

**DICOM CONFORMANCE STATEMENT
FOR
MEDICAL IMAGE PROCESSOR**

VAS-01
V7.4 SP0000J OR LATER

CANON MEDICAL SYSTEMS CORPORATION

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1. CONFORMANCE STATEMENT OVERVIEW

The application supports image receives across the network from other systems for 2D and 3D viewing. The SOP Classes in table 1-1 can be received and stored.

The application also supports the ability to query remote systems for a list of DICOM objects that may be retrieved. It also supports incoming queries from remote systems for a list of DICOM objects and the ability to retrieve them from the application. CT and Secondary Capture images can be generated and sent to remote systems.

The application acts as a Verification SOP Class SCU and SCP.

Table 1-1 Network Services

| SOP Classes | User of Service (SCU) | Provider of Service (SCP) |
|--|-----------------------|---------------------------|
| Transfer | | |
| Verification | Yes | Yes |
| CT Image Storage | Yes | Yes |
| Enhanced CT Image Storage | Yes (*) | Yes |
| MR Image Storage | Yes | Yes |
| Enhanced MR Image Storage | Yes (*) | Yes |
| Secondary Capture Image Storage | Yes | Yes |
| Multi-frame Single Bit Secondary Capture Image Storage | Yes (*) | Yes |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | Yes (*) | Yes |
| Multi-frame Grayscale Word Secondary Capture Image Storage | Yes (*) | Yes |
| Multi-frame True Color Secondary Capture Image Storage | Yes (*) | Yes |
| X-Ray Angiographic Image Storage | Yes | Yes |
| X-Ray 3D Angiographic Image Storage | Yes | Yes |
| Nuclear Medicine Image Storage | Yes (*) | Yes |
| Basic Text SR Storage | Yes | Yes |
| Enhanced SR Storage | Yes (*) | Yes |
| X-Ray Radiation Dose SR Storage | Yes (*) | Yes |
| Positron Emission Tomography Image Storage | Yes (*) | Yes |
| Query/Retrieve | | |
| Study Root Query/Retrieve Information Model – FIND | Yes | Yes |
| Study Root Query/Retrieve Information Model – MOVE | Yes | Yes |
| Print Management | | |
| Basic Grayscale Print Management | Yes | No |
| Basic Color Print Management | Yes | No |

* Store without processing the structure that received as SCP.

Table 1-2 Media Services

| Media Storage Application Profile | Write Files (FSC or FSU) | Read Files (FSR) |
|--|--------------------------|------------------|
| Compact Disk – Recordable | | |
| CT/MR Studies Image CD-R | No | Yes |
| General Purpose CD-R | No | Yes |
| DVD | | |
| CT/MR Studies Image DVD-RAM | No | Yes |
| CT/MR Studies Image DVD media (*) | No | Yes |
| General Purpose DVD Interchange with JPEG | No | Yes |
| General Purpose DVD Interchange with JPEG 2000 | No | Yes |

* DVD-R only

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3. INTRODUCTION

3.1 Revision History

Table 3-1 Revision History

| REV. | Data of Issue | Author | Description |
|------|---------------|-----------------------|------------------------|
| | Jan 2017 | TMSC | Initial Version |
| A | Jan 2018 | Canon Medical Systems | Change of company name |

3.2 Audience

This document is written for the people that need to understand how the VAS-01 will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features. Also note that this document is formatted according to the DICOM 3.1 Specification, Part 2: Conformance.

3.3 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between the VAS-01 and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

- The comparison of different Conformance Statements is just the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

3.4 Terms and Definitions

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Computed Tomography Image Storage SOP Class.

Application Entity (AE) – an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title – the externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.

Application Context – the specification of the type of communication used between Application Entities. Example: DICOM network protocol.

Association – a network communication channel set up between Application Entities.

Digital Imaging and Communications in Medicine (DICOM) - DICOM is a global Information-Technology standard used in all hospitals worldwide.

Information Object Definition (IOD) – the specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: CT Image IOD, Print Job IOD.

Joint Photographic Experts Group (JPEG) – a set of standardized image compression techniques, available for use by DICOM applications.

Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs).

Module – a set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – first phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context – the set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.

Protocol Data Unit (PDU) – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data.

Service Class Provider (SCP) – role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP)

Service Class User (SCU) – role of an Application Entity that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU).

Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Computed Tomography Image Storage Service, Basic Grayscale Print Management.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element. Examples: 0010,0020 [Patient ID], (07FE,0010) [Pixel Data].

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), little endian explicit value representation.

Unique Identifier (UID) – a globally unique “dotted decimal” string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person’s name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

3.5 Basics of DICOM Communication

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in italics below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two Application Entities (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network “handshake”. One of the two devices must initiate an Association (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (Negotiation).

DICOM specifies a number of network services and types of information objects, each of which is called an Abstract Syntax for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted Transfer Syntaxes. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the Association; these combinations are called Presentation Contexts. The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on Roles – which one is the Service Class User (SCU - client) and which is the Service Class Provider (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (PDU) size, security information, and network service options (called Extended Negotiation information).

The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports), and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate Information Object Definition, and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most efficient for some use cases. Each transfer is explicitly acknowledged by the receiver with a Response Status indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a CD-R). Since there is no Association Negotiation possible, they both use a Media Application Profile that specifies “pre-negotiated” exchange media format, Abstract Syntax, and Transfer Syntax.

3.6 Abbreviations

| | |
|--------|---|
| AE | Application Entity |
| AET | Application Entity Title |
| CD-R | Compact Disk Recordable |
| DICOM | Digital Imaging and Communications in Medicine |
| DIMSE | DICOM Message Service Element |
| FSC | File-Set Creator |
| FSU | File-Set Updater |
| FSR | File-Set Reader |
| IOD | Information Object Definition |
| JPEG | Joint Photographic Experts Group |
| MR | Magnetic Resonance Imaging |
| NM | Nuclear Medicine |
| PDU | Protocol Data Unit |
| PET | Positron Emission Tomography |
| SC | Secondary Capture |
| SCP | Service Class Provider |
| SCU | Service Class User |
| SOP | Service-Object Pair |
| SR | Structured Reporting |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| VR | Value Representation |
| XA | X-ray Angiography |

3.7 References

NEMA PS3 DICOM Standard, available free at <http://medical.nema.org/>

4. NETWORKING

4.1 Implementation Model

4.1.1 Application Data Flow

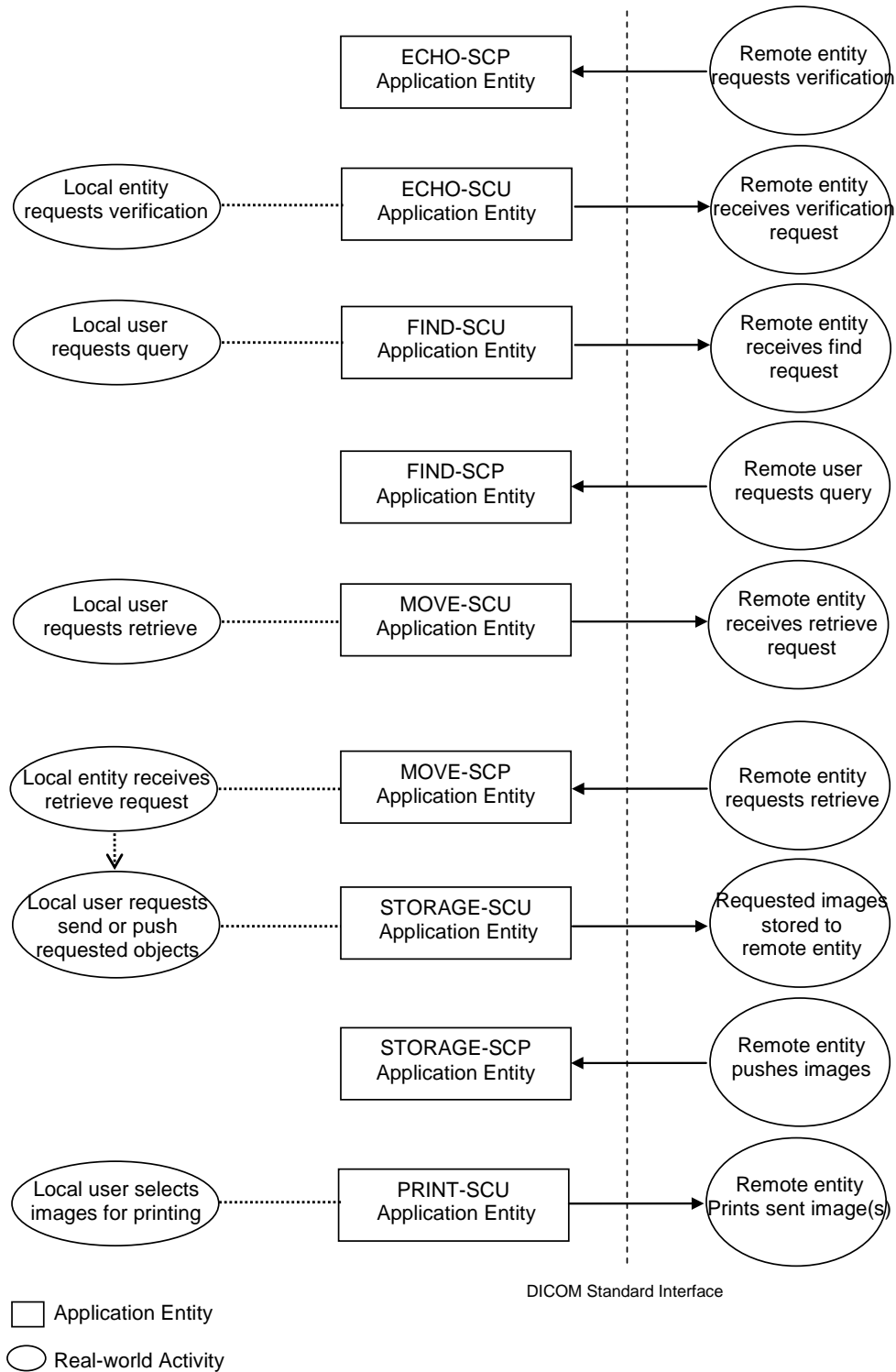


Figure 4.1 Implementation Model

The implementation consists of a set of applications which provide a user interface, internal database and network listeners that spawn additional threads or processes as necessary to handle incoming connections.

Conceptually the network services may be modeled as the following separate AEs, though in fact some AEs share (configurable) AE Titles:

- ECHO-SCP, which responds to verification requests
- ECHO-SCU, which sends verification requests
- FIND-SCU, which queries remote entities for lists of studies, series and instances
- FIND-SCP, which processes queries from remote entities for lists of studies, series and instances
- MOVE-SCU, which retrieves studies, series and instances from remote entities
- MOVE-SCP, which processes retrieve requests from remote entities for studies, series and instances
- STORAGE-SCU, which stores images and other composite instances to remote entities
- STORAGE-SCP, which receives images and other composite instances from remote entities
- PRINT-SCU, which sends images and print requests

4.1.2 Functional Definition of AE's

4.1.2.1 ECHO-SCP

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 successfully to echo requests.

4.1.2.2 ECHO-SCU

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 FIND-SCU

FIND-SCU is activated through the user interface when a user selects a remote AE to query (from a pre-configured list), then initiates a query. Queries are performed at the study level. A user can further expand each result in the query, which then initiates a series level query.

4.1.2.4 FIND-SCP

FIND-SCP continuously runs in the background, waiting for connections, and will accept associations from known IP addresses with Presentation Contexts for Study Root Query/Retrieve Model Service Class. It will query the permanent database based on the tags specified in the query, and send the appropriate responses to the requesting entity. A limit of 500 matching responses is currently imposed on the service. A configuration option for receiving from all IP addresses is available, by default only configured incoming connections are accepted.

4.1.2.5 MOVE-SCU

MOVE-SCU is activated through the user interface when a user selects a study or series for retrieval. A connection to the remote AE is established to initiate and monitor the retrieval while the STORAGE-SCP AE receives the retrieved instances.

4.1.2.6 MOVE-SCP

MOVE-SCP continuously runs in the background, waiting for connections, and will accept associations with Presentation Contexts for Study Root Query/Retrieve Model Service Class. It will query the local database for instances matching the tags specified, and send the instances to the requested remote entity via the STORAGE-SCU.

4.1.2.7 STORAGE-SCU

STORAGE-SCU is activated through the user interface when a user selects instances from the permanent database, or the currently displayed instance, and requests that they be sent to a remote AE (selected from a pre-configured list).

4.1.2.8 STORAGE-SCP

STORAGE-SCP continuously runs in the background, waiting for connections and will accept associations with Presentation Contexts for SOP Classes of the Storage Service Class and the Verification Service Class. It will store the received instances to the local database, complete preprocessing, and store the data to the local disk, after which they are listed and viewed through the user interface. A configuration option for receiving only from known IP addresses is available, by default all incoming connections are accepted. Any tags of type 1 (including all UIDs) which are missing, empty, or longer than the defined Standard value will be rejected.

4.1.2.9 PRINT-SCU

PRINT-SCU is activated through the user interface when a user selects the currently displayed instance, and requests that it be printed by a remote AE (selected from a pre-configured list).

4.1.3 Sequencing of Real-World Activities

4.1.3.1 DICOM Validation

4.1.3.1.1 Invalid Dicom Values

Within the system there is validation for DICOM tags. Any tags of type 1 (including all UIDs) which are missing, empty, or longer than the defined Standard value will be rejected at the time of SCP receive. These tags have been identified as possible patient hazards if incorrectly populated, therefore they will not be allowed into the system. Users should reconcile the non-conformant data if it is to be processed by the system.

4.1.3.1.2 Demographic Updates

STORAGE-SCP receives instances which may have changed demographic data. The new instances received replace the previously received specific instances. Demographic information in the system is updated to match the latest received instances and necessary volumes are regenerated.

New values for the following DICOM attributes can trigger a demographic update:

PATIENT

- (0010,0010) Patient's Name
- (0010,0020) Patient ID
- (0010,0030) Patient's Birth Date
- (0010,0032) Patient's Birth Time
- (0010,0040) Patient's Sex
- (0010,1000) Other Patient IDs
- (0010,1001) Other Patient Names
- (0010,1010) Patient's Age
- (0010,1020) Patient's Size
- (0010,1030) Patient's Weight
- (0010,2160) Ethnic Group
- (0010,2180) Occupation
- (0010,21B0) Additional Patient History
- (0010,4000) Patient Comments

STUDY

- (0008,0020) Study Date
- (0008,0030) Study Time
- (0008,0050) Accession Number
- (0008,0090) Referring Physician's Name
- (0008,1060) Name of Physician(s) Reading Study
- (0008,1080) Admitting Diagnoses Description
- (0008,1030) Study Description
- (0020,0010) Study ID
- (0020,1070) Other Study Numbers (RET)

SERIES

- (0008,0021) Series Date
- (0008,0031) Series Time
- (0008,0060) Modality
- (0008,0070) Manufacturer
- (0008,0080) Institution Name
- (0008,103E) Series Description
- (0008,1090) Manufacturer's Model Name
- (0018,0015) Body Part Examined
- (0018,0022) Scan Options
- (0018,1030) Protocol Name
- (0020,0011) Series Number

4.1.3.1.3 Duplicate Unique IDs

Data with duplicate Unique IDs are in violation of the DICOM standard. However this kind of data is sometimes created in a healthcare enterprise as a workaround for certain workflows. The system has different levels of support depending on which UIDs are duplicated.

- Data with same (duplicate) StudyInstanceUID but with unique Series and/or InstanceUIDs is received and stored in the system.
- Data with same (duplicate) SeriesInstanceUID but in different Studies is received by the system but is not stored in the database. They need to be administratively cleaned out.
- Data with same (duplicate) SOPInstanceUID but in different Series is received and stored in the system.

4.2 AE Specifications

4.2.1 ECHO-SCP

4.2.1.1 SOP Classes

ECHO-SCP provides Standard Conformance to the following SOP Class(es):

Table 4-1 SOP Classes Supported by 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

ECHO-SCP accepts but never initiates associations.

Table 4-2 Maximum PDU size received as a SCP for ECHO-SCP

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

4.2.1.2.2 Number of Associations

Table 4-3 Number of Associations as a SCP for ECHO-SCP

| | |
|------------------------|-----------|
| Number of Associations | Unlimited |
|------------------------|-----------|

4.2.1.2.3 Asynchronous Nature

ECHO-SCP will only allow a single outstanding operation on an Association. Therefore, ECHO-SCP will not perform asynchronous operations window negotiation.

