

RAIM Server

Versió 5.6

DICOM Conformance Statement

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UDIAT Centre Diagnòstic SA, Centre d'Imatge Mèdica Digital
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0. Cover page

Company name:	UDIAT Centre Diagnòstic S.A.
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1. Conformance Statement Overview

The RAIMServer is a self-contained networked computer system used for archiving diagnostic medical images. It allows external systems to send images to it for permanent storage, retrieve information about such images, and retrieve the images themselves. The system conforms to the DICOM standard to allow the sharing of medical information with other digital imaging systems.

NETWORK SERVICES		
SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Computed Radiography Image Storage	YES	YES
CT Image Storage	YES	YES
Digital Mammography XRay Image Storage For Presentation	YES	YES
Digital Mammography XRay Image Storage For Processing	YES	YES
Digital Xray ImageStorageForPresentation	YES	YES
Digital XRay Image Storage For Processing	YES	YES
MR Image Storage	YES	YES
Multiframe Color Secondary Capture Image Storage	YES	YES
Multiframe Grayscale Byte Secondary Capture Image Storage	YES	YES
Multiframe Grayscale Word Secondary Capture Image Storage	YES	YES
Multiframe Single Bit Secondary Capture Image Storage	YES	YES
Nuclear Medicine Image Storage	YES	YES
Nuclear Medicine Image Storage Retired	YES	YES
Secondary Capture Image Storage	YES	YES
Ultrasound Image Storage	YES	YES
Ultrasound Image Storage Retired	YES	YES
Ultrasound Multiframe Image Storage	YES	YES
Ultrasound Multiframe Image Storage Retired	YES	YES
XRay Angiographic BiPlane Image Storage Retired	YES	YES
XRay Angiographic Image Storage	YES	YES
XRay Radiofluoroscopic Image Storage	YES	YES
Query/Retrieve		
PatientRoot QueryRetrieve Information Model FIND	NO	YES
StudyRoot QueryRetrieve Information Model FIND	NO	YES
PatientStudyOnly QueryRetrieve Information Model FIND	NO	YES
PatientRoot QueryRetrieve Information Model MOVE	NO	YES
StudyRootQuery Retrieve Information Model MOVE	NO	YES
PatientStudyOnly QueryRetrieve Information Model MOVE	NO	YES
Workflow Management		
Modality Worklist Information Model FIND	NO	YES
Storage Commitment Push Model	NO	YES
MPPS		

Modality Performance Procedure Step	YES	YES
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3. Introduction

3.1. Revision history

<i>Document version</i>	<i>Date</i>	<i>Author</i>	<i>Description</i>
1	20060301	Connectivitat-IHE	Version for final text
2	20060228	Connectivitat-IHE	Revision for Connectathon 2006
3	20070228	Connectivitat-IHE	MPPS and Revision for Connectathon 2007

3.2. Audience

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

3.3. Remarks

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

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

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

The user should be aware of the following important issues:

- The comparison of different Conformance Statements is the first step towards assessing interconnectivity between RAIMServer and other DICOM conformant equipment.
- Test procedures should be defined to validate the desired level of connectivity.

3.4. Definitions, terms and abbreviations

AE Application Entity

CR Computerized radiography

CT Computerized Tomography

DICOM Digital Imaging and Communications in Medicine

IE Information Entity

IOD Information Object Definition

ISO International Standards Organization

MR Magnetic Resonance
PDU Protocol Data Unit
SC Secondary Capture
SCP Service Class Provider
SCU Service Class User
SOP Service-Object Pair
TCP/IP Transmission Control Protocol/Internet Protocol
UID Unique Identifier
US Ultrasound
VM Value Multiplicity
VR Value Representation

