

TOSHIBA

DICOM CONFORMANCE STATEMENT
FOR
TOSHIBA WHOLE-BODY X-RAY CT SCANNER
Aquilion™ /Asteion™ V1.61
(TSX-101A/G, TSX-101A/F, TSX-101A/7, TSX76-101A/9,
TSX-201A, TSX-021B/4, TSX-021B/5)

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1. CONFORMANCE STATEMENT OVERVIEW

Table 1-1 provides an overview of the network services supported by Aquilion™ /Asteion™.

**Table 1-1
NETWORK SERVICES**

| SOP Classes | User of Service (SCU) | Provider of Service (SCP) |
|---|---|---|
| Transfer | | |
| CT Image Storage | Yes | Yes* ¹ (COT-30D) |
| Secondary Capture Image Storage | Yes | Yes* ¹ (COT-30D) |
| Grayscale Softcopy Presentation State Storage | Yes | No |
| RT Image Storage | Yes * ² (CGPM-010B) * ² (CGPS-008B) | No |
| RT Structure Set Storage | Yes * ² (CGPM-010B) * ² (CGPS-008B) | No |
| RT Plan Storage | Yes * ² (CGPM-010B) * ² (CGPS-008B) | Yes * ² (CGPM-010B) * ² (CGPS-008B) |
| Storage Commitment | | |
| Storage Commitment Push Model | Yes* ¹ (COT-41D) | No |
| Query/Retrieve | | |
| Patient Root Q/R Information Model – Find | No | Yes* ¹ (COT-34D) |
| Patient Root Q/R Information Model – Move | No | Yes* ¹ (COT-34D) |
| Study Root Q/R Information Model – Find | Yes* ¹ (COT-35D) | Yes* ¹ (COT-34D) |
| Study Root Q/R Information Model – Move | Yes* ¹ (COT-35D) | Yes* ¹ (COT-34D) |
| Patient/Study Only Information Model – Find | No | Yes* ¹ (COT-34D) |
| Patient/Study Only Information Model – Move | No | Yes* ¹ (COT-34D) |
| Workflow Management | | |
| Modality Worklist Information Model – Find | Yes* ¹ (COT-32D) | No |
| Modality Performed Procedure Step | Yes* ¹ (COT-33D) | No |
| Modality Performed Procedure Step Retrieve | Yes* ¹ (COT-33D) | No |
| Print Management | | |
| Basic Grayscale Print Management | Yes | No |
| Basic Color Print Management | Yes | No |

*¹: Option, (COT-XXX):Option Model Name

*²: Option, (CGPM-010B) (CGPS-008B): TSX-021B/4A, 4B only

Table 1-2 provides an overview of the Media Storage Application Profiles supported by Aquilion™ /Asteion™.

**Table 1-2
MEDIA SERVICES**

| Media Storage Application Profile | Write Files (FSC or FSU) | Read Files (FSR) |
|--|-------------------------------------|-----------------------------|
| Compact Disk – Recordable | | |
| CT and MR Image CD-R | Yes* ¹ (CRDM-001A) | No* ² |
| General Purpose CD-R | Yes* ¹ (CRDM-001A) | Yes |

*¹: Option, (CRDM-001A):Option Model Name

*²: The system supports some parts of the CT and MR Image CD-R Application Profile as an FSR. Supported SOP Classes and Transfer Syntaxes are listed below.

**Table 1-3
SUPPORTED IODS, SOP CLASSES AND TRANSFER SYNTAXES**

| Information Object Definition | SOP Class UID | Transfer Syntax | Transfer Syntax UID |
|--|---------------------------|---|----------------------------|
| Media Storage Directory Storage | 1.2.840.10008.1.3.10 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| Secondary Capture Image Storage (Grayscale) | 1.2.840.10008.5.1.4.1.1.7 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |

*

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3. INTRODUCTION

3.1 AUDIENCE

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

3.2 REMARKS

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

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

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

The user should be aware of the following important issues:

- The comparison of different conformance statements is the first step towards assessing interconnectivity between Toshiba Medical Systems and non- Toshiba Medical Systems equipment.
- Test procedures should be defined to validate the desired level of connectivity.
- The DICOM standard will evolve to meet the users' future requirements. Toshiba Medical Systems is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

3.3 DEFINITIONS, TERMS AND ABBREVIATIONS

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

Abbreviations and terms are as follows:

| | |
|--------------|--|
| AE | Application Entity |
| AET | Application Entity Title |
| ASCE | Association Control Service Element |
| CD-R | Compact Disk Recordable |
| DIMSE | DICOM Message Service Element |
| FSC | File-Set Creator |
| FSU | File-Set Updater |
| FSR | File-Set Reader |
| IE | Information Entity |
| IOD | Information Object Definition |
| MPPS | Modality Performed Procedure Step |
| MPPSR | Modality Performed Procedure Step Retrieve |
| MSPS | Modality Scheduled Procedure Step |
| MWM | Modality Worklist Management |
| R | Required Key Attribute |
| O | Optional Key Attribute |
| PDU | Protocol Data Unit |
| SCU | Service Class User (DICOM client) |
| SCP | Service Class Provider (DICOM server) |
| SOP | Service-Object Pair |
| U | Unique Key Attribute |
| UID | Unique Identifier |

3.4 REFERENCES

[DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.18, 2004

4. NETWORKING

4.1 IMPLEMENTATION MODEL

4.1.1 Application Data Flow

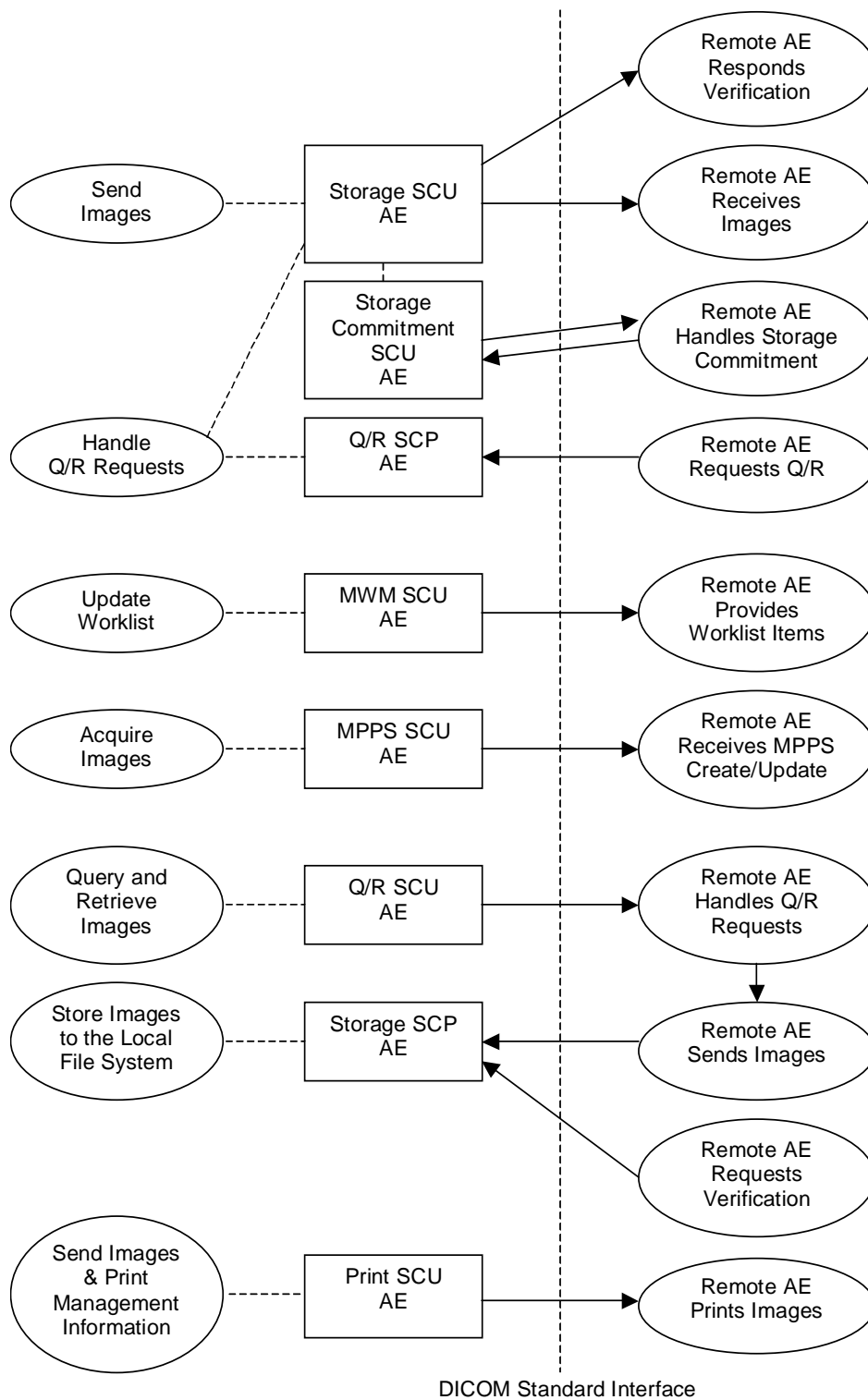


Figure 4.1-1
APPLICATION DATA FLOW DIAGRAM

- The Storage SCU AE sends images to a remote AE. It is associated with the local real-world activity “Send Images”. “Send Images” is performed upon user request for specific images selected. If the remote AE is configured as an archive device, the Storage SCU AE will send a storage commitment request to the Storage Commitment SCU AE. The Storage SCU AE can also issue C-ECHO requests as a Verification SCU.
- Receiving the storage commitment request from the Storage SCU AE, the Storage Commitment SCU AE will request Storage Commitment and if a commitment is successfully obtained will record this information in the local database.
- The Q/R SCP AE handles incoming query and retrieve requests issued by a remote AE. It is associated with the local real-world activity “Handle Q/R Requests”. “Handle Q/R Requests” handles retrieval requests by issuing a command to the Storage SCU AE to send the requested Images to the destination specified by the remote AE. The Q/R SCP AE functions as an SCP for C-FIND and C-MOVE requests.
- The MWM SCU AE receives Worklist information from a remote AE. It is associated with the local real-world activity “Update Worklist”. When the “Update Worklist” is performed the MWM SCU AE queries a remote AE for worklist items and provides the set of worklist items matching the query request. “Update Worklist” is performed as a result of an operator request.
- The MPPS SCU AE sends MPPS information to a remote AE. It is associated with the local real-world activity “Acquire Images”. When the “Acquire Images” is performed the MPPS SCU AE creates and updates Modality Performed Procedure Step instances managed by a remote AE. Acquisition of images will result in automated creation of an MPPS Instance. Completion of the MPPS is performed as the result of an operator action. If the remote AE is configured as an MPPSR SCP, the MPPS SCU AE can receive MPPSR information.
- The Q/R SCU AE queries a remote AE for lists of studies, series and images and retrieves selected studies, series or images. It is associated with the local real-world activity “Query and Retrieve Images”.
- The Storage SCP AE receives incoming images. It is associated with the local real-world activity “Store Images to the Local File System”. “Store Images to the Local File System” stores the received images to the local file system. The Storage SCP AE can also respond to C-ECHO requests as a Verification SCP.
- The Print SCU AE prints images on a remote AE (Printer). It is associated with the local real-world activity “Send Images & Print Management Information”. “Send Images & Print Management Information” creates a print-job within the print queue containing one or more virtual film sheets composed from images selected by the user.

4.1.2 Functional Definition of AEs

4.1.2.1 Functional Definition of Storage SCU AE

The existence of a send-job queue entry with associated network destination will activate the Storage SCU AE. An Association request is sent to the destination AE and upon successful negotiation of a Presentation Context the image transfer is started. If the image transfer fails, the Storage SCU AE will retry this send-job automatically. If the remote AE is configured as an archive device, the storage SCU AE will send a storage commitment request to the Storage Commitment SCU AE. The Storage SCU AE can also issue C-ECHO requests as a Verification SCU before the image transfer.

4.1.2.2 Functional Definition of Storage Commitment SCU AE

Receiving the storage commitment request from the Storage SCU AE, the Storage Commitment SCU AE will request Storage Commitment and if a commitment is successfully obtained will record this information in the local database.

4.1.2.3 Functional Definition of Q/R SCP AE

The Q/R SCP AE waits for another application to connect at the presentation address configured for its Application Entity Title. The Q/R SCP AE will accept Associations with Presentation Contexts for SOP Class of the Query/Retrieve Service Class. It will handle query and retrieve requests on these Presentation Contexts and respond with data objects with values corresponding to the contents of the local file system. When a retrieval request is received, the Q/R SCP AE issues a command to the Storage SCU AE to send the specified images to the destination.

4.1.2.4 Functional Definition of MWM SCU AE

The MWM SCU AE attempts to download a worklist from a remote node. If the MWM SCU AE establishes an Association to a remote AE, it will transfer patient's information and worklist items via the open Association. The results will be displayed in a separate list. The patient's information will be used for the patient registration.

4.1.2.5 Functional Definition of MPPS SCU AE

The MPPS SCU AE performs the creation of an MPPS Instance automatically whenever images are acquired. Further updates on the MPPS data can be performed automatically or interactively. If the remote AE is configured as an MPPSR SCP, the MPPS SCU AE can receive MPPSR information.

4.1.2.6 Functional Definition of Q/R SCU AE

The Q/R SCU AE is activated when the user selects a remote node to query and enters some key information, Patient's Name, Patient ID and/or Study Date. The user can select studies, series and images to be retrieved. The images will be received at the Storage SCP AE.

4.1.2.7 Functional Definition of Storage SCP AE

The Storage SCP AE waits for another application to connect at the presentation address configured for its Application Entity Title. The Storage SCP AE will accept Associations with Presentation Contexts for SOP Classes of the Verification and Storage Service Classes. Any images received on such Presentation Contexts will be stored to the local file system.

4.1.2.8 Functional Definition of Print SCU AE

The existence of a print-job in the print queue will activate the Print SCU AE. An Association is established with the printer and the printer's status determined. If the printer is operating normally, the film sheets described within the print-job will be printed. If the printer is not operating normally, an error message will be displayed and this print-job can be canceled or restarted by the user operations.

4.1.3 Sequencing of Real-World Activities

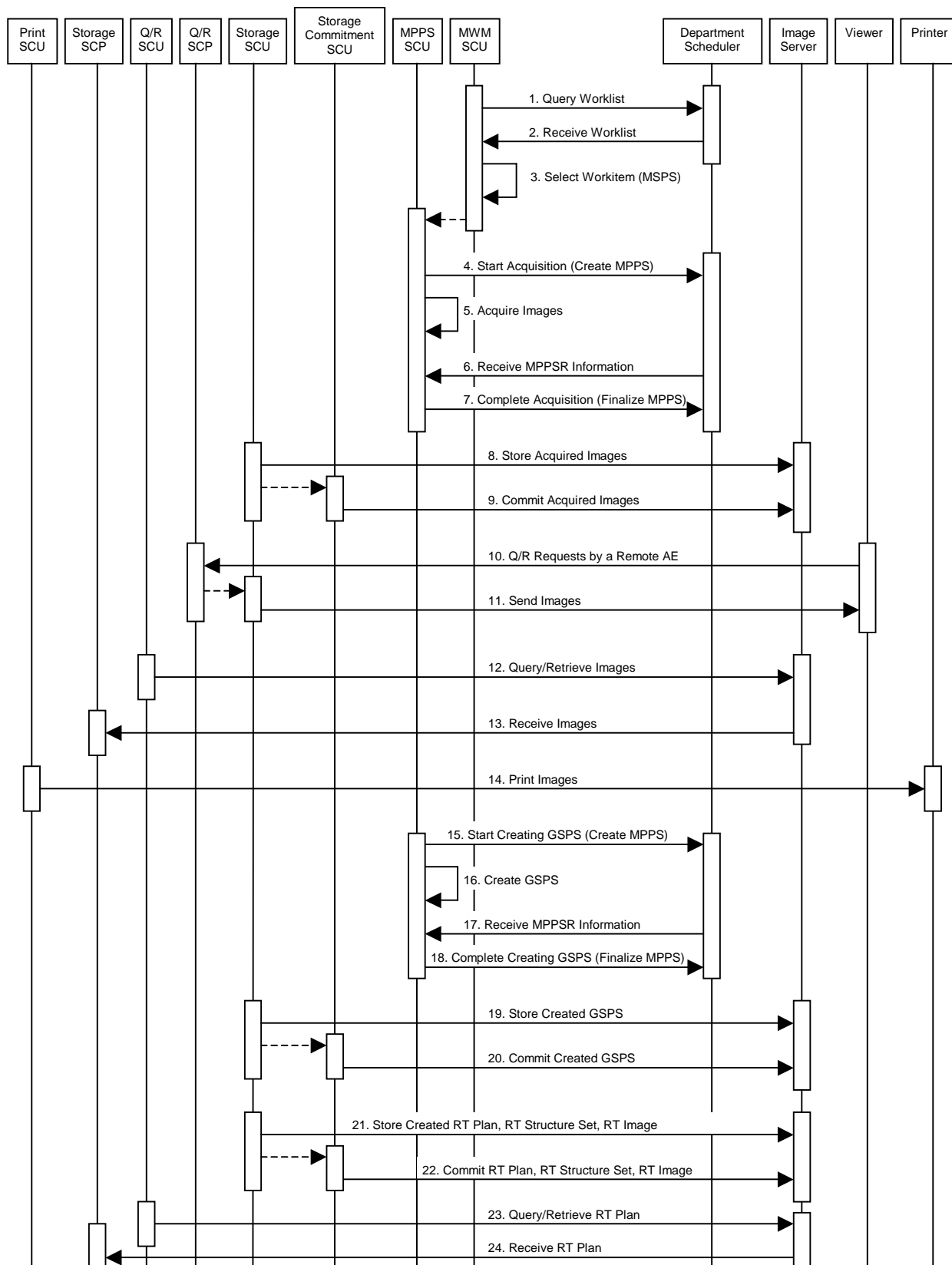


Figure 4.1-2
SEQUENCING CONSTRAINTS

Under typical scheduled workflow conditions the sequencing constraints illustrated in Figure 4.1-2 apply:

1. Query Worklist
2. Receive Worklist of Modality Scheduled Procedure Steps (MSPS)
3. Select Workitem (MSPS) from Worklist
4. Start Acquisition and Create MPPS
5. Acquire Images
6. Receive MPPSR Information
7. Complete Acquisition and Finalize MPPS
8. Store Acquired Images
9. Commit Acquired Images
10. Q/R Requests by a Remote AE
11. Send Images
12. Query/Retrieve Images
13. Receive Images
14. Print Images
15. Start Creating GSPS and Create MPPS
16. Create GSPS
17. Receive MPPSR Information
18. Complete Creating GSPS and Finalize MPPS
19. Store Created GSPS
20. Commit Created GSPS
21. Store Create RT Plan, RT Structure Set, RT Image
22. Commit Created RT Plan, RT Structure Set, RT Image
23. Query/Retrieve RT Plan
24. Receive RT Plan

Other workflow situations (e.g. unscheduled procedure steps) will have other sequencing constraints. Some activities may be omitted according to situations.

4.2 AE SPECIFICATIONS

4.2.1 Storage SCU AE Specification

4.2.1.1 SOP Classes

The Storage SCU AE provides Standard Conformance to the following SOP Classes:

**Table 4.2-1
SOP CLASSES FOR THE STORAGE SCU AE**

| SOP Class Name | SOP Class UID | SCU | SCP |
|---|-------------------------------|-----|-----|
| Verification | 1.2.840.10008.1.1 | Yes | No |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | Yes | No |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | Yes | No |
| Grayscale Softcopy Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.1 | Yes | Yes |
| RT Image Storage | 1.2.840.10008.5.1.4.1.1.481.1 | Yes | No |
| RT Structure Set Storage | 1.2.840.10008.5.1.4.1.1.481.3 | Yes | No |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 | Yes | No |

4.2.1.2 Association Policies

4.2.1.2.1 General

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

**Table 4.2-2
DICOM APPLICATION CONTEXT FOR THE STORAGE SCU AE**

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

4.2.1.2.2 Number of Associations

The Storage SCU AE can initiate up to two Associations at a time for each destination to which a transfer request is being processed in the active job queue list. Up to two jobs, that images will be sent to the different remote hosts, will be active at a time, the other remains pending until the active job is completed or failed.

**Table 4.2-3
NUMBER OF ASSOCIATIONS INITIATED FOR THE STORAGE SCU AE**

| | |
|---|---|
| Maximum number of simultaneous Associations | 2 |
|---|---|

4.2.1.2.3 Asynchronous Nature

The Storage SCU AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

**Table 4.2-4
ASYNCHRONOUS NATURE FOR THE STORAGE SCU AE**

| | |
|---|---|
| Maximum number of outstanding asynchronous transactions | 1 |
|---|---|

4.2.1.2.4 Implementation Identifying Information

The implementation information for the Storage SCU AE is:

**Table 4.2-5
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE STORAGE SCU AE**

| | |
|-----------------------------|-------------------------------|
| Implementation Class UID | 1.2.392.200036.9116.2.2.2.100 |
| Implementation Version Name | TM_CT_CMW_V2.00 |

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity – Send Images

4.2.1.3.1.1 Description and Sequencing of Activities

The Storage SCU AE attempts to initiate a new Association in order to issue a Verification request (C-ECHO) if needed.

The Storage SCU AE attempts to initiate a new Association in order to issue a Storage request (C-STORE). If the job contains multiple images then multiple C-STORE requests will be issued over the same Association. If the image transfer fails, the Storage SCU AE will retry this send-job automatically.

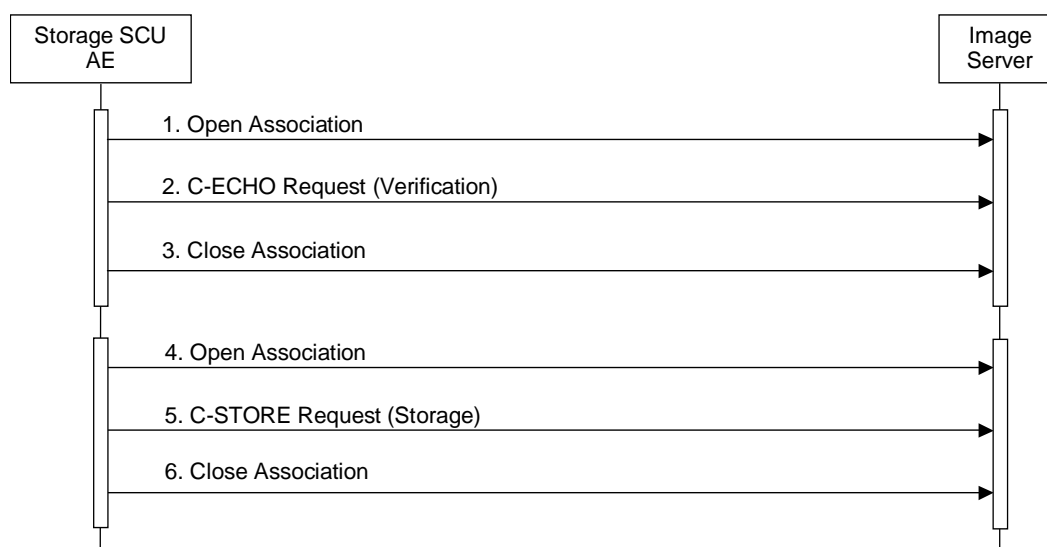


Figure 4.2-1
SEQUENCING OF ACTIVITY – SEND IMAGES

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

1. The Storage SCU AE opens an Association with the Image Server.
2. The Storage SCU AE issues a Verification request (C-ECHO) and the Image Server replies with a C-ECHO response (status success).
3. The Storage SCU AE closes the Association with the Image Server.
4. The Storage SCU AE opens an Association with the Image Server
5. Acquired images, created GSPS or RT objects are transmitted to the Image Server using a Storage request (C-STORE) and the Image Server replies with a C-STORE response (status success).
6. The Storage SCU AE closes the Association with the Image Server.

4.2.1.3.1.2 Proposed Presentation Contexts

The Storage SCU AE is capable of proposing the Presentation Contexts shown in the following table:

**Table 4.2-6
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY SEND IMAGES**

| Presentation Context Table | | | | | |
|---|-----------------------------------|---------------------------|---------------------|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name List | UID List | | |
| Verification | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| 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 Big Endian | 1.2.840.10008.1.2.2 | | |
| Secondary Capture Image Storage | 1.2.840.10008.5.1 .4.1.1.7 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Grayscale Softcopy Presentation State Storage | 1.2.840.10008.5.1 .4.1.1.11.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| RT Image Storage | 1.2.840.10008.5.1 .4.1.1.481.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| RT Structure Set Storage | 1.2.840.10008.5.1 .4.1.1.481.3 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| RT Plan Storage | 1.2.840.10008.5.1 .4.1.1.481.5 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

4.2.1.3.1.3 SOP Specific Conformance for Verification SOP Class

The Storage SCU AE provides standard conformance to the Verification Service Class as an SCU. It is initiated automatically at the "Send Images" activity.

The behavior of Storage SCU AE when encountering status codes in a C-ECHO response is summarized in the Table below:

**Table 4.2-7
VERIFICATION C-ECHO RESPONSE STATUS HANDLING BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|-----------------|-------------|---|
| Success | Success | 0000 | The Storage SCU AE judges the remote AE is present and active on the network. |

The behavior of Storage SCU AE during communication failure is summarized in the Table below:

**Table 4.2-8
VERIFICATION COMMUNICATION FAILURE BEHAVIOR**

| Exception | Behavior |
|--|--|
| Timeout | The Association is aborted using A-ABORT and the send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application. |
| Association aborted by the SCP or network layers | The send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application. |

4.2.1.3.1.4 SOP Specific Conformance for Storage SOP Classes

The Storage SCU AE provides standard conformance to the Storage Service Class as an SCU.