4.2.1.2.4 Implementation Identifying Information

Table 4-4 DICOM Implementation Class and Version for ECHO-SCP

| | |
|-----------------------------|-------------------------|
| Implementation Class UID | 1.3.6.1.4.1.25403.1.1.1 |
| Implementation Version Name | Dicom 0.1 |

4.2.1.3 Association Acceptance Policy

4.2.1.3.1 Activity – Handle Verification Request

4.2.1.3.1.1 Description and Sequencing of Activities

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

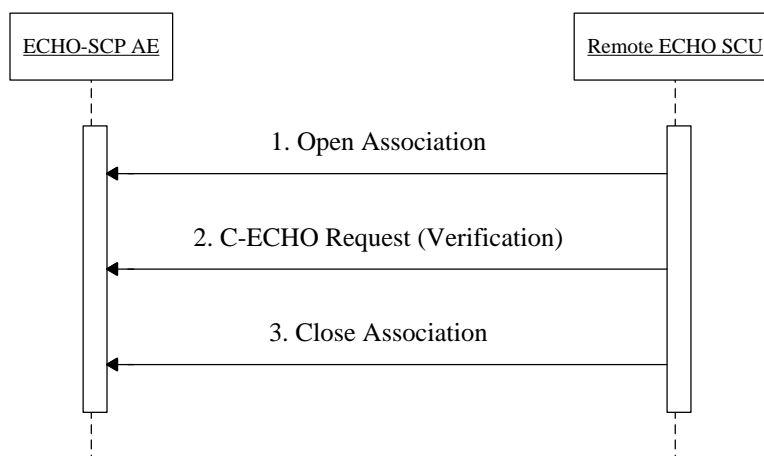


Figure 4.2 Sequencing of Activity – Handling Verification Request

4.2.1.3.1.2 Accepted Presentation Contexts

Table 4-5 Accepted Presentation Contexts for ECHO-SCP

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

4.2.1.3.1.3 Extended Negotiation

No extended negotiation is performed.

4.2.1.3.1.4 SOP Specific Conformance

4.2.1.3.1.4.1 SOP Specific Conformance Verification SOP Class

ECHO-SCP provides standard conformance to the Verification Service Class.

4.2.1.3.1.4.2 Presentation Context Acceptance Criterion

ECHO-SCP will only accept a Presentation Context compatible with the one listed in DICOM PS3.2 Table D.4.2-5.

4.2.1.3.1.4.3 Transfer Syntax Selection Policies

ECHO-SCP will select the first Transfer Syntax proposed by the client that is supported by the SCP, per Presentation Context.

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 method for selecting a Transfer Syntax for each.

4.2.1.3.1.5 Response Status

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

Table 4-6 Response Status for STORAGE-SCP and Receive Storage Request

| Service Status | Further Meaning | Status Codes | Reason |
|----------------|-----------------------------------|--------------|---|
| Refused | Out of Resources | A7xx | Association limit reached, local disk space low |
| Error | Data Set does not match SOP Class | A9xx | Never sent – data set is not checked prior to storage |
| | Cannot understand | Cxxx | Internal processing error |
| Warning | Coercion of Data Elements | B000 | Never sent - no coercion is ever performed |
| | Data Set does not match SOP Class | B007 | Never sent - data set is not checked prior to storage |
| | Elements Discarded | B006 | Never sent – all elements are always stored |
| Success | | 0000 | |

4.2.2 ECHO-SCU

4.2.2.1 SOP Classes

ECHO- SCU provides Standard Conformance to the following SOP Class(es):

Table 4-7 SOP Classes Supported by 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

ECHO-SCU initiates associations through a user interface.

Table 4-8 Maximum PDU size received as a SCP for ECHO-SCU

| | |
|---------------------------|-----------------------------|
| Maximum PDU size received | Unlimited, default is 16384 |
|---------------------------|-----------------------------|

4.2.2.2.2 Number of Associations

Table 4-9 Number of Associations as a SCP for ECHO-SCU

| | |
|------------------------|---|
| Number of Associations | 1 |
|------------------------|---|

4.2.2.2.3 Asynchronous Nature

ECHO-SCU will only allow a single outstanding operation on an Association. Therefore, ECHO-SCU will not perform asynchronous operations window negotiation.

4.2.2.2.4 Implementation Identifying Information

Table 4-10 DICOM Implementation Class and Version for ECHO-SCU

| | |
|-----------------------------|-------------------------|
| Implementation Class UID | 1.3.6.1.4.1.25403.1.1.1 |
| Implementation Version Name | Dicom 0.1 |

4.2.2.3 Association Initiation Policy

4.2.2.3.1 Activity – Sending Verification Request

4.2.2.3.1.1 Description and Sequencing of Activities

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.

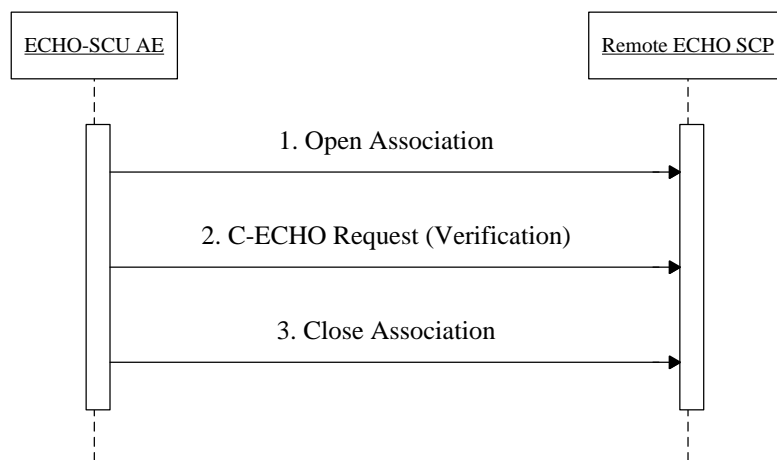


Figure 4.3 Sequencing of Activity – Sending Verification Request

4.2.2.3.1.2 Proposed Presentation Contexts

Table 4-11 Accepted Presentation Contexts for ECHO-SCU

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

4.2.2.3.1.3 Extended Negotiation

No extended negotiation is performed.

4.2.2.3.1.4 SOP Specific Conformance

4.2.2.3.1.4.1 SOP Specific Conformance to Verification SOP Classes

ECHO-SCU provides standard conformance to the Verification Service Class.

4.2.2.3.1.4.2 Presentation Context Acceptance Criterion

ECHO-SCU does not accept associations.

4.2.2.3.1.4.3 Transfer Syntax Selection Policies

ECHO-SCU prefers Explicit VR Little Endian Transfer Syntax, which is always first in the proposed Presentation Context.

4.2.2.3.1.5 Response Status

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

Table 4-12 Response Status for STORAGE-SCU and Request Storage

| Service Status | Further Meaning | Status Codes | Behavior |
|----------------|-----------------------------------|--------------|---------------------------|
| Refused | Out of Resources | A7xx | Job set to Failed state |
| Error | Data Set does not match SOP Class | A9xx | Job set to Failed state |
| | Cannot understand | Cxxx | Job set to Failed state |
| Warning | Coercion of Data Elements | B000 | Job set to Complete state |
| | Data Set does not match SOP Class | B007 | Job set to Failed state |
| | Elements Discarded | B006 | Job set to Complete state |
| Success | | 0000 | Job set to Complete state |

4.2.3 FIND-SCU

4.2.3.1 SOP Classes

FIND-SCU provides Standard Conformance to the following SOP Class(es):

Table 4-13 SOP Classes Supported by FIND-SCU

| SOP Class Name | SOP Class UID | SCU | SCP |
|--|-----------------------------|-----|-----|
| Study Root Query/Retrieve Information Model – FIND | 1.2.840.10008.5.1.4.1.2.2.1 | Yes | No |

4.2.3.2 Association Policies

4.2.3.2.1 General

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

Table 4-14 DICOM Application Context for FIND-SCU

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

Table 4-15 Maximum PDU Size Sent for FIND-SCU

| | |
|-----------------------|-----------------------------|
| Maximum PDU size sent | Unlimited, default is 65536 |
|-----------------------|-----------------------------|

4.2.3.2.2 Number of Associations

Table 4-16 Number of Associations for FIND-SCU

| | |
|---|---|
| Maximum number of simultaneous associations | 1 |
|---|---|

4.2.3.2.3 Asynchronous Nature

FIND-SCU will only allow a single outstanding operation on an Association. Therefore, FIND-SCU will not perform asynchronous operations window negotiation.

4.2.3.2.4 Implementation Identifying Information

Table 4-17 DICOM Implementation Class and Version for FIND-SCU

| | |
|-----------------------------|-------------------------|
| Implementation Class UID | 1.3.6.1.4.1.25403.1.1.1 |
| Implementation Version Name | Dicom 0.1 |

4.2.3.3 Association Initiation Policy

FIND-SCU attempts to initiate a new association when the user performs a find action from the user interface.

4.2.3.3.1 Activity – Query Remote AE

4.2.3.3.1.1 Description and Sequencing of Activities

A single attempt will be made to query the remote AE. If the query fails, for whatever reason, no retry will be performed and the user is visually notified of the failure.

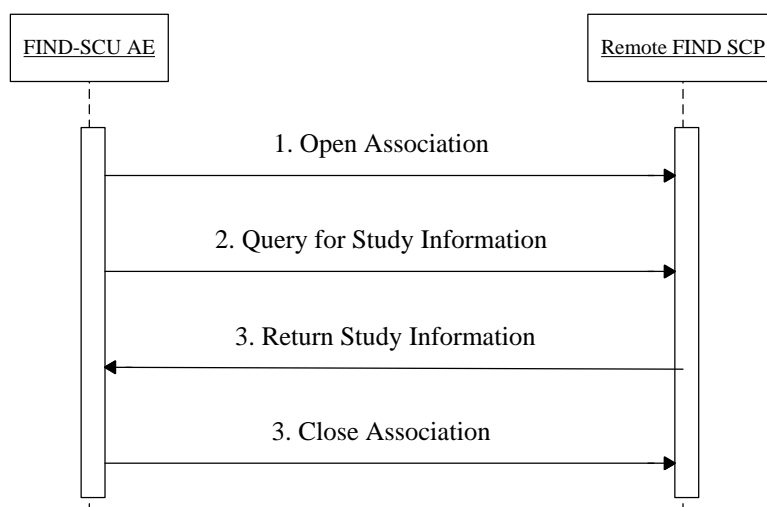


Figure 4.4 Sequencing of Activity – Query Remote AE

4.2.3.3.1.2 Proposed Presentation Contexts**Table 4-18 Proposed Presentation Contexts for FIND-SCU and Query Remote AE**

| Presentation Context Table | | | | | |
|---|----------------|---------------------------|---------------------|-------------|---|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name | UID | 1 | |
| See Table 4-13 SOP Classes Supported by FIND-SCU | See Table 4-13 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | Fuzzy Semantic Matching (optional) |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | Fuzzy Semantic Matching (optional) |

FIND-SCU will propose a single Presentation Context, specified in the above table.

4.2.3.3.1.3 Extended Negotiation

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

4.2.3.3.1.4 SOP Specific Conformance

4.2.3.3.1.4.1 SOP Specific Conformance to C-FIND SOP Classes

FIND-SCU provides standard conformance to the supported C-FIND SOP Classes. Only a single information model, Study Root, is supported. Queries are initiated at the STUDY and SERIES levels, according to the request generated by the user interface. CANCEL requests are issued when the total number of matches exceeds the configurable limit, to avoid overflow of data, where the default limit is 100 matches. Unexpected attributes returned in a C-FIND response (those not requested) are ignored. Requested return attributes not returned by the SCP will not cause a failure and will be interpreted as empty values, this will be logged for further information. Non-matching responses returned by the SCP due to unsupported (hopefully optional) matching keys are not filtered locally by the FIND-SCU and thus will still be presented in the worklist. Duplicate responses will replace existing entries in the display.

Table 4-19 Study Root Request Identifier for FIND-SCU

| Name | Tag | Types of Matching |
|------------------------------------|-------------|-------------------|
| STUDY Level | | |
| Study Date | (0008,0020) | *,U,R |
| Study Time | (0008,0030) | *,U,R |
| Accession Number | (0008,0050) | S,*,U |
| Modalities In Study | (0008,0061) | S,U |
| Referring Physician's Name | (0008,0090) | U |
| Study Description | (0008,1030) | U |
| Patient's Name | (0010,0010) | S,*,U |
| Patient ID | (0010,0020) | S,*,U |
| Study Instance UID | (0020,000D) | UNIQUE |
| Study ID | (0020,0010) | U |
| Number of Study Related Instances | (0020,1208) | U |
| SERIES Level | | |
| Series Date | (0008,0021) | U |
| Series Time | (0008,0031) | U |
| Modality | (0008,0060) | U |
| Series Description | (0008,103E) | U |
| Protocol | (0018,1030) | U |
| Series Instance UID | (0020,000E) | UNIQUE |
| Series Number | (0020,0011) | U |
| Number of Series Related Instances | (0020,1209) | U |

Types of Matching:

- S Indicates the identifier attribute uses Single Value Matching
- R Indicates Range Matching
- * Indicates wildcard matching
- U Indicates Universal Matching
- 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.

4.2.3.3.1.4.2 Presentation Context Acceptance Criterion

FIND-SCU does not accept associations.

4.2.3.3.1.4.3 Transfer Syntax Selection Policies

FIND-SCU uses only Implicit Little Endian Transfer Syntax.

4.2.3.3.1.4.4 Response Status

FIND-SCU will behave as described in DICOM PS 3.2 Table D.4.2-24 in response to the status returned in the C-FIND response command message(s).

Table 4-20 Response Status for FIND-SCU and Query Remote AE Request

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

4.2.3.4 Association Acceptance Policy

FIND-SCU does not accept associations.

4.2.4 FIND-SCP

4.2.4.1 SOP Classes

FIND-SCP provides Standard Conformance to the following SOP Class(es):

Table 4-21 SOP Classes Supported by FIND-SCP

| SOP Class Name | SOP Class UID | SCU | SCP |
|--|-----------------------------|-----|-----|
| Study Root Query/Retrieve Information Model – FIND | 1.2.840.10008.5.1.4.1.2.2.1 | No | Yes |

4.2.4.2 Association Policies

4.2.4.2.1 General

FIND-SCP initiates but never accepts associations.

Table 4-22 Maximum PDU Size Received for FIND-SCP

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

4.2.4.2.2 Number of Associations

Table 4-23 Number of Associations for FIND-SCP

| | |
|---|-----------|
| Maximum number of simultaneous associations | Unlimited |
|---|-----------|

4.2.4.2.3 Asynchronous Nature

FIND-SCP will only allow a single outstanding operation on an Association. Therefore, FIND-SCP will not perform asynchronous operations window negotiation.

4.2.4.2.4 Implementation Identifying Information

Table 4-24 DICOM Implementation Class and Version for FIND-SCP

| | |
|-----------------------------|-------------------------|
| Implementation Class UID | 1.3.6.1.4.1.25403.1.1.1 |
| Implementation Version Name | Dicom 0.1 |

4.2.4.3 Association Negotiation Policy

FIND-SCP does not initiate associations.

4.2.4.4 Association Acceptance Policy

Incoming connections must be defined from a pre-configured list of known IP addresses, only these connections will be accepted by default. A configuration option for receiving from all IP addresses is available. When FIND-SCP accepts an association, it will process query requests. If the Called AE Title does not match the pre-configured AE Title for the FIND-SCP, the association will be rejected.

4.2.4.4.1 Activity – Receive Query Request
4.2.4.4.1.1 Description and Sequencing of Activities

All queries are matched against records in the database.

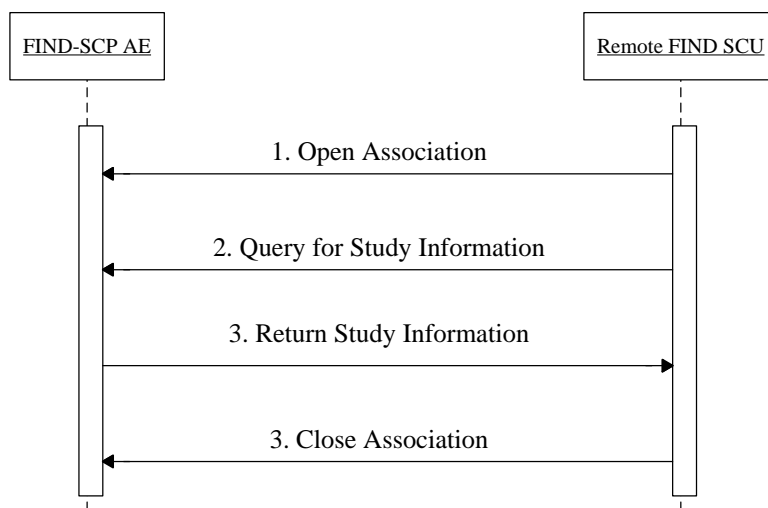


Figure 4.5 Sequencing of Activity – Receive Query Request

4.2.4.4.1.2 Accepted Presentation Contexts

Table 4-25 Accepted Presentation Contexts for FIND-SCP and Receive Query Request

| Presentation Context Table | | | | | |
|----------------------------|----------------|---------------------------|-------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name | UID | | |
| See Table 4-21 | See Table 4-21 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |

FIND-SCP will accept a single Presentation Context, specified in the above table.

