

DICOM Conformance Statement
for SONIALVISION G4
(DR-300 Rev01.05.xx or later)



NO TEXT

Overview:

This conformance statement details the compliance to DICOM of Digital Radiography DR-300 mounted in the SONIAL VISION G4 system.

Table below provides an overview of the network services supported by the DR-300.

NETWORK SERVICES

| SOP Classes | User of Services (SCU) | Provider of Services (SCP) |
|--|------------------------|----------------------------|
| Transfer | | |
| X-Ray Radiofluoroscopic Image Storage | Yes | No |
| X-Ray Angiographic Image Storage | Yes | No |
| Computed Radiography Image Storage | Yes | No |
| Digital X-Ray Image Storage - For Presentation | Yes | No |
| Digital X-Ray Image Storage - For Processing | Yes | No |
| X-Ray Radiation Dose SR Storage | Option (see Note 1) | No |
| Storage Commitment | Yes | No |
| Workflow Management | | |
| Modality Worklist Information Model – FIND | Option (see Note 1) | No |
| Modality Performed Procedure Step | Option (see Note 1) | No |
| Print Management | | |
| Basic Grayscale Print Management Meta | Yes | No |
| Basic Film Session | Yes | No |
| Basic Film Box | Yes | No |
| Basic Grayscale Image Box | Yes | No |
| Printer | Yes | No |
| Print Job | Yes | No |
| Verification | | |
| Verification | Yes | Yes |

Note

1. Support for these functions are separately licensable option each.

Table below provides an overview of the Media Storage Application Profiles supported by the DR-300.

MEDIA SERVICES

| Media Storage Application Profile | Write Files (FSC or FSU) | Read Files (FSR) |
|--|---------------------------------|-------------------------|
| DVD | | |
| General Purpose CD-R | Yes | No |

Notice

- All copyrights regarding this document are property of Shimadzu Corporation. Neither all nor part of these contents shall be reproduced or duplicated without the express permission of Shimadzu Corporation.
- Content of this document may be changed for improvement without notice. Although every possible effort has been made to avoid errors while creating this document, immediate revision may not be possible in the event the errors or missing information are detected.
- SONIALVISION is a registered trademark of Shimadzu Corporation.
- Other company names and product names mentioned in this document are trademarks or registered trademarks of their respective companies.
- TM and ® marks are omitted in this document.

TABLE OF CONTENTS:

| | |
|--|-----------|
| 1. INTRODUCTION | 6 |
| 1.1. REVISION HISTORY | 6 |
| 1.2. AUDIENCE | 7 |
| 1.3. REMARKS | 7 |
| 1.4. TERMS AND DEFINITIONS | 7 |
| 1.5. BASICS OF DICOM COMMUNICATION | 9 |
| 1.6. ABBREVIATIONS | 10 |
| 1.7. REFERENCES | 10 |
| 2. NETWORKING | 11 |
| 2.1. IMPLEMENTATION MODEL | 11 |
| 2.1.1. Application Data Flow | 11 |
| 2.1.2. Functional Definitions of AE's | 13 |
| 2.1.3. Sequencing of Real-World Activities | 14 |
| 2.2. AE SPECIFICATIONS | 15 |
| 2.2.1. Storage Application Entity Specification | 15 |
| 2.2.2. Workflow Application Entity Specification | 25 |
| 2.2.3. Hardcopy Application Entity Specification | 40 |
| 2.2.4. Verification Application Entity Specification | 51 |
| 2.3. NETWORK INTERFACES | 54 |
| 2.3.1. Physical Network Interface | 54 |
| 2.3.2. IPv4 and IPv6 Support | 54 |
| 2.4. CONFIGURATION | 55 |
| 2.4.1. AE Title/Presentation Address Mapping | 55 |
| 2.4.2. Parameters | 56 |
| 3. MEDIA INTERCHANGE | 57 |
| 3.1. IMPLEMENTATION MODEL | 57 |
| 3.1.1. Application Data Flow | 57 |
| 3.1.2. Functional Definition of AE's | 57 |
| 3.1.3. Sequencing of Real-World Activities | 57 |
| 3.1.4. File Meta Information Options | 57 |
| 3.2. AE SPECIFICATIONS | 58 |
| 3.2.1. Offline-Media Application Entity Specification | 58 |
| 3.3. AUGMENTED AND PRIVATE APPLICATION PROFILES | 59 |
| 3.4. MEDIA CONFIGURATION | 59 |
| 4. SUPPORT OF CHARACTER SETS | 60 |
| 5. SECURITY | 60 |
| 6. ANNEXES | 61 |
| 6.1. IOD CONTENTS | 61 |
| 6.1.1. Created SOP Instances | 61 |
| 6.1.2. Used Fields in received IOD by application | 96 |
| 6.1.3. Attribute mapping | 97 |
| 6.1.4. Coerced/Modified Fields | 98 |
| 6.2. DATA DICTIONARY OF PRIVATE ATTRIBUTES | 99 |
| 6.3. CODED TERMINOLOGY AND TEMPLATES | 99 |
| 6.4. GRAYSCALE IMAGE CONSISTENCY | 99 |
| 6.5. STANDARD EXTENDED/SPECIALIZED/PRIVATE SOP CLASSES | 99 |
| 6.6. PRIVATE TRANSFER SYNTAXES | 99 |

1. INTRODUCTION

1.1. REVISION HISTORY

| Revision | Date | Description |
|---------------|---------|--|
| First Edition | 2012/11 | New Release |
| A | 2013/06 | Add CR and DX modalities for Storage Application Entity Correction of errors in Table 2.2-21 Delete (0018,1030)[Protocol Name] and (0020,000E)[Series Ins. UID] which are wrongly described in Exposure Dose Sequence. Add following attributes for MPPS in Table 2.2-21 (0040,0302)[Entrance Dose] (0040,8302)[Entrance Dose in mGy] Add explanation to the following attribute in Table 2.2-21 (0040,030E)[Exposure Dose Sequence] Add [Note 1] – [Note 4] in Table 6.1-34 |
| B | 2013/11 | Correction of typo and error Change URL in [1.7. REFERENCES] Add [Attribute Description] to Private Attributes in Table 6.2-1 |
| C | 2014/10 | Correction of typo |
| D | 2015/04 | Add RDSR for Storage Application Entity Add Storage Commitment Service |
| E | 2017/06 | Add Verification Service |
| | | |

1.2. AUDIENCE

This document is written for the people that need to understand how the DR-300 will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product.

This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

1.3. REMARKS

The scope of this DICOM Conformance Statement is to facilitate integration between the DR-300 and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

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

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

1.4. TERMS AND DEFINITIONS

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

Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class.

Examples : Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

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

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

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

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

Attribute – a unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

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

Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Module – a set of Attributes within an Information Object Definition that are logically related to each other.

Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

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

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

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

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

Service Class User (SCU) – role of an Application Entity that uses a DICOM network service; typically, a client.

Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

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

Service/Object Pair (SOP) Instance – an information object; a specific occurrence of information exchanged in a SOP Class.

Examples: a specific x-ray image.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element.

Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages.

Examples: JPEG compressed (images), little endian explicit value representation.

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

Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

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

1.5. BASICS OF DICOM COMMUNICATION

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

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

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

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

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

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

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

1.6. ABBREVIATIONS

| | |
|--------|---|
| AE | Application Entity |
| AET | Application Entity Title |
| CR | Computed Radiography |
| CT | Computed Tomography |
| DHCP | Dynamic Host Configuration Protocol |
| DICOM | Digital Imaging and Communications in Medicine |
| DNS | Domain Name System |
| DX | Digital X-ray |
| GSDF | Grayscale Standard Display Function |
| GRSP | Grayscale Softcopy Presentation State |
| HIS | Hospital Information System |
| IHE | Integrating the Healthcare Enterprise |
| IOD | Information Object Definition |
| Ipv4 | Internet Protocol version 4 |
| ISO | International Organization for Standardization |
| LDAP | Lightweight Directory Access Protocol |
| LUT | Look-up Table |
| MPPS | Modality Performed Procedure Step |
| MSPS | Modality Scheduled Procedure Step |
| MWL | Modality Worklist |
| NTP | Network Time Protocol |
| PACS | Picture Archiving and Communication System |
| PDU | Protocol Data Unit |
| RF | Radiofluoroscopy |
| RIS | Radiology Information System |
| SCP | Service Class Provider |
| SCU | Service Class User |
| SOP | Service-Object Pair |
| SPS | Scheduled Procedure Step |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| UL | Upper Layer |
| VM | Value Multiplicity |
| VR | Value Representation |

1.7. REFERENCES

- NEMA PS3 Digital Imaging and Communications in Medicine (DICOM) Standard, available free at <http://dicom.nema.org/>

2. NETWORKING

2.1. IMPLEMENTATION MODEL

2.1.1. Application Data Flow

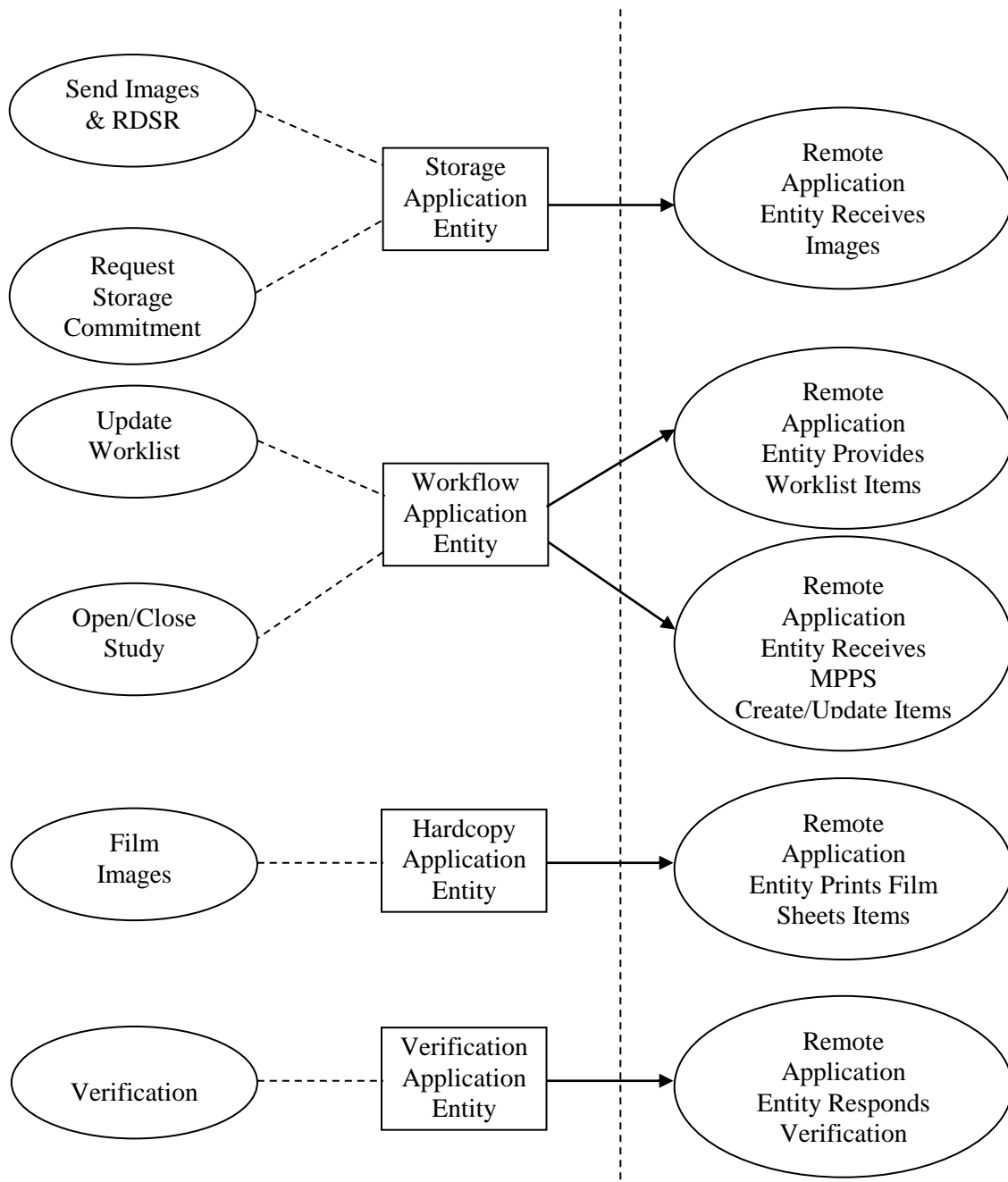


Figure 2.1-1
APPLICATION DATA FLOW DIAGRAM

The Storage Application Entity 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 each radiography/study or for specific images selected. When activated by user’s settings (auto-send), each marked set of images can be immediately stored to a preferred destination whenever next radiography is performed or a Patient/Study is closed by the user. If the remote AE is configured as Storage Commitment SCP, the Storage AE will request Storage Commitment after sending corresponding image and if a commitment is successfully obtained will record this information in the local database and display its indicator ‘C’ on its Image List.

The Workflow Application Entity receives Worklist information from and sends MPPS information to a remote AE. It is associated with the local real-world activities “Update Worklist” and “Open/Close Study”. When the “Update Worklist” local real-world activity is performed the Workflow Application Entity 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 or can be performed automatically at specific operation. When the “Open/Close Study” local real-world activity is performed the Worklist Application Entity creates and updates Modality Performed Procedure Step instances managed by a remote AE. Opening Study will result in automated creation of an MPPS Instance. Completion of the MPPS is performed as the result of an operator action.

The Hardcopy Application Entity prints images on a remote AE (Printer). It is associated with the real-world activity “Film Images”. “Film Images” creates a print-job within the print queue containing one or more virtual film sheets composed from images selected by the user.

The Verification Application Entity sends echo message to a remote AE. It is associated with the real world activity “ECHO” to verify the connectivity with remote AEs.

2.1.2. Functional Definitions of AE's

2.1.2.1. Functional Definition of Storage Application Entity

The existence of a send-job queue entry with associated network destination will activate the Storage 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 association cannot be opened, the related send-job is set to an error state and can be restarted by the user via job control interface. By default, the Storage AE will not try to initiate another association for this send-job automatically.

2.1.2.2. Functional Definition of Workflow Application Entity

Worklist Update attempts to download a Worklist from a remote node. If the Workflow AE establishes an Association to a remote AE, it will transfer all worklist items via the open Association. During receiving the worklist response items are counted and the query processing is canceled if the configurable limit of items is reached. The result will be displayed in a separate list, which can be cleared with the next Worklist Update based on the configuration.

The Workflow AE performs the creation of a MPPS Instance automatically whenever studies are started. Further updates on the MPPS data can be performed interactively from the related MPPS user interface. The MPPS “Complete” or “Discontinued” states can only be set from the user interface.

2.1.2.3. Functional Definition of Hardcopy Application Entity

The existence of a print-job in the print queue will activate the Hardcopy 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. Changes in printer status will be detected (e.g. out of film) and reported to the user. If the printer is not operating normally, the print-job will set to an error state and can be restarted by the user via the job control interface.

2.1.2.4. Functional Definition of VerificationApplication Entity

Service personnel can check the connectivity with remote AEs by using this function. An association is established with the server, and C-ECHO message is sent to the server. If the server responds normally, the result is displayed on the service tool. If the server doesn't respond normally, the result is displayed on the service tool so that service personnel can check the connectivity prior to use any other DICOM related functions.

