.1.1. Options

The MEDIA AE supports all the SOP Classes and Transfer Syntaxes supported by the STORAGE AE as listed in Table 3.1.4-I and Table 3.1.4-R.

4.1.5.2.2. Activity – Export

The MEDIA AE acts as an FSC when requested to export SOP Instances from the local database to a removable medium.

A dialogue will be presented allowing the user to modify the suggested media label and provides control over the available media capacity. If the contents of the current selection do not fit on a single media an automatic separation into multiple export jobs will be suggested which can be adapted by the user.

The user will be prompted to insert an empty media for each export job. The contents of the export job will be written together with a corresponding DICOMDIR to a single-session media. Writing in multi-session mode is not supported. The user can cancel an export job.

4.1.5.2.2.1. Media Storage Application Profiles

The MEDIA AE supports the Application Profiles listed in Table 4.1.5-A.

4.1.5.2.2.1.1. Options

The MEDIA AE supports all the SOP Classes and Transfer Syntaxes supported by the STORAGE AE as listed in Table 3.1.4-I and Table 3.1.4-R. The default transfer syntax used is the one with which the instance has been stored. The user may decide to change it from the user interface during the export activity.

AUGMENTED AND PRIVATE APPLICATION PROFILES

MEDIA AE does not support any augmented for private application profiles.

MEDIA CONFIGURATION

The AE Title of the CardioPACS Workstation is configured upon first launch and used by all local AEs.

5. SUPPORT OF CHARACTER SETS

The following Character Sets (with or without ISO 2022 Extensions) are supported:

Character Set Description	Defined Term
Default	ISO_IR 6
Latin alphabet No. 1	ISO_IR 100
Latin alphabet No. 2	ISO_IR 101
Latin alphabet No. 3	ISO_IR 109
Latin alphabet No. 4	ISO_IR 110
Latin alphabet No. 5	ISO_IR 148
Cyrillic	ISO_IR 144
Arabic	ISO_IR 127
Greek	ISO_IR 126
Hebrew	ISO_IR 138
Japanese (Katakana)	ISO_IR 13
Japanese (Kanji)	ISO_IR 87
Japanese (Kanji Supp.)	ISO_IR 159
Thai	ISO_IR 166
Korean	ISO_IR 149
Chinese	GB18030
UTF-8 (Unicode)	ISO_IR 192

The above Character Sets are supported for both Composite SOP Instance storage and display as well as for C-FIND requests. Support is dependent on the installation of the Character Set support for the underlying Operating System.

Composite SOP Instances using unsupported character sets will be accepted but all unknown characters will be show with the corresponding octal value.

CardioPACS Server can be configured to respond with specific individually configured Character Sets (limited to Character Sets without extensions) to the different Application Entities with which it interacts. Such configuration will be applied also to C-FIND responses.

6. SECURITY

It is assumed that the CardioPACS systems are used within a secured environment. It is assumed that a secured environment includes at a minimum:

- Firewall or router protections to ensure that only approved external hosts have network access to CardioPACS Servers or Workstations.
- Firewall or router protections to ensure that CardioPACS Servers or Workstations only have network access to approved external hosts and services.
- Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g. such as a Virtual Private Network (VPN))

Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

SECURITY PROFILES

None supported.

ASSOCIATION LEVEL SECURITY

The Q/R AE and the STORAGE AE can both be configured to check the following DICOM values when determining whether to accept Association Open Requests:

- Calling AE Title
- Called AE Title
- Application Context

Each AE can be configured to accept Association Requests from only a limited list of Calling AE Titles. The different AEs can have different lists. Each AE can be configured to check that the Association requestor specifies the correct Called AE Title for the SCP.

APPLICATION LEVEL SECURITY

Any additional support for Application Level that applies to DICOM communication (e.g. password, biometrics) is not applicable.