The behavior of Storage SCU AE when encountering status codes in a C-STORE response is summarized in the Table below:

**Table 4.2-9
STORAGE C-STORE RESPONSE STATUS HANDLING BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|-----------------------------------|------------------------|---|
| Success | Success | 0000 | The SCP has successfully stored the SOP Instance. If all SOP Instances in a send job have status success then the job is marked as complete. |
| Refused | Out of Resources | A7xx | The Association is aborted using A-ABORT and the send job is marked as failed. The status meaning is logged and the job failure is reported to the user via the job control application. This is a transient failure. |
| Error | Data Set does not match SOP Class | A9xx | The Association is aborted using A-ABORT and the send job is marked as failed. The status meaning is logged and the job failure is reported to the user via the job control application. |
| Error | Cannot Understand | Cxxx | The Association is aborted using A-ABORT and the send job is marked as failed. The status meaning is logged and the job failure is reported to the user via the job control application. |
| Warning | Coercion of Data Elements | B000 | Image transmission is considered successful if it is configured that the status would be considered successful. |
| Warning | Data Set does not match SOP Class | B007 | Image transmission is considered successful if it is configured that the status would be considered successful. |
| Warning | Elements Discarded | B006 | Image transmission is considered successful if it is configured that the status would be considered successful. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the send job is marked as failed. The status code is logged and the job failure is reported to the user via the job control application. |

The behavior of Storage SCU AE during communication failure is summarized in the Table below:

**Table 4.2-10
STORAGE COMMUNICATION FAILURE BEHAVIOR**

| Exception | Behavior |
|--|--|
| Timeout | The Association is aborted using A-ABORT and the send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application. |
| Association aborted by the SCP or network layers | The send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application. |

If the image transfer fails, the Storage SCU AE will retry this send-job automatically. The delay between resending failed jobs and the number of retries is also configurable.

The contents of Image Storage SOP Instances created by the Storage SCU AE conform to the DICOM Image IOD definitions and are described in section 8.1.

4.2.2 Storage Commitment SCU AE Specification

4.2.2.1 SOP Classes

The Storage Commitment SCU AE provides Standard Conformance to the following SOP Classes:

Table 4.2-11
SOP CLASSES FOR THE STORAGE COMMITMENT SCU AE

| SOP Class Name | SOP Class UID | SCU | SCP |
|-------------------------------|----------------------|-----|-----|
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Yes | No |
| Verification | 1.2.840.10008.1.1 | No | Yes |

4.2.2.2 Association Policies

4.2.2.2.1 General

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

Table 4.2-12
DICOM APPLICATION CONTEXT FOR THE STORAGE COMMITMENT SCU AE

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

4.2.2.2.2 Number of Associations

The Storage Commitment SCU AE initiates one Association at a time.

Table 4.2-13
NUMBER OF ASSOCIATIONS INITIATED FOR THE STORAGE COMMITMENT SCU AE

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

The Storage Commitment SCU AE accepts Associations to receive N-EVENT-REPORT notifications for the Storage Commitment Push Model SOP Class.

Table 4.2-14
NUMBER OF ASSOCIATIONS ACCEPTED FOR THE STORAGE COMMITMENT SCU AE

| | |
|---|---|
| Maximum number of simultaneous Associations | 3 |
|---|---|

4.2.2.2.3 Asynchronous Nature

The Storage Commitment SCU AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4.2-15
ASYNCHRONOUS NATURE FOR THE STORAGE COMMITMENT SCU AE

| | |
|---|---|
| Maximum number of outstanding asynchronous transactions | 1 |
|---|---|

4.2.2.2.4 Implementation Identifying Information

The implementation information for the Storage Commitment SCU AE is:

Table 4.2-16
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE STORAGE COMMITMENT SCU AE

| | |
|-----------------------------|----------------------------|
| Implementation Class UID | 1.2.392.200036.9116.7.4.10 |
| Implementation Version Name | TM_DCM_1.0 |

4.2.2.3 Association Initiation Policy

4.2.2.3.1 Activity – Commit Sent Images

4.2.2.3.1.1 Description and Sequencing of Activities

If the remote AE is configured as an archive device the Storage Commitment SCU AE will, after all images have been sent, transmit a single Storage Commitment request (N-ACTION). Upon receiving the N-ACTION response the Storage Commitment SCU AE will release the Association. The notification of Storage commitment (N-EVENT-REPORT) will be received over a separate Association.

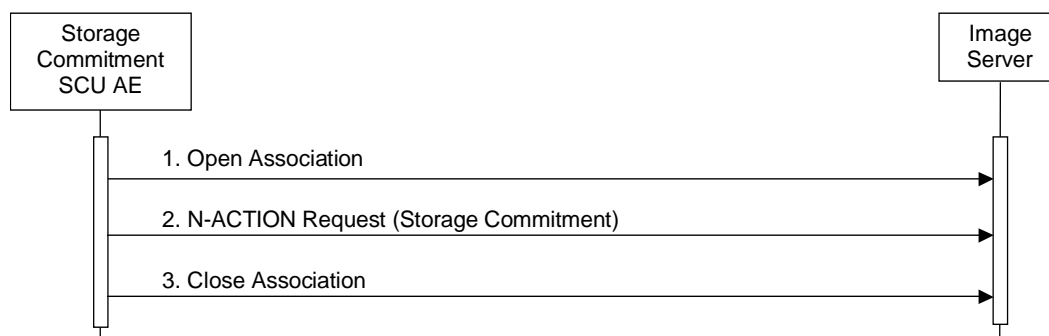


Figure 4.2-2
SEQUENCING OF ACTIVITY – COMMIT SENT IMAGES

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

1. The Storage Commitment SCU AE opens an Association with the Image Server.
2. A Storage Commitment request (N-ACTION) is transmitted to the Image Server to obtain Storage Commitment of previously transmitted images. The Image Server replies with an N-ACTION response indicating the request has been received and is being processed.
3. The Storage Commitment AE closes the Association with the Image Server.

NOTE: The N-EVENT-REPORT will be sent over a separate Association initiated by the Image Server (see Section 4.2.2.4.1).

4.2.2.3.1.2 Proposed Presentation Contexts

The Storage Commitment SCU AE is capable of proposing the Presentation Contexts shown in the following table:

Table 4.2-17
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY COMMIT SENT IMAGES

| Presentation Context Table | | | | | |
|-------------------------------|----------------------|---------------------------|-------------------|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name List | UID List | | |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |

A Presentation Context for the Storage Commitment Push Model will only be proposed if the remote AE is configured as an archive device.

4.2.2.3.1.3 SOP Specific Conformance for Storage Commitment SOP Class

4.2.2.3.1.3.1 Storage Commitment Operations (N-ACTION)

The Storage Commitment SCU AE provides standard conformance to the Storage Commitment Service Class as an SCU.

The Storage Commitment SCU AE will request storage commitment for instances of the Storage SOP Classes if the remote AE is configured as an archive device and a presentation context for the Storage Commitment Push Model has been accepted.

The behavior of Storage SCU Commitment AE when encountering status codes in a N-ACTION response is summarized in the Table below:

**Table 4.2-18
STORAGE COMMITMENT N-ACTION RESPONSE STATUS HANDLING BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|-----------------|------------------------|---|
| Success | Success | 0000 | The request for storage commitment is considered successfully sent. A timer is started which will expire if no N-EVENT-REPORT for the Transaction UID is received within a configurable timeout period. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the request for storage commitment is marked as failed. |

The behavior of Storage Commitment AE during communication failure is summarized in the Table below:

**Table 4.2-19
STORAGE COMMITMENT COMMUNICATION FAILURE BEHAVIOR**

| Exception | Behavior |
|--|--|
| Timeout | The Association is aborted using A-ABORT and the send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application. |
| Association aborted by the SCP or network layers | The send job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application. |

4.2.2.4 Association Acceptance Policy

4.2.2.4.1 Activity – Receive Storage Commitment Response

4.2.2.4.1.1 Description and Sequencing of Activities

The Storage Commitment SCU AE will accept Associations in order to receive responses to a Storage Commitment Request.

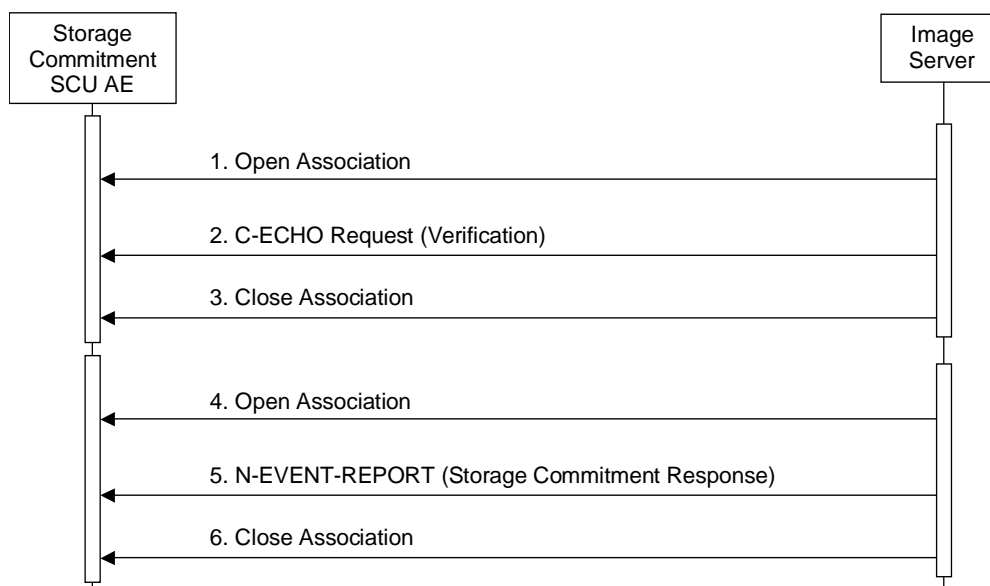


Figure 4.2-3
SEQUENCING OF ACTIVITY - RECEIVE STORAGE COMMITMENT RESPONSE

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

1. The Image Server opens an Association with the Storage Commitment SCU AE.
2. The Image Server issues a Verification request (C-ECHO), and the Storage Commitment SCU AE replies with a C-ECHO response (status success).
3. The Image Server closes the Association with the Storage Commitment SCU AE.
4. The Image Server opens a new Association with the Storage Commitment SCU AE.
5. The Image Server sends an N-EVENT-REPORT request notifying the Storage Commitment SCU AE of the status of a previous Storage Commitment Request. The Storage Commitment SCU AE replies with an N-EVENT-REPORT response confirming receipt.
6. The Image Server closes the Association with the Storage Commitment SCU AE.

The Storage Commitment SCU AE may reject Association attempts as shown in the Table below. The Result, Source and Reason/Diag columns represent the values returned in the appropriate fields of an ASSOCIATE-RJ PDU (see PS 3.8, Section 9.3.4). The contents of the Source column is abbreviated to save space and the meaning of the abbreviations are:

- a) 1 – DICOM UL service-user

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

Table 4.2-20
ASSOCIATION REJECTION REASONS

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

4.2.2.4.1.2 Accepted Presentation Contexts

The Storage Commitment SCU AE will accept Presentation Contexts as shown in the Table below.

**Table 4.2-21
ACCEPTABLE PRESENTATION CONTEXTS FOR
ACTIVITY RECEIVE STORAGE COMMITMENT RESPONSE**

| Presentation Context Table | | | | | |
|-----------------------------------|----------------------|---------------------------|-------------------|-------------|------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name List | UID List | | |
| Verification | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |

4.2.2.4.1.3 SOP Specific Conformance for Storage Commitment SOP Class

4.2.2.4.1.3.1 Storage Commitment Notifications (N-EVENT-REPORT)

The Storage Commitment SCU AE provides standard conformance to the Storage Commitment Service Class as an SCU.

The behavior of Storage Commitment SCU AE when receiving Event Types within the N-EVENT-REPORT is summarized in the Table below.

Table 4.2-22
STORAGE COMMITMENT N-EVENT-REPORT BEHAVIOUR

| Event Type Name | Event Type ID | Behavior |
|--|---------------|---|
| Storage Commitment Request Successful | 1 | The Storage Commitment SCU AE permits the operator(s) to delete the Referenced SOP Instances under Referenced SOP Sequence (0018,1199), or deletes the Instances from the local database automatically. |
| Storage Commitment Request Complete – Failures Exist | 2 | The Storage Commitment SCU AE requests the Storage SCU AE to send the Referenced SOP Instances under Failed SOP Sequence (0018,1198). |

The reasons for returning specific status codes in a N-EVENT-REPORT response are summarized in the Table below.

Table 4.2-23
STORAGE COMMITMENT N-EVENT-REPORT RESPONSE STATUS REASONS

| Service Status | Further Meaning | Status Code | Reasons |
|----------------|------------------------|-------------|---|
| Success | Success | 0000 | The storage commitment result has been successfully received. |
| Failure | Unrecognized Operation | 0211H | The Transaction UID in the N-EVENT-REPORT request is not recognized (was never issued within an N-ACTION request). |
| Failure | Resource Limitation | 0213H | The Transaction UID in the N-EVENT-REPORT request has expired (no N-EVENT-REPORT was received within a configurable time limit). |
| Failure | No Such Event Type | 0113H | An invalid Event Type ID was supplied in the N-EVENT-REPORT request. |
| Failure | Processing Failure | 0110H | An internal error occurred during processing of the N-EVENT-REPORT. A short description of the error will be returned in Error Comment (0000,0902). |
| Failure | Invalid Argument Value | 0115H | One or more SOP Instance UIDs with the Referenced SOP Sequence (0008,1199) or Failed SOP Sequence (0008,1198) was not included in the Storage Commitment Request associated with this Transaction UID. The unrecognized SOP Instance UIDs will be returned within the Event Information of the N-EVENT-REPORT response. |

4.2.2.4.1.4 SOP Specific Conformance for Verification SOP Class

The Storage Commitment SCU AE provides standard conformance to the Verification SOP Class as an SCP.

4.2.3 Q/R SCP AE Specification

4.2.3.1 SOP Classes

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

Table 4.2-24
SOP CLASSES FOR THE Q/R SCP AE

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

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 4.2-25
DICOM APPLICATION CONTEXT FOR THE Q/R SCP AE

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

4.2.3.2.2 Number of Associations

The Q/R SCP AE can support up to three Associations at a time.

Table 4.2-26
NUMBER OF ASSOCIATIONS ACCEPTED FOR THE Q/R SCP AE

| | |
|---|---|
| Maximum number of simultaneous Associations | 3 |
|---|---|

4.2.3.2.3 Asynchronous Nature

The Q/R SCP AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4.2-27
ASYNCHRONOUS NATURE FOR THE Q/R SCP AE

| | |
|---|---|
| Maximum number of outstanding asynchronous transactions | 1 |
|---|---|

4.2.3.2.4 Implementation Identifying Information

The implementation information for the Q/R SCP AE is:

Table 4.2-28
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE Q/R SCP AE

| | |
|-----------------------------|-------------------------------|
| Implementation Class UID | 1.2.392.200036.9116.2.2.2.100 |
| Implementation Version Name | TM_CT_CMW_V2.00 |

4.2.3.3 Association Initiation Policy

The Q/R SCP AE does not initiate Associations.

4.2.3.4 Association Acceptance Policy

4.2.3.4.1 Activity – Handle Q/R Requests

4.2.3.4.1.1 Description and Sequencing of Activities

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

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

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

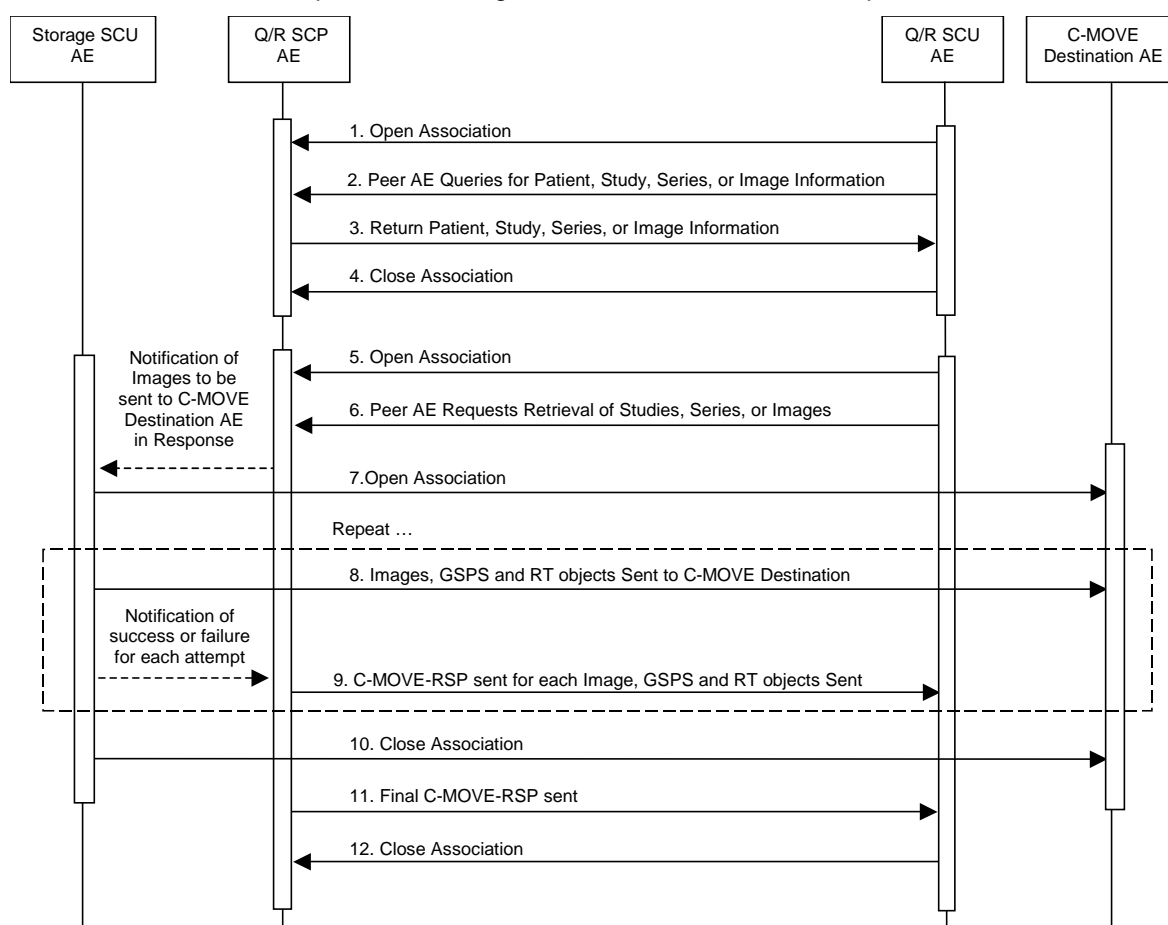


Figure 4.2-4
SEQUENCING OF ACTIVITY – HANDLE Q/R REQUESTS

The following sequencing constraints illustrated in the Figure above:

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

The Q/R SCP AE may reject Association attempts as shown in the table below. The Result, Source and Reason/Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8, Section 9.3.4). The following abbreviations are used in the Source column:

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

**Table 4.2-29
ASSOCIATION REJECTION REASONS**

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

4.2.3.4.1.2 Accepted Presentation Contexts

The default Behavior of the Q/R SCP AE supports the Implicit VR Little Endian and Explicit VR Big Endian Transfer Syntaxes for all Associations.

If the both Transfer Syntaxes are proposed per Presentation Context then the Q/R SCP AE will select Explicit VR Big Endian Transfer Syntax.

Any of the Presentation Contexts shown in the following table are acceptable to the Q/R SCP AE.

**Table 4.2-30
ACCEPTED PRESENTATION CONTEXTS BY THE Q/R SCP AE**

| Presentation Context Table | | | | | |
|---|---------------------------------|---------------------------|---------------------|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name | UID | | |
| Patient Root Q/R Information Model - FIND | 1.2.840.10008.5.1.4 .1.2.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Patient Root Q/R Information Model - MOVE | 1.2.840.10008.5.1.4 .1.2.1.2 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Study Root Q/R Information Model - FIND | 1.2.840.10008.5.1.4 .1.2.2.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Study Root Q/R Information Model - MOVE | 1.2.840.10008.5.1.4 .1.2.2.2 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Patient/Study Only Q/R Information Model - FIND | 1.2.840.10008.5.1.4 .1.2.3.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Patient/Study Only Q/R Information Model - MOVE | 1.2.840.10008.5.1.4 .1.2.3.2 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

4.2.3.4.1.3 SOP Specific Conformance for Q/R Find SOP Classes

The Q/R SCP AE provides standard conformance to the Query/Retrieve Find SOP Class as an SCP. It supports hierarchical queries and not relational queries.

**Table 4.2-31
PATIENT ROOT C-FIND SCP SUPPORTED ELEMENTS**

| Level Name Attribute Name | Tag | VR | Types of Matching |
|-----------------------------------|-------------|----|----------------------|
| Patient Level | | | |
| Patient's Name | (0010,0010) | PN | S,*,U |
| Patient ID | (0010,0020) | LO | S,*,U |
| Patient's Sex | (0010,0040) | CS | S,*,U |
| Study Level | | | |
| Study Date | (0008,0020) | DA | S,R,U |
| Study Time | (0008,0030) | TM | R,U |
| Accession Number | (0008,0050) | SH | S,*,U |
| Patient's Age | (0010,1010) | AS | S,*,U |
| Study Instance UID | (0020,000D) | UI | S,*,U |
| Study ID | (0020,0010) | SH | S,*,U |
| Number of Study Related Series | (0020,1206) | IS | S,*,U |
| Number of Study Related Instances | (0020,1208) | IS | S,*,U |
| Series Level | | | |
| Modality | (0008,0060) | CS | S,*,U |
| Series Number | (0020,0011) | IS | S,*,U |
| Series Instance UID | (0020,000E) | UI | S,*,U |
| Instance Level | | | |
| SOP Instance UID | (0008,0018) | UI | S,*,U |
| Acquisition Date | (0008,0022) | DA | S,*,U |
| Contrast/Bolus Agent | (0018,0010) | LO | S,*,U |
| Scanning Sequence | (0018,0020) | CS | S,*,U |
| Slice Thickness | (0018,0050) | DS | S,*,U |
| KVP | (0018,0060) | DS | S,*,U |
| X-ray Tube Current | (0018,1151) | IS | S,*,U |
| Convolution Kernel | (0018,1210) | SH | S,*,U |
| Instance Number | (0020,0013) | IS | S,*,U |

**Table 4.2-32
STUDY ROOT C-FIND SCP SUPPORTED ELEMENTS**

| Level Name Attribute Name | Tag | VR | Types of Matching |
|--------------------------------------|-------------|-----------|------------------------------|
| Study Level | | | |
| Study Date | (0008,0020) | DA | S,R,U |
| Study Time | (0008,0030) | TM | R,U |
| Accession Number | (0008,0050) | SH | S,*,U |
| Patient's Name | (0010,0010) | PN | S,*,U |
| Patient ID | (0010,0020) | LO | S,*,U |
| Patient's Sex | (0010,0040) | CS | S,*,U |
| Patient's Age | (0010,1010) | AS | S,*,U |
| Study Instance UID | (0020,000D) | UI | S,*,U |
| Study ID | (0020,0010) | SH | S,*,U |
| Number of Study Related Series | (0020,1206) | IS | S,*,U |
| Number of Study Related Instances | (0020,1208) | IS | S,*,U |
| Series Level | | | |
| Modality | (0008,0060) | CS | S,*,U |
| Series Number | (0020,0011) | IS | S,*,U |
| Series Instance UID | (0020,000E) | UI | S,*,U |
| Instance Level | | | |
| SOP Instance UID | (0008,0018) | UI | S,*,U |
| Instance Number | (0020,0013) | IS | S,*,U |
| Acquisition Date | (0008,0022) | DA | S,R,U |
| Contrast/Bolus Agent | (0018,0010) | LO | S,*,U |
| Scanning Sequence | (0018,0020) | CS | S,*,U |
| Slice Thickness | (0018,0050) | DS | S,*,U |
| KVP | (0018,0060) | DS | S,*,U |
| X-ray Tube Current | (0018,1151) | IS | S,*,U |
| Convolution Kernel | (0018,1210) | SH | S,*,U |
| Instance Number | (0020,0013) | IS | S,*,U |

**Table 4.2-33
PATIENT/STUDY ONLY C-FIND SCP SUPPORTED ELEMENTS**

| Level Name Attribute Name | Tag | VR | Types of Matching |
|--------------------------------------|-------------|-----------|------------------------------|
| Patient Level | | | |
| Patient's Name | (0010,0010) | PN | S,*,U |
| Patient ID | (0010,0020) | LO | S,*,U |
| Patient's Sex | (0010,0040) | CS | S,*,U |
| Study Level | | | |
| Study Date | (0008,0020) | DA | S,R,U |
| Study Time | (0008,0030) | TM | R,U |
| Accession Number | (0008,0050) | SH | S,*,U |
| Patient's Age | (0010,1010) | AS | S,*,U |
| Study Instance UID | (0020,000D) | UI | S,*,U |
| Study ID | (0020,0010) | SH | S,*,U |
| Number of Study Related Series | (0020,1206) | IS | S,*,U |
| Number of Study Related Instances | (0020,1208) | IS | S,*,U |

The tables should be read as follows:

Attribute Name: Attributes supported for returned C-FIND Responses.

Tag: Appropriate DICOM tag for this attribute.

VR: Appropriate DICOM VR for this attribute.

Types of Matching: The types of Matching supported by the C-FIND SCP.

A "S" indicates the identifier attribute can specify Single Value Matching, a "R" will indicate Range Matching, an "*" will denote wildcard matching, and a "U" will indicate universal matching.

The Q/R SCP AE returns C-FIND response status as specified below.

