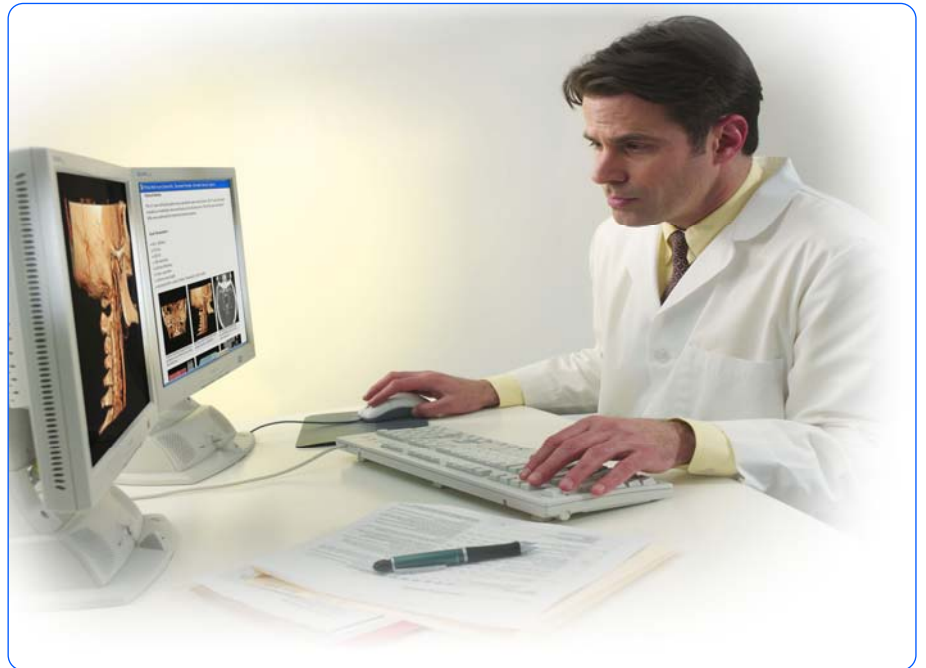

DICOM

Conformance Statement

Extended Brilliance Workspace V3



Issued by:

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1. DICOM CONFORMANCE STATEMENT OVERVIEW

- This conformance statement refers to the Brilliance™ Workspace, Philips user environment for CT scanning and visualization. All Brilliance Workspace users enjoy the same easy to use interface and access to advanced applications. This version of the DICOM conformance statement applies to Extended Brilliance Workspace (EBW) workstation, versions 3.x.

The first column specifies the used SOP classes exactly as named in PS 3.6. (Ref. PS 3.2 Annex A.) of the DICOM Standard.

Table 1: Network Services

| SOP Class | | User of Service (SCU) | Provider of Service (SCP) |
|--|-------------------------------|-----------------------|---------------------------|
| Name | UID | | |
| Transfer | | | |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | Yes | Yes |
| Digital X-Ray Image Storage – for Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | Yes | Yes |
| Digital X-Ray Image Storage – for Processing | 1.2.840.10008.5.1.4.1.1.1.1.1 | Yes | Yes |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | Yes | Yes |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 | Yes | Yes |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | Yes | Yes |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2 | Yes | Yes |
| Multi-frame True Color Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.4 | Yes | Yes |
| General ECG Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.1.2 | Yes | Yes |
| Grayscale Softcopy Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.1 | Yes | Yes |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 | Yes | Yes |
| X-Ray Radiofluoroscopic Image Storage | 1.2.840.10008.5.1.4.1.1.12.2 | Yes | Yes |
| Nuclear Medicine Image Storage | 1.2.840.10008.5.1.4.1.1.20 | Yes | Yes |
| Raw Data Storage | 1.2.840.10008.5.1.4.1.1.66 | Yes | Yes |
| Key Object Selection Document | 1.2.840.10008.5.1.4.1.1.88.59 | Yes | Yes |
| Encapsulated PDF | 1.2.840.10008.5.1.4.1.1.104.1 | Yes | Yes |
| Positron Emission Tomography Image Storage | 1.2.840.10008.5.1.4.1.1.128 | Yes | Yes |
| RT Image Storage | 1.2.840.10008.5.1.4.1.1.481.1 | Yes | Yes |
| RT Structure Set Storage | 1.2.840.10008.5.1.4.1.1.481.3 | Yes | Yes |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 | Yes | Yes |
| Query/Retrieve | | | |
| Study Root Query/Retrieve Information Model – FIND | 1.2.840.10008.5.1.4.1.2.2.1 | Yes | Yes |
| Study Root Query/Retrieve Information Model – MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | Yes | Yes |
| Workflow Management | | | |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Yes | No |
| Print Management | | | |
| 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 |
| Basic Color Image Box | 1.2.840.10008.5.1.1.4.1 | Yes | No |
| Basic Grayscale Print Management (Meta) | 1.2.840.10008.5.1.1.9 | Yes | No |

| SOP Class | | User of Service (SCU) | Provider of Service (SCP) |
|-------------------------------------|------------------------|-----------------------|---------------------------|
| Name | UID | | |
| Printer | 1.2.840.10008.5.1.1.16 | Yes | No |
| Basic Color Print Management (Meta) | 1.2.840.10008.5.1.1.18 | Yes | No |

