

**DICOM CONFORMANCE STATEMENT**

**FOR**

**Automation Platform**

**SCAI-1PF**

**V1.3 SP0000\* or later**

**CANON MEDICAL SYSTEMS CORPORATION**

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## 1. OVERVIEW

This Conformance Statement applies to the DICOM interface for the SCAI-1PF. This interface is provided by the DICOMProxy and Prefetching components.

DICOMProxy and Prefetching components handle the DICOM communication and storage in between SCAI-1PF and any other Application Entity capable to treat DICOM objects (PACS, ...).

It provides storage and retrieval of DICOM objects such as Images and Structured Reports, obtained over the network.

The supported network services are:

**Table 1.1-1 Network Services**

<b>SOP Class</b>	<b>User of Service (SCU)</b>	<b>Provider of Service (SCP)</b>
<b>Transfer</b>		
CT Image Storage	Yes	Yes
MR Image Storage	Yes	Yes
Enhanced CT Image Storage	No	Yes
Basic Text SR	Yes	No
Grayscale Softcopy Presentation State Storage	Yes	No
Segmentation Storage	Yes	No
Secondary Capture Image Storage	Yes	Yes
Encapsulated PDF Storage	Yes	No
<b>Verification</b>		
Verification SOP Class	Yes	Yes
<b>Query/Retrieve</b>		
Study Root Q/R Information Model - FIND	Yes (Note1)	No
Study Root Q/R Information Model - MOVE	Yes (Note1)	No

Note1 :This operation is automatically done by SCAI-1PF, so user cannot operate it manually.

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### 3. INTRODUCTION

#### 3.1. REVISION HISTORY

REV.	Date of Issue	Author	Description
	April, 2020	Canon Medical Systems	First Edition.
A	September, 2020	Canon Medical Systems	Add TLS Support Add Supported Abstract Syntax (Encapsulated PDF Storage) and Transfer Syntax (JPEG Baseline (Process 1)) to STORAGE-SCU
B	July, 2021	Canon Medical Systems	Add Supported SOP Class (MR Image Storage). Add Supported DICOM Application Entities (QUERY-RETRIEVE-SCU AE).
C	November, 2021	Canon Medical Systems	Change default AE Title.

#### 3.2. AUDIENCE

This document is intended for hospital staff, health system integrators, software designers and/or system implementers. It is assumed that the reader of this document has a working understanding of the DICOM 3.0 Standard as well as with the terminology and concepts, which are used in that Standard.

#### 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 the intended information.

The scope of this Conformance Statement is to facilitate communication between the product and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [DICOM]. However, by itself, this Conformance Statement does not guarantee the desired interoperability and successful interconnectivity.

The user should be aware of the following important issues:

- Comparison of the different conformance statements is the first step towards assessing the interconnectivity between the product and other equipment.
- Test procedures should be defined to validate the desired level of connectivity.
- The DICOM standard is evolving to meet the future requirements of users. Canon Medical Systems Corporation is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue them.

#### 3.4. TERMS AND DEFINITIONS

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Abbreviations and terms are as follows:

**AE** DICOM Application Entity

**AET** Application Entity Title

**CT** Computed Tomography

**MR** Magnetic Resonance

**DICOM** Digital Imaging and Communications in Medicine

**DIMSE** DICOM Message Service Element

**IOD** Information Object Definition

**ISO** International Standard Organization

**PDU** DICOM Protocol Data Unit

**SCP** Service Class Provider

**SCU** Service Class User

**SOP** DICOM Service-Object Pair

**TCP/IP** Transmission Control Protocol/Internet Protocol

**TLS** Transport Layer Security

**UID** Unique Identifier

**VR** Value Representation

### **3.5. REFERENCES**

- [DICOM] Digital Imaging and Communications in Medicine (DICOM), Part 1 – 22,

## 4. NETWORKING

### 4.1. IMPLEMENTATION MODEL

SCAI-1PF has five DICOM Application Entities: ECHO-SCP, ECHO-SCU, STORAGE-SCP, STORAGE-SCU, and QUERY-RETRIEVE-SCU.

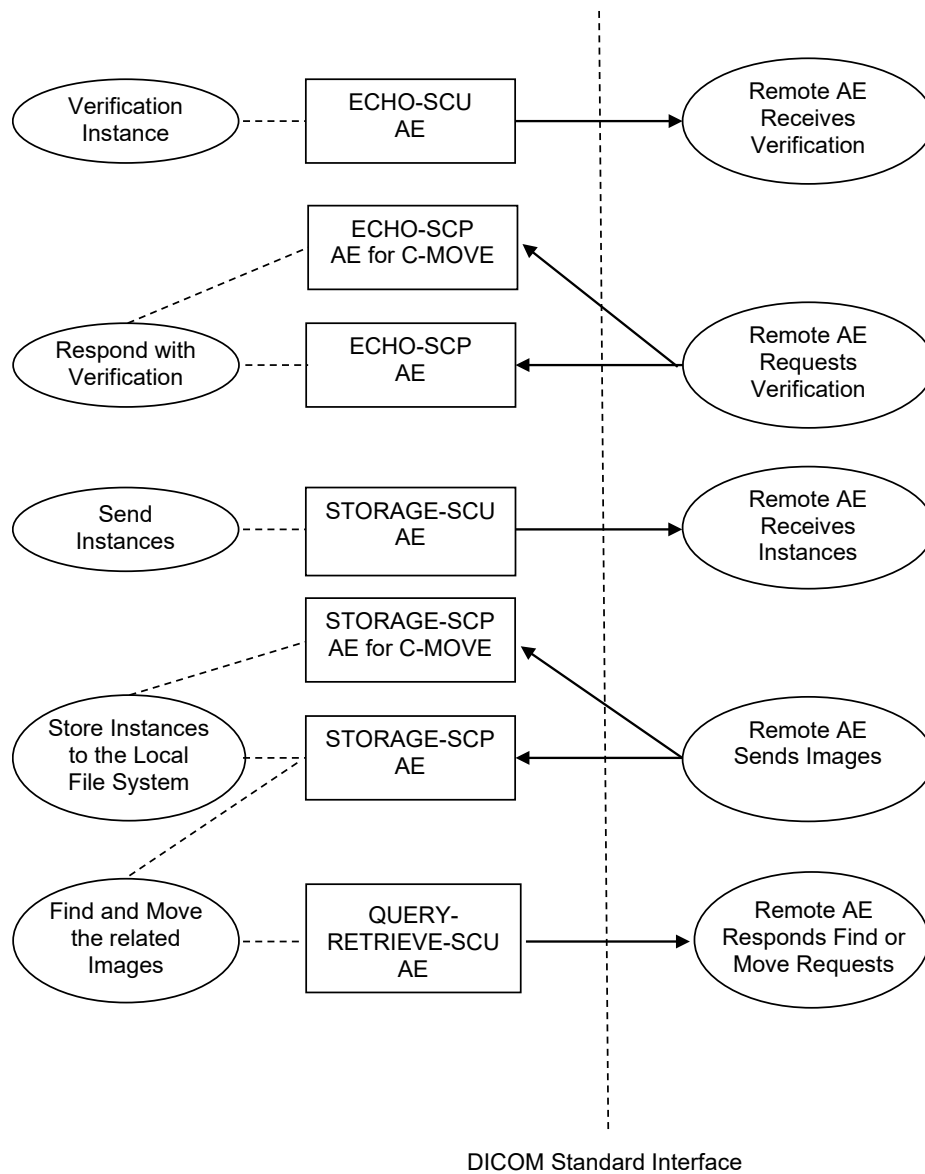
#### 4.1.1. Application Data Flow

SCAI-1PF provides both a graphical user interface, internal database and network listener that spawns additional threads as necessary to handle incoming connections.

The network services may be modeled as the following separate AE's:

- ECHO-SCP, which responds to verification requests
- ECHO-SCU, which verification requests to the specified DICOM destination.
- STORAGE-SCP, which receives incoming images
- STORAGE-SCU, which sends outbound images and other composite instances
- QUERY-RETRIEVE-SCU, which queries a remote AE for lists of studies, series, images and sends the retrieve requests for selected studies, series, images.
- ECHO-SCP (for C-MOVE), which responds to verification requests
- STORAGE-SCP (for C-MOVE), which receives incoming images





**Figure 4.1-1 Application Data Flow**

## 4.1.2. Functional Definitions of AE's

### 4.1.2.1. ECHO-SCP

SCAI-1PF ECHO-SCP waits in the background for connections, will accept associations with Presentation Contexts for SOP Class of the Verification Service Class, and will respond to echo requests.

### 4.1.2.2. ECHO-SCU

SCAI-1PF ECHO-SCU is activated through the user interface when a user requests an echo to a remote AE. An echo is performed to that remote AE, verifying basic DICOM connectivity and displaying results.

### 4.1.2.3. STORAGE-SCP

The SCAI-1PF Storage Server Application Entity waits in the background for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the STORAGE-SCP AE expects it to be a DICOM application.

The STORAGE-SCP AE will accept associations with Presentation Contexts for SOP Class of the Storage Service Class.

DICOM Instances as well as a subset of attributes from instances received in a Storage Request are stored in records local database.

The STORAGE-SCP AE activates SCAI-1PF QUERY-RETRIEVE-SCU when the STORAGE-SCP AE receives images which match the pre-configured conditions.