4. Networking

4.1. Implementation model

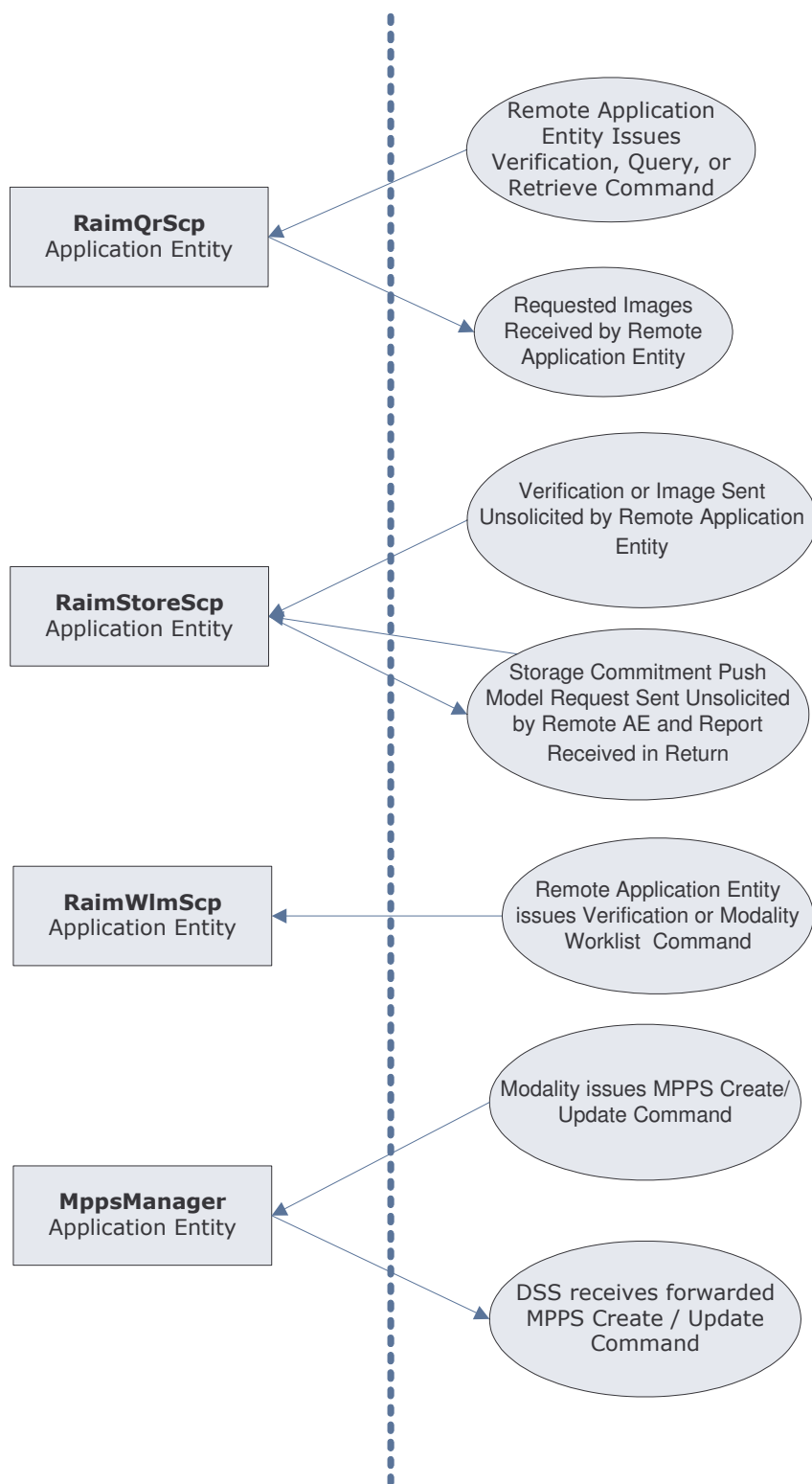
4.1.1. Application data flow

The division of RAIMServer into the separate DICOM Application Entities represents a somewhat arbitrary partitioning of functionality. For the purpose of this document they are organized in this manner so as to detail their independent logical functionality.

By default all of the defined Application Entities have different AE Titles.

The Application Entities detailed in the Application Data Flow Diagram are all Windows 2003 Server applications.

- The RaimQrScp 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 RaimQrScp can send Composite SOP Instances to send the requested Images to the destination specified by the Remote AE. The RaimQrScp AE functions as an SCP for C-FIND and C-MOVE requests and as an SCU for C-STORE.
- The RaimStoreScp AE can receive incoming DICOM images and add them to the RaimServer database. It can respond to external Storage and Verification Requests as a Service Class Provider (SCP) for C-STORE and C-ECHO requests. The RaimStoreScp AE can also handle Storage Commitment Push Model Requests. It can thus be used to query whether the Raim Server will confirm ownership and responsibility for specific Composite SOP Instances.



4.1.2. Functional definition of AEs

4.1.2.1. Functional definition of RaimQrScp Application Entity

The RaimQrScp AE waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, RaimQrScp AE expects it to be

a DICOM application. RaimQrScp AE 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 RAIMServer 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 RaimQrScp AE transfers specific images to a remote destination AE. The RaimQrScp AE must be correctly configured with the host and port number of any external DICOM AE's that are to be C-MOVE retrieval destinations. The Presentation Contexts to use are determined from the headers of the DICOM files to be transferred. Some conversion of the DICOM image objects is possible if the original Presentation Context is not supported by the remote destination AE or if compression is preferred.

4.1.2.2. *Functional definition of RaimStoreScp*

The RaimStoreScp AE waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the RaimStoreScp AE expects it to be a DICOM application. The RaimStoreScp AE 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 RAIMServer database. If a Storage Commitment Push Model N-ACTION Request is received then the RaimStoreScp AE will immediately check if the referenced Composite SOP Instances are in the RaimServer database and return an N-EVENT-REPORT Notification.

4.1.2.3. *Funcional definition of MPPSManager*

The MPPSManager receives the workflow messages sent by the modality which are serialized and sends them to the DSS. The MPPSManager will accept Association with Presentation Contexts for Verification and Modality Performed Procedure Step Service Classes.

If a MPPS N-CREATE Request is received then the MPPSManager will create an instance and its attributes; if a MPPS N-SET Request is received then the MPPSManager will update the instance attributes.

4.1.3. Sequencing of real-world activities

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

Note that the only constraint is for the Composite SOP Instance to be received prior to the other events. For example, it is not necessary for the Storage Commitment Push Model Request to be received prior to receiving Query or Retrieval Requests related to the SOP Instance.