2.1.3. Sequencing of Real-World Activities

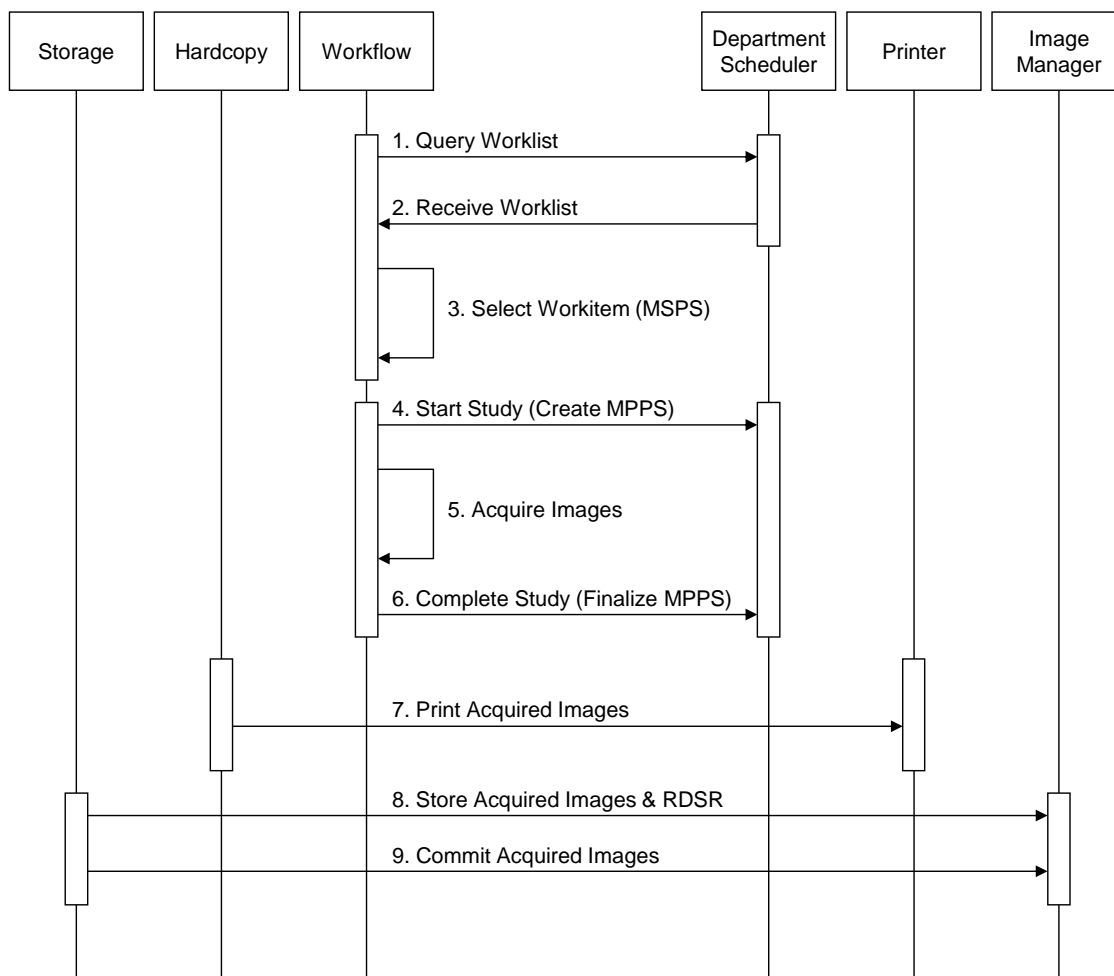


Figure 2.1-2 SEQUENCING CONSTRAINTS

Under normal scheduled workflow conditions the sequencing constraints illustrated in Figure 2-1-2 apply;

1. Query Worklist
2. Receive Worklist of Modality Scheduled Procedure Steps (MSPS)
3. Select Workitem (MSPS) from Worklist
4. Start Study and create MPPS
5. Acquire Images
6. Complete Study and finalize MPPS
7. Print acquired images (optional step)
8. Store acquired images and associated RDSR
9. If the Image Manager is configured as Storage Commitment SCP, the Storage AE will request Storage Commitment for the images.

Other workflow situations (e.g. unscheduled procedure steps) will have other sequencing constraints. Printing could equally take place after the acquired images have been stored. Printing could be omitted completely if no printer is connected or hardcopies are not required.

2.2. AE SPECIFICATIONS

2.2.1. Storage Application Entity Specification

2.2.1.1. SOP Classes

The DR-300 provides Standard Conformance to the following SOP Classes:

Table 2.2-1
SOP CLASSES FOR AE STORAGE

| SOP Class Name | SOP Class UID | SCU | SCP |
|--|-------------------------------|-----|-----|
| X-Ray Radiofluoroscopic Image Storage | 1.2.840.10008.5.1.4.1.1.12.2 | Yes | No |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 | Yes | No |
| Digital X-Ray Image Storage - For Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | Yes | No |
| Digital X-Ray Image Storage - For Processing | 1.2.840.10008.5.1.4.1.1.1.1.1 | Yes | No |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | Yes | No |
| X-Ray Radiation Dose SR Storage | 1.2.840.10008.5.1.4.1.1.88.67 | Yes | No |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1.1 | Yes | No |

2.2.1.2. Association Policies

2.2.1.2.1. General

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

Table 2.2-2
DICOM APPLICATION CONTEXT FOR AE STORAGE

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

2.2.1.2.2. Number of Associations

The DR-300 initiates one Association at a time for each destination to which a transfer request is being processed in the active job queue list. Only one job will be active at a time, the other remains pending until the active job is completed or failed.

Table 2.2-3
NUMBER OF ASSOCIATIONS INITIATED FOR AE STORAGE

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

2.2.1.2.3. Asynchronous Nature

The DR-300 does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 2.2-4

ASYNCHRONOUS NATURE AS A SCU FOR AE STORAGE

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

2.2.1.2.4. Implementation Identifying Information

The implementation information for this Application Entity is:

Table 2.2-5

DICOM IMPLEMENTATION CLASS AND VERSION FOR AE STORAGE

| | |
|-----------------------------|--------------------------------------|
| Implementation Class UID | 1.2.392.200036.9110.1.0.6711.2001002 |
| Implementation Version Name | SPF XX (XX : version number) |

2.2.1.3. Association Initiation Policy

2.2.1.3.1. Activity – Send Images

2.2.1.3.1.1. Description and Sequencing of Activities

A user can select images and request them to be sent to multiple destinations. Each request is forwarded to the job queue and processed individually. When the “Auto-send” option is active, each marked instance or marked set of instances stored in database will be forwarded to the network job queue for a pre-configured auto-send target destination. It can be configured which instances will be automatically marked and the destination where the instances are automatically sent to. The “Auto-send” is triggered by the next acquisition.

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

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

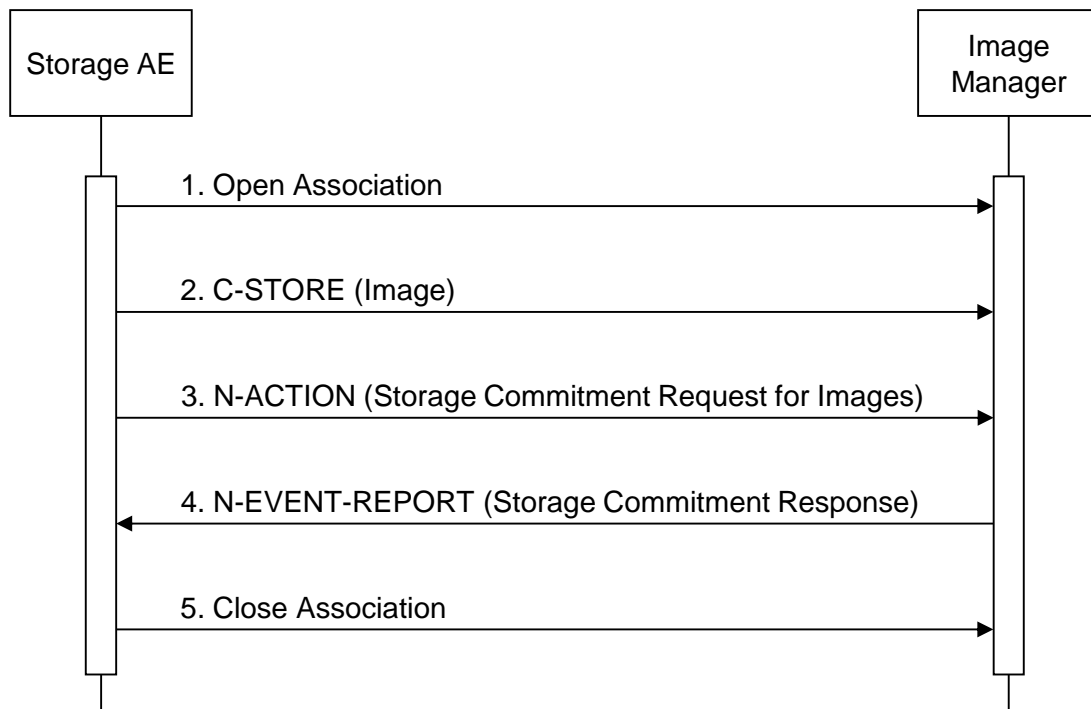


Figure 2.2-1 SEQUENCE OF ACTIVITY – SEND IMAGES

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

1. The Storage AE opens an association with the Image Manager
 2. An acquired image is transmitted to the Image Manager using a C-STORE request and the Image Manager replies with a C-STORE response (status success).
 3. An N-ACTION request is transmitted to the Image Manager to obtain commitment of image. The Image Manager replies with an N-ACTION response indicating the request has been received and is being processed.
 4. The Image Manager transmits an N-EVENT-REPORT request notifying the Storage AE of the status of the Storage Commitment Request (sent in step3 using the N-ACTION message). The Storage AE replies with an N-EVENT-REPORT response confirming receipt.
 5. The Storage AE closes the association with the Image Manager.
- Above sequence will be repeated everytime when an image is acquired.

NOTE: Many other message sequences are possible depending on the number of images to be stored.

2.2.1.3.1.2. Proposed Presentation Contexts

The DR-300 is capable of proposing the Presentation Contexts shown in the following table:

Table 2.2-6

PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY SEND IMAGES

| Presentation Context Table | | | | | |
|---|-------------------------------|--|---|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name | UID | | |
| X-Ray Radio Fluoroscopic Image Storage | 1.2.840.10008.5.1.4.1.1.12.2 | Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 | SCU | None |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 | Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 | SCU | None |
| Digital X-Ray Image Storage - For Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 | SCU | None |
| Digital X-Ray Image Storage - For Processing | 1.2.840.10008.5.1.4.1.1.1.1.1 | Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 | SCU | None |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 | SCU | None |
| X-Ray Radiation Dose SR Storage | 1.2.840.10008.5.1.4.1.1.88.67 | Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 | SCU | None |
| Storage Commitment Push Model | 1.2.840.10008.1.2.0.1.1 | Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 | SCU | None |

Presentation Contexts for each Image Storage will only be proposed if the Send Job contains instances for these SOP Classes.

2.2.1.3.1.3. SOP Specific Conformance Image Storage SOP Classes

All Image Storage SOP Classes supported by the Storage AE exhibit the same behaviour, except where stated, and are described together in this section.

Table 2.2-7
STORAGE C-STORE RESPONSE STATUS HANDLING BEHAVIOUR

| Service Status | Further Meaning | Error Code | Behaviour |
|-----------------------|-----------------------------------|------------------------|--|
| 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 | A700-A7FF | The Association is released using A-RELEASE 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 | A900-A9FF | The Association is released using A-RELEASE 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 | C000-CFFF | The Association is released using A-RELEASE 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 but the status meaning is logged. |
| Warning | Elements Discarded | B006 | Image transmission is considered successful but the status meaning is logged. |
| Warning | Data Set does not match SOP Class | B007 | Image transmission is considered successful. The status meaning is logged and the job warning is reported to the user via the job control application. |
| * | * | Any other status code. | The Association is released using A-RELEASE 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 behaviour of Storage AE during communication failure is summarized in the Table below:

Table 2.2-8
STORAGE COMMUNICATION FAILURE BEHAVIOUR

| Exception | Behaviour |
|--|---|
| Timeout | The Association is released using A-RELEASE 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. |

A failed send job can be restarted by user interaction.

The contents of each Image Storage SOP Instances created by the DR-300 conform to the DICOM Image IOD definition and are described in Annex A of this document.

2.2.1.3.1.4. SOP Specific Conformance for Storage Commitment SOP Classes

2.2.1.3.1.4.1. Storage Commitment Operations (N-ACTION)

The Storage AE will request Storage Commitment for instances of any Image Storage SOP Class, if the Remote AE is configured as Storage Commitment SCP.

The Storage AE will consider Storage Commitment failed if no N-EVENT-REPORT is received for a Transaction UID within a configurable time period after receiving a successful N-ACTION response (duration of applicability for a Transaction UID).

The Storage AE does not send the optional Storage Media FileSetID & UID Attributes or the Referenced Study Component Sequence Attributes in the N-ACTION.

The behaviour of Storage AE when encountering status codes in an N-ACTION response is summarized in the Table below:

Table 2.2-9
STORAGE C-STORE RESPONSE STATUS HANDLING BEHAVIOUR

| Service Status | Further Meaning | Error Code | Behaviour |
|-----------------------|------------------------|------------------------|--|
| Success | Success | 0000 | The request for Storage Commitment is considered successfully sent. A timer is started that 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 released using A-RELEASE and the storage commitment 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 behaviour of Storage AE during communication failure is summarized in the Table below:

Table 2.2-10
STORAGE COMMITMENT COMMUNICATION FAILURE BEHAVIOUR

| Exception | Behaviour |
|--|---|
| Timeout | The Association is released using A-RELEASE 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. |

2.2.1.3.1.4.2. Storage Commitment Notifications (N-EVENT-REPORT)

The Storage AE is capable of receiving an N-EVENT-REPORT notification if it has successfully negotiated a Presentation Context for the Storage Commitment Push Model.

Upon receipt of an N-EVENT-REPORT the timer associated with the Transaction UID will be canceled.

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

Table 2.2-11
STORAGE COMMITMENT N-EVENT-REPORT BEHAVIOUR

| Event Type Name | Event Type ID | Behaviour |
|--|---------------|---|
| Storage Commitment Request Successful | 1 | The Referenced SOP Instances under Referenced SOP Sequence (0008,1199) are marked within the database as “Committed (C)”. |
| Storage Commitment Request Complete – Failures Exist | 2 | The Referenced SOP Instances under Referenced SOP Sequence (0008,1199) are not marked within the database as “Committed (C)”. |

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

Table 2.2-12
STORAGE COMMITMENT N-EVENT-REPORT RESPONSE STATUS REASONS

| Service Status | Further Meaning | Error Code | Reasons |
|----------------|-----------------|------------------------|--|
| Success | Success | 0000 | The Storage Commitment result has been successfully received. |
| * | * | Any other status code. | The Association is released using A-RELEASE and the storage commitment job is marked as failed. The status code is logged and the job failure is reported to the user via the job control application. |

2.2.1.4. Association Acceptance Policy

2.2.1.4.1. Activity – Receive Storage Commitment Response

2.2.1.4.1.1. Description and Sequencing of Activities

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

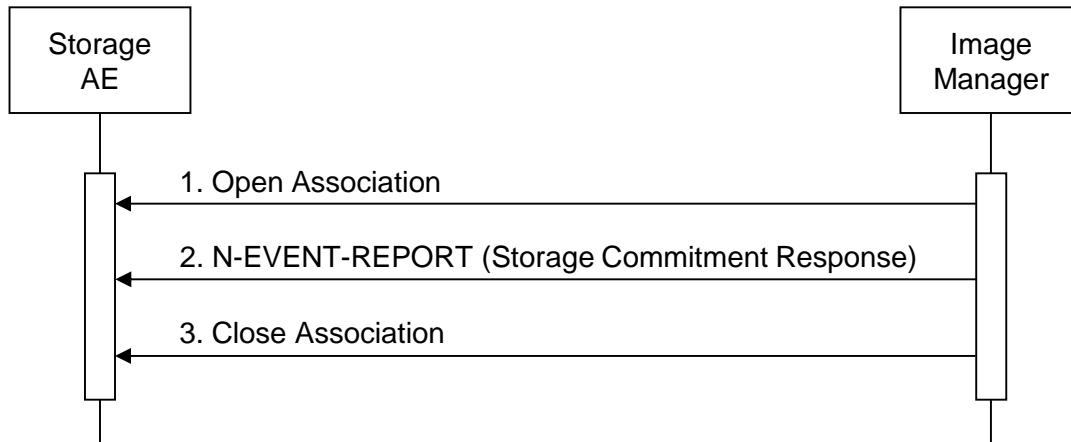


Figure 2.2-2 SEQUENCE OF ACTIVITY – RECEIVE STORAGE COMMITMENT RESPONSE

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

1. The Image Manager opens a new association with the Storage AE.
2. The Image Manager sends an N-EVENT-REPORT request notifying the Storage AE of the status of a previous Storage Commitment Request. The Storage AE replies within an N-EVENT-REPORT response confirming receipt.
3. The Image Manager closes the association with the Storage AE.

2.2.1.4.1.2. Accepted Presentation Contexts

The DR-300 will accept Presentation Contexts as shown in the Table below.

Table 2.2-13

ACCEPTABLE PRESENTATION CONTEXTS FOR ACTIVITY RECEIVE STORAGE COMMITMENT RESPONSE

| Presentation Context Table | | | | | |
|----------------------------------|----------------------------|---------------------------|---------------------|------|--------------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name | UID | | |
| Storage Commitment Push Model | 1.2.840.10008.1.2 0.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

The Storage AE will prefer to select the Explicit VR Little Endian Transfer Syntax if multiple transfer syntaxes are offered. The Storage AE will only accept the SCU role (which must be proposed via SCP/SCU Role Selection Negotiation) within a Presentation Context for the Storage Commitment Push Model SOP Class.

2.2.1.4.1.3. SOP Specific Conformance for Storage Commitment SOP Classes

2.2.1.4.1.3.1. Storage Commitment Notifications (N-EVENT-REPORT)

Under receipt of an N-EVENT-REPORT the timer associated with the Transaction UID will be canceled.

The behavior of Storage AE when receiving Event Types within the N-EVENT-REPORT is summarized in the Table 2.2-11.

2.2.2. Workflow Application Entity Specification

2.2.2.1. SOP Classes

The DR-300 provides Standard Conformance to the following SOP Classes:

Table 2.2-14

SOP CLASSES SUPPORTED FOR AE WORKFLOW

| SOP Class Name | SOP Class UID | SCU | SCP |
|--|-------------------------|------------|------------|
| Modality Worklist Information Model - FIND | 1.2.840.10008.5.1.4.3.1 | Yes | No |
| Modality Performed Procedure Step | 1.2.840.10008.3.1.2.3.3 | Yes | No |

2.2.2.2. Association Policies

2.2.2.2.1. General

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

Table 2.2-15

DICOM APPLICATION CONTEXT FOR AE WORKFLOW

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

2.2.2.2.2. Number of Associations

The DR-300 initiates one Association at a time for Worklist request.