Note: Verification SCP (C-ECHO) is not included in the table above because it is required for any Acceptor of an Association. The Verification SCU details are covered in the details of the conformance statement.

Table 2: Media Services

| Media Storage Application Profile | Write Files (FSC) | Update Files (FSU) | Read Files (FSR) |
|-----------------------------------|-------------------|--------------------|------------------|
| Compact Disk – Recordable | | | |
| CT/MR Studies on CD-R | Yes | Yes | Yes |
| STD-GEN-CD | Yes | No | Yes |

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3. INTRODUCTION

The introduction specifies product and relevant disclaimers as well as any general information that the vendor feels is appropriate.

3.1. Revision History

The revision history provides dates and differences of the different releases.

Table 3: Revision History

| Document Version | Date of Issue | Author | Description |
|------------------|---------------|--------|------------------------|
| 3.0.1 | 15 July 2006 | PMS-CT | Updated for EBW V3.0.1 |

3.2. Audience

This Conformance Statement is intended for:

- (Potential) customers
- System integrators of medical equipment
- Marketing staff interested in system functionality
- Software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

3.3. Remarks

The DICOM Conformance Statement is contained in chapter 4 through 8 and follows the contents and structuring requirements of [DICOM] PS 3.2.

This DICOM Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

- **Interoperability**
Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment.
It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.
- **Validation**
Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement.
Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of

the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

- **New versions of the DICOM Standard**

The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery.

The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

3.4. Definitions, Terms and Abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see [DICOM] PS 3.3 and PS 3.4.

The word Philips in this document refers to Philips Medical Systems.

The following acronyms and abbreviations are used in this document.

| | |
|---------|--|
| AE | Application Entity |
| ANSI | American National Standard Institute |
| AP | Application Profile |
| BOT | Basic Offset Table |
| CD | Compact Disc |
| CD-R | CD-Recordable |
| CD-M | CD-Medical |
| CR | Computed Radiography |
| CT | Computed Tomography |
| DCR | Dynamic Cardio Review |
| DICOM | Digital Imaging and Communications in Medicine |
| DIMSE | DICOM Message Service Element |
| DIMSE-C | DIMSE-Composite |
| DIMSE-N | DIMSE-Normalized |
| DVD | Digital Versatile Disc |
| DX | Digital X-Ray |
| EBE | DICOM Explicit VR Big Endian |
| ELE | DICOM Explicit VR Little Endian |
| FSC | File-set Creator |
| FSR | File-set Reader |
| FSU | File-set Updater |
| GUI | Graphic User Interface |
| HIS | Hospital Information System |
| HL7 | Health Level Seven |
| ILE | DICOM Implicit VR Little Endian |
| IOD | Information Object Definition |
| ISIS | Information System – Imaging System |
| MOD | Magneto-Optical Disk |
| MPPS | Modality Performed Procedure Step |
| MR | Magnetic Resonance |
| NEMA | National Electrical Manufacturers Association |
| NM | Nuclear Medicine |
| PDU | Protocol Data Unit |
| PET | Positron Emission Tomography |

| | |
|--------|---|
| RF | X-Ray Radiofluoroscopic |
| RIS | Radiology Information System |
| RT | Radiotherapy |
| RWA | Real-World Activity |
| SC | Secondary Capture |
| SCM | Study Component Management |
| SCP | Service Class Provider |
| SCU | Service Class User |
| SOP | Service Object Pair |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| UID | Unique Identifier |
| US | Ultrasound |
| USMF | Ultrasound Multi-frame |
| WLM | Worklist Management |
| XA | X-Ray Angiographic |

3.5. References

- [DICOM] Digital Imaging and Communications in Medicine (DICOM), Part 1 – 18 (NEMA PS 3.1-2006 – PS 3.18-2006), National Electrical Manufacturers Association (NEMA) Publication Sales 1300 N. 17th Street, Suite 1847 Rosslyn, Virginia. 22209, United States of America.
Note that at any point in time the official standard consists of the most recent yearly edition of the base standard (currently 2006) PLUS all the supplements and correction items that have been approved as Final Text

4. NETWORKING

This section contains the networking related services vs. the media related ones in Chapter 5.