4.2. AE Specifications

4.2.1. RaimWlm Application Entity Specification

4.2.1.1. SOP Classes

The RaimWlmScp AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Classes for RaimWlmScp

SOP Class Name	SOP Class UID	SCU	SCP
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	No	Yes

4.2.1.2. Association establishment policies

4.2.1.2.1. General

The RaimWlmScp AE will accept Associations for Verification and C-FIND requests; it only accepts Association Requests from external DICOM AEs.

The DICOM standard Application Context Name for DICOM 3.0 is always accepted:

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

4.2.1.2.2. Number of associations

The RaimWlmScp AE can support multiple simultaneous Associations. Each time the RaimWlmScp 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. The default maximum is 10 in total.

Maximum number of simultaneous Associations	10
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4.2.1.2.3. Asynchronous nature

The RaimWlmScp 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.

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
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4.2.1.2.4. Implementation Identifying Information

The implementation information for the Application Entity is:

Implementation Class UID	1.2.826.0.1.3680043.2.403.1.40.1.2.0.0
Implementation Version Name	RAIMDicom_1.4

This Version Name is updated with each new release of the product software.

4.2.1.3. Association Acceptance Policy

4.2.1.3.1. Activity – Handling Query Requests

4.2.1.3.1.1. Description and sequencing of activity

The RAIMQRSCP 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. If RAIMQRSCP 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.

4.2.1.3.1.2. Accepted presentation contexts

RaimWlmScp AE will accept Presentation Contexts as shown in the following table:

4.2.1.4.

ACCEPTED PRESENTATION CONTEXTS BY THE RaimWlmScp

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCP	None
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCP	None

4.2.1.5. SOP Specific Conformance for Worklist SOP Classes

RaimWlmScp queries are forwarded to RIS agendas. Attributes settings depend on RIS configuration.

4.2.2. RaimQrScp Application Entity Specification

4.2.2.1. SOP Classes

The RaimQrScp AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Classes for RaimQrScp

SOP Class Name	SOP Class UID	SCU	SCP
PatientRoot QueryRetrieve Information Model FIND	1.2.840.10008.5.1.4.1.2.1.1	No	Yes
StudyRoot QueryRetrieve Information Model FIND	1.2.840.10008.5.1.4.1.2.2.1	No	Yes
PatientStudyOnly QueryRetrieve Information Model FIND	1.2.840.10008.5.1.4.1.2.3.1	No	Yes
PatientRoot QueryRetrieve Information Model MOVE	1.2.840.10008.5.1.4.1.2.1.2	No	Yes
StudyRootQuery Retrieve Information Model MOVE	1.2.840.10008.5.1.4.1.2.2.2	No	Yes
PatientStudyOnly QueryRetrieve Information Model MOVE	1.2.840.10008.5.1.4.1.2.3.2	No	Yes

4.2.2.2. Association establishment policies

4.2.2.2.1. General

The RaimQrScp AE will accept Associations for Verification, C-FIND, and C-MOVE requests; it only accepts Association Requests from external DICOM AEs.

In the case of a C-MOVE request, the RaimQrScp AE will 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:

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

4.2.2.2.2. Number of associations

The RaimQrScp AE can support multiple simultaneous Associations. Each time the RaimQrScp 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. The default maximum is 10 in total.

Maximum number of simultaneous Associations	10
---	----

4.2.2.2.3. Asynchronous nature

The RaimQrScp 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.

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

4.2.2.2.4. Implementation Identifying Information

The implementation information for the Application Entity is:

Implementation Class UID	1.2.826.0.1.3680043.2.403.1.40.1.2.0.0
Implementation Version Name	RAIMDicom_1.4

This Version Name is updated with each new release of the product software.

4.2.2.3. Association Initiation Policy

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

4.2.2.3.1.1. Description and sequencing of activity

The RaimQrScp AE will initiate a new Association when needs to satisfy a 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 RaimQrScp AE will not attempt to independently retry the image export.

Note that the RaimQrScp 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.

The following sequencing constraints illustrated in Figure apply to the RaimQrScp AE:

1. Peer AE requests retrieval of Study, Series, or Images from RAIMQRSCP AE (C-MOVE-RQ).
2. Instances indicated in the C-MOVE-RQ to the C-MOVE Destination AE.
3. RaimQrScp AE opens a new Association with the indicated C-MOVE Destination AE.
4. RaimQrScp AE sends the indicated Composite SOP Instances.
5. RaimQrScp 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.