#### 4.1.2.4. STORAGE-SCU

SCAI-1PF STORAGE-SCU is automatically activated when data is identified to be sent to a remote AE (selected from a pre-configured list).

#### 4.1.2.5. QUERY-RETRIEVE-SCU

SCAI-1PF QUERY-RETRIEVE-SCU is automatically activated when STORAGE-SCP receives images that require retrieval of related images. This operation is automatically done by SCAI-1PF, so user cannot operate it manually.

#### 4.1.2.6. ECHO-SCP (for C-MOVE)

SCAI-1PF ECHO-SCP (for C-MOVE) waits in the background for connections, will accept associations with Presentation Contexts for SOP Class of the Verification Service Class, and will respond to echo requests.

#### 4.1.2.7. STORAGE-SCP (for C-MOVE)

The SCAI-1PF Storage Server Application Entity for C-MOVE waits in the background for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the STORAGE-SCP AE (for C-MOVE) expects it to be a DICOM application.

### 4.1.3. Sequencing of Real-World Activities

All SCP activities are performed asynchronously in the background and are not dependent on any sequencing.

All SCU activities are sequentially initiated automatically or from within the user interface, and another activity **may** not be initiated until the prior activity has completed.

## 4.2. AE SPECIFICATIONS

### 4.2.1. ECHO-SCP AE Specification

#### 4.2.1.1. SOP Classes

SCAI-1PF ECHO-SCP provide Standard Conformance to the following SOP Class(es):

**Table 4.2-1 SOP Classes supported by SCAI-1PF ECHO-SCP**

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes

#### 4.2.1.2. Association Policies

##### 4.2.1.2.1. General

SCAI-1PF ECHO-SCP accepts but never initiates associations.

The DICOM standard application context name for DICOM is always accepted and proposed:

**Table 4.2-2 DICOM Application Context for SCAI-1PF ECHO-SCP**

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

**Table 4.2-3 Maximum PDU size received as a SCP for SCAI-1PF ECHO-SCP**

Maximum PDU size received	16378 (Not configurable)
---------------------------	--------------------------

**4.2.1.2.2. Number of Associations**

SCAI-1PF ECHO-SCP can support up to three Associations at a time.

**Table 4.2-4 Number of Associations as a SCP for SCAI-1PF ECHO-SCP**

Maximum number of simultaneous associations	5 (Not configurable)
---	----------------------

**4.2.1.2.3. Asynchronous Nature**

SCAI-1PF ECHO-SCP does not support asynchronous communication.

**Table 4.2-5 Asynchronous Nature as SCP for SCAI-1PF ECHO-SCP**

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

**4.2.1.2.4. Implementation Identifying Information****Table 4.2-6 DICOM Implementation Class and Version for SCAI-1PF ECHO-SCP**

Implementation Class UID	1.2.392.200036.9116.7.39
Implementation Version Name	AP-1.0

**4.2.1.3. Association Initiation Policy**

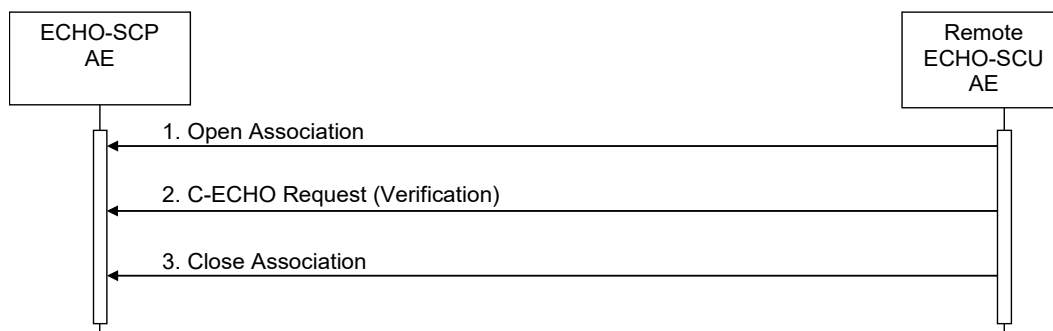
SCAI-1PF ECHO-SCP does not initiate associations.

**4.2.1.4. Association Acceptance Policy**

When SCAI-1PF ECHO-SCP accepts an association, it will respond to echo requests. If the Called AE Title does not match the pre-configured AE Titles, the association will be rejected.

**4.2.1.4.1. Activity – Receive Echo Request****4.2.1.4.1.1. Description and Sequencing of Activities**

When the ECHO-SCP AE accepts an association, it will respond to a verification request (C-ECHO).



**Figure 4.2-1**  
**SEQUENCING OF ACTIVITY – RESPOND TO VERIFICATION REQUEST**

A remote peer DICOM Application Entity, acting as an ECHO-SCU, tries to establish an association with SCAI-1PF ECHO-SCP that accepts or doesn't accept these Associations for the purpose of testing the DICOM communication between peer DICOM AEs.

In the default configuration any Calling and Called AET will be accepted. If the Called AET does not correspond to the actual SCAI-1PF ECHO-SCP AET, the SCU can only verify the DICOM Association.

If the Calling AE Titles property is configured, only these Application Entities will be accepted.

#### 4.2.1.4.1.2. Accepted Presentation Contexts

**Table 4.2-7 Acceptable Presentation Contexts for SCAI-1PF ECHO-SCP**

Presentation Context Table				
Abstract Syntax		Transfer Syntax		Role
Name	UID	Name	UID	
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP

No extended negotiation is performed.

#### 4.2.1.4.1.3. SOP Specific Conformance

##### 4.2.1.4.1.3.1. SOP Specific Conformance to Verification SOP Class

SCAI-1PF ECHO-SCP provides standard conformance to the DICOM Verification Service Class as a SCP. The status code for the C-ECHO is described in the following table:

**Table 4.2-8 SOP Specific Conformance to Verification SOP Class**

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0	The C-ECHO request is accepted

#### **4.2.1.4.1.3.2. Presentation Context Acceptance Criterion**

SCAI-1PF ECHO-SCP will always accept any Presentation Context for the supported SOP Classes with the supported Transfer Syntaxes. More than one proposed Presentation Context will be accepted for the same Abstract Syntax if the Transfer Syntax is supported, whether or not it is the same as another Presentation Context.

#### **4.2.1.4.1.3.3. Transfer Syntax Selection Policies**

SCAI-1PF ECHO-SCP prefers explicit Transfer Syntaxes. If offered a choice of Transfer Syntaxes in a Presentation Context, it will apply the following priority to the choice of Transfer Syntax:

first encountered explicit Transfer Syntax,

default Transfer Syntax.

SCAI-1PF ECHO-SCP will accept duplicate Presentation Contexts, that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same priority for selecting a Transfer Syntax for each.

## 4.2.2. ECHO-SCU AE Specification

### 4.2.2.1. SOP Classes

SCAI-1PF ECHO-SCU provide Standard Conformance to the following SOP Class(es):

**Table 4.2-9 SOP Classes supported by SCAI-1PF ECHO-SCU**

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	No

### 4.2.2.2. Association Policies

#### 4.2.2.2.1. General

SCAI-1PF ECHO-SCU can only request the starting of an association.

The DICOM standard application context name for DICOM is always proposed and accepted:

**Table 4.2-10 DICOM Application Context for SCAI-1PF ECHO-SCU**

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

#### 4.2.2.2.2. Number of Associations

The maximum number of simultaneous Associations is not configurable.

**Table 4.2-11 Number of Associations as a SCU for SCAI-1PF ECHO-SCU**

Maximum number of simultaneous associations	1(Not Configurable)
---	---------------------

#### 4.2.2.2.3. Asynchronous Nature

SCAI-1 PF ECHO-SCU does not support asynchronous communication (multiple incomplete transactions on a single association). All association requests must be completed and confirmed before new actions can be performed.

**Table 4.2-12 Asynchronous Nature as SCU for SCAI-1PF ECHO-SCU**

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

#### 4.2.2.2.4. Implementation Identifying Information

**Table 4.2-13 DICOM Implementation Class and Version for SCAI-1PF ECHO-SCU**

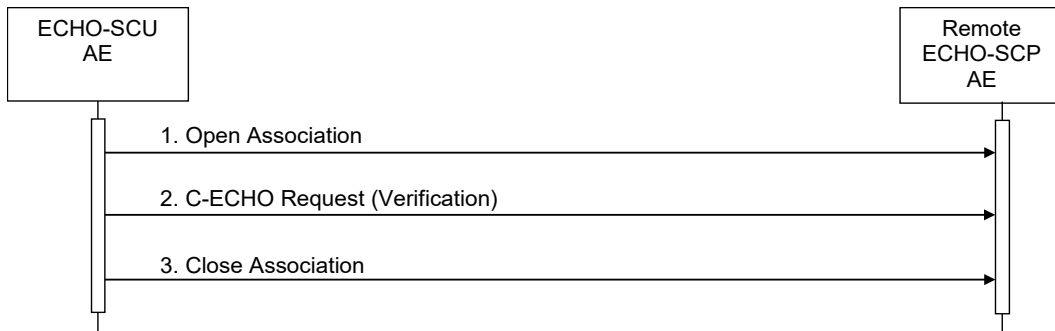
Implementation Class UID	1.2.392.200036.9116.7.39
Implementation Version Name	AP-1.0

**4.2.2.3. Association Initiation Policy**

**4.2.2.3.1. Activity – Receive Echo Request**

**4.2.2.3.1.1. Description and Sequencing of Activities**

SCAI-1 PF ECHO-SCU attempts to initiate a new association when the user requests an Echo from the user interface to a single remote AE. A single attempt will be made to verify the remote AE. If the verification fails, for whatever reason, no retry will be performed. The results will be displayed.