Table 2.2-16

NUMBER OF ASSOCIATIONS INITIATED FOR AE WORKFLOW

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

2.2.2.2.3. Asynchronous Nature

The DR-300 does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 2.2-17

ASYNCHRONOUS NATURE AS A SCU FOR AE WORKFLOW

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

2.2.2.2.4. Implementation Identifying Information

The implementation information for this Application Entity is:

Table 2.2-18

DICOM IMPLEMENTATION CLASS AND VERSION FOR AE WORKFLOW

| | |
|-----------------------------|--------------------------------------|
| Implementation Class UID | 1.2.392.200036.9110.1.0.6711.2001002 |
| Implementation Version Name | SPF XX (XX : version number) |

2.2.2.3. Association Initiation Policy

2.2.2.3.1. Activity – Worklist Update

2.2.2.3.1.1. Description and Sequencing of Activities

The request for a Worklist Update is initiated by user interaction, i.e. pressing the buttons “Update” / ”Query” or automatically triggered by specific operation. With “Update” the automated query mechanism is performed immediately on request, while with “Query” a dialog to enter search criteria is opened an interactive query can be performed.

The interactive Patient Worklist Query will display a dialog for entering data as search criteria. When the Query is started on user request, only the data from the dialog will be inserted as matching keys into the query.

Upon initiation of the request, the DR-300 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 DR-300 will access the local database to add or update patient demographic data. To protect the system from overflow, the DR-300 will limit the number of processed worklist responses to a configurable maximum. During receiving the worklist response items are counted and the query processing is canceled by issuing a C-FIND-CANCEL if the configurable limit of items is reached.

The DR-300 will initiate an Association in order to issue a C-FIND request according to the Modality Worklist Information Model.

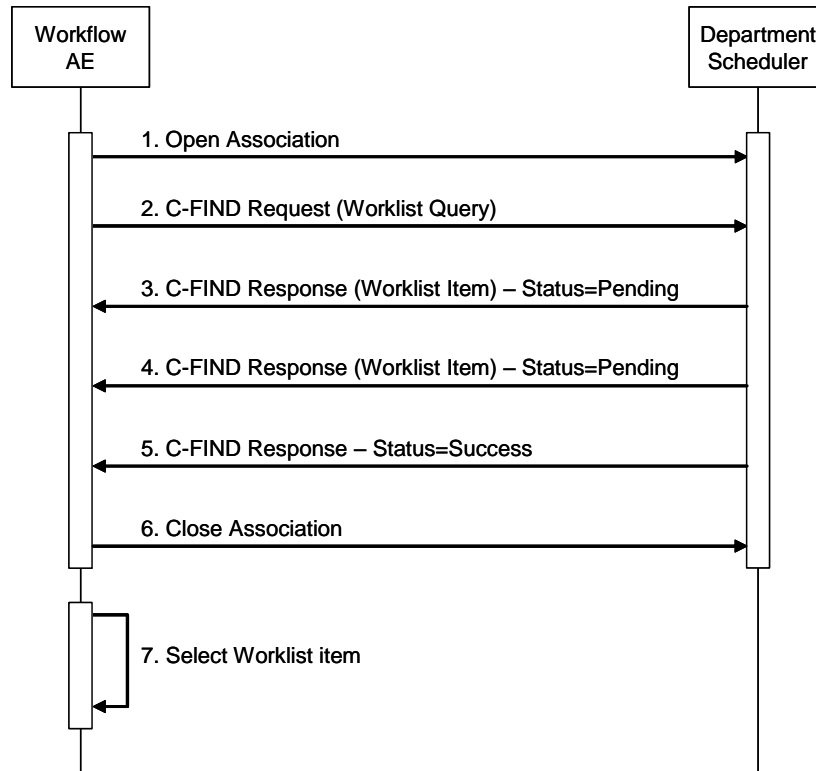


Figure 2.2-3 SEQUENCE OF ACTIVITY – WORKLIST UPDATE

A possible sequence of interactions between the Workflow 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 Figure above:

1. The Worklist AE opens an association with the Department Scheduler.
2. The Worklist 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 Worklist AE closes the association with the Department Scheduler.
7. The user selects a Worklist Item from the Worklist and prepares to acquire new images.

2.2.2.3.1.2. Proposed Presentation Contexts

The DR-300 will propose Presentation Contexts as shown in the following table:

Table 2.2-19

PROPOSED PRESENTATION CONTEXTS FOR WORKLIST UPDATE

| Presentation Context Table | | | | | |
|--|------------------------|---------------------------|---------------------|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name | UID | | |
| 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 |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

2.2.2.3.1.3. SOP Specific Conformance for Modality Worklist

The behaviour of the DR-300 when encountering status codes in a Modality Worklist C-FIND response is summarized in the Table below. If any other SCP response status than “Success” or “Pending” is received by the DR-300, an error message will appear on the user interface.

Table 2.2-20

MODALITY WORKLIST C-FIND RESPONSE STATUS HANDLING BEHAVIOUR

| Service Status | Further Meaning | Error Code | Behaviour |
|----------------|-------------------------------------|------------|---|
| 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 released using A-RELEASE 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 released using A-RELEASE 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 | C000-CFFF | The Association is released using A-RELEASE 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. |

| Service Status | Further Meaning | Error Code | Behaviour |
|-----------------------|--|------------------------|---|
| 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 released using A-RELEASE 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 released using A-RELEASE 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 behaviour of the DR-300 during communication failure is summarized in the Table below.

Table 2.2-21
MODALITY WORKLIST COMMUNICATION FAILURE BEHAVIOUR

| Exception | Behaviour |
|--|--|
| Timeout | The Association is released using A-RELEASE 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 DR-300 Worklist Request Identifier and specifies the attributes that are copied into the images. Unexpected attributes returned in a C-FIND response are ignored.

Requested return attributes not supported by the SCP are set to have no value. Non-matching responses returned by the SCP due to unsupported optional matching keys are ignored.

Table 2.2-22
WORKLIST REQUEST IDENTIFIER

| Module Name Attribute Name | Tag | VR | M | R | Q | D | IOD |
|---|-------------|----|----|---|---|---|-----|
| SOP Common | | | | | | | |
| Specific Character Set | (0008,0005) | CS | S | | | | |
| Scheduled Procedure Step | | | | | | | |
| Scheduled Procedure Step Sequence | (0040,0100) | SQ | | x | | | |
| > Modality | (0008,0060) | CS | S | | x | | |
| > Requested Contrast Agent | (0032,1070) | LO | | | | | |
| > Scheduled Station AE Title | (0040,0001) | AE | S | x | x | | |
| > Scheduled Procedure Step Start Date | (0040,0002) | DA | R | | x | x | |
| > Scheduled Procedure Step Start Time | (0040,0003) | TM | R | | x | x | |
| > Scheduled Performing Physician's Name | (0040,0006) | PN | | x | | | |
| > Scheduled Procedure Step Description | (0040,0007) | LO | | x | | | |
| > Scheduled Protocol Code Sequence | (0040,0008) | SQ | | x | | | |
| > Code Value | (0008,0100) | CS | | x | | | |
| > Coding Scheme Designator | (0008,0102) | SH | | x | | | |
| > Coding Scheme Version | (0008,0103) | SH | | x | | | |
| > Code Meaning | (0008,0104) | LO | | x | | | |
| > Scheduled Procedure Step ID | (0040,0009) | SH | | x | | | |
| > Scheduled Station Name | (0040,0010) | SH | | x | | | |
| Requested Procedure | | | | | | | |
| Referenced Study Sequence | (0008,1110) | SQ | | x | | | |
| > Referenced SOP Class UID | (0008,1150) | UI | | x | | | |
| > Referenced SOP Instance UID | (0008,1155) | UI | | x | | | |
| Study Instance UID | (0020,000D) | UI | | x | | | |
| Requested Procedure Description | (0032,1060) | LO | | x | | | |
| Requested Procedure Code Sequence | (0032,1064) | SQ | | x | | | |
| > Code Value | (0008,0100) | CS | | x | | | |
| > Coding Scheme Designator | (0008,0102) | SH | | x | | | |
| > Coding Scheme Version | (0008,0103) | SH | | x | | | |
| > Code Meaning | (0008,0104) | LO | | x | | | |
| Requested Procedure ID | (0040,1001) | SH | S* | x | x | | |

| Module Name Attribute Name | Tag | VR | M | R | Q | D | IOD |
|-------------------------------|-------------|----|----|---|---|---|-----|
| Imaging Service Request | | | | | | | |
| Accession Number | (0008,0050) | SH | S* | x | x | x | |
| Referring Physician's Name | (0008,0090) | PN | | x | | | |
| Requesting Physician | (0032,1032) | PN | | x | | | |
| Patient Identification | | | | | | | |
| Patient Name | (0010,0010) | PN | S* | x | x | x | |
| Patient ID | (0010,0020) | LO | S* | x | x | x | |
| Patient Demographic | | | | | | | |
| Patient's Birth Date | (0010,0030) | DA | | x | | x | |
| Patient's Sex | (0010,0040) | CS | | x | | x | |
| Patient's Age | (0010,1010) | AS | | | | x | |
| Patient's Size | (0010,1020) | DS | | x | | x | |
| Patient's Weight | (0010,1030) | DS | | x | | x | |
| Patient Medical | | | | | | | |
| Medical Alerts | (0010,2000) | LO | | x | | x | |
| Special Needs | (0038,0050) | LO | | x | | 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 a DR-300 Worklist Request Identifier.

Tag: DICOM tag for this attribute.

VR: DICOM VR for this attribute.

M: Matching keys for Worklist Update. An "S" will indicate that the DR-300 will supply an attribute value for Single Value Matching, a "R" will indicate Range Matching and a "*" will denote wildcard matching.

R: Return keys. An "x" will indicate that the DR-300 will supply this attribute as Return Key with zero length for Universal Matching.

Q: Interactive Query Key. An "x" will indicate that the DR-300 will supply this attribute as matching key, if entered in the Query Patient Worklist dialog. For example, the Patient Name can be entered thereby restricting Worklist responses to Procedure Steps scheduled for the patient.

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.

IOD: An "x" indicates that this Worklist attribute is included into all Object Instances created during performance of the related Procedure Step.

2.2.2.3.2. Activity – Acquire Images

2.2.2.3.2.1. Description and Sequencing of Activities

After Patient registration, the DR-300 is awaiting starting study of the patient. The trigger to create a MPPS SOP Instance is derived from this event. An Association to the configured MPPS SCP system is established immediately and the related MPPS SOP Instance will be created.

The DR-300 will set its status as “DISCONTINUED” when closing the study without any X-Ray exposure during the study. Otherwise, the status will be set as “COMPLETED”. A MPPS Instance that has been sent with a state of “COMPLETED” or “DISCONTINUED” can no longer be updated.

The DR-300 will support creation of “unscheduled cases” by allowing MPPS Instances to be communicated for locally registered Patients.

The DR-300 will initiate an Association to issue an:

- N-CREATE request according to the CREATE Modality Performed Procedure Step SOP Instance operation.
- N-SET request to update the contents and state of the MPPS according to the SET Modality Performed Procedure Step Information operation.

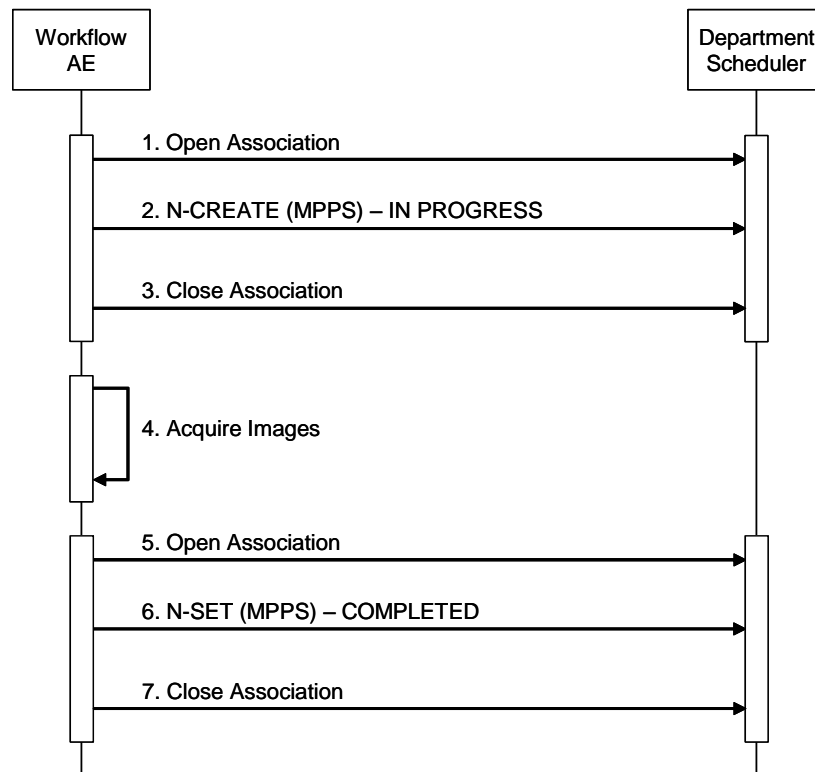


Figure 2.2-4 SEQUENCE OF ACTIVITY – ACQUIRE IMAGES

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

1. The Worklist AE opens an association with the Department Scheduler.
2. The Worklist 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 Worklist AE closes the association with the Department Scheduler.
4. All images are acquired and stored in the local database.
5. The Worklist AE opens an association with the Department Scheduler.
6. The Worklist 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 an N-SET response (status success).
7. The Worklist AE closes the association with the Department Scheduler.

2.2.2.3.2.2. Proposed Presentation Contexts

The DR-300 will propose Presentation Contexts as shown in the following table:

Table 2.2-23

PROPOSED PRESENTATION CONTEXTS FOR REAL-WORLD ACTIVITY ACQUIRE IMAGES

| Presentation Context Table | | | | | |
|----------------------------|-------------------|---------------------------|---------------------|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name | UID | | |
| Modality Performed | 1.2.840.10008.3.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| Procedure Step | .2.3.3 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

2.2.2.3.2.3. SOP Specific Conformance for MPPS

The behaviour of the DR-300 when encountering status codes in an MPPS N-CREATE or N-SET response is summarized in the Table below. If any other SCP response status than “Success” or “Warning” is received by the DR-300, an error message will appear on the user interface.

Table 2.2-24

MPPS N-CREATE / N-SET RESPONSE STATUS HANDLING BEHAVIOUR

| Service Status | Further Meaning | Error Code | Behaviour |
|----------------|---|------------------------|---|
| Success | Success | 0000 | The SCP has completed the operation successfully. |
| Failed | Processing Failure – Performed Procedure Step Object may no longer be updated | 0110 | The Association is released using A-RELEASE 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. |
| Warning | Attribute Value Out of Range | 0116 | The MPPS operation is considered successful but the status meaning is logged. Additional information in the Response identifying the attributes out of range will be logged. |
| * | * | Any other status code. | The Association is released using A-RELEASE and the MPPS is marked as failed. The status meaning is logged and reported to the user. |

The behaviour of the DR-300 during communication failure is summarized in the Table below.