4.2.4.4.1.2.1 Extended Negotiation

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

4.2.4.4.1.3 SOP Specific Conformance

4.2.4.4.1.3.1 SOP Specific Conformance to C-FIND SOP Classes

FIND-SCP provides standard conformance to the supported C-FIND SOP Classes. Only a single information model, Study Root, is supported. Queries may be initiated at the STUDY, SERIES or IMAGE levels.

CANCEL requests may be issued at any time, which will terminate the current query.

A hierarchical model will be followed for data matches. The Identifier shall contain all of the Unique Keys at higher levels and all of the values of the Attributes which were passed in on the C-FIND request. Unsupported attributes requested in a C-FIND request are ignored.

All data matching the passed in criteria at the specified level will be returned on the C-FIND response up to a five hundred response limit. Once the responses have reached the limit a successful response will be sent.

Table 4-26 Study Root Request Identifier for FIND-SCP

| Name | Tag | Types of Matching |
|------------------------------------|-------------|--------------------------|
| STUDY Level | | |
| Study Date | (0008,0020) | S,*U,R |
| Study Time | (0008,0030) | S,*U,R |
| Accession Number | (0008,0050) | S,*U |
| Modalities In Study | (0008,0061) | S,*U |
| Referring Physician's Name | (0008,0090) | S,*U |
| Study Description | (0008,1030) | S,*U |
| Patient's Name | (0010,0010) | S,*U |
| Patient ID | (0010,0020) | S,*U |
| Study Instance UID | (0020,000D) | UNIQUE |
| Study ID | (0020,0010) | S,*U |
| Number of Study Related Instances | (0020,1208) | U |
| Number of Study Related Series | (0020,1206) | U |
| Patient's Birth Date | (0010,0030) | S,U,R |
| Patient's Sex | (0010,0040) | S,U |
| SERIES Level | | |
| Series Date | (0008,0021) | S,*U,R |
| Series Time | (0008,0031) | S,*U,R |
| Modality | (0008,0060) | S,*U |
| Series Description | (0008,103E) | S,*U |
| Protocol | (0018,1030) | S,*U |
| Series Instance UID | (0020,000E) | UNIQUE |
| Series Number | (0020,0011) | S,*U |
| Number of Series Related Instances | (0020,1209) | U |
| IMAGE Level | | |
| SOP Class UID | (0008,0016) | S,*U |
| SOP Instance UID | (0008,0018) | UNIQUE |
| Instance Number | (0020,0013) | S,*U |
| Rows | (0028,0010) | U |
| Columns | (0028,0011) | U |
| Bits Allocated | (0028,0100) | U |
| Number of Frames | (0028,0008) | U |

Types of Matching:

- S Indicates the identifier attribute uses Single Value Matching
- R Indicates Range Matching
- * Indicates wildcard matching
- U Indicates Universal Matching

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.

4.2.4.4.1.3.2 Presentation Context Acceptance Criterion

FIND-SCP accepts only a single presentation context.

4.2.4.4.1.3.3 Transfer Syntax Selection Policies

FIND-SCP uses only Implicit Little Endian Transfer Syntax.

4.2.4.4.1.3.4 Response Status

FIND-SCP will behave as described in DICOM PS 3.2 Table D.4.2-24 in response to the status returned in the C-FIND response command message(s).

Table 4-27 Response Status for FIND-SCP and Receive Query Request

| Service Status | Further Meaning | Status Codes | Reason |
|----------------|--|--------------|--|
| Refused | Out of Resources | A700 | Association limit reached |
| Error | Identifier does not match SOP Class | A900 | Query keys are not valid |
| | Unable to process | Cxxx | Internal processing error |
| Cancel | Matching terminated due to Cancel request | FE00 | Current query is terminated; remaining queries continue |
| Success | Matching is complete - No final Identifier is supplied | 0000 | Current query is finished; remaining queries continue |
| Pending | Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys | FF00 | All query attributes are supported, matches continuing |
| | Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier | FF01 | One or more query attributes are not supported, matches continuing |

4.2.5 MOVE-SCU

4.2.5.1 SOP Classes

MOVE-SCU provides Standard Conformance to the following SOP Class(es):

Table 4-28 SOP Classes Supported by MOVE-SCU

| SOP Class Name | SOP Class UID | SCU | SCP |
|--|-----------------------------|-----|-----|
| Study Root Query/Retrieve Information Model – MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | Yes | No |

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 4-29 DICOM Application Context for MOVE-SCU

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

Table 4-30 Maximum PDU Size Sent for MOVE-SCU

| | |
|-----------------------|-----------------------------|
| Maximum PDU size Sent | Unlimited, default is 65536 |
|-----------------------|-----------------------------|

4.2.5.2.2 Number of Associations

Table 4-31 Number of Associations for MOVE-SCU

| | |
|---|--------------|
| Maximum number of simultaneous associations | Configurable |
|---|--------------|

4.2.5.2.3 Asynchronous Nature

MOVE-SCU will only allow a single outstanding operation on an Association. Therefore, MOVE-SCU will not perform asynchronous operations window negotiation.

4.2.5.2.4 Implementation Identifying Information

Table 4-32 DICOM Implementation Class and Version for MOVE-SCU

| | |
|-----------------------------|-------------------------|
| Implementation Class UID | 1.3.6.1.4.1.25403.1.1.1 |
| Implementation Version Name | Dicom 0.1 |

4.2.5.3 Association Initiation Policy

MOVE-SCU attempts to initiate a new association when the user performs a move action from the user interface.

4.2.5.3.1 Activity – Retrieve from Remote AE

4.2.5.3.1.1 Description and Sequencing of Activities

For the entity (study or series) selected from the user interface to be retrieved, an attempt will be made to retrieve it from the selected remote AE. If the retrieve fails, for whatever reason, it will be retried every minute up to 3 times. This number of retries is configurable through the configuration tool.

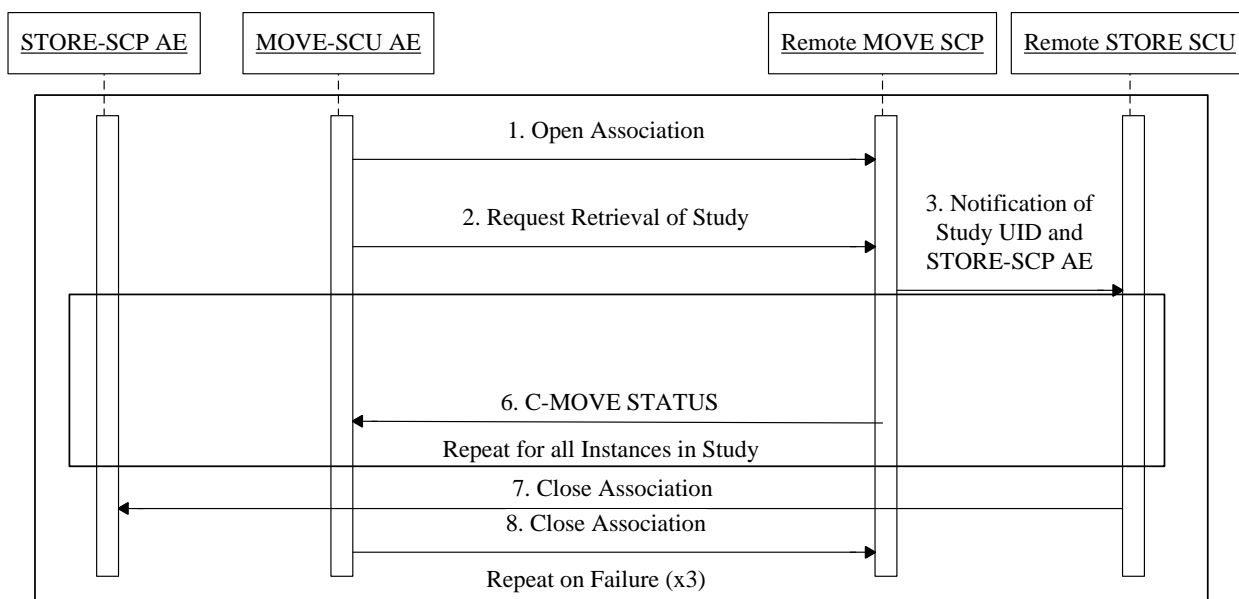


Figure 4.6 Sequencing of Activity – Retrieve from Remote AE

4.2.5.3.1.2 Proposed Presentation Contexts

Table 4-33 Proposed Presentation Contexts for MOVE-SCU and Retrieve from Remote AE

| Presentation Context Table | | | | | |
|----------------------------|----------------|---------------------------|-------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name | UID | | |
| See Table 4-28 | See Table 4-28 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |

MOVE-SCU will propose a single Presentation Context.

4.2.5.3.1.2.1 Extended Negotiation

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

4.2.5.3.1.3 SOP Specific Conformance

4.2.5.3.1.3.1 SOP Specific Conformance to C-MOVE SOP Classes

MOVE-SCU provides standard conformance to the supported C-MOVE SOP Classes. Only a single information model, Study Root, is supported. Retrieval will be performed at the STUDY or SERIES level depending on what level of entity has been selected by the user in the browser. No CANCEL requests are ever issued.

The retrieval is performed from the AE that was specified in the Retrieve AE attribute returned from the query performed by FIND-SCU. The instances are retrieved to the current application’s local database by specifying the destination as the AE Title of the STORE-SCP AE of the local application. This implies that the remote C-MOVE SCP must be preconfigured to determine the presentation address corresponding to the STORE-SCP AE. The STORE-SCP AE will accept storage requests addressed to it from anywhere, so no pre-configuration of the local application to accept from the remote AE is necessary (except to configure the FIND-SCU).

Table 4-34 Study Root Request Identifier for MOVE-SCU

| Name | Tag | Unique, Matching or Return Key |
|---------------------|-------------|--------------------------------------|
| STUDY level | | |
| Study Instance UID | (0020,000D) | U |
| SERIES level | | |
| Series Instance UID | (0020,000E) | U |

4.2.5.3.1.3.2 Presentation Context Acceptance Criterion

MOVE-SCU does not accept associations.

4.2.5.3.1.3.3 Transfer Syntax Selection Policies

MOVE-SCU uses only Implicit Little Endian Transfer Syntax.

4.2.5.3.1.3.4 Response Status

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

Table 4-35 Response Status for MOVE-SCU and Retrieve from Remote AE Request

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

4.2.5.3.1.3.5 Sub-operation dependent behavior

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

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

Whether or not completely or partially successfully retrievals are made available in the local database to the user is purely dependent on the success or failure of the C-STORE sub-operations, not on any explicit action by MOVE-SCU. If there are any failures that are recoverable, the retrieve will be retried up to a configurable limit, where the default is 3 times on a one minute interval.

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

4.2.5.4 Association Acceptance Policy

MOVE-SCU does not accept associations.

4.2.6 MOVE-SCP

4.2.6.1 SOP Classes

MOVE-SCP provides Standard Conformance to the following SOP Class(es):

Table 4-36 SOP Classes Supported by MOVE-SCP

| SOP Class Name | SOP Class UID | SCU | SCP |
|--|-----------------------------|-----|-----|
| Study Root Query/Retrieve Information Model – MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | No | Yes |

4.2.6.2 Association Policies

4.2.6.2.1 General

MOVE-SCP accepts but never initiates associations.

Table 4-37 Maximum PDU Size Received for MOVE-SCP

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

4.2.6.2.2 Number of Associations

Table 4-38 Number of Associations for MOVE-SCP

| | |
|---|-----------|
| Maximum number of simultaneous associations | Unlimited |
|---|-----------|

4.2.6.2.3 Asynchronous Nature

MOVE-SCP will only allow a single outstanding operation on an Association. Therefore, MOVE-SCP will not perform asynchronous operations window negotiation.

4.2.6.2.4 Implementation Identifying Information

Table 4-39 DICOM Implementation Class and Version for MOVE-SCP

| | |
|-----------------------------|-------------------------|
| Implementation Class UID | 1.3.6.1.4.1.25403.1.1.1 |
| Implementation Version Name | Dicom 0.1 |

4.2.6.3 Association Initiation Policy

MOVE-SCP does not initiate associations.

4.2.6.4 Association Acceptance Policy

When MOVE-SCP accepts an association, it will respond to retrieve requests. If the Called AE Title does not match the pre-configured AE Title for the RETRIEVE-SCP, the association will be rejected.

4.2.6.4.1 Activity – Retrieve Request from Remote AE

4.2.6.4.1.1 Description and Sequencing of Activities

When retrieve requests are received, the attributes specified in the request are used to query the database. The instances that match are sent as sub-operations by the STORAGE-SCU to the requested destination.

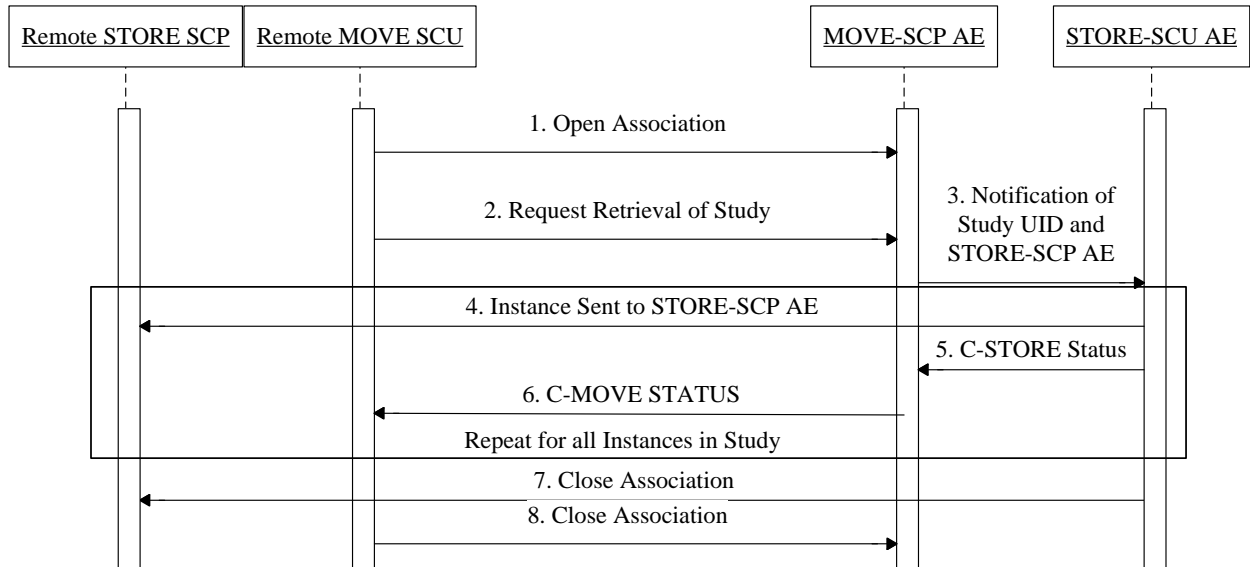


Figure 4.7 Sequencing of Activity – Retrieve Request from Remote AE

4.2.6.4.1.2 Accepted Presentation Contexts

Table 4-40 Accepted Presentation Contexts for MOVE-SCP and Retrieve Request from Remote AE

| Presentation Context Table | | | | | |
|----------------------------|----------------|---------------------------|-------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name | UID | | |
| See Table 4-36 | See Table 4-36 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |

MOVE-SCP will accept a single Presentation Context.

4.2.6.4.1.2.1 Extended Negotiation

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

4.2.6.4.1.3 SOP Specific Conformance

4.2.6.4.1.3.1 SOP Specific Conformance to C-MOVE SOP Classes

MOVE-SCP provides standard conformance to the supported C-MOVE SOP Classes. Only a single information model, Study Root, is supported. Retrieval may be performed at the STUDY, SERIES or IMAGE level depending on what level of entity has been requested.

CANCEL requests may be issued at any time, which will terminate the current retrieve.