**Figure 4.2-2  
SEQUENCING OF ACTIVITY**

1. SCAI-1 PF ECHO-SCU opens a new association with the specified destination AE.
2. SCAI-1 PF ECHO-SCU sends C-ECHO requests.
3. SCAI-1 PF ECHO-SCU closes the Association.

**4.2.2.3.1.2. Proposed Presentation Contexts**

**Table 4.2-14 Proposed Presentation Contexts for SCAI-1PF ECHO-SCU**

Presentation Context Table				
Abstract Syntax		Transfer Syntax		Role
Name	UID	Name	UID	
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU

4.2.2.3.1.3. SOP Specific Conformance

4.2.2.3.1.3.1. SOP Specific Conformance to Verification SOP Class

Table 4.2-15 Response Status for SCAI-1PF ECHO-SCU

Service Status	Further Meaning	Status Codes	Related Fields	Behavior
Error	Data Set does not match SOP Class	A9xx	(0000,0901) (0000,0902)	Never sent – data set is not checked prior to storage
	Cannot understand	Cxxx	(0000,0901) (0000,0902)	Never sent
Success	Success	0000	None	-



### 4.2.3. STORAGE-SCP AE Specification

#### 4.2.3.1. SOP Classes Supported

SCAI-1PF Storage Application Entity provides Standard Conformance to the following SOP Class(es):

**Table 4.2-16 SOP Classes supported by SCAI-1PF Storage Application Entity (SCP)**

SOP Class Name	SOP Class UID	SCU	SCP
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	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 SCAI-1PF Storage Application Entity accepts but never initiates association requests. It will accept Association Requests for the Verification and Storage Services.

The DICOM standard application context name for DICOM is always accepted and proposed:

**Table 4.2-17 DICOM Application Context**

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

**Table 4.2-18 Maximum PDU size the SCAI-1PF STORAGE-SCP AE can receive**

Maximum PDU size received	16378 (Not configurable)
---------------------------	--------------------------

**Table 4.2-19 Maximum PDU size the SCAI-1PF STORAGE-SCP AE can send**

Maximum PDU size to send	16378 (Not configurable)
--------------------------	--------------------------

##### 4.2.3.2.2. Number of Associations

The SCAI-1PF Storage Application Entity can support multiple simultaneous Associations requested by peer AEs. The maximum total number of simultaneous Associations accepted from peer AEs is 5.

**Table 4.2-20 Number of Associations**

Maximum number of simultaneous associations	5 (Not configurable)
---	----------------------

**4.2.3.2.3. Asynchronous Nature**

The SCAI-1PF STORAGE-SCP does not support asynchronous communication.

**Table 4.2-21 Asynchronous Nature for SCAI-1PF STORAGE-SCP Server AE**

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

**4.2.3.2.4. Implementation Identifying Information****Table 4.2-22 DICOM Implementation Class and Version for SCAI-1PF STORAGE-SCP**

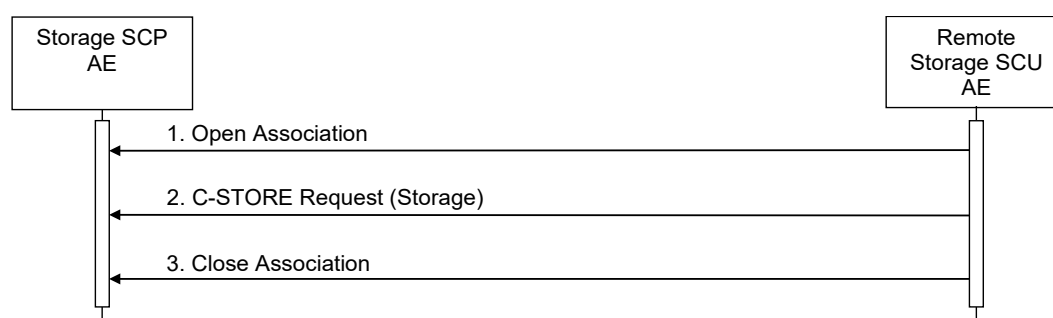
Implementation Class UID	1.2.392.200036.9116.7.39
Implementation Version Name	AP-1.0

**4.2.3.3. Association Initiation Policy**

SCAI-1PF STORAGE-SCP does not initiate associations.

**4.2.3.4. Association Acceptance Policy**

The SCAI-1PF Storage Application Entity can be configured to only accept Associations with certain hosts (using TCP/IP address) and/or Application Entity Titles.



**Figure 4.2-3**  
**SEQUENCING OF ACTIVITY – STORE IMAGES TO THE LOCAL FILE SYSTEM**

A possible sequence of interactions between the Storage SCP AE and the Server is illustrated in the Figure above:

1. Storage SCU AE opens an association with the Storage SCP AE.
2. Storage SCU AE sends images to the Storage SCP AE using a storage request (C-STORE) and the Storage SCP AE replies with a C-STORE response (status success).
3. Storage SCU AE closes the association with the Storage SCP AE.

#### 4.2.3.4.1.1. Description and Sequencing of Activities

A remote peer DICOM Application Entity, acting as a Storage SCU, establishes an association with SCAI-1PF STORAGE-SCP that accepts these Associations for the purpose of receiving supported SOP Class Instances.

In the default configuration, any Calling and Called AET will be accepted. If the Called AET does not correspond to the actual SCAI-1PF Storage AET, the SCU can only verify the DICOM Association, but cannot invoke any other related DICOM service.

When an association has been established the Sequencing of Real-World Activities is as described in Section "Sequencing of Real-World Activities".

The SCAI-1PF STORAGE-SCP AE may reject Association attempts as shown in the table below. The Result, Source and Reason columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8, Section 9.3.4).

**Table 4.2-23 Association Rejection Reasons**

Result	Source	Reason	Description
2- rejected transient	provider	2 – local limit exceeded	The maximum number of simultaneous associations has been reached. An association request with the same parameters may succeed later.
1 – rejected permanent	User	2 – application context name not supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will NOT succeed later.
1 – rejected permanent	User	3 – calling AE Title not recognized	The Association request contained an unrecognized Calling AE Title. An association request with the same parameters will NOT succeed later unless configuration changes are made.

As instances are received, they are copied to the local database and a record is inserted into the local database. If the received instance is a duplicate of a previously received instance, the old file and database record will be overwritten with the new one.

## 4.2.3.4.1.2. Accepted Presentation Contexts

Table 4.2-24 Acceptable Presentation Contexts for SCAI-1PF STORAGE-SCP

Presentation Context Table				
Abstract Syntax		Transfer Syntax		Role
Name	UID	Name	UID	
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP
		JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process14 [Selection Value 1])	1.2.840.10008.1.2.4.70	SCP
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCP
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP
		JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process14 [Selection Value 1])	1.2.840.10008.1.2.4.70	SCP
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP
		JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process14 [Selection Value 1])	1.2.840.10008.1.2.4.70	SCP
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCP

## 4.2.3.4.1.2.1. Extended Negotiation

No extended negotiation is performed, though SCAI-1PF STORAGE-SCP:

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

#### **4.2.3.4.1.3. SOP Specific Conformance**

##### **4.2.3.4.1.3.1. SOP Specific Conformance for Storage SOP Classes**

The associated Activity with the Storage service is the storage of medical DICOM data received over the network on a designated storage repository. The SCAI-1PF STORAGE-SCP AE will return a failure status if it is unable to store the received instance(s).

The SCAI-1PF STORAGE-SCP AE does not have any dependencies on the number of Associations used to send images to it. Images belonging to one or several studies can be sent over different Associations. SCAI-1PF STORAGE-SCP AE can be configured to correctly receive series split into several 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 SCAI-1PF STORAGE-SCP AE is configured to retain the original DICOM data in DICOM Part 10 compliant file format. The AE server of the SCAI-1PF complies with Level 2 (complete) as a Storage SCP.

In addition, all Private and SOP Class Extended Elements are maintained in the DICOM format files.

In addition to saving all Elements in files, a subset of the Elements is stored in the SCAI-1PF Server database to support query and retrieval requests and also to allow the updating of Patient, Study, and Series information by user input, or demographic and Study related messages, solely via the SCAI-1PF interface .

If the received Series instance is a duplicate of a previously received instance, the old files and database information will be overwritten with the new one.

Performance will depend greatly on the performance of the remote STORAGE-SCU, the number of simultaneous active Associations, and the underlying network performance.

##### **4.2.3.4.1.3.2. Presentation Context Acceptance Criterion**

SCAI-1PF STORAGE-SCP will always accept any Presentation Context for the supported SOP Classes with the supported Transfer Syntaxes. More than one proposed Presentation Context will be accepted for the same Abstract Syntax if the Transfer Syntax is supported, whether or not it is the same as another Presentation Context.