Table 2.2-25
MODALITY WORKLIST COMMUNICATION FAILURE BEHAVIOUR

| Exception | Behaviour |
|--|--|
| Timeout | The Association is released using A-RELEASE and the 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 following Table provides a description of the MPPS N-CREATE and N-SET request identifiers sent by the DR-300. 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 2.2-26
MPPS N-CREATE / N-SET REQUEST IDENTIFIER

| Attribute Name | Tag | VR | N-CREATE | N-SET |
|----------------------------|-------------|----|---|-------|
| Specific Character Set | (0008,0005) | CS | In Japanese Mode: “\ISO 2022 IR 87\ISO 2022 IR 159” or “\ISO 2022 IR 87” or the value received from MWL In English Mode: “ISO_IR 100” or the value received from MWL | |
| Modality | (0008,0060) | CS | “RF”, “XA”, “DX”, “CR” Note: This is determined by the Procedure which is used in the Study. | |
| Procedure Code Sequence | (0008,1032) | SQ | From Modality Worklist | |
| > Code Value | (0008,0100) | SH | From Modality Worklist | |
| > Coding Scheme Designator | (0008,0102) | SH | From Modality Worklist | |
| > Coding Scheme Version | (0008,0103) | SH | From Modality Worklist | |
| > Code Meaning | (0008,0104) | LO | From Modality Worklist | |

| Attribute Name | Tag | VR | N-CREATE | N-SET |
|---|-------------|-----------|--|--------------------------------|
| Referenced Patient Sequence | (0008,1120) | SQ | Zero length | |
| Patient's Name | (0010,0010) | PN | From Modality Worklist or user input (3 component groups with 5 components) | |
| 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 | |
| Distance Source to Detector (SID) | (0018,1110) | DS | Zero length | Actual SID |
| Image and Fluoroscopy Area Dose Product | (0018,115E) | DS | Zero length | Total DAP |
| Study ID | (0020,0010) | SH | Auto input | |
| Performed Station AE Title | (0040,0241) | AE | MPPS AE Title from configuration | |
| 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 End Date | (0040,0250) | DA | Zero length | Actual end date |
| Performed Procedure Step End Time | (0040,0251) | TM | Zero length | Actual end time |
| Performed Procedure Step Status | (0040,0252) | CS | "IN PROGRESS" | "DISCONTINUED" or, "COMPLETED" |
| Performed Procedure Step ID | (0040,0253) | SH | From Modality Worklist or from configuration | |
| Performed Procedure Step Description | (0040,0254) | LO | From Modality Worklist | |
| Performed Procedure Type Description | (0040,0255) | LO | Zero length | |

| Attribute Name | Tag | VR | N-CREATE | N-SET |
|--|--------------|----|---|---------------------------|
| Performed Protocol Code Sequence | (0040,0260) | SQ | Zero length | Zero or more items |
| > Code Value | (0008,0100) | SH | | From Modality Worklist |
| > Coding Scheme Designator | (0008,0102) | SH | | From Modality Worklist |
| > Coding Scheme Version | (0008,0103) | SH | | From Modality Worklist |
| > Code Meaning | (0008,0104) | LO | | From Modality Worklist |
| Scheduled Step Attributes Sequence | (0040,0270) | SQ | If 1st dose applied results in an Instance | |
| > Accession Number | (0008,0050) | SH | From Modality Worklist or user input | |
| > Referenced Study Sequence | (0008,1110) | SQ | Zero length | |
| > Study Instance UID | (0020,000D) | UI | From Modality Worklist or generated by device | |
| > Requested Procedure Description | (0032,1060) | LO | From Modality Worklist | |
| > Scheduled Procedure Step Description | (0040,0007) | LO | From Modality Worklist | |
| > Scheduled Protocol Code Sequence | (0040,0008) | SQ | From Modality Worklist | |
| >> Code Value | (0008,0100) | SH | From Modality Worklist | |
| >> Coding Scheme Designator | (0008,0102) | SH | From Modality Worklist | |
| >> Coding Scheme Version | (0008,0103) | SH | From Modality Worklist | |
| >> Code Meaning | (0008,0104) | LO | From Modality Worklist | |
| > Scheduled Procedure Step ID | (0040,0009) | SH | From Modality Worklist | |
| > Requested Procedure ID | (0040,1001) | SH | From Modality Worklist | |
| Total Time of Fluoroscopy | (0040,0300) | US | Zero length | Total time of Fluoroscopy |

| Attribute Name | Tag | VR | N-CREATE | N-SET |
|-----------------------------------|------------------|----|-------------|--|
| Total Number of Exposures | (0040,0301) | US | Zero length | Number of exposures. In case of SDA-SPOT acquisition, number of each exposure will be counted, and its combined image is not counted. Number of Fluoroscopy is not included. |
| Entrance Dose | (0040,0302) | US | | Total Entrance Dose (Air Kerma) |
| Distance Source to Entrance (SOD) | (0040,0306) | DS | Zero length | Actual SOD |
| Exposure Dose Sequence | (0040,030E) | SQ | Zero length | Contain Total Number of Exposure (0040, 0301) items plus an item for the last fluoroscopy episode in that study. In case of SDA, each radiography will be counted as an independent Exposure. |
| > KVP | (0018,0060) | DS | | Actual KV |
| > Exposure Time | (0018,1150) | IS | | Actual Exposure Time |
| > Radiation Mode | (0018,115A)) | CS | | Radiography : “PULSED” Fluoroscopy : “CONTINUOUS” |
| > X-Ray Tube Current in micro A | (0018,8151) | DS | | Actual X-Ray Tube Current in micro A |
| > Filter Type | (0018,1160) | CS | | Filter is being inserted : “STRIP” Filter is not inserted : “NONE” |
| > Filter Material | (0018,7050) | CS | | Actual Filter Material being inserted |
| Film Consumption Sequence | (0040,0321) | SQ | Zero length | Zero or more items |
| > Film Size ID | (2010,0050) | CS | | Actual Film Size being printed during the study |
| > Number of Films | (2100,0170) | IS | | Actual Number of Films being printed during the study |
| Performed Series Sequence | (0040,0340) | SQ | Zero length | Only one item |
| > Retrieve AE Title | (0008,0054) | AE | | Zero length |

| Attribute Name | Tag | VR | N-CREATE | N-SET |
|--|-------------|----|-------------|--|
| > Series Description | (0008,103E) | LO | | Procedure Name and its Description selected when the study is closed |
| > Performing Physician's Name | (0008,1050) | PN | | Performing Physician's Name |
| > Operator's Name | (0008,1070) | PN | | Operator's Name |
| > Referenced Image Sequence | (0008,1140) | SQ | | Zero or more items |
| >> Referenced SOP Class UID | (0008,1150) | UI | | RF: "1.2.840.10008.5.1.4.1.1.1.2.2" XA: "1.2.840.10008.5.1.4.1.1.1.2.1" DX for Presentation: "1.2.840.10008.5.1.4.1.1.1.1" DX for Processing: "1.2.840.10008.5.1.4.1.1.1.1" CR: "1.2.840.10008.5.1.4.1.1.1.1" |
| >> Referenced SOP Instance UID | (0008,1155) | UI | | x In case of SDA, Instance UID of SDA Acquired image will be set. |
| > Protocol Name | (0018,1030) | LO | | Protocol Name selected when the study is closed |
| > Series Instance UID | (0020,000E) | UI | | x |
| > Referenced Non-Image Composite SOP Instance Sequence | (0040,0220) | SQ | Zero length | Zero length |
| Entrance Dose in mGy | (0040,8302) | DS | | Total Entrance Dose (Air Kerma) in mGy |

2.2.2.4. Association Acceptance Policy

The Workflow Application Entity does not accept Associations.

2.2.3. Hardcopy Application Entity Specification

2.2.3.1. SOP Classes

The DR-300 provides Standard Conformance to the following SOP Classes:

Table 2.2-27

SOP CLASSES FOR AE HARDCOPY

| SOP Class Name | SOP Class UID | SCU | SCP |
|---------------------------------------|------------------------|-----|-----|
| Basic Grayscale Print Management Meta | 1.2.840.10008.5.1.1.9 | Yes | No |
| Basic Film Session | 1.2.840.10008.5.1.1.1 | Yes | No |
| Basic Film Box | 1.2.840.10008.5.1.1.2 | Yes | No |
| Basic Grayscale Image Box | 1.2.840.10008.5.1.1.4 | Yes | No |
| Printer | 1.2.840.10008.5.1.1.16 | Yes | No |
| Print Job | 1.2.840.10008.5.1.1.14 | Yes | No |

2.2.3.2. Association Policies

2.2.3.2.1. General

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

Table 2.2-28

DICOM APPLICATION CONTEXT FOR AE HARDCOPY

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

2.2.3.2.2. Number of Associations

The DR-300 initiates one Association at a time for each configured hardcopy device. Multiple hardcopy devices can be configured.

Table 2.2-29

NUMBER OF ASSOCIATIONS INITIATED FOR AE HARDCOPY

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

2.2.3.2.3. Asynchronous Nature

The DR-300 does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 2.2-30

ASYNCHRONOUS NATURE AS A SCU FOR AE HARDCOPY

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

2.2.3.2.4. Implementation Identifying Information

The implementation information for this Application Entity is:

Table 2.2-31

DICOM IMPLEMENTATION CLASS AND VERSION FOR AE HARDCOPY

| | |
|-----------------------------|--------------------------------------|
| Implementation Class UID | 1.2.392.200036.9110.1.0.6711.2001002 |
| Implementation Version Name | SPF XX (XX : version number) |

2.2.3.3. Association Initiation Policy

2.2.3.3.1. Activity – Film Images

2.2.3.3.1.1. Description and Sequencing of Activities

A user can compose 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. Each print-job is forwarded to the job queue and processed individually.

The Hardcopy AE is invoked by the job control interface that is responsible for processing network tasks. The job consists of data describing the images and graphics to be printed as well as the requested layout and other parameters. Each image on the sheet is sent to the specified device and will be set in the same sheet there. If no association to the printer can be established, the print-job is switched to a failed state and the user informed.

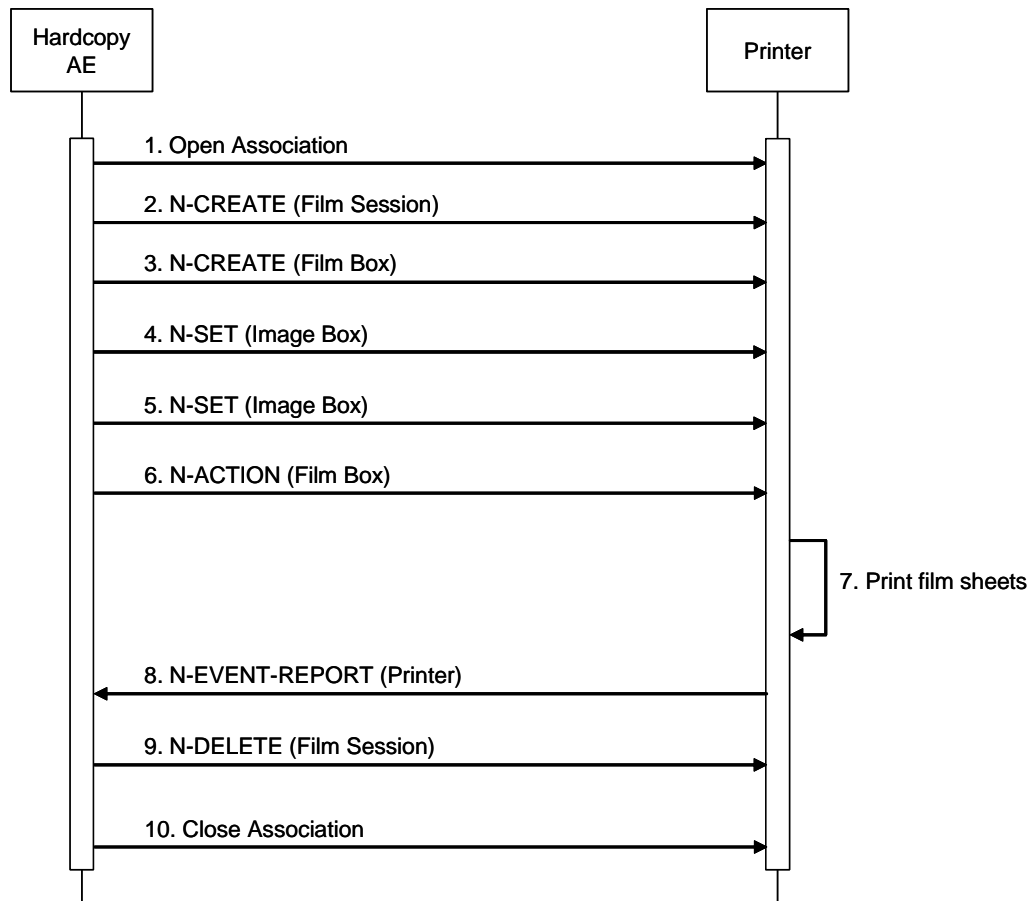


Figure 2.2-5 SEQUENCE OF ACTIVITY – FILM IMAGES

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

1. Hardcopy AE opens an association with the Printer
2. N-CREATE on the Film Session SOP Class creates a Film Session.
3. N-CREATE on the Film Box SOP Class creates a Film Box linked to the Film Session.
4. N-SET on the Image Box SOP Class transfers image of the film sheet to the printer.
5. N-SET on the Image Box SOP Class transfers another image 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. Hardcopy AE does not require the N-EVENT-REPORT to be sent. Hardcopy AE is capable of receiving an N-EVENT-REPORT notification at any time during an association. If the Printer reports a status of FAILURE, the print-job is switched to a failed status and the user informed.
9. N-DELETE on the Film Session SOP Class deletes the complete Film Session SOP Instance hierarchy.
10. Hardcopy AE closes the association with the Printer.

Status of the print-job is reported through the job control interface. Only one job will be active at a time for each separate hardcopy device. If any Response from the remote Application contains a status other than Success or Warning, the Association is aborted and the related job is switched to a failed state. It can be restarted any time by user interaction.

2.2.3.3.1.2. Proposed Presentation Contexts

The DR-300 is capable of proposing the Presentation Contexts shown in the following table:

Table 2.2-32

PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY FILM IMAGES

| Presentation Context Table | | | | | |
|---|------------------------|---------------------------|---------------------|-------------|------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID | Name | UID | | |
| 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 Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |
| Print Job | 1.2.840.10008.5.1.1.14 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

2.2.3.3.1.3. Common SOP Specific Conformance for all Print SOP Classes

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

Table 2.2-33
HARDCOPY COMMUNICATION FAILURE BEHAVIOUR

| Exception | Behaviour |
|--|--|
| Timeout | The Association is released using A-RELEASE 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. |

2.2.3.3.1.4. SOP Specific Conformance for the Printer SOP Class

Hardcopy AE supports the following DIMSE notifications for the Printer SOP Class:

- N-EVENT-REPORT

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

2.2.3.3.1.4.1. Printer SOP Class Operation (N-EVENT-REPORT)

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

The behaviour of Hardcopy AE when receiving Event Types within the N-EVENT-REPORT is summarized in the Table below:

Table 2.2-34
PRINTER SOP CLASS N-EVENT-REPORT BEHAVIOUR

| Event Type Name | Event Type ID | Behaviour |
|-----------------|---------------|--|
| Normal | 1 | The print-job continues to be printed. |
| Warning | 2 | 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. |
| Failure | 3 | 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. |
| * | * | An invalid Event Type ID will cause a status code of 0113H to be returned in an N-EVENT-REPORT response. |

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

Table 2.2-35
PRINTER SOP CLASS N-EVENT-REPORT RESPONSE STATUS REASONS

| Service Status | Further Meaning | Error Code | Reasons |
|-----------------------|------------------------|-------------------|---|
| Success | Success | 0000 | The notification event has been successfully received. |
| Failure | No Such Event Type | 0113 | An invalid Event Type ID was supplied in the N-EVENT-REPORT request. |
| Failure | Processing Failure | 0110 | 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). |

2.2.3.3.1.5. SOP Specific Conformance for the Film Session SOP Class

Hardcopy AE supports the following DIMSE operations for the Film Session SOP Class:

- N-CREATE
- N-DELETE

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

2.2.3.3.1.5.1. Film Session SOP Class Operation (N-CREATE)

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

Table 2.2-36
FILM SESSION SOP CLASS N-CREATE REQUEST ATTRIBUTES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------|-------------|-----------|--------------|--------------------------|---------------|
| Number of Copies | (2000,0010) | IS | 1 .. | ALWAYS | USER |
| Print Priority | (2000,0020) | CS | | ALWAYS | AUTO |
| Medium Type | (2000,0030) | CS | | ALWAYS | AUTO |
| Film Destination | (2000,0040) | CS | | ALWAYS | AUTO |

The behaviour of Hardcopy AE when encountering status codes in a N-CREATE response is summarized in the Table below:

Table 2.2-37

FILM SESSION SOP CLASS N-CREATE RESPONSE STATUS HANDLING BEHAVIOUR

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

2.2.3.3.1.5.2. Film Session SOP Class Operation (N-DELETE)

The behaviour of Hardcopy AE when encountering status codes in a N-DELETE response is summarized in the Table below:

Table 2.2-38

FILM SESSION SOP CLASS N-DELETE RESPONSE STATUS HANDLING BEHAVIOUR

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

2.2.3.3.1.6. SOP Specific Conformance for the Film Box SOP Class

Hardcopy AE supports the following DIMSE operations for the Film Box SOP Class:

- N-CREATE
- N-ACTION

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

2.2.3.3.1.6.1. Film Box SOP Class Operation (N-CREATE)

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

Table 2.2-39
FILM BOX SOP CLASS N-CREATE REQUEST ATTRIBUTES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------------------|-------------|----|--------------------|-------------------|--------|
| Image Display Format | (2010,0010) | ST | From user input | ALWAYS | USER |
| Film Orientation | (2010,0040) | CS | From user input | ALWAYS | USER |
| Film Size ID | (2010,0050) | CS | From user input | ALWAYS | USER |
| Magnification Type | (2010,0060) | CS | From Configuration | ALWAYS | AUTO |
| Smoothing Type | (2010,0080) | CS | From Configuration | ALWAYS | AUTO |
| Border Density | (2010,0100) | CS | From Configuration | ALWAYS | AUTO |
| Empty Image Density | (2010,0110) | CS | From Configuration | ALWAYS | AUTO |
| Trim | (2010,0140) | CS | From Configuration | ALWAYS | AUTO |
| Configuration Information | (2010,0150) | CS | From Configuration | ALWAYS | AUTO |
| Referenced Film Session Sequence | (2010,0500) | SQ | | ALWAYS | AUTO |
| >Referenced SOP Class UID | (0008,1150) | UI | | ALWAYS | AUTO |
| >Referenced SOP Instance UID | (0008,1155) | UI | | ALWAYS | AUTO |

The behaviour of Hardcopy AE when encountering status codes in a N-CREATE response is summarized in the Table below:

