DICOM

CONFORMANCE STATEMENT

SERVER

For use with Version 3.0.0.5218

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EUM-026, Rev. B

1. OVERVIEW

imageSPECTRUM Server is the Server component of a Client and Server Image Management application developed by Canon Medical Systems (CMS).

imageSPECTRUM Server implements necessary DICOM ® compliant services to provide the following;

- Interface directly with DICOM Modalities (e.g., Eye Q Capture application, Retinal Imaging Control Software) and provide storage for patient study data and images.
- Provide imageSPECTRUM Review clients with filtered patient study lists and resulting study specific data and images for viewing and analysis.
- Append existing studies with derived images from imageSPECTRUM Review.

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1.1 Supported SOP Classes

Table 1-1 Supported SOP Classes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Ophthalmic Photography 8 Bit Image Storage	Yes	Yes
Visible Light Photographic Image Storage	Yes	Yes
Secondary Capture	Yes	Yes
Query and Retrieve Workflow Management		
Patient Root C-FIND	No	Yes
Study Root C-MOVE	No	Yes
Verification		
Verification	Yes	Yes
Print Management		
Structured Reporting	No	No

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5. INTRODUCTION

5.1 Audience

The imageSPECTRUM Server DICOM Conformance Statement is intended for:

- Software designers implementing DICOM interfaces
- System Integrators
- Marketing Staff
- Customers

Readers of this DICOM Conformance Statement are assumed to be familiar with the DICOM Standard.

5.2 Remarks

The DICOM Conformance Statement follows the contents and structure requirements of DICOM PS3.2.

5.3 Definitions, Terms, and Abbreviations

AE	Application Entity
CMS	Canon Medical Systems
DICOM	Digital Imaging and Communication in Medicine
IOD	Information Object Definition
NEMA	National Electrical Manufacturers Association
OP	Ophthalmic Photography
PDU	Protocol Data Unit
Q/R	Query and Retrieve
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
VR	Value Representation

5.4 References

DICOM Standard — The Digital Imaging and Communications in Medicine (DICOM) standard (NEMA PS 3.X): National Electrical Manufacturers Association (NEMA) Publication Sales 1300 N. 17th Street, Suite 1847 Rosslyn, VA 22209, United States of America

6. NETWORKING

6.1 Implementation Model

6.1.1 Application Data Flow

The imageSPECTRUM Server will act as a broker and storage device for DICOM modalities and DICOM review workstations. This entails data management functions and information request processing. See Figure 1.

imageSPECTRUM SERVER AE is responsible for supporting the following DICOM services as an SCP:

- Verification (C-ECHO)
- Q/R (C-FIND/C-MOVE)
- Storage (C-STORE)

imageSPECTRUM Review AE is responsible for supporting the following DICOM services as an SCU:

- Verification (C-ECHO)
- Storage (C-STORE)

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

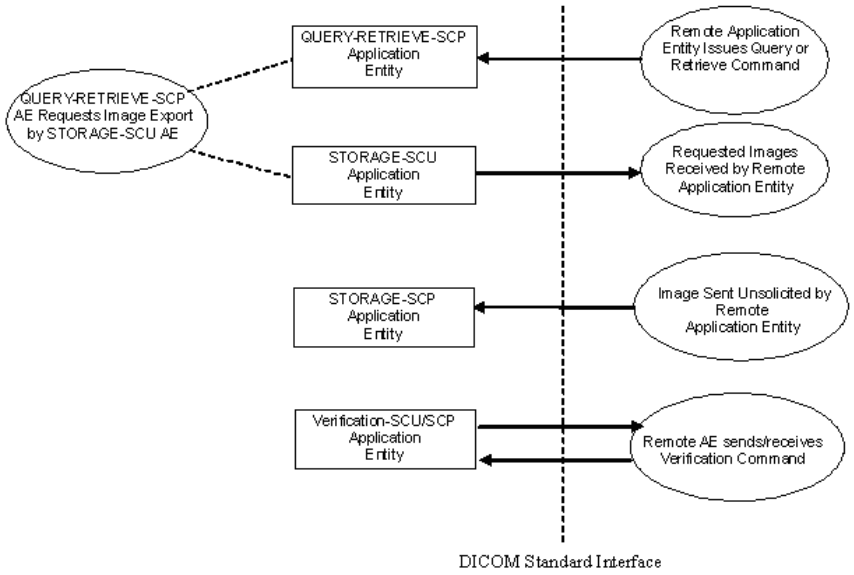

Figure 1 imageSPECTRUM Server Data Flow Diagram

There can be only one AE Title.

6.1.2 Functional Definition of Application Entities

6.1.2.1 Functional Definition of STORAGE SCP Application Entity

The modalities will transfer images and study related data to imageSPECTRUM Server for storage management. imageSPECTRUM Review functions may transfer derived images to imageSPECTRUM Server for storage management as additions to existing studies.

6.1.2.2 Functional Definition of Q/R SCP Application Entity

imageSPECTRUM Review AE will request patient and study lists relating to the images and data managed by imageSPECTRUM Server. imageSPECTRUM Server will supply the lists, selected as per review function request.

6.1.2.3 Functional Definition of STORAGE SCU Application Entity

imageSPECTRUM Review AE may request images and data be transferred for viewing and image manipulation and imageSPECTRUM Server will fulfill the request.

6.1.2.4 Functional Definition of VERIFICATION SCU/SCP Application Entity

The imageSPECTRUM Server will transmit a C-ECHO message and the Registered AE Titles will respond. Registered AE Titles will transmit a C-ECHO message and imageSPECTRUM Server will respond.

6.1.3 Sequencing of Real World Activities

The following diagram is a UML sequence diagram depicting an overview of the interactions of various AE's:

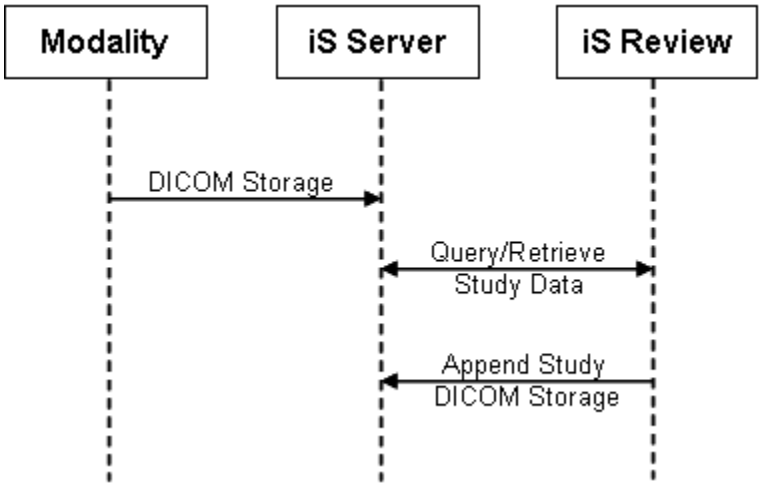

Figure 2 imageSPECTRUM Server UML Sequence Diagram

The imageSPECTRUM Server will act as a broker and storage device for DICOM modalities and DICOM review workstations. This entails data management functions and information request processing. See Figure 2.