The retrieval is performed to the AE that was specified in the Retrieve AE Destination attribute returned from the query performed by FIND-SCU. The instances are retrieved to the current application's local database by specifying the destination as the AE Title of the STORE-SCP AE of the local application. This implies that the remote C-MOVE SCP must be preconfigured to determine the presentation address corresponding to the STORE-SCP AE. The STORE-SCP AE will accept storage requests addressed to it from anywhere, so no pre-configuration of the local application to accept from the remote AE is necessary. Multiple destination storage requests are supported.

Table 4-41 Study Root Request Identifier for MOVE-SCP

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

4.2.6.4.1.3.2 Presentation Context Acceptance Criterion

MOVE-SCP accepts only a single Presentation Context.

4.2.6.4.1.3.3 Transfer Syntax Selection Policies

MOVE-SCP accepts only Implicit Little Endian Transfer Syntax.

4.2.6.4.1.3.4 Response Status

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

Table 4-42 Response Status for MOVE-SCP and Retrieve Request from Remote AE

| Service Status | Further Meaning | Status Codes | Related Fields | Behavior |
|-----------------------|--|---------------------|--|--|
| Refused | Out of Resources - Unable to calculate number of matches | A701 | (0000,0902) | Association limit reach; Retrieval is terminated; |
| | Out of Resources - Unable to perform sub-operations | A702 | (0000,1020) (0000,1021) (0000,1022) (0000,1023) | Never used in a response |
| | Move Destination unknown | A801 | (0000,0902) | Retrieval is terminated |
| Failed | Identifier does not match SOP Class | A900 | (0000,0901) (0000,0902) | Retrieval is terminated |
| | Unable to process | Cxxx | (0000,0901) (0000,0902) | Retrieval is terminated |
| Cancel | Sub-operations terminated due to Cancel Indication | FE00 | (0000,1020) (0000,1021) (0000,1022) (0000,1023) | Retrieval is terminated |
| Warning | Sub-operations Complete - One or more Failures | B000 | (0000,1020) (0000,1022) (0000,1023) | Retrieval is terminated |
| Success | Sub-operations Complete - No Failures | 0000 | (0000,1020) (0000,1021) (0000,1022) (0000,1023) | Retrieval is finished |
| Pending | Sub-operations are continuing | FF00 | (0000,1020) (0000,1021) (0000,1022) (0000,1023) | Retrieval continues |

4.2.6.4.1.3.5 Sub-operation dependent behavior

Since the C-MOVE operation is dependent on completion of C-STORE sub-operations that are occurring on a separate association by the STORAGE-SCU, the question of failure of operations on the other association(s) must be considered. Once the C-MOVE has been initiated it runs to completion (or failure) as described in the C-MOVE response command message(s). There is no attempt by MOVE-SCU to confirm that instances have actually been locally stored. If the association on which the C-MOVE was issued is aborted for any reason, the C-STORE sub-operations are halted. Failures are automatically retried based on the STORAGE-SCU configuration for each of the destinations specified in the C-MOVE request.

4.2.7 STORAGE-SCU

4.2.7.1 SOP Classes

STORAGE-SCU provide Standard Conformance to the following SOP Class(es): see Table 1-1 Network Services

4.2.7.2 Association Policies

4.2.7.2.1 General

STORAGE-SCU initiates, but never accepts associations.

Table 4-43 Maximum PDU Size Sent for STORAGE-SCU

| | |
|-----------------------|-----------------------------|
| Maximum PDU size sent | Unlimited, default is 16384 |
|-----------------------|-----------------------------|

4.2.7.2.2 Number of Associations

Table 4-44 Number of Associations for STORAGE-SCU

| | |
|---|---|
| Maximum number of simultaneous associations | 1 |
|---|---|

4.2.7.2.3 Asynchronous Nature

STORAGE-SCU will only allow a single outstanding operation on an Association. Therefore, STORAGE-SCU will not perform asynchronous operations window negotiation.

4.2.7.2.4 Implementation Identifying Information

Table 4-45 DICOM Implementation Class and Version for STORAGE-SCU

| | |
|-----------------------------|-------------------------|
| Implementation Class UID | 1.3.6.1.4.1.25403.1.1.1 |
| Implementation Version Name | Dicom 0.1 |

4.2.7.3 Association Initiation Policy

STORAGE-SCU initiates a new association when the user performs an export action from the user interface.

4.2.7.3.1 Activity – Request Storage

4.2.7.3.1.1 Description and Sequencing of Activities

A user can select images and request them to be sent to a pre-configured destination. Each request is forwarded to the job queue and processed individually.

STORAGE-SCU is invoked by the job control interface that is responsible for processing export tasks. The job consists of data describing the instances to be stored and the destination. An internal daemon process triggered by a job for a specific network destination initiates a C-STORE request to store images. If the process successfully establishes an Association to a remote Application Entity, it will transfer each marked instance one after another via the open Association. Status of the transfer is reported through the job control interface. Only one job will be active at a time. If the C-STORE Response from the remote Application contains a status other than Success or Warning, the Association is aborted and the related Job is switched to a retry state. It will be retried automatically up to 5 times.

The Storage AE attempts to initiate a new Association in order to issue a C-STORE request. If the job contains multiple images then multiple C-STORE requests will be issued over the same Association.

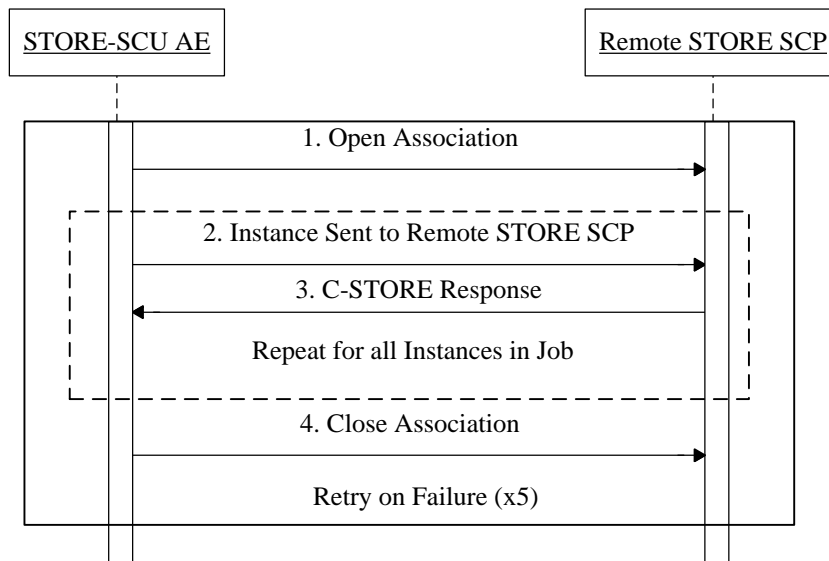


Figure 4.8 Sequencing of Activity –Request Storage

4.2.7.3.1.2 Accepted Presentation Contexts

Table 4-46 Proposed Presentation Contexts for STORAGE-SCU and Request Storage

| Presentation Context Table | | | | | |
|----------------------------|-----------------------------|--|------------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| 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 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| 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 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| Enhanced MR Image Storage | 1.2.840.10008.5.1.4.1.1.4.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| Secondary Capture | 1.2.840.10008.5.1.4. | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |

| Presentation Context Table | | | | | |
|--|--------------------------------|--|------------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name | UID | | |
| Image Storage | 1.1.7 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| Multi-frame Single Bit Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| Multi-frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| Multi-frame True Color Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.4 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| X-Ray 3D Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.13.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| Nuclear Medicine Image Storage | 1.2.840.10008.5.1.4.1.1.20 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |
| Basic Text SR Storage | 1.2.840.10008.5.1.4.1.1.88.11 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| Enhanced SR | 1.2.840.10 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |

| Presentation Context Table | | | | | |
|--|-------------------------------|--|------------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name | UID | | |
| Storage | 008.5.1.4.1.1.88.22 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| X-Ray Radiation Dose SR Storage | 1.2.840.10008.5.1.4.1.1.88.67 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| Positron Emission Tomography Image Storage | 1.2.840.10008.5.1.4.1.1.128 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCU | None |

4.2.7.3.1.2.1 Extended Negotiation

No extended negotiation is performed, though STORAGE-SCU.

4.2.7.3.1.3 SOP Specific Conformance

4.2.7.3.1.3.1 SOP Specific Conformance to Storage SOP Classes

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

4.2.7.3.1.3.2 Presentation Context Acceptance Criterion

STORAGE-SCU does not accept associations.

4.2.7.3.1.3.3 Transfer Syntax Selection Policies

STORAGE-SCU prefers JPEG Lossless 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 JPEG Lossless Transfer Syntax
- First encountered Implicit Transfer Syntax
- Default Transfer Syntax

4.2.7.3.1.3.4 Response Status

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

Table 4-47 Response Status for STORAGE-SCU and Request Storage

| Service Status | Further Meaning | Status Codes | Behavior |
|----------------|-----------------------------------|--------------|---------------------------|
| Refused | Out of Resources | A7xx | Job set to Retry state |
| Error | Data Set does not match SOP Class | A9xx | Job set to Failed state |
| | Cannot understand | Cxxx | Job set to Retry state |
| Warning | Coercion of Data Elements | B000 | Job set to Complete state |
| | Data Set does not | B007 | Job set to Failed state |

| | | | |
|---------|--------------------|------|---------------------------|
| | match SOP Class | | |
| | Elements Discarded | B006 | Job set to Complete state |
| Success | | 0000 | Job set to Complete state |

4.2.7.4 Association Acceptance Policy

STORAGE-SCU does not accept associations.

4.2.8 STORAGE-SCP

4.2.8.1 SOP Classes

STORAGE-SCP provide Standard Conformance to the following SOP Class(es): see Table 1-1 Network Services

4.2.8.2 Association Policies

4.2.8.2.1 General

STORAGE-SCP accepts but never initiates associations.

Table 4-48 Maximum PDU Size Received for STORAGE-SCP

| | |
|---------------------------|-----------------------------|
| Maximum PDU size received | Unlimited, default is 16384 |
|---------------------------|-----------------------------|

4.2.8.2.2 Number of Associations

Table 4-49 Number of Associations for STORAGE-SCP

| | |
|---|-----------|
| Maximum number of simultaneous associations | Unlimited |
|---|-----------|

4.2.8.2.3 Asynchronous Nature

STORAGE-SCP will not perform asynchronous operations window negotiation for outstanding negotiations.

4.2.8.2.4 Implementation Identifying Information

Table 4-50 DICOM Implementation Class and Version for STORAGE-SCP

| | |
|-----------------------------|-------------------------|
| Implementation Class UID | 1.2.840.113747.20080222 |
| Implementation Version Name | VIMS_1.0 |

4.2.8.3 Association Initiation Policy

STORAGE-SCP does not initiate associations.

4.2.8.4 Association Acceptance Policy

When STORAGE-SCP accepts an association, it will respond to storage requests. The exact behavior for a given AE title can be configured by service personnel. A configuration option for receiving only from known IP addresses is available, by default all incoming connections are accepted.

4.2.8.4.1 Activity – Receive Storage Request

4.2.8.4.1.1 Description and Sequencing of Activities

As instances are received they are written to the local file system and a record inserted into the temporary database. If the received instance is a duplicate of a previously received instance, the old file will be overwritten with the new one, however the database records will not. At a later time, the received DICOM instances will be moved to the local disk, updated in the permanent tables, and are then made available for viewing.

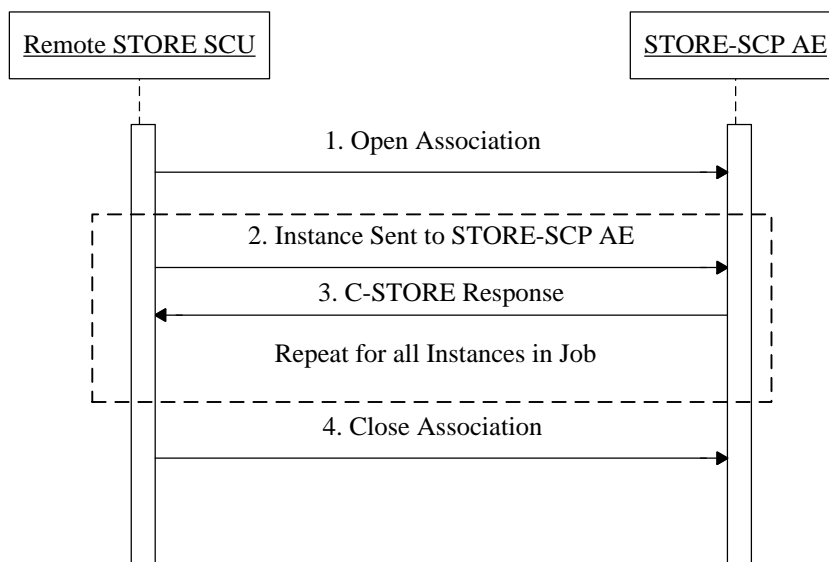


Figure 4.9 Sequencing of Activity – Receive Storage Request

4.2.8.4.1.2 Accepted Presentation Contexts

Table 4-51 Accepted Presentation Contexts for STORAGE-SCP and Receive Storage Request

| Presentation Context Table | | | | | |
|----------------------------|-----------------------------|--|------------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| 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 | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |
| 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 | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |
| Enhanced MR Image Storage | 1.2.840.10008.5.1.4.1.1.4.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |

| Presentation Context Table | | | | | |
|--|--------------------------------|--|------------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name | UID | | |
| 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 | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |
| Multi-frame Single Bit Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |
| Multi-frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |
| Multi-frame True Color Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.4 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |
| X-Ray 3D Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.13.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |
| Nuclear Medicine Image Storage | 1.2.840.10008.5.1.4.1.1.20 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |
| Basic Text SR Storage | 1.2.840.10008.5.1.4.1.1.88.11 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| Enhanced SR | 1.2.840.10 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |

| Presentation Context Table | | | | | |
|--|---------------------------------------|--|------------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name | UID | | |
| Storage | 008.5.1.4. 1.1.88.22 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| X-Ray Radiation Dose SR Storage | 1.2.840.10 008.5.1.4. 1.1.88.67 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| Positron Emission Tomography Image Storage | 1.2.840.10 008.5.1.4. 1.1.128 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP | None |
| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | JPEG Lossless, Non-Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 | SCP | None |

4.2.8.4.1.2.1 Extended Negotiation

No extended negotiation is performed, though STORAGE-SCP:

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

4.2.8.4.1.3 SOP Specific Conformance

4.2.8.4.1.3.1 SOP Specific Conformance to Storage SOP Classes

STORAGE-SCP provides standard conformance to the Storage Service Class. STORAGE-SCP does not support Grayscale Softcopy Presentation State as required by Enhanced CT Image Storage.

When handling images in the VAS-01, the following attributes are not supported:

- Real World Value Mapping Sequence (0040, 9096)

4.2.8.4.1.3.2 Presentation Context Acceptance Criterion

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.

4.2.8.4.1.3.3 Transfer Syntax Selection Policies

STORAGE-SCP prefers JPEG Lossless 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 JPEG Lossless Transfer Syntax
- First encountered Implicit Transfer Syntax
- Default Transfer Syntax

STORAGE-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.

4.2.8.4.1.3.4 Response Status

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

Table 4-52 Response Status for STORAGE-SCP and Receive Storage Request

| Service Status | Further Meaning | Status Codes | Reason |
|----------------|-----------------------------------|--------------|---|
| Refused | Out of Resources | A7xx | Association limit reached, local disk space low |
| Error | Data Set does not match SOP Class | A9xx | Never sent – data set is not checked prior to storage |
| | Cannot understand | Cxxx | Internal processing error |
| Warning | Coercion of Data Elements | B000 | Never sent - no coercion is ever performed |
| | Data Set does not match SOP Class | B007 | Never sent - data set is not checked prior to storage |
| | Elements Discarded | B006 | Never sent – all elements are always stored |
| Success | | 0000 | |

4.2.9 PRINT-SCU

4.2.9.1 SOP Classes

PRINT-SCU provides Standard Conformance to the following SOP Classes:

Table 4-53 SOP Classes for PRINT-SCU

| SOP Class Name | SOP Class UID | SCU | SCP |
|---|------------------------|-----|-----|
| Basic Grayscale Print Management Meta SOP Class | 1.2.840.10008.5.1.1.9 | Yes | No |
| Basic Color Print Management Meta SOP Class | 1.2.840.10008.5.1.1.18 | Yes | No |

4.2.9.2 Association Policies

4.2.9.2.1 General

PRINT-SCU initiates, but never accepts associations.

4.2.9.2.2 Number of Associations**Table 4-54 Number of Associations for PRINT-SCU**

| | |
|---|---|
| Maximum number of simultaneous associations | 1 |
|---|---|

4.2.9.2.3 Asynchronous Nature

PRINT-SCU will only allow a single outstanding operation on an Association. Therefore, PRINT-SCU will not perform asynchronous operations window negotiation.