Table 2.2-40

FILM BOX SOP CLASS N-CREATE RESPONSE STATUS HANDLING BEHAVIOUR

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

2.2.3.3.1.6.2. Film Box SOP Class Operation (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 behaviour of Hardcopy AE when encountering status codes in a N-ACTION response is summarized in the Table below:

Table 2.2-41

FILM BOX SOP CLASS N-ACTION RESPONSE STATUS HANDLING BEHAVIOUR

| Service Status | Further Meaning | Error Code | Reasons |
|-----------------------|------------------------|------------------------|---|
| Success | Success | 0000 | The SCP has completed the operation successfully. The film has been accepted for printing. |
| * | * | Any other status code. | The Association is released using A-RELEASE and the print-job is marked as failed. The status meaning is logged and reported to the user. |

2.2.3.3.1.7. SOP Specific Conformance for the Image Box SOP Class

Hardcopy AE supports the following DIMSE operations for the Image Box SOP Class:

- N-SET

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

2.2.3.3.1.7.1. Image Box SOP Class Operation (N-SET)

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

Table 2.2-42
IMAGE BOX SOP CLASS N-SET REQUEST ATTRIBUTES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------------------|-------------|----|---------------------------|-------------------|--------|
| Image Box Position | (2020,0010) | US | Depends on image position | ALWAYS | AUTO |
| 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 | Depends on image size | ALWAYS | AUTO |
| >Columns | (0028,0011) | US | Depends on image size | ALWAYS | AUTO |
| >Bits Allocated | (0028,0100) | US | From Configuration | ALWAYS | AUTO |
| >Bits Stored | (0028,0101) | US | From Configuration | ALWAYS | AUTO |
| >High Bit | (0028,0102) | US | From Configuration | ALWAYS | AUTO |
| >Pixel Representation | (0028,0103) | US | “0” | ALWAYS | AUTO |
| >Pixel Data | (7FE0,0010) | OW | Pixels of rendered image | ALWAYS | AUTO |

The behaviour of Hardcopy AE when encountering status codes in a N-SET response is summarized in the Table below:

Table 2.2-43

IMAGE BOX SOP CLASS N-SET RESPONSE STATUS HANDLING BEHAVIOUR

| Service Status | Further Meaning | Error Code | Reasons |
|-----------------------|------------------------|------------------------|---|
| Success | Success | 0000 | The SCP has completed the operation successfully. Image successfully stored in Image Box. |
| * | * | Any other status code. | The Association is released using A-RELEASE and the print-job is marked as failed. The status meaning is logged and reported to the user. |

2.2.4. Verification Application Entity Specification

2.2.4.1. SOP Classes

The DR-300 provides Standard Conformance to the following SOP Classes:

Table 2.2-44

SOP CLASSES FOR AE VERIFICATION

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

2.2.4.2. Association Policies

2.2.4.2.1. General

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

Table 2.2-45

DICOM APPLICATION CONTEXT FOR AE STORAGE

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

2.2.4.2.2. Number of Associations

The DR-300 initiates one Association at a time for each destination to which a transfer request is being processed in the active job queue list. Only one job will be active at a time, the other remains pending until the active job is completed or failed.

Table 2.2-46

NUMBER OF ASSOCIATIONS INITIATED FOR AE STORAGE

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

2.2.4.2.3. Asynchronous Nature

The DR-300 does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 2.2-47

ASYNCHRONOUS NATURE AS A SCU FOR AE STORAGE

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

2.2.4.2.4. Implementation Identifying Information

The implementation information for this Application Entity is:

Table 2.2-48

DICOM IMPLEMENTATION CLASS AND VERSION FOR AE STORAGE

| | |
|-----------------------------|--------------------------------------|
| Implementation Class UID | 1.2.392.200036.9110.1.0.6711.2001002 |
| Implementation Version Name | SPF XX (XX : version number) |

2.2.4.3. Association Initiation Policy

2.2.4.3.1. Activity – Verification

2.2.4.3.1.1. Description and Sequencing of Activities

Service personnel can select servers in the maintenance tool to check the connectivity.

The verification AE is invoked by activating [ECHO] by the service personnel. It will send verification message to the selected server and display its verification result notified by the server.

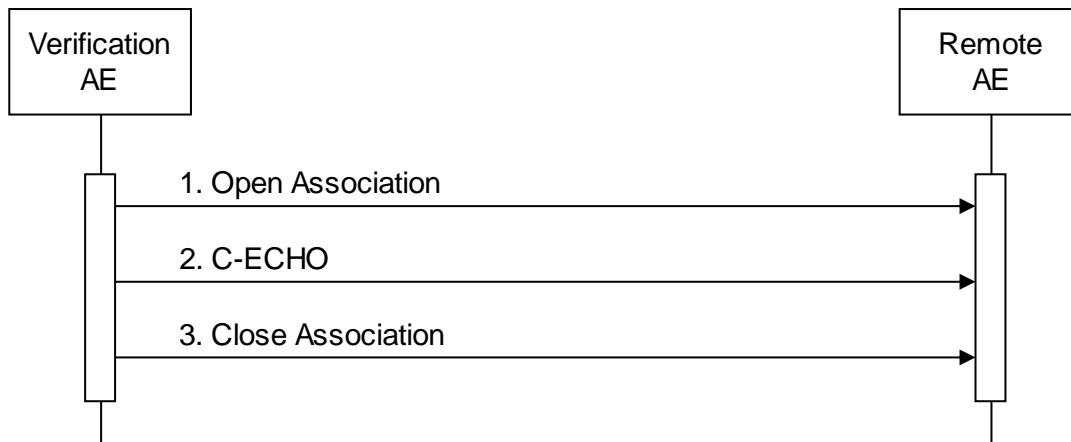


Figure 2.2-6 SEQUENCE OF ACTIVITY – VERIFICATION

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

1. The Verification AE opens an association with the Remote AE.
2. A C-ECHO message is transmitted to the Remote AE and the Remote AE replies with C-ECHO response.
3. The Verification AE closes the association with the Remote AE.

2.2.4.3.1.2. Proposed Presentation Contexts

The DR-300 is capable of proposing the Presentation Contexts shown in the following table:

Table 2.2-49

PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY VERIFICATION

| 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 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

2.2.4.3.1.3. SOP Specific Conformance Verification SOP Classes

The DR-300 provides standard conformance to the DICOM Verification Service Class as as SCU. The status code for the C-ECHO is as follows;

Table 2.2-50

C-ECHO RESPONSE STATUS HANDLING BEHAVIOUR

| Service Status | Further Meaning | Error Code | Behaviour |
|----------------|-----------------|------------|--|
| Success | Success | 0000 | The SCP has successfully responded the C-ECHO. |

The behaviour of Verification AE during communication failure is summarized in the Table below:

Table 2.2-51

VERIFICATION COMMUNICATION FAILURE BEHAVIOUR

| Exception | Behaviour |
|--|--|
| Timeout | The Association is released using A-RELEASE. The reason is logged and the job failure is reported to the service personnel via the maintenance tool. |
| Association aborted by the SCP or network layers | The reason is logged and the job failure is reported to the service personnel via the maintenance tool. |

2.3. NETWORK INTERFACES

2.3.1. Physical Network Interface

The DR-300 supports a single network interface. One of the following physical network interfaces will be available depending on installed hardware options:

Table 2.3-1

SUPPORTED PHYSICAL NETWORK INTERFACES

| |
|---------------------|
| Ethernet 1000baseT |
| Ethernet 100base-TX |
| Ethernet 10baseT |

2.3.2. IPv4 and IPv6 Support

This product only supports IPv4 connections.

2.4. CONFIGURATION

2.4.1. AE Title/Presentation Address Mapping

2.4.1.1. Local AE Titles

All local applications use the AE Titles and TCP/IP Ports configured via the Service Tool. The default AE Titles is listed below.

Table 2.4-1
AE TITLE CONFIGURABLE TABLE

| Application Entity | | Default AE Title | Default TCP/IP Port |
|--------------------|------|------------------|---------------------|
| Storage | | DR300_StoreSCU | |
| Workflow | MWM | DR300_MwmSCU | |
| | MPPS | DR300_MppsSCU | |
| Hardcopy | | DR300_PrintSCU | |

2.4.1.2. Remote AE Title/Presentation Address Mapping

The AE Title, host names and port numbers of remote applications are configured using the DR-300 Service Tool.

2.4.1.2.1. Storage

The DR-300 Service Tool must be used to set the AE Titles, port-numbers, host-names and capabilities for the remote Storage SCPs, and also to set Storage Commitment capability of each Storage SCPs. Associations will only be accepted from known AE Titles and associations from unknown AE Titles will be rejected (an AE Title is known if it can be selected within the Service Tool). Multiple remote Storage SCPs can be defined.

2.4.1.2.2. Workflow

The DR-300 Service Tool must be used to set the AE Titles, port-numbers, host-names and capabilities of the remote Modality Worklist SCPs. Even though multiple remote Workflow SCPs can be defined, only one SCP can be selected at a time. The DR-300 will open an association to the SCP selected in the user interface.

The DR-300 Service Tool must be used to set the AE Title, port-number, host-name and capabilities of the remote MPPS SCP. Only a single remote MPPS SCP can be defined.

2.4.1.2.3. Hardcopy

The DR-300 Service Tool must be used to set the AE Titles, port-numbers, host-names and capabilities for the remote Print SCPs. Multiple remote Print SCPs can be defined.

2.4.2. Parameters

A large number of parameters related to acquisition and general operation can be configured using the Service Tool. The Table below only shows those configuration parameters relevant to DICOM communication. See the DR-300 Service Manual for details on general configuration capabilities.

Table 2.4-2
CONFIGURATION PARAMETERS TABLE

| Parameter | Configurable (Yes/No) | Default Value |
|---|--------------------------|---------------|
| General Parameters | | |
| PDU Size | Yes | 16kB |
| Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout) | No | None |
| General DIMSE level time-out values | No | None |
| Time-out waiting for response to TCP/IP connect request. (Low-level timeout) | No | None |
| Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout) | No | None |
| Time-out for waiting for data between TCP/IP packets.(Low-level timeout) | No | None |
| Any changes to default TCP/IP settings, such as configurable stack parameters. | No | None |

3. MEDIA INTERCHANGE

3.1. IMPLEMENTATION MODEL

3.1.1. Application Data Flow

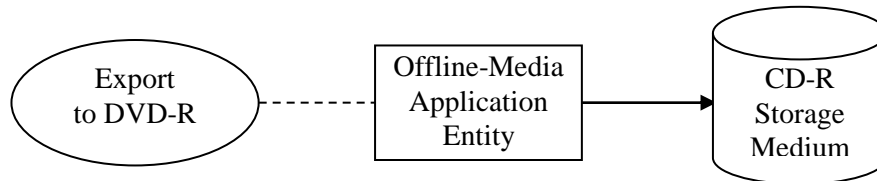


Figure 3.1-1 APPLICATION DATA FLOW DIAGRAM FOR MEDIA STORAGE

The Offline-Media Application Entity exports images to a DVD-R Storage medium. It is associated with the local real-world activity “Export to DVD-R”. “Export to DVD-R” is performed upon user request for selected patients, studies, series, or images.

3.1.2. Functional Definition of AE’s

3.1.2.1. Functional Definition of Offline-Media Application Entity

Activation of the “Export to DVD-R” menu entry will pass the currently selected patients, studies, series or images to the Offline-Media Application Entity. The SCP Instances associated with the selection will be collected into one or more export jobs. The contents of each export job will be written to a single DVD-R media.

3.1.3. Sequencing of Real-World Activities

At least one image must exist and be selected before the Offline-Media Application Entity can be invoked. The operator can insert a new DVD-R media at any time before or after invocation of the Offline-Media Application Entity. The Offline-Media Application Entity will wait indefinitely for a media to be inserted before starting to write to the DVD-R device. If no DVD-R media is available the export job can be canceled from the job queue.

3.1.4. File Meta Information Options

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

Table 3.1-1

DICOM IMPLEMENTATION CLASS AND VERSION FOR MEDIA STORAGE

| | |
|-----------------------------|--------------------------------------|
| Implementation Class UID | 1.2.392.200036.9110.1.0.6711.2001002 |
| Implementation Version Name | SPF XX (XX : version number) |

3.2. AE SPECIFICATIONS

3.2.1. Offline-Media Application Entity Specification

The Offline-Media Application Entity provides standard conformance to the Media Storage Service Class. The Application Profiles and roles are listed below:

Table 3.2-1

APPLICATION PROFILES, ACTIVITIES AND ROLES FOR OFFLINE-MEDIA

| Application Profiles Supported | Real World Activity | Role |
|---------------------------------------|----------------------------|-------------|
| STD-GEN-CD | Export to CD-R | FSC |

3.2.1.1. File Meta Information for the Application Entity

The Source Application Entity Title included in the File Meta Header is fixed (see section 3.4).

3.2.1.2. Real-World Activities

3.2.1.2.1. Activity – Export to DVD-R

The Offline-Media Application Entity acts as an FSC when requested to export SOP Instances from the local database to a DVD-R medium.

A dialogue will be presented informing the user about the required / available media capacity. If the contents of the current selection do not fit on a single media selection will be canceled and ask the user to select SOP Instances again.

The user will be prompted to insert a DVD-R media which is empty or written in this system for each export job. The contents of the export job will be written together with a corresponding DICOMDIR. The user can cancel an export job in the job queue.

3.2.1.2.1.1. Media Storage Application Profiles

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

3.2.1.2.1.1. Options

The Offline-Media Application Entity supports the SOP Classes and Transfer Syntaxes listed in the Table below:

Table 3.2-2
IODS, SOP CLASSES AND TRANSFER SYNTAXES FOR OFFLINEMEDIA

| 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 | 1.2.840.10008.1.2.1 |
| X-Ray Radio Fluoroscopic Image Storage | 1.2.840.10008.5.1.4.1.1.12.2 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |
| Digital X-Ray Image Storage - For Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |
| Digital X-Ray Image Storage - For Processing | 1.2.840.10008.5.1.4.1.1.1.1.1 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |
| X-Ray Radiation Dose SR Storage | 1.2.840.10008.5.1.4.1.1.88.67 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |

3.3. AUGMENTED AND PRIVATE APPLICATION PROFILES

The DR-300 does not support any augmented for private application profiles.

3.4. MEDIA CONFIGURATION

All local applications use the fixed AE Title listed in the Table below:

Table 3.4-1
AE TITLE CONFIGURATION TABLE

| Application Entity | Default AE Title |
|---------------------------|-------------------------|
| Offline-Media | DR300-0000000000 |

4. SUPPORT OF CHARACTER SETS

All the DR-300 applications support the following character sets:

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

ISO 2022 IR 87 (JIS X 0208: Kanji)

ISO 2022 IR 159 (JIS X 0212: Supplementary Kanji set)

The DR-300 will set the corresponding character sets based on its configuration as listed below:

Table 3.4-1
CHARACTER SET

| Configuration | Character Set |
|----------------------|--|
| English mode | ISO_IR 100 |
| Japanese mode | \ISO 2022 IR 87\ISO 2022 IR 159 or \ISO 2022 IR 87 |

5. SECURITY

The DR-300 does not support any specific security measures.

It is assumed that the DR-300 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 DR-300
- b. Firewall or router protections to ensure that the DR-300 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.

6. ANNEXES

6.1. IOD CONTENTS

6.1.1. Created SOP Instances

The attributes of each IODs transmitted by the DR-300 storage application are specified in the Table listed below:

Table 6.1-1
ATTRIBUTES FOR EACH IOD

| IOD | Specified Table |
|--|------------------------|
| X-Ray Radio Fluoroscopic Image IOD | Table 6.1-2 |
| X-Ray Angiographic Image IOD | Table 6.1-3 |
| Digital X-Ray Image IOD - For Presentation | Table 6.1-4 |
| Digital X-Ray Image IOD - For Processing | Table 6.1-4 |
| Computed Radiography Image IOD | Table 6.1-5 |
| X-Ray Radiation Dose SR IOD | Table 6.1-6 |

The following tables use a number of abbreviations. The abbreviations used in the “Presence of Module” 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 are:

| | |
|--------|---|
| MWL | the attribute value source 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 |

NOTE: All dates and times are encoded in the local configured calendar and time. Date, Time and Time zone are configured using the Windows Date and Time configuration.