##### **4.2.3.4.1.3.3. Transfer Syntax Selection Policies**

The SCAI-1PF STORAGE-SCP will examine the Transfer Syntaxes for a given Presentation Context in the order that they are presented in the Association Request. The first Transfer Syntax that matches a supported Transfer Syntax will be accepted for each proposed Presentation Context.

## 4.2.3.4.1.3.4. Response Status

Table 4.2-25 Response Status for SCAI-1PF STORAGE-SCP

Service Status	Further Meaning	Status Codes	Related Fields	Behavior
Refused	Out of Resources	A7xx	(0000,0902)	Never sent
Error	Data Set does not match SOP Class	A9xx	(0000,0901) (0000,0902)	Never sent – data set is not checked prior to storage
	Cannot understand	Cxxx	(0000,0901) (0000,0902)	Never sent
Warning	Coercion of Data Elements	B000	(0000,0901) (0000,0902)	Never sent - no coercion is never performed
	Data Set does not match SOP Class	B007	(0000,0901) (0000,0902)	Never sent - data set is not checked prior to storage
	Elements Discarded	B006	(0000,0901) (0000,0902)	Never sent – all elements are always stored
Success	Success	0000	None	-

## 4.2.4. STORAGE-SCU AE Specification

### 4.2.4.1. SOP Classes Supported

**Table 4.2-26 SOP Classes supported by SCAI-1PF STORAGE-SCU**

SOP Class Name	SOP Class UID	SCU	SCP
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Yes	No
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	No
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	No

### 4.2.4.2. Association Policies

#### 4.2.4.2.1. General

The DICOM standard application context name for DICOM is always accepted and proposed:

**Table 4.2-27 DICOM Application Context**

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

The SCAI-1PF STORAGE-SCU AE initiates but never accepts association requests.

**Table 4.2-28 Maximum PDU size the SCAI-1PF STORAGE-SCU AE can receive**

Maximum PDU size received	16378 (Not configurable)
---------------------------	--------------------------

**Table 4.2-29 Maximum PDU size the SCAI-1PF STORAGE-SCU AE can send**

Maximum PDU size to send	16378 (Not configurable)
--------------------------	--------------------------

#### 4.2.4.2.2. Number of Associations

The SCAI-1PF STORAGE-SCU can support multiple simultaneous Associations. The maximum total number of simultaneous Associations is 5.

**Table 4.2-30 Number of Associations**

Maximum number of simultaneous associations	5 (Not configurable)
---	----------------------

#### 4.2.4.2.3. Asynchronous Nature

SCAI-1PF STORAGE-SCU does not support asynchronous communication. Multiple outstanding transactions are not supported. It allows up to one invoked and one performed operation on an Association (it is synchronous). Asynchronous mode of operation is not supported.

**Table 4.2-31 Asynchronous Nature as an association initiator for SCAI-1PF STORAGE-SCU**

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

**4.2.4.2.4. Implementation Identifying Information**

SCAI-1PF will respond with the identifying parameters as listed in the following table:

**Table 4.2-32 DICOM Implementation Class and Version for SCAI-1PF STORAGE-SCU**

Implementation Class UID	1.2.392.200036.9116.7.39
Implementation Version Name	AP-1.0

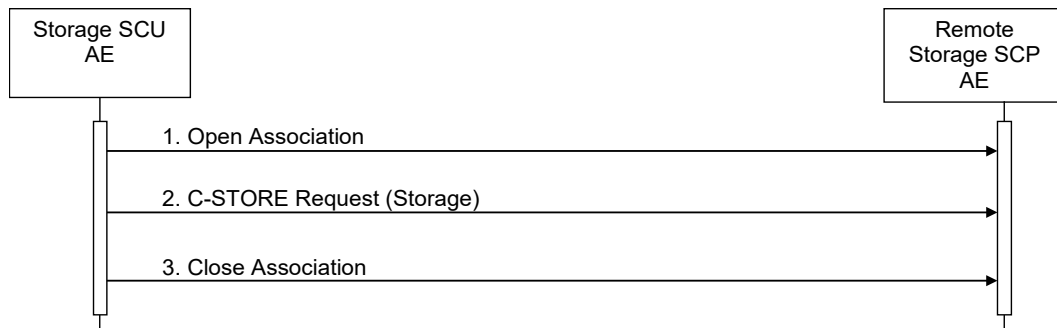
**4.2.4.3. Association Initiation Policy Policies**

SCAI-1PF STORAGE-SCU attempts to initiate a new association for each instance it attempts to transfer.

**4.2.4.3.1. Activity – Send Storage Request****4.2.4.3.1.1. Description and Sequencing of Activities**

An association is established when the user initiates a transmit request. For each instance selected from the user interface to be transferred, a single attempt will be made to transmit it to the selected remote AE. If the send fails, retry will be performed some times.

Storage SCU AE attempts to initiate a new Association in order to issue a Storage Request (C-STORE).



**Figure 4.2-4**  
**SEQUENCING OF ACTIVITY – SEND INSTANCES**

A possible sequence of interactions between the Storage SCU AE and a Server (e.g. a storage or archive device supporting the Storage SOP Classes as an SCP) is illustrated in the Figure above:

1. Storage SCU AE opens an Association with Storage SCP AE.
2. Acquired instances are transmitted to the server using a Storage Request (C-STORE) and Storage SCP AE replies with a C-STORE response (status success).
3. Storage SCU AE closes the Association with Storage SCP AE.



**4.2.4.3.1.2. Proposed Presentation Contexts**

SCAI-1PF STORAGE-SCU may request any of the Presentation Contexts listed in the following table for Storage.

**Table 4.2-33 Proposed Presentation Contexts for SCAI-1PF STORAGE-SCU**

<b>Presentation Context Table</b>				
<b>Abstract Syntax</b>		<b>Transfer Syntax</b>		<b>Role</b>
<b>Name</b>	<b>UID</b>	<b>Name</b>	<b>UID</b>	
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Implicit VR Little Endian	1.2.840.10008.1.2	SCU
Grayscale Softcopy Presentation State SR	1.2.840.10008.5.1.4.1.1.11.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCU
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU

Note: SCAI-1PF STORAGE-SCU does not convert Enhanced CT Image to multiple CT Images, thus Enhanced CT Image is only received by STORAGE-SCP AE for processing.

**4.2.4.3.1.2.1. Extended Negotiation**

No extended negotiation is performed.

**4.2.4.3.1.3. SOP Specific Conformance****4.2.4.3.1.3.1. SOP Specific Conformance for Storage SOP Classes**

SCAI-1PF STORAGE-SCU provides standard conformance to the Storage Service Class.

**4.2.4.3.1.3.2. Presentation Context Acceptance Criterion**

SCAI-1PF STORAGE-SCU does not accept associations.

**4.2.4.3.1.3.3. Transfer Syntax Selection Policies**

SCAI-1PF STORAGE-SCU prefers the original Transfer Syntax of the data to be sent.

**4.2.4.3.1.3.4. Response status**

SCAI-1PF STORAGE-SCU will behave as described in the Table below in response to the status returned in the C-STORE response command message.

**Table 4.2-34 Response Status for SCAI-1PF STORAGE-SCU**

<b>Service Status</b>	<b>Further Meaning</b>	<b>Status Codes</b>	<b>Related Fields</b>	<b>Behavior</b>
Refused	Out of Resources	A7xx	(0000,0902)	Never sent
Error	Data Set does not match SOP Class	A9xx	(0000,0901) (0000,0902)	Never sent – data set is not checked prior to storage
	Cannot understand	Cxxx	(0000,0901) (0000,0902)	Never sent
Warning	Coercion of Data Elements	B000	(0000,0901) (0000,0902)	Never sent - no coercion is ever performed
	Data Set does not match SOP Class	B007	(0000,0901) (0000,0902)	Never sent - data set is not checked prior to storage
	Elements Discarded	B006	(0000,0901) (0000,0902)	Never sent – all elements are always stored
Success	Success	0000	None	-

**4.2.4.4. Association Acceptance Policy**

SCAI-1PF STORAGE-SCU does not accept associations.

## 4.2.5. QUERY-RETRIEVE-SCU AE Specification

### 4.2.5.1. SOP Classes

The QUERY-RETRIEVE-SCU AE provides Standard Conformance to the following SOP Classes:

**Table 4.2-35 SOP Classes FOR THE QUERY-RETRIEVE-SCU AE**

SOP Class Name	SOP Class UID	SCU	SCP
Study Root Q/R Information Model – Find	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Q/R Information Model – Move	1.2.840.10008.5.1.4.1.2.2.2		

### 4.2.5.2. Association Policies

#### 4.2.5.2.1. General

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

**Table 4.2-36 DICOM Application Context for SCAI-1PF QUERY-RETRIEVE-SCU**

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

**Table 4.2-37 Maximum PDU size the SCAI-1PF QUERY-RETRIEVE-SCU AE can receive**

Maximum PDU size received	16378 (Not configurable)
---------------------------	--------------------------

**Table 4.2-38 Maximum PDU size the SCAI-1PF QUERY-RETRIEVE-SCU AE can send**

Maximum PDU size to send	16378 (Not configurable)
--------------------------	--------------------------

#### 4.2.5.2.2. Number of Associations

The maximum number of simultaneous Associations is not configurable.