Table 4.2-34
THE Q/R SCP AE C-FIND RESPONSE STATUS RETURN BEHAVIOR

| Service Status | Further Meaning | Status Code | Behavior |
|-----------------------|--|--------------------|--|
| Success | Success | 0000 | Matching is complete. No final identifier is supplied. |
| Refused | Out of Resources | A700 | System reached the limit in disk space or memory usage. Error message is output to as an alert to the User Interface, and to the Service Log. |
| Failed | Identifier does not match SOP Class | A900 | The C-FIND query identifier contains invalid Elements or values, or is missing mandatory Elements or values for the specified SOP Class. Error message is output to the Service Log. |
| | Unable to process | C000 | The C-FIND query identifier is valid for the specified SOP Class but cannot be used to query the database. For example, this can occur if received data contains unsupported character sets. (See section 6 'SUPPORT OF CHARACTER SET'.) |
| Cancel | Matching terminated due to Cancel Request | FE00 | The C-FIND SCU sent a Cancel Request. This has been acknowledged and the search for matches has been halted. |
| Pending | Matches are continuing and current match is supplied. | FF00 | Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming. This status code is returned if all Optional keys in the query identifier are actually supported. |
| | Matches are continuing but one or more Optional Keys were not supported. | FF01 | Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming. This status code is returned if there are Optional keys in the query identifier that are not supported. |

4.2.3.4.1.4 SOP Specific Conformance for Q/R Move SOP Classes

The Q/R SCP AE provides standard conformance to the Query/Retrieve Move SOP Classes as an SCP.

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

The Q/R SCP AE returns C-MOVE response status as specified below.

Table 4.2-35
THE Q/R SCP AE C-MOVE RESPONSE STATUS RETURN BEHAVIOR

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|--|-------------|---|
| Success | Sub-operations complete – No Failures | 0000 | All the Composite SOP Instances have been successfully sent to the C-MOVE Destination AE. |
| Refused | Out of Resources – Unable to calculate number of matches | A701 | Number of matches cannot be determined due to system failure. Returned if the server's database is not functioning so the search for matches to the C-MOVE Request cannot be found. Error message is output as an alert on the User Interface, and to the Service Log. |
| | Out of Resources – Unable to perform sub-operations | A702 | C-STORE sub-operations cannot be performed due to failure to access Composite SOP Instances in archive, or failure of a C-STORE Request. Error message is output as an alert on the User Interface, and to the Service Log. |
| | Move destination unknown | A801 | The Destination Application Entity named in the C-MOVE Request is unknown to Q/R SCP AE. Error message is output to the Service Log. |
| Failed | Identifier does not match SOP Class | A900 | The C-MOVE identifier contains invalid Elements or values, or is missing mandatory Elements or values for the specified SOP Class or retrieval level. Error message is output to the Service Log. |
| Cancel | Matching terminated due to Cancel Request | FE00 | The C-MOVE SCU sent a Cancel Request. This has been acknowledged and the export of Composite SOP Instances to the C-MOVE Destination AE has been halted. |

4.2.4 MWM SCU AE Specification

4.2.4.1 SOP Classes

The MWM SCU AE provides Standard Conformance to the following SOP Classes:

Table 4.2-36
SOP CLASSES FOR THE MWM SCU AE

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

4.2.4.2 Association Policies

4.2.4.2.1 General

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

Table 4.2-37
DICOM APPLICATION CONTEXT FOR THE MWM SCU AE

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

4.2.4.2.2 Number of Associations

The MWM SCU AE initiates one Association at a time for a Worklist request.

Table 4.2-38
NUMBER OF ASSOCIATIONS INITIATED FOR THE MWM SCU AE

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

4.2.4.2.3 Asynchronous Nature

The MWM SCU AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4.2-39
ASYNCHRONOUS NATURE FOR THE MWM SCU AE

| | |
|---|---|
| Maximum number of outstanding asynchronous transactions | 1 |
|---|---|

4.2.4.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 4.2-40
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE MWM SCU AE

| | |
|-----------------------------|-------------------------------|
| Implementation Class UID | 1.2.392.200036.9116.2.2.2.100 |
| Implementation Version Name | TM_CT_CMW_V2.00 |

4.2.4.3 Association Initiation Policy

4.2.4.3.1 Activity – Update Worklist

4.2.4.3.1.1 Description and Sequencing of Activities

The request for a “Update Worklist” is initiated by user interaction, i.e. pressing the buttons “Worklist Reload” or automatically at the time of key-word change.

Upon initiation of the request, the MWM SCU AE will build an Identifier for the C-FIND request, will initiate an Association to send the request and will wait for Worklist responses. After retrieval of all responses, the MWM SCU AE will access the local database to add or update patient demographic data. The results will be displayed in a separate list.

The MWM SCU AE will initiate an Association in order to issue a C-FIND request according to the Modality Worklist Information Model.

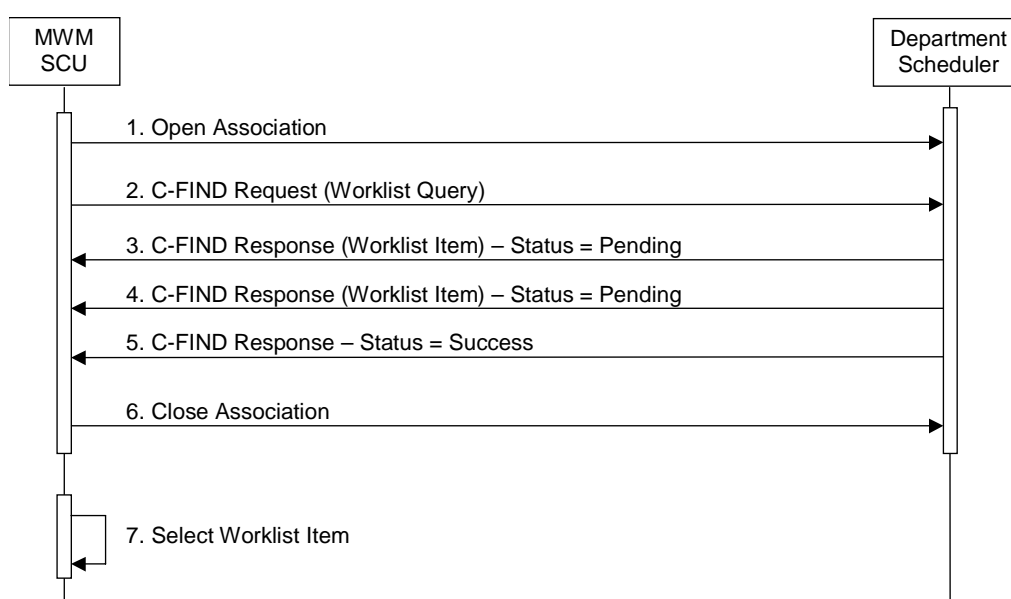


Figure 4.2-5
SEQUENCING OF ACTIVITY – UPDATE WORKLIST

A possible sequence of interactions between the MWM SCU AE and a Department Scheduler (e.g. a device such as a RIS or HIS which supports the Modality Worklist SOP Class as an SCP) is illustrated in the Figure above:

1. The MWM SCU AE opens an association with the Department Scheduler
2. The MWM SCU AE sends a C-FIND request to the Department Scheduler containing the Worklist Query attributes.
3. The Department Scheduler returns a C-FIND response containing the requested attributes of the first matching Worklist Item.
4. The Department Scheduler returns another C-FIND response containing the requested attributes of the second matching Worklist Item.
5. The Department Scheduler returns another C-FIND response with status Success indicating that no further matching Worklist Items exist. This example assumes that only 2 Worklist items match the Worklist Query.
6. The MWM SCU AE closes the association with the Department Scheduler.
7. The user selects a Worklist Item from the Worklist and prepares to acquire new images.

4.2.4.3.1.2 Proposed Presentation Contexts

The MWM SCU AE will propose Presentation Contexts as shown in the following table:

**Table 4.2-41
Proposed Presentation Contexts for Activity Update Worklist**

| Presentation Context Table | | | | | |
|--|------------------------|---------------------------|-------------------|-------------|------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name List | UID List | | |
| Modality Worklist Information Model – FIND | 1.2.840.10008.5.1.4.31 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |

4.2.4.3.1.3 SOP Specific Conformance for Modality Worklist SOP Class

The MWM SCU AE provides standard conformance to the Modality Worklist SOP Class as an SCU.

The behavior of the MWM SCU when encountering status codes in a Modality Worklist C-FIND response is summarized in the Table below.

**Table 4.2-42
Modality Worklist C-FIND Response Status Handling Behavior**

| Service Status | Further Meaning | Status Code | Behavior |
|-----------------------|--|------------------------|--|
| Success | Matching is complete | 0000 | The SCP has completed the matches. Worklist items are available for display or further processing. |
| Refused | Out of Resources | A700 | The Association is aborted using A-ABORT and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged. |
| Failed | Identifier does not match SOP Class | A900 | The Association is aborted using A-ABORT and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged. |
| Failed | Unable to Process | Cxxx | The Association is aborted using A-ABORT and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged. |
| Cancel | Matching terminated due to Cancel request | FE00 | If the query was cancelled due to too many worklist items then the SCP has completed the matches. Worklist items are available for display or further processing. Otherwise, the Association is aborted using A-ABORT and the worklist query is marked as failed. The status meaning is logged and reported to the user if an interactive query. |
| Pending | Matches are continuing | FF00 | The worklist item contained in the Identifier is collected for later display or further processing. |
| Pending | Matches are continuing – Warning that one or more Optional Keys were not supported | FF01 | The worklist item contained in the Identifier is collected for later display or further processing. The status meaning is logged only once for each C-FIND operation. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the worklist is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged. |

The behavior of the MWM SCU AE during communication failure is summarized in the Table below.

**Table 4.2-43
MODALITY WORKLIST COMMUNICATION FAILURE BEHAVIOR**

| Exception | Behavior |
|--|---|
| Timeout | The Association is aborted using A-ABORT and the worklist query is marked as failed. The reason is logged and reported to the user if an interactive query. |
| Association aborted by the SCP or network layers | The worklist query is marked as failed. The reason is logged and reported to the user if an interactive query. |

Acquired images will always use the Study Instance UID specified for the Scheduled Procedure Step (if available). If an acquisition is unscheduled, a Study Instance UID will be generated locally.

The Table below provides a description of the MWM SCU AE Worklist Request Identifier and specifies the attributes that are copied into the images. Unexpected attributes returned in a C-FIND response are ignored.

**Table 4.2-44
WORKLIST REQUEST IDENTIFIER**

| Module Name Attribute Name | Tag | VR | M | R | D | IOD |
|---|-------------|----|------|---|---|-----|
| SOP Common | | | | | | |
| Specific Character Set | (0008,0005) | CS | | x | | x |
| Scheduled Procedure Step | | | | | | |
| Scheduled Procedure Step Sequence | (0040,0100) | SQ | | x | | |
| > Scheduled Station AE Title | (0040,0001) | AE | | x | | |
| > Scheduled Station Name | (0040,0010) | LO | | x | | |
| > Scheduled Procedure Step Location | (0040,0011) | SH | | x | | |
| > Scheduled Procedure Step Start Date | (0040,0002) | DA | | x | x | |
| > Scheduled Procedure Step Start Time | (0040,0003) | TM | | x | x | |
| > Scheduled Procedure Step End Date | (0040,0004) | DA | | x | | |
| > Scheduled Procedure Step End Time | (0040,0005) | TM | | x | | |
| > Scheduled Performing Physician's Name | (0040,0006) | PN | | x | | |
| > Scheduled Procedure Step Description | (0040,0007) | SH | | x | | x |
| > Scheduled Protocol Code Sequence | (0040,0008) | SQ | | x | | x |
| > Scheduled Procedure Step ID | (0040,0009) | SH | | x | | x |
| > Scheduled Procedure Step Status | (0040,0020) | CS | | | | |
| > Comments on Scheduled Procedure Step | (0040,0400) | LT | | x | | |
| > Modality | (0008,0060) | CS | S(CT | x | x | x |
| > Requested Contrast Agent | (0032,1070) | LO |) | x | | x |
| > Pre-Medication | (0040,0012) | LO | | x | | |
| Requested Procedure | | | | | | |
| Requested Procedure ID | (0040,1001) | SH | | x | | |
| Reason for the Requested Procedure | (0040,1002) | LO | | x | | |
| Requested Procedure Comments | (0040,1400) | LT | | x | | |
| Requested Procedure Code Sequence | (0032,1064) | SQ | | x | | |
| Referenced Study Sequence | (0008,1110) | SQ | | x | | |
| Requested Procedure Description | (0032,1060) | LO | | x | | |
| Study Instance UID | (0020,000D) | UI | | x | x | x |
| Requested Procedure Priority | (0040,1003) | SH | | x | | |
| Patient Transport Arrangements | (0040,1004) | LO | | x | | |
| Requested Procedure Location | (0040,1005) | LO | | x | | |
| Confidentiality Code | (0040,1008) | LO | | x | | |
| Reporting Priority | (0040,1009) | SH | | x | | |
| Names of Intended Recipients of Results | (0040,1010) | PN | | x | | |

| Imaging Service Request | | | | | | |
|--|-------------|----|--|---|---|---|
| Reason for the Imaging Service Request | (0040,2001) | LO | | x | | |
| Imaging Service Request Comments | (0040,2400) | LT | | x | | |
| Requesting Physician | (0032,1032) | PN | | x | | |
| Referring Physician's Name | (0008,0090) | PN | | x | | x |
| Requesting Service | (0032,1033) | LO | | x | | x |
| Accession Number | (0008,0050) | SH | | x | x | x |
| Issue Date of Imaging Service Request | (0040,2004) | DA | | x | | |
| Issue Time of Imaging Service Request | (0040,2005) | TM | | x | | |
| Order Entered By | (0040,2008) | PN | | x | | |
| Order Enters Location | (0040,2009) | SH | | x | | |
| Order Callback Phone Number | (0040,2010) | SH | | x | | |
| Visit Relationship | | | | | | |
| Referenced Patient Sequence | (0008,1120) | SQ | | x | | |
| Visit Identification | | | | | | |
| Institution Name | (0008,0080) | LO | | x | | |
| Institution Address | (0008,0081) | ST | | x | | |
| Institution Code Sequence | (0008,0082) | SQ | | x | | |
| Admission ID | (0038,0010) | LO | | x | | |
| Issuer of Admission ID | (0038,0011) | LO | | x | | |
| Visit Status | | | | | | |
| Visit Status ID | (0038,0008) | CS | | | | |
| Current Patient Location | (0038,0300) | LO | | | | |
| Patient's Institution Residence | (0038,0400) | LO | | | | |
| Visit Comments | (0038,4000) | LT | | | | |
| Visit Admission | | | | | | |
| Referring Physician's Address | (0008,0092) | ST | | x | | |
| Referring Physician's Telephone Number | (0008,0094) | SH | | x | | |
| Admitting Diagnosis Description | (0008,1080) | LO | | x | | |
| Admitting Diagnosis Code Sequence | (0008,1084) | SQ | | x | | |
| Route of Admissions | (0038,0016) | LO | | x | | |
| Admitting Date | (0038,0020) | DA | | x | | |
| Admitting Time | (0038,0021) | TM | | x | | |
| Patient Relationship | | | | | | |
| Referenced Visit Sequence | (0008,1125) | SQ | | x | | |
| Referenced Patient Alias Sequence | (0038,0004) | SQ | | x | | |
| Patient Identification | | | | | | |
| Patient's Name | (0010,0010) | PN | | x | x | x |
| Patient ID | (0010,0020) | LO | | x | x | x |
| Issuer of Patient ID | (0010,0021) | LO | | x | | |
| Other Patient IDs | (0010,1000) | LO | | x | | x |
| Other Patient Names | (0010,1001) | PN | | x | | x |
| Patient's Birth Name | (0010,1005) | PN | | x | | x |
| Patient's Mother's Birth Name | (0010,1060) | PN | | x | | x |
| Medical Record Locator | (0010,1090) | LO | | x | | |
| Patient Demographic | | | | | | |

| | | | | | | |
|---|-------------|----|--|---|--|---|
| Patient's Age | (0010,1010) | AS | | x | | x |
| Occupation | (0010,2180) | SH | | x | | |
| Patient Data Confidentiality Constraint Description | (0040,3001) | LO | | x | | |
| Patient's Birth Date | (0010,0030) | DA | | x | | x |
| Patient's Birth Time | (0010,0032) | TM | | x | | |
| Patient's Sex | (0010,0040) | CS | | x | | x |
| Patient's Insurance Plan Code Sequence | (0010,0050) | SQ | | x | | |
| Patient's Size | (0010,1020) | DS | | x | | x |
| Patient's Weight | (0010,1030) | DS | | x | | x |
| Patient's Address | (0010,1040) | LO | | x | | x |
| Military Rank | (0010,1080) | LO | | x | | |
| Branch of Service | (0010,1081) | LO | | x | | |
| Country Residence | (0010,2150) | LO | | x | | |
| Region of Residence | (0010,2152) | LO | | x | | |
| Patient's Telephone Number | (0010,2154) | SH | | x | | |
| Ethnic Group | (0010,2160) | SH | | x | | |
| Patient's Religious Reference | (0010,21F0) | LO | | x | | |
| Patient Comment | (0010,4000) | LT | | x | | x |
| Patient Medical | | | | | | |
| Medical Alerts | (0010,2000) | LO | | x | | |
| Contrast Allergies | (0010,2110) | LO | | x | | x |
| Smoking Status | (0010,21A0) | CS | | x | | x |
| Additional Patient History | (0010,21B0) | LT | | x | | |
| Pregnancy Status | (0010,21C0) | US | | x | | x |
| Last Menstrual Date | (0010,21D0) | DA | | x | | |
| Special Needs | (0038,0050) | LO | | x | | |
| Patient State | (0038,0500) | LO | | x | | |

The above table should be read as follows:

- Module Name: The name of the associated module for supported worklist attributes.
- Attribute Name: Attributes supported to build the MWM SCU AE Worklist Request Identifier.
- Tag: DICOM tag for this attribute.
- VR: DICOM VR for this attribute.
- M: Matching keys for (automatic) Worklist Update. An "S" will indicate that the MWM SCU AE will supply an attribute value for Single Value Matching. This setting can be configured using the user tool. The system's default setting is described in the above table.
- R: Return keys. An "x" will indicate that the MWM SCU AE will supply this attribute as Return Key with zero length for Universal Matching. This setting can be configured using the service tool. The system's default setting is described in the above table.
- D: Displayed keys. An "x" indicates that this worklist attribute is displayed to the user during a patient registration dialog. For example, Patient Name will be displayed when registering the patient prior to an examination. This setting can be configured using the service tool. The system's default setting is described in the above table.
- IOD: An "x" indicates that this Worklist attribute is included into all Object Instances created during performance of the related Procedure Step. This setting can be configured using the service tool. The system's default setting is described in the above table.

4.2.4.4 Association Acceptance Policy

The MWM SCU AE does not accept Associations.

4.2.5 MPPS SCU AE Specification

4.2.5.1 SOP Classes

The MPPS SCU AE provides Standard Conformance to the following SOP Classes:

Table 4.2-45
SOP CLASSES FOR THE MPPS SCU AE

| SOP Class Name | SOP Class UID | SCU | SCP |
|--|-------------------------|-----|-----|
| Modality Performed Procedure Step | 1.2.840.10008.3.1.2.3.3 | Yes | No |
| Modality Performed Procedure Step Retrieve | 1.2.840.10008.3.1.2.3.4 | 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 4.2-46
DICOM APPLICATION CONTEXT FOR THE MPPS SCU AE

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

4.2.5.2.2 Number of Associations

The MPPS SCU AE initiates one Association at a time.

Table 4.2-47
NUMBER OF ASSOCIATIONS INITIATED FOR THE MPPS SCU AE

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

4.2.5.2.3 Asynchronous Nature

The MPPS SCU AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4.2-48
ASYNCHRONOUS NATURE FOR THE MPPS SCU AE

| | |
|---|---|
| Maximum number of outstanding asynchronous transactions | 1 |
|---|---|

4.2.5.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 4.2-49
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE MPPS SCU AE

| | |
|-----------------------------|-------------------------------|
| Implementation Class UID | 1.2.392.200036.9116.2.2.2.100 |
| Implementation Version Name | TM_CT_CMW_V2.00 |

4.2.5.3 Association Initiation Policy

4.2.5.3.1 Activity – Acquire Images

4.2.5.3.1.1 Description and Sequencing of Activities

The MPPS SCU AE performs the creation of a MPPS Instance automatically whenever images are acquired. Further updates on the MPPS data can be performed automatically or interactively.

The MPPS SCU AE will initiate an Association to issue an:

- N-CREATE request according to the CREATE Modality Performed Procedure Step SOP Instance operation, or an:
- N-GET request to get MPPSR information, or an:
- N-SET request to update the contents and state of the MPPS according to the SET Modality Performed Procedure Step Information operation.

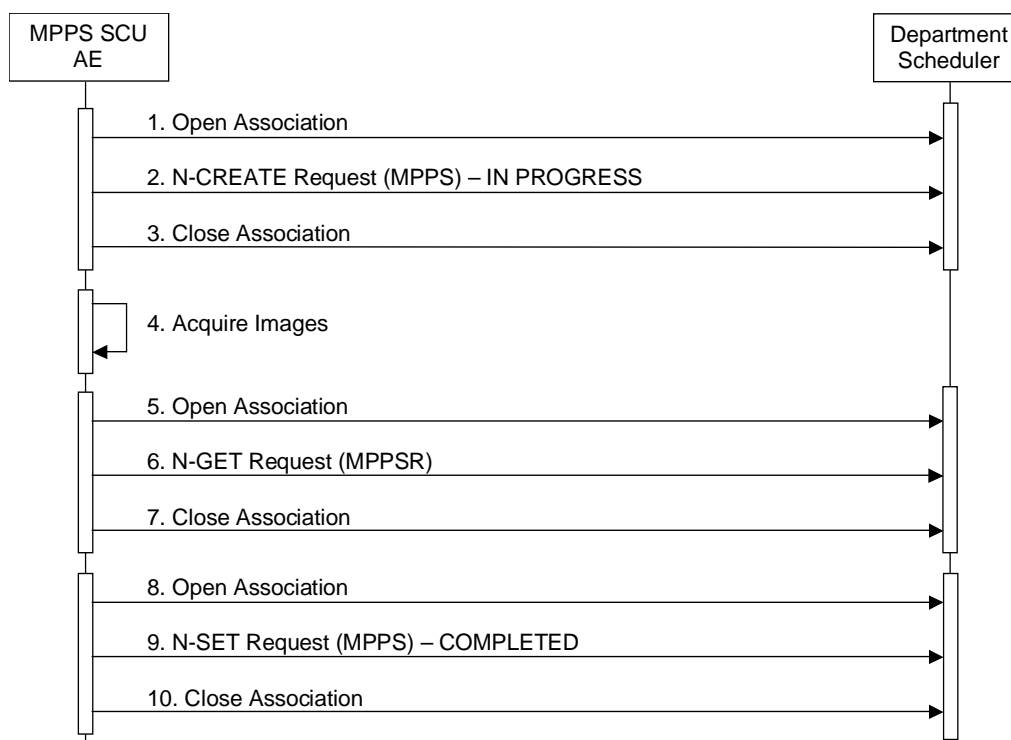


Figure 4.2-6
SEQUENCING OF ACTIVITY – ACQUIRE IMAGES

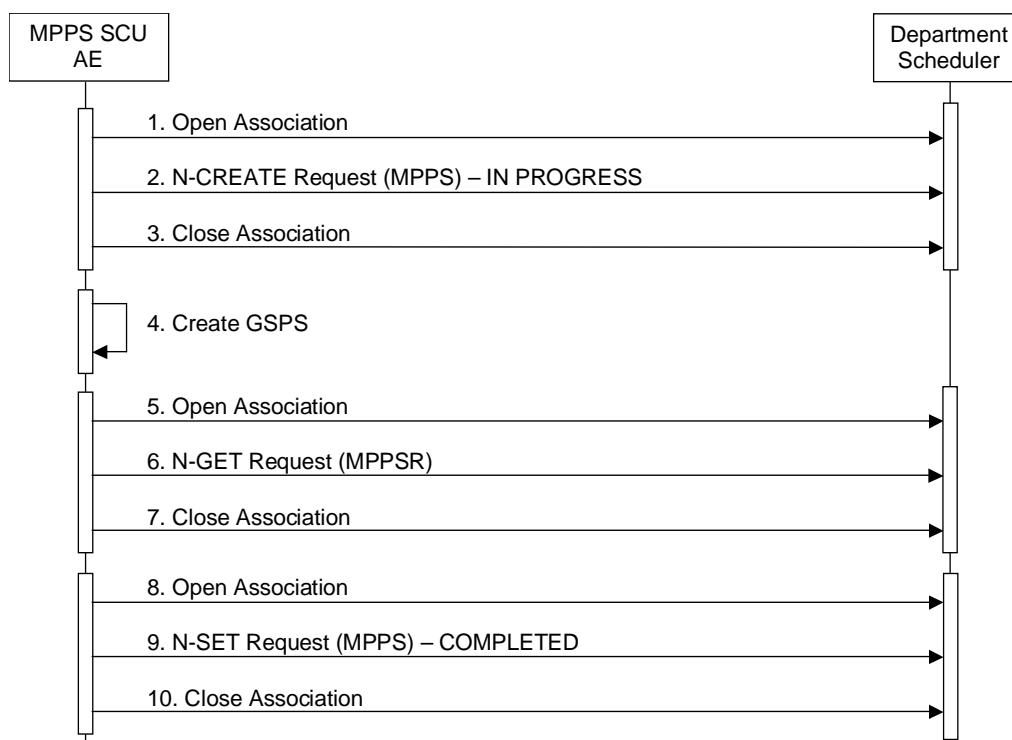


Figure 4.2-7
SEQUENCING OF ACTIVITY – CREATE GSPS

A possible sequence of interactions between the MPPS SCU AE and a Department Scheduler (e.g. a device such as a RIS or HIS which supports the MPPS SOP Class and MPPSR SCP Class as an SCP) is illustrated in the Figure above:

1. The MPPS SCU AE opens an association with the Department Scheduler
2. The MPPS SCU AE sends an N-CREATE request to the Department Scheduler to create an MPPS instance with status of "IN PROGRESS" and create all necessary attributes. The Department Scheduler acknowledges the MPPS creation with an N-CREATE response (status success).
3. The MPPS SCU AE closes the association with the Department Scheduler.
4. All images are acquired and stored in the local database. (Figure 4.2-6)
GSPS are created and stored in the local database. (Figure 4.2-7)
5. The MPPS SCU AE opens an association with the Department Scheduler.
6. The MPPS SCU AE sends an N-GET request to the Department Scheduler to get MPPSR information.
7. The MPPS SCU AE closes the association with the Department Scheduler.
8. The MPPS SCU AE opens an association with the Department Scheduler.
9. The MPPS SCU AE sends an N-SET request to the Department Scheduler to update the MPPS instance with status of "COMPLETED" and set all necessary attributes. The Department Scheduler acknowledges the MPPS update with an N-SET response (status success).
10. The MPPS SCU AE closes the association with the Department Scheduler.