6.1.1.1. X-Ray Radio Fluoroscopic Image IOD

Table 6.1-2
IOD OF CREATED RF SOP INSTANCES

| IE | Module | Reference | Presence of Module |
|-----------|-------------------|------------------|---------------------------|
| Patient | Patient | Table 6.1-7 | ALWAYS |
| Study | General Study | Table 6.1-8 | ALWAYS |
| | Patient Study | Table 6.1-9 | ALWAYS |
| Series | General Series | Table 6.1-10 | ALWAYS |
| Equipment | General Equipment | Table 6.1-14 | ALWAYS |
| Image | General Image | Table 6.1-16 | ALWAYS |
| | Image Pixel | Table 6.1-19 | ALWAYS |
| | Contrast/Bolus | Table 6.1-20 | ALWAYS |
| | Cine | Table 6.1-21 | Only if Multi-frame |
| | Multi-frame | Table 6.1-22 | Only if Multi-frame |
| | Frame Pointers | Table 6.1-23 | Only if Multi-frame |
| | Mask | Table 6.1-24 | Only if subtracted image |
| | Display Shutter | Table 6.1-25 | ALWAYS |
| | X-Ray Image | Table 6.1-27 | ALWAYS |
| | X-Ray Acquisition | Table 6.1-28 | ALWAYS |
| | X-Ray Collimator | Table 6.1-29 | ALWAYS |
| | XRF Positioner | Table 6.1-30 | ALWAYS |
| | VOI LUT | Table 6.1-31 | ALWAYS |
| | SOP Common | Table 6.1-38 | ALWAYS |

6.1.1.2. X-Ray Angiographic Image IOD

Table 6.1-3
IOD OF CREATED XA SOP INSTANCES

| IE | Module | Reference | Presence of Module |
|-----------|-------------------|------------------|---------------------------|
| Patient | Patient | Table 6.1-7 | ALWAYS |
| Study | General Study | Table 6.1-8 | ALWAYS |
| | Patient Study | Table 6.1-9 | ALWAYS |
| Series | General Series | Table 6.1-10 | ALWAYS |
| Equipment | General Equipment | Table 6.1-14 | ALWAYS |
| Image | General Image | Table 6.1-16 | ALWAYS |
| | Image Pixel | Table 6.1-19 | ALWAYS |
| | Contrast/Bolus | Table 6.1-20 | ALWAYS |
| | Cine | Table 6.1-21 | Only if Multi-frame |
| | Multi-frame | Table 6.1-22 | Only if Multi-frame |
| | Frame Pointers | Table 6.1-23 | Only if Multi-frame |
| | Mask | Table 6.1-24 | Only if subtracted image |
| | Display Shutter | Table 6.1-25 | ALWAYS |
| | X-Ray Image | Table 6.1-27 | ALWAYS |
| | X-Ray Acquisition | Table 6.1-28 | ALWAYS |
| | X-Ray Collimator | Table 6.1-29 | ALWAYS |
| | VOI LUT | Table 6.1-31 | ALWAYS |
| | XA Positioner | Table 6.1-33 | ALWAYS |
| | SOP Common | Table 6.1-38 | ALWAYS |

6.1.1.3. Digital X-Ray Image IOD

Table 6.1-4
IOD OF CREATED DX SOP INSTANCES

| IE | Module | Reference | Presence of Module |
|-----------|------------------------|------------------|---------------------------|
| Patient | Patient | Table 6.1-7 | ALWAYS |
| Study | General Study | Table 6.1-8 | ALWAYS |
| | Patient Study | Table 6.1-9 | ALWAYS |
| Series | General Series | Table 6.1-10 | ALWAYS |
| | DX Series | Table 6.1-12 | ALWAYS |
| Equipment | General Equipment | Table 6.1-14 | ALWAYS |
| Image | General Image | Table 6.1-16 | ALWAYS |
| | Image Pixel | Table 6.1-19 | ALWAYS |
| | Contrast/Bolus | Table 6.1-20 | ALWAYS |
| | Display Shutter | Table 6.1-25 | ALWAYS |
| | X-Ray Collimator | Table 6.1-29 | ALWAYS |
| | VOI LUT | Table 6.1-31 | ALWAYS |
| | X-Ray Acquisition Dose | Table 6.1-32 | ALWAYS |
| | DX Anatomy Imaged | Table 6.1-34 | ALWAYS |
| | DX Image | Table 6.1-35 | ALWAYS |
| | DX Detector | Table 6.1-36 | ALWYAS |
| | Acquisition Context | Table 6.1-37 | ALWAYS |
| | SOP Common | Table 6.1-38 | ALWAYS |

6.1.1.4. Computed Radiography Image IOD

Table 6.1-5
IOD OF CREATED CR SOP INSTANCES

| IE | Module | Reference | Presence of Module |
|-----------|-------------------|------------------|---------------------------|
| Patient | Patient | Table 6.1-7 | ALWAYS |
| Study | General Study | Table 6.1-8 | ALWAYS |
| | Patient Study | Table 6.1-9 | ALWAYS |
| Series | General Series | Table 6.1-10 | ALWAYS |
| | CR Series | Table 6.1-11 | ALWAYS |
| Equipment | General Equipment | Table 6.1-14 | ALWAYS |
| Image | General Image | Table 6.1-16 | ALWAYS |
| | Image Pixel | Table 6.1-19 | ALWAYS |
| | Display Shutter | Table 6.1-25 | ALWAYS |
| | CR Image | Table 6.1-26 | ALWAYS |
| | VOI LUT | Table 6.1-31 | ALWAYS |
| | SOP Common | Table 6.1-38 | ALWAYS |

6.1.1.5. X-Ray Radiation Dose SR IOD

Table 6.1-6
IOD OF CREATED RDSR SOP INSTANCES

| IE | Module | Reference | Presence of Module |
|-----------|----------------------------|------------------|---------------------------|
| Patient | Patient | Table 6.1-7 | ALWAYS |
| Study | General Study | Table 6.1-8 | ALWAYS |
| | Patient Study | Table 6.1-9 | ALWAYS |
| Series | SR Document Series | Table 6.1-11 | ALWAYS |
| Equipment | General Equipment | Table 6.1-14 | ALWAYS |
| | Enhanced General Equipment | Table 6.1-15 | ALWAYS |
| Document | SR Document General | Table 6.1-17 | ALWAYS |
| | SR Document Content | Table 6.1-18 | ALWAYS |
| | SOP Common | Table 6.1-38 | ALWAYS |

6.1.1.6. Modules

6.1.1.6.1. Patient Module

Table 6.1-7

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 or generated by device | ALWAYS | MWL/ USER/ AUTO |
| Patient ID | (0010,0020) | LO | From Modality Worklist or user input or generated by device | ALWAYS | MWL/ USER/ AUTO |
| 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 | VNAP | USER |

6.1.1.6.2. General Study Module

Table 6.1-8

GENERAL STUDY MODULE OF CREATED SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------------|-------------|-----------|---|--------------------------|-----------------------|
| Study Date | (0008,0020) | DA | <yyyymmdd> format date when the study is started | ALWAYS | AUTO |
| Study Time | (0008,0030) | TM | <hhmmss.fff> format time when the study is started | ALWAYS | AUTO |
| Accession Number | (0008,0050) | SH | From Modality Worklist or user input or generated by device | VNAP | MWL/ USER/ AUTO |
| Referring Physician's Name | (0008,0090) | PN | From Modality Worklist or user input | VNAP | MWL/ USER |
| Study Description | (0008,1030) | LO | Description of the selected Procedure | ALWAYS | USER |
| Physician(s) of Record | (0008,1048) | PN | From Modality Worklist or user input | VNAP | MWL/ USER |
| Name of Physician(s) Reading Study | (0008,1060) | PN | From Modality Worklist or user input | VNAP | MWL/ USER |
| Study Instance UID | (0020,000D) | UI | From Modality Worklist or generated by device | ALWAYS | MWL/ AUTO |
| Study ID | (0020,0010) | SH | From Modality Worklist or generated by device | ALWAYS | MWL/ AUTO |

6.1.1.6.3. Patient Study Module

Table 6.1-9

PATIENT STUDY MODULE OF CREATED SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------|-------------|-----------|--|--------------------------|---------------|
| Patient's Age | (0010,1010) | AS | From user input or generated by device | VNAP | USER/ AUTO |
| Patient's Size | (0010,1020) | DS | From Modality Worklist | VNAP | MWL |
| Patient's Weight | (0010,1030) | DS | From Modality Worklist | VNAP | MWL |

6.1.1.6.4. General Series Module

Table 6.1-10

GENERAL SERIES MODULE OF CREATED SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------|-------------|-----------|---|--------------------------|---------------|
| Series Date | (0008,0021) | DA | <yyyymmdd> format date when the series is created | ALWAYS | AUTO |
| Series Time | (0008,0031) | TM | <hhmmss.fff> format time when the series is created | ALWAYS | AUTO |
| Modality | (0008,0060) | CS | “RF”, “XA”, “DX” , “CR” | ALWAYS | USER |
| Series Description | (0008,103E) | LO | Name and Description of the selected Procedure | ALWAYS | USER |
| Performing Physician’s Name | (0008,1050) | PN | From Modality Worklist or user input | VNAP | MWL/ USER |
| Operator’s Name | (0008,1070) | PN | From Modality Worklist or user input | VNAP | MWL/ USER |
| Body Part Examined | (0018,0015) | CS | From user input in Protocol | VNAP | USER |
| Protocol Name | (0018,1030) | LO | Name and Description of the selected Protocol | ALWAYS | USER |
| Series Instance UID | (0020,000E) | UI | Generated by device | ALWAYS | AUTO |
| Series Number | (0020,0011) | IS | Generated by device | ALWAYS | AUTO |
| Laterality | (0020,0060) | CS | “” | EMPTY | AUTO |

6.1.1.6.5. CR Series Module

Table 6.1-11

CR SERIES MODULE OF CREATED SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------|-------------|-----------|-----------------------------|--------------------------|---------------|
| Body Part Examined | (0018,0015) | CS | From user input in Protocol | VNAP | USER |
| View Position | (0018,5101) | CS | “” | EMPTY | AUTO |

6.1.1.6.6. DX Series Module

Table 6.1-12

DX SERIES MODULE OF CREATED SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--|-------------|----|--|-------------------|--------|
| Modality | (0008,0060) | CS | “DX” | ALWAYS | AUTO |
| Presentation Intent Type | (0008,0068) | CS | “FOR PRESENTATION” “FOR PROCESSING” | ALWAYS | AUTO |
| Referenced Performed Procedure Step Sequence | (0008,1111) | SQ | Only if MPPS is enabled | ANAP | AUTO |
| >Referenced SOP Class UID | (0008,1150) | UI | “1.2.840.10008.3.1.2.3.3” | ANAP | AUTO |
| >Referenced SOP Instance UID | (0008,1155) | UI | From related MPPS Instance | ANAP | AUTO |

6.1.1.6.7. SR Document Series Module

Table 6.1-13

SR DOCUMENT SERIES MODULE OF CREATED SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------|-------------|----|---|-------------------|--------|
| Series Date | (0008,0021) | DA | <yyyymmdd> format date when the series is created | ALWAYS | AUTO |
| Series Time | (0008,0031) | TM | <hhmmss.fff> format time when the series is created | ALWAYS | AUTO |
| Modality | (0008,0060) | LO | “SR” | ALWAYS | AUTO |
| Series Description | (0008,103E) | LO | Procedure Name selected when the first radiography is performed | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Generated by device | ALWAYS | AUTO |
| Series Number | (0020,0011) | IS | Generated by device | ALWAYS | AUTO |

6.1.1.6.8. General Equipment Module**Table 6.1-14****GENERAL EQUIPMENT MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------|-------------|-----------|--------------------|--------------------------|---------------|
| Manufacturer | (0008,0070) | LO | “Shimadzu Corp.” | ALWAYS | AUTO |
| Institution Name | (0008,0080) | LO | From Configuration | ALWAYS | CONFIG |
| Institution Address | (0008,0081) | ST | From Configuration | ALWAYS | CONFIG |
| Station Name | (0008,1010) | SH | From Configuration | ALWAYS | CONFIG |
| Institution Department Name | (0008,1040) | LO | From Configuration | ALWAYS | CONFIG |
| Manufacturer’s Model Name | (0008,1090) | LO | “DR-300” | ALWAYS | AUTO |
| Device Serial Number | (0018,1000) | LO | From Configuration | ALWAYS | CONFIG |
| Software Versions | (0018,1020) | LO | From Configuration | ALWAYS | CONFIG |

6.1.1.6.9. Enhanced General Equipment Module**Table 6.1-15****ENHANCED GENERAL EQUIPMENT MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------------|-------------|-----------|--------------------|--------------------------|---------------|
| Manufacturer | (0008,0070) | LO | “Shimadzu Corp.” | ALWAYS | AUTO |
| Manufacturer’s Model Name | (0008,1090) | LO | “DR-300” | ALWAYS | AUTO |
| Device Serial Number | (0018,1000) | LO | From Configuration | ALWAYS | CONFIG |
| Software Versions | (0018,1020) | LO | From Configuration | ALWAYS | CONFIG |

6.1.1.6.10. General Image Module

Table 6.1-16

GENERAL IMAGE MODULE OF CREATED SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------|-------------|----|--|-------------------|--------|
| Acquisition Date | (0008,0022) | DA | <yyyymmdd> format date when the image is acquired | ALWAYS | AUTO |
| Content Date | (0008,0023) | DA | <yyyymmdd> format date when the image is acquired | ALWAYS | AUTO |
| Acquisition Time | (0008,0032) | TM | <hhmmss> format time when the image is acquired | ALWAYS | AUTO |
| Content Time | (0008,0033) | TM | <hhmmss> format time when the image is acquired | ALWAYS | AUTO |
| Source Image Sequence | (0008,2112) | SQ | Generated by device only in case of SDA Combined image to indicate its original images | ANAP | AUTO |
| >Referenced SOP Class UID | (0008,1150) | UI | From referenced image | ANAP | AUTO |
| >Referenced SOP Instance UID | (0008,1155) | UI | From referenced image | ANAP | AUTO |
| >Referenced Frame Number | (0008,1160) | IS | If referenced image is a multiframe image | ANAP | AUTO |
| Irradiation Event UID | (0008,3010) | UI | From related RDSR | ANAP | AUTO |
| Acquisition Number | (0020,0012) | IS | Generated by device | ALWAYS | AUTO |
| Instance Number | (0020,0013) | IS | Generated by device | ALWAYS | AUTO |
| Patient Orientation | (0020,0020) | CS | From user input in Protocol | VNAP | USER |
| Image Comments | (0020,4000) | LT | From user input | VNAP | USER |
| Burned In Annotation | (0028,0301) | CS | “NO” | ALWAYS | AUTO |

6.1.1.6.11. SR Document General Module**Table 6.1-17****SR DOCUMENT GENERAL MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------------|-------------|----|---|-------------------|--------|
| Content Date | (0008,0023) | DA | <yyyymmdd> format date when the image is acquired | ALWAYS | AUTO |
| Content Time | (0008,0033) | TM | <hhmmss> format time when the image is acquired | ALWAYS | AUTO |
| Performed Procedure Code Sequence | (0040,A372) | SQ | "" | ALWAYS | AUTO |
| Instance Number | (0020,0013) | IS | Generated by device | ALWAYS | AUTO |
| Completion Flag | (0040,A491) | CS | "PARTIAL" or "COMPLETE" | ALWAYS | AUTO |
| Verification Flag | (0040,A493) | CS | "UNVERIFIED" | ALWAYS | AUTO |

6.1.1.6.12. SR Document Content Module**Table 6.1-18****SR DOCUMENT CONTENT MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------------|-------------|----|-------------------------------|-------------------|--------|
| Value Type | (0040,A040) | CS | "CONTAINER" | ALWAYS | AUTO |
| Concept Name Code Sequence | (0040,A043) | SQ | | ALWAYS | AUTO |
| >Code Value | (0008,0100) | SH | "113701" | ALWAYS | AUTO |
| >Coding Scheme Designator | (0008,0102) | SH | "DCM" | ALWAYS | AUTO |
| >Coding Scheme Version | (0008,0103) | SH | "01" | ALWAYS | AUTO |
| >Code Meaning | (0008,0104) | LO | "X-Ray Radiation Dose Report" | ALWAYS | AUTO |
| Continuity of Content | (0040,A050) | CS | "SEPARATE" | ALWAYS | AUTO |

* Refer to 6.1.1.7 for detailed information.