The following diagram is a UML sequence diagram depicting a detailed view of the interactions of the various AE's. The VERIFICATION SCU and VERIFICATION SCP are not depicted as it is a simple retrieve⇆response interaction without sequencing issues.

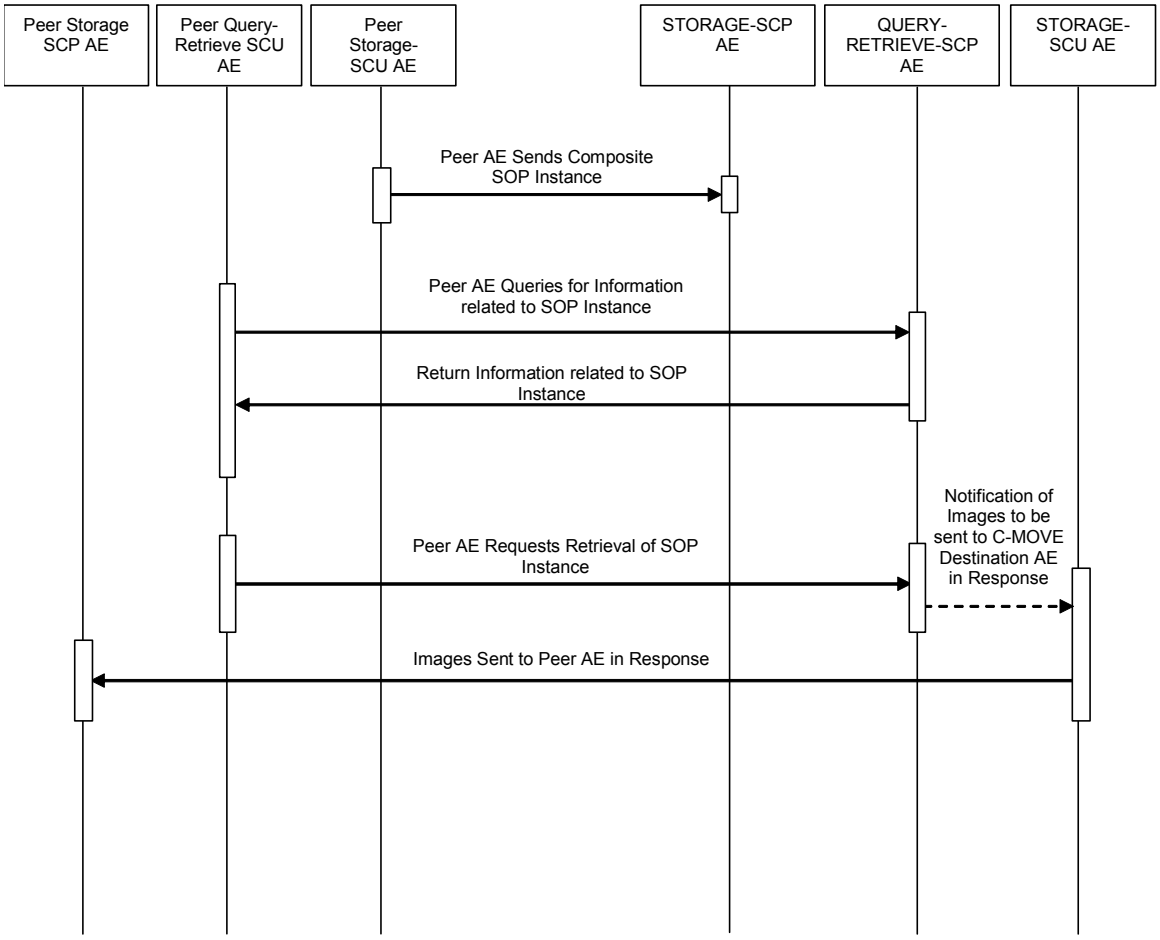

Figure 3 Detailed Sequencing Diagram

Note that the only constraint is for the Composite SOP Instance to be received prior to the other events.

6.2 Application Entity Specifications:

6.2.1 STORAGE SCP

6.2.1.1 Service Object Pair (SOP) Classes

The STORAGE SCP AE provides conformance to the following DICOM V3.0 SOP Classes.

Table 6-1 SOP Classes

SOP Class Name	SOP Class UID	SCU	SCP
Ophthalmic Photography 8 bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
Visible Light Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	No	Yes

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

6.2.1.2 Association Policies

6.2.1.2.1 General

The DICOM Standard Application Context shall be specified as detailed in Table 6-2.

Table 6-2 DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

6.2.1.2.2 Number of Associations

The STORAGE SCP accepts up to 12 simultaneous association establishment requests for Storage. See Table 6-3 and Table 6-4.

Table 6-3 Number of Associations as an Association Initiator

Maximum number of simultaneous associations	0

Table 6-4 Number of Associations as an Association Acceptor

Maximum number of simultaneous associations	12

6.2.1.2.3 Asynchronous Nature

Not Supported.

6.2.1.2.4 Implementation Identifying Information

Table 6-5 contains implementation identifying information for imageSPECTRUM Server.

Table 6-5 DICOM Implementation Class and Version

Implementation Class UID	a.b.c.xxxxxxx.yyy.zz
Implementation Version Name	1.2.828.0.1.3680043.2.60.0.1

6.2.1.3 Association Initiation Policy

The STORAGE SCP does not initiate associations.

6.2.1.4 Association Acceptance Policy

6.2.1.4.1 Activity Receive Images and Associated Data for Storage

6.2.1.4.2 Description and Sequencing of Activities

As instances are received they are copied to the local file system and a record inserted into the local database.