4.2.5.3.1.2 Proposed Presentation Contexts

The MPPS SCU AE will propose Presentation Contexts as shown in the following Table:

**Table 4.2-50
PROPOSED PRESENTATION CONTEXTS FOR REAL-WORLD ACTIVITY ACQUIRE IMAGES**

| Presentation Context Table | | | | | |
|--|-------------------------|---------------------------|---------------------|-------------|------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name List | UID List | | |
| Modality Performed Procedure Step | 1.2.840.10008.3.1.2.3.3 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Modality Performed Procedure Step Retrieve | 1.2.840.10008.3.1.2.3.4 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

4.2.5.3.1.3 SOP Specific Conformance for MPPS SOP Class

The MPPS SCU AE provides standard conformance to the Modality Performed Procedure Step SOP Class as an SCU.

The behavior of the MPPS SCU AE when encountering status codes in an MPPS N-CREATE or N-SET response is summarized in the Table below.

**Table 4.2-51
MPPS N-CREATE / N-SET RESPONSE STATUS HANDLING BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|-----------------------|---|------------------------|--|
| Success | Success | 0000 | The SCP has completed the operation successfully. |
| Failure | Processing Failure – Performed Procedure Step Object may no longer be updated | 0110H | The Association is aborted using A-ABORT and the MPPS is marked as failed. The status meaning is logged and reported to the user. Additional information in the Response will be logged (i.e. Error Comment and Error ID). |
| Warning | Attribute Value Out of Range | 0116H | The MPPS operation is considered successful if it is configured that the status would be considered successful. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the MPPS is marked as failed. The status meaning is logged and reported to the user. |

The behavior of the MPPS SCU AE during communication failure is summarized in the Table below:

**Table 4.2-52
MPPS COMMUNICATION FAILURE BEHAVIOR**

| Exception | Behavior |
|--|---|
| Timeout | The Association is aborted using A-ABORT and MPPS is marked as failed. The reason is logged and reported to the user. |
| Association aborted by the SCP or network layers | The MPPS is marked as failed. The reason is logged and reported to the user. |

The Table below provides a description of the MPPS N-CREATE and N-SET request identifiers sent by the MPPS SCU AE. Empty cells in the N-CREATE and N-SET columns indicate that the attribute is not sent. An "x" indicates that an appropriate value will be sent. A "Zero length" attribute will be sent with zero length.

Table 4.2-53
MPPS N-CREATE / N-SET REQUEST IDENTIFIER

| Attribute Name | Tag | VR | N-CREATE | N-SET |
|---|-------------|----|--|-------|
| Specific Character Set | (0008,0005) | CS | Created, if an extended or replacement character set is used. Refer to Section 6 | |
| Performed Procedure Step Relationship | | | | |
| Scheduled Step Attributes Sequence | (0040,0270) | SQ | Always Set | |
| > Study Instance UID | (0020,000D) | UI | From Modality Worklist | |
| > Referenced Study Sequence | (0008,1110) | SQ | From Modality Worklist | |
| >> Referenced SOP Class UID | (0008,1150) | UI | From Modality Worklist | |
| >> Referenced SOP Instance UID | (0008,1155) | UI | From Modality Worklist | |
| > Accession Number | (0008,0050) | SH | From Modality Worklist | |
| > Placer Order Number/Imaging Service Request | (0040,2016) | LO | From Modality Worklist | |
| > Filler Order Number/Imaging Service Request | (0040,2017) | LO | From Modality Worklist | |
| > Requested Procedure ID | (0040,1001) | SH | From Modality Worklist | |
| > Requested Procedure Description | (0032,1060) | LO | From Modality Worklist | |
| > Scheduled Procedure Step ID | (0040,0009) | SH | From Modality Worklist | |
| > Scheduled Procedure Step Description | (0040,0007) | LO | From Modality Worklist | |
| > Scheduled Protocol Code Sequence | (0040,0008) | SQ | From Modality Worklist | |
| Patient's Name | (0010,0010) | PN | From Modality Worklist or user input | |
| Patient ID | (0010,0020) | LO | From Modality Worklist or user input. | |
| Patient's Birth Date | (0010,0030) | DA | From Modality Worklist or user input. | |
| Patient's Sex | (0010,0040) | CS | From Modality Worklist or user input. | |
| Referenced Patient Sequence | (0008,1120) | SQ | From Modality Worklist. | |
| Performed Procedure Step Information | | | | |
| Performed Procedure Step ID | (0040,0253) | SH | Automatically created. | |
| Performed Station AE Title | (0040,0241) | AE | MPPS AE Title | |
| Performed Station Name | (0040,0242) | SH | From configuration | |
| Performed Location | (0040,0243) | SH | From configuration | |
| Performed Procedure Step Start Date | (0040,0244) | DA | Actual start date | |
| Performed Procedure Step Start Time | (0040,0245) | TM | Actual start time | |

| | | | | |
|--|-------------|----|--|---------------------------|
| Performed Procedure Step Status | (0040,0252) | CS | IN PROGRESS | COMPLETED or DISCONTINUED |
| Performed Procedure Step Description | (0040,0254) | LO | From Modality Worklist. | |
| Performed Procedure Type Description | (0040,0255) | LO | From Modality Worklist. | |
| Procedure Code Sequence | (0008,1032) | SQ | Zero or more items | Zero or more items |
| Performed Procedure Step End Date | (0040,0250) | DA | Zero length | Actual end date |
| Performed Procedure Step End Time | (0040,0251) | TM | Zero length | Actual end time |
| Image Acquisition Results | | | | |
| Modality | (0008,0060) | CS | CT | |
| Study ID | (0020,0010) | SH | From Modality Worklist or automatically created. | |
| Performed Protocol Code Sequence | (0040,0260) | SQ | Zero or more items | Zero or more items |
| Performed Series Sequence | (0040,0340) | SQ | Zero length | One or more items |
| > Performing Physician's Name | (0008,1050) | PN | | x |
| > Protocol Name | (0018,1030) | LO | | x |
| > Operator's Name | (0008,1070) | PN | | x |
| > Series Instance UID | (0020,000E) | UI | | x |
| > Series Description | (0008,103E) | LO | | x |
| > Retrieve AE Title | (0008,0054) | AE | | x |
| > Referenced Image Sequence | (0008,1140) | SQ | | One or more items |
| >> Referenced SOP Class UID | (0008,1150) | UI | | x |
| >> Referenced SOP Instance UID | (0008,1155) | UI | | x |
| > Referenced Non-Image Composite SOP Instance Sequence | (0040,0220) | SQ | | x |
| >> Referenced SOP Class UID | (0008,1150) | UI | | x |
| >> Referenced SOP Instance UID | (0008,1155) | UI | | x |
| Billing and Material Code | | | | |
| Film Consumption Sequence | (0040,0321) | SQ | | Zero or more items |
| >Number of Films | (2100,0170) | IS | | x |
| >Medium Type | (2000,0030) | CS | | x |
| >Film Size ID | (2010,0050) | CS | | x |
| Billing Supplies and Devices Sequence | (0040,0324) | SQ | | Zero or more items |
| >Quantity Sequence | (0040,0293) | SQ | | x |
| >>Quantity | (0040,0294) | DS | | x |
| >>Measuring Units Sequence | (0040,0295) | SQ | | x |

4.2.5.3.1.4 SOP Specific Conformance for MPPSR SOP Class

The MPPS SCU AE provides standard conformance to the Modality Performed Procedure Step Retrieve SOP Class as an SCU.

The behavior of the MPPS SCU AE when encountering status codes in an MPPSR N-GET response is summarized in the Table below.

**Table 4.2-54
MPPSR N-GET RESPONSE STATUS HANDLING BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|-----------------|------------------------|---|
| Success | Success | 0000 | The SCP has completed the operation successfully. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the MPPSR is marked as failed. The status meaning is logged. |

The behavior of the MPPS SCU AE during communication failure is summarized in the Table below:

**Table 4.2-55
MPPSR COMMUNICATION FAILURE BEHAVIOR**

| Exception | Behavior |
|--|--|
| Timeout | The Association is aborted using A-ABORT and MPPSR is marked as failed. The reason is logged and reported to the user. |
| Association aborted by the SCP or network layers | The MPPSR is marked as failed. The reason is logged. |

The Table below provides a description of the MPPSR N-GET request identifiers sent by the MPPS SCU AE.

**Table 4.2-56
MPPSR SOP CLASS N-GET REQUEST ATTRIBUTES**

| Attribute Name | Tag | VR | Value |
|---|-------------|----|---|
| Performed Procedure Step Information | | | |
| Performed Procedure Step Description | (0040,0254) | LO | The Value sent by the MPPS SCU AE in the MPPS N-CREATE. |
| Performed Procedure Type Description | (0040,0255) | LO | The Value sent by the MPPS SCU AE in the MPPS N-CREATE. |

4.2.5.4 Association Acceptance Policy

The MPPS SCU AE does not accept Associations.

4.2.6 Q/R SCU AE Specification

4.2.6.1 SOP Classes

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

Table 4.2-57
SOP CLASSES FOR THE Q/R SCU AE

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

4.2.6.2 Association Policies

4.2.6.2.1 General

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

Table 4.2-58
DICOM APPLICATION CONTEXT FOR THE Q/R SCU AE

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

4.2.6.2.2 Number of Associations

The Q/R SCU AE can initiate up to three Associations at a time.

Table 4.2-59
NUMBER OF ASSOCIATIONS INITIATED FOR THE Q/R SCU AE

| | |
|---|---|
| Maximum number of simultaneous Associations | 3 |
|---|---|

4.2.6.2.3 Asynchronous Nature

The Q/R SCU AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4.2-60
ASYNCHRONOUS NATURE FOR THE Q/R SCU AE

| | |
|---|---|
| Maximum number of outstanding asynchronous transactions | 1 |
|---|---|

4.2.6.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 4.2-61
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE Q/R SCU AE

| | |
|-----------------------------|-------------------------------|
| Implementation Class UID | 1.2.392.200036.9116.2.2.2.100 |
| Implementation Version Name | TM_CT_CMW_V2.00 |

4.2.6.3 Association Initiation Policy

4.2.6.3.1 Activity – Query and Retrieve Images

4.2.6.3.1.1 Description and Sequencing of Activities

The Q/R SCU AE is activated when the user selects a remote node to query and enters some key information, Patient’s Name, Patient ID and/or Study Date. The user can select studies, series and images to be retrieved. The images will be received at the Storage SCP AE.

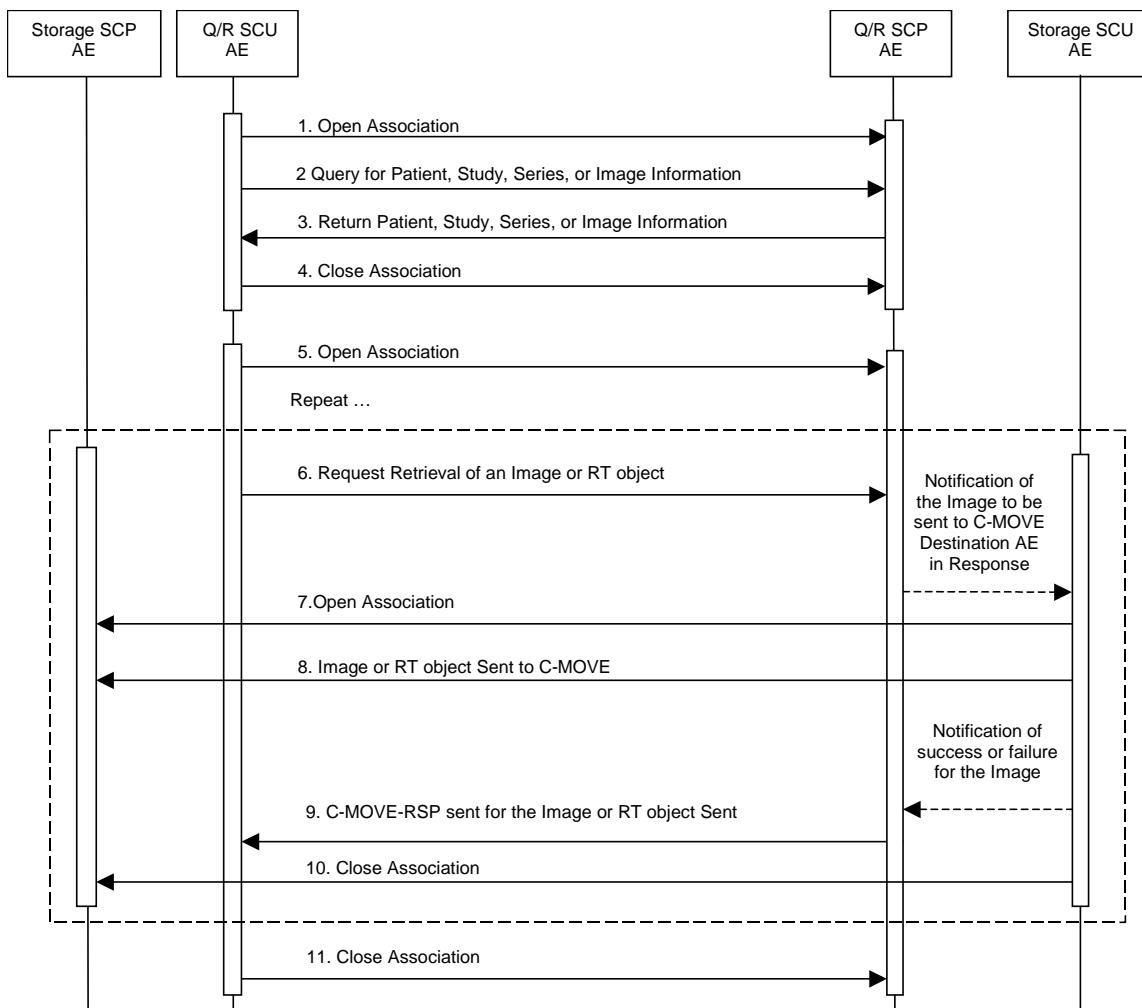


Figure 4.2-8
SEQUENCING OF ACTIVITY – QUERY AND RETRIEVE IMAGES

The following sequencing constraints illustrated in the Figure above:

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

4.2.6.3.1.2 Proposed Presentation Contexts

The Q/R SCU AE will propose Presentation Contexts as shown in the following Table:

Table 4.2-62
PROPOSED PRESENTATION CONTEXTS FOR REAL-WORLD ACTIVITY
QUERY AND RETRIEVE IMAGES

| Presentation Context Table | | | | | |
|---|-----------------------------|---------------------------|---------------------|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name List | UID List | | |
| Study Root Q/R Information Model – Find | 1.2.840.10008.5.1.4.1.2.2.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Study Root Q/R Information Model – Move | 1.2.840.10008.5.1.4.1.2.2.2 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

4.2.6.3.1.3 SOP Specific Conformance for Q/R Find SOP Classes

The Q/R SCU AE provides standard conformance to the Query/Retrieve Find SOP Classes as an SCU.

The behavior of the Q/R SCU AE when encountering status codes in a Q/R C-FIND response is summarized in the Table below:

Table 4.2-63
THE Q/R SCU AE C-FIND RESPONSE STATUS BEHAVIOR

| Service Status | Further Meaning | Status Code | Behavior |
|-----------------------|--|------------------------|---|
| Success | Matching is complete | 0000 | The SCP has completed the matches. Study, Series or Image information items are available for display or further processing. |
| Refused | Out of Resources | A700 | The Association is aborted using A-ABORT and the Study, Series, or Image information query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged. |
| Failed | Identifier does not match SOP Class | A900 | The Association is aborted using A-ABORT and the Study, Series, or Image information query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged. |
| Failed | Unable to Process | Cxxx | The Association is aborted using A-ABORT and the Study, Series, or Image information query is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged. |
| Cancel | Matching terminated due to Cancel request | FE00 | The Association is aborted using A-ABORT and the Study, Series, or Image information query is marked as failed. The status meaning is logged and reported to the user if an interactive query. |
| Pending | Matches are continuing | FF00 | The Study, Series, or Image information items contained in the Identifier is collected for later display or further processing. |
| Pending | Matches are continuing – Warning that one or more Optional Keys were not supported | FF01 | The Study, Series, or Image information items contained in the Identifier is collected for later display or further processing. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the Study, Series, or Image information is marked as failed. The status meaning is logged and reported to the user if an interactive query. Any additional error information in the Response will be logged. |

The behavior of the Q/R SCU AE during communication failure is summarized in the Table below.

Table 4.2-64
Q/R FIND COMMUNICATION FAILURE BEHAVIOR

| Exception | Behavior |
|--|---|
| Timeout | The Association is aborted using A-ABORT and the study, series or image query is marked as failed. The reason is logged and reported to the user if an interactive query. |
| Association aborted by the SCP or network layers | The study, series or image query is marked as failed. The reason is logged and reported to the user if an interactive query. |

All queries are initiated at the highest level of the information model (the STUDY level), and then for each response received, recursively repeated at the next lower levels (the SERIES and then IMAGE levels), in order to completely elucidate the “tree” of instances available on the remote AE.

The Table below provides a description of the Q/R SCU AE C-FIND Request Identifier.

Table 4.2-65
STUDY ROOT REQUEST IDENTIFIER FOR C-FIND

| 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 |
| Study Description | (0008,1030) | S,*U |
| Patient's Name | (0010,0010) | S,*U |
| Patient's ID | (0010,0020) | S,*U |
| Patient's Sex | (0010,0040) | S,*U |
| Patient's Age | (0010,1010) | S,*U |
| Study Instance UID | (0020,000D) | UNIQUE |
| Study ID | (0020,0010) | S,*U |
| Number of Study Related Series | (0020,1206) | U |
| Number of Study Related Instances | (0020,1208) | U |
| Series Level | | |
| Modality | (0008,0060) | S,*U |
| Series Instance UID | (0020,000E) | UNIQUE |
| Series Number | (0020,0011) | S,*U |
| Instance Level | | |
| SOP Instance UID | (0008,0018) | UNIQUE |
| Acquisition Date | (0008,0022) | S,*U,R |
| Contrast/Bolus Agent | (0018,0010) | U |
| Scanning Sequence | (0018,0020) | U |
| Slice Thickness | (0018,0050) | U |
| KVP | (0018,0060) | U |
| Repetition Time | (0018,0080) | U |
| Echo Time | (0018,0081) | U |
| Inversion Time | (0018,0082) | U |
| Echo Number(s) | (0018,0086) | U |
| Gantry/Detector Tilt | (0018,1120) | U |
| X-ray Tube Current | (0018,1151) | U |
| Convolution Kernel | (0018,1210) | U |
| Acquisition Number | (0020,0012) | U |
| Instance Number | (0020,0013) | U |
| Rows | (0028,0010) | U |
| Columns | (0028,0011) | U |

Types of Matching:

The types of Matching supported by the Q/R SCU AE. An "S" indicates the identifier attribute uses Single Value Matching, an "R" indicates Range Matching, an "*" indicates wildcard matching, and a '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.

4.2.6.3.1.4 SOP Specific Conformance for Q/R Move SOP Classes

The Q/R SCU AE provides standard conformance to the Query/Retrieve Move SOP Classes as an SCU.

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

**Table 4.2-66
THE Q/R SCU AE C-MOVE RESPONSE STATUS BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|--|-------------|---|
| Success | Sub-operations complete – No Failures | 0000 | The Storage SCP AE has successfully received the SOP Instance. If all SOP Instances in a move job have status success then the job is marked as complete. |
| Refused | Out of Resources – Unable to calculate number of matches | A701 | The Association is aborted using A-ABORT and the move job is marked as failed. The status meaning is logged and the job failure is reported to the user via the job control application. This is a transient failure. |
| | Out of Resources – Unable to perform sub-operations | A702 | The Association is aborted using A-ABORT and the move job is marked as failed. The status meaning is logged and the job failure is reported to the user via the job control application. |
| | Move destination unknown | A801 | The Association is aborted using A-ABORT and the move job is marked as failed. The status meaning is logged and the job failure is reported to the user via the job control application. |
| Failed | Identifier does not match SOP Class | A900 | The Association is aborted using A-ABORT and the move job is marked as failed. The status meaning is logged and the job failure is reported to the user via the job control application. |
| Warning | Sub-operations complete but one or more failures. | B000 | The Association is aborted using A-ABORT and the move job is marked as failed. The status meaning is logged and the job failure is reported to the user via the job control application. |

The behavior of the Q/R SCU AE during communication failure is summarized in the Table below.

**Table 4.2-67
Q/R MOVE COMMUNICATION FAILURE BEHAVIOR**

| Exception | Behavior |
|--|---|
| Timeout | The Association is aborted using A-ABORT and the retrieve is marked as failed. The reason is logged and reported to the user if an interactive query. |
| Association aborted by the SCP or network layers | The retrieve is marked as failed. The reason is logged and reported to the user if an interactive query. |

The system requests Image Level Move only.

4.2.6.4 Association Acceptance Policy

The Q/R SCU AE does not accept Associations.

4.2.7 Storage SCP AE Specification

4.2.7.1 SOP Classes

The Storage SCP AE provides Standard Conformance to the following SOP Classes:

Table 4.2-68
SOP CLASSES FOR THE STORAGE SCU AE

| SOP Class Name | SOP Class UID | SCU | SCP |
|---------------------------------|-------------------------------|-----|-----|
| Verification | 1.2.840.10008.1.1 | No | Yes |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | No | Yes |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | No | Yes |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 | No | Yes |

4.2.7.2 Association Policies

4.2.7.2.1 General

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

Table 4.2-69
DICOM APPLICATION CONTEXT FOR THE STORAGE SCP AE

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

4.2.7.2.2 Number of Associations

The Storage SCP AE can support up to three Associations at a time.

Table 4.2-70
NUMBER OF ASSOCIATIONS ACCEPTED FOR THE STORAGE SCP AE

| | |
|---|---|
| Maximum number of simultaneous Associations | 3 |
|---|---|

4.2.7.2.3 Asynchronous Nature

The Storage SCP AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4.2-71
ASYNCHRONOUS NATURE FOR THE STORAGE SCP AE

| | |
|---|---|
| Maximum number of outstanding asynchronous transactions | 1 |
|---|---|

4.2.7.2.4 Implementation Identifying Information

The implementation information for the Storage SCP AE is:

Table 4.2-72
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE STORAGE SCP AE

| | |
|-----------------------------|-------------------------------|
| Implementation Class UID | 1.2.392.200036.9116.2.2.2.100 |
| Implementation Version Name | TM_CT_CMW_V2.00 |

4.2.7.3 Association Initiation Policy

The Storage SCP AE does not initiate Associations.

4.2.7.4 Association Acceptance Policy

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

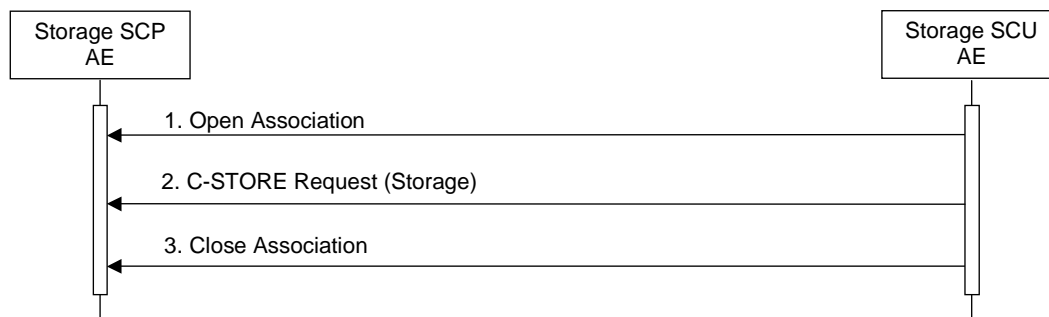


Figure 4.2-9
SEQUENCING OF ACTIVITY – STORE IMAGES TO THE LOCAL FILE SYSTEM

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

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

The Storage SCP AE may reject Association attempts as shown in the Table below. The Result, Source and Reason/Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8, Section 9.3.4). The following abbreviations are used in the Source column:

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

**Table 4.2-73
ASSOCIATION REJECTION REASONS**

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

4.2.7.4.1.1 Accepted Presentation Contexts

The default Behavior of the Storage SCP AE supports the Implicit VR Little Endian and Explicit VR Big Endian Transfer Syntaxes.

If the both Transfer Syntaxes are proposed per Presentation Context then the Storage SCP AE will select Explicit VR Big Endian Transfer Syntax.

Any of the Presentation Contexts shown in the following table are acceptable to the Storage SCP AE.