4.2.9.2.4 Implementation Identifying Information**Table 4-55 DICOM Implementation Class and Version for PRINT-SCU**

| | |
|-----------------------------|-------------------------|
| Implementation Class UID | 1.3.6.1.4.1.25403.1.1.1 |
| Implementation Version Name | Dicom 0.1 |

4.2.9.3 Association Initiation Policy

PRINT-SCU initiates a new association when the user performs a print action from the user interface.

4.2.9.3.1 Activity – Request Print**4.2.9.3.1.1 Description and Sequencing of Activities**

A user can select images and request them to be printed to a pre-configured print server. Each request is forwarded to a job queue and processed individually. Only one print job may be active at a time, but any number of jobs may be in the queue, and are serviced on a first-come, first-serve basis. Each print job results in a separate association, but each print job may contain multiple film boxes. If a print job is not successful, it will be marked as failed and will be retried up to 5 times.

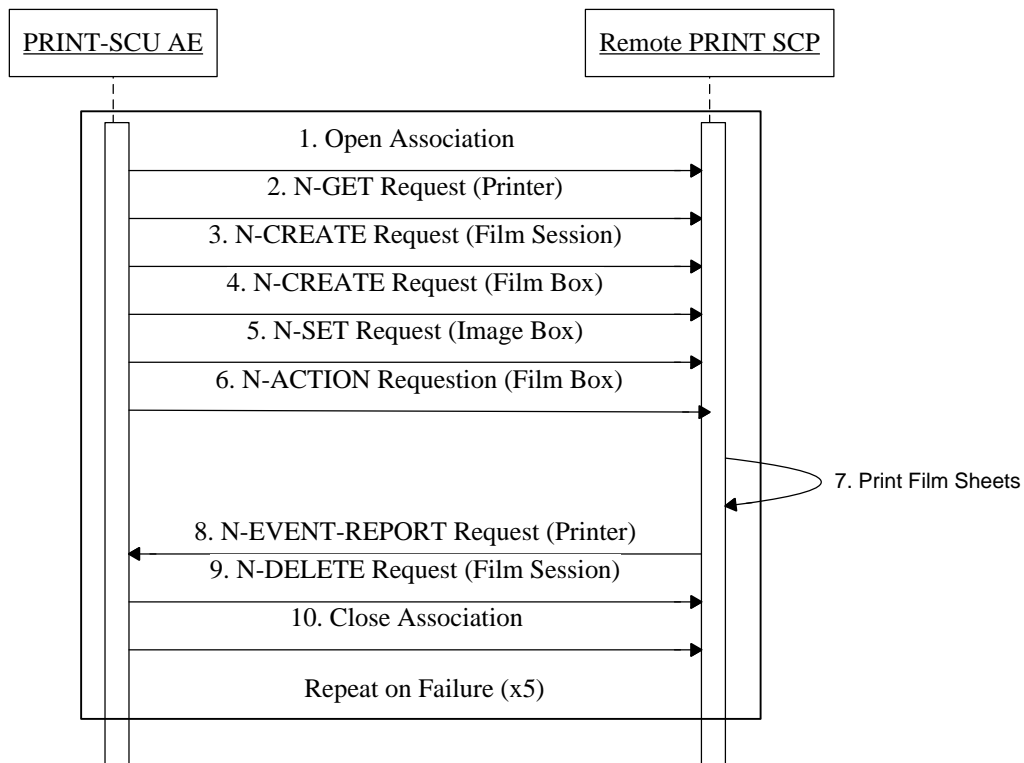


Figure 4.10 Sequencing of Activity – Request Print

4.2.9.3.1.2 Proposed Presentation Contexts

Table 4-56 Proposed Presentation Contexts for PRINT-SCU

| Presentation Context Table | | | | | |
|----------------------------|----------------|---------------------------|-------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| See Table 4-53 | See Table 4-53 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |

4.2.9.3.1.3 SOP Specific Conformance

4.2.9.3.1.3.1 Specific Conformance to Basic Grayscale Print Management Meta SOP Class

PRINT-SCU supports the following mandatory SOP classes as defined by the Basic Grayscale Print Management Meta SOP Class:

Table 4-57 SOP Classes for Basic Grayscale Print management Meta SOP Class

| SOP Class Name | SOP Class UID | SCU | SCP |
|---------------------------|------------------------|-----|-----|
| Basic Film Session | 1.2.840.10008.5.1.1.1 | Yes | No |
| Basic Film Box | 1.2.840.10008.5.1.1.2 | Yes | No |
| Basic Grayscale Image Box | 1.2.840.10008.5.1.1.4 | Yes | No |
| Printer | 1.2.840.10008.5.1.1.16 | Yes | No |

The specific SOP Conformance statement for each of the Basic Grayscale Print Management Meta SOP Class components is described in the subsequent sections.

4.2.9.3.1.3.1.1 Specific Conformance for Basic Film Session SOP Class

PRINT-SCU provides support for the following DIMSE Services:

- N-CREATE
- N-SET
- N-ACTION
- N-DELETE

4.2.9.3.1.3.1.1.1 Basic Film Session SOP Class Operations for N-CREATE

The EXAMPLE-PRINT-SERVER-MANAGEMENT provides the following support for the Film Session attributes sent by the N-CREATE DIMSE service:

Table 4-58 Basic Film Session SOP Class N-CREATE Request Attributes

| Attribute | Tag | Valid Range | Default Value |
|--------------------|-------------|--|----------------------------|
| Number of Copies | (2000,0010) | 1 – 99 | 1 |
| Print Priority | (2000,0020) | LOW MED HIGH | LOW |
| Medium Type | (2000,0030) | CLEAR FILM BLUE FILM PAPER STORED PRINT | Current configured setting |
| Film Destination | (2000,0040) | MAGAZINE PROCESSOR STORED PRINT | Current configured setting |
| Film Session Label | (2000,0050) | Any string | Empty String |

PRINT-SCU will behave as described in the Table below when receiving the N-CREATE response command message.

Table 4-59 Film Session SOP Class N-CREATE Response Status Handling Reasons

| Service Status | Further Meaning | Error Code | Behavior |
|-----------------------|---------------------------------|-------------------|---|
| Success | Success | 0000 | The N-CREATE operation is successful. |
| Warning | Attribute Value Out of Range | 0116 | The N-CREATE operation is considered successful but the status meaning is logged. |
| Warning | Memory allocation not supported | B600 | N-CREATE operation is considered successful, but the status meaning is logged. |
| Warning | Attribute List Error | 0107 | The N-CREATE operation is considered successful but the status meaning is logged |
| Failure | Invalid attribute value | 0106 | The N-CREATE operation failed, and the print job is marked as failed. |
| Failure | Processing failure | 0110 | The N-CREATE operation failed, and the print job is marked as failed. |
| Failure | Invalid object instance | 0117 | The N-CREATE operation failed, and the print job is marked as failed. |
| Failure | Resource limitation | 0213 | The N-CREATE operation failed, and the print job is marked as failed. |

4.2.9.3.1.3.1.1.2 Film Session SOP Class Operations for N-SET

PRINT-SCU provides the support for the Film Session attributes sent by the N-SET DIMSE service identically as it is described for the Film Session with N-CREATE, Table 4-58.

The Print Server Management behavior and specific status codes sent for the N-SET of a specific Film Session is described in the following table:

Table 4-60 Film Session SOP Class N-SET Response Status Handling Reasons

| Service Status | Further Meaning | Error Code | Behavior |
|-----------------------|---------------------------------|-------------------|--|
| Success | Success | 0000 | The N-SET operation is successful. |
| Warning | Attribute Value Out of Range | 0116 | The N-SET operation is considered successful |
| Warning | Attribute List Error | 0107 | The N-SET operation is considered successful |
| Warning | Memory allocation not supported | B600 | The N-SET operation is considered successful |
| Failure | Invalid attribute value | 0106 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Processing failure | 0110 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Invalid object instance | 0112 | The N-SET operation failed, and the print job is marked as failed. |

4.2.9.3.1.3.1.1.3 Film Session SOP Class Operations for N-DELETE

PRINT-SCU behavior and specific status codes sent for the N-DELETE of a specific Film Session is described in the following table:

Table 4-61 Film Session SOP Class N-DELETE Response Status Handling Reasons

| Service Status | Further Meaning | Error Code | Behavior |
|----------------|-----------------|------------|--|
| Success | Success | 0000 | The SCP has completed the operation successfully. Film session has been successfully deleted. |
| Failure | Unknown UID | 0112 | No such object instance: the instance UID given does not exist. The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged. |

4.2.9.3.1.3.1.1.4 Film Session SOP Class Operations for N-ACTION

PRINT-SCU behavior and specific status codes sent for the N-ACTION of a specific Film Session is described in the following table:

Table 4-62 Film Session SOP Class N-ACTION Response Status Handling Reasons

| Service Status | Further Meaning | Error Code | Behavior |
|----------------|-----------------------------|------------|---|
| Success | Success | 0000 | N-ACTION operation is successful. |
| Warning | Empty film page | B602 | N-ACTION operation is considered successful. |
| Warning | Image larger than Image Box | B604 | N-ACTION operation is considered successful. |
| Warning | Image larger than Image Box | B609 | N-ACTION operation is considered successful. |
| Warning | Image larger than Image Box | B60A | N-ACTION operation is considered successful. |
| Failure | Invalid object | 0112 | The N-ACTION operation failed, and the print job is marked as failed. |
| Failure | Invalid operation | 0211 | The N-ACTION operation failed, and the print job is marked as failed. |
| Failure | Processing failure | C600 | The N-ACTION operation failed, and the print job is marked as failed. |
| Failure | OUT of Resources | C601 | The N-ACTION operation failed, and the print job is marked as failed. |
| Failure | Wrong Image size | C603 | The N-ACTION operation failed, and the print job is marked as failed. |
| Failure | Wrong Print Image size | C613 | The N-ACTION operation failed, and the print job is marked as failed. |

4.2.9.3.1.3.1.2 Specific Conformance for Basic Film Box SOP Class

PRINT-SCU provides support for the following DIMSE Services:

- N-CREATE
- N-SET
- N-ACTION
- N-DELETE

4.2.9.3.1.3.1.2.1 Basic Film Box SOP Class Operations for N-CREATE

PRINT-SCU provides the following support for the Film Box attributes sent by the N-CREATE DIMSE service.

Table 4-63 Basic Film Box SOP Class N-CREATE Request Attributes

| Attribute | Tag | Valid Range | Default Value if not sent by SCU or invalid value received |
|----------------------|-------------|--|--|
| Image Display Format | (2010,0010) | STANDARD≠C,R ROW≠R1,R2,R3 COL≠C1,C2,C3 | Configurable |
| Film Orientation | (2010,0040) | PORTRAIT LANDSCAPE | Configurable |
| Film Size Id | (2010,0050) | 8INX10IN 11INX14IN 14INX17IN | Configurable |
| Magnification Type | (2010,0060) | REPLICATE BILINEAR CUBIC NONE | Configurable |
| Max Density | (2010,0130) | 170-350 | Configurable |
| Smoothing Type | (2010,0080) | 0-15, the value is laser specific. | Configurable |
| Border Density | (2010,0100) | WHITE BLACK | Configurable |
| Trim | (2010,0140) | YES NO | Configurable |

PRINT-SCU behavior and specific status codes sent for the N-CREATE of a specific Film Box is described in the following table:

Table 4-64 Film Box SOP Class N-CREATE Response Status Handling Behavior

| Service Status | Further Meaning | Error Code | Behavior |
|-----------------------|------------------------------|-------------------|---|
| Success | Success | 0000 | The N-CREATE operation is successful. |
| Warning | Attribute Value Out of Range | 0116 | The N-CREATE operation is assumed to be successful. |
| Warning | Min/Max Density out-range | B605 | The N-CREATE operation is assumed to be successful. |
| Failure | Invalid attribute value | 0106 | The N-CREATE operation failed, and the print job is marked as failed. |
| Failure | Processing failure | 0110 | The N-CREATE operation failed, and the print job is marked as failed. |
| Failure | Duplicate SOP instance | 0111 | The N-CREATE operation failed, and the print job is marked as failed. |
| Failure | Invalid object instance | 0117 | The N-CREATE operation failed, and the print job is marked as failed. |
| Failure | Missing attribute | 0120 | The N-CREATE operation failed, and the print job is marked as failed. |
| Failure | Missing attribute value | 0121 | The N-CREATE operation failed, and the print job is marked as failed. |
| Failure | Resource limitation | 0213 | The N-CREATE operation failed, and the print job is marked as failed. |
| Failure | Out of Print Job Sequence | C616 | The N-CREATE operation failed, and the print job is marked as failed. |

4.2.9.3.1.3.1.2.2 Basic Film Box SOP Class Operations for N-SET

PRINT-SCU provides the support for the following Film Box attributes sent by the N-SET DIMSE service:

Table 4-65 Basic Film Box SOP Class N-SET Request Attributes

| Attribute | Tag | Valid Range | Default Value if not sent by SCU or invalid value received |
|--------------------|-------------|--|--|
| Magnification Type | (2010,0060) | REPLICATE BILINEAR CUBIC NONE | Configurable |
| Max Density | (2010,0130) | 170-350 | Configurable |
| Smoothing Types | (2010,0080) | 0-15, the value is laser specific. | Configurable |
| Border Density | (2010,0100) | WHITE BLACK | Configurable |
| Trim | (2010,0140) | YES NO | Configurable |

PRINT-SCU behavior and specific status codes sent for the N-SET of a specific Film Box is described in the following table:

Table 4-66 Film Box SOP Class N-SET Response Status Handling Behavior

| Service Status | Further Meaning | Error Code | Behavior |
|----------------|-------------------------|------------|--|
| Success | Success | 0000 | The N-SET operation is successful. |
| Warning | Illegal Attribute | 0107 | The N-SET operation is assumed to be successful. |
| Warning | Attribute out of range | 0116 | The N-SET operation is assumed to be successful. |
| Failure | Invalid attribute value | 0106 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Processing failure | 0110 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | No object instance | 0112 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Missing attribute value | 0121 | The N-SET operation failed, and the print job is marked as failed. |

4.2.9.3.1.3.1.2.3 Basic Film Box SOP Class Operations for N-DELETE

PRINT-SCU provides the support for deleting the last created Film Box.

The specific behavior and status codes sent for the N-DELETE of the last created Film Box is described in the following table:

Table 4-67 Film Box SOP Class N-DELETE Response Handling Behavior

| Service Status | Further Meaning | Error Code | Behavior |
|----------------|-----------------|------------|---|
| Success | Success | 0000 | The N-DELETE operation is successful. |
| Failure | Illegal UID | 0112 | The N-DELETE operation failed, and the print job is marked as failed. |

4.2.9.3.1.3.1.2.4 Basic Film Box SOP Class Operations for N-Action

PRINT-SCU provides the support for submitting the print job for printing the specific Film Box. The Film BOX N-ACTION arguments are defined in the DICOM Standard PS 3.4, table H.4-8.