The STORAGE SCP implements the following sequence of activities:

1. The Modality or Registered Review AE (Calling AE) opens an association with the STORAGE SCP.
2. The Calling AE sends a C-STORE Request to the STORAGE SCP.
3. The STORAGE SCP stores the data, updates the local database appropriately and returns a C-STORE Response.
4. The Calling AE closes the association.
5. In this illustration there is one request⇆response per opened association. However, the Open Association and Close Association are controlled by the Calling AE. The number of storage requests per open association is also controlled by the Calling AE.

This sequence is illustrated in Figure 4.

The Calling AE controls the sequence of storage requests. For example, a Calling AE is requesting to store 30 images. The Calling AE can open an association, transmit requests for 30 images to be stored and then close the association. On the other hand, the Calling AE can open an association, request a single image store, and close the association, going through this cycle until all 30 images are stored. The time required to completely store the 30 image study would differ based on which control sequence is followed.

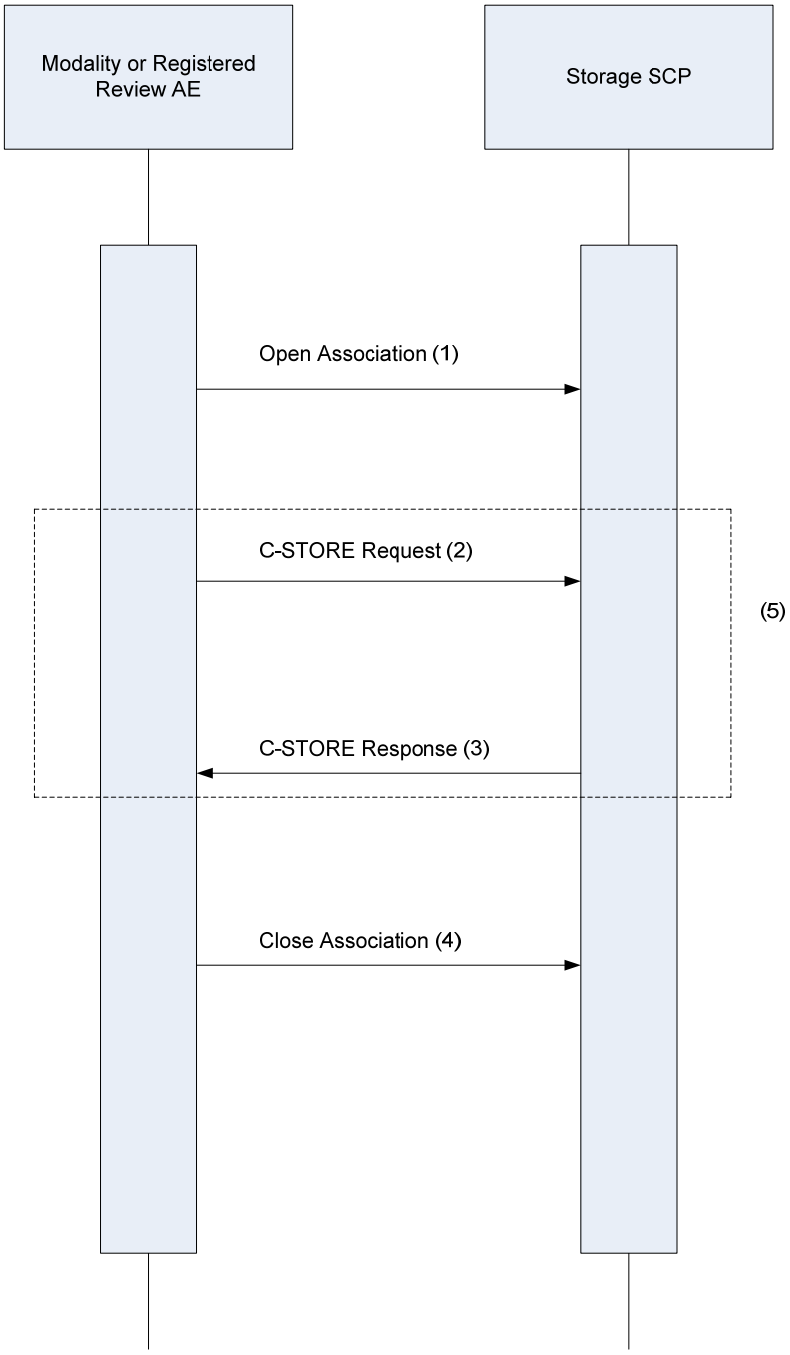

Figure 4 STORAGE SCP Sequence Diagram

6.2.1.4.3 Accepted Presentation Contexts

imageSPECTRUM Server's STORAGE SCP is capable of accepting the Presentation Contexts shown in Table 6-6.

Table 6-6 Proposed Presentation Context: STORAGE SCP

Presentation Context Table				
Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
Name	UID			
Ophthalmic Photography 8 bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Table 6-7	SCP	None
Visible Light Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Table 6-7	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Table 6-7	SCP	None

Table 6-7 Presentation Context Transfer Syntax for Storage SOP Classes

Transfer Syntax Table	
Name	UID
Implicit Little Endian (default)	1.2.840.10008.1.2
Explicit Little Endian	1.2.840.10008.1.2.1
Baseline JPEG	1.2.840.10008.1.2.4.50
Lossless, Non-hierarchical, First-order (default)	1.2.840.10008.1.2.4.70

6.2.1.4.4 SOP Specific Conformance for Storage SOP Classes

The STORAGE SCP provides DICOM conformance to the Storage Service Class. The behavior of imageSPECTRUM Server's STORAGE SCP is summarized in Table 6-8.

Table 6-8 DICOM Command Response Status Handling Behavior: STORAGE SCP

Status	Further Meaning	Error Code	Further Information
Success	Process complete	0000	Message was received successfully.

Status	Further Meaning	Error Code	Further Information
Failure	Out of Resources.	A700	Return response and continue.
	Unable to process. Database not operational.	C000	Return response and continue.

The behavior of imageSPECTRUM Server's STORAGE SCP during communication failure is summarized in Table 6-9.

Table 6-9 DICOM Command Communication Failure Behavior: STORAGE SCP

Exception	Behavior
Timeout	The reason is logged and reported to the user.
Abort	The command is marked as failed. The reason is logged and reported to the user.

6.2.2 Q/R SCP

6.2.2.1 Service Object Pair (SOP) Classes

The Q/R SCP AE provides DICOM conformance to the following DICOM V3.0 SOP Classes.