Table 4.2-74
ACCEPTED PRESENTATION CONTEXTS BY THE STORAGE SCP AE

| Presentation Context Table | | | | | |
|---------------------------------|-------------------------------|---|--|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name | UID | | |
| Verification | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | Implicit VR Little Endian Explicit VR Big Endian | 1.2.840.10008.1.2 1.2.840.10008.1.2.2 | SCP | None |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | Implicit VR Little Endian Explicit VR Big Endian | 1.2.840.10008.1.2 1.2.840.10008.1.2.2 | SCP | None |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP | None |

4.2.7.4.1.2 SOP Specific Conformance for Verification SOP Class

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

4.2.7.4.1.3 SOP Specific Conformance for Storage SOP Classes

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

The Storage SCP AE is Level 0 conformant as a Storage SCP.

Table 4.2-75
THE STORAGE SCP AE C-STORE RESPONSE STATUS RETURN REASONS

| Service Status | Further Meaning | Status Code | Reason |
|----------------|-----------------------------------|-------------|--|
| Success | Success | 0000 | The Composite SOP Instance was successfully received, verified, and stored in the system database. |
| Refused | Out of Resources | A700 | Indicates that there was not enough local resources. |
| Error | Data Set does not match SOP Class | A900 | Indicates that the Data Set does not encode a valid instance of the SOP Class specified. |
| | Cannot understand | C000 | Indicates that the Storage SCP AE cannot parse the Data Set into Elements. |

4.2.8 Print SCU AE Specification

4.2.8.1 SOP Classes

The Print SCU AE provides Standard Conformance to the following Meta SOP Classes:

Table 4.2-76
META SOP CLASSES FOR THE PRINT SCU AE

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

The above Meta SOP Classes are defined by the following set of supported SOP Classes:

Table 4.2-77
SOP CLASSES FOR THE PRINT SCU AE

| SOP Class Name | SOP Class UID | SCU | SCP |
|-------------------------------------|-------------------------|-----|-----|
| Basic Film Session SOP Class | 1.2.840.10008.5.1.1.1 | Yes | No |
| Basic film Box SOP Class | 1.2.840.10008.5.1.1.2 | Yes | No |
| Basic Grayscale Image Box SOP Class | 1.2.840.10008.5.1.1.4 | Yes | No |
| Basic Color Image Box SOP Class | 1.2.840.10008.5.1.1.4.1 | Yes | No |
| Printer SOP Class | 1.2.840.10008.5.1.1.16 | Yes | No |

4.2.8.2 Association Policies

4.2.8.2.1 General

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

Table 4.2-78
DICOM APPLICATION CONTEXT FOR THE PRINT SCU AE

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

4.2.8.2.2 Number of Associations

The Print SCU AE can initiate up to two Associations at a time.

Table 4.2-79
NUMBER OF ASSOCIATIONS ACCEPTED FOR THE PRINT SCU AE

| | |
|---|---|
| Maximum number of simultaneous Associations | 2 |
|---|---|

4.2.8.2.3 Asynchronous Nature

The Print SCU AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4.2-80
ASYNCHRONOUS NATURE FOR THE PRINT SCU AE

| | |
|---|---|
| Maximum number of outstanding asynchronous transactions | 1 |
|---|---|

4.2.8.2.4 Implementation Identifying Information

The implementation information for the Print SCU AE is:

**Table 4.2-81
DICOM IMPLEMENTATION CLASS AND VERSION FOR THE PRINT SCU AE**

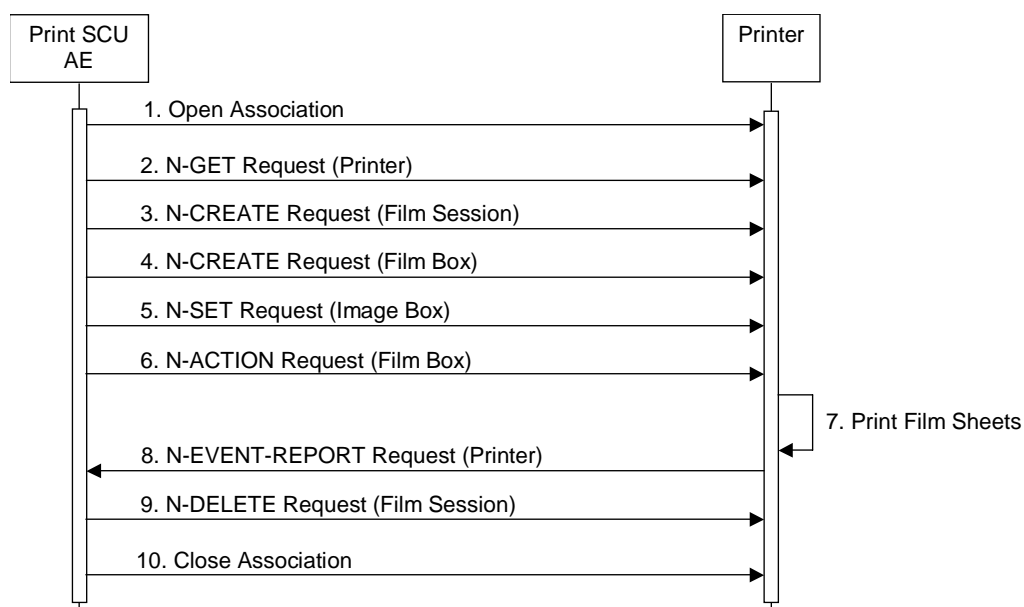
| | |
|-----------------------------|-------------------------------|
| Implementation Class UID | 1.2.392.200036.9116.2.2.2.100 |
| Implementation Version Name | TM_CT_CMW_V2.00 |

4.2.8.3 Association Initiation Policy

4.2.8.3.1 Activity – Send Images & Print Management Information

4.2.8.3.1.1 Description and Sequencing of Activities

A user composes images onto film sheets and requests them to be sent to a specific hardcopy device. The user can select the desired film format and number of copies.



**Figure 4.2-10
SEQUENCING OF ACTIVITY – SEND IMAGES & PRINT MANAGEMENT INFORMATION**

A typical sequence of DIMSE messages sent over an association between the Print SCU AE and a Printer is illustrated in the Figure above:

1. The Print SCU AE opens an Association with the Printer.
2. N-GET on the Printer SOP Class is used to obtain current printer status information.
3. N-CREATE on the Film Session SOP Class creates a Film Session.
4. N-CREATE on the Film Box SOP Class creates a Film Box linked to the Film Session.
5. N-SET on the Image Box SOP Class transfers the contents of the film sheet to the printer.
6. N-ACTION on the Film Box SOP Class instructs the Printer to print the Film Box.
7. The Printer prints the requested number of film sheets.
8. The Printer asynchronously reports its status via N-EVENT-REPORT notification (Printer SOP Class). The printer can send this message at any time. The Print SCU AE does not require the N-EVENT-REPORT to be sent. The Print SCU AE is capable of receiving an N-EVENT-REPORT notification at any time during an association.
9. N-DELETE on the Film Session SOP Class deletes the complete Film Session SOP Instance hierarchy.
10. The Print SCU AE closes the Association with the Printer.

4.2.8.3.1.2 Proposed Presentation Contexts

The Print SCU AE is capable of proposing the Presentation Contexts shown in the Table below:

Table 4.2-82
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY
SEND IMAGES & PRINT MANAGEMENT INFORMATION

| Presentation Context Table | | | | | |
|---------------------------------------|------------------------|---------------------------|---------------------|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name List | UID List | | |
| Basic Grayscale Print Management Meta | 1.2.840.10008.5.1.1.9 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Basic Color Print Management Meta | 1.2.840.10008.5.1.1.18 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

4.2.8.3.1.3 Common SOP Specific Conformance for all Print SOP Classes

The general behavior of the Print SCU AE during communication failure is summarized in the Table below. This behavior is common for all SOP Classes supported by the Print SCU AE.

Table 4.2-83
PRINT COMMUNICATION FAILURE BEHAVIOR

| Exception | Behavior |
|--|---|
| Timeout | The Association is aborted using A-ABORT and the print-job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application. |
| Association aborted by the SCP or network layers | The print-job is marked as failed. The reason is logged and the job failure is reported to the user via the job control application. |

4.2.8.3.1.4 SOP Specific Conformance for Printer SOP Class

The Print SCU AE supports the following DIMSE operations and notifications for the Printer SOP Class:

- N-GET
- N-EVENT-REPORT

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.8.3.1.4.1 Printer SOP Class Operations (N-GET)

The Print SCU AE uses the Printer SOP Class N-GET operation to obtain information about the current printer status. The attributes obtained via N-GET are listed in the Table below:

Table 4.2-84
PRINTER SOP CLASS N-GET REQUEST ATTRIBUTES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------|-------------|----|---------------------|-------------------|---------|
| Printer Status | (2110,0010) | CS | Provided by Printer | ALWAYS | Printer |
| Printer Status Info | (2110,0020) | CS | Provided by Printer | ALWAYS | Printer |

The Printer Status information is evaluated as follows:

1. If Printer status (2110,0010) is NORMAL, the print-job continues to be printed.
2. If Printer status (2110,0010) is FAILURE, the print-job is marked as failed. The contents of Printer Status Info (2110,0020) is logged and reported to the user via the job control application.
3. If Printer status (2110,0010) is WARNING, the print-job continues to be printed. The contents of Printer Status Info (2110,0020) is logged and reported to the user via the job control application.

The behavior of The Print SCU AE when encountering status codes in a N-GET response is summarized in the Table below:

Table 4.2-85
PRINTER SOP CLASS N-GET RESPONSE STATUS HANDLING BEHAVIOR

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|-----------------|------------------------|--|
| Success | Success | 0000 | The request to get printer status information was success. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |

4.2.8.3.1.4.2 Printer SOP Class Notifications (N-EVENT-REPORT)

The Print SCU AE is capable of receiving an N-EVENT-REPORT request at any time during an association.

The behavior of The Print SCU AE when receiving Event Types within the N-EVENT-REPORT is summarized in the Table below:

Table 4.2-86
PRINTER SOP CLASS N-EVENT-REPORT BEHAVIOUR

| Event Type Name | Event Type ID | Behavior |
|-----------------|---------------|--|
| Normal | 1 | The print-job continues to be printed. |
| Warning | 2 | The print-job continues to be printed. |
| Failure | 3 | The print-job continues to be printed. |
| * | * | The print-job continues to be printed. |

The reasons for returning specific status codes in a N-EVENT-REPORT response are summarized in the Table below:

Table 4.2-87
PRINTER SOP CLASS N-EVENT-REPORT RESPONSE STATUS REASONS

| Service Status | Further Meaning | Status Code | Reasons |
|----------------|-----------------|-------------|--|
| Success | Success | 0000 | The notification event has been successfully received. |

4.2.8.3.1.5 SOP Specific Conformance for the Film Session SOP Class

The Print SCU AE supports the following DIMSE operations for the Film Session SOP Class:

- N-CREATE
- N-DELETE

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.8.3.1.5.1 Film Session SOP Class Operations (N-CREATE)

The attributes supplied in an N-CREATE Request are listed in the Table below:

Table 4.2-88
FILM SESSION SOP CLASS N-CREATE REQUEST ATTRIBUTES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------|-------------|----|--------------------------------|-------------------|--------|
| Number of Copies | (2000,0010) | IS | 1 .. 99 | ALWAYS | User |
| Print Priority | (2000,0020) | CS | MED | ALWAYS | Auto |
| Medium Type | (2000,0030) | CS | BLUE FILM, CLEAR FILM or PAPER | ALWAYS | User |
| Film Destination | (2000,0040) | CS | MAGAZINE or PROCESSOR | ALWAYS | User |

The behavior of The Print SCU AE when encountering status codes in a N-CREATE response is summarized in the Table below:

**Table 4.2-89
FILM SESSION SOP CLASS N-CREATE RESPONSE STATUS HANDLING BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|-----------------------|------------------------------|------------------------|--|
| Success | Success | 0000 | The SCP has completed the operation successfully. |
| Warning | Attribute Value Out of Range | 0116H | The N-CREATE operation is considered successful if it is configured that the status would be considered successful. |
| Warning | Attribute List Error | 0107H | The N-CREATE operation is considered successful if it is configured that the status would be considered successful. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |

4.2.8.3.1.5.2 Film Session SOP Class Operations (N-DELETE)

The behavior of The Print SCU AE when encountering status codes in a N-DELETE response is summarized in the Table below:

**Table 4.2-90
PRINTER SOP CLASS N-DELETE RESPONSE STATUS HANDLING BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|-----------------------|------------------------|------------------------|--|
| Success | Success | 0000 | The SCP has completed the operation successfully. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |

4.2.8.3.1.6 SOP Specific Conformance for the Film Box SOP Class

The Print SCU AE supports the following DIMSE operations for the Film Box SOP Class:

- N-CREATE
- N-ACTION

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.8.3.1.6.1 Film Box SOP Class Operations (N-CREATE)

The attributes supplied in an N-CREATE Request are listed in the Table below:

**Table 4.2-91
FILM BOX SOP CLASS N-CREATE REQUEST ATTRIBUTES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------------------|-------------|----|---|-------------------|--------|
| Image Display Format | (2010,0010) | ST | STANDARD,C,R | ALWAYS | User |
| Referenced Film Session Sequence | (2010,0500) | SQ | | ALWAYS | Auto |
| >Referenced SOP Class UID | (0008,1150) | UI | 1.2.840.10008.5.1.1.1 | ALWAYS | Auto |
| >Referenced SOP Instance UID | (0008,1155) | UI | From created Film Session SOP Instance | ALWAYS | Auto |
| Film Orientation | (2010,0040) | CS | PORTRAIT or LANDSCAPE | ALWAYS | User |
| Film Size ID | (2010,0050) | CS | 14INX17IN, 14INX14IN, 11INX14IN, 11INX11IN, 85INX11IN, 8INX10IN, etc. | ALWAYS | User |
| Magnification Type | (2010,0060) | CS | REPLICATE, BILINEAR, CUBIC or NONE | ALWAYS | User |
| Smoothing Type | (2010,0080) | CS | | ANAP | User |
| Border Density | (2010,0100) | CS | BLACK or WHITE | ALWAYS | User |
| Empty Image Density | (2010,0110) | CS | BLACK or WHITE | ALWAYS | User |
| Min Density | (2010,0120) | US | 0 .. 9999 | ALWAYS | User |
| Max Density | (2010,0130) | US | 0 .. 9999 | ALWAYS | User |
| Trim | (2010,0140) | CS | YES or NO | ALWAYS | User |
| Configuration Information | (2010,0150) | ST | | ALWAYS | Auto |

The behavior of the Print SCU AE when encountering status codes in a N-CREATE response is summarized in the Table below:

**Table 4.2-92
FILM BOX SOP CLASS N-CREATE RESPONSE STATUS HANDLING BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|-----------------------|---|------------------------|--|
| Success | Success | 0000 | The SCP has completed the operation successfully. |
| Warning | Requested Min Density or Max Density outside of printer's operating range | B605 | The N-CREATE operation is considered successful if it is configured that the status would be considered successful. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |

4.2.8.3.1.6.2 Film Box SOP Class Operations (N-ACTION)

An N-ACTION Request is issued to instruct the Print SCP to print the contents of the Film Box. The Action Reply argument in an N-ACTION response is not evaluated.

The behavior of The Print SCU AE when encountering status codes in a N-ACTION response is summarized in the Table below:

**Table 4.2-93
FILM BOX SOP CLASS N-ACTION RESPONSE STATUS HANDLING BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|-----------------------|---|------------------------|--|
| Success | Success | 0000 | The SCP has completed the operation successfully. The film has been accepted for printing. |
| Warning | Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page) | B603 | The N-ACTION operation is considered successful if it is configured that the status would be considered successful. |
| Warning | Image size is larger than Image Box size. The image has been demagnified. | B604 | The N-ACTION operation is considered successful if it is configured that the status would be considered successful. |
| Warning | Image size is larger than Image Box size. The image has been cropped to fit. | B609 | The N-ACTION operation is considered successful if it is configured that the status would be considered successful. |
| Warning | Image size or Combined Print Image Size is larger than Image Box size. The image or combined Print Image has been decimated to fit. | B60A | The N-ACTION operation is considered successful if it is configured that the status would be considered successful. |
| Failure | Unable to create Print Job SOP Instance; print queue is full. | C602 | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |
| Failure | Image size is larger than Image Box size. | C603 | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |
| Failure | Combined Print Image Size is larger than Image Box size. | C613 | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |

4.2.8.3.1.7 SOP Specific Conformance for the Grayscale Image Box SOP Class

The Print SCU AE supports the following DIMSE operations for the Grayscale Image Box SOP Class:

— N-SET

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.8.3.1.7.1 Grayscale Image Box SOP Class Operations (N-SET)

The attributes supplied in an N-SET Request are listed in the Table below:

Table 4.2-94
GRAYSCALE IMAGE BOX SOP CLASS N-SET REQUEST ATTRIBUTES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------------------|-------------|----|------------------------------------|-------------------|--------|
| Image Position | (2020,0010) | US | 1 .. 36 | ALWAYS | Auto |
| Polarity | (2020,0020) | CS | NORMAL or REVERSE | ALWAYS | User |
| Magnification Type | (2010,0060) | CS | REPLICATE, BILINEAR, CUBIC or NONE | ALWAYS | User |
| Smoothing Type | (2010,0080) | CS | | ANAP | User |
| Basic Grayscale Image Sequence | (2020,0110) | SQ | | ALWAYS | Auto |
| >Samples Per Pixel | (0028,0002) | US | 1 | ALWAYS | Auto |
| >Photometric Interpretation | (0028,0004) | CS | MONOCHROME2 | ALWAYS | Auto |
| >Rows | (0028,0010) | US | | ALWAYS | Auto |
| >Columns | (0028,0011) | US | | ALWAYS | Auto |
| >Pixel Aspect Ratio | (0028,0034) | IS | 1\1 | ALWAYS | Auto |
| >Bits Allocated | (0028,0100) | US | 8 | ALWAYS | Auto |
| >Bits Stored | (0028,0101) | US | 8 | ALWAYS | Auto |
| >High Bit | (0028,0102) | US | 7 | ALWAYS | Auto |
| >Pixel Representation | (0028,0103) | US | 0 | ALWAYS | Auto |
| >Pixel Data | (7FE0,0010) | OB | | ALWAYS | Auto |

The behavior of the Print SCU AE when encountering status codes in a N-SET response is summarized in the Table below:

**Table 4.2-95
GRAYSCALE IMAGE BOX SOP CLASS N-SET RESPONSE STATUS HANDLING BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|-----------------------|---|------------------------|--|
| Success | Success | 0000 | The SCP has completed the operation successfully. Image successfully stored in Image Box. |
| Warning | Image size is larger than Image Box size. The image has been demagnified. | B604 | The N-SET operation is considered successful if it is configured that the status would be considered successful. |
| Warning | Requested Min Density or Max Density outside of printer's operating range. | B605 | The N-SET operation is considered successful if it is configured that the status would be considered successful. |
| Warning | Image size is larger than Image Box size. The image has been cropped to fit. | B609 | The N-SET operation is considered successful if it is configured that the status would be considered successful. |
| Warning | Image size or Combined Print Image Size is larger than Image Box size. The image or combined Print Image has been decimated to fit. | B60A | The N-SET operation is considered successful if it is configured that the status would be considered successful. |
| Failure | Image size is larger than Image Box size. | C603 | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |
| Failure | Insufficient memory in printer to store the image. | C605 | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |
| Failure | Combined Print Image Size is larger than Image Box size. | C613 | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |

4.2.8.3.1.8 SOP Specific Conformance for the Color Image Box SOP Class

The Print SCU AE supports the following DIMSE operations for the Color Image Box SOP Class:

— N-SET

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.8.3.1.8.1 Color Image Box SOP Class Operations (N-SET)

The attributes supplied in an N-SET Request are listed in the Table below:

Table 4.2-96
COLOR IMAGE BOX SOP CLASS N-SET REQUEST ATTRIBUTES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------------------|-------------|----|------------------------------------|-------------------|--------|
| Image Position | (2020,0010) | US | 1 .. 36 | ALWAYS | Auto |
| Magnification Type | (2010,0060) | CS | REPLICATE, BILINEAR, CUBIC or NONE | ALWAYS | User |
| Smoothing Type | (2010,0080) | CS | | ANAP | User |
| Basic Grayscale Image Sequence | (2020,0110) | SQ | | ALWAYS | Auto |
| >Samples Per Pixel | (0028,0002) | US | 3 | ALWAYS | Auto |
| >Photometric Interpretation | (0028,0004) | CS | RGB | ALWAYS | Auto |
| >Planar Condition | (0028,0006) | US | 0x0001 | ALWAYS | Auto |
| >Rows | (0028,0010) | US | | ALWAYS | Auto |
| >Columns | (0028,0011) | US | | ALWAYS | Auto |
| >Pixel Aspect Ratio | (0028,0034) | IS | 1\1 | ALWAYS | Auto |
| >Bits Allocated | (0028,0100) | US | 8 | ALWAYS | Auto |
| >Bits Stored | (0028,0101) | US | 8 | ALWAYS | Auto |
| >High Bit | (0028,0102) | US | 7 | ALWAYS | Auto |
| >Pixel Representation | (0028,0103) | US | 0 | ALWAYS | Auto |
| >Pixel Data | (7FE0,0010) | OB | | ALWAYS | Auto |

The behavior of the Print SCU AE when encountering status codes in a N-SET response is summarized in the Table below:

**Table 4.2-97
COLOR IMAGE BOX SOP CLASS N-SET RESPONSE STATUS HANDLING BEHAVIOR**

| Service Status | Further Meaning | Status Code | Behavior |
|-----------------------|---|------------------------|--|
| Success | Success | 0000 | The SCP has completed the operation successfully. Image successfully stored in Image Box. |
| Warning | Image size is larger than Image Box size. The image has been demagnified. | B604 | The N-SET operation is considered successful if it is configured that the status would be considered successful. |
| Warning | Requested Min Density or Max Density outside of printer's operating range. | B605 | The N-SET operation is considered successful if it is configured that the status would be considered successful. |
| Warning | Image size is larger than Image Box size. The image has been cropped to fit. | B609 | The N-SET operation is considered successful if it is configured that the status would be considered successful. |
| Warning | Image size or Combined Print Image Size is larger than Image Box size. The image or combined Print Image has been decimated to fit. | B60A | The N-SET operation is considered successful if it is configured that the status would be considered successful. |
| Failure | Image size is larger than Image Box size. | C603 | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |
| Failure | Insufficient memory in printer to store the image. | C605 | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |
| Failure | Combined Print Image Size is larger than Image Box size. | C613 | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |
| * | * | Any other status code. | The Association is aborted using A-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user. |

4.2.8.4 Association Acceptance Policy

The Print SCU AE does not accept Associations.

4.3 NETWORK INTERFACES

4.3.1 Physical Network Interface

This Product supports a single network interface. One of the following physical network interfaces will be available depending on installed hardware options:

**Table 4.3-1
SUPPORTED PHYSICAL NETWORK INTERFACES**

| |
|--------------------|
| Ethernet 1000baseT |
| Ethernet 100baseT |
| Ethernet 10baseT |

4.3.2 Additional Protocols

None.

4.4 CONFIGURATION

4.4.1 AE Title/Presentation Address Mapping

4.4.1.1 Local AE Titles

All local applications use the AE Titles and TCP/IP Ports configured via the Service/Installation Tool. The Field Service Engineer can configure the TCP Port via the Service/Installation Tool.

**Table 4.4-1
AE TITLE CONFIGURATION TABLE**

| Application Entity | Default AE Title | Default TCP/IP Port |
|------------------------|------------------|-------------------------------------|
| MWM SCU | TM_CT_CMW_V2.00 | Not Applicable |
| MPPS SCU | | |
| Q/R SCU | | |
| Print SCU | | |
| Storage SCU | | |
| Storage SCP | | |
| Q/R SCP | 2700 | |
| Storage Commitment SCU | TM_DCM_1.0 | 5001 (For receiving N-EVENT-REPORT) |

Note AE-Title of the Storage Commitment SCU AE must be different from the others.

4.4.1.2 Remote AE Title/Presentation Address Mapping

The AE Titles, host names and port numbers of remote applications are configured using the Service/Installation Tool.

4.4.2 Parameters

A large number of parameters related to acquisition and general operation can be configured using the Service/Installation Tool. The Table below only shows those configuration parameters relevant to DICOM communication. See the Product's Service Manual for details on general configuration capabilities.