7. ANNEXES

IOD CONTENTS

7.1.1 Created SOP Instance(s)

CardioPACS Workstation can create two types of SOP Instances:

- a) DICOM Structured Reports
- b) DICOM Encapsulated PDF Documents

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:

SEL	the attribute value source is the selected item (Patient, Study, Series, Instance)
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 that use for Modality Performed Procedure Step
CONFIG	the attribute value source is a configurable parameter

7.1.1.1. Common Modules

Table 7.1.1-A Patient Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	From selected patient. Maximum 64 characters.	VNAP	SEL
Patient ID	(0010,0020)	LO	From selected patient. Maximum 64 characters.	VNAP	SEL
Patient's Birth Date	(0010,0030)	DA	From selected patient.	VNAP	SEL
Patient's Sex	(0010,0040)	CS	From selected or user input	VNAP	SEL/ USER

Table 7.1.1-B General Study Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	From selected study.	ALWAYS	SEL
Study Date	(0008,0020)	DA	From selected study.	ALWAYS	SEL
Study Time	(0008,0030)	TM	From selected study.	ALWAYS	SEL
Referring Physician's Name	(0008,0090)	PN	From selected study.	ANAP	SEL
Study ID	(0020,0010)	SH	From selected study.	ANAP	SEL
Accession Number	(0008,0050)	SH	From selected study.	ANAP	SEL
Study Description	(0008,1030)	LO	From selected study.	ANAP	SEL

Table 7.1.1-C Patient Study Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Age	(0010,1010)	AS	User input or calculated from DoB input on base of actual Date	ANAP	SEL/USER
Patient's Height	(0010,1020)	DS	From selected study or user input	ANAP	SEL/USER
Patient's Weight	(0010,1030)	DS	From selected study or user input	ANAP	SEL/USER

Table 7.1.1-D General Series Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	SR	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Generated by device	ALWAYS	AUTO
Series Number	(0020,0011)	IS	Generated by device	ALWAYS	AUTO
Series Date	(0008,0021)	DA	<yyyymmdd>	ALWAYS	AUTO
Series Time	(0008,0031)	TM	<hhmmss>	ALWAYS	AUTO

Table 7.1.1-E General Equipment Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	MediMatic	ALWAYS	AUTO

7.1.1.2. Structured Reports

Table 7.1.1-F SOP Common Module of Created Structured Report

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	(0008,0005)	CS	Selected by configuration or user input.	ALWAYS	CONFIG/USER
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

Table 7.1.1-G SR Document General Module of Created Structured Report

Attribute Name	Tag	VR	Value	Presence of Value	Source
Content Date	(0008,0023)	DA	<yyyymmdd>	ALWAYS	AUTO
Content Time	(0008,0033)	TM	<hhmmss>	ALWAYS	AUTO
Instance Number	(0020,0013)	IS	Generated by device	ALWAYS	AUTO
Completion Flag	(0040,A491)	CS	PARTIAL/COMPLETE	ALWAYS	USER
Completion Flag Description	(0040,A492)	LO	Description to indicate if the report is also in its finalized form.	ANAP	AUTO
Verification Flag	(0040,A493)	CS	UNVERIFIED/VERIFIED	ALWAYS	USER

Additional IODs will also be present based on the configured templates used.

7.1.1.3. Encapsulated PDF Documents

Table 7.1.1-H SOP Common Module of Created Encapsulated PDF

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	(0008,0005)	CS	Selected by configuration or user input.	ALWAYS	CONFIG/USER
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.104.1	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Generated by device	ALWAYS	AUTO

Table 7.1.1-I SR Document General Module of Created Structured Report

Attribute Name	Tag	VR	Value	Presence of Value	Source
Content Date	(0008,0023)	DA	<yyyymmdd>	ALWAYS	AUTO
Content Time	(0008,0033)	TM	<hhmmss>	ALWAYS	AUTO
Instance Number	(0020,0013)	IS	Generated by device	ALWAYS	AUTO
Burned In Annotation	(0028,0301)	CS	YES/NO	VNAP	AUTO
Document Title	(0042,0010)	ST	Based on configuration	ALWAYS	CONFIG
Verification Flag	(0040,A493)	CS	UNVERIFIED/VERIFIED	ALWAYS	USER
Mime Type	(0042,0012)	LO	application/pdf	ALWAYS	AUTO
Encapsulated Document	(0042,0011)	OB	Document Stream	ALWAYS	AUTO

7.1.2 Usage Attributes from Received IOD's

7.1.2.1. CardioPACS Workstation

SOP Instances conforming to the following Composite Image SOP Classes are fully supported for display on the system workstations.