4.1. Implementation model

The implementation model consists of three sections:

- The application data flow diagram, specifying the relationship between the Application Entities and the “external world” or Real-World Activities,
- A functional description of each Application Entity, and
- The sequencing constraints among them.

4.1.1. Application Data Flow

The system implements and provides DICOM services using the following Application Entities:

- Dicom-Manager
- Print-Manager

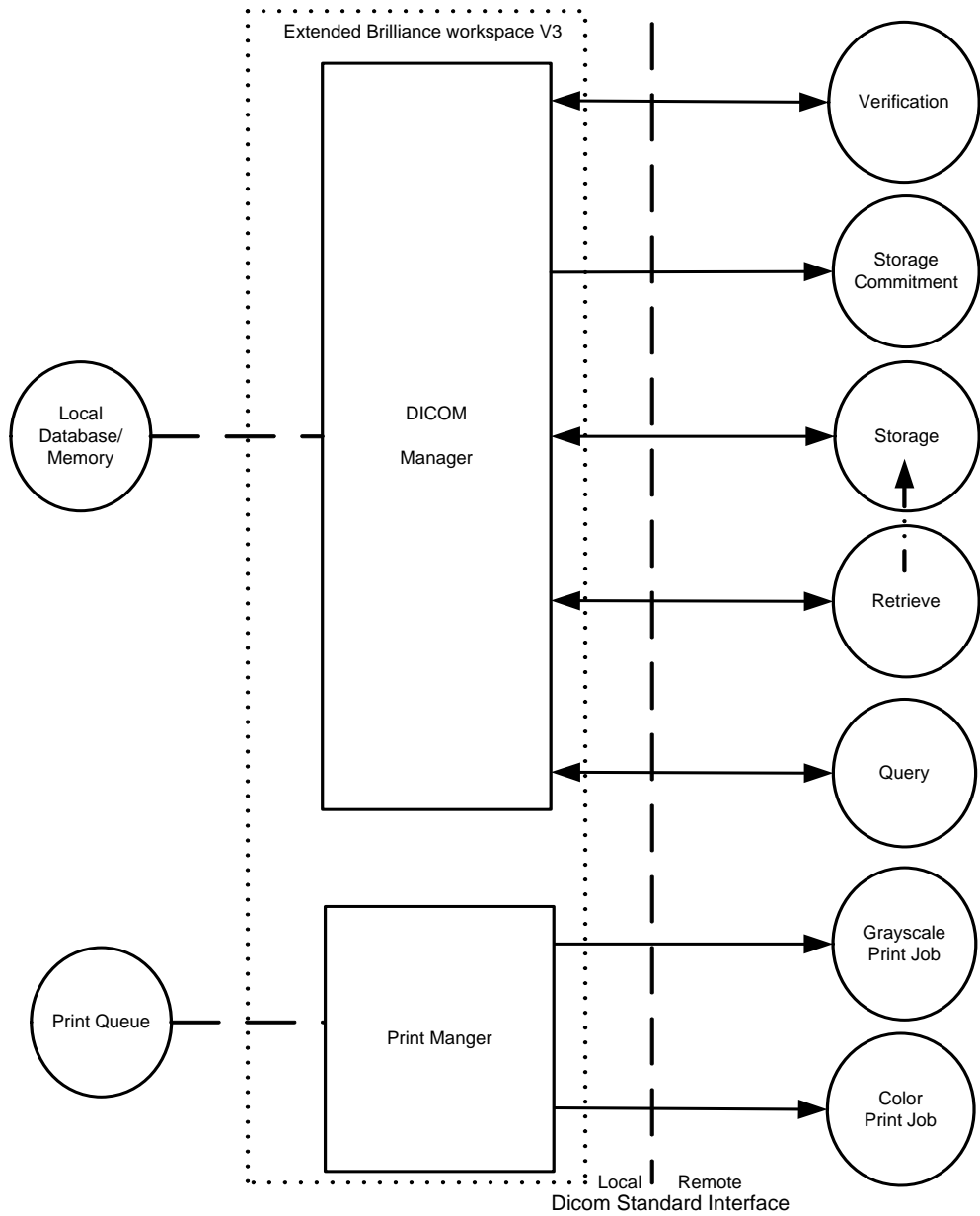


Figure 1: Application Data Flow Diagram

4.1.2. Functional Definition of AE's

This part contains a functional definition for each individual local Application Entity. It describes in general terms the functions to be performed by the AE, and the DICOM services used to accomplish these functions. In this sense, "DICOM services" refers not only to DICOM Service Classes, but also to lower level DICOM services, such as Association Services.