**Table 4.4-2
CONFIGURATION PARAMETERS TABLE**

| Parameter | Configurable (Yes/No) [Range] | Default Value |
|---|---|--|
| General Parameters | | |
| Max PDU Receive Size | Yes | 64Kbytes |
| Max PDU Send Size | [1-9999999] | |
| Time-out waiting for a acceptance or rejection response to an Association Request (Application Level Timeout) | Yes [1-9999999] | 30 Sec |
| Time-out waiting for a response to an Association release request (Application Level Timeout) | Yes [1-9999999] | 30 sec |
| Time-out waiting for completion of a TCP/IP connect request (Low-level timeout) | Yes [1-9999999] | 60 sec |
| Time-out awaiting a Response to a DIMSE Request (Low-Level Timeout) | Yes [1-9999999] | 60 sec |
| Time-out for waiting for data between TCP/IP-packets (Low Level Timeout) | Yes [1-9999999] | 60 sec |
| Storage SCU Parameters | | |
| Storage SCU time-out waiting for a response to a C-STORE-RQ | Yes [1-9999999] | 180sec |
| Number of times a failed send job may be retried | No | Forever, until the job succeeds or user deletes the job. |
| Delay between retrying failed send jobs | No | 60sec |
| Maximum number of simultaneously initiated Associations by the Storage SCU AE | No | 2 |
| Supported Transfer Syntaxes (separately configurable for each remote AE) | Yes | Implicit VR Little Endian |
| Behavior when receiving the Warning "Coercion of Data Elements" as service status. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Data Set does not match SOP Class" as service status. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Elements Discarded" as service status. | Yes [Considered as Success or Failure] | Considered as Failure |

| Parameter | Configurable (Yes/No) [Range] | Default Value |
|--|---|---|
| Storage Commitment SCU Parameters | | |
| Storage Commitment SCU time-out waiting for a response to a N-ACTION-RQ | Yes [1-9999999] | 30 Sec |
| Maximum number of simultaneously initiated Associations by the Storage Commitment SCU AE | No | 1 |
| Timeout waiting for a Storage Commitment Notification (maximum duration of applicability for a Storage Commitment Transaction UID). | No | Forever |
| Maximum number of simultaneously accepted Associations by the Storage Commitment SCU AE | No | 3 |
| Delay association release after sending a Storage Commitment Request (wait for a Storage Commitment Notification over the same association). | No | 0 |
| Behavior when receiving N-EVENT Report - the Storage Commitment Request Successful. | Yes | Permit the operator (s) to delete the Instances |
| Q/R SCP parameters | | |
| Maximum number of simultaneously accepted Associations by the Q/R SCP AE | No | 3 |
| Modality Worklist SCU Parameters | | |
| Modality Worklist SCU time-out waiting for the final response to a C-FIND-RQ | Yes [1-9999999] | 180sec |
| Maximum number of simultaneously initiated Associations by the MWM SCU AE | No | 1 |
| MPPS SCU Parameters | | |
| MPPS SCU time-out waiting for a response to a N-CREATE-RQ | Yes [1-9999999] | 180sec |
| MPPS SCU time-out waiting for a response to a N-SET-RQ | Yes [1-9999999] | 180sec |
| MPPS SCU time-out waiting for a response to a N-GET-RQ | Yes [1-9999999] | 180sec |
| Maximum number of simultaneously initiated Associations by the MPPS SCU AE | No | 1 |
| Supported Transfer Syntaxes for MPPS | Yes | Implicit VR Little Endian |
| Behavior when receiving the Warning "Attribute Value Out of Range" as service status. | Yes [Considered as Success or Failure] | Considered as Failure |
| Storage SCP parameters | | |
| Maximum number of simultaneously accepted Associations by the Storage SCP AE | No | 3 |
| Print SCU Parameters | | |
| Print SCU time-out waiting for a response to a N-GET-RQ | Yes [1-9999999] | 180sec |

| Parameter | Configurable (Yes/No) [Range] | Default Value |
|---|--|---------------------------|
| Print SCU time-out waiting for a response to a N-CREATE-RQ | Yes [1-999999] | 180sec |
| Print SCU time-out waiting for a response to a N-SET-RQ | Yes [1-999999] | 180sec |
| Print SCU time-out waiting for a response to a N-ACTION-RQ | Yes [1-999999] | 180sec |
| Maximum number of simultaneously initiated Associations by the Print SCU AE | No | 1 |
| Supported Transfer Syntaxes (separately configurable for each remote printer) | Yes | Implicit VR Little Endian |
| Behavior when receiving the Warning "Attribute Value Out of Range" as service status of the Film Session N-CREATE. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Attribute List Error" as service status of the Film Session N-CREATE. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Requested Min Density or Max Density outside of printer's operating range" as service status of the Film Box N-CREATE. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page)" as service status of the Film Box N-ACTION. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Image size is larger than Image Box size. The image has been demagnified." as service status of the Film Box N-ACTION. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Image size is larger than Image Box size. The image has been cropped to fit." as service status of the Film Box N-ACTION. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Image size or Combined Print Image Size is larger than Image Box size. The image or combined Print Image has been decimated to fit." as service status of the Film Box N-ACTION. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Image size is larger than Image Box size. The image has been demagnified." as service status of the Grayscale Image Box N-SET. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Requested Min Density or Max Density outside of printer's operating range." as service status of the Grayscale Image Box N-SET. | Yes [Considered as Success or Failure] | Considered as Failure |

| Parameter | Configurable (Yes/No) [Range] | Default Value |
|---|---|-----------------------|
| Behavior when receiving the Warning "Image size is larger than Image Box size. The image has been cropped to fit." as service status of the Grayscale Image Box N-SET. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Image size or Combined Print Image Size is larger than Image Box size. The image or combined Print Image has been decimated to fit." as service status of the Grayscale Image Box N-SET. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Image size is larger than Image Box size. The image has been demagnified." as service status of the Color Image Box N-SET. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Requested Min Density or Max Density outside of printer's operating range." as service status of the Color Image Box N-SET. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Image size is larger than Image Box size. The image has been cropped to fit." as service status of the Color Image Box N-SET. | Yes [Considered as Success or Failure] | Considered as Failure |
| Behavior when receiving the Warning "Image size or Combined Print Image Size is larger than Image Box size. The image or combined Print Image has been decimated to fit." as service status of the Color Image Box N-SET. | Yes [Considered as Success or Failure] | Considered as Failure |

5. MEDIA INTERCHANGE

5.1 IMPLEMENTATION MODEL

5.1.1 Application Data Flow

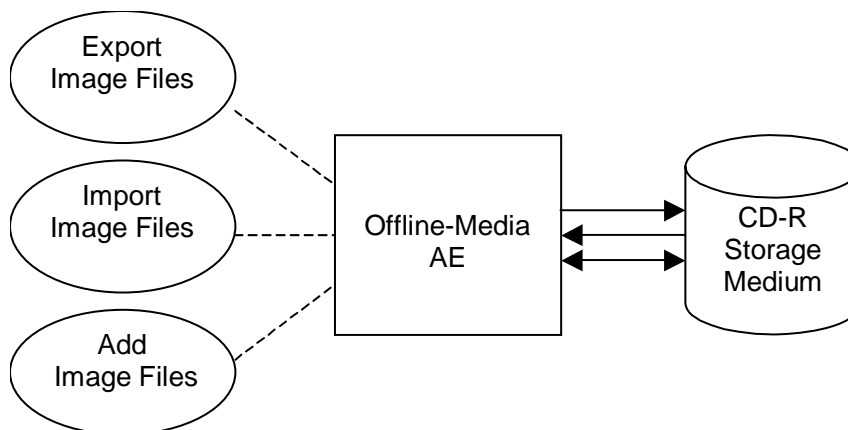


Figure 5.1-1
APPLICATION DATA FLOW DIAGRAM FOR MEDIA STORAGE

- The Offline-Media AE exports image files to a CD-R Storage medium. It is associated with the local real-world activity “Export Image Files” performed upon user request.
- The Offline-Media AE imports image files from a CD-R Storage medium. It is associated with the local real-world activity “Import Image Files” performed upon user request.
- The Offline-Media AE updates image files on a CD-R Storage medium. It is associated with the local real-world activity “Add Image Files” performed upon user request.

5.1.2 Functional Definition of AEs

5.1.2.1 Functional Definition of Offline-Media AE

The Offline-Media AE is performed upon user request for selected studies /series/images to/from an offline DICOM CD-R medium. It therefore performs the following tasks:

Export:

- Builds DICOM Information Objects.
- Creates a DICOMDIR file that represents the contents of the DICOM Information Objects to be recorded.
- Records DICOM Information Objects and the DICOMDIR file to the CD-R medium.

Import:

- Reads the DICOMDIR file that represents the contents of the data as recorded.
- Displays the ordered list of studies/series/images, identifying information.
- Loads the selected studies/series/images from the CD-R medium and displays them on the screen.

Addition:

- Reads a File-set of the CD-R and writes it to the local storage device.
- Adds the studies/series/images to the File-Set, then writes it to the medium.
- Modifies the DICOMDIR file.

Note: The Offline-Media AE can update files created by the product itself.

5.1.3 Sequencing of Real-World Activities

5.1.3.1 Activity - Export Image Files

Operator requests to create new File-set(s) onto a new CD-R. The requests are placed in a queue and are executed in the background.

The operations for “Export Image Files” are described below:

- Step-1: Select the instance(s), series or studies on the local storage device to be created to the CD-R medium.
- Step-2: Select the image archiving.
- Step-3: Select the Virtual CD device as a destination.
- Step-4: Request to copy to the CD-R.

5.1.3.2 Activity - Import Image Files

Operator requests to retrieve File-set(s) on the CD-R. The requests are placed in a queue and are executed in the background.

The operations for “Import Image Files” are described below:

- Step-1: Select the CT image(s) and/or SC image(s), series or studies on the medium to be retrieved to the local storage device.
- Step-2: Select the data retrieval.
- Step-3: Select the local storage device as a destination.

5.1.3.3 Activity – Add Image Files

Operator requests to add new objects to an already existing File-set on the CD-R. The requests are placed in a queue and are executed in the background.

The operations for “Add Image Files” are described below:

- Step-1: Select the instance(s), series or studies on the local storage device to be added to the CD-R medium.
- Step-2: Select the image archiving.
- Step-3: Select the Virtual CD device as a destination.
- Step-4: Request to copy to the CD-R.

5.1.4 File Meta Information for Implementation Class and Version

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

**Table 5.1-1
DICOM IMPLEMENTATION CLASS AND VERSION FOR MEDIA STORAGE**

| | |
|-------------------------------|-------------------------------|
| File Meta Information Version | 1 |
| Implementation Class UID | 1.2.392.200036.9116.2.2.2.100 |
| Implementation Version Name | TM_CT_CMW_V2.00 |

5.2 AE SPECIFICATIONS

5.2.1 Offline-Media AE Specification

The Offline-Media AE provides standard conformance to the DICOM Interchange Option of the Media

Storage Service Class. The Application Profiles and roles are listed below:

**Table 5.2-1
APPLICATION PROFILES, ACTIVITIES AND ROLES FOR OFFLINE-MEDIA**

| Application Profiles Supported | Real World Activity | Role | SC Option |
|---------------------------------------|----------------------------|-------------|------------------|
| STD-CTMR-CD, STD-GEN-CD | Export Image Files | FSC | Interchange |
| | Add Image Files | FSU | Interchange |
| STD-GEN-CD | Import Image Files | FSR | Interchange |

5.2.1.1 File Meta Information for the Application Entity

The Offline-Media AE does not set the Source Application Entity Title.

5.2.1.2 Real-World Activities

5.2.1.2.1 Activity – Export Image Files

The Offline-Media AE acts as an FSC using the interchange option when requested to export SOP Instances from the local database to a CD-R medium.

5.2.1.2.1.1 Media Storage Application Profiles

The Offline-Media AE supports the STD-CTMR-CD and the STD-GEN-CD Application Profile.

5.2.1.2.1.1.1 Options

The Offline-Media AE supports the SOP Classes and Transfer Syntaxes listed in the Table below for the STD-CTMR-CD Application Profile as an FSC.

**Table 5.2-2
IODS, SOP CLASSES AND TRANSFER SYNTAXES FOR THE STD-CTMR-CD PROFILE**

| Information Object Definition | SOP Class UID | Transfer Syntax | Transfer Syntax UID |
|---|---------------------------|---|---------------------|
| Media Storage Directory Storage | 1.2.840.10008.1.3.10 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| Secondary Capture Image Storage (Grayscale) | 1.2.840.10008.5.1.4.1.1.7 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |

The Offline-Media AE supports the SOP Classes and Transfer Syntaxes listed in the Table below for the STD-GEN-CD Application Profile as an FSC/FSU.

**Table 5.2-3
IODS, SOP CLASSES AND TRANSFER SYNTAXES FOR THE STD-GEN-CD PROFILE (FSC/FSU)**

| Information Object Definition | SOP Class UID | Transfer Syntax | Transfer Syntax UID |
|--|---------------------------|---|---------------------|
| Media Storage Directory Storage | 1.2.840.10008.1.3.10 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| Secondary Capture Image Storage (Grayscale) | 1.2.840.10008.5.1.4.1.1.7 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| Secondary Capture Image Storage (Color, RGB) | 1.2.840.10008.5.1.4.1.1.7 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |

5.2.1.2.2 Activity – Import Image Files

The Offline-Media AE acts as an FSR using the interchange option when requested to import SOP Instances from a CD-R medium to the local database.

5.2.1.2.2.1 Media Storage Application Profiles

The Offline-Media AE supports the STD-GEN-CD Application Profile.

5.2.1.2.2.1.1 Options

The Offline-Media AE supports the SOP Classes and Transfer Syntaxes listed in the Table below for the STD-GEN-CD Application Profile as an FSR.

**Table 5.2-4
IODS, SOP CLASSES AND TRANSFER SYNTAXES FOR THE STD-GEN-CD PROFILE (FSR)**

| Information Object Definition | SOP Class UID | Transfer Syntax | Transfer Syntax UID |
|--|---------------------------|---|---------------------|
| Media Storage Directory Storage | 1.2.840.10008.1.3.10 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | Implicit VR Little Endian Uncompressed | 1.2.840.10008.1.2 |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| Secondary Capture Image Storage (Grayscale) | 1.2.840.10008.5.1.4.1.1.7 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| Secondary Capture Image Storage (Grayscale) | 1.2.840.10008.5.1.4.1.1.7 | Implicit VR Little Endian Uncompressed | 1.2.840.10008.1.2 |
| Secondary Capture Image Storage (Color, RGB) | 1.2.840.10008.5.1.4.1.1.7 | Explicit VR Little Endian Uncompressed | 1.2.840.10008.1.2.1 |
| Secondary Capture Image Storage (Color, RGB) | 1.2.840.10008.5.1.4.1.1.7 | Implicit VR Little Endian Uncompressed | 1.2.840.10008.1.2 |

5.2.1.2.3 Activity – Add Image Files

The Offline-Media AE acts as an FSU using the interchange option when requested to add SOP Instances to a CD-R medium.

5.2.1.2.3.1 Media Storage Application Profiles

The Offline-Media AE supports the STD-GEN-CD Application Profile.

5.2.1.2.3.1.1 Options

The Offline-Media AE supports the SOP Classes and Transfer Syntaxes listed in the Table 5.2-3 for the STD-GEN-CD Application Profile as an FSR.

5.3 AUGMENTED AND PRIVATE APPLICATION PROFILES

5.3.1 Augmented Application Profiles

Not applicable to this product

5.3.2 Private Application Profiles

Not applicable to this product

5.4 MEDIA CONFIGURATION

Not applicable to this product

7. SECURITY

This product does not support any specific security measures.

It is assumed that the product is used within a secured environment. It is assumed that a secured environment includes at a minimum:

- a. Firewall or router protections to ensure that only approved external hosts have network access to the product.
- b. Firewall or router protections to ensure that the product only has network access to approved external hosts and services.
- c. 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.

8. ANNEXES

8.1 IOD CONTENTS

8.1.1 Created SOP Instances

Table 8.1-1 specifies the attributes of a CT Image transmitted by the Storage SCU AE.

Table 8.1-2 specifies the attributes of a Secondary Capture Image transmitted by the Storage SCU AE.

Table 8.1-3 specifies the attributes of a Grayscale Softcopy Presentation State transmitted by the Storage SCU AE.

Table 8.1-4 specifies the attributes of a RT Image transmitted by the Storage SCU AE.

Table 8.1-5 specifies the attributes of a RT Structure Set transmitted by the Storage SCU AE.

Table 8.1-6 specifies the attributes of a RT Plan transmitted by the Storage SCU AE.

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:

| | |
|--------|---|
| MWL | the attribute value source is from Modality Worklist |
| USER | the attribute value source is from User input |
| AUTO | the attribute value is generated automatically |
| MPPS | the attribute value is the same as that use for Modality Performed Procedure Step |
| CONFIG | the attribute value source is a configurable parameter |

8.1.1.1 CT Image IOD

**Table 8.1-1
IOD OF CREATED CT IMAGE SOP INSTANCES**

| IE | Module | Reference | Presence of Module |
|--------------------|---------------------|------------------|---|
| Patient | Patient | Table 8.1-7 | ALWAYS |
| Study | General Study | Table 8.1-8 | ALWAYS |
| | Patient Study | Table 8.1-9 | Only if "Patient's Age" is present |
| Series | General Series | Table 8.1-10 | ALWAYS |
| Frame of Reference | Frame of Reference | Table 8.1-11 | ALWAYS |
| Equipment | General Equipment | Table 8.1-12 | ALWAYS |
| Image | General Image | Table 8.1-13 | ALWAYS |
| | Image Plane | Table 8.1-14 | ALWAYS |
| | Image Pixel | Table 8.1-15 | ALWAYS |
| | Contrast/Bolus | Table 8.1-16 | Only if contrast media was used in this image |
| | VOI LUT | Table 8.1-17 | ALWAYS |
| | SOP Common | Table 8.1-18 | ALWAYS |
| | CT Image | Table 8.1-19 | ALWAYS |
| | Private Application | Table 8.1-20 | Only if private data are present |

8.1.1.2 SC Image IOD

**Table 8.1-2
IOD OF CREATED SC IMAGE SOP INSTANCES**

| IE | Module | Reference | Presence of Module |
|-----------|---------------------|------------------|------------------------------------|
| Patient | Patient | Table 8.1-7 | ALWAYS |
| Study | General Study | Table 8.1-8 | ALWAYS |
| | Patient Study | Table 8.1-9 | Only if "Patient's Age" is present |
| Series | General Series | Table 8.1-10 | ALWAYS |
| Equipment | General Equipment | Table 8.1-12 | ALWAYS |
| | SC Equipment | Table 8.1-21 | ALWAYS |
| Image | General Image | Table 8.1-13 | ALWAYS |
| | Image Pixel | Table 8.1-22 | ALWAYS |
| | SC Image | Table 8.1-23 | ALWAYS |
| | VOI LUT | Table 8.1-24 | ALWAYS |
| | SOP Common | Table 8.1-25 | ALWAYS |
| | Private Application | Table 8.1-26 | Only if private data are present |

8.1.1.3 Grayscale Softcopy Presentation State IOD

**Table 8.1-3
IOD OF CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES**

| IE | Module | Reference | Presence of Module |
|--------------------|---------------------------|--------------|--|
| Patient | Patient | Table 8.1-7 | ALWAYS |
| Study | General Study | Table 8.1-8 | ALWAYS |
| | Patient Study | Table 8.1-9 | Only if "Patient's Age" is present |
| Series | General Series | Table 8.1-10 | ALWAYS |
| | Presentation Series | Table 8.1-27 | ALWAYS |
| Equipment | General Equipment | Table 8.1-12 | ALWAYS |
| Presentation State | Presentation State | Table 8.1-28 | ALWAYS |
| | Displayed Area | Table 8.1-29 | ALWAYS |
| | Spatial Transformation | Table 8.1-30 | Only if Graphic Annotations are to be applied to referenced image(s) |
| | Modality LUT | Table 8.1-31 | ALWAYS |
| | Softcopy VOI LUT | Table 8.1-32 | Only if a VOI LUT is to be applied to referenced image(s) |
| | Softcopy Presentation LUT | Table 8.1-33 | ALWAYS |
| | SOP Common | Table 8.1-34 | ALWAYS |

8.1.1.4 RT Image IOD

**Table 8.1-4
IOD OF CREATED RT IMAGE SOP INSTANCES**

| IE | Module | Reference | Presence of Module |
|--------------------|--------------------|--------------|------------------------------------|
| Patient | Patient | Table 8.1-7 | ALWAYS |
| Study | General Study | Table 8.1-8 | ALWAYS |
| | Patient Study | Table 8.1-9 | Only if "Patient's Age" is present |
| Series | RT Series | Table 8.1-35 | ALWAYS |
| Frame of Reference | Frame of Reference | Table 8.1-11 | ALWAYS |
| Equipment | General Equipment | Table 8.1-12 | ALWAYS |
| Image | General Image | Table 8.1-36 | ALWAYS |
| | Image Pixel | Table 8.1-37 | ALWAYS |
| | RT Image | Table 8.1-38 | ALWAYS |
| | VOI LUT | Table 8.1-39 | ALWAYS |
| | Curve | Table 8.1-40 | Only if treatment field generated |
| | SOP Common | Table 8.1-41 | ALWAYS |

8.1.1.5 RT Structure Set IOD

**Table 8.1-5
IOD OF CREATED RT STRUCTURE SET SOP INSTANCES**

| IE | Module | Reference | Presence of Module |
|---------------|---------------------|------------------|------------------------------------|
| Patient | Patient | Table 8.1-7 | ALWAYS |
| Study | General Study | Table 8.1-8 | ALWAYS |
| | Patient Study | Table 8.1-9 | Only if "Patient's Age" is present |
| Series | RT Series | Table 8.1-42 | ALWAYS |
| Equipment | General Equipment | Table 8.1-12 | ALWAYS |
| Structure Set | Structure Set | Table 8.1-43 | ALWAYS |
| | ROI Contour | Table 8.1-44 | ALWAYS |
| | RT ROI Observations | Table 8.1-45 | ALWAYS |
| | SOP Common | Table 8.1-46 | ALWAYS |

8.1.1.6 RT Plan IOD

**Table 8.1-6
IOD OF CREATED RT PLAN SOP INSTANCES**

| IE | Module | Reference | Presence of Module |
|--------------------|--------------------|------------------|-------------------------------------|
| Patient | Patient | Table 8.1-7 | ALWAYS |
| Study | General Study | Table 8.1-8 | ALWAYS |
| | Patient Study | Table 8.1-9 | Only if "Patient's Age" is present |
| Series | RT Series | Table 8.1-47 | ALWAYS |
| Frame of Reference | Frame of Reference | Table 8.1-11 | ALWAYS |
| Equipment | General Equipment | Table 8.1-12 | ALWAYS |
| Plan | RT General Plan | Table 8.1-48 | ALWAYS |
| | RT Patient Setup | Table 8.1-49 | ALWAYS |
| | RT Beams | Table 8.1-50 | Only if generated one or more beams |
| | SOP Common | Table 8.1-51 | ALWAYS |

8.1.1.7 Common Modules

**Table 8.1-7
PATIENT MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------|-------------|----|---|-------------------|--------------|
| Patient's Name | (0010,0010) | PN | From Modality Worklist or user input. Values supplied via Modality Worklist will be entered as received. Maximum 64 characters. | VNAP | MWL/ USER |
| Patient ID | (0010,0020) | LO | From Modality Worklist or user input. Maximum 64 characters. | VNAP | MWL/ USER |
| Patient's Birth Date | (0010,0030) | DA | From Modality Worklist or user input | VNAP | MWL/ USER |
| Patient's Sex | (0010,0040) | CS | From Modality Worklist or user input | VNAP | MWL/ USER |
| Patient Comments | (0010,4000) | LT | From User Input. Maximum 1024 characters. | VNAP | USER |

**Table 8.1-8
GENERAL STUDY MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------|-------------|----|--|-------------------|--------------|
| Study Instance UID | (0020,000D) | UI | From Modality Worklist or generated by device | ALWAYS | MWL/ AUTO |
| Study Date | (0008,0020) | DA | <yyyymmdd> | ALWAYS | AUTO |
| Study Time | (0008,0030) | TM | <hhmmss.frac> | ALWAYS | AUTO |
| Referring Physician's Name | (0008,0090) | PN | From Modality Worklist | VNAP | MWL |
| Study ID | (0020,0010) | SH | Requested Procedure ID from Worklist or User Input | VNAP | MWL/ USER |
| Accession Number | (0008,0050) | SH | From Modality Worklist or user input | VNAP | MWL/ USER |
| Referenced Study Sequence | (0008,1110) | SQ | From Modality Worklist | ANAP | MWL |
| >Referenced SOP Class UID | (0008,1150) | UI | From Modality Worklist | ANAP | MWL |
| >Referenced SOP Instance UID | (0008,1155) | UI | From Modality Worklist | ANAP | MWL |
| Procedure Code Sequence | (0008,1032) | SQ | From Modality Worklist | ANAP | MWL |

**Table 8.1-9
PATIENT STUDY MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------|-------------|----|--|-------------------|--------|
| Patient's Age | (0010,1010) | AS | Calculated from DoB input on base of actual Date | ALWAYS | AUTO |

**Table 8.1-10
GENERAL SERIES MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------------------------|-------------|----|--|-------------------|--------|
| Modality | (0008,0060) | CS | "CT" | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Generated by device | ALWAYS | AUTO |
| Series Number | (0020,0011) | IS | Generated by device | ALWAYS | AUTO |
| Series Date | (0008,0021) | DA | | ANAP | AUTO |
| Series Time | (0008,0031) | TM | | ANAP | AUTO |
| Operator's Name | (0008,1070) | PN | Operator field in Study list. Maximum 64 characters. | VNAP | USER |
| Protocol Name | (0018,1030) | LO | | ANAP | AUTO |
| Body Part Examined | (0018,0015) | CS | | ANAP | USER |
| Patient Position | (0018,5100) | CS | | ALWAYS | AUTO |
| Laterality | (0020,0060) | CS | | VNAP | AUTO |
| Request Attributes Sequence | (0040,0275) | SQ | From Modality Worklist | ANAP | MWL |
| >Requested Procedure ID | (0040,1001) | SH | From Modality Worklist | ANAP | MWL |
| >Scheduled Procedure Step ID | (0040,0009) | SH | From Modality Worklist | ANAP | MWL |
| >Scheduled Procedure Step Description | (0040,0007) | LO | From Modality Worklist | ANAP | MWL |
| Performed Procedure Step ID | (0040,0253) | SH | Generated by device | ANAP | AUTO |
| Performed Procedure Step Description | (0040,0254) | LO | From Modality Worklist Study Description(0008,1030) | ANAP | MWL |