4.2.2.3.1.2. Proposed Presentation Contexts

RaimQrScp AE will propose Presentation Contexts as shown in the following table:

PROPOSED PRESENTATION CONTEXTS BY THE RaimQrScp

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Digital XRay Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Digital Xray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		

Digital Mammography XRay Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.2	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Digital Mammography XRay Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Ultrasound Multiframe Image Storage Retired	1.2.840.10008.5.1.4.1.1.3	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		RLELossless	1.2.840.10008.1.2.5		
Ultrasound Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		RLELossless	1.2.840.10008.1.2.5		
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Nuclear Medicine Image Storage Retired	1.2.840.10008.5.1.4.1.1.5	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Ultrasound Image Storage Retired	1.2.840.10008.5.1.4.1.1.6	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		RLELossless	1.2.840.10008.1.2.5		
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		RLELossless	1.2.840.10008.1.2.5		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEGBaseline	1.2.840.10008.1.2.4.50		
Multiframe Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Multiframe Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Multiframe Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None

		JPEGBaseline	1.2.840.10008.1.2.4.50		
XRay Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
XRay Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
XRay Angiographic BiPlane Image Storage Retired	1.2.840.10008.5.1.4.1.1.12.3	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		

Note: The SOP Classes and Transfer Syntaxes that the RaimQrScp AE proposes, as listed above, represent the default behavior. The default behavior is to determine the Transfer Syntaxes the SCP can accept as opposed to which it prefers (every proposed Presentation Context has a unique SOP Class and one or more Transfer Syntaxes).

4.2.2.3.1.3. Specific Conformance for Image SOP Classes

Composite DICOM SOP Instances are maintained as DICOM Part 10 compliant files in the RAIMServer database. The entire set of tags received with the image will be saved in RAIMServer; this includes all Private and SOP Extended Elements. When a SOP Instance is selected for export from RAIMServer, 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 RAIMServer 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. Refer to the Annex for the specific details of which Elements can have their values altered at time of export.

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

All Status Codes indicating an error or refusal are treated as a permanent failure. The STORAGE-SCU AE never automatically resends images when an error Status Code is returned in a C-STORE Response.

4.2.2.4. Association Acceptance Policy

4.2.2.4.1. Activity – Handling Query and Retrieval Requests

4.2.2.4.1.1. Description and sequencing of activity

The RaimQrScp 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.

If RaimQrScp 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 RaimQrScp 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 RaimQrScp AE creates a new thread to send the requested SOP Instances to the C-MOVE Destination. That thread notifies its creator thread of the success or failure of each attempt to send a Composite SOP Instance to the peer C-MOVE Destination AE. The RaimQrScp AE then sends a C-MOVE Response indicating this status after each attempt. Once the sender thread has finished attempting to transfer all the requested SOP Instances, the RaimQrScp AE sends a final C-MOVE Response indicating the overall status of the attempted retrieval.

1. Peer AE opens an Association with the RaimQrScp AE.
2. Peer AE sends a C-FIND-RQ Message
3. RaimQrScp 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-FINDRQ. 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.

Sequencing constraints for RaimQrScp AE handling retrievals (C-MOVE-Requests):

1. Peer AE opens an Association with the RaimQrScp AE.
2. Peer AE sends a C-MOVE-RQ Message
3. RaimQrScp AE creates a thread 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, sender thread AE indicates to the main thread whether the transfer succeeded or failed. The RaimqRScp AE then returns a C-MOVE-RSP indicating this success or failure.
5. Once the sender thread AE has completed all attempts to transfer the SOP Instances to the C-MOVE Destination AE, or the first failure occurred, the RaimQrScp 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 RaimQrScp 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 (see PS 3.8, Section 9.3.4). 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)

ASSOCIATION REJECTION REASONS			
Result	Source	Reason/Diag	Explanation
2 – rejectedtransient	c	2 – local-limitexceeded	The (configurable) maximum number of simultaneous Associations has been reached. An Association request with the same parameters may succeed at a later time.
2 – rejectedtransient	c	1 – temporarycongestion	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 – rejectedpermanent	a	2 – applicationcontext-namenot-supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will not succeed at a later time.

4.2.2.4.1.2. Accepted presentation contexts

RaimQrScp AE will accept Presentation Contexts as shown in the following table:

ACCEPTED PRESENTATION CONTEXTS BY THE RaimQrScp AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCP	None
PatientRoot QueryRetrieve Information Model FIND	1.2.840.10008.5.1.4.1.2.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCP	None
StudyRoot QueryRetrieve InformationModel FIND	1.2.840.10008.5.1.4.1.2.2.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCP	None
PatientStudyOnly QueryRetrieve InformationModel FIND	1.2.840.10008.5.1.4.1.2.3.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCP	None
PatientRoot QueryRetrieve Information Model MOVE	1.2.840.10008.5.1.4.1.2.1.2	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCP	None
StudyRoot QueryRetrieve Information Model MOVE	1.2.840.10008.5.1.4.1.2.2.2	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCP	None

PatientStudyOnly QueryRetrieve Information Model MOVE	1.2.840.10008.5.1.4.1.2.3.2	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCP	None
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4.2.2.4.1.3. SOP Specific Conformance for Query SOP Classes

The RAIMQRSCP AE supports hierarchical queries and not relational queries.

The following attributes are returned by default. More attributes shall be returned by default if configured to do so.