6.1.1.6.13. Image Pixel Module**Table 6.1-19****IMAGE PIXEL MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------|-------------|----|--------------------------------|-------------------|--------|
| Rows | (0028,0010) | US | Number of rows in the image | ALWAYS | AUTO |
| Columns | (0028,0011) | US | Number of columns in the image | ALWAYS | AUTO |
| Pixel Aspect Ratio | (0028,0034) | IS | “1\1” | ALWAYS | AUTO |
| Pixel Data | (7FE0,0010) | OW | The Pixel Data itself | ALWAYS | AUTO |

6.1.1.6.14. Contrast/Bolus Module**Table 6.1-20****CONTRAST/BOLUS MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------------|-------------|----|---|-------------------|--------|
| Contrast/Bolus Agent | (0018,0010) | LO | “” | EMPTY | AUTO |
| Contrast/Bolus Start Time | (0018,1042) | TM | <hhmmss> format time when the contrast/bolus is injected Only if Injector Control in the Protocol is checked | VNAP | AUTO |

6.1.1.6.15. Cine Module**Table 6.1-21****CINE MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------------------|-------------|----|---------------------|-------------------|--------|
| Recommended Display Frame Rate | (0008,2144) | IS | Only if multi-frame | ANAP | AUTO |
| Cine Rate | (0018,0040) | IS | Only if multi-frame | ANAP | AUTO |
| Frame Time Vector | (0018,1065) | DS | Only if multi-frame | ANAP | AUTO |

6.1.1.6.16. Multi-Frame Module**Table 6.1-22****MULTI-FRAME MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-------------------------|-------------|-----------|--------------------------------------|--------------------------|---------------|
| Number of Frames | (0028,0008) | IS | Only if multi-frame | ANAP | AUTO |
| Frame Increment Pointer | (0028,0009) | AT | “(0018,1065)” Only if multi-frame | ANAP | AUTO |

6.1.1.6.17. Frame Pointers Module**Table 6.1-23****FRAME POINTERS MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------|-------------|-----------|---------------------|--------------------------|---------------|
| Representative Frame Number | (0028,6010) | US | Only if multi-frame | ANAP | AUTO |

6.1.1.6.18. Mask Module**Table 6.1-24****MASK MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------------|-------------|-----------|-------------------------------|--------------------------|---------------|
| Recommended Viewing Mode | (0028,1090) | CS | “SUB” | ANAP | AUTO |
| Mask Subtraction Sequence | (0028,6100) | SQ | Only if subtracted image | ANAP | AUTO |
| >Mask Operation | (0028,6101) | CS | “AVG_SUB” | ANAP | AUTO |
| >Mask Frame Numbers | (0028,6110) | US | Indicate frame number of mask | ANAP | AUTO |
| >Mask Sub-pixel Shift | (0028,6114) | FL | Indicate pixel shift value | ANAP | AUTO |

6.1.1.6.19. Display Shutter Module**Table 6.1-25****DISPLAY SHUTTER MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-------------------------------|-------------|-----------|---------------------------|--------------------------|---------------|
| Shutter Shape | (0018,1600) | CS | “RECTANGULAR” | ALWAYS | AUTO |
| Shutter Left Vertical Edge | (0018,1602) | IS | Left edge of the shutter | ALWAYS | AUTO |
| Shutter Right Vertical Edge | (0018,1604) | IS | Right edge of the shutter | ALWAYS | AUTO |
| Shutter Upper Horizontal Edge | (0018,1606) | IS | Upper edge of the shutter | ALWAYS | AUTO |
| Shutter Lower Horizontal Edge | (0018,1608) | IS | Lower edge of the shutter | ALWAYS | AUTO |

6.1.1.6.20. CR Image Module**Table 6.1-26****CR IMAGE MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------|-------------|-----------|--|--------------------------|---------------|
| KVP | (0018,0060) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Distance Source to Detector | (0018,1110) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Distance Source to Patient | (0018,1111) | DS | Assumed the patient is on 10 cm above from table-top | ALWAYS | AUTO |
| Exposure Time | (0018,1150) | IS | From Acquisition parameters | ALWAYS | AUTO |
| X-Ray Tube Current | (0018,1151) | IS | From Acquisition parameters | ALWAYS | AUTO |
| Image Pixel Spacing | (0018,1164) | DS | Generated by device (on the detector) | ALWAYS | AUTO |
| Photometric Interpretation | (0028,0004) | CS | “MONOCHROME1” “MONOCHROME2” | ALWAYS | AUTO |
| Pixel Spacing | (0028,0030) | DS | Generated by device (on 10cm above from table-top) | ALWAYS | AUTO |

6.1.1.6.21. X-Ray Image Module

Table 6.1-27

X-RAY IMAGE MODULE OF CREATED SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------|-------------|----|--|-------------------|--------|
| Image Type | (0008,0008) | CS | Generated by device SPOT: SPOT/SPOT_R SERIAL: SERIAL SDA: SDA_O DSA: DSA RSMDSA: RSMDSA TOMO: TOMO/TOMO_R TOMOS: TOMOS_O SLOT: SLOT_O BMD: BMD Fluoroscopy: FLUORO | 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 Bits | (0028,0102) | US | “15” | ALWAYS | AUTO |
| Pixel Representation | (0028,0103) | US | “0” | ALWAYS | AUTO |
| Pixel Intensity Relationship | (0028,1040) | CS | “LIN” | ALWAYS | AUTO |
| Lossy Image Compression | (0028,2110) | CS | “00” | ALWAYS | AUTO |

6.1.1.6.22. X-Ray Acquisition Module**Table 6.1-28****X-RAY ACQUISITION MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|-------------|-----------|--|--------------------------|---------------|
| KVP | (0018,0060) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Field of View Shape | (0018,1147) | CS | “RECTANGLE” | ALWAYS | AUTO |
| Field of View Dimension(s) | (0018,1149) | IS | Generated by device | ALWAYS | AUTO |
| Exposure Time | (0018,1150) | IS | From Acquisition parameters | ALWAYS | AUTO |
| X-Ray Tube Current | (0018,1151) | IS | From Acquisition parameters | ALWAYS | AUTO |
| Radiation Setting | (0018,1155) | CS | In case of Radiography image: “GR” In case of Fluoro Record image: “SC” | ALWAYS | AUTO |
| Radiation Mode | (0018,115A) | CS | In case of Radiography image: “PULSED” In case of Fluoro Record image: “CONTINUOUS” | ALWAYS | AUTO |
| Image and Fluoroscopy Area Dose Product | (0018,115E) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Image Pixel Spacing | (0018,1164) | DS | Generated by device (on the detector) | ALWAYS | AUTO |
| Exposure Time in uS | (0018,8150) | DS | From Acquisition parameters | ALWAYS | AUTO |
| X-Ray Tube Current in uA | (0018,8151) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Pixel Spacing | (0028,0030) | DS | Generated by device (on 10cm above from table-top) | ALWAYS | AUTO |

6.1.1.6.23. X-Ray Collimator Module**Table 6.1-29****X-RAY COLLIMATOR MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------------------|-------------|----|------------------------------|-------------------|--------|
| Collimator Shape | (0018,1700) | CS | “RECTANGULAR” | ALWAYS | AUTO |
| Collimator Left Vertical Edge | (0018,1702) | IS | Left edge of the collimator | ALWAYS | AUTO |
| Collimator Right Vertical Edge | (0018,1704) | IS | Right edge of the collimator | ALWAYS | AUTO |
| Collimator Upper Horizontal Edge | (0018,1706) | IS | Upper edge of the collimator | ALWAYS | AUTO |
| Collimator Lower Horizontal Edge | (0018,1708) | IS | Lower edge of the collimator | ALWAYS | AUTO |

6.1.1.6.24. XRF Positioner Module**Table 6.1-30****XRF POSITIONER MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|-------------|----|---|-------------------|--------|
| Distance Source to Detector | (0018,1110) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Distance Source to Patient | (0018,1111) | DS | From Acquisition parameters Assumed the patient is on 10 cm above from table-top | ALWAYS | AUTO |
| Estimated Radiographic Magnification Factor | (0018,1114) | DS | From Acquisition parameters | ALWAYS | AUTO |

6.1.1.6.25. VOI LUT Module**Table 6.1-31****VOI LUT MODULE OF CREATED SOP INSTANCES**

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

6.1.1.6.26. X-Ray Acquisition Dose Module**Table 6.1-32****X-RAY ACQUISITION DOSE MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|-------------|-----------|--|--------------------------|---------------|
| KVP | (0018,0060) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Distance Source to Detector | (0018,1110) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Distance Source to Patient | (0018,1111) | DS | Assumed the patient is on 10 cm above from table-top | ALWAYS | AUTO |
| Exposure Time | (0018,1150) | IS | From Acquisition parameters | ALWAYS | AUTO |
| X-Ray Tube Current | (0018,1151) | IS | From Acquisition parameters | ALWAYS | AUTO |
| Image and Fluoroscopy Area Dose Product | (0018,115E) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Exposure Time in uS | (0018,8150) | DS | From Acquisition parameters | ALWAYS | AUTO |
| X-Ray Tube Current in uA | (0018,8151) | DS | From Acquisition parameters | ALWAYS | AUTO |

6.1.1.6.27. XA Positioner Module**Table 6.1-33****XA POSITIONER MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---|-------------|-----------|---|--------------------------|---------------|
| Distance Source to Detector | (0018,1110) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Distance Source to Patient | (0018,1111) | DS | From Acquisition parameters Assumed the patient is on 10 cm above from table-top | ALWAYS | AUTO |
| Estimated Radiographic Magnification Factor | (0018,1114) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Positioner Motion | (0018,1500) | CS | From Acquisition parameters | ALWAYS | AUTO |
| Positioner Primary Angle | (0018,1510) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Positioner Secondary Angle | (0018,1511) | DS | From Acquisition parameters | ALWAYS | AUTO |

6.1.1.6.28. DX Anatomy Imaged Module**Table 6.1-34****DX ANATOMY IMAGED MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------------|-------------|-----------|-----------------------------|--------------------------|---------------|
| Anatomic Region Sequence | (0008,2218) | SQ | “” | EMPTY | AUTO |
| Image Laterality | (0020,0062) | CS | From Acquisition parameters | ALWAYS | AUTO |

6.1.1.6.29. DX Image Module

Table 6.1-35

DX IMAGE MODULE OF CREATED SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------------|-------------|----|---|-------------------|--------|
| Image Type | (0008,0008) | CS | Generated by device SPOT: SPOT/SPOT_R | ALWAYS | AUTO |
| Patient Orientation | (0020,0020) | CS | From user input in Protocol | ALWAYS | USER |
| Samples per Pixel | (0028,0002) | US | “1” | ALWAYS | AUTO |
| Photometric Interpretation | (0028,0004) | CS | “MONOCHROME1” “MONOCHROME2” | ALWAYS | AUTO |
| Bits Allocated | (0028,0100) | US | “16” | ALWAYS | AUTO |
| Bits Stored | (0028,0101) | US | “16” | ALWAYS | AUTO |
| High Bits | (0028,0102) | US | “15” | ALWAYS | AUTO |
| Pixel Representation | (0028,0103) | US | “0” | ALWAYS | AUTO |
| Burned In Annotation | (0028,0301) | CS | “YES” “NO” | ALWAYS | AUTO |
| Pixel Intensity Relationship | (0028,1040) | CS | “LIN” | ALWAYS | AUTO |
| Pixel Intensity Relationship Sign | (0028,1041) | SS | “1” | ALWAYS | AUTO |
| Window Center | (0028,1050) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Window Width | (0028,1051) | DS | From Acquisition parameters | ALWAYS | AUTO |
| Rescale Intercept | (0028,1052) | DS | “0” | ALWAYS | AUTO |
| Rescale Slope | (0028,1053) | DS | “1” | ALWAYS | AUTO |
| Rescale Type | (0028,1054) | LO | “US” | ALWAYS | AUTO |
| Lossy Image Compression | (0028,2110) | CS | “00” | ALWAYS | AUTO |
| Presentation LUT Shape | (2050,0020) | CS | “INVERSE” if (0028,0004) is “MONOCHROME1” “IDENTITY” if (0028,0004) is “MONOCHROME2” | ALWAYS | AUTO |

6.1.1.6.30. DX Detector Module**Table 6.1-36****DX DETECTOR MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------------|-------------|-----------|---|--------------------------|---------------|
| Field of View Shape | (0018,1147) | CS | “RECTANGLE” | ALWAYS | AUTO |
| Field of View Dimension(s) | (0018,1149) | IS | Generated by device | ALWAYS | AUTO |
| Image Pixel Spacing | (0018,1164) | DS | Generated by device (on the detector) | ALWAYS | AUTO |
| Detector Type | (0018,7004) | CS | “” | EMPTY | AUTO |
| Pixel Spacing | (0028,0030) | DS | Generated by device (on 10cm above from table-top) | ALWAYS | AUTO |

6.1.1.6.31. Acquisition Context Module**Table 6.1-37****ACQUISITION CONTEXT MODULE OF CREATED SOP INSTANCES**

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------------|-------------|-----------|--------------|--------------------------|---------------|
| Acquisition Context Sequence | (0040,0555) | SQ | “” | EMPTY | AUTO |

6.1.1.6.32. SOP Common Module

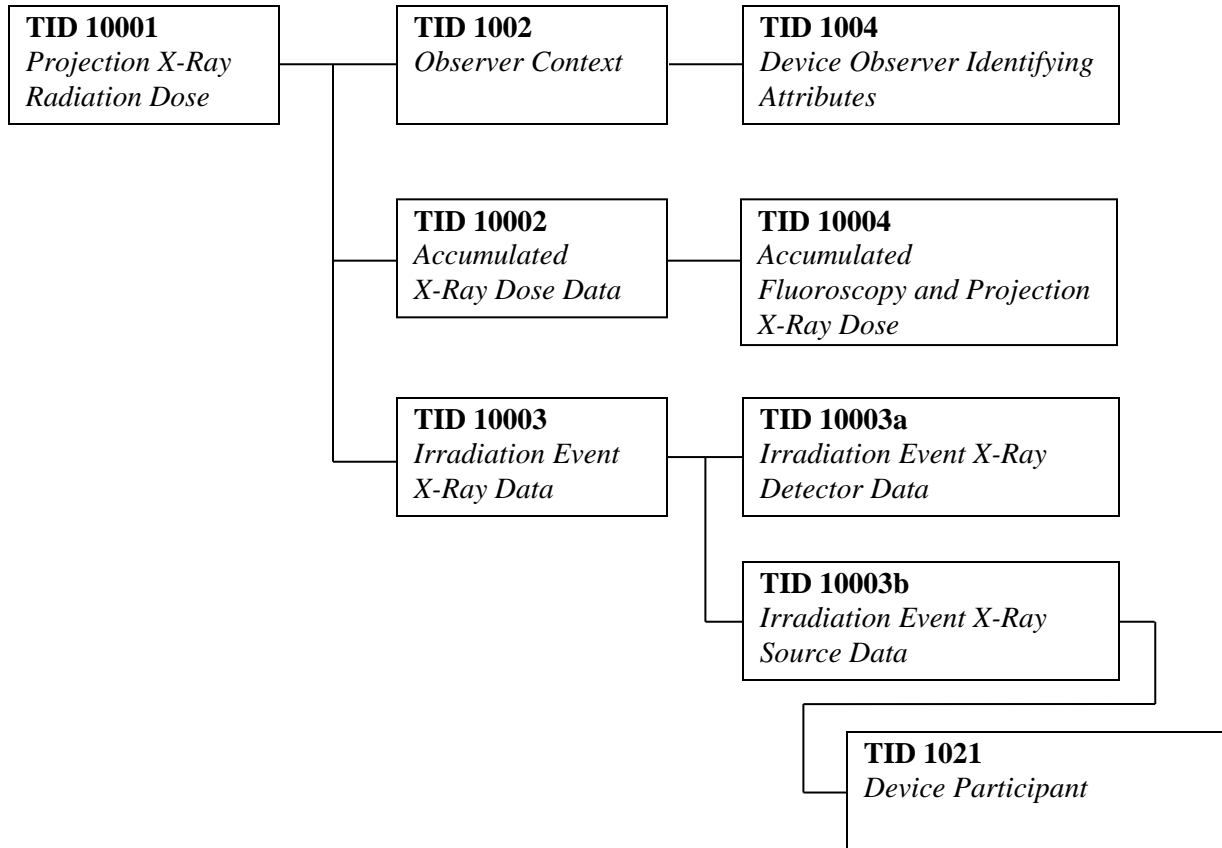
Table 6.1-38

SOP COMMON MODULE OF CREATED SOP INSTANCES

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------------|-------------|----|--|-------------------|--------------|
| Specific Character Set | (0008,0005) | CS | In Japanese Mode: “\ISO 2022 IR 87\ISO 2022 IR 159” or “\ISO 2022 IR 87” or the value received from MWL In English Mode: “ISO_IR 100” or the value received from MWL | ALWAYS | AUTO/ MWL |
| Instance Creation Date | (0008,0012) | DA | <yyyymmdd> formats date when the image data is created | ALWAYS | AUTO |
| Instance Creation Time | (0008,0013) | TM | <hhmmss> formats time when the image data is created | ALWAYS | AUTO |
| SOP Class UID | (0008,0016) | UI | RF: “1.2.840.10008.5.1.4.1.1.12.2” XA: “1.2.840.10008.5.1.4.1.1.12.1” DX for Presentation: “1.2.840.10008.5.1.4.1.1.1” DX for Processing: “1.2.840.10008.5.1.4.1.1.1” CR: “1.2.840.10008.5.1.4.1.1.1” | ALWAYS | AUTO |
| SOP Instance UID | (0008,0018) | UI | Generated by device | ALWAYS | AUTO |

6.1.1.7. X-Ray Radiation Dose Report

6.1.1.7.1. Template Structure



6.1.1.7.2. Projection X-Ray Radiation Dose (TID10001)

Table 6.1-39

PROJECTION X-RAY RADIATION DOSE INFORMATIONS

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|-----------|------------------------|-----------|---|---------------------------------------|--------------------------|---------------|
| | | CONTAINER | EV(113701, DCM, "X-Ray Radiation Dose Report") | | ALWAYS | AUTO |
| > | HAS CONCEPT MOD | CODE | EV(121058, DCM, "Procedure reported") | EV(113704, DCM, "Projection X-Ray") | ALWAYS | AUTO |
| >> | HAS CONCEPT MOD | CODE | EV(G-C0E8, SRT, "Has Intent") | EV(R-408C3, SRT, "Diagnostic Intent") | ALWAYS | AUTO |
| > | | | DTID(1002) Observer Context | Table 6.1-45 | ALWAYS | AUTO |
| > | HAS OBS CONTEXT | CODE | EV(113705, DCM, "Scope of Accumulation") | EV(113015, DCM, "Series") | ALWAYS | AUTO |
| >> | HAS PROPERTIES | UIDREF | EV(112002,DC M,"Series Instance UID") | UID generated by device | ALWAYS | AUTO |
| > | CONTAINS | CODE | EV (113945, DCM, "X-Ray Detector Data Available") | EV(R-0038D, SRT, "Yes") | ALWAYS | AUTO |
| > | CONTAINS | CODE | EV (113943, DCM, "X-Ray Source Data Available") | EV(R-0038D, SRT, "Yes") | ALWAYS | AUTO |
| > | CONTAINS | CODE | EV (113944, DCM, "X-Ray Mechanical Data Available") | EV(R-00339, SRT, "No") | ALWAYS | AUTO |
| > | CONTAINS | INCLUDE | DTID(10002) Accumulated X-Ray Dose | Table 6.1-40 | ALWAYS | AUTO |