**Table 4.2-39 Number of Associations Initiated for SCAI-1PF QUERY-RETRIEVE-SCU**

Maximum number of simultaneous associations	1 (Not configurable)
---	----------------------

#### 4.2.5.2.3. Asynchronous Nature

SCAI-1PF QUERY-RETRIEVE-SCU does not support asynchronous communication. Multiple outstanding transactions are not supported. It allows up to one invoked and one performed operation on an Association (it is synchronous). Asynchronous mode of operation is not supported.

**Table 4.2-40 Asynchronous Nature for SCAI-1PF QUERY-RETRIEVE-SCU**

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

#### 4.2.5.2.4. Implementation Identifying Information

The implementation information for this Application Entity is:

**Table 4.2-41 DICOM Implementation Class and Version for SCAI-1PF QUERY-RETRIEVE-SCU**

Implementation Class UID	1.2.392.200036.9116.7.39
Implementation Version Name	AP-1.0

4.2.5.3. Association Initiation Policy

4.2.5.3.1. Activity – Query and Retrieve Images

4.2.5.3.1.1. Description and Sequencing of Activities

SCAI-1PF QUERY-RETRIEVE-SCU AE is automatically activated by STORAGE-SCP AE when it receives images that require the retrieval of related images, then, requests the remote Query-Retrieve SCP AE to retrieve the related images to STORAGE-SCP (for C-MOVE) AE.

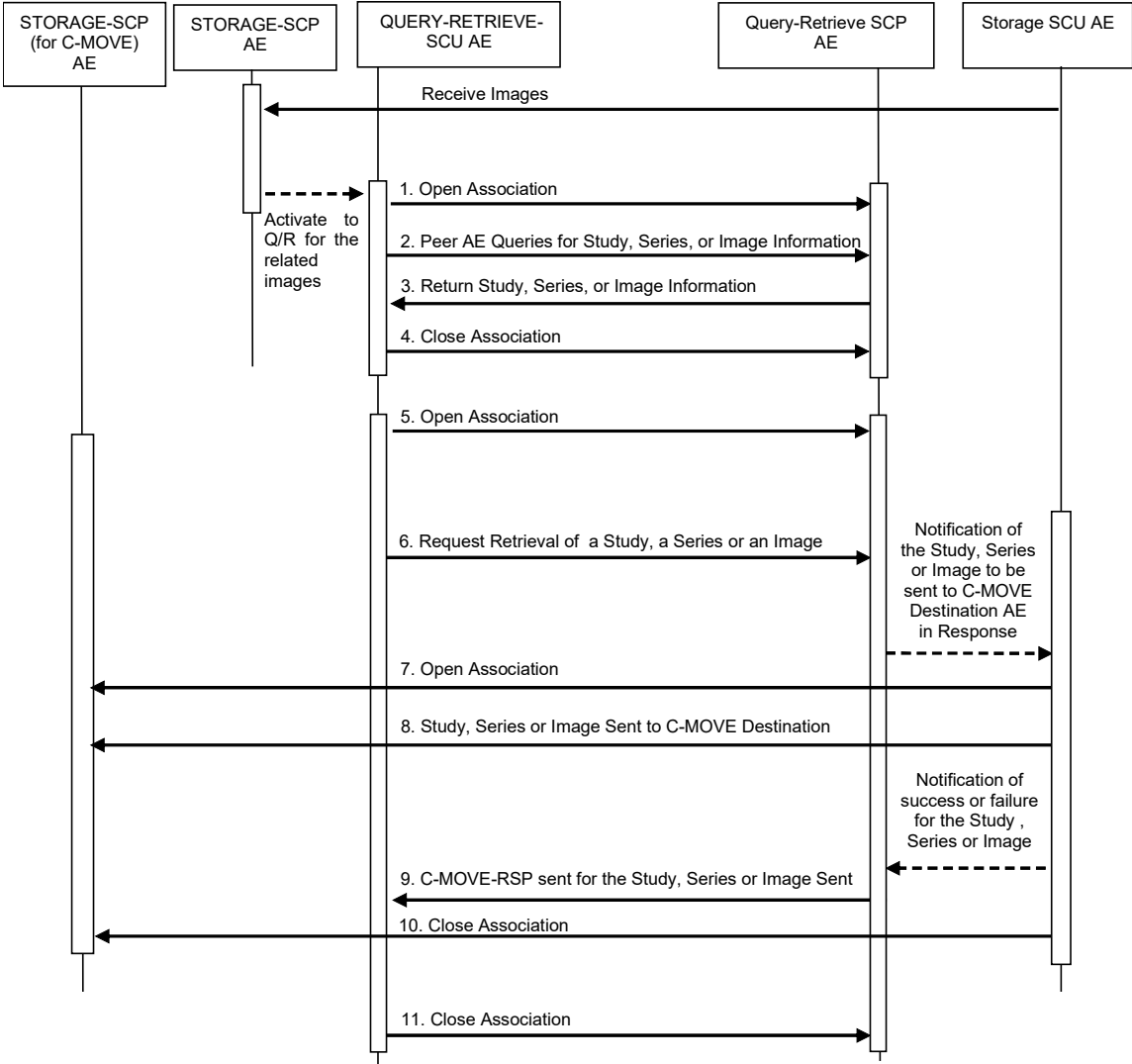


Figure 4.2-5 Sequencing of Activity – QUERY AND RETRIEVE IMAGES

The following sequencing constraints illustrated in the Figure above:

1. The QUERY-RETRIEVE-SCU AE opens an association with the Query-Retrieve SCP AE.
2. The QUERY-RETRIEVE-SCU AE sends a C-FIND-RQ Message
3. The Query-Retrieve SCP AE returns a C-FIND-RSP Message to the QUERY-RETRIEVE-SCU AE with matching information.  
A C-FIND-RSP is sent for each entity matching the identifier specified in the C-FIND-RQ. A final C-FIND-RSP is sent indicating that the matching is complete.
4. The QUERY-RETRIEVE-SCU AE closes the association.
5. The QUERY-RETRIEVE-SCU AE opens an association with the Query-Retrieve SCP AE.
6. The QUERY-RETRIEVE-SCU AE sends a C-MOVE-RQ Message. The Query-Retrieve SCP AE notifies the Storage SCU AE to send the Composite SOP Instances to the peer C-MOVE Destination AE as indicated in the C-MOVE-RQ.
7. The Storage SCU AE opens an association with the C-MOVE Destination AE.
8. The Storage SCU AE sends images to the C-MOVE Destination AE. The Storage SCU AE indicates to the Query-Retrieve SCP AE whether the transfer succeeded or failed.
9. The Query-Retrieve SCP AE then returns a C-MOVE-RSP indicating this success or failure.
10. The Storage SCU AE closes the association.
11. The QUERY-RETRIEVE-SCU AE closes the association.

**4.2.5.3.1.2. Proposed Presentation Contexts**

SCAI-1PF QUERY-RETRIEVE-SCU AE will propose Presentation Contexts shown in the following table:

**Table 4.2-42 Proposed Presentation Contexts for Real-World Activity QUERY AND RETRIEVE IMAGES**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Study Root Q/R Information Model – Find	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Study Root Q/R Information Model – Move	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

**4.2.5.3.1.3. SOP Specific Conformance for Q/R Find SOP Classes**

SCAI-1PF QUERY-RETRIEVE-SCU AE provides standard conformance to the Query/Retrieve Find SOP Classes as an SCU.

The behavior of SCAI-1PF QUERY-RETRIEVE-SCU AE when encountering status codes in a Q/R C-FIND response is summarized in the table below:

**Table 4.2-43 Response Status for SCAI-1PF QUERY-RETRIEVE-SCU Q/R Find**

Service Status	Further Meaning	Status Codes	Behavior
Refused	Out of Resources	A7xx	The query is marked as failed.
Error	Data Set does not match SOP Class	A9xx	
	Cannot understand	Cxxx	
Pending	Matches are continuing	FF00	Update the list information held inside the software.  (SCAI-1PF don't have feature to show the results provided by Query-Retrieve SCP AE.)
	Matches are continuing – Warning that one or more Optional Keys were not supported	FF01	
Success	Success	0000	Proceed to the next process (C-MOVE request).

The behavior of the QUERY-RETRIEVE-SCU AE during communication failure is summarized in the table below.

**Table 4.2-44 Q/R FIND Communication Failure Behavior**

<b>Exception</b>	<b>Behavior</b>
Timeout	The association is aborted and the study, series or image query is marked as failed. The reason is logged.
Association aborted by the SCP or network layers	The study, series or image query is marked as failed. The reason is logged.

The table below provides a description of the QUERY-RETRIEVE-SCU AE C-FIND Request Identifier.

**Table 4.2-45 STUDY ROOT REQUEST IDENTIFIER FOR C-FIND**

<b>Name</b>	<b>Tag</b>	<b>Types of Matching</b>
<b>Study Level</b>		
Study Date	(0008,0020)	S,U,R
Modalities in Study	(0008,0061)	S,U,L
Patient's ID	(0010,0020)	S,U
Study Instance UID	(0020,000D)	UNIQUE
<b>Series Level</b>		
Series Date	(0008,0021)	U
Series Time	(0008,0031)	U
Modality	(0008,0060)	U
Series Instance UID	(0020,000E)	UNIQUE
<b>Image Level</b>		
SOP Instance UID	(0008,0018)	UNIQUE

Types of Matching:

The types of Matching supported by the QUERY-RETRIEVE-SCU AE.