4.1.2.1. Functional Definition of DICOM Manager

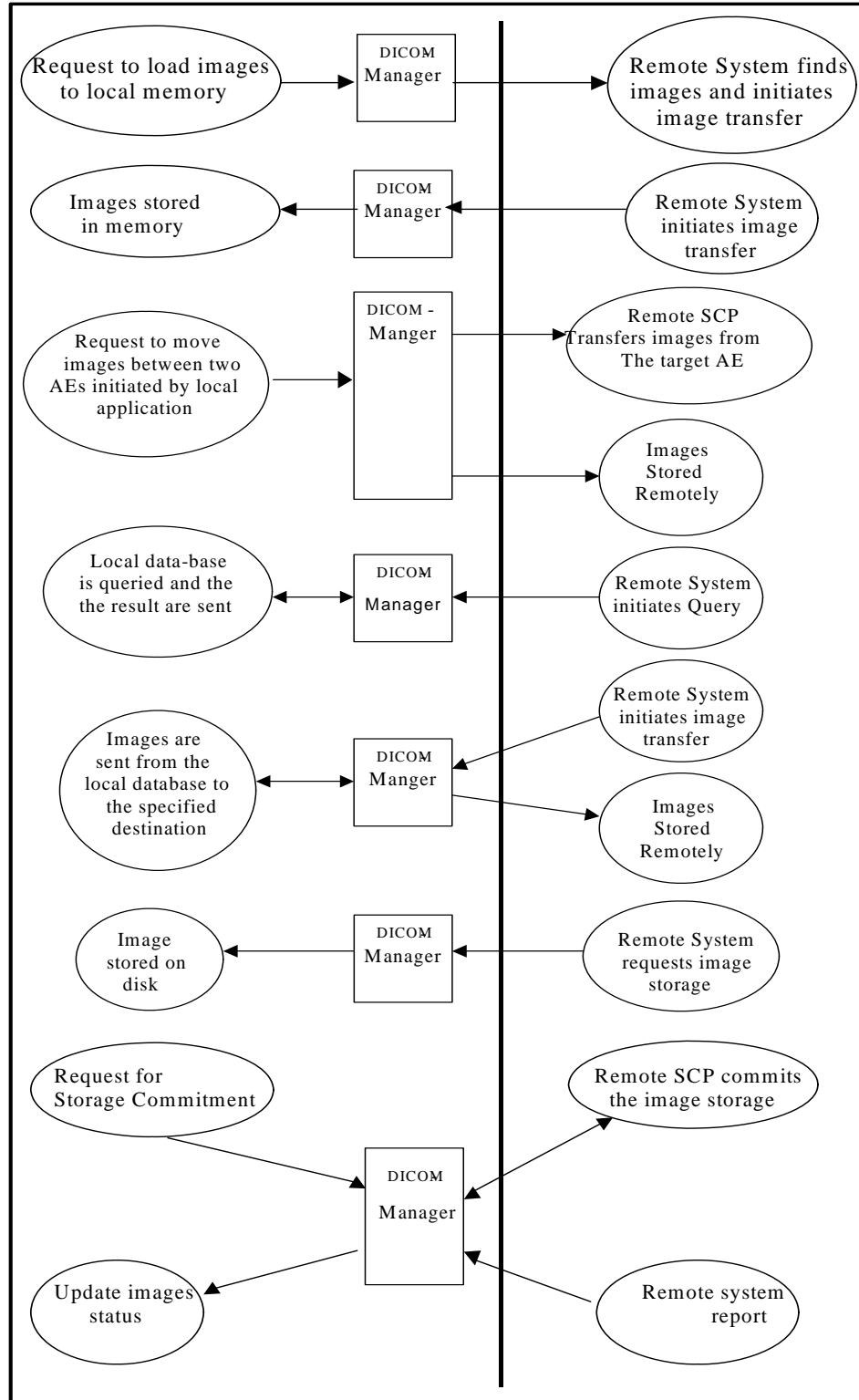


Figure 2: Illustration of DICOM Manager

- The DICOM-Manager is responsible for loading images into memory. The DICOM- Manager gets requests from local image processing and display applications to load images to the memory. It performs these requests using the Query-Retrieve Service Class (C-MOVE only).
- The DICOM-Manager waits for another application to connect at the presentation address configured for its AE title. Memory-Server will accept associations with Presentation Contexts for SOP classes of the Storage and Verification Service Classes. It will receive images on these Presentation Contexts and load them into the system's memory.
- The DICOM Manager is responsible to issue and support the storage commitment service as SCU. When some remote storage device server is configured to support this service, The DICOM Manager establishes association with the specified AE title and sends storage commitment (N-ACTION) request using push the model. After that, it may accept storage commitment (N-EVENT-REPORT) requests on the same association or by establishing another association
- The DICOM Manager waits for another application to connect at the presentation address configured for its AE title. The DICOM Manager will accept associations with Presentation Contexts for Service Object Pair (SOP) classes of the Storage, Query-Retrieve (C-MOVE and C-FIND only) and Verification Service Classes.
- When performing a Storage Service Class (SCP), the DICOM Manager will receive images and store them into the system's local database. The same AE may be used (with a configurable different AE title) to access the local MOD or different local hard disk folders.
- When performing Query-Retrieve Service Class (C-FIND SCP), the DICOM Manager will query its local database according to the request's parameters, and will send the results to the issuer.
- When performing Query-Retrieve Service Class (C-MOVE SCP), the DICOM Manager will issue a C-STORE (SCU) to the target AE for every image found according to the request.

4.1.2.2. Functional Definition of Print Manager