The specific behavior and status codes sent for the N-ACTION of the specific Film Box is described in the following table:

Table 4-68 Film Box SOP Class N-ACTION Response Handling Behavior

| Service Status | Further Meaning | Error Code | Behavior |
|----------------|-----------------------------|------------|--|
| Success | Success | 0000 | The N-ACTION operation is successful, and the film is accepted for printing. |
| Warning | Empty Film Page | B603 | The N-ACTION operation is considered successful, but the empty page will not be printed. |
| Warning | Image larger than Image Box | B604 | The N-ACTION operation is considered successful. |
| Warning | Image larger than Image Box | B609 | The N-ACTION operation is considered successful. |
| Warning | Image larger than Image Box | B60A | The N-ACTION operation is considered successful. |
| Failure | Out of Resources | C602 | The N-ACTION operation failed, and the print job is marked as failed. |
| Failure | Wrong Image size | C603 | The N-ACTION operation failed, and the print job is marked as failed. |
| Failure | Wrong Print Image size | C613 | The N-ACTION operation failed, and the print job is marked as failed. |

4.2.9.3.1.3.1.3 Specific Conformance for Image Box SOP Class

PRINT-SCU provides the following support for the attributes contained in the N-SET DIMSE Service of the Basic Grayscale Image Box SOP Class:

Table 4-69 Image Box SOP Class N-SET Request Attributes

| Attribute | Tag | Valid Range | Default Value if not sent by SCU or invalid value received |
|--------------------------------|-------------|--|--|
| Image Position | (2020,0010) | 1 - Max number of images for Display Format | Mandatory, no default. |
| Basic Grayscale Image Sequence | (2020,0110) | N/A | N/A |
| >Samples Per Pixel | (0028,0002) | 1 | Mandatory, no default. |
| >Photometric Interpretation | (0028,0004) | MONOCHROME1 MONOCHROME2 | Mandatory, no default. |
| >Rows | (0028,0010) | 1 – Maximum rows for film size | Mandatory, no default. |
| >Columns | (0028,0011) | 1 – Maximum columns for film size. | Mandatory, no default. |
| >Pixel Aspect Ratio | (0028,0034) | Any pair of valid positive integers (1 to 215-1) | No default |
| >Bits Allocated | (0028,0100) | 8 or 16 | Mandatory, no default. |
| >Bits Stored | (0028,0101) | 8 – 16 | Mandatory, no default. |
| >High Bit | (0028,0102) | 7-15 | Mandatory, no default. |
| >Pixel Representation | (0028,0103) | 0 = unsigned 1 = 2's Complement | Mandatory, no default. |
| Polarity | (2020,0020) | NORMAL REVERSE | NORMAL |
| Magnification Type | (2010,0060) | REPLICATE BILINEAR CUBIC NONE | Configurable |
| Smoothing Type | (2010,0080) | 0-15, the value is laser specific. | Configurable |

PRINT-SCU behavior and specific status codes sent for the N-SET of a specific Image Box is described in the following table:

Table 4-70 Image Box SOP Class N-SET Response Status Handling Behavior

| Service Status | Further Meaning | Error Code | Behavior |
|-----------------------|-----------------------------|-------------------|--|
| Success | Success | 0000 | The N-SET operation is successful. |
| Warning | Attribute out of range | 0116 | The N-SET operation is considered successful. |
| Warning | Image larger than Image Box | B604 | The N-SET operation is considered successful. |
| Warning | Image larger than Image Box | B609 | The N-SET operation is considered successful. |
| Warning | Image larger than Image Box | B60A | The N-SET operation is considered successful. |
| Failure | No object instance | 0112 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Missing attributes | 0120 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Missing attribute value | 0121 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Image size doesn't match | C603 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Out of Resources | C605 | The N-SET operation failed, and the print job is marked as failed. |

4.2.9.3.1.3.1.4 Specific Conformance for Printer SOP Class

PRINT-SCU never issues N-GET or N-EVENT-REPORT requests for the Printer SOP Class.

4.2.9.3.1.3.2 Specific Conformance to Basic Color Print Management Meta SOP Class

PRINT-SCU supports the following mandatory SOP classes as defined by the Basic Color Print Management Meta SOP Class:

Table 4-71 SOP Classes for Basic Color Print Management Meta SOP Class

| SOP Class Name | SOP Class UID | SCU | SCP |
|-----------------------|-------------------------|-----|-----|
| Basic Film Session | 1.2.840.10008.5.1.1.1 | Yes | No |
| Basic Film Box | 1.2.840.10008.5.1.1.2 | Yes | No |
| Basic Color Image Box | 1.2.840.10008.5.1.1.4.1 | Yes | No |
| Printer | 1.2.840.10008.5.1.1.16 | Yes | No |

The specific SOP Conformance statement for each of the Basic Color Print Management Meta SOP Class components is described in the subsequent sections.

4.2.9.3.1.3.2.1 Specific Conformance for Basic Film Session SOP Class

See Section 4.2.9.3.1.3.1.1

4.2.9.3.1.3.2.2 Specific Conformance for Basic Film Box SOP Class

See Section 4.2.9.3.1.3.1.2

4.2.9.3.1.3.2.3 Specific Conformance for Basic Color Image Box SOP Class

PRINT-SCU provides the following support for the attributes contained in the N-SET DIMSE Service of the Basic Color Image Box SOP Class:

Table 4-72 Image Box SOP Class N-SET Request Attributes

| Attribute | Tag | Valid Range | Default Value if not sent by SCU or invalid value received |
|-----------------------------|-------------|--|---|
| Image Position | (2020,0010) | 1 - Max number of images for Display Format | Mandatory, no default. |
| Basic Color Image Sequence | (2020,0111) | N/A | N/A |
| >Samples Per Pixel | (0028,0002) | 3 | Mandatory, no default. |
| >Photometric Interpretation | (0028,0004) | RGB | Mandatory, no default. |
| >Rows | (0028,0010) | 1 – Maximum rows for film size | Mandatory, no default. |
| >Columns | (0028,0011) | 1 – Maximum columns for film size. | Mandatory, no default. |
| >Pixel Aspect Ratio | (0028,0034) | Any pair of valid positive integers (1 to 215-1) | No default |
| >Bits Allocated | (0028,0100) | 8 or 16 | Mandatory, no default. |
| >Bits Stored | (0028,0101) | 8 – 16 | Mandatory, no default. |
| >High Bit | (0028,0102) | 7-15 | Mandatory, no default. |
| >Pixel Representation | (0028,0103) | 0 = unsigned 1 = 2's Complement | Mandatory, no default. |
| Polarity | (2020,0020) | NORMAL REVERSE | NORMAL |
| Magnification Type | (2010,0060) | REPLICATE BILINEAR CUBIC NONE | Configurable |
| Smoothing Type | (2010,0080) | 0-15, the value is laser specific. | Configurable |

PRINT-SCU behavior and specific status codes sent for the N-SET of a specific Image Box is described in the following table:

Table 4-73 Image Box SOP Class N-SET Response Status Handling Behavior

| Service Status | Further Meaning | Error Code | Behavior |
|-----------------------|-----------------------------|-------------------|--|
| Success | Success | 0000 | The N-SET operation is successful. |
| Warning | Attribute out of range | 0116 | The N-SET operation is considered successful. |
| Warning | Image larger than Image Box | B604 | The N-SET operation is considered successful. |
| Warning | Image larger than Image Box | B609 | The N-SET operation is considered successful. |
| Warning | Image larger than Image Box | B60A | The N-SET operation is considered successful. |
| Failure | No object instance | 0112 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Missing attributes | 0120 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Missing attribute value | 0121 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Image size doesn't match | C603 | The N-SET operation failed, and the print job is marked as failed. |
| Failure | Out of Resources | C605 | The N-SET operation failed, and the print job is marked as failed. |

4.2.9.3.1.3.2.4 Specific Conformance for Printer SOP Class

PRINT-SCU never issues N-GET or N-EVENT-REPORT requests for the Printer SOP Class.

4.3 Network Interfaces

4.3.1 Physical Network Interface

The application is indifferent to the physical medium over which TCP/IP executes; which is dependent on the underlying operating system and hardware.

4.3.2 Additional Protocols

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

4.4 Configuration

Configuration is performed through the use of an administration tool. Refer to the product documentation for specific details.

4.4.1 AE Title/Presentation Address Mapping

All SCU requests are performed using the "local" AE. Each AE has an alias assigned to allow a user to easily distinguish AEs from each other. Aliases are configurable, and are generally human-readable strings. Presentation addresses (IP address and Port) are also configurable for all AEs.

4.4.2 Parameters

Table 4-74 Configuration Parameters Table

| Parameter | Configurable | Default Value |
|---|--------------|--|
| General Parameters | | |
| PDU Size | No | 65kB |
| Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout) | No | 60 seconds |
| General DIMSE level time-out values | No | 60 seconds |
| Time-out waiting for response to TCP/IP connect() request. (Low-level timeout) | No | 60 seconds |
| Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout) | No | 60 seconds |
| Time-out for waiting for data between TCP/IP packets. (Low-level timeout) | No | 60 seconds |
| Any changes to default TCP/IP settings, such as configurable stack parameters. | No | None |
| AE Specific Parameters (all AEs) | | |
| Size constraint in maximum object size | No | None |
| Maximum PDU size the AE can receive | No | Unlimited |
| Maximum PDU size the AE can send | No | 65kB |
| AE specific DIMSE level time-out values | No | 60 seconds |
| Number of retries on failure (MOVE-SCU AE, STORE-SCU AE, PRINT-SCU AE only) | Yes | 3 (MOVE-SCU AE), 5 (STORE-SCU AE and PRINT-SCU AE) |
| Number of simultaneous Associations by Service and/or SOP Class | No | Unlimited |
| SOP Class support | Yes | See Table 4-75 |
| Transfer Syntax support | Yes | See Table 4-76 |
| Supported DIMSE services | No | None |
| AE Specific Parameters (FIND-SCP) | | |
| Matching responses | No | 500 |
| AE Specific Parameters (FIND-SCU) | | |
| Fuzzy Semantic Matching | Yes | False |

| Parameter | Configurable | Default Value |
|-------------------|--------------|---|
| Transfer Syntaxes | Yes | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 |

Table 4-75 Default SOP Classes for Configured AEs

| SOP Class Name | SOP Class UID |
|--|--------------------------------|
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 |
| Enhanced CT Image Storage | 1.2.840.10008.5.1.4.1.1.2.1 |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 |
| Enhanced MR Image Storage | 1.2.840.10008.5.1.4.1.1.4.1 |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 |
| Multi-frame Single Bit Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.1 |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2 |
| Multi-frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3 |
| Multi-frame True Color Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.4 |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 |
| X-Ray 3D Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.13.1.1 |
| Nuclear Medicine Image Storage | 1.2.840.10008.5.1.4.1.1.20 |
| Basic Text SR Storage | 1.2.840.10008.5.1.4.1.1.88.11 |
| Enhanced SR Storage | 1.2.840.10008.5.1.4.1.1.88.22 |
| X-Ray Radiation Dose SR Storage | 1.2.840.10008.5.1.4.1.1.88.67 |
| Positron Emission Tomography Image Storage | 1.2.840.10008.5.1.4.1.1.128 |

Table 4-76 Default Transfer Syntaxes for Configured AEs

| Transfer Syntax Name | Transfer Syntax UID |
|---|------------------------|
| Implicit VR Little Endian | 1.2.840.10008.1.2 |
| Explicit VR Little Endian | 1.2.840.10008.1.2.1 |
| JPEG Lossless, Non- Hierarchical (Process 14) | 1.2.840.10008.1.2.4.70 |

5. MEDIA INTERCHANGE

5.1 Implementation Model

5.1.1 Application Data Flow



Figure 5.1 Implementation Model

The application provides a user interface and media support as a File Set Reader. Conceptually it may be modeled as the following single AE:

- MEDIA-FSR, which loads a user-selected PS 3.10 compliant file, which may be a DICOMDIR or an instance object, either from the local file system or from PS 3.12 compliant media according to one of the General Purpose Media Application Profiles of PS 3.11 (CD-R or DVD-RAM)

5.1.2 Functional Definitions of AE's

5.1.2.1 MEDIA-FSR

MEDIA-FSR is activated through the user interface to select datasets for display, or to import into the local database.

5.1.3 Sequencing of Real-World Activities

All FSR activities are sequentially initiated in the user interface, and another activity may not be initiated until the prior activity has completed.

5.2 AE Specifications

5.2.1 MEDIA-FSR

MEDIA-FSR provides standard conformance to the Media Storage Service Class.

Table 5-1 Application Profiles, Activities and Roles for MEDIA-FSR

| Application Profiles Supported | Real World Activity | Role |
|--------------------------------|---------------------|------|
| STD-GEN-CD | Load dataset | FSR |
| STD-CTMR-CD | Load dataset | FSR |
| STD-CTMR-DVD | Load dataset | FSR |
| STD-GEN-DVD-JPEG | Load dataset | FSR |
| STD-GEN-DVD-J2K | Load dataset | FSR |

5.2.1.1 File Meta Information for the Application Entity

Not applicable, since MEDIA-FSR is not an FSC or FSU.

5.2.1.2 Real World Activities

5.2.1.2.1 Activity – Load Dataset

MEDIA-FSR is activated through the user interface when a user selects the import or load operation. The import operation will cause the contents of the media to be imported into the local dataset. The load operation will cause the dataset to be loaded for display.

5.2.1.2.1.1 Application Profile Specific Conformance

There are no extensions or specializations.

5.2.2 MEDIA-FSC

VAS-01 does not support MEDIA-FSC.

5.3 Augmented and Private Application Profiles

5.3.1 Augmented Profiles

None.

5.3.2 Private Profiles

None.

5.4 MEDIA Configuration

None.

6. SUPPORT OF CHARACTER SETS

VAS-01 supports the following character sets:

- ISO-IR 6 (default) ISO 646
- ISO-IR 100 (ISO 8859-1:1987 Latin Alphabet No. 1 supplementary set).
- ISO 2022 IR 87 (JIS X 0208-1990 Code for the Japanese Graphic Character set for information interchange)

No other character sets are supported.

Table 6-1 lists of ISO-IR 100/87

| Attribute Name | Tag | VR |
|------------------------------------|-------------|-----------|
| Institution Name | (0008,0080) | LO |
| Referring Physician's Name | (0008,0090) | PN |
| Study Description | (0008,1030) | LO |
| Series Description | (0008,103E) | LO |
| Name of Physician(s) Reading Study | (0008,1060) | PN |
| Patient's Name | (0010,0010) | PN |
| Issuer of Patient ID | (0010,0021) | LO |
| Protocol Name | (0018,1030) | LO |
| Image Comment | (0020,4000) | LT |

7. SECURITY

7.1 Network

This product does not support any specific network security measures. It is assumed the software is used within a secured environment. It is assumed that a secured environment includes at a minimum:

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

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

7.2 Basic Application Level Confidentiality Profile (De-Identification)

The application can remove patient identification from images during Media Storage reading. Partial de-identification can also be done by selecting Patient Editing vs Anonymization. Editing modifies only those DICOM tags which are selected by the user. The remainder of this section describes anonymization.

The de-identification (Anonymization) process maintains the study/series/image hierarchy of the original images, and any cross references that may exist between images.

The following table describes which DICOM tags are removed or available for modification during de-identification. All other tags (defined in DICOM 3.0 data dictionary) are left unchanged. Private tags are not maintained. The application removes, re-maps, nulls (empty value), or adjusts the required attributes as specified in DICOM PS 3.15 Table E.1-1. Additional attributes from the Patient Identification and Patient Demographic Modules are also removed based on common usage for identifying information.

Note: No change is made to the pixel data, therefore any burnt-in annotations which contain patient identification will remain. The application does not add or modify the Patient Identity Removed (0012,0062) attribute since it is impossible to determine whether or not the image pixel data has been de-identified.

Table 7-1 Attributes Modified During De-identification

| Attribute Name | Dicom Tag | De-identification Action |
|---|------------------|---------------------------------|
| Instance Creation Date | (0008,0012) | O |
| Instance Creation Time | (0008,0013) | O |
| Instance Creator UID | (0008,0014) | R |
| SOP Instance UID | (0008,0018) | M |
| Series Date | (0008,0021) | O |
| Instance Creation Date | (0008,0012) | O |
| Acquisition DateTime | (0008,002A) | O |
| Series Time | (0008,0031) | O |
| Accession Number | (0008,0050) | N, U |
| Institution Name | (0008,0080) | N |
| Institution Address | (0008,0081) | N |
| Referring Physician's Name | (0008,0090) | N |
| Referring Physician's Address | (0008,0092) | N |
| Referring Physician's Telephone Numbers | (0008,0094) | N |
| Station Name | (0008,1010) | N |
| Study Description | (0008,1030) | N |
| Series Description | (0008,103E) | N, U |
| Institutional Department Name | (0008,1040) | N, U |
| Physician(s) of Record | (0008,1048) | N |
| Performing Physicians' Name | (0008,1050) | N |
| Name of Physician(s) Reading Study | (0008,1060) | N |
| Operators' Name | (0008,1070) | N |
| Admitting Diagnoses Description | (0008,1080) | N |
| Additional Patient's History | (0010,21B0) | N |
| Responsible Person | (0010,2297) | R |
| Responsible Person Role | (0010,2298) | R |
| Responsible Organization | (0010,2299) | R |
| Patient Comments | (0010,4000) | N |
| Referenced SOP Instance UID | (0008,1155) | M |
| Derivation Description | (0008,2111) | N |
| Patient's Name | (0010,0010) | N, U |
| Patient ID | (0010,0020) | N, U |
| Patient's Birth Date | (0010,0030) | N, U |
| Patient's Birth Time | (0010,0032) | N |
| Patient's Sex | (0010,0040) | N |
| Patient's Primary Language Seq | (0010,0101) | R |
| Patients Insurance Plan Code Seq | (0010,0050) | R |
| Other Patient Ids | (0010,1000) | N |

| | | |
|--|-------------|---|
| Other Patient Names | (0010,1001) | N |
| Other Patient IDs Sequence | (0010,1002) | R |
| Patient's Birth Name | (0010,1005) | R |
| Patient's Age | (0010,1010) | N |
| Patient's Size | (0010,1020) | N |
| Patient's Weight | (0010,1030) | N |
| Occupation | (0010,2180) | N |
| Ethnic Group | (0010,2160) | N |
| Patient's Address | (0010,1040) | R |
| Patient's Telephone Numbers | (0010,2154) | R |
| Medical Record Locator | (0010,1090) | N |
| Branch of Service | (0010,1081) | R |
| Military Rank | (0010,1080) | R |
| Patient's Mother's Birth Name | (0010,1060) | R |
| Device Serial Number | (0018,1000) | N |
| Protocol Name | (0018,1030) | N |
| Radiopharmaceutical Start DateTime | (0018,1078) | O |
| Radiopharmaceutical Stop DateTime | (0018,1079) | O |
| Frame Acquisition DateTime | (0018,9074) | O |
| Frame Reference DateTime | (0018,9151) | O |
| Content Date | (0008,0023) | O |
| Content Time | (0008,0033) | O |
| Start Acquisition DateTime | (0018,9516) | O |
| Stop Acquisition DateTime | (0018,9517) | O |
| Study Instance UID | (0020,000D) | M |
| Series Instance UID | (0020,000E) | M |
| Study ID | (0020,0010) | N |
| Frame of Reference UID | (0020,0052) | M |
| Synchronization Frame of Reference UID | (0020,0200) | M |
| Image Comments | (0020,4000) | N |
| Request Attributes Sequence | (0040,0275) | R |
| UID | (0040,A124) | M |
| Substance Administration DateTime | (0044,0010) | O |
| Creation Date | (2100,0040) | O |
| Referenced Frame of Reference UID | (3006,0024) | M |
| Related Frame of Reference UID | (3006,00C2) | M |
| Date of Secondary Capture | (0018,1012) | O |
| Time of Secondary Capture | (0018,0014) | O |

In the de-identification action column, the following legend applies:

- N: the attribute is nulled, or set to an empty value.
- R: the attribute is removed entirely.
- M: the value is a DICOM UID that is remapped.
- U: the value is specified by the user.
- G: the value is generated.
- O: date or date/time offset by the difference between the original and modified Study Date.