Table 6-10 SOP Classes

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

6.2.2.2 Association Policies

6.2.2.2.1 General

The DICOM Application Context is specified as detailed in Table 6-11.

Table 6-11 DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

6.2.2.2.2 Number of Associations

Q/R SCP accepts up to 12 simultaneous association establishment requests. See Table 6-12 and Table 6-13.

Table 6-12 Number of Associations as an Association Initiator

Maximum number of simultaneous associations	0

Table 6-13 Number of Associations as an Association Acceptor

Maximum number of simultaneous associations	12

6.2.2.2.3 Asynchronous Nature

Not Supported.

6.2.2.2.4 Implementation Identifying Information

Table 6-14 contains implementation identifying information for imageSPECTRUM Server.

Table 6-14 DICOM Implementation Class and Version

Implementation Class UID	a.b.c.xxxxxxx.yyy.zz
Implementation Version Name	1.2.828.0.1.3680043.2.60.0.1

6.2.2.3 Association Initiation Policy

Q/R SCP does not initiate associations.

6.2.2.4 Association Acceptance Policy

6.2.2.4.1 Activity Processing Query and Retrieve Requests

6.2.2.4.2 Description and Sequencing of Activities

Q/R SCP accepts requests for a patient list and returns a patient list. Q/R SCP accepts requests for a patient study list and returns a study list. Q/R SCP accepts requests for a date-constrained patient/study list and returns the date constrained list. Q/R SCP accepts requests for study data and triggers the Storage SCU to transfer information and images to the designated recipient.

All requests and their responses are processed by the Q/R SCP. There are two types of requests that are accepted by the Q/R SCP, C-FIND and C-MOVE requests.

The C-FIND request will contain the query type and query level requested and attributes used for database matching. There are three types of C-FIND query supported by the Q/R SCP, Patient Root–Patient Level, Patient Root–Study Level, and Patient Root–Study Level with a date constraint. The response to a Patient Root–Patient Level query will contain the patient information associated with the matching criteria designated in the query request. The response to a Patient Root–Study Level query will contain the study information associated with a matching patient. The response to a Patient Root–Study Level query with a date constraint will contain the patient and study information associated with the matching criteria designated in the query request.

The imageSPECTRUM Server Q/R SCP supports the Study Root– Image Level C-MOVE request. The C-MOVE request will contain the Study Specification associated with the images requested, and the Destination AE information. The Destination AE can be the same AE that generated the C-MOVE request. The response to the Study Root Image Level C-MOVE request will contain the image information associated with a matching study. The Q/R SCP will trigger the imageSPECTRUM Server Storage SCU to transfer the images to the designated Destination AE. The Storage SCU will be responsible for closing the Associations with the Destination AE.

The Q/R SCP implements the following sequence of activities for a Query Request:

1. The Registered AE opens an association with the Q/R SCP.
2. The Registered AE sends a C-FIND Query to the Q/R SCP.
3. The Q/R SCP queries its database using the attributes from the C-FIND Request and returns 0 to N C-FIND Responses (with a Pending status) depending on the matches returned from the database.
4. The Q/R SCP sends the final C-FIND Response with the appropriate status indication.
5. The Registered AE closes the association.

This sequence is illustrated in Figure 5.

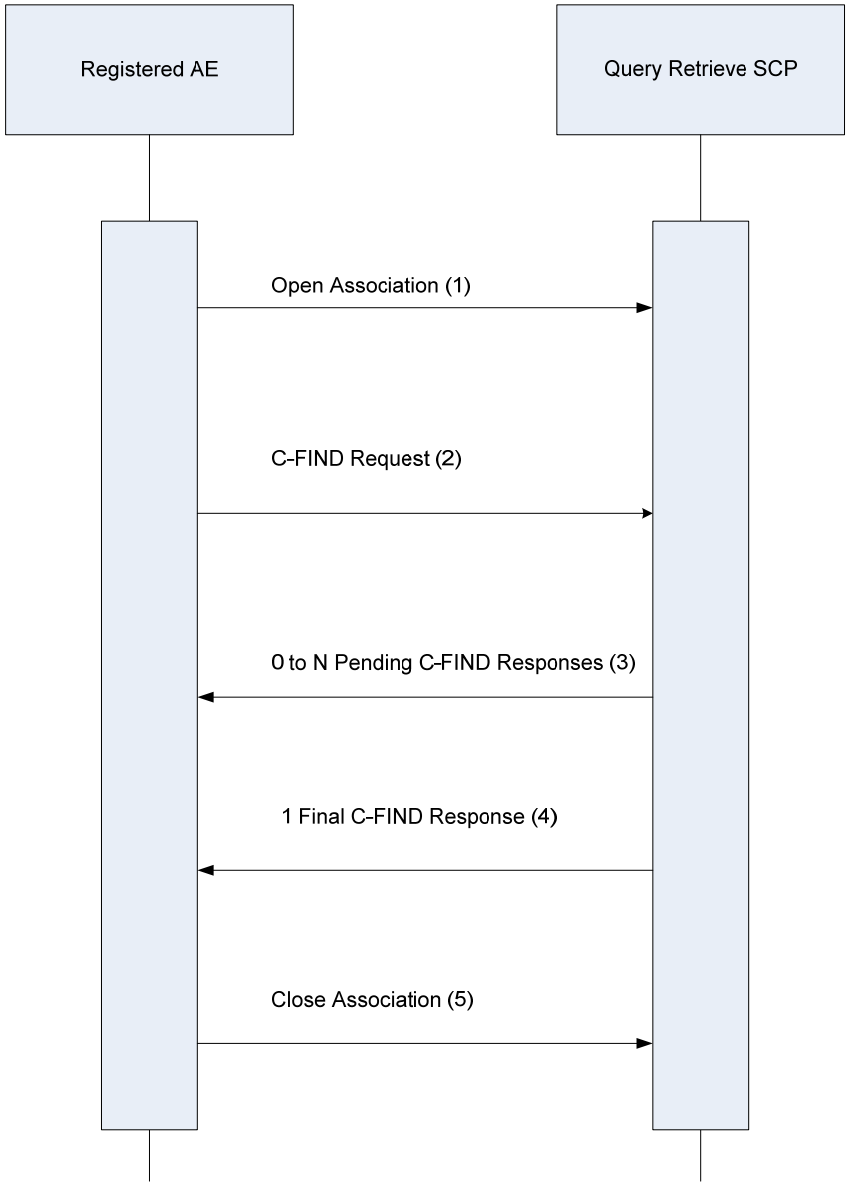

Figure 5 Query and Retrieve SCP: Query Sequence Diagram

The Q/R SCP implements the following sequence of activities for a retrieve request:

1. The Registered AE Q/R SCU opens an association with the Q/R SCP.
2. The Registered AE sends a C-MOVE Request to the Q/R SCP. The C-MOVE Request contains the Destination AE information.
3. The Q/R SCP will internally notify imageSPECTRUM Server's Storage SCU of the C-MOVE Request and include all required information for the MOVE operation.