A "S" indicates the identifier attribute uses single value matching, a "R" indicates range matching, a "L" indicates list matching, a "U" indicates universal matching and a "UNIQUE" indicates that this is the Unique Key for that retrieval level.



**4.2.5.3.1.4. SOP Specific Conformance for Q/R Move SOP Classes**

The QUERY-RETRIEVE-SCU AE provides standard conformance to the Query/Retrieve Move SOP Classes as an SCU.

The behavior of the QUERY-RETRIEVE-SCU AE when encountering status codes in a Q/R C-MOVE response is summarized in the table below:

**Table 4.2-46 Response Status for SCAI-1PF QUERY-RETRIEVE-SCU Q/R Move**

<b>Service Status</b>	<b>Further Meaning</b>	<b>Status Codes</b>	<b>Behavior</b>
Refused	Out of Resources	A7xx	Retrieval is terminated
Error	Data Set does not match SOP Class	A9xx	
	Cannot understand	Cxxx	
Pending	Matches are continuing	FF00	Retrieval continues
Success	Success	0000	-

The behavior of the QUERY-RETRIEVE-SCU AE during communication failure is summarized in the table below.

**Table 4.2-47 Q/R MOVE Communication Failure Behavior**

<b>Exception</b>	<b>Behavior</b>
Timeout	The retrieve is marked as failed. The reason is logged.
Association aborted by the SCP or network layers	The retrieve is marked as failed. The reason is logged.

The table below provides a description of the QUERY-RETRIEVE-SCU AE C-MOVE Request Identifier.

**Table 4.2-48 STUDY ROOT REQUEST IDENTIFIER FOR C-MOVE**

<b>Name</b>	<b>Tag</b>	<b>Types of Matching</b>
<b>Study Level</b>		
Study Instance UID	(0020,000D)	UNIQUE
<b>Series Level</b>		
Series Instance UID	(0020,000E)	UNIQUE
<b>Image Level</b>		
SOP Instance UID	(0008,0018)	UNIQUE

Types of Matching:

The types of Matching supported by the QUERY-RETRIEVE-SCU AE.

A "UNIQUE" indicates that this is the Unique Key for that query level, in which case Universal Matching or Single Value Matching is used depending on the query level.

#### **4.2.5.4. Association Acceptance Policy**

The QUERY-RETRIEVE-SCU AE does not accept associations.

## 4.2.6. ECHO-SCP (for C-MOVE) AE Specification

### 4.2.6.1. SOP Classes

SCAI-1PF ECHO-SCP (for C-MOVE) provide Standard Conformance to the following SOP Class(es):

**Table 4.2-49 SOP Classes supported by SCAI-1PF ECHO-SCP (for C-MOVE)**

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes

### 4.2.6.2. Association Policies

#### 4.2.6.2.1. General

SCAI-1PF ECHO-SCP (for C-MOVE) accepts but never initiates associations.

The DICOM standard application context name for DICOM is always accepted and proposed:

**Table 4.2-50 DICOM Application Context for SCAI-1PF ECHO-SCP (for C-MOVE)**

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

**Table 4.2-51 Maximum PDU size received as a SCP for SCAI-1PF ECHO-SCP (for C-MOVE)**

Maximum PDU size received	16378 (Not configurable)
---------------------------	--------------------------

#### 4.2.6.2.2. Number of Associations

SCAI-1PF ECHO-SCP (for C-MOVE) can support up to three Associations at a time.

**Table 4.2-52 Number of Associations as a SCP for SCAI-1PF ECHO-SCP (for C-MOVE)**

Maximum number of simultaneous associations	1 (Not configurable)
---	----------------------

#### 4.2.6.2.3. Asynchronous Nature

SCAI-1PF ECHO-SCP (for C-MOVE) does not support asynchronous communication.

**Table 4.2-53 Asynchronous Nature as SCP for SCAI-1PF ECHO-SCP (for C-MOVE)**

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

#### 4.2.6.2.4. Implementation Identifying Information

**Table 4.2-54 DICOM Implementation Class and Version for SCAI-1PF ECHO-SCP (for C-MOVE)**

Implementation Class UID	1.2.392.200036.9116.7.39
Implementation Version Name	AP-1.0

#### 4.2.6.3. Association Initiation Policy

SCAI-1PF ECHO-SCP (for C-MOVE) does not initiate associations.

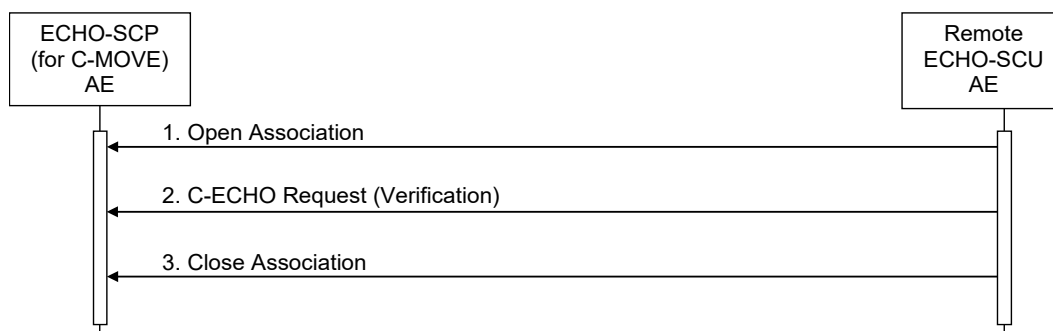
#### 4.2.6.4. Association Acceptance Policy

When SCAI-1PF ECHO-SCP (for C-MOVE) accepts an association, it will respond to echo requests. If the Called AE Title does not match the pre-configured AE Titles, the association will be rejected.

#### 4.2.6.4.1. Activity – Receive Echo Request

##### 4.2.6.4.1.1. Description and Sequencing of Activities

When the ECHO-SCP (for C-MOVE) AE accepts an association, it will respond to a verification request (C-ECHO).



**Figure 4.2-6  
SEQUENCING OF ACTIVITY – RESPOND TO VERIFICATION REQUEST**

A remote peer DICOM Application Entity, acting as an ECHO-SCU, tries to establish an association with SCAI-1PF ECHO-SCP (for C-MOVE) that accepts or doesn't accept these Associations for the purpose of testing the DICOM communication between peer DICOM AEs.

In the default configuration any Calling and Called AET will be accepted. If the Called AET does not correspond to the actual SCAI-1PF ECHO-SCP (for C-MOVE) AET, the SCU can only verify the DICOM Association.

If the Calling AE Titles property is configured, only these Application Entities will be accepted.

#### 4.2.6.4.1.2. Accepted Presentation Contexts

**Table 4.2-55 Acceptable Presentation Contexts for SCAI-1PF ECHO-SCP (for C-MOVE)**

Presentation Context Table				
Abstract Syntax		Transfer Syntax		Role
Name	UID	Name	UID	
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP

No extended negotiation is performed.

#### 4.2.6.4.1.3. SOP Specific Conformance

##### 4.2.6.4.1.3.1. SOP Specific Conformance to Verification SOP Class

SCAI-1PF ECHO-SCP (for C-MOVE) provides standard conformance to the DICOM Verification Service Class as a SCP. The status code for the C-ECHO is described in the following table:

**Table 4.2-56 SOP Specific Conformance to Verification SOP Class**

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0	The C-ECHO request is accepted

##### 4.2.6.4.1.3.2. Presentation Context Acceptance Criterion

SCAI-1PF ECHO-SCP (for C-MOVE) will always accept any Presentation Context for the supported SOP Classes with the supported Transfer Syntaxes. More than one proposed Presentation Context will be accepted for the same Abstract Syntax if the Transfer Syntax is supported, whether or not it is the same as another Presentation Context.

##### 4.2.6.4.1.3.3. Transfer Syntax Selection Policies

SCAI-1PF ECHO-SCP (for C-MOVE) prefers explicit Transfer Syntaxes. If offered a choice of Transfer Syntaxes in a Presentation Context, it will apply the following priority to the choice of Transfer Syntax:

first encountered explicit Transfer Syntax,

default Transfer Syntax.

SCAI-1PF ECHO-SCP (for C-MOVE) will accept duplicate Presentation Contexts, that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same priority for selecting a Transfer Syntax for each.

## 4.2.7. STORAGE-SCP (for C-MOVE) AE Specification

### 4.2.7.1. SOP Classes Supported

SCAI-1PF Storage Application Entity provides Standard Conformance to the following SOP Class(es):

**Table 4.2-57 SOP Classes supported by SCAI-1PF Storage Application Entity (SCP)**

SOP Class Name	SOP Class UID	SCU	SCP
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes

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

### 4.2.7.2. Association Policies

#### 4.2.7.2.1. General

The SCAI-1PF Storage Application Entity accepts but never initiates association requests. It will accept Association Requests for the Verification and Storage Services.

The DICOM standard application context name for DICOM is always accepted and proposed:

**Table 4.2-58 DICOM Application Context**

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

**Table 4.2-59 Maximum PDU size the SCAI-1PF STORAGE-SCP (for C-MOVE) AE can receive**

Maximum PDU size received	16378 (Not configurable)
---------------------------	--------------------------

**Table 4.2-60 Maximum PDU size the SCAI-1PF STORAGE-SCP (for C-MOVE) AE can send**

Maximum PDU size to send	16378 (Not configurable)
--------------------------	--------------------------

#### 4.2.7.2.2. Number of Associations

The SCAI-1PF Storage Application Entity can support multiple simultaneous Associations requested by peer AEs. The maximum total number of simultaneous Associations accepted from peer AEs is 5.