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|----|-----------------|---------|--|----------------------------------|-------------------|--------|
| | CONTAINS | INCLUDE | DTID(10003) Irradiation Event X-Ray Data | Table 6.1-41 | ALWAYS | AUTO |
| > | CONTAINS | CODE | EV(113854, DCM, “Source of Dose Information”) | EV(A-2C090, SRT, ”Dosimeter”) | ALWAYS | AUTO |

6.1.1.7.3. Accumulated X-Ray Dose (TID10002)

Table 6.1-40

ACCUMULATED X-RAY DOSE INFORMATIONS

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|----|-----------------|-----------|--|---|-------------------|--------|
| | | CONTAINER | EV(113702, DCM, "Accumulated X-Ray Dose Data") | | ALWAYS | AUTO |
| > | HAS CONCEPT MOD | CODE | EV(113764, DCM, "Acquisition Plane") | EV(113622, DCM, "Single Plane") | ALWAYS | AUTO |
| > | CONTAINS | CONTAINER | EV(122505, DCM, "Calibration") | | ALWAYS | AUTO |
| >> | HAS CONCEPT MOD | CODE | EV(113794, DCM, "Dose Measurement Device") | EV(A-2C090, SRT, "Dosimeter") | ALWAYS | AUTO |
| >> | CONTAINS | DATETIME | EV(113723, DCM, "Calibration Date") | <yyyymmddhhmms> format date when calibration is performed | ALWAYS | AUTO |
| >> | CONTAINS | NUM | EV(122322, DCM, "Calibration Factor") | UNIT = EV(1, UCUM, "no units") From Configuration | ALWAYS | CONFIG |
| >> | CONTAINS | NUM | EV(113763, DCM, "Calibration Uncertainty") | UNIT = EV(1, UCUM, "Percent") From Configuration | ALWAYS | CONFIG |
| >> | CONTAINS | TEXT | EV(113724, DCM, "Calibration Responsible Party") | "Shimadzu Corp." | ALWAYS | CONFIG |
| > | CONTAINS | INCLUDE | DTID(10004) Accumulated Projection X-Ray Dose | Table 6.1-44 | ALWAYS | AUTO |

6.1.1.7.4. Irradiation Event X-Ray Data (TID10003)

Table 6.1-41

IRRADIATION EVENT X-RAY DATA INFORMATIONS

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|----|-----------------|-----------|---|---|-------------------|--------|
| | | CONTAINER | EV(113706, DCM, "Irradiation Event X-Ray Data") | | ALWAYS | AUTO |
| > | HAS CONCEPT MOD | CODE | EV(113764, DCM, "Acquisition Plane") | EV(113622, DCM, "Single Plane") | ALWAYS | AUTO |
| > | CONTAINS | UIDREF | EV(113769, DCM, "Irradiation Event UID") | DCID(10002) Irradiation Event Type UID generated by device In case of SDA, only 1 Irradiation Event will be set for a series of SDA irradiations. | ALWAYS | AUTO |
| > | CONTAINS | DATETIME | DT(111526, DCM, "DateTime Started") | <yyyymmddhhmms> format date when irradiation is started | ALWAYS | AUTO |
| > | CONTAINS | CODE | EV(113721, DCM, "Irradiation Event Type") | In case of Radiography: EV(113611, DCM, "Stationary Acquisition") In case of Fluoro: EV(P5-06000, SRT, "Fluoroscopy") | ALWAYS | AUTO |

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|----|-----------------|------|--|---|-------------------|--------|
| > | CONTAINS | TEXT | EV(125203, DCM, "Acquisition Protocol") | SPOT: SPOT /SPOT_R SERIAL: SERIAL SDA: SDA_O DSA: DSA RSMDSA: RSMDSA TOMO: TOMO/ TOMO_R TOMOS: TOMOS_O SLOT: SLOT_O BMD: BMD Fluoroscopy: FLUORO | ALWAYS | AUTO |
| > | CONTAINS | CODE | EV(123014, DCM, "Target Region") | DCID(4031) Common Anatomic Regions ID of the target "SRT" Name of the target | ALWAYS | USER |
| > | CONTAINS | NUM | EV(122130, DCM, "Dose Area Product") | UINT = EV(Gy.m2, UCUM, "Gy.m2") Dose Area Product of this irradiation | ALWAYS | AUTO |
| > | | | DTID (10003a) Irradiation Event X-Ray Detector Data | Table 6.1-42 | ALWAYS | AUTO |
| > | | | DTID (10003b) Irradiation Event X-Ray Source Data | Table 6.1-43 | ALWAYS | AUTO |

6.1.1.7.5. Irradiation Event X-Ray Detector Data (10003a)

Table 6.1-42

IRRADIATION EVENT X-RAY DETECTOR DATA INFORMATIONS

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|-----------|------------------------|-----------|-----------------------------------|--|--------------------------|---------------|
| > | CONTAINS | IMAGE | EV(113795, DCM, "Acquired Image") | SOP Instance UID generated by device In case of SDA, only 1 UID for the acquired image will be set. | In case of Radiography | AUTO |

6.1.1.7.6. Irradiation Event X-Ray Source Data (10003b)

Table 6.1-43

IRRADIATION EVENT X-RAY SOURCE DATA INFORMATIONS

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|----|-----------------|------|---|---|-------------------|--------|
| > | CONTAINS | NUM | EV(113738, DCM, "Dose (RP)") | UNIT = EV(Gy, UCUM, "Gy") Air Kerma of this irradiation | ALWAYS | AUTO |
| > | CONTAINS | CODE | EV(113780, DCM, "Reference Point Definition") | EV(113863, DCM, "30cm above tabletop") | ALWAYS | AUTO |
| > | CONTAINS | CODE | EV(113732, DCM, "Fluoro Mode") | In case of Continuous Fluoro: EV(113630, DCM, "Continuous") In case of Pulse Fluoro: EV(113631, DCM, "Pulsed") | ALWAYS | AUTO |
| > | CONTAINS | NUM | EV(113791, DCM, "Pulse Rate") | In case of Pulse Fluoro: UNIT = EV({pulse}/s, UCUM, "pulse/s") | ALWAYS | AUTO |
| > | CONTAINS | NUM | EV(113768, DCM, "Number of Pulses") | UNIT = EV(1, UCUM, "no units") Total number of pulses of this irradiation | ALWAYS | AUTO |
| >> | HAS CONCEPT MOD | CODE | EV(121401, DCM, "Derivation") | EV(R-10260, SRT, "Estimated") | ALWAYS | AUTO |
| > | CONTAINS | NUM | EV(113733, DCM, "KVP") | UNIT = EV(kV, UCUM, "kV") Kilo-voltage of this irradiation In case of SDA, all the value during the series of SDA will be enumerated. | ALWAYS | AUTO |

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|----|-----------------|-----|---------------------------------------|--|-------------------|--------|
| > | CONTAINS | NUM | EV(113734, DCM, "X-Ray Tube Current") | UINT = EV(mA, UCUM, "mA") Tube current of this irradiation In case of SDA, all the value during the series of SDA will be enumerated. | ALWAYS | AUTO |
| > | CONTAINS | NUM | EV(113824, DCM, "Exposure Time") | UINT = EV(ms, UCUM, "ms") Exposure time of this irradiation In case of SDA, all the value during the series of SDA will be enumerated. | ALWAYS | AUTO |
| > | | | DTID(1021) Device Participant | Table 6.1-47 | ALWAYS | AUTO |

6.1.1.7.7. Accumulated Projection X-Ray Dose (TID10004)

Table 6.1-44

ACCUMULATED PROJECTION X-RAY DOSE INFORMATIONS

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|----|-----------------|-----|--|--|-------------------|--------|
| | CONTAINS | NUM | EV(113722, DCM, “Dose Area Product Total”) | EV(Gy.m2, UCUM, “Gy.m2”) Total Dose Area Product in the study | ALWAYS | AUTO |
| | CONTAINS | NUM | EV(113725, DCM, “Dose (RP) Total”) | EV(Gy, UCUM, “Gy”) Total Air Kerma in the study | ALWAYS | AUTO |
| | CONTAINS | NUM | EV(113726, DCM, “Fluoro Dose Area Product Total”) | EV(Gy.m2, UCUM, “Gy.m2”) Total Fluoro Dose Area Product in the study | ALWAYS | AUTO |
| | CONTAINS | NUM | EV(113728, DCM, “Fluoro Dose (RP) Total”) | EV(Gy, UCUM, “Gy”) Total Fluoro Air Kerma in the study | ALWAYS | AUTO |
| | CONTAINS | NUM | EV(113730, DCM, “Total Fluoro Time”) | EV(s, UCUM, “s”) Total Fluoro Time in the study | ALWAYS | AUTO |
| | CONTAINS | NUM | EV(113727, DCM, “Acquisition Dose Area Product Total”) | EV(Gy.m2, UCUM, “Gy.m2”) Total Rad Dose Area Product in the study | ALWAYS | AUTO |
| | CONTAINS | NUM | EV(113729, DCM, “Acquisition Dose (RP) Total”) | EV(Gy, UCUM, “Gy”) Total Rad Air Kerma in the study | ALWAYS | AUTO |
| | CONTAINS | NUM | EV(113855, DCM, “Total Acquisition Time”) | EV(s, UCUM, “s”) Total Rad time in the study | ALWAYS | AUTO |

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|----|-----------------|------|--|---|-------------------|--------|
| | CONTAINS | NUM | EV(113731, DCM, “Total Number of Radiographic Frames”) | EV(1, UCUM, ”no unit”) Total number of frames acquired in the study In case of SDA, the number of frame of the acquired image will be set | ALWAYS | AUTO |
| | CONTAINS | CODE | EV(113780, DCM, “Reference Point Definition”) | DCID(10025) Radiation Dose Reference Points “30cm above the tabletop” | ALWAYS | AUTO |

6.1.1.7.8. Observer Context (TID1002)

Table 6.1-45

OBSERVER CONTEXT INFORMATIONS

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|----|-----------------|------|---|---------------------------|-------------------|--------|
| | HAS OBS CONTEXT | CODE | EV(121005, DCM, “Observer Type”) | EV(121007, DCM, ”Device”) | ALWAYS | AUTO |
| | | | DTID(1004) Device Observer Identifying Attributes | Table 6.1-46 | ALWAYS | AUTO |

6.1.1.7.9. Device Observer Identifying Attributes (TID1004)

Table 6.1-46

DEVICE OBSERVER IDENTIFYING ATTRIBUTES INFORMATIONS

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|----|-----------------|--------|--|-------------------------|-------------------|--------|
| | HAS OBS CONTEXT | UIDREF | EV(121012, DCM, “Device Observer UID”) | UID Generated by device | ALWAYS | AUTO |

6.1.1.7.10. Device Participant (TID1021)

Table 6.1-47

DEVICE PARTICIPANT INFORMATIONS

| NL | Rel with Parent | VT | Concept Name | Value | Presence of Value | Source |
|----|-----------------|--------|---|--|-------------------|--------|
| | | CODE | EV(113876, DCM, "Device Role in Procedure") | EV(113859, DCM, "Irradiation Device ") | ALWAYS | AUTO |
| > | HAS PROPERTIES | TEXT | EV(113878, DCM, "Device Manufacturer") | Shimadzu Corp. | ALWAYS | CONFIG |
| > | HAS PROPERTIES | TEXT | EV(113879, DCM, " Device Model Name ") | SONIALVISION G4 | ALWAYS | CONFIG |
| > | HAS PROPERTIES | TEXT | EV(113880, DCM, " Device Serial Number ") | Device Serial Number | ALWAYS | CONFIG |
| > | HAS PROPERTIES | UIDREF | EV (121012,DCM, "Device Observer UID") | UID Generated by device | ALWAYS | CONFIG |

6.1.2. Used Fields in received IOD by application

The DR-300 storage application does not receive SOP Instances. The usage of attributes received via Modality Worklist is described in section 2.2.2.3.2.3.

6.1.3. Attribute mapping

The relationship between attributes received via Modality Worklist, stored in acquired images and communicated via MPPS are summarized in the Table below.

Table 6.1-48

ATTRIBUTE MAPPING BETWEEN MODALITY WORKLIST, IMAGE AND MPPS

| Modality Worklist | Image IOD | MPPS IOD |
|---|-----------------------------|---|
| Specific Character Set | Specific Character Set | Specific Character Set |
| >Modality [Note 2] | Modality | Modality |
| >Scheduled Station AE Title [Note 2] | | Performed Station AE Title |
| >Scheduled Performing Physician's Name [Note 2] | Performing Physician's Name | >Performing Physician's Name [Note 3] |
| >Scheduled Procedure Step Description [Note 2] | | >Scheduled Procedure Step Description [Note 4] |
| | | Performed Procedure Step Description |
| >Scheduled Protocol Code Sequence [Note 1] [Note 2] | | >Scheduled Protocol Code Sequence [Note 1] [Note 4] |
| | | Performed Protocol Code Sequence [Note 1] |
| >Scheduled Procedure Step ID [Note 2] | | >Scheduled Procedure Step ID [Note 4] |
| | | Performed Procedure Step ID |
| >Scheduled Station Name [Note 2] | Station Name | Performed Station Name |
| >Scheduled Procedure Step Location [Note 2] | Institution Department Name | Performed Location |
| Referenced Study Sequence | | >Referenced Study Sequence [Note 4] |

| Modality Worklist | Image IOD | MPPS IOD |
|---|----------------------------|--|
| Study Instance UID | Study Instance UID | >Study Instance UID [Note 4] |
| Requested Procedure Description | Study Description | >Requested Procedure Description [Note 4] |
| Requested Procedure Code Sequence [Note 1] | | Procedure Code Sequence [Note 1] |
| Requested Procedure ID | | >Requested Procedure ID [Note 4] |
| Accession Number | Accession Number | Accession Number |
| Referring Physician's Name | Referring Physician's Name | |
| Patient's Name | Patient's Name | Patient's Name |
| Patient ID | Patient ID | Patient ID |
| Patient's Birth Date | Patient's Birth Date | Patient's Birth Date |
| Patient's Sex | Patient's Sex | Patient's Sex |
| Patient's Weight | Patient's Weight | |
| | Series Description | >Series Description [Note 3] |
| | Operator's Name | >Operator's Name [Note 3] |
| | Protocol Name | Protocol Name |
| | Series Instance UID | Series Instance UID |
| | Study ID | Study ID |

[Note 1] During these attributes mapping, only the first item will be copied to MPPS IOD, even multiple items might be defined in the Worklist IOD.

[Note 2] These attributes are belonging to 'Scheduled Procedure Step Sequence (0040, 0100)'.

[Note 3] These attributes are belonging to 'Performed Series Sequence (0040, 0340)'.

[Note 4] These attributes are belonging to 'Scheduled Step Attribute Sequence (0040, 0270)'.

6.1.4. Coerced/Modified Fields

The DR-300 does not coerce/modify any attribute values received in the response to a Modality Worklist Query.

6.2. DATA DICTIONARY OF PRIVATE ATTRIBUTES

The Private Attributes added to created SOP Instances are listed in the Table below. The DR-300 reserves block of private attributes in groups 6B07.

These Private Attributes will be added to all the Image Instances created by the DR-300.

Table 6.2-1
DATA DICTIONARY OF PRIVATE ATTRIBUTES

| Tag | Attribute Name | VR | VM | Attribute Description |
|-------------|------------------|----|----|---|
| (6B07,0030) | Private Creator | LO | 1 | SHPF0730.0 |
| (6B07,3000) | Last Modifier | UI | 1 | UID of the system who modified this image last. |
| (6B07,3001) | Last Modify Date | DA | 1 | Data when this image is modified last. |
| (6B07,3002) | Last Modify Time | TM | 1 | Time when this image is modified last. |

6.3. Coded Terminology and Templates

The Workflow AE is capable of supporting arbitrary coding scheme for Procedure and Protocol Codes. The contents of Requested Procedure Code Sequence (0032,1064) and Scheduled Protocol Code Sequence (0040,0008) supplied in Worklist items will be mapped to MPPS attributes as described in Table 6-5.

6.4. Grayscale Image Consistency

The high resolution display monitor attached to the DR-300 should be adjusted by the Service Personnel during the installation.

6.5. Standard Extended/Specialized/Private SOP Classes

No Specialized or Private SOP Classes are supported.

6.6. Private Transfer Syntaxes

No Private Transfer Syntaxes are supported.