During de-identification, no attributes are added, with the exception of those specified by the user, replacing the existing DICOM tab values. With the exception of UIDs, Study Date and the Date or Date/time attributes offset by the difference in Study Date (those marked with an O in Table 7-1), no attribute values are generated.

8. ANNEXES

8.1 IOD CONTENTS

The following sections specify the attributes used for the SOP Instances created by STORAGE-SCU. The following tables use a number of abbreviations. The abbreviations used in the "Presence of ..." column are:

| | |
|--------|--|
| VNAP | Value Not Always Present (attribute sent zero length if no value is present) |
| ANAP | Attribute Not Always Present |
| ALWAYS | Always Present |
| EMPTY | Attribute is sent without a value |

The abbreviations used in the "Source" column:

| | |
|--------|--|
| SRC | the attribute value source is from the original SOP Instance |
| USER | the attribute value source is from User input |
| CONFIG | the attribute value source is a configurable parameter |
| AUTO | the attribute is automatically generated |

NOTE: All dates and times are encoded in the local configured calendar and time.

NOTE: The received datasets directly send without processing by STORAGE-SCU.

8.1.1 CT Image SOP Instances

Table 8-1 IOD of Created CT SOP Instances

| IE | Module | Reference | Presence of Module |
|--------------------|----------------------|-----------|--|
| Patient | Patient | 8.2.1.1 | ALWAYS |
| Study | General Study | 8.2.1.3 | ALWAYS |
| | Patient Study | 8.2.1.2 | ALWAYS |
| Series | General Series | 8.2.1.5 | ALWAYS |
| Frame of Reference | Frame of Reference | 8.2.1.13 | ALWAYS |
| Equipment | General Equipment | 8.2.1.4 | ALWAYS |
| Image | General Image | 8.2.1.6 | ALWAYS |
| | Image Plane | 8.2.1.7 | ALWAYS |
| | Image Pixel | 8.2.1.8 | ALWAYS |
| | Contrast/Bolus | 8.2.1.9 | Included if Contrast used in original images |
| | CT Image | 8.2.1.16 | ALWAYS |
| | SOP Common | 8.2.1.12 | ALWAYS |
| | Modality LUT | 8.2.1.11 | ALWAYS |
| | VOI LUT | 8.2.1.10 | ALWAYS |
| | Vital Images Private | 8.2.1.31 | ALWAYS |

8.1.2 MR Image SOP Instances

Table 8-2 IOD of Created MR SOP Instances

| IE | Module | Reference | Presence of Module |
|--------------------|----------------------|------------------|--|
| Patient | Patient | 8.2.1.1 | ALWAYS |
| Study | General Study | 8.2.1.3 | ALWAYS |
| | Patient Study | 8.2.1.2 | ALWAYS |
| Series | General Series | 8.2.1.5 | ALWAYS |
| Frame of Reference | Frame of Reference | 8.2.1.13 | ALWAYS |
| Equipment | General Equipment | 8.2.1.4 | ALWAYS |
| Image | General Image | 8.2.1.6 | ALWAYS |
| | Image Pixel | 8.2.1.7 | ALWAYS |
| | Image Plane | 8.2.1.8 | ALWAYS |
| | Contrast/Bolus | 8.2.1.9 | Included if Contrast used in original images |
| | MR Image | 8.2.1.17 | ALWAYS |
| | VOI LUT | 8.2.1.10 | ALWAYS |
| | SOP Common | 8.2.1.12 | ALWAYS |
| | Vital Images Private | 8.2.1.31 | ALWAYS |

8.1.3 Secondary Capture SOP Instances

Table 8-3 IOD of Created Secondary Capture SOP Instances

| IE | Module | Reference | Presence of Module |
|-----------|----------------------|------------------|---------------------------|
| Patient | Patient | 8.2.1.1 | ALWAYS |
| Study | General Study | 8.2.1.3 | ALWAYS |
| | Patient Study | 8.2.1.2 | ALWAYS |
| Series | General Series | 8.2.1.5 | ALWAYS |
| Equipment | General Equipment | 8.2.1.4 | ALWAYS |
| | SC Equipment | 8.2.1.14 | ALWAYS |
| Image | General Image | 8.2.1.6 | ALWAYS |
| | Image Pixel | 8.2.1.7 | ALWAYS |
| | SC Image | 8.2.1.15 | ALWAYS |
| | SOP Common | 8.2.1.12 | ALWAYS |
| | Vital Images Private | 8.2.1.31 | ALWAYS |

8.1.4 XA Image SOP Instances

Table 8-4 IOD of Created XA SOP Instances

| IE | Module | Reference | Presence of Module |
|--------------------|----------------------|-----------|--------------------|
| Patient | Patient | 8.2.1.1 | ALWAYS |
| Study | General Study | 8.2.1.3 | ALWAYS |
| | Patient Study | 8.2.1.2 | ALWAYS |
| Series | General Series | 8.2.1.5 | ALWAYS |
| Frame of Reference | Frame of Reference | 8.2.1.13 | ALWAYS |
| Equipment | General Equipment | 8.2.1.4 | ALWAYS |
| Image | General Image | 8.2.1.6 | ALWAYS |
| | Image Pixel | 8.2.1.7 | ALWAYS |
| | X-Ray Image | 8.2.1.18 | ALWAYS |
| | X-Ray Acquisition | 8.2.1.19 | ALWAYS |
| | XA Positioner | 8.2.1.20 | ALWAYS |
| | SOP Common | 8.2.1.12 | ALWAYS |
| | Vital Images Private | 8.2.1.31 | ALWAYS |

8.1.5 X-Ray 3D Angiographic Image SOP Instances

Table 8-5 IOD of Created X-Ray 3D Angiographic Image SOP Instances

| IE | Module | Reference | Presence of Module |
|----------------------|-------------------------------|-----------|--|
| Patient | Patient | 8.2.1.1 | ALWAYS |
| Study | General Study | 8.2.1.3 | ALWAYS |
| | Patient Study | 8.2.1.2 | ALWAYS |
| Series | General Series | 8.2.1.5 | ALWAYS |
| | Enhanced Series | 8.2.1.22 | ALWAYS |
| Frame of Reference | Frame of Reference | 8.2.1.13 | ALWAYS |
| Equipment | General Equipment | 8.2.1.4 | ALWAYS |
| | Enhanced General Equipment | 8.2.1.23 | ALWAYS |
| Image | Image Pixel | 8.2.1.7 | ALWAYS |
| | Contrast/Bolus | 8.2.1.9 | Included if Contrast used in original images |
| | Enhanced Contrast/Bolus | 8.2.1.24 | NEVER |
| | Acquisition Context | 8.2.1.25 | NEVER |
| | Multi-frame Functional Groups | 8.2.1.26 | ALWAYS |
| | X-Ray 3D Image | 8.2.1.27 | ALWAYS |
| | SOP Common | 8.2.1.12 | ALWAYS |
| Vital Images Private | 8.2.1.31 | ALWAYS | |

8.1.6 Basic Text SR SOP Instances

Table 8-6 IOD of Created Basic Text SR SOP Instances

| IE | Module | Reference | Presence of Module |
|-----------|---------------------|------------------|---------------------------|
| Patient | Patient | 8.2.1.1 | ALWAYS |
| Study | General Study | 8.2.1.3 | ALWAYS |
| | Patient Study | 8.2.1.2 | ALWAYS |
| Series | SR Document Series | 8.2.1.28 | ALWAYS |
| | Presentation Series | 8.2.1.21 | ALWAYS |
| Equipment | General Equipment | 8.2.1.4 | ALWAYS |
| Document | SR Document General | 8.2.1.29 | ALWAYS |
| | SR Document Content | 8.2.1.30 | ALWAYS |
| | SOP Common | 8.2.1.12 | ALWAYS |

8.2 Modules

8.2.1 Common Modules

8.2.1.1 Patient Module

See DICOM PS 3.3 C.7.1.1 for more information.

Table 8-7 Patient Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------|-------------|----|--------------------|-------------------|--------|
| Patient's Name | (0010,0010) | PN | From source images | VNAP | SRC |
| Patient ID | (0010,0020) | LO | From source images | VNAP | SRC |
| Patient's Birth Date | (0010,0030) | DA | From source images | VNAP | SRC |
| Patient's Sex | (0010,0040) | CS | From source images | VNAP | SRC |

8.2.1.2 Patient Study Module

See DICOM PS 3.3 C.7.2.2 for more information.

Table 8-8 Patient Study Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------|-------------|----|--------------------|-------------------|--------|
| Patient's Age | (0010,1010) | AS | From source images | VNAP | SRC |

8.2.1.3 General Study Module

See DICOM PS 3.3 C.7.2.1 for more information.

Table 8-9 General Study Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------------|-------------|----|--------------------|-------------------|--------|
| Study Date | (0008,0020) | DA | From source images | VNAP | SRC |
| Study Time | (0008,0030) | TM | From source images | VNAP | SRC |
| Accession Number | (0008,0050) | SH | From source images | VNAP | SRC |
| Referring Physician's Name | (0008,0090) | PN | From source images | VNAP | SRC |
| Study Description | (0008,1030) | LO | From source images | ANAP | SRC |
| Name of Physician(s) Reading Study | (0008,1060) | PN | From source images | ANAP | SRC |
| Study Instance UID | (0020,000D) | UI | From source images | ALWAYS | SRC |
| Study ID | (0020,0010) | SH | From source images | VNAP | SRC |

8.2.1.4 General Equipment Module

See DICOM PS 3.3 C.7.5.1

Table 8-10 General Equipment Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------------|-------------|----|-------------------------|-------------------|--------|
| Manufacturer | (0008,0070) | LO | "Vital Images, Inc" | ALWAYS | AUTO |
| Institution Name | (0008,0080) | LO | From source images | VNAP | SRC |
| Institution Address | (0008,0081) | ST | From source images | VNAP | SRC |
| Institution Department | (0008,1040) | LO | From source images | VNAP | SRC |
| Manufacturer's Model Name | (0008,1090) | LO | Automatically Generated | ALWAYS | AUTO |

8.2.1.5 General Series Module

See DICOM PS 3.3 C.7.3.1

Table 8-11 General Series Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------|-------------|----|---|-------------------|--------|
| Modality | (0008,0060) | CS | Based on IOD | ALWAYS | AUTO |
| Series Description | (0008,103E) | LO | Automatically generated or User Entered | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Automatically Generated | ALWAYS | AUTO |
| Series Number | (0020,0011) | IS | Automatically Generated | ALWAYS | AUTO |

8.2.1.6 General Image Module

See DICOM PS 3.3 C.7.6.1

Table 8-12 General Image Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------|-------------|----|-------------------------|-------------------|--------|
| Image Type | (0008,0008) | CS | Automatically Generated | ALWAYS | AUTO |
| Content Date | (0008,0023) | DA | Automatically Generated | ALWAYS | AUTO |
| Content Time | (0008,0033) | TM | Automatically Generated | ALWAYS | AUTO |
| Instance Number | (0020,0013) | IS | Automatically Generated | ALWAYS | AUTO |
| Burned In Annotation | (0028,0301) | CS | Automatically Generated | ANAP | AUTO |

NOTE: All dates and times are encoded in the local configured calendar and time.

8.2.1.7 Image Plane Module

See DICOM PS 3.3 C.7.6.2

Table 8-13 Image Plane Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------|-------------|----|-------------------------|-------------------|--------|
| Slice Thickness | (0018,0050) | DS | Automatically Generated | ALWAYS | AUTO |
| Image Orientation (Patient) | (0020,0032) | DS | Automatically Generated | ALWAYS | AUTO |
| Image Position (Patient) | (0020,0037) | DS | Automatically Generated | ALWAYS | AUTO |
| Pixel Spacing | (0028,0030) | DS | Automatically Generated | ALWAYS | AUTO |

8.2.1.8 Image Pixel Module

See DICOM PS 3.3 C.7.6.3

Table 8-14 Image Pixel Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------|-------------|-------|-------------------------|-------------------|--------|
| Samples Per Pixel | (0028,0002) | US | Automatically Generated | ANAP | AUTO |
| Planar Configuration | (0028,0006) | US | Automatically Generated | ANAP | AUTO |
| Rows | (0028,0010) | US | Automatically Generated | ALWAYS | AUTO |
| Columns | (0028,0011) | US | Automatically Generated | ALWAYS | AUTO |
| Pixel Aspect Ratio | (0028,0034) | IS | Automatically Generated | ANAP | AUTO |
| Bits Allocated | (0028,0100) | US | Automatically Generated | ALWAYS | AUTO |
| Bits Stored | (0028,0101) | US | Automatically Generated | ALWAYS | AUTO |
| High Bit | (0028,0102) | US | Automatically Generated | ALWAYS | AUTO |
| Pixel Representation | (0028,0103) | US | Automatically Generated | ALWAYS | AUTO |
| Pixel Data | (7FE0,0010) | OB/OW | Automatically Generated | ALWAYS | AUTO |

8.2.1.9 Contrast/Bolus Module

See DICOM PS 3.3 C.7.6.4

Table 8-15 Contrast/Bolus Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------|-------------|----|--------------------|-------------------|--------|
| Contrast/Bolus Agent | (0018,0010) | LO | From source images | ANAP | SRC |

8.2.1.10 VOI LUT Module

See DICOM PS 3.3 C.11.2

Table 8-16 VOI LUT Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------|-------------|----|-------------------------|-------------------|--------|
| Window Center | (0028,1050) | DS | Automatically Generated | ANAP | AUTO |
| Window Width | (0028,1051) | DS | Automatically Generated | ANAP | AUTO |

8.2.1.11 Modality LUT Module

See DICOM PS 3.3 C.11.1

Table 8-17 Modality LUT Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-------------------|-------------|----|-------------------------|-------------------|--------|
| Rescale Intercept | (0028,1052) | DS | Automatically Generated | ANAP | AUTO |
| Rescale Slope | (0028,1053) | DS | Automatically Generated | ANAP | AUTO |
| Rescale Type | (0028,1054) | LO | US | ANAP | AUTO |

8.2.1.12 SOP Common Module

See DICOM PS 3.3 C.12.1

Table 8-18 SOP Common Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------|-------------|----|-------------------------|-------------------|--------|
| SOP Class UID | (0008,0016) | UI | Automatically Generated | ALWAYS | AUTO |
| SOP Instance UID | (0008,0018) | UI | Automatically Generated | ALWAYS | AUTO |

8.2.1.13 Frame of Reference Module

See DICOM PS 3.3 C.7.4.1

Table 8-19 Frame of Reference Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------|-------------|----|--------------------|-------------------|--------|
| Frame of Reference UID | (0020,0052) | UI | From source images | ALWAYS | SRC |
| Position Reference Indicator | (0020,1040) | LO | From source images | VNAP | SRC |

8.2.1.14 Secondary Capture Equipment Module

See DICOM PS 3.3 C.8.6.1

Table 8-20 Secondary Capture Equipment Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------|-------------|----|-------------------------|-------------------|--------|
| Conversion Type | (0008,0064) | CS | Automatically generated | ALWAYS | AUTO |

8.2.1.15 Secondary Capture Image Module

See DICOM PS 3.3 C.8.6.2

Table 8-21 Secondary Capture Image Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------------|-------------|----|-------------------------|-------------------|--------|
| Date of Secondary Capture | (0018,1012) | DA | Automatically generated | ALWAYS | AUTO |
| Time of Secondary Capture | (0018,1014) | TM | Automatically generated | ALWAYS | AUTO |

NOTE: All dates and times are encoded in the local configured calendar and time.