**Table 4.2-61 Number of Associations**

Maximum number of simultaneous associations	1 (Not configurable)
---	----------------------

**4.2.7.2.3. Asynchronous Nature**

The SCAI-1PF STORAGE-SCP (for C-MOVE) does not support asynchronous communication.

**Table 4.2-62 Asynchronous Nature for SCAI-1PF STORAGE-SCP (for C-MOVE) Server AE**

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

**4.2.7.2.4. Implementation Identifying Information**

**Table 4.2-63 DICOM Implementation Class and Version for SCAI-1PF STORAGE-SCP (for C-MOVE)**

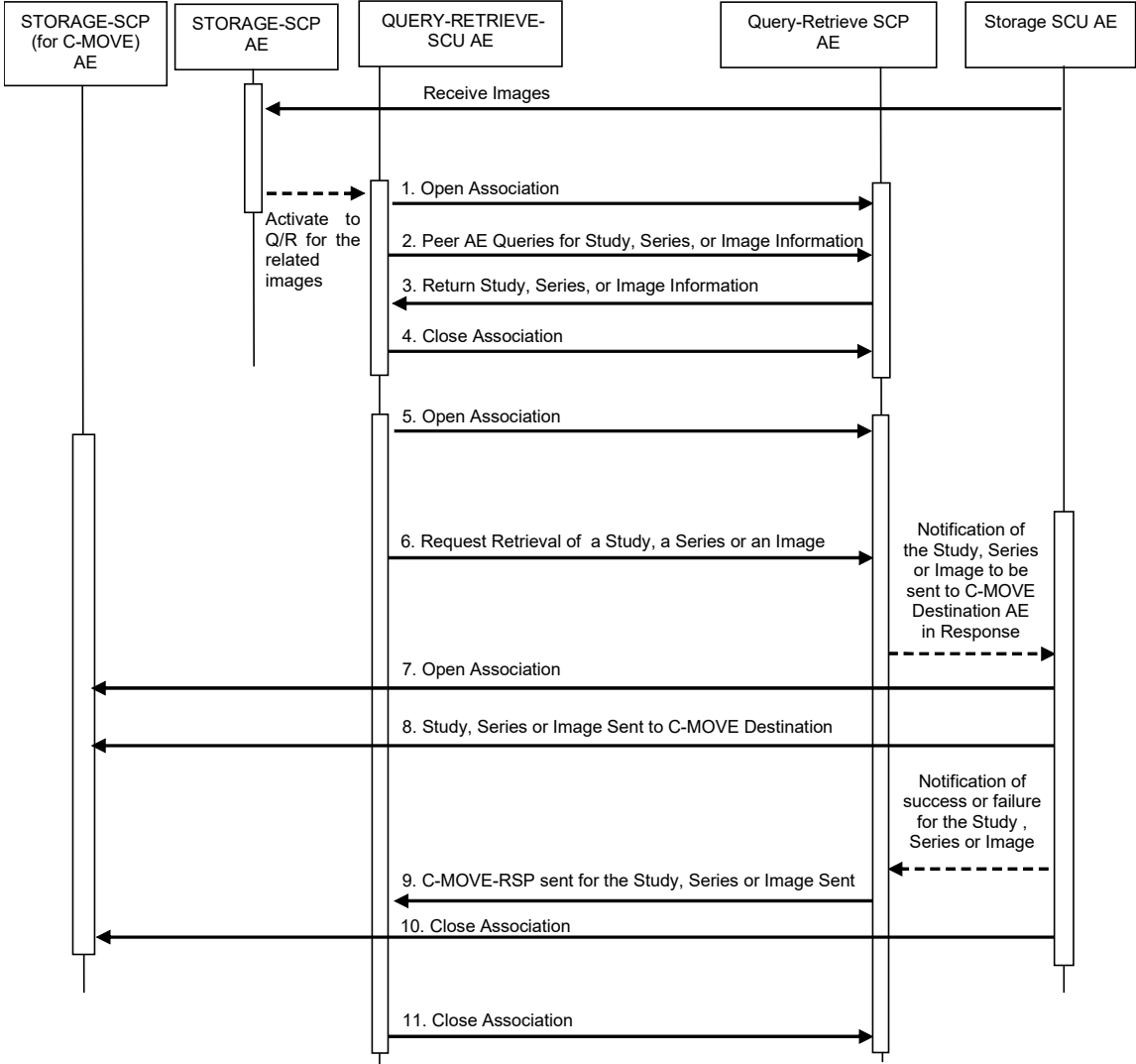
Implementation Class UID	1.2.392.200036.9116.7.39
Implementation Version Name	AP-1.0

**4.2.7.3. Association Initiation Policy**

SCAI-1PF STORAGE-SCP (for C-MOVE) does not initiate associations.

**4.2.7.4. Association Acceptance Policy**

The SCAI-1PF Storage Application Entity can be configured to only accept Associations with certain hosts (using TCP/IP address) and/or Application Entity Titles.



**Figure 4.2-7**  
**SEQUENCING OF ACTIVITY – STORE IMAGES TO THE LOCAL FILE SYSTEM**



The following sequencing constraints illustrated in the Figure above:

1. The QUERY-RETRIEVE-SCU AE opens an association with the Query-Retrieve SCP AE.
2. The QUERY-RETRIEVE-SCU AE sends a C-FIND-RQ Message
3. The Query-Retrieve SCP AE returns a C-FIND-RSP Message to the QUERY-RETRIEVE-SCU AE with matching information.  
A C-FIND-RSP is sent for each entity matching the identifier specified in the C-FIND-RQ. A final C-FIND-RSP is sent indicating that the matching is complete.
4. The QUERY-RETRIEVE-SCU AE closes the association.
5. The QUERY-RETRIEVE-SCU AE opens an association with the Query-Retrieve SCP AE.
6. The QUERY-RETRIEVE-SCU AE sends a C-MOVE-RQ Message. The Query-Retrieve SCP AE notifies the Storage SCU AE to send the Composite SOP Instances to the peer C-MOVE Destination AE as indicated in the C-MOVE-RQ.
7. The Storage SCU AE opens an association with the C-MOVE Destination AE.
8. The Storage SCU AE sends images to the C-MOVE Destination AE. The Storage SCU AE indicates to the Query-Retrieve SCP AE whether the transfer succeeded or failed.
9. The Query-Retrieve SCP AE then returns a C-MOVE-RSP indicating this success or failure.
10. The Storage SCU AE closes the association.
11. The QUERY-RETRIEVE-SCU AE closes the association.

#### 4.2.7.4.1.1. Description and Sequencing of Activities

A remote peer DICOM Application Entity, acting as a Storage SCU, establishes an association with SCAI-1PF STORAGE-SCP (for C-MOVE) that accepts these Associations for the purpose of receiving supported SOP Class Instances.

In the default configuration, any Calling and Called AET will be accepted. If the Called AET does not correspond to the actual SCAI-1PF Storage AET, the SCU can only verify the DICOM Association, but cannot invoke any other related DICOM service.

When an association has been established the Sequencing of Real-World Activities is as described in Section “Sequencing of Real-World Activities”.

The SCAI-1PF STORAGE-SCP (for C-MOVE) AE may reject Association attempts as shown in the table below. The Result, Source and Reason columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8, Section 9.3.4).

**Table 4.2-64 Association Rejection Reasons**

Result	Source	Reason	Description
2- rejected transient	provider	2 – local limit exceeded	The maximum number of simultaneous associations has been reached. An association request with the same parameters may succeed later.
1 – rejected permanent	User	2 – application context name not supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will NOT succeed later.
1 – rejected permanent	User	3 – calling AE Title not recognized	The Association request contained an unrecognized Calling AE Title. An association request with the same parameters will NOT succeed later unless configuration changes are made.

As instances are received, they are copied to the local database and a record is inserted into the local database. If the received instance is a duplicate of a previously received instance, the old file and database record will be overwritten with the new one.

## 4.2.7.4.1.2. Accepted Presentation Contexts

Table 4.2-65 Acceptable Presentation Contexts for SCAI-1PF STORAGE-SCP (for C-MOVE)

Presentation Context Table				
Abstract Syntax		Transfer Syntax		Role
Name	UID	Name	UID	
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP
		JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process14 [Selection Value 1])	1.2.840.10008.1.2.4.70	SCP
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCP
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP
		JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process14 [Selection Value 1])	1.2.840.10008.1.2.4.70	SCP
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP
		JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process14 [Selection Value 1])	1.2.840.10008.1.2.4.70	SCP
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCP

## 4.2.7.4.1.2.1. Extended Negotiation

No extended negotiation is performed, though SCAI-1PF STORAGE-SCP (for C-MOVE):

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

#### **4.2.7.4.1.3. SOP Specific Conformance**

##### **4.2.7.4.1.3.1. SOP Specific Conformance for Storage SOP Classes**

The associated Activity with the Storage service is the storage of medical DICOM data received over the network on a designated storage repository. The SCAI-1PF STORAGE-SCP (for C-MOVE) AE will return a failure status if it is unable to store the received instance(s).