Attributes always returned

Level name / Attribute name	Tag	VR	Notes
Accession Number	0008,0050	SH	At STUDY, SERIES or IMAGE level only
Retrieve AE Title	0008,0054	AE	
Storage Media File Set ID	0088,0130	SH	

Query responses always return values from the RaimQrScp 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 C-FIND SCP SUPPORTED ELEMENTS

Level name / Attribute name	Tag	Type	VR	matching	return
SOP Common Specific Character Set	0008,0005		CS		
Patient Level					
Patient's Name	0010,0010	R	PN	*	
Patient ID	0010,0020	R	LO	*	
Patient's Birth Date	0010,0030	O	DA	*	
Patient's Sex	0010,0040	O	CS	*	
Number of Patient Related Studies	0020,1200	O	IS		*
Number of Patient Related Series	0020,1202	O	IS		*
Number of Patient Related Instances	0020,1204	O	IS		*
Study Level					
Study Date	0008,0020	R	DA	*	
Study Time	0008,0030	R	TM	*	
Accession Number	0008,0050	R	SH	*	
Study ID	0020,0010	R	SH	*	
Study Instance UID	0020,000D	R	UI	*	
Modalities in Study	0008,0061	R	CS	*	
Referring Physician's Name	0008,0090	R	PN	*	
Study Description	0008,1030	O	LO	*	
Number of Study Related Series	0020,1206	O	IS		*
Number of Study Related Instances	0020,1208	O	IS		*
Series Level					
Modality	0008,0060	R	CS	*	
Series Number	0020,0011	R	IS	*	

Series Instance UID	0020,000E	R	UI	*	
Number of Series Related Instances	0020,1209	O	IS		*
Requested Attribute Sequence	0040,0275	R	IS	*	
>Requested Procedure ID	0040,1001	R	IS	*	
>Scheduled Procedure Step ID	0040,0009	R	IS	*	
Scheduled Procedure Step Start Date	0040,0244	R	DA	*	
Scheduled Procedure Step Start Time	0040,0245	R	TM	*	
Series Description	0008,103E	O	LO	*	
Image Level					
Instance Number	0020,0013	R	IS	*	
SOP Instance UID	0008,0018	R	UI	*	
SOP Class UID	0008,0016	R	UI	*	
Rows	0028,0010	O	US		*
Columns	0028,0011	O	US		*
Bits Allocated	0028,0100	O	US		*
Number of Frames	0028,0008	O	IS		*

STUDY ROOT C-FIND SCP SUPPORTED ELEMENTS

Level name / Attribute name	Tag	Type	VR	matching	return
SOP Common Specific Character Set	0008,0005		CS		
Study Level					
Patient's Name	0010,0010	R	PN	*	
Patient ID	0010,0020	R	LO	*	
Patient's Birth Date	0010,0030	O	DA	*	
Patient's Sex	0010,0040	O	CS	*	
Number of Patient Related Studies	0020,1200	O	IS		*
Number of Patient Related Series	0020,1202	O	IS		*
Number of Patient Related Instances	0020,1204	O	IS		*
Study Date	0008,0020	R	DA	*	
Study Time	0008,0030	R	TM	*	
Accession Number	0008,0050	R	SH	*	
Study ID	0020,0010	R	SH	*	
Study Instance UID	0020,000D	R	UI	*	
Modalities in Study	0008,0061	R	CS	*	
Referring Physician's Name	0008,0090	R	PN	*	
Study Description	0008,1030	O	LO	*	
Number of Study Related Series	0020,1206	O	IS		*
Number of Study Related Instances	0020,1208	O	IS		*
Series Level					
Modality	0008,0060	R	CS	*	
Series Number	0020,0011	R	IS	*	
Series Instance UID	0020,000E	R	UI	*	
Number of Series Related Instances	0020,1209	O	IS		*
Requested Attribute Sequence	0040,0275	R	IS	*	
>Requested Procedure ID	0040,1001	R	IS	*	
>Scheduled Procedure Step ID	0040,0009	R	IS	*	
Scheduled Procedure Step Start Date	0040,0244	R	DA	*	

Scheduled Procedure Step Start Time	0040,0245	R	TM	*	
Series Description	0008,103E	O	LO	*	
Image Level					
Instance Number	0020,0013	R	IS	*	
SOP Instance UID	0008,0018	R	UI	*	
SOP Class UID	0008,0016	R	UI	*	
Rows	0028,0010	O	US		*
Columns	0028,0011	O	US		*
Bits Allocated	0028,0100	O	US		*
Number of Frames	0028,0008	O	IS		*

PATIENT STUDY ONLY C-FIND SCP SUPPORTED ELEMENTS

Level name / Attribute name	Tag	Type	VR	matching	return
SOP Common Specific Character Set	0008,0005		CS		
Patient Level					
Patient's Name	0010,0010	R	PN	*	
Patient ID	0010,0020	R	LO	*	
Patient's Birth Date	0010,0030	O	DA	*	
Patient's Sex	0010,0040	O	CS	*	
Number of Patient Related Studies	0020,1200	O	IS		*
Number of Patient Related Series	0020,1202	O	IS		*
Number of Patient Related Instances	0020,1204	O	IS		*
Study Level					
Study Date	0008,0020	R	DA	*	
Study Time	0008,0030	R	TM	*	
Accession Number	0008,0050	R	SH	*	
Study ID	0020,0010	R	SH	*	
Study Instance UID	0020,000D	R	UI	*	
Modalities in Study	0008,0061	R	CS	*	
Referring Physician's Name	0008,0090	R	PN	*	
Study Description	0008,1030	O	LO	*	
Number of Study Related Series	0020,1206	O	IS		*
Number of Study Related Instances	0020,1208	O	IS		*
Series Level					
Modality	0008,0060	R	CS	*	
Series Number	0020,0011	R	IS	*	
Series Instance UID	0020,000E	R	UI	*	
Number of Series Related Instances	0020,1209	O	IS		*
Requested Attribute Sequence	0040,0275	R	IS	*	
>Requested Procedure ID	0040,1001	R	IS	*	
>Scheduled Procedure Step ID	0040,0009	R	IS	*	
Scheduled Procedure Step Start Date	0040,0244	R	DA	*	
Scheduled Procedure Step Start Time	0040,0245	R	TM	*	
Series Description	0008,103E	O	LO	*	