4. imageSPECTRUM Server's Storage SCU opens an Association for each C-STORE dataset sequentially with the designated Destination AE. The Destination AE may be the same as the Q/R SCU AE. The illustration depicts the Destination AE as separate from the Q/R SCU AE.
5. The Storage SCU transfers the study information and images to the Destination AE and a notification of the Final Move operation status to the Q/R SCP. The Destination AE sends a response along the existing Association.
6. The Storage SCU closes the Association when the C-Store dataset has been transferred to the Destination AE. The sequence detailed in steps 4 through 6 of **Error! Reference source not found.** are repeated until all datasets in the C-MOVE request have been processed.
7. The Storage SCU notifies the Q/R SCP of the C-STORE final status and Q/R SCP sends the final C-MOVE Response with the appropriate Status indication.
8. The Registered AE closes the association.

This sequence is illustrated in Figure 6**Error! Reference source not found.**.

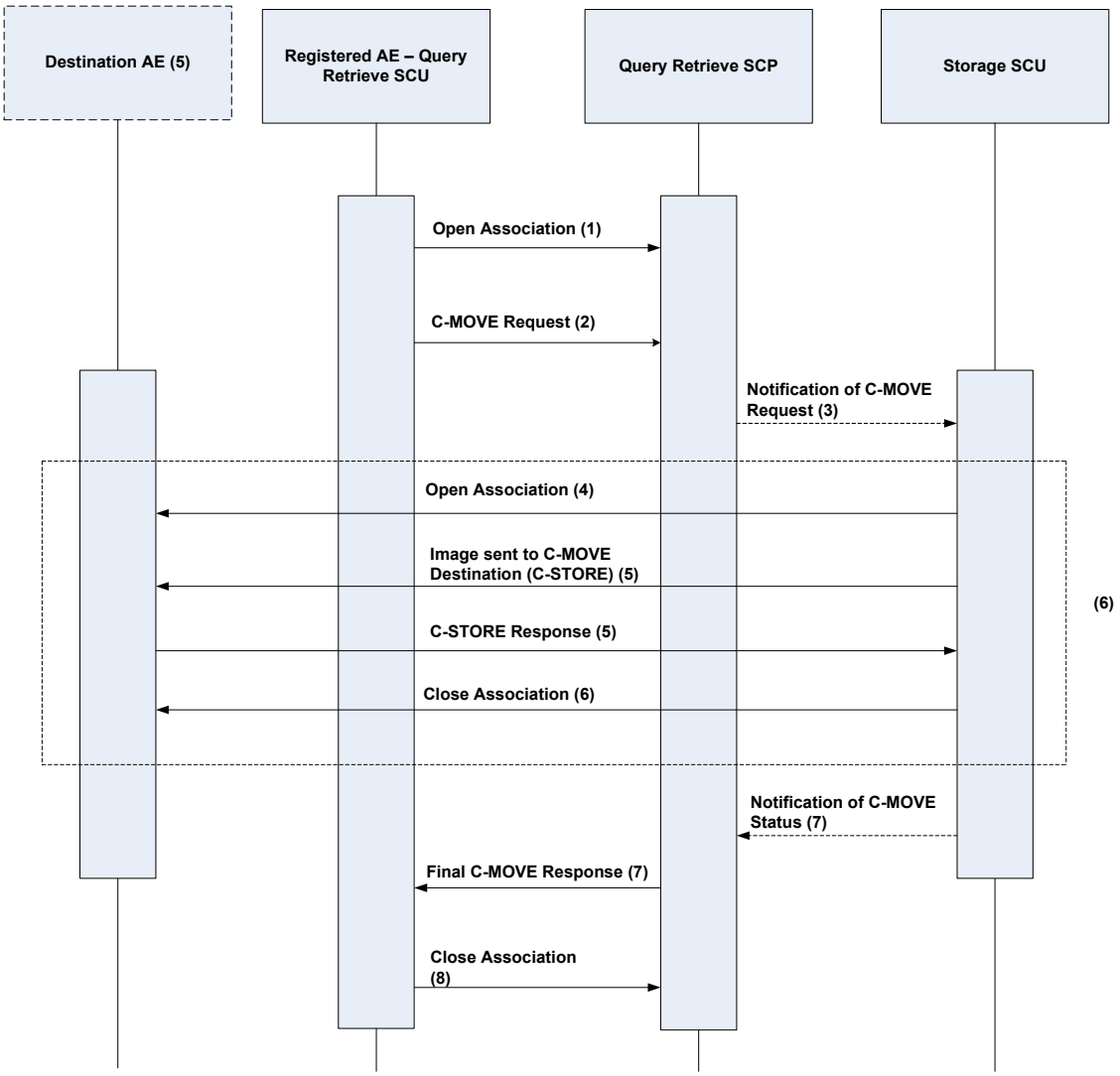

Figure 6 Query and Retrieve SCP: Retrieve Sequence Diagram

6.2.2.4.3 Accepted Presentation Contexts

imageSPECTRUM Server's Q/R SCP is capable of accepting the Presentation Contexts shown in Table 6-15.

Table 6-15 Accepted Presentation Context: Q/R SCP

Presentation Context Table					
Abstract Context		Transfer Context		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None for non-relational queries; Relational flag required for relational Patient Root – Study Level queries
Study Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

6.2.2.4.4 SOP Specific Conformance for Query SOP Classes

The Q/R SCP AE supports hierarchical queries and relational queries. Only those attributes listed in Table 6-16 are returned. Query responses return values from the imageSPECTRUM Server database. Exported SOP Instances are 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.

6.2.2.4.5 Patient Root Information Model

The search levels supported by the imageSPECTRUM Server's Q/R SCP are the patient level, the study level and the image level. All required search keys on the three levels are supported.