8.2.1.16 CT Image Module

See DICOM PS 3.3 C.8.2.1

Table 8-22 CT Image Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------------|-------------|----|--------------------|-------------------|--------|
| KVP | (0018,0060) | DS | From source images | VNAP | SRC |
| Data Collection Diameter | (0018,0090) | DS | From source images | ANAP | SRC |
| Reconstruction Diameter | (0018,1100) | DS | From source images | ANAP | SRC |
| Gantry/Detector Tilt | (0018,1120) | DS | From source images | ANAP | SRC |
| Table Height | (0018,1130) | DS | From source images | ANAP | SRC |
| Rotation Direction | (0018,1140) | CS | From source images | ANAP | SRC |
| Exposure Time | (0018,1150) | IS | From source images | ANAP | SRC |
| X-Ray Tube Current | (0018,1151) | IS | From source images | ANAP | SRC |
| Exposure | (0018,1152) | IS | From source images | ANAP | SRC |
| Filter Type | (0018,1160) | SH | From source images | ANAP | SRC |
| Generator Power | (0018,1170) | IS | From source images | ANAP | SRC |
| Convolution Kernel | (0018,1210) | SH | From source images | ANAP | SRC |
| Acquisition Number | (0020,0012) | IS | From source images | VNAP | SRC |

8.2.1.17 MR Image Module

See DICOM PS 3.3 C.8.3.1

Table 8-23 MR Image Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------------|-------------|----|--------------------|-------------------|--------|
| Scanning Sequence | (0018,0020) | CS | From source images | ALWAYS | SRC |
| Sequence Variant | (0018,0021) | CS | From source images | ALWAYS | SRC |
| Scan Options | (0018,0022) | CS | From source images | VNAP | SRC |
| MR Acquisition Type | (0018,0023) | CS | From source images | VNAP | SRC |
| Sequence Name | (0018,0024) | SH | From source images | ANAP | SRC |
| Angio Flag | (0018,0025) | CS | From source images | ANAP | SRC |
| Repetition Time | (0018,0080) | DS | From source images | VNAP | SRC |
| Echo Time | (0018,0081) | DS | From source images | VNAP | SRC |
| Inversion Time | (0018,0082) | DS | From source images | VNAP | SRC |
| Number of Averages | (0018,0083) | DS | From source images | ANAP | SRC |
| Imaging Frequency | (0018,0084) | DS | From source images | ANAP | SRC |
| Imaged Nucleus | (0018,0085) | SH | From source images | ANAP | SRC |
| Echo Number(s) | (0018,0086) | IS | From source images | ANAP | SRC |
| Magnetic Field Strength | (0018,0087) | DS | From source images | ANAP | SRC |
| Spacing Between Slices | (0018,0088) | DS | From source images | ANAP | SRC |
| Number of Phase Encoding Steps | (0018,0089) | IS | From source images | ANAP | SRC |
| Echo Train Length | (0018,0091) | IS | From source images | VNAP | SRC |
| Reconstruction Diameter | (0018,1100) | DS | From source images | ANAP | SRC |
| Receive Coil Name | (0018,1250) | SH | From source images | ANAP | SRC |
| Transmit Coil Name | (0018,1251) | SH | From source images | ANAP | SRC |
| In-Plane Phase Encoding Direction | (0018,1312) | CS | From source images | ANAP | SRC |

8.2.1.18 X-Ray Image Module

See DICOM PS 3.3 C.8.7.1

Table 8-24 X-Ray Image Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------|-------------|----|--------------------|-------------------|--------|
| Pixel Intensity Relationship | (0028,1040) | CS | From source images | ALWAYS | SRC |

8.2.1.19 X-Ray Acquisition Module

See DICOM PS 3.3 C.8.7.2

Table 8-25 X-Ray Acquisition Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------|-------------|----|--------------------|-------------------|--------|
| KVP | (0018,0060) | DS | From source images | ALWAYS | SRC |
| Exposure Time | (0018,1150) | IS | From source images | ALWAYS | SRC |
| X-Ray Tube Current | (0018,1151) | IS | From source images | ALWAYS | SRC |
| Exposure | (0018,1152) | IS | From source images | ALWAYS | SRC |
| Radiation Setting | (0018,1155) | CS | From source images | ALWAYS | SRC |

8.2.1.20 XA Positioner Module

See DICOM PS 3.3 C.8.7.5

Table 8-26 XA Positioner Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------------|-------------|----|-------------------------|-------------------|--------|
| Positioner Primary Angle | (0018,1510) | DS | Automatically generated | ALWAYS | AUTO |
| Positioner Secondary Angle | (0018,1511) | DS | Automatically generated | ALWAYS | AUTO |

8.2.1.21 Presentation Series Module

See DICOM PS 3.3 C.11.9

Table 8-27 Presentation Series Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------|-------------|----|-------|-------------------|--------|
| Modality | (0008.0060) | CS | PR | ALWAYS | SRC |

8.2.1.22 Enhanced Series Module

See DICOM PS 3.3 C.7.3.3

Table 8-28 Enhanced Series Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------|-------------|----|-------------------------|-------------------|--------|
| Series Number | (0020,0011) | IS | Automatically generated | ALWAYS | AUTO |

8.2.1.23 Enhanced General Equipment Module

See DICOM PS 3.3 C.7.5.2

Table 8-29 Enhanced General Equipment Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------------|-------------|----|-------------------------|-------------------|--------|
| Manufacturer | (0008,0070) | LO | "Vital Images, Inc" | ALWAYS | AUTO |
| Manufacturer's Model Name | (0008,1090) | LO | Automatically generated | ALWAYS | AUTO |
| Device Serial Number | (0018,1000) | LO | Automatically generated | ALWAYS | AUTO |
| Software Versions | (0018,1020) | LO | Automatically generated | ALWAYS | AUTO |

8.2.1.24 Enhanced Contrast/Bolus Module

See DICOM PS 3.3 C.7.6.4b

Table 8-30 Enhanced Contrast/Bolus Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-------------------------------|-------------|----|---|-------------------|--------|
| Contrast/Bolus Agent Sequence | (0018,0012) | SQ | Entire sequence copied from source images | ANAP | SRC |

8.2.1.25 Acquisition Context

See DICOM PS 3.3 C.7.6.14

Table 8-31 Acquisition Context Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------|-------------|----|----------------|-------------------|--------|
| Acquisition Context Sequence | (0040,0555) | SQ | Empty sequence | ALWAYS | AUTO |

8.2.1.26 Multi-frame Functional Groups

See DICOM PS 3.3 C.7.6.16

Table 8-32 Multi-frame Functional Groups Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------------------------|-------------|----|-------------------------|-------------------|--------|
| Shared Functional Groups Sequence | (5200,9229) | SQ | | ALWAYS | AUTO |
| >Pixel Value Transformation Sequence | (0028,9145) | SQ | | ALWAYS | AUTO |
| >>Rescale Intercept | (0028,1052) | DS | Automatically generated | ALWAYS | AUTO |
| >>Rescale Slope | (0028,1053) | DS | Automatically generated | ALWAYS | AUTO |
| >>Rescale Type | (0028,1054) | LO | No value | NEVER | AUTO |
| Per-Frame Functional Groups Sequence | (5200,9229) | SQ | | ALWAYS | AUTO |
| >Derivation Image Sequence | (0008,9124) | SQ | | NEVER | AUTO |
| >X-Ray 3D Frame Type Sequence | (0018,9504) | SQ | | NEVER | AUTO |
| >Frame Content Sequence | (0020,9111) | SQ | | NEVER | AUTO |
| >Plane Position Sequence | (0020,9113) | SQ | | ALWAYS | AUTO |
| >>Image Position (Patient) | (0020,0032) | DS | Automatically generated | ALWAYS | AUTO |
| >Plane Orientation Sequence | (0020,9116) | SQ | | ALWAYS | AUTO |
| >>Image Orientation (Patient) | (0020,0037) | DS | Automatically generated | ALWAYS | AUTO |
| >Frame Anatomy Sequence | (0020,9071) | SQ | | NEVER | AUTO |
| >Pixel Measures Sequence | (0028,9110) | SQ | | ALWAYS | AUTO |
| >>Slice Thickness | (0018,0050) | DS | No value | NEVER | AUTO |
| >>Pixel Spacing | (0028,0030) | DS | Automatically generated | ALWAYS | AUTO |
| >Frame VOI LUT Sequence | (0028,9132) | SQ | | NEVER | AUTO |
| Content Date | (0008,0023) | DA | Automatically generated | ALWAYS | AUTO |
| Content Time | (0008,0033) | TM | Automatically generated | ALWAYS | AUTO |
| Instance Number | (0020,0013) | IS | Automatically generated | ALWAYS | AUTO |
| Number of Frames | (0028,0008) | IS | Automatically generated | ALWAYS | AUTO |

8.2.1.27 X-Ray 3D Image

See DICOM PS 3.3 C.8.21.1

Table 8-33 X-Ray 3D Image Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------------|-------------|----|-------------------------|-------------------|--------|
| Image Type | (0008,0008) | CS | Automatically generated | ALWAYS | AUTO |
| Pixel Presentation | (0008,9205) | CS | No value | NEVER | AUTO |
| Volumetric Properties | (0008,9206) | CS | VOLUME | ALWAYS | AUTO |
| Volume Based Calculation Technique | (0008,9207) | CS | NONE | ALWAYS | AUTO |
| Bits Allocated | (0028,0100) | US | Automatically generated | ALWAYS | AUTO |
| Bits Stored | (0028,0101) | US | Automatically generated | ALWAYS | AUTO |
| High Bit | (0028,0102) | US | Automatically generated | ALWAYS | AUTO |
| Samples Per Pixel | (0028,0002) | US | 1 | ALWAYS | AUTO |
| Photometric Interpretation | (0028,0004) | CS | MONOCHROME2 | ALWAYS | AUTO |
| Content Qualification | (0018,9004) | CS | No value | NEVER | AUTO |
| Burned In Annotation | (0028,0301) | CS | NO | ALWAYS | AUTO |
| Lossy Image Compression | (0028,2110) | CS | No value | NEVER | AUTO |
| Presentation LUT Shape | (2050,0020) | CS | IDENTITY | ALWAYS | AUTO |

8.2.1.28 SR Document Series

See DICOM PS 3.3 C.17.1

Table 8-34 SR Document Series Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--|-------------|----|-------------------------|-------------------|--------|
| Modality | (0008,0060) | CS | SR | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Automatically generated | ALWAYS | AUTO |
| Series Number | (0020,0011) | IS | Automatically generated | ALWAYS | AUTO |
| Referenced Performed Procedure Step Sequence | (0008,1111) | SQ | Empty sequence | ALWAYS | AUTO |

8.2.1.29 SR Document General

See DICOM PS 3.3 C.17.2

Table 8-35 SR Document General Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--|-------------|----|-------------------------|-------------------|--------|
| Instance Number | (0020,0013) | IS | Automatically generated | ALWAYS | AUTO |
| Completion Flag | (0040,A491) | CS | COMPLETE | ALWAYS | AUTO |
| Verification Flag | (0040,A493) | CS | VERIFIED | ALWAYS | AUTO |
| Content Date | (0008,0023) | DA | Automatically generated | ALWAYS | AUTO |
| Content Time | (0008,0033) | TM | Automatically generated | ALWAYS | AUTO |
| Verifying Observer Sequence | (0040,A073) | SQ | Empty sequence | ALWAYS | AUTO |
| >Verifying Observer Name | (0040,A075) | PN | Automatically generated | ALWAYS | AUTO |
| >Verifying Observer Identification Code Sequence | (0040,A088) | SQ | Empty sequence | ALWAYS | AUTO |
| >Verifying Organization | (0040,A027) | LO | Toshiba-Medical | ALWAYS | AUTO |
| >Verification Date Time | (0040,A030) | DT | Automatically generated | ALWAYS | AUTO |
| Performed Procedure Code Sequence | (0040,A372) | SQ | Empty sequence | ALWAYS | AUTO |

8.2.1.30 SR Document Content

See DICOM PS 3.3 C.17.3

Table 8-36 SR Document Content Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------------|-------------|----|-------------------------|-------------------|--------|
| Value Type | (0040,a040) | CS | CONTAINER | ALWAYS | AUTO |
| Concept Name Code Sequence | (0040,a043) | SQ | Empty sequence | ALWAYS | AUTO |
| >Code Value | (0008,0100) | SH | 121070 | ALWAYS | AUTO |
| >Coding Scheme Designator | (0008,0102) | SH | DCM | ALWAYS | AUTO |
| >Code Meaning | (0008,0104) | LO | Findings | ALWAYS | AUTO |
| Continuity of Content | (0040,A050) | CS | SEPARATE | ALWAYS | AUTO |
| Content Sequence | (0040,A730) | SQ | Automatically generated | ALWAYS | AUTO |

8.2.1.31 Vital Images Private Module

Table 8-37 Vital Images Private Module of Created SOP Instances

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------|-------------|----|-------------------------|-------------------|--------|
| Saved Workflow | (5653,xx10) | OB | Automatically Generated | ALWAYS | AUTO |
| Saved Workflow File Sequence | (5653,xx14) | SQ | Automatically Generated | ANAP | AUTO |
| >Saved Workflow File Name | (5653,xx11) | LO | Automatically Generated | ANAP | AUTO |
| >Saved Workflow File Data | (5653,xx12) | OB | Automatically Generated | ANAP | AUTO |
| >Saved Workflow File Length | (5653,xx13) | SL | Automatically Generated | ANAP | AUTO |
| Image Sequence | (5653,xx15) | SQ | Automatically Generated | ANAP | AUTO |
| >Image Orientation (Patient) | (0020,0032) | DS | Automatically Generated | ANAP | AUTO |
| >Image Position (Patient) | (0020,0037) | DS | Automatically Generated | ANAP | AUTO |
| Volume Interpolated Slices | (5653,xx16) | SL | Automatically Generated | ANAP | AUTO |
| Volume SOP Instance UID | (5653,xx17) | UI | Automatically Generated | ANAP | AUTO |
| Saved Workflow Type | (5653,xx18) | SH | Automatically Generated | ANAP | AUTO |
| Volume Study Instance UID | (5653,xx19) | UI | Automatically Generated | ANAP | AUTO |
| Volume Series Instance UID | (5653,xx22) | UI | Automatically Generated | ANAP | AUTO |
| Saved Workflow Code Meaning | (5653,xx23) | LO | Automatically Generated | ANAP | AUTO |
| Saved Workflow Data | (5653,xx24) | OB | Automatically Generated | ANAP | AUTO |
| Saved Workflow Data Length | (5653,xx25) | SL | Automatically Generated | ANAP | AUTO |

8.3 Data Dictionary of Private Attributes

Table 8-38 Vital Images Private Attributes

| Tag | Attribute Name | VR | VM |
|-------------|------------------------------|----|----|
| (5653,00xx) | Private Creator | LO | 1 |
| (5653,xx10) | Saved Workflow | OB | 1 |
| (5653,xx11) | Saved Workflow File Name | LO | 1 |
| (5653,xx12) | Saved Workflow File Data | OB | 1 |
| (5653,xx13) | Saved Workflow File Length | SL | 1 |
| (5653,xx14) | Saved Workflow File Sequence | SQ | 1 |
| (5653,xx15) | Image Sequence | SQ | 1 |
| (5653,xx16) | Volume Interpolated Slices | SL | 1 |
| (5653,xx17) | Volume SOP Instance UID | UI | 1 |
| (5653,xx18) | Saved Workflow Type | SH | 1 |
| (5653,xx19) | Volume Study Instance UID | UI | 1 |
| (5653,xx22) | Volume Series Instance UID | UI | 1 |
| (5653,xx23) | Saved Workflow Code Meaning | LO | 1 |
| (5653,xx24) | Saved Workflow Data | OB | 1 |
| (5653,xx25) | Saved Workflow Data Length | SL | 1 |