Table 7.1.2-A Significant Elements in Received Composite SOP Instances

Module	Attribute Name	Tag ID	Type	Significance
Patient	Patient Name	(0010,0010)	Opt	CardioPACS Workstation distinguishes patients based on their names, ID, sex and DOB.
	Patient ID	(0010,0020)	Opt	CardioPACS Workstation distinguishes patients based on their names, ID, sex and DOB.
	Patient's Birth Date	(0010,0030)	Opt	CardioPACS Workstation distinguishes patients based on their names, ID, sex and DOB.
	Patient's Sex	(0010,0040)	Opt	
General Study	Study Instance UID	(0020,000D)	Mand	Must be provided.
	Study Date	(0008,0020)	Opt	
	Study Time	(0008,0030)	Opt	
	Study ID	(0020,0010)	Opt	
	Referring Physician's Name	(0008,0090)	Opt	
	Accession Number	(0008,0050)	Opt	
	Study Description	(0008,1030)	Opt	
General Series	Series Instance UID	(0020,000E)	Mand.	
	Series Date	(0008,0021)	Opt	
	Series Time	(0008,0031)	Opt	
	Modality	(0008,0060)	Mand	
	Series Description	(0008,103E)	Opt	
	Performing Physician's Name	(0008,1050)	Opt	
	Operator's Name	(0008,1070)	Opt	
	Body Part Examined	(0018,0015)	Opt	
	Protocol Name	(0018,1030)	Opt	
	View Position	(0018,5101)	Opt	
General Image	Image Type	(0008,0008)	Opt	
Image Plane	Pixel Spacing	(0028,0030)	Opt	Used for automatic scaling of measurement tool if specified in an image SOP Instance.
US Region Calibration	Sequence of Ultrasound Regions	(0018,6011)	Opt	Used for automatic scaling of measurement tool if specified in an Ultrasound or Ultrasound Multiframe Image SOP Instance.

Module	Attribute Name	Tag ID	Type	Significance
Image Pixel	Photometric Interpretation	(0028,0004)	Cond	The following photometric interpretations are supported for image display purposes: MONOCHROME1, MONOCHROME2, RGB, PALETTE COLOR, YBR FULL 422, and YBR FULL. Required if SOP Instance is an Image.
	Bits Allocated	(0028,0100)	Cond	Must be 8 or 16 bits for image display purposes. Required if SOP Instance is an Image.
	Bits Stored	(0028,0101)	Cond	All values of 16 or fewer are supported for image display purposes. Required if SOP Instance is an Image.
VOI LUT	Window Center	(0028,1050)	Opt	It is recommended that this value be defined for images that have greater than 8 bits stored per pixel sample for image display
	Window Width	(0028,1051)	Opt	It is recommended that this value be defined for images that have greater than 8 bits stored per pixel sample for image display
SOP Common	SOP Instance UID	(0008,0018)	Mand	Must be provided and be unique.
	SOP Class UID	(0008,0016)	Mand,	Must be provided and be unique.

7.1.2.2. CardioPACS Server

SOP Instances conforming to the following Composite Image SOP Classes are fully supported for storage and retrieval on the system workstations.

Table 7.1.2-B Significant Elements in Received Composite SOP Instances

Module	Attribute Name	Tag ID	Type	Significance
Patient	Patient Name	(0010,0010)	Opt	CardioPACS Workstation distinguishes patients based on their names, ID, sex and DOB. Names will be parsed correctly if they are in the format of 'lname^fname^mname^prefix^suffix.'. If space separation is used (i.e. 'lname fname') then the entire name will be treated as the last name.
	Patient ID	(0010,0020)	Opt	STORAGE AE can be configured to apply a default value if there is no value specified or to coerce the value if the ID is already in use for a patient with different name, DOB or sex.
	Patient's Birth Date	(0010,0030)	Opt	
	Patient's Sex	(0010,0040)	Opt	