The query elements supported by imageSPECTRUM Server's Q/R SCP are summarized in Table 6-16.

The following Value Representation (VR) definitions are used for Table 6-16.

Attribute Name	Query attributes supported by the imageSPECTRUM Server's Q/R SCP
Tag	DICOM attribute tag.
VR	Value Representation.
Types of Matching	S Single value
	* wildcard
	U Universal
	R Range
	None no matching supported but values can be returned.
Return	Return keys. An "X" will indicate that the SCP will supply this attribute as part of its response.

The following Value Representation (VR) definitions are used in Table 6-16.

AE	Application Entity
CS	Code String
DA	Date
LO	Long String
LT	Long Text
PN	Person Name
SQ	Sequence of Items
TM	Time
UI	Unique Identifier (UID)

Table 6-16 Patient Root C-FIND SCP Supported Elements

Level Name Attribute Name	Tag	VR	Types of Matching	Return
SOP Common				
Specific Character Set	(0008,0005)	LO	None	
Patient Level				
Patient Name	(0010,0010)	PN	S,*,U	X
Patient ID	(0010,0020)	LO	S,*,U	X
Patient Birth Date	(0010,0030)	DA	None	X
Patient Birth Time	(0010,0032)	TM	None	X
Patient Sex	(0010,0040)	CS	None	X
Patient Ethnicity	(0010,2160)	CS	None	X
Study Level				
Study Date	(0008,0020)	DA	R	X
Study Time	(0008,0030)	TM	None	X
Accession Number	(0008,0050)	SH	None	X
Study ID	(0020,0010)	SH	None	X
Study Instance UID	(0020,000D)	UI	None	X
Referring Physician's Name	(0008,0090)	PN	None	X
Study Description	(0008,1030)	LO	None	X

The behavior of imageSPECTRUM Server's Q/R SCP during Patient Root Q/R Information Model–Find communication is summarized in Table 6-17.

Table 6-17 Patient Root Q/R Information Model–Find Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Process complete.	0000	Message was received successfully.
Failure	Out of resources – one or more successful transfers.	A702	Insufficient storage.
	One or more errors.	B000	Return response and continue.
	Unable to process. Database not operational.	C000	Return response and continue.

6.2.2.4.6 SOP Specific Conformance for Retrieval SOP Classes

The Q/R SCP AE will convey to the STORAGE SCU 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 SCU AE 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 6-19 will be negotiated.

The Q/R SCP AE can support lists of UIDs in the C-MOVE Request at the Image Level. The list of UIDs must be at the Image Level of the C-MOVE Request.

An initial C-MOVE Response is sent after confirming that the C-MOVE Request itself can be processed. After this, the Q/R SCP AE will return a final response to the C-MOVE SCU after the STORAGE SCU AE has finished processing.

The behavior of imageSPECTRUM Server's Q/R SCP during Study Root Q/R Information Model–Move communication is summarized in Table 6-17.

The behavior of imageSPECTRUM Server's Q/R SCP during communication failure is summarized in Table 6-18.

Table 6-18 DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	The reason is logged and reported to the user.
Abort	The command is marked as failed. The reason is logged and reported to the user.

6.2.3 STORAGE SCU

6.2.3.1 Service Object Pair (SOP) Classes

The STORAGE SCU AE provides conformance to the following DICOM V3.0 SOP Classes.

Table 6-19 SOP Classes

SOP Class Name	SOP Class UID	SCU	SCP
Ophthalmic Photography 8 bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
Visible Light Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	No

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

6.2.3.2 Association Policies

6.2.3.2.1 General

The DICOM Application Context shall be specified as detailed in Table 6-20.

Table 6-20 DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

6.2.3.2.2 Number of Associations

The STORAGE SCU initiates up to 1 simultaneous association establishment requests for Storage. See Table 6-21 and Table 6-22.

Table 6-21 Number of Associations as an Association Initiator

Maximum number of simultaneous associations	1

Table 6-22 Number of Associations as an Association Acceptor

Maximum number of simultaneous associations	0

6.2.3.2.3 Asynchronous Nature

Not Supported.

6.2.3.2.4 Implementation Identifying Information

Table 6-23 contains implementation identifying information for imageSPECTRUM Server.

Table 6-23 DICOM Implementation Class and Version

Implementation Class UID	a.b.c.xxxxxxx.yyy.zz
Implementation Version Name	1.2.828.0.1.3680043.2.60.0.1

6.2.3.3 Association Initiation Policy

6.2.3.3.1 Activity Send Images Requested by an External AE

6.2.3.3.2 Description and Sequencing of Activities

This AE accepts requests to move study information and images to a designated recipient.

The C-MOVE request will contain the study information associated with the images requested, and the Destination AE information. The Destination AE can be the same AE that generated the C- MOVE request, or it can be different. The Q/R SCP will trigger the imageSPECTRUM Server's Storage SCU to transfer the images after opening a new association to the designated Destination AE. The Storage SCU will be responsible for closing the association with the Destination AE.

The C-MOVE sequence is illustrated in steps 4 through 6 of Figure 6**Error! Reference source not found.**.

6.2.3.3.3 Proposed Presentation Contexts

imageSPECTRUM Server's STORAGE SCU is capable of proposing the Presentation Contexts shown in Table 6-24.

Table 6-24 Proposed Presentation Context: STORAGE SCU

Presentation Context Table				
Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
Name	UID			
Ophthalmic Photography 8 bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Table 6-7	SCU	None
Visible Light Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Table 6-7	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Table 6-7	SCU	None

6.2.3.3.4 SOP Specific Conformance for Image and Storage SOP Classes

If the status of storage response (C-Store-RSP) is Success, the process of receiving images continues until all images have been sent. In the event that the storage response is Failure, an appropriate response is sent to the sending application.

All images received by imageSPECTRUM Server are locally stored and persist in a local data-store. Images are never removed.

If an image with the same SOP Instance UID, as that of an image already in the local data-store (i.e., duplicate image) is received, imageSPECTRUM Server will accept the incoming image and ignore the image with the same SOP Instance UID in the data-store.

Individual image data elements are not discarded or modified.

The behavior of imageSPECTRUM Server's STORAGE SCU is summarized in Table 6-25.

Table 6-25 Command Response Status Handling Behavior: STORAGE SCU

Status	Further Meaning	Error Code	Further Information
Success	Process complete	0000	Message was received successfully.
Failure	Out of Resources.	A700	Return response and continue.
	Dataset does not match SOP Class	A900	Return response and continue.
	Unable to process.	C000	Return response and continue.