4.2.2.4.1.4. SOP Specific Conformance for Retrieval SOP Classes

The RaimQrScp AE conveys 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 perform C-STORE operations on specific images requested by the external C-MOVE SCU. One or more of the Image Storage Presentation Contexts listed in table will be negotiated.

The RaimQrScp AE can support lists of UIDs in the C-MOVE Request at the Study, Series, and Image Levels. The list of UIDs must be at the Level of the C-MOVE Request however. For example, if the C-MOVE Request is for Series Level retrieval but the identifier contains a list of Study UIDs 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 RaimQrScp AE will return a response to the C-MOVE SCU after attempting 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 but typically varies between 3 and 10 minutes.

4.2.3. RaimStoreScp Application Entity Specification

4.2.3.1. SOP Classes

The RaimStoreScp AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Classes for RaimQrScp			
SOP Class Name	SOP Class UID	SCU	SCP
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
Digital Mammography XRay Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.2	No	Yes
Digital Mammography XRay Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	No	Yes
Digital XRay ImageStorage For Presentation	1.2.840.10008.5.1.4.1.1.1.1	No	Yes
Digital XRay Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Multiframe Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	No	Yes
Multiframe Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	No	Yes
Multiframe Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	No	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	No	Yes
Nuclear Medicine Image Storage Retired	1.2.840.10008.5.1.4.1.1.5	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes
Ultrasound Image Storage Retired	1.2.840.10008.5.1.4.1.1.6	No	Yes
Ultrasound Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes
Ultrasound Multiframe Image Storage Retired	1.2.840.10008.5.1.4.1.1.3	No	Yes

XRay Angiographic BiPlane Image Storage Retired	1.2.840.10008.5.1.4.1.1.12.3	No	Yes
XRay Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	No	Yes
XRay Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	No	Yes

These are the default SOP Classes supported. By altering the configuration it is possible to support additional or fewer SOP Classes.

4.2.3.2. Association Policies

4.2.3.2.1. General

The RaimStoreScp AE can both accept and propose Association Requests. The RaimStoreScp AE will accept Association Requests for the Verification, Storage, and Storage Commitment Push Model Services. It will propose Associations only for the Storage Commitment Push Model Service.

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

Application Context Name	1.2.840.10008.3.1.1.1
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4.2.3.2.2. Number of associations

The RaimStoreScp AE can support multiple simultaneous Associations requested by peer AEs. Each time the RaimStoreScp AE receives an Association, a child thread will be spawned to process the Verification, Storage, or Storage Commitment Push Model Service requests. The maximum number of child threads, and thus the maximum number of simultaneous Associations that can be processed, is set by configuration. The default maximum number is 25 in total.

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

Maximum number of simultaneous Associations	10
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4.2.3.2.3. Asynchronous nature

The RaimStoreScp AE does not support asynchronous communication (multiple outstanding transactions over a single Association). The RaimStoreScp AE does permit an SCU to send multiple Storage Commitment Push Model Requests before it has sent back any N-EVENT-REPORT Notifications. However, the RaimStoreScp 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.

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
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There is no limit on the number of outstanding Storage Commitment Push Model Requests that can be received and acknowledged before the RaimStoreScp AE has responded with the corresponding NEVENT-REPORT Notifications.

OUTSTANDING STORAGE COMMITMENT PUSH MODEL REQUESTS FOR RaimStoreScp AE

Maximum number of outstanding Storage Commitment Requests for which no N-EVENT Notification has been sent	No Maximum Limit
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4.2.3.2.4. Implementation Identifying Information

The implementation information for this Application Entity is:

Implementation Class UID	1.2.826.0.1.3680043.2.403.1.40.1.2.0.0
Implementation Version Name	RAIMDicom_1.4

4.2.3.3. Association Initiation Policy

4.2.3.3.1. Activity – Send Storage Commitment Notification over new Association

4.2.3.3.1.1. Description and sequencing of activity

The RaimStoreScp AE will initiate a new Association if a Storage Commitment Push Model Notification (N-EVENT-REPORT) cannot be sent back over the original Association used to send the corresponding request. A new Association will always be requested by the RaimStoreScp AE in such cases even if the peer AE requests another Association after the original has been closed (i.e. A peer AE opens an Association and sends some Storage requests and a Storage Commitment Push Model request. Before the RaimStoreScp AE can send the Storage Commitment Push Model N-EVENT-REPORT the Association is closed. The peer AE then opens another Association and begins to send Storage requests. In such a case the RaimStoreScp AE will always initiate a new Association to send the N-EVENT-REPORT even though it could send the N-EVENT-REPORT over the new Association opened by the peer AE).