Module	Attribute Name	Tag ID	Type	Significance
General Study	Study Instance UID	(0020,000D)	Mand	Must be provided. STORAGE AE can be configured to coerce the value if the UID is already in use for a study with a different date (and optionally time).
	Study Date	(0008,0020)	Opt	
	Study Time	(0008,0030)	Opt	
	Study ID	(0020,0010)	Opt	
	Referring Physician's Name	(0008,0090)	Opt	
	Accession Number	(0008,0050)	Opt	
	Study Description	(0008,1030)	Opt	
General Series	Series Instance UID	(0020,000E)	Mand.	Must be provided. STORAGE AE can be configured to coerce the value if the UID is already in use for a series with a different modality
	Series Date	(0008,0021)	Opt	
	Series Time	(0008,0031)	Opt	
	Modality	(0008,0060)	Mand	
	Series Description	(0008,103E)	Opt	
	Performing Physician's Name	(0008,1050)	Opt	
	Operator's Name	(0008,1070)	Opt	
	Body Part Examined	(0018,0015)	Opt	
	Protocol Name	(0018,1030)	Opt	
View Position	(0018,5101)	Opt		
General Image	Image Type	(0008,0008)	Opt	
Image Plane	Pixel Spacing	(0028,0030)	Opt	Used for automatic scaling of measurement tool if specified in an image SOP Instance.
US Region Calibration	Sequence of Ultrasound Regions	(0018,6011)	Opt	Used for automatic scaling of measurement tool if specified in an Ultrasound or Ultrasound Multiframe Image SOP Instance.
Image Pixel	Photometric Interpretation	(0028,0004)	Cond	The following photometric interpretations are supported for image display purposes: MONOCHROME1, MONOCHROME2, RGB, PALETTE COLOR, YBR FULL 422, and YBR FULL. Required if SOP Instance is an Image.
	Bits Allocated	(0028,0100)	Cond	Must be 8 or 16 bits for image display purposes. Required if SOP Instance is an Image.

Module	Attribute Name	Tag ID	Type	Significance
	Bits Stored	(0028,0101)	Cond	All values of 16 or fewer are supported for image display purposes. Required if SOP Instance is an Image.
VOI LUT	Window Center	(0028,1050)	Opt	It is recommended that this value be defined for images that have greater than 8 bits stored per pixel sample for image display
	Window Width	(0028,1051)	Opt	It is recommended that this value be defined for images that have greater than 8 bits stored per pixel sample for image display
SOP Common	SOP Instance UID	(0008,0018)	Mand	Must be provided and be unique.
	SOP Class UID	(0008,0016)	Mand,	Must be provided and be unique.

7.1.3 Attribute Mapping

Not applicable.

7.1.4 Coerced/Modified Fields

Table 7.1.4-A Coerced Field by CardioPACS Server

Module	Attribute Name	Tag ID	Description
Patient	Patient ID	(0010,0020)	STORAGE AE can be configured to coerce this value if it conflicts with existing patients (identified by name, dob, id and sex). A ".CPSxxxxx" will be added to the coerced ID.
General Study	Study Instance UID	(0020,000D)	STORAGE AE can be configured to coerce this value if it conflicts with existing studies (identified by accession number, study date - and/or time and related Patient ID).
General Series	Series Instance UID	(0020,000E)	STORAGE AE can be configured to coerce this value if it conflicts with existing series (identified by modality and related Patient ID and Study Instance UID).
SOP Common	SOP Instance UID	(0008,0018)	STORAGE AE can be configured to coerce this value if it conflicts with existing series (identified by related Patient ID, Study Instance UID and Series Instance UID).

7.1.5 DATA DICTIONARY OF PRIVATE ATTRIBUTES

No private attributes are defined.

CODED TERMINOLOGY AND TEMPLATES

CardioPACS Structured Reports depend on external files that are configured at installation time. These files determine the templates supported, the context groups used and recognized, the private code definitions as well as user interface and printing layout information.

7.1.6 Context Groups

CARDIOPACS context groups used in Structured Reports are entirely dependent on CardioPACS Server configuration.

7.1.7 Templates Specifications

CARDIOPACS template specifications used in Structured Reports are entirely dependent on CardioPACS Server configuration.

7.1.8 Private Code Definitions

CARDIOPACS private code definitions used in Structured Reports are entirely dependent on CardioPACS Server configuration.

GRAYSCALE IMAGE CONSISTENCY

CARDIOPACS does not support the Grayscale Standard Display Function.

STANDARD EXTENDED/SPECIALIZED/PRIVATE SOP CLASSES

None

PRIVATE TRANSFER SYNTAXES

CARDIOPACS optionally supports the following private transfer syntaxes:

Table 7.1.8-A Private Transfer Syntaxes

Private Transfer Syntaxes	
Name	UID
CardioPACS Proprietary Web 1 Compression	1.2.840.114236.4.1.1