The behavior of imageSPECTRUM Server's STORAGE SCP during communication failure is summarized in Table 6-26.

Table 6-26 Command Communication Failure Behavior: STORAGE SCU

Exception	Behavior
Timeout	The reason is logged and reported to the user.
Abort	The command is marked as failed. The reason is logged and reported to the user.

6.2.3.4 Association Acceptance Policy

The STORAGE SCU does not accept associations.

6.2.4 VERIFICATION SCU/SCP

6.2.4.1 Service Object Pair (SOP) Classes

The VERIFICATION SCU and VERIFICATION SCP AE's provide conformance to the following DICOM V3.0 SOP Classes.

Table 6-27 SOP Classes

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

6.2.4.2 Association Policies

6.2.4.2.1 General

The DICOM Application Context shall be specified as detailed in Table 6-28.

Table 6-28 DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

6.2.4.2.2 Number of Associations

VERIFICATION SCU and VERIFICATION SCP's accept up to 12 simultaneous association establishment requests. See Table 6-29 and Table 6-30.

Table 6-29 Number of Associations as an Association Initiator

Maximum number of simultaneous associations	0

Table 6-30 Number of Associations as an Association Acceptor

Maximum number of simultaneous associations	12

6.2.4.2.3 Asynchronous Nature

Not Supported.

6.2.4.2.4 Implementation Identifying Information

Table 6-31 contains implementation identifying information for imageSPECTRUM Server.

Table 6-31 DICOM Implementation Class and Version

Implementation Class UID	a.b.c.xxxxxxx.yyy.zz
Implementation Version Name	1.2.828.0.1.3680043.2.60.0.1

6.2.4.3 Association Initiation Policy

6.2.4.3.1 Activity Send Verification Request

6.2.4.3.2 Description and Sequencing of Activities

This application component transmits C-ECHO requests. imageSPECTRUM Server's Verification SCU sends an Echo Request to verify that a Remote AE Title is awake and listening.

6.2.4.3.3 Proposed Presentation Contexts

imageSPECTRUM Server's VERIFICATION SCU is capable of proposing the Presentation Contexts shown in Table 6-32.

Table 6-32 Proposed Presentation Context: VERIFICATION SCU

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

6.2.4.3.4 SOP Specific Conformance for Verification SOP Class

DICOM conformance to the Verification Service Class as an SCU is provided.

6.2.4.4 Association Acceptance Policy

6.2.4.4.1 Activity Receive Verification Request

6.2.4.4.2 Description and Sequencing of Activities

This application component responds to C-ECHO requests. A remote AE sends an Echo Request to verify that imageSPECTRUM Server is awake and listening. The Verification SCP responds with success status as long as the request can be parsed.

6.2.4.4.3 Accepted Presentation Contexts

imageSPECTRUM Server's VERIFICATION SCP is capable of accepting the Presentation Contexts shown in Table 6-33.

Table 6-33 Proposed Presentation Context: VERIFICATION SCP

Presentation Context Table					
Abstract Context		Transfer Context		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

6.2.4.4.4 SOP Specific Conformance for Verification SOP Class

DICOM conformance to the Verification Service Class as an SCP is provided.

6.3 Network Interfaces

imageSPECTRUM Server provides DICOM V3.0 TCP/IP network communication support as stated in DICOM Standard Part 8. imageSPECTRUM Server inherits its TCP/IP stack from the OS upon which it executes.

6.3.1 Physical Network Interface

imageSPECTRUM Server utilizes the available network hardware using the installed OS interfaces.

6.3.2 Additional Protocols

No additional protocols are used.

6.4 Configuration

6.4.1 AE Title/Presentation Address Mapping

6.4.1.1 Local AE Titles

The local Calling AE Title is present as a value in the application configuration file. At this time setting the IP Address to 127.0.0.1 is not supported.

The local AE Title is presented in Table 6-34.

Table 6-34 AE Title Configuration Table

Application Entity	Default AE Title	Default TCP/IP Port
imageSPECTRUM Server	SERVER	104

6.4.1.2 Remote AE Title/Presentation Address Mapping

Configuration of remote calling AEs and port numbers are present as values in the application configuration file. If the server and the registered modalities are to be on the same computer, then the port value associated with the Registered Modalities AE Information MUST be different from the port value associated with the Server AE Information. At this time setting the IP Address to 127.0.0.1 is not supported.

6.4.1.2.1 Configuration File Elements

The configuration file is titled Configuration.xml. Configuration elements are detailed in Table 6-35.

Table 6-35 Configuration Elements

XML element	Example value	Explanation
<NewDataSet xmlns="…">	<NewDataSet xmlns="http://CMS.Com.PS">	Set during the development process designates the xml namespace.
<Configuration>	Grouping element like a heading in a document no value associated with this element other than sub elements and their values.	
Server SCP AE Information		
<AETitle>	SERVER1	Server SCP AE Title. Can be modified via Server Web page through the My SCP Associations.
<MaxPDUSize>	16384	Maximum size of the Protocol Data Unit.
<RootPath>	C:\PROSERVER\	Parent folder for DICOM related processing.

XML element	Example value	Explanation
<LogLevel>	3	Logging Level scale of 1 5, with 1 being the least logging and 5 being the most logging.
<LogDirPath>	Log\	Appended to the <RootPath> value to designate the folder containing the log file.
<SerializedDicomPath>	xmlDicom\	Appended to the <RootPath> value to designate the folder containing the serialized DICOM files.
<MaxLogDiskSpace>	1000000000	Log file size in bytes.
<LogFlag>	True	Allow/disallow logging.
<ServiceClassSupport>	Grouping element no value other than sub elements and their value.	
<Port>	104	Port associated with this service class.
<ARTim>	10000	Association State Machine Timeout interval in ms.
<LogLevel>	3	Logging Level scale of 1 5, with 1 being the least logging and 5 being the most logging.
<MaxQueueAssociations>	5	Maximum number of concurrent associations accepted.