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-EVENTREPORT is sent. If there are multiple outstanding N-EVENT-REPORTs to be sent to a single peer AE then the RaimStoreScp 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-EVENTREPORTs 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 RaimStoreScp AE will attempt to resend an N-EVENT-REPORT is configurable, along with the amount of time to wait between attempts to resend.

If the RaimStoreScp AE sends a Notification request (N-EVENT-REPORT-RQ) over the original Association opened by the peer AE but receives a request to close the Association rather than a response to the Notification (N-EVENT-REPORT-RSP) then this is handled in the same way as if the request to close the Association had been received before trying to send the Notification request. Thus, the RaimStoreScp AE will then open a new Association to resend the Notification request.

4.2.3.3.1.2. Proposed presentation contexts

RaimStoreScp AE will propose Presentation Contexts as shown in the following table:

PROPOSED PRESENTATION CONTEXTS BY RaimStoreScp

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None

Storage Commitment Push Model	1.2.840.10008.1.20.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
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4.2.3.3.1.3. SOP Specific Conformance for Storage SOP Classes

The associated Activity with the Storage Commitment Push Model service is the communication by the RaimStoreScp 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 RAIMServer has taken responsibility for the archiving of specific SOP Instances so that they can be flushed from the peer AE system.

The RaimStoreScp AE will initiate a new Association to a peer AE that sent a Storage Commitment Push Model request if the original Association over which this was sent is no longer open.

4.2.3.4. Association Acceptance Policy

4.2.3.4.1. Activity – Receive Images and Storage Commitment Requests

4.2.3.4.1.1. Description and sequencing of activity

The RaimStoreScp 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.

The default behavior of the RaimStoreScp AE is to always attempt to send a Storage Commitment Push Model Notification (N-EVENT-REPORT) over the same Association opened by the peer AE to send the request (N-ACTION). If the RaimStoreScp AE receives a request to close the Association either before sending the Notification or before receiving the corresponding N-EVENT-REPORT-RSP then it will open a new Association to send the Notification.

4.2.3.4.1.2. Accepted Presentation Contexts

The default Behavior of the RaimStoreScp AE supports the Implicit VR Little Endian and Explicit VR Little Endian Transfer Syntaxes for all Associations. Also, JPEG Lossless compression syntax is supported for every grayscale image SOP Class.

Any of the Presentation Contexts shown in the following table are acceptable to the RAIMSTORESCP AE for receiving images.

ACCEPTED PRESENTATION CONTEXTS BY RaimStoreScp

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		

Digital XRay Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Digital Xray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Digital Mammography XRay Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.2	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Digital Mammography XRay Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Ultrasound Multiframe Image Storage Retired	1.2.840.10008.5.1.4.1.1.3	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		RLELossless	1.2.840.10008.1.2.5		
Ultrasound Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		RLELossless	1.2.840.10008.1.2.5		
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Nuclear Medicine Image Storage Retired	1.2.840.10008.5.1.4.1.1.5	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Ultrasound Image Storage Retired	1.2.840.10008.5.1.4.1.1.6	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		RLELossless	1.2.840.10008.1.2.5		
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		RLELossless	1.2.840.10008.1.2.5		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEGBaseline	1.2.840.10008.1.2.4.50		
Multiframe Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		

Multiframe Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Multiframe Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEGBaseline	1.2.840.10008.1.2.4.50		
XRay Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
XRay Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
XRay Angiographic BiPlane Image Storage Retired	1.2.840.10008.5.1.4.1.1.12.3	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		JPEG Lossless	1.2.840.10008.1.2.4.70		

4.2.3.4.1.2.1. SOP Specific Conformance for Verification SOP Class

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

4.2.3.4.1.2.2. SOP Specific Conformance for Storage SOP Classes

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

The RaimStoreScp 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 RaimStoreScp AE is configured to retain the original DICOM data in DICOM Part 10 compliant file format. 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 RAIMServer 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.

NOTE: If a failure condition does occur when handling an Association then all images previously received successfully over the Association are maintained in the RAIMServer database. No previously successfully received images are discarded. Even if an image is successfully received but an error occurs transmitting the C-STORE Response then this final image is maintained rather than discarded. If the loss of an Association is detected then the Association is closed.

4.2.3.4.1.2.3. SOP Specific Conformance for Storage Commitment SOP Class

The associated Activity with the Storage Commitment Push Model service is the communication by the RaimStoreScp 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 RAIMServer has taken responsibility for the archiving of specific SOP Instances so that they can be flushed from the peer AE system.

The RaimStoreScp 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 RAIMServer database. As long as the Composite SOP Instance UIDs are present in the database, the RaimStoreScp AE will consider those Composite SOP Instance UIDs to be successfully archived. The RaimStoreScp 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 RaimStoreScp 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 the same Association that was used by the peer AE to send the original N-ACTION Request. If the Association has already been released or Message transfer fails for some reason then the RaimStoreScp AE will attempt to send the N-EVENT-REPORT-RQ over a new Association. The RaimStoreScp AE will request a new Association with the peer AE that made the original N-ACTION Request.