**Table 8.1-11
FRAME OF REFERENCE MODULE OF CREATED SOP INSTANCES**

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

**Table 8.1-12
GENERAL EQUIPMENT MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------|-------------|----|---------------------|-------------------|--------|
| Manufacturer | (0008,0070) | LO | "TOSHIBA" | ALWAYS | AUTO |
| Institution Name | (0008,0080) | LO | From Configuration | ALWAYS | CONFIG |
| Station Name | (0008,1010) | SH | From Configuration | ALWAYS | CONFIG |
| Institution Department Name | (0008,1040) | LO | From Configuration | VNAP | CONFIG |
| Manufacturer's Model Name | (0008,1090) | LO | Aquilion or Asteion | ALWAYS | AUTO |
| Device Serial Number | (0018,1000) | LO | From Configuration | VNAP | CONFIG |

| | | | | | |
|------------------|-------------|----|--------------------|------|--------|
| Software Version | (0018,1020) | LO | From Configuration | VNAP | CONFIG |
|------------------|-------------|----|--------------------|------|--------|

**Table 8.1-13
GENERAL IMAGE MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------|-------------|----|---|-------------------|--------|
| Instance Number | (0020,0013) | IS | Generated by device | ALWAYS | AUTO |
| Patient Orientation | (0020,0020) | CS | | VNAP | AUTO |
| Content Date | (0008,0023) | DA | <yyyymmdd> | ALWAYS | AUTO |
| Content Time | (0008,0033) | TM | <hhmmss.frac> | ALWAYS | AUTO |
| Image Type | (0008,0008) | CS | | ALWAYS | AUTO |
| Acquisition Number | (0020,0012) | IS | Generated by device | ALWAYS | AUTO |
| Acquisition Date | (0008,0022) | DA | <yyyymmdd> | ALWAYS | AUTO |
| Acquisition Time | (0008,0032) | TM | <hhmmss.frac> | ALWAYS | AUTO |
| Image in Acquisition | (0020,1002) | IS | | VNAP | AUTO |
| Image Comments | (0020,4000) | LT | From user input. Maximum 44 characters. | VNAP | USER |

8.1.1.8 CT Image Modules

**Table 8.1-14
IMAGE PLANE MODULE OF CREATED CT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------|-------------|----|-------|-------------------|--------|
| Pixel Spacing | (0028,0030) | DS | | ALWAYS | AUTO |
| Image Position (Patient) | (0020,0032) | DS | | ALWAYS | AUTO |
| Image Orientation (Patient) | (0020,0037) | DS | | ALWAYS | AUTO |
| Slice Thickness | (0018,0050) | DS | | ALWAYS | AUTO |
| Slice Location | (0020,1041) | DS | | ANAP | AUTO |

**Table 8.1-15
IMAGE PIXEL MODULE OF CREATED CT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------|-------------|----------------|-------|-------------------|--------|
| Pixel Representation | (0028,0103) | US | 1 | ALWAYS | AUTO |
| Pixel Data | (7FE0,0010) | OB or OW | | ALWAYS | AUTO |

**Table 8.1-16
CONTRAST/BOLUS MODULE OF CREATED CT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------------|-------------|-----------|--------------|--------------------------|---------------|
| Contrast/Bolus Agent | (0018,0010) | LO | | VNAP | USER |
| Contrast/Bolus Route | (0018,1040) | LO | | ANAP | USER |
| Contrast/Bolus Volume | (0018,1041) | DS | | ANAP | AUTO |
| Contrast/Bolus Start Time | (0018,1042) | TM | | ANAP | AUTO |
| Contrast/Bolus Stop Time | (0018,1043) | TM | | ANAP | AUTO |
| Contrast/Bolus Total Dose | (0018,1044) | DS | | ANAP | AUTO |

**Table 8.1-17
VOI/LUT MODULE OF CREATED CT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------|-------------|-----------|--------------|--------------------------|---------------|
| Window Center | (0028,1050) | DS | | ALWAYS | USER or AUTO |
| Window Width | (0028,1051) | DS | | ALWAYS | USER or AUTO |

**Table 8.1-18
SOP COMMON MODULE OF CREATED CT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------|-------------|-----------|-----------------------------|--------------------------|---------------|
| Specific Character set | (0008,0008) | CS | Refer to Section 6 | ANAP | CONFIG |
| SOP Class UID | (0008,0016) | UI | "1.2.840.10008.5.1.4.1.1.2" | ALWAYS | AUTO |
| SOP Instance UID | (0008,0018) | UI | Generated by device | ALWAYS | AUTO |

**Table 8.1-19
CT IMAGE MODULE OF CREATED CT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------|-------------|----|---|-------------------|--------|
| Image Type | (0008,0008) | CS | "ORIGINALPRIMARYLOCALIZER" "ORIGINALPRIMARYAXIAL" "DERIVEDSECONDARY" | ALWAYS | AUTO |
| Samples per Pixel | (0028,0002) | US | 1 | ALWAYS | AUTO |
| Photometric Interpretation | (0028,0004) | CS | "MONOCHROME2" | ALWAYS | AUTO |
| Bits Allocated | (0028,0100) | US | 16 | ALWAYS | AUTO |
| Bits Stored | (0028,0101) | US | 16 | ALWAYS | AUTO |
| High Bit | (0028,0102) | US | 15 | ALWAYS | AUTO |
| Rescale Intercept | (0028,1052) | DS | "0" | ALWAYS | AUTO |
| Rescale Slope | (0028,1053) | DS | "1" | ALWAYS | AUTO |
| KVP | (0018,0060) | DS | | VNAP | AUTO |
| Acquisition Number | (0020,0012) | IS | | VNAP | AUTO |
| Scan Options | (0018,0022) | CS | | ANAP | AUTO |
| Data Collection Diameter | (0018,0090) | DS | | ANAP | AUTO |
| Reconstruction Diameter | (0018,1100) | DS | | ANAP | AUTO |
| Distance Source to Detector | (0018,1110) | DS | | ANAP | AUTO |
| Distance Source to Patient | (0018,1111) | DS | | ANAP | AUTO |
| Gantry/Detector Tilt | (0018,1120) | DS | | ANAP | AUTO |
| Table Height | (0018,1130) | DS | | ANAP | AUTO |
| Rotation Direction | (0018,1140) | CS | | ANAP | AUTO |
| Exposure Time | (0018,1150) | IS | | ANAP | AUTO |
| Exposure | (0018,1152) | IS | | ANAP | AUTO |
| Filter Type | (0018,1160) | SH | | ANAP | AUTO |
| Generator Power | (0018,1170) | IS | | ANAP | AUTO |
| Focal Spot(s) | (0018,1190) | DS | | ANAP | AUTO |
| Convolution Kernel | (0018,1210) | SH | | ANAP | AUTO |

**Table 8.1-20
PRIVATE APPLICATION MODULE OF CREATED CT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|-------------|----|---|-------------------|--------|
| Private Creator Code | (7005,00xx) | LO | "TOSHIBA_MEC_CT3" | ANAP | AUTO |
| CT Private Data 1 | (7005,xx00) | OB | | ANAP | AUTO |
| Cardiac R-R Mean Time | (7005,xx03) | SH | Ex.) "9999.9ms" | ANAP | AUTO |
| Cardiac Reconstruction Getting Phase in Percent | (7005,xx04) | SH | Ex.) "99%" | ANAP | AUTO |
| Cardiac Reconstruction Getting Phase in ms | (7005,xx05) | SH | Ex.) "999ms" | ANAP | AUTO |
| Cardiac Reconstruction Mode | (7005,xx06) | SH | "HALF", "SEGMENT" | ANAP | AUTO |
| Reconstruction Center | (7005,xx07) | DS | | ANAP | AUTO |
| Detector Slice Thickness in mm | (7005,xx08) | DS | Ex.) "+9999.99" | ANAP | AUTO |
| Number of Detector rows to Reconstruct | (7005,xx09) | LO | Ex.) "0000111111110000" or "FFFF" 8 detectors were used to reconstruct image | ANAP | AUTO |
| Table Speed in mm/rot | (7005,xx0A) | DS | Ex.) "+99.99" | ANAP | AUTO |
| Filter | (7005,xx0B) | SH | Ex.) "ORG " | ANAP | AUTO |
| Reconstruction Correction Type | (7005,xx0C) | SH | | ANAP | AUTO |
| File Type Remarks | (7005,xx0E) | SH | "IMG" | ANAP | AUTO |
| Direction | (7005,xx0F) | SH | "HF", "FF", etc. | ANAP | AUTO |
| CT Private Data 2 | (7005,xx10) | OB | | ANAP | AUTO |
| Position | (7005,xx12) | SH | "SU", "PR", etc. | ANAP | AUTO |
| Expert Plan No. | (7005,xx13) | US | | ANAP | AUTO |
| Reconstruction ROI No. | (7005,xx14) | US | | ANAP | AUTO |
| Special Helical ACQ No. | (7005,xx15) | US | | ANAP | AUTO |
| Convolution Kernel for Series Record | (7005,xx1B) | SH | Ex.) "FL99" or "FC99" | NAP | AUTO |
| Contrast/Bolus Agent for Series Record | (7005,xx1C) | LO | | NAP | AUTO |
| Reconstruction Number | (7005,xx1D) | UL | | ANAP | AUTO |
| Decrease in Artifact Filter | (7005,xx21) | LO | Ex.) "RASP", "BOOST" | ANAP | AUTO |

NOTE: CT Private Data1 (7005,xx00) or CT Private Data 2 (7005,xx10) may contain some patient information.

8.1.1.9 SC Image Modules

Table 8.1-21
SC EQUIPMENT MODULE OF CREATED SC IMAGE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|-------------|----|-------|-------------------|--------|
| Conversion Type | (0028,0064) | CS | "WSD" | ALWAYS | AUTO |
| Modality | (0008,0060) | CS | "CT" | ALWAYS | AUTO |
| Secondary Capture Device ID | (0018,1010) | LO | | ANAP | AUTO |
| Secondary Capture Device Manufacture | (0018,1016) | LO | | ANAP | AUTO |
| Secondary Capture Manufacturer's Model Name | (0018,1018) | LO | | ANAP | AUTO |
| Secondary Capture Device Software Version | (0018,1019) | LO | | ANAP | AUTO |

Table 8.1-22
IMAGE PIXEL MODULE OF CREATED SC IMAGE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------------|-------------|----------------|------------------------|-------------------|--------|
| Samples per Pixel | (0028,0002) | US | 1 or 3 | ALWAYS | AUTO |
| Photometric Interpretation | (0028,0004) | CS | "MONOCHROME2" or "RGB" | ALWAYS | AUTO |
| Rows | (0028,0010) | US | | ALWAYS | AUTO |
| Columns | (0028,0011) | US | | ALWAYS | AUTO |
| Bits Allocated | (0028,0100) | US | 16 or 8 | ALWAYS | AUTO |
| Bits Stored | (0028,0101) | US | 16 or 8 | ALWAYS | AUTO |
| High Bit | (0028,0102) | US | 15 or 7 | ALWAYS | AUTO |
| Pixel Representation | (0028,0103) | US | 0 | ALWAYS | AUTO |
| Pixel Data | (7FE0,0010) | OB or OW | | ALWAYS | AUTO |
| Planar Configuration | (0028,0006) | US | 0 | ANAP | AUTO |

Table 8.1-23
SC IMAGE MODULE OF CREATED SC IMAGE SOP INSTANCES

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

Table 8.1-24
VOI/LUT MODULE OF CREATED SC IMAGE SOP INSTANCES

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

Table 8.1-25
SOP COMMON MODULE OF CREATED SC IMAGE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------|-------------|----|-----------------------------|-------------------|--------|
| Specific Character set | (0008,0008) | CS | Refer to Section 6 | ANAP | CONFIG |
| SOP Class UID | (0008,0016) | UI | "1.2.840.10008.5.1.4.1.1.7" | ALWAYS | AUTO |
| SOP Instance UID | (0008,0018) | UI | Generated by device | ALWAYS | AUTO |

Table 8.1-26
PRIVATE APPLICATION MODULE OF CREATED SC IMAGE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|-------------|----|---|-------------------|--------|
| Private Creator Code | (7005,00xx) | LO | "TOSHIBA_MEC_CT3" | ANAP | AUTO |
| CT Private Data 1 | (7005,xx00) | OB | | ANAP | AUTO |
| Cardiac R-R Mean Time | (7005,xx03) | SH | Ex.) "9999.9ms" | ANAP | AUTO |
| Cardiac Reconstruction Getting Phase in Percent | (7005,xx04) | SH | Ex.) "99%" | ANAP | AUTO |
| Cardiac Reconstruction Getting Phase in ms | (7005,xx05) | SH | Ex.) "999ms" | ANAP | AUTO |
| Cardiac Reconstruction Mode | (7005,xx06) | SH | "HALF", "SEGMENT" | ANAP | AUTO |
| Reconstruction Center | (7005,xx07) | DS | | ANAP | AUTO |
| Detector Slice Thickness in mm | (7005,xx08) | DS | Ex.) "+9999.99" | ANAP | AUTO |
| Number of Detector rows to Reconstruct | (7005,xx09) | LO | Ex.) "0000111111110000" or "FFFF" 8 detectors were used to reconstruct image | ANAP | AUTO |
| Table Speed in mm/rot | (7005,xx0A) | DS | Ex.) "+99.99" | ANAP | AUTO |
| Filter | (7005,xx0B) | SH | Ex.) "ORG " | ANAP | AUTO |
| Reconstruction Correction Type | (7005,xx0C) | SH | | ANAP | AUTO |
| CT Private Data 2 | (7005,xx10) | OB | | ANAP | AUTO |

NOTE: CT Private Data1 (7005,xx00) or CT Private Data 2 (7005,xx10) may contain some patient information.

8.1.1.10 Grayscale Softcopy Presentation State Modules

Table 8.1-27

PRESENTATION SERIES MODULE OF CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------|-------------|----|-------|-------------------|--------|
| Modality | (0008,0060) | CS | PR | ALWAYS | AUTO |

Table 8.1-28

PRESENTATION STATE MODULE OF CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-------------------------------|-------------|----|---------------------|-------------------|--------|
| Instance Number | (0020,0013) | IS | Generated by device | ALWAYS | AUTO |
| Presentation Label | (0070,0080) | CS | Generated by device | ALWAYS | AUTO |
| Presentation Description | (0070,0081) | LO | | VNAP | USER |
| Presentation Creation Date | (0070,0082) | DA | <yyyymmdd> | ALWAYS | AUTO |
| Presentation Creation Time | (0070,0083) | TM | <hhmmss.frac> | ALWAYS | AUTO |
| Presentation Creator's Name | (0070,0084) | PN | | VNAP | USER |
| Presentation Series Sequence | (0008,1115) | SQ | | ALWAYS | AUTO |
| >Series Instance UID | (0020,000E) | UI | | ALWAYS | AUTO |
| >Referenced Image Sequence | (0008,1140) | SQ | | ALWAYS | AUTO |
| >>Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | AUTO |
| >>Referenced SOP Instance UID | (0008,1155) | UI | | ALWAYS | AUTO |

Table 8.1-29
DISPLAYED AREA MODULE OF CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--|-------------|----|-------|-------------------|--------|
| Displayed Area Selection Sequence | (0070,005A) | SQ | | ALWAYS | AUTO |
| >Referenced Image Sequence | (0008,1140) | SQ | | ANAP | AUTO |
| >>Referenced SOP Class UID | (0008,1150) | UI | | ANAP | AUTO |
| >>Referenced SOP Instance UID | (0008,1155) | UI | | ANAP | AUTO |
| >Displayed Area Top Left Hand Corner | (0070,0052) | IS | | ALWAYS | AUTO |
| >Displayed Area Bottom Right Hand Corner | (0070,0053) | IS | | ALWAYS | AUTO |
| >Presentation Size Model | (0070,0100) | CS | | ALWAYS | AUTO |
| >Presentation Pixel Aspect Ratio | (0070,0102) | IS | | ALWAYS | AUTO |
| >Presentation Pixel Magnification Ratio | (0070,0103) | FL | | ANAP | AUTO |

Table 8.1-30
SPATIAL TRANSFORMATION MODULE OF CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------|-------------|----|-------|-------------------|--------|
| Image Horizontal Flip | (0070,0041) | US | | ALWAYS | AUTO |
| Image Rotation | (0070,0042) | US | | ALWAYS | AUTO |

Table 8.1-31
MODALITY LUT MODULE OF CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES

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

Table 8.1-32
SOFTCOPY VOI LUT MODULE OF CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------------|-------------|----|-------|-------------------|--------|
| Softcopy VOI LUT Sequence | (0028,3110) | SQ | | ALWAYS | AUTO |
| >Referenced Image Sequence | (0008,1140) | SQ | | ALWAYS | AUTO |
| >>Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | AUTO |
| >>Referenced SOP Instance UID | (0008,1155) | UI | | ALWAYS | AUTO |
| >Window Center | (0028,1050) | DS | | ALWAYS | AUTO |
| >Window Width | (0028,1051) | DS | | ALWAYS | AUTO |
| >Window Center & Width Explanation | (0028,1055) | LO | | ANAP | AUTO |

Table 8.1-33
SOFTCOPY PRESENTATION LUT MODULE OF CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------|-------------|----|-------|-------------------|--------|
| Presentation LUT Shape | (2050,0020) | CS | | ALWAYS | AUTO |

Table 8.1-34
SOP COMMON MODULE OF CREATED GRAYSCALE SOFTCOPY PRESENTATION STATE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------|-------------|----|--------------------------------|-------------------|--------|
| Specific Character Set | (0008,0005) | CS | Refer to Section 6 | ANAP | AUTO |
| Instance Creation Date | (0008,0012) | DA | <yyyymmdd> | ANAP | AUTO |
| Instance Creation Time | (0008,0013) | TM | <hhmmss.frac> | ANAP | AUTO |
| SOP Class UID | (0008,0016) | UI | "1.2.840.10008.5.1.4.1.1.11.1" | ALWAYS | AUTO |
| SOP Instance UID | (0008,0018) | UI | Generated by device | ALWAYS | AUTO |

8.1.1.11 RT Image Modules

Table 8.1-35
RT SERIES MODULE OF CREATED RT IMAGE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------|-------------|----|---------------------|-------------------|--------|
| Modality | (0008,0060) | CS | "RTIMAGE" | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Generated by device | ALWAYS | AUTO |
| Series Number | (0020,0011) | UI | Generated by device | ALWAYS | AUTO |
| Series Description | (0008,103E) | LO | | ANAP | AUTO |

Table 8.1-36
GENERAL IMAGE MODULE OF CREATED RT IMAGE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------|-------------|----|---|-------------------|--------|
| Instance Number | (0020,0013) | IS | Generated by device | ALWAYS | AUTO |
| Patient Orientation | (0020,0020) | CS | | EMPTY | AUTO |
| Content Date | (0008,0023) | DA | <yyyymmdd> | ALWAYS | AUTO |
| Content Time | (0008,0033) | TM | <hhmmss.frac> | ALWAYS | AUTO |
| Image Type | (0008,0008) | CS | "DERIVED\PRIMARY\DRR" or "DERIVED\SECONDARY\DRR" | ALWAYS | AUTO |
| Image Comments | (0020,4000) | LT | From user input. Maximum 44 characters. | ANAP | USER |

Table 8.1-37
IMAGE PIXEL MODULE OF CREATED RT IMAGE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------------|-------------|----------------|---------------|-------------------|--------|
| Samples per Pixel | (0028,0002) | US | 1 | ALWAYS | AUTO |
| Photometric Interpretation | (0028,0004) | CS | "MONOCHROME2" | ALWAYS | AUTO |
| Rows | (0028,0010) | US | 512 | ALWAYS | AUTO |
| Columns | (0028,0011) | US | 512 | ALWAYS | AUTO |
| Bits Allocated | (0028,0100) | US | 16 | ALWAYS | AUTO |
| Bits Stored | (0028,0101) | US | 16 | ALWAYS | AUTO |
| High Bit | (0028,0102) | US | 15 | ALWAYS | AUTO |
| Pixel Representation | (0028,0103) | US | 0 | ALWAYS | AUTO |
| Pixel Data | (7FE0,0010) | OB or OW | | ALWAYS | AUTO |

**Table 8.1-38
RT IMAGE MODULE OF CREATED RT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------------------|-------------|----|---|-------------------|--------|
| Samples per Pixel | (0028,0002) | US | 1 | ALWAYS | AUTO |
| Photometric Interpretation | (0028,0004) | CS | "MONOCHROME2" | ALWAYS | AUTO |
| Bits Allocated | (0028,0100) | US | 16 | ALWAYS | AUTO |
| Bits Stored | (0028,0101) | US | 16 | ALWAYS | AUTO |
| High Bit | (0028,0102) | US | 15 | ALWAYS | AUTO |
| Pixel Representation | (0028,0103) | US | 0 | ALWAYS | AUTO |
| RT Image Label | (3002,0002) | SH | | ALWAYS | AUTO |
| RT Image Name | (3002,0003) | LO | "BEV", "H" or "V" | ALWAYS | AUTO |
| RT Image Description | (3002,0004) | ST | | ALWAYS | AUTO |
| Operators' Name | (0008,1070) | PN | Operator field in Study list. Maximum 64 characters. | VNAP | USER |
| Image Type | (0008,0008) | CS | "DERIVED\PRIMARY\DRR" or "DERIVED\SECONDARY\DRR" | ALWAYS | AUTO |
| Conversion Type | (0008,0064) | CS | "WSD" | ALWAYS | AUTO |
| RT Image Plane | (3002,000C) | CS | "NORMAL" | ALWAYS | AUTO |
| X-Ray Image Receptor Angle | (3002,000E) | DS | 0 | ALWAYS | AUTO |
| RT Image Orientation | (3002,0010) | DS | "\0\0\0\0\0\0" | ALWAYS | AUTO |
| Image Plane Pixel Spacing | (3002,0011) | DS | | ALWAYS | AUTO |
| RT Image Position | (3002,0012) | DS | | ALWAYS | AUTO |
| Radiation Machine Name | (3002,0020) | SH | | ALWAYS | AUTO |
| Primary Dosimeter Unit | (300A,00B3) | CS | | EMPTY | AUTO |
| Radiation Machine SAD | (3002,0022) | DS | | ALWAYS | CONFIG |
| RT Image SID | (3002,0026) | DS | | ALWAYS | USER |
| Referenced RT Plan Sequence | (300C,0002) | SQ | | ANAP | AUTO |
| >Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | AUTO |
| >Referenced SOP Instance UID | (0008,1155) | UI | | ALWAYS | AUTO |
| Referenced Beam Number | (300C,0006) | IS | | ALWAYS | AUTO |
| Exposure Sequence | (3002,0030) | SQ | Only if viewed from radiation source. | ANAP | AUTO |
| >Beam Limiting Device Sequence | (300A,00B6) | SQ | Number of sequence items 2 or 3. | ALWAYS | CONFIG |
| >>RT Beam Limiting Device Type | (300A,00B8) | CS | "X", "Y", "ASYMX", "ASYMY", "MLCX" | ALWAYS | CONFIG |
| >>>Number of Leaf/Jaw Pairs | (300A,00BC) | IS | From Configuration Maximum 81 pairs. | ALWAYS | CONFIG |

| | | | | | |
|----------------------------|-------------|----|---|--------|--------|
| >>Leaf Position Boundaries | (300A,00BE) | DS | Only if RT Beam Limiting Device Type (300A,00B8) is "MLCX". | VNAP | CONFIG |
| >> Leaf/Jaw Positions | (300A,011C) | DS | | ALWAYS | USER |
| >Number of Blocks | (300A,00F0) | IS | 0 | ALWAYS | AUTO |
| Gantry Angle | (300A,011E) | DS | | ALWAYS | USER |
| Beam Limiting Device Angle | (300A,0120) | DS | Only if viewed from radiation source. | ANAP | USER |
| Patient Support Angle | (300A,0122) | DS | | ALWAYS | AUTO |

**Table 8.1-39
VOI LUT MODULE OF CREATED RT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------|-------------|----|-------|-------------------|--------------|
| Window Center | (0028,1050) | DS | | ALWAYS | USER or AUTO |
| Window Width | (0028,1051) | DS | | ALWAYS | USER or AUTO |

**Table 8.1-40
CURVE MODULE OF CREATED RT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------------|-------------|----------------|--|-------------------|--------|
| Curve Dimensions | (50xx,0005) | US | 2 | ANAP | AUTO |
| Number of Points | (50xx,0010) | US | | ANAP | USER |
| Type of Data | (50xx,0020) | CS | "ROI" | ANAP | AUTO |
| Data Value Representation | (50xx,0103) | US | 2 | ANAP | AUTO |
| Curve Data | (50xx,3000) | OW or OB | Treatment field, i.e. x and y coordinates of IEC X-RAY IMAGE RECEPTOR coordinate system with respect to IEC GANTRY coordinate system. (mm) | ANAP | USER |
| Curve Description | (50xx,0022) | LO | "TREATMENT_FIELD" | ANAP | AUTO |
| Axis Unit | (50xx,0030) | SH | "MMMM" | ANAP | AUTO |

**Table 8.1-41
SOP COMMON MODULE OF CREATED RT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------|-------------|----|---------------------------------|-------------------|--------|
| Specific Character set | (0008,0008) | CS | Refer to Section 6 | ANAP | CONFIG |
| SOP Class UID | (0008,0016) | UI | "1.2.840.10008.5.1.4.1.1.481.1" | ALWAYS | AUTO |
| SOP Instance UID | (0008,0018) | UI | Generated by device | ALWAYS | AUTO |

8.1.1.12 Structure Set Modules

Table 8.1-42
RT SERIES MODULE OF CREATED RT IMAGE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------|-------------|----|---------------------|-------------------|--------|
| Modality | (0008,0060) | CS | "RTSTRUCT" | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Generated by device | ALWAYS | AUTO |
| Series Number | (0020,0011) | UI | Generated by device | ALWAYS | AUTO |
| Series Description | (0008,103E) | LO | | ANAP | AUTO |