XML element	Example value	Explanation
<Enabled>	true	Ready or Idle state.
<ServiceClass>	Grouping element no value other than sub elements and their value.	
<ServiceClassName>	Verification SOP Class	Enumerated value representing a Service Object Pair class type.
<LogLevel>	3	Logging Level scale of 1 5, with 1 being the least logging and 5 being the most logging.
<LogFlag>	True	Allow/disallow logging.
Proxy and Multiple NIC Information		
<ProxyInfo>	Grouping element no value other than sub elements and their value. This section is reserved for future development.	
<ProxyEnable>	False	Proxy server enabled.
<NodeInfo>	Grouping element no value other than sub elements and their value. This section is reserved for future development.	
<IPAddress>	192.168.1.3	Proxy node IP Address.
<PortNumber>	1234	Proxy node port number
<NICInfo>	Grouping element no value other than sub elements and their value. This section is reserved for future development.	

XML element	Example value	Explanation
<AdapterID>	0	Network Interface Card Adapter ID.
Registered Modality AE Information		
<CallingAEInfo>	Grouping element no value other than sub elements and their value.	
<EntityTitle>	CORE	The AE Title of the registered modality.
<HostName> <IPAddress>	CLIENT1	The host name of the registered modality or it's IP Address. When part of the <CallingAETitle> grouping these elements will be the same for the imageSPECTRUM product classification.
<VerificationInterval>	600	Verification response timeout in ms.
<Accept>	True	Utilize the server if true, otherwise save the settings but do not associate.
<ServiceClassInfo>	Grouping element no value other than sub elements and their value.	
<Port>	104	Port associated with this service class.
<ARTim>	10000	Association State Machine Timeout interval in ms.
<LogLevel>	3	Logging Level scale of 1 5, with 1 being the least logging and

XML element	Example value	Explanation
		5 being the most logging.
<LogFlag>	True	Allow/disallow logging.
Modality Worklist Related Information		
<HL7Configuration>		Grouping element no value other than sub elements and their value.
<HL7IncomingPort>	123	HL 7 port
<HL7Filter>		Grouping element no value other than sub elements and their value.
		Grouping element no value other than sub elements and their value.
<SegmentValue>	OBR	HL 7 segment identifier.
<Fields>		Grouping element no value other than sub elements and their value.
<Field>		Grouping element no value other than sub elements and their value.
<FieldIndex>	30	Segment field index.
<SearchStrings>		Grouping element no value other than sub elements and their value.
<SearchString>	Unknown	Matching string.
<BodyPartPosition>		Grouping element no value other than sub elements and their value.
	OBR	The element of the

XML element	Example value	Explanation
		<BodyPartPosition> grouping represents the segment of the Body Part position HL 7 message.
<Field>	4	Field number.
<ComponentIndex>	3	Component index.

6.4.2 Parameters

Parameters related to acquisition and general operation are configurable via the application configuration file.

Table 6-36 shows only those configuration parameters relevant to DICOM communication.

Table 6-36 Configuration Parameters Table

Parameter	Configurable (Y/N)	Default Value
General Parameters		
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	No	120 seconds
General DIMSE level time-out values.	No	120 seconds
Time-out waiting for response to TCP/IP connect request. (Low-level timeout)	OS system value	
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	OS system value	
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	No	120 seconds
Any changes to default TCP/IP settings, such as configurable stack parameters.	No	n/a

Parameter	Configurable (Y/N)	Default Value
AE Specific Parameters		
Size constraint in maximum object size.	Only limited by available memory.	
Maximum PDU size the AE can receive.	Yes	16k
Maximum PDU size the AE can send.	Yes	16k
AE specific DIMSE level time-out values.	Not configurable by AE.	
Number of simultaneous Associations by Service and/or SOP Class.	No Limit	n/a
<SOP Class support> (e.g., Multi-frame vs. single frame vs. SC support), when configurable)	ALL SOP classes are accepted.	
<Transfer Syntax support> (e.g., JPEG, Explicit VR, when configurable)	For each presentation context: Selects a transfer syntax from those offered as in configuration. Accepts any presentation context (whatever the SOP class) if there is a suitable transfer syntax.	

7. MEDIA INTERCHANGE

Media interchange is not supported at this time.

8. SUPPORT OF CHARACTER SETS

imageSPECTRUM Server uses the Latin 1 (ISO_IR 100) character set exclusively.

9. SECURITY

9.1 Security Profiles

imageSPECTRUM Server does not support any specific security measures.

9.2 Association Level Security

imageSPECTRUM Server is used within a secure environment which includes a firewall designed so that imageSPECTRUM Server only has network access to approved external hosts and services. Approved external hosts are entered into imageSPECTRUM Server configuration file.

9.3 Application Level Security

imageSPECTRUM Server Administrative web page utilizes user passwords intended to limit access to approved operators only. Password administration conforms to the following rules:

- the password consists of at least 6 characters and a maximum of 30 characters.
- at least one character of the password must be a letter
- at least one character of the password must be a number
- the password must be changed every 90 days
- for new password selection, the last 5 passwords are ineligible as the new password

10. ANNEXES

10.1 IOD Contents

10.1.1 Storage SCP AE Element Use

Elements of Composite SOP Instances received by the STORAGE SCP AE are either stored to the permanent imageSPECTRUM Server's database or of particular importance in the received images.

Series Laterality (0020,0060) may be used instead of Image Laterality (0020,0062) in order to facilitate the use of a laterality value of BOTH (B).

10.1.2 Usage of Attributes from received IODs

imageSPECTRUM Server does not depend on specific attribute fields in order to perform its intended function correctly.

10.1.3 Attribute Mapping

Series Laterality (0020,0060) may be used instead of Image Laterality (0020,0062) in order to facilitate the use of a laterality value of BOTH (B).

10.1.4 Coerced/Modified fields

No fields are coerced or modified.

Date and Time fields returned in a query response are not in UTC format.

10.2 Data Dictionary of Private Attributes

imageSPECTRUM Server does not utilize any private attributes.

10.3 Coded Terminology and Templates

The imageSPECTRUM Server is not using any Codes (SNOMED) or Controlled Terminology, such as the use of the DICOM Content Mapping Resource (DCMR).

10.3.1 Template Specifications

Templates are not used by imageSPECTRUM Server.

10.3.2 Private Code definitions

No private codes are used by imageSPECTRUM Server.

10.4 Grayscale Image Consistency

The DICOM Grayscale Standard Display Function is not supported by imageSPECTRUM Server.

10.5 Standard Extended/Specialized/Private SOP Classes

There is no Standard Extended SOP Class, Specialized SOP Class, or Private SOP Class used by imageSPECTRUM Server.

10.6 Private Transfer Syntaxes

No private Transfer Syntaxes are used by imageSPECTRUM Server.