The SCAI-1PF STORAGE-SCP (for C-MOVE) AE does not have any dependencies on the number of Associations used to send images to it. Images belonging to one or several studies can be sent over different Associations. SCAI-1PF STORAGE-SCP (for C-MOVE) AE can be configured to correctly receive series split into several 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 SCAI-1PF STORAGE-SCP (for C-MOVE) AE is configured to retain the original DICOM data in DICOM Part 10 compliant file format. The AE server of the SCAI-1PF complies with Level 2 (complete) as a Storage SCP.

In addition, all Private and SOP Class Extended Elements are maintained in the DICOM format files.

In addition to saving all Elements in files, a subset of the Elements is stored in the SCAI-1PF Server database to support query and retrieval requests and also to allow the updating of Patient, Study, and Series information by user input, or demographic and Study related messages, solely via the SCAI-1PF interface .

If the received Series instance is a duplicate of a previously received instance, the old files and database information will be overwritten with the new one.

Performance will depend greatly on the performance of the remote STORAGE-SCU, the number of simultaneous active Associations, and the underlying network performance.

##### **4.2.7.4.1.3.2. Presentation Context Acceptance Criterion**

SCAI-1PF STORAGE-SCP (for C-MOVE) will always accept any Presentation Context for the supported SOP Classes with the supported Transfer Syntaxes. More than one proposed Presentation Context will be accepted for the same Abstract Syntax if the Transfer Syntax is supported, whether or not it is the same as another Presentation Context.

##### **4.2.7.4.1.3.3. Transfer Syntax Selection Policies**

The SCAI-1PF STORAGE-SCP (for C-MOVE) will examine the Transfer Syntaxes for a given Presentation Context in the order that they are presented in the Association Request. The first Transfer Syntax that matches a supported Transfer Syntax will be accepted for each proposed Presentation Context.

## 4.2.7.4.1.3.4. Response Status

Table 4.2-66 Response Status for SCAI-1PF STORAGE-SCP (for C-MOVE)

Service Status	Further Meaning	Status Codes	Related Fields	Behavior
Refused	Out of Resources	A7xx	(0000,0902)	Never sent
Error	Data Set does not match SOP Class	A9xx	(0000,0901) (0000,0902)	Never sent – data set is not checked prior to storage
	Cannot understand	Cxxx	(0000,0901) (0000,0902)	Never sent
Warning	Coercion of Data Elements	B000	(0000,0901) (0000,0902)	Never sent - no coercion is never performed
	Data Set does not match SOP Class	B007	(0000,0901) (0000,0902)	Never sent - data set is not checked prior to storage
	Elements Discarded	B006	(0000,0901) (0000,0902)	Never sent – all elements are always stored
Success	Success	0000	None	-

### 4.3. NETWORK INTERFACES

#### 4.3.1. Physical Network Interfaces

SCAI-1PF is indifferent to the physical medium over which TCP/IP executes; which is dependent on the underlying Operating System and hardware.

#### 4.3.2. Supported Communications Stacks

SCAI-1PF provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8 of the DICOM Standard. SCAI-1PF inherits their TCP/IP stack from the installed Java Runtime Environment on the underlying operating system upon which it executes.

#### 4.3.3. Additional Protocols

SCAI-1PF conforms to the System Management Profiles listed in Table 4.3-1.

**Table 4.3-1 Supported System Management Profiles**

Profile Name	Actor	Protocol	Support
Network Address Management	DHCP Client	DHCP	No
	DNS Client	DNS	Depends on the operating system
Time Synchronization	NTP Client	NTP	Depends on the operating system
	DHCP Client	DHCP	No
DICOM Application Configuration Management	LDAP Client	LDAP	No

## 4.4. CONFIGURATION

Configuration is performed through the use of Java properties file(s) stored in pre-defined locations that are specific to the underlying operating system.

### 4.4.1. AE Title/Presentation Address Mapping

The Calling AE Title of the local application is configurable in the preferences file, and is shared by all of the AEs.

The mapping of the logical name by which remote AEs are described in the user interface to Called AE Titles as well as presentation address (hostname or IP address and port number) is configurable in the preferences files.

**Table 4.4-1 AE Title Configuration Table**

Application Entity	Default AE Title	Default TCP/IP Port
ECHO-SCP	CM_OT_AP	104
ECHO-SCU		None
STORAGE-SCP		104
STORAGE-SCU		None
Secured ECHO-SCP		2762
Secured STORAGE-SCP		2762
QUERY-RETRIEVE-SCU	CM_OT_PAP	None
ECHO-SCP (for C-MOVE)		3840
STORAGE-SCP (for C-MOVE)		3840

### 4.4.2. Parameters

A large number of parameters can be specified in the SCAI-1PF configuration files by Service or Installation Personnel. Users of SCAI-1PF must contact Canon Medical Systems Service or Installation personnel if they wish to change any of these settings.

Some of these properties can be changed by user via interface.

**Table 4.4-2 Configuration Parameters table for ECHO-SCP and STORAGE-SCP**

Parameter	Configurable (Yes/No)[Range]	Default Value
Time-out waiting for an acceptance or rejection response to an Association Request (Application Level Timeout)	Yes [1-60]	5 sec

**Table 4.4-3 Configuration Parameters table for ECHO-SCU and STORAGE-SCU**

<b>Parameter</b>	<b>Configurable (Yes/No)[Range]</b>	<b>Default Value</b>
Retry count	Yes [1-10]	1



## **5. MEDIA INTERCHANGE**

SCAI-1PF does not support Media Storage.

## 6. SUPPORT OF EXTENDED CHARACTER SETS

This product supports the following character sets:

- ISO-IR 6 (default)                      ISO646
- ISO-IR 100(Latin alphabet No.1)      Supplementary set of ISO8859
- ISO-IR 87                                 JIS X 0208(Kanji)

## 7. SECURITY

SCAI-1PF supports the TLS Secure Transport Connection Profile. SCAI-1PF does not provide any other specific security measures like firewalls, router protections, VPN (Virtual Private Network) ... related to network access to external hosts and services.

### 7.1. DICOM Security Profile Availability

SCAI-1PF provides two configurations of parameters for its local AE: one unsecured basic connection and one TLS connection. There is one associated port number for which SCAI-1PF accepts secured connections. This configuration of parameters is optional.

#### 7.1.1. Secure Transport Connection Profiles

SCAI-1PF supports the following requirements for the secure DICOM communication. At the default configuration, the TLS option is deactivated.

**Table 7.1-1 Secure Transport Connection Profiles and Cipher Suites**

Profile	Sender	Receiver	Reference
BCP195 TLS Secure Transport Connection	Y	Y	8.6.1
Non-Downgrading BCP195 TLS Secure Transport Connection	Y	Y	8.6.1
Extended BCP195 TLS Profile Secure Transport Connection	Y	Y	8.6.1

## **8. ANNEXES**

### **8.1. IOD CONTENTS**

SCAI-1PF does not create any SOP instances but sends one created by SCAI-1AP and/or third-party applications.

#### **8.1.1. Created SOP Instances**

Not applicable.

#### **8.1.2. Usage of attributes from received IOD's**

No SOP Class specific fields are required.

#### **8.1.3. Attribute Mapping**

Not applicable.

#### **8.1.4. Coerced/modified fields**

No coercion is performed.

### **8.2. DATA DICTIONARY OF PRIVATE ATTRIBUTES**

Not applicable.

### **8.3. CONTROLLED TERMINOLOGY**

None.

### **8.4. GRAYSCALE IMAGE CONSISTENCY**

None.

### **8.5. PRIVATE TRANSFER SYNTAXES**

None.

## 8.6. DICOM Security Profile Details

### 8.6.1. Secure Transport Connection Details

In order to handle secured connections on the specified port number, SCAI-1PF must be given a key store file, a trust store file and their associated passwords. When these parameters are fulfilled, after restarting, SCAI-1PF can accept TLS connections.

Key store, trust store files and their passwords are also used for each Remote AE for which it initiates connections. A boolean parameter indicates whether the Remote AE is designated as handling TLS connections or non-TLS connections.

The following table specifies the cipher suites that this product can support in each profile.

**Table 8.6-1 Secure Transport Connection Profiles and Cipher Suites**

Profile	Reference
BCP195 TLS Secure Transport Connection (TLS 1.3)	TLS_AES_128_GCM_SHA256
	TLS_AES_256_GCM_SHA384
BCP195 TLS Secure Transport Connection (TLS 1.2)	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384
	TLS_DHE_RSA_WITH_AES_256_GCM_SHA384
	TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
	TLS_DHE_RSA_WITH_AES_128_GCM_SHA256
Non-Downgrading BCP195 TLS Secure Transport Connection	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384
	TLS_DHE_RSA_WITH_AES_256_GCM_SHA384
	TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
	TLS_DHE_RSA_WITH_AES_128_GCM_SHA256
	TLS_AES_128_GCM_SHA256
	TLS_AES_256_GCM_SHA384
Extended BCP195 TLS Profile Secure Transport Connection	TLS_DHE_RSA_WITH_AES_128_GCM_SHA256
	TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
	TLS_DHE_RSA_WITH_AES_256_GCM_SHA384
	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384