The RAIMServer 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 RAIMServer and is dependent on the actual specifications of the purchased system.

4.2.4. MPPSManager Specification

4.2.4.1. SOP Classes

The MPPSManager provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Classes for RaimWImScp

SOP Class Name	SOP Class UID	SCU	SCP
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Yes	Yes

4.2.4.2. Association establishment policies

4.2.4.2.1. General

The MPPSManager will accept Associations for Verification, N-CREATE, and N-SET requests; it only accepts Association Requests from external DICOM AEs.

In the case that the MPPSManager is the SCU, it will initiate an Association with the DSS to send the workflow messages.

The DICOM standard Application Context Name for DICOM 3.0 is always accepted:

Application Context Name	1.2.840.10008.3.1.1.1
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4.2.4.2.2. Number of associations

The MPPSManager can support multiple simultaneous Associations. Each time the MPPSManager receives an Association, a child thread will be spawned to process the Verification or the Modality Performed Procedure Step request. The maximum number of child threads, and thus the maximum number of simultaneous Associations that can be processed, is set by configuration. The default maximum is 10 in total.

Maximum number of simultaneous Associations	10
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4.2.4.2.3. Asynchronous nature

The MPPSManager 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.

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
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4.2.4.2.4. Implementation Identifying Information

The implementation information for the Application Entity is:

Implementation Class UID	1.2.826.0.1.3680043.2.403.1.40.1.4.0.0
Implementation Version Name	RAIMDicom_1.4

This Version Name is updated with each new release of the product software.

4.2.4.3. Association Initiation Policy

4.2.4.3.1. Activity – Send Storage Commitment Notification over new Association

4.2.4.3.1.1. Description and sequencing of activity

The MPPSManager will initiate a new Association to forward to the DSS any workflow messages sent by the modalities. Possible messages are N-CREATE and N-SET.

If there are multiple outstanding workflow messages to be sent to the DSS then the MPPSManager will attempt to send each one in a different sequential Association. It will be one Association for each workflow message.

The DSS is expected to send a response for every workflow message and if any type of error occurs the value of the attribute status will be different of zero. After the error the MPPSManager will send a Release Request and the Association will be closed.

4.2.4.3.1.2. Proposed presentation contexts

RaimStoreScp AE will propose Presentation Contexts as shown in the following table:

PROPOSED PRESENTATION CONTEXTS BY RaimStoreScp

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Negotiation
Name	UID	Name	UID		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCU	None
		ExplicitVR LittleEndian	1.2.840.10008.1.2.1	SCU	None

4.2.4.3.1.3. SOP Specific Conformance for MPPS SOP Classes

After having received the workflow message, the MPPSManager has to send it in a different association to the DSS.

DICOM COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Successful completion of the N-SET or N-CREATE Request	0000	The response status code and meaning are logged in the job log file.
Failure	Processing Failure	XXXX	<ul style="list-style-type: none"> Log the response Retry message forwarding after configurable timespan. The span is three hours by default.

4.2.4.4. Association Acceptance Policy

4.2.4.4.1. Activity – Handling Query Requests

4.2.4.4.1.1. Description and sequencing of activity

The MPPSManager 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.

4.2.4.4.1.2. Accepted presentation contexts

MPPSManager will accept Presentation Contexts as shown in the following table:

ACCEPTED PRESENTATION CONTEXTS BY THE RaimWImScp

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCP	None
		ExplicitVRLittleEndian	1.2.840.10008.1.2.1	SCP	None
ModalityPerformed Procedure Step	1.2.840.10008.3.1.2.3.3	ImplicitVR LittleEndian	1.2.840.10008.1.2	SCP	None
		ExplicitVRLittleEndian	1.2.840.10008.1.2.1	SCP	NONE

4.2.4.5. SOP Specific Conformance for MPPS SOP Classes

The MPPSManager will send the workflow messages that has received by the modality. It never will do any change in these messages.

Code Value (0008,0100) = 110514 (Incorrect worklist entry selected) is not supported. If received, service status is set to 0110.

DICOM COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Reasons
Success	Successful completion of the N-SET or N-CREATE Request	0000	Message is successfully processed.
Failure	Processing Failure	0110	<ul style="list-style-type: none"> Internal error within RAIM Server. "Incorrect worklist entry selected". Option is not supported.

4.3. Configuration

4.3.1. AE Title/Presentation Address Mapping

4.3.1.1. Local AE Titles

The mapping from AE Title to TCP/IP addresses and ports is configurable and set at the time of installation by Installation Personnel.

4.3.1.2. Remote AE Title/Presentation Address Mapping

The mapping of external AE Titles to TCP/IP addresses and ports is configurable and set at the time

of installation by Installation Personnel. This mapping is necessary for resolving the IP address and port of C-MOVE Destination Application Entities and must be correctly configured for the RaimQrScp AE to correctly function as a C-MOVE SCP.

5. Media Interchange

RAIMServer does not support Media Storage.

6. Support of extended character sets

All RAIMServer DICOM applications support the following:

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