Table 8.1-43
STRUCTURE SET MODULE OF CREATED RT STRUCTURE SET SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--|-------------|----|----------------------------------|-------------------|--------------|
| Structure Set Label | (3006,0002) | SH | | ALWAYS | AUTO |
| Structure Set Name | (3006,0004) | LO | "RTSTRUCT#" (# is RT Plan Label) | ALWAYS | AUTO |
| Structure Set Date | (3006,0008) | DA | <yyyymmdd> | ALWAYS | AUTO |
| Structure Set Time | (3006,0009) | TM | <hhmmss.frac> | ALWAYS | AUTO |
| Referenced Frame of Reference Sequence | (3006,0010) | SQ | | ALWAYS | AUTO |
| >Frame of Reference UID | (0020,0052) | UI | | ALWAYS | AUTO |
| >RT Referenced Study Sequence | (3006,0012) | SQ | | ALWAYS | AUTO |
| >>Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | AUTO |
| >>Referenced Study Instance UID | (0008,1155) | UI | | ALWAYS | AUTO |
| >>RT Referenced Series Sequence | (3006,0014) | SQ | | ALWAYS | AUTO |
| >>>Series Instance UID | (0020,000E) | UI | | ALWAYS | AUTO |
| >>>Contour Image Sequence | (3006,0016) | SQ | | ALWAYS | AUTO |
| >>>>Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | AUTO |
| >>>>Referenced SOP Instance UID | (0008,1155) | UI | | ALWAYS | AUTO |
| Structure Set ROI Sequence | (3006,0020) | SQ | | ALWAYS | AUTO |
| >ROI Number | (3006,0022) | IS | | ALWAYS | AUTO |
| >Referenced Frame of Reference UID | (3006,0024) | UI | | ALWAYS | AUTO |
| >ROI Name | (3006,0026) | LO | | VNAP | USER or AUTO |
| >ROI Generation Algorithm | (3006,0036) | CS | "MANUAL" or "SEMIAUTOMATIC" | ALWAYS | USER or AUTO |
| >ROI Generation Description | (3006,0038) | LO | | ANAP | USER or AUTO |

Table 8.1-44
ROI CONTOUR MODULE OF CREATED RT STRUCTURE SET SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------------|-------------|----|-----------------|-------------------|--------|
| ROI Contour Sequence | (3006,0039) | SQ | | ALWAYS | AUTO |
| >Referenced ROI Number | (3006,0084) | IS | | ALWAYS | AUTO |
| >ROI Display Color | (3006,002A) | IS | | ALWAYS | AUTO |
| >Contour Sequence | (3006,0040) | SQ | | ALWAYS | AUTO |
| >>Contour Image Sequence | (3006,0016) | SQ | | ALWAYS | AUTO |
| >>>SOP Class UID | (0008,1150) | UI | | ALWAYS | AUTO |
| >>>SOP Instance UID | (0008,1155) | UI | | ALWAYS | AUTO |
| >>Contour Geometric Type | (3006,0042) | CS | "CLOSED_PLANAR" | ALWAYS | AUTO |
| >>Number of Contour Points | (3006,0046) | IS | | ALWAYS | USER |
| >>Contour Data | (3006,0050) | DS | | ALWAYS | USER |

Table 8.1-45
RT ROI OBSERVATIONS MODULE OF CREATED RT STRUCTURE SET SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------------------------|-------------|----|---------------------------|-------------------|--------|
| RT ROI Observations Sequence | (3006,0080) | SQ | | ALWAYS | AUTO |
| >Observation Number | (3006,0082) | IS | | ALWAYS | AUTO |
| >Referenced ROI Number | (3006,0084) | IS | | ALWAYS | AUTO |
| >ROI Observation Label | (3006,0085) | SH | | ANAP | AUTO |
| >RT Related ROI Sequence | (3006,0030) | SQ | | ANAP | AUTO |
| >>Referenced ROI Number | (3006,0084) | IS | | ALWAYS | AUTO |
| >>RT ROI Relationship | (3006,0033) | CS | "ENCLOSED" or "ENCLOSING" | ALWAYS | USER |
| >Related RT ROI Observations Sequence | (3006,00A0) | SQ | | ANAP | AUTO |
| >>Observation Number | (3006,0082) | IS | | ALWAYS | AUTO |
| >RT ROI Interpreted Type | (3006,00A4) | CS | "PTV", "GTV" or "ORGAN" | ALWAYS | USER |
| >ROI Interpreter | (3006,00A6) | PN | | EMPTY | AUTO |

Table 8.1-46
SOP COMMON MODULE OF CREATED RT IMAGE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------|-------------|----|---------------------------------|-------------------|--------|
| Specific Character set | (0008,0008) | CS | Refer to Section 6 | ANAP | CONFIG |
| SOP Class UID | (0008,0016) | UI | "1.2.840.10008.5.1.4.1.1.481.3" | ALWAYS | AUTO |
| SOP Instance UID | (0008,0018) | UI | Generated by device | ALWAYS | AUTO |

8.1.1.13 RT Plan Modules

Table 8.1-47
RT SERIES MODULE OF CREATED RT IMAGE SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------|-------------|----|---------------------|-------------------|--------|
| Modality | (0008,0060) | CS | "RTPLAN" | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Generated by device | ALWAYS | AUTO |
| Series Number | (0020,0011) | UI | Generated by device | ALWAYS | AUTO |
| Series Description | (0008,103E) | LO | | ANAP | AUTO |

Table 8.1-48
RT GENERAL PLAN MODULE OF CREATED RT PLAN SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------------|-------------|----|--|-------------------|--------|
| RT Plan Label | (300A,0002) | SH | | ALWAYS | AUTO |
| RT Plan Name | (300A,0003) | LO | "RTPLAN#" (# is RT Plan Label) | ALWAYS | AUTO |
| Operator's Name | (0008,1070) | PN | Operator field in Study list. Maximum 64 characters. | VNAP | USER |
| RT Plan Date | (300A,0006) | DA | <yyyymmdd> | ALWAYS | AUTO |
| RT Plan Time | (300A,0007) | TM | <hhmmss.frac> | ALWAYS | AUTO |
| Treatment Sites | (300A,000B) | LO | | ANAP | USER |
| RT Plan Geometry | (300A,000C) | CS | "TREATMENT_DEVICE" or "PATIENT" | ALWAYS | AUTO |
| Referenced Structure Set Sequence | (300C,0060) | SQ | Only if RT Plan Geometry (300A,000C) is "PATIENT". | ANAP | AUTO |
| >Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | AUTO |
| >Referenced SOP Instance UID | (0008,1155) | UI | | ALWAYS | AUTO |

Table 8.1-49
RT PATIENT SETUP MODULE OF CREATED RT PLAN SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--|-------------|----|--|-------------------|--------|
| Patient Setup Sequence | (300A,0180) | SQ | | ALWAYS | AUTO |
| >Patient Setup Number | (300A,0182) | IS | | ALWAYS | AUTO |
| >Patient Position | (0018,5100) | CS | "HFP", "HFS", "HFDR", "HFDL", "FFP", "FFS", "FFDR", "FFDL" | ALWAYS | USER |
| >Setup Technique | (300A,01B0) | CS | "SKIN_APPOSITION" | ALWAYS | AUTO |
| >Setup Device Sequence | (300A,01B4) | SQ | Only if reference point marking. | ANAP | USER |
| >>Setup Device Type | (300A,01B6) | CS | "LASER_POINTER" | ALWAYS | AUTO |
| >>Setup Device Label | (300A,01B8) | SH | "X", "Y" or "Z" | ALWAYS | AUTO |
| >>Setup Device Parameter | (300A,01BC) | DS | A point of reference. (Laser Pointer Position) | ALWAYS | USER |
| >Table Top Vertical Setup Displacement | (300A,01D2) | DS | Only if reference point and isocenter are sets. | ANAP | USER |
| >Table Top Longitudinal Setup Displacement | (300A,01D4) | DS | Only if reference point and isocenter are sets. | ANAP | USER |

| | | | | | |
|---------------------------------------|-------------|----|---|------|------|
| >Table Top Lateral Setup Displacement | (300A,01D6) | DS | Only if reference point and isocenter are sets. | ANAP | USER |
|---------------------------------------|-------------|----|---|------|------|

**Table 8.1-50
RT BEAMS MODULE OF CREATED RT PLAN SOP INSTANCE**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------------------------|-------------|----|---|-------------------|--------|
| Beam Sequence | (300A,00B0) | SQ | Only if generated one or more beams of plan. | ANAP | USER |
| >Beam Number | (300A,00C0) | IS | | ALWAYS | AUTO |
| >Beam Name | (300A,00C2) | LO | "Fix", "Mirror", "Tangential", "ARC" or "CONF" | ANAP | USER |
| >Beam Description | (300A,00C3) | ST | | ANAP | AUTO |
| >Beam Type | (300A,00C4) | CS | "STATIC" or "DYNAMIC" | ALWAYS | USER |
| >Radiation Type | (300A,00C6) | CS | "PHOTON" | ALWAYS | AUTO |
| >Treatment Machine Name | (300A,00B2) | SH | From Configuration Maximum 16 characters. | ALWAYS | CONFIG |
| >Manufacturer | (0008,0070) | LO | From Configuration Maximum 32 characters. | ANAP | CONFIG |
| >Manufacturer's Model Name | (0008,1090) | LO | From Configuration Maximum 32 characters. | ANAP | CONFIG |
| >Primary Dosimeter Unit | (300A,00B3) | CS | "MU" | ALWAYS | AUTO |
| >Source-Axis Distance | (300A,00B4) | DS | | ALWAYS | CONFIG |
| >Beam Limiting Device Sequence | (300A,00B6) | SQ | Number of sequence items 2 or 3. | ALWAYS | CONFIG |
| >>RT Beam Limiting Device Type | (300A,00B8) | CS | "X", "Y", "ASYMX", "ASYMY" or "MLCX" | ALWAYS | CONFIG |
| >>Number of Leaf/Jaw Pairs | (300A,00BC) | IS | From Configuration Maximum 81 pairs. | ALWAYS | CONFIG |
| >>Leaf Position Boundaries | (300A,00BE) | DS | Only if RT Beam Limiting Device Type (300A,00B8) is "MLCX". | ANAP | CONFIG |
| >Referenced Patient Setup Number | (300C,006A) | IS | | ALWAYS | AUTO |
| >Referenced Reference Image Sequence | (300C,0042) | SQ | | ANAP | AUTO |
| >>Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | AUTO |
| >>Referenced SOP Instance UID | (0008,1155) | UI | | ALWAYS | AUTO |
| >>Reference Image Number | (300A,00C8) | IS | | ALWAYS | AUTO |
| >Planned Verification Image Sequence | (300A,00CA) | SQ | Only if DRR Image generated. | ANAP | AUTO |
| >>RT Image SID | (3002,0026) | DS | | ALWAYS | USER |
| >>Referenced Reference Image Number | (300C,0007) | IS | | ALWAYS | AUTO |
| >Treatment Delivery Type | (300A,00CE) | CS | "TREATMENT" | ALWAYS | AUTO |
| >Number of Wedges | (300A,00D0) | IS | "0" | ALWAYS | AUTO |

| | | | | | |
|--|-------------|----|--|--------|--------|
| >Number of Compensators | (300A,00E0) | IS | "0" | ALWAYS | AUTO |
| >Number of Boli | (300A,00ED) | IS | Maximum 6. | ALWAYS | USER |
| >Referenced Bolus Sequence | (300C,00B0) | SQ | Only if Number of Boli (300A,00ED) is more than zero. | ANAP | USER |
| >>Referenced ROI Number | (3006,0084) | IS | | ALWAYS | AUTO |
| >Number of Blocks | (300A,00F0) | IS | "0" | ALWAYS | AUTO |
| >Final Cumulative Meterset Weight | (300A,010E) | DS | "100" | ALWAYS | AUTO |
| >Number of Control Points | (300A,0110) | IS | "2" to "180" | ALWAYS | USER |
| >Control Point Sequence | (300A,0111) | SQ | | ALWAYS | AUTO |
| >>Control Point Index | (300A,0112) | IS | | ALWAYS | AUTO |
| >>Cumulative Meterset Weight | (300A,0134) | DS | | ALWAYS | AUTO |
| >>Nominal Beam Energy | (300A,0114) | DS | (MV) | ANAP | USER |
| >>Dose Rate Set | (300A,0115) | DS | (MU/min) | ANAP | USER |
| >>Beam Limiting Device Position Sequence | (300A,011A) | SQ | Always present only if first item of Control Point Sequence (300A,0111), or if Beam Limiting Device changes during beam. | ANAP | AUTO |
| >>>RT Beam Limiting Device Type | (300A,00B8) | CS | "X", "Y", "ASYMX", "ASYMY", "MLCX" | ALWAYS | CONFIG |
| >>> Leaf/Jaw Positions | (300A,011C) | DS | | ALWAYS | USER |
| >> Gantry Angle | (300A,011E) | DS | Always present only if first item of Control Point Sequence (300A,0111), or if Gantry Angle changes during beam. | ANAP | USER |
| >> Gantry Rotation Direction | (300A,011F) | CS | Always present "NONE" or "CW" only if first item of Control Point Sequence (300A,0111). | ANAP | USER |
| >> Beam Limiting Device Angle | (300A,0120) | DS | Always present only if first item of Control Point Sequence (300A,0111). | ANAP | USER |
| >> Beam Limiting Device Rotation Direction | (300A,0121) | CS | Always present "NONE" only if first item of Control Point Sequence (300A,0111). | ANAP | AUTO |
| >> Patient Support Angle | (300A,0122) | DS | Always present only if first item of Control Point Sequence (300A,0111). | ANAP | AUTO |
| >> Patient Support Rotation Direction | (300A,0123) | CS | Always present "NONE" only if first item of Control Point Sequence (300A,0111). | ANAP | AUTO |
| >> Table Top Eccentric Angle | (300A,0125) | DS | Always present "0" only if first item of Control Point Sequence (300A,0111). | ANAP | AUTO |
| >> Table Top Eccentric Rotation Direction | (300A,0126) | CS | Always present "NONE" only if first item of Control Point Sequence (300A,0111). | ANAP | AUTO |

| | | | | | |
|------------------------------------|-------------|----------------|--|-------|------|
| >> Table Top Vertical Position | (300A,0128) | DS | Always length 0 only if first item of Control Point Sequence (300A,0111). | EMPTY | AUTO |
| >> Table Top Longitudinal Position | (300A,0129) | DS | Always length 0 only if first item of Control Point Sequence (300A,0111). | EMPTY | AUTO |
| >> Table Top Lateral Position | (300A,012A) | DS | Always length 0 only if first item of Control Point Sequence (300A,0111). | EMPTY | AUTO |
| >> Isocenter Position | (300A,012C) | DS | Always present only if first item of Control Point Sequence (300A,0111). | ANAP | USER |
| >>Curve Dimensions | (50xx,0005) | US | Always present 2 if treatment field generated. | ANAP | AUTO |
| >>Number of Points | (50xx,0010) | US | Always present if Curve Dimensions (50xx,0005) is present. | ANAP | USER |
| >>Type of Data | (50xx,0020) | CS | Always present "ROI" if Curve Dimensions (50xx,0005) is present. | ANAP | AUTO |
| >>Data Value Representation | (50xx,0103) | US | Always present 2 if Curve Dimensions (50xx,0005) is present. | ANAP | AUTO |
| >>Curve Data | (50xx,3000) | OW or OB | Always present treatment field if Curve Dimensions (50xx,0005) is present. Treatment field, i.e. x and y coordinates of IEC X-RAY IMAGE RECEPTOR coordinate system with respect to IEC GANTRY coordinate system. (mm) | ANAP | USER |
| >>Curve Description | (50xx,0022) | LO | Always present "TREATMENT_FIELD" if Curve Dimensions (50xx,0005) is present. | ANAP | AUTO |
| >>Axis Unit | (50xx,0030) | SH | Always present "MMMM" if Curve Dimensions (50xx,0005) is present. | ANAP | AUTO |

**Table 8.1-51
SOP COMMON MODULE OF CREATED RT IMAGE SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------|-------------|----|---------------------------------|-------------------|--------|
| Specific Character set | (0008,0008) | CS | Refer to Section 6 | ANAP | CONFIG |
| SOP Class UID | (0008,0016) | UI | "1.2.840.10008.5.1.4.1.1.481.5" | ALWAYS | AUTO |
| SOP Instance UID | (0008,0018) | UI | Generated by device | ALWAYS | AUTO |

8.1.2 Usage of Attributes from received IOD's

Fields from RT Plan such as technique and supplies and how they are used

Table 8.1-52

RT BEAMS MODULE OF CREATED RT PLAN SOP INSTANCE

| Attribute Name | Tag | Database Updates |
|-------------------------------------|-------------|---|
| Patient Module | | |
| Patient's Name | (0010,0010) | This value for attribute needs to match value in the referenced CT images. Required same Patient's Name with referenced CT image. If not, will be rejected. |
| Patient ID | (0010,0020) | This value for attribute needs to match value in the referenced CT images. Required same Patient ID with referenced CT images. If not, will be rejected. |
| General Study Module | | |
| Study Instance UID | (0020,000D) | Required same Study Instance UID of referenced CT images. If different study instance, the Referenced Study Component Sequence (8,1111) is used. |
| RT Series Module | | |
| Referenced Study Component Sequence | (0008,1111) | Required if the RT Plan and referenced CT images are different study instance UID. |
| >Referenced SOP Class | (0008,1150) | Required "1.2.840.10008.3.1.2.3.2" |
| >Referenced SOP Instance UID | (0008,1155) | Required same Study Instance UID of the reference CT images. |
| Frame of Reference Module | | |
| Frame of Reference UID | (0020,0052) | If present, this value for attribute needs to match value in the referenced CT images. The RT Plan and the referenced CT images are different the Frame of Reference UID so that will be rejected. |
| RT Patient Setup Module | | |
| Patient Setup Sequence | (300A,0180) | Required the number of sequence items of 4 and under. If not, will be rejected. |
| >Patient Position | (0018,5100) | Required same Patient Position in referenced CT image. If different, will be rejected. |
| RT Beams Module | | |
| Beam Sequence | (300A,00B0) | Required the number of sequence items of 48 and under. If not, will be rejected. |
| >Treatment Machine Name | (300A,00B2) | This value for attribute needs to match value in configurations. Required same Treatment Machine Name in configurations. If not, will be rejected. |
| >Beam Limiting Device Sequence | (300A,00B6) | Required the number of sequence items of 2 or 3. If not, will be rejected. |
| >>RT Beam Limiting Device Type | (300A,00B8) | Required following types. If not, will be rejected. "X", "Y", "ASYMX", "ASYMY", "MLCX" |
| >>Number of Leaf/Jaw Pairs | (300A,00BC) | Required 1 to 81. If not, will be rejected. |
| >Number of Control Points | (300A,0110) | Required 2 to 181. If not, will be rejected. |
| >Control Point Sequence | (300A,0111) | |

| | | |
|--|-------------|---|
| >>Beam Limiting Device Position Sequence | (300A,011A) | Required the number of sequence items 2 or 3. If not, will be rejected. |
| >>>RT Beam Limiting Device Type | (300A,00B8) | Required following types. If not, will be rejected. "X", "Y", "ASYMX", "ASYMY", "MLCX". |
| >> Gantry Rotation Direction | (300A,011F) | Must be "NONE" or "CW" in first item of Control Point Sequence (300A,0111). |
| >> Beam Limiting Device Angle | (300A,0120) | Must set in first item of Control Point Sequence (300A,0111). |
| >> Beam Limiting Device Rotation Direction | (300A,0121) | Must be "NONE" in first item of Control Point Sequence (300A,0111), and must not change during beam. |
| >> Patient Support Angle | (300A,0122) | Must set in first item of Control Point Sequence (300A,0111). |
| >> Patient Support Rotation Direction | (300A,0123) | Must be "NONE" in first item of Control Point Sequence (300A,0111), and must not change during beam. |
| >> Table Top Eccentric Angle | (300A,0125) | Must be zero in first item of Control Point Sequence (300A,0111). |
| >> Table Top Eccentric Rotation Direction | (300A,0126) | Must be "NONE" in first item of Control Point Sequence (300A,0111), and must not change during beam. |
| >> Table Top Vertical Position | (300A,0128) | Must not change during beam. |
| >> Table Top Longitudinal Position | (300A,0129) | Must not change during beam. |
| >> Table Top Lateral Position | (300A,012A) | Must not change during beam. |
| >> Isocenter Position | (300A,012C) | Display to user and can be move to the Laser Pointer. Must set in first item of Control Point Sequence (300A,0111), and must not change during beam. If no exist, will be rejected. |
| >>Curve Dimensions | (50xx,0005) | Expect 2 |
| >>Number of Points | (50xx,0010) | Expect 512 and under. |
| >>Type of Data | (50xx,0020) | Expect "ROI" |
| >>Data Value Representation | (50xx,0103) | Expect "FL" |
| >>Curve Data | (50xx,3000) | Expect the Treatment Field. Treatment field, i.e. x and y coordinates of IEC X-RAY IMAGE RECEPTOR coordinate system with respect to IEC GANTRY coordinate system. (mm) |
| >>Curve Description | (50xx,0022) | Expect "TREATMENT_FIELD" |
| >>Axis Unit | (50xx,0030) | Expect "MMMM" |

8.1.3 Attribute Mapping

The relationships between attributes received via Modality Worklist, stored in acquired images and communicated via MPPS are summarized in Table 8.1-53.

Table 8.1-53
ATTRIBUTE MAPPING BETWEEN MODALITY WORKLIST, IMAGE AND MPPS

| Modality Worklist | Image IOD | MPPS IOD |
|--------------------|--------------------|------------------------------------|
| -- | -- | Scheduled Step Attributes Sequence |
| Study Instance UID | Study Instance UID | >Study Instance UID |

| | | |
|--------------------------------------|---------------------------------------|---------------------------------------|
| Referenced Study Sequence | Referenced Study Sequence | >Referenced Study Sequence |
| Accession Number | Accession Number | >Accession Number |
| -- | Request Attributes Sequence | -- |
| Requested Procedure ID | >Requested Procedure ID | >Requested Procedure ID |
| Scheduled Procedure Step ID | >Scheduled Procedure Step ID | >Scheduled Procedure Step ID |
| Scheduled Procedure Step Description | >Scheduled Procedure Step Description | >Scheduled Procedure Step Description |
| Requested Procedure ID | Study ID | Study ID |
| -- | Performed Procedure Step ID | Performed Procedure Step ID |
| -- | Performed Procedure Step Description | Performed Procedure Step Description |
| Requested Procedure Code Sequence | Procedure Code Sequence | Procedure Code Sequence |

This table shows only typical data sets.

Other data sets are also set as default settings.

All map settings, including the default setting data sets, can be customized.

8.1.4 Coerced/Modified Fields

Not applicable to this product

8.2 DATA DICTIONARY OF PRIVATE ATTRIBUTES

This product reserves private attribute values in the group 7005.

The private attributes added to created SOP instances or directory records are listed in the following table;

Table 8.2-1
DATA DICTIONARY OF PRIVATE ATTRIBUTES

| Tag | Attribute Name | VR | VM |
|-------------|--|----|-----|
| (7005,00xx) | Private Creator Code | LO | 1 |
| (7005,xx00) | CT Private Data 1 | OB | 1-n |
| (7005,xx03) | Cardiac R-R Mean Time | SH | 1 |
| (7005,xx04) | Cardiac Reconstruction Gating Phase in Percent | SH | 1 |
| (7005,xx05) | Cardiac Reconstruction Gating Phase in ms | SH | 1 |
| (7005,xx06) | Cardiac Reconstruction Mode | SH | 1 |
| (7005,xx07) | Reconstruction Center | DS | 2 |
| (7005,xx08) | Detector Slice Thickness in mm | DS | 1 |
| (7005,xx09) | Number of Detector rows to Reconstruct | LO | 1 |
| (7005,xx0A) | Table Speed in mm/rot | DS | 1 |
| (7005,xx0B) | Filter | SH | 1 |
| (7005,xx0C) | Reconstruction Correction Type | SH | 1 |
| (7005,xx0E) | File Type Remarks | SH | 1 |
| (7005,xx0F) | Direction | SH | 1 |
| (7005,xx10) | CT Private Data 2 | OB | 1 |
| (7005,xx12) | Position | SH | 1 |
| (7005,xx13) | Expert Plan No. | US | 1 |
| (7005,xx14) | Reconstruction ROI No. | US | 1 |
| (7005,xx15) | Special Helical ACQ No. | US | 1 |
| (7005,xx1B) | Convolution Kernel for Series Record | SH | 1 |
| (7005,xx1C) | Contrast/Bolus Agent for Series Record | LO | 1 |
| (7005,xx1D) | Reconstruction Number | UL | 1 |
| (7005,xx21) | Decrease in Artifact Filter | LO | 1 |

NOTE: CT Private Data 1 (7005,xx00) or CT Private Data 2 (7005,xx10) may contain some patient information.

8.3 CONTROLLED TERMINOLOGY AND TEMPLATES

Not applicable to this product

8.4 GRAYSCALE IMAGE CONSISTENCY

Not applicable to this product

8.5 STANDARD EXTENDED/SPECIALIZED/PRIVATE SOP CLASSES

8.5.1 Standard Extended RT Plan Storage SOP Class

The RT Plan application is making the following extensions to RT Plan Storage SOP Class.

The following table is the Curve Module that is used to transfer of treatment field generated.

Table 8.5-1
Standard Extended RT Plan Storage SOP Class

| Attribute Name | Tag | VR | Attribute Description |
|---------------------------|-------------|----------------|--|
| Curve Dimensions | (50xx,0005) | US | Number of dimensions for these data. The dimensions may be any number from 1 to n. |
| Number of Points | (50xx,0010) | US | Number of data points in this Curve. |
| Type of Data | (50xx,0020) | CS | Type of data in this curve. |
| Data Value Representation | (50xx,0103) | US | Data representation of the curve data points. |
| Curve Data | (50xx,3000) | OW or OB | Curve Data. |
| Curve Description | (50xx,0022) | LO | User-defined comments about the Curve. |
| Axis Unit | (50xx,0030) | SH | Units of measure for the axes. |

8.6 PRIVATE TRANSFER SYNTAXES

Not applicable to this product