The Print-Manager is a Graphical User Interface (GUI) based application. It enables the user to print predefined images using the DICOM protocol. The user can specify as a printing destination one of several predefined printers. The user can also modify some of the printing parameters such as the film size and format. The following figure provides an illustration of Print-Manager activities:

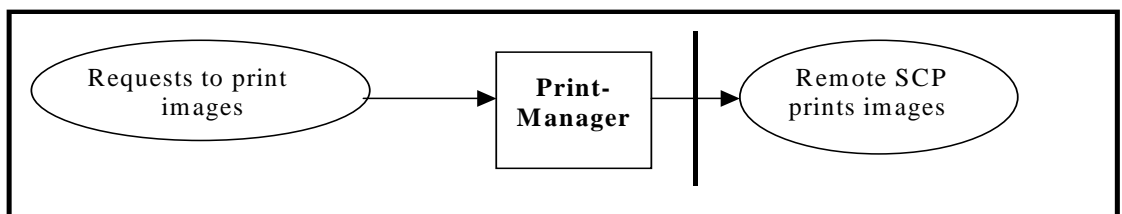


Figure 3: Illustration of Print Manager

4.2. AE Specifications

The Extended Brilliance Workspace V3.x consists of 2 AE, The DICOM Manager and Print Manager. These two AE's will be described in the subsections 4.2.1 and 4.2.2.

4.2.1. DICOM Manager

Every detail of this specific Application Entity shall be completely specified under this section.

4.2.1.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 4: SOP Classes for DICOM Manager

| SOP Class Name | SOP Class UID | SCU | SCP |
|--|-------------------------------|-----|-----|
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | Yes | Yes |
| Digital X-Ray Image Storage – for Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | Yes | Yes |
| Digital X-Ray Image Storage – for Processing | 1.2.840.10008.5.1.4.1.1.1.1.1 | Yes | Yes |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | Yes | Yes |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 | Yes | Yes |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | Yes | Yes |
| Multi-frame Grayscale Byte Secondary Capture Image Storage (**) | 1.2.840.10008.5.1.4.1.1.7.2 | Yes | Yes |
| Multi-frame True Color Secondary Capture Image Storage (**) | 1.2.840.10008.5.1.4.1.1.7.4 | Yes | Yes |
| General ECG Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.1.2 | Yes | Yes |
| Grayscale Softcopy Presentation State Storage (*) | 1.2.840.10008.5.1.4.1.1.11.1 | Yes | Yes |
| X-Ray Angiographic Image Storage (***) | 1.2.840.10008.5.1.4.1.1.12.1 | Yes | Yes |
| X-Ray Radiofluoroscopic Image Storage (***) | 1.2.840.10008.5.1.4.1.1.12.2 | Yes | Yes |
| Nuclear Medicine Image Storage (**) | 1.2.840.10008.5.1.4.1.1.20 | Yes | Yes |
| Raw Data Storage (*) | 1.2.840.10008.5.1.4.1.1.66 | Yes | Yes |
| Key Object Selection Document (*) | 1.2.840.10008.5.1.4.1.1.88.59 | Yes | Yes |
| Encapsulated PDF (*) | 1.2.840.10008.5.1.4.1.1.104.1 | Yes | Yes |
| Positron Emission Tomography Image Storage | 1.2.840.10008.5.1.4.1.1.128 | Yes | Yes |
| RT Image Storage | 1.2.840.10008.5.1.4.1.1.481.1 | Yes | Yes |
| RT Structure Set Storage | 1.2.840.10008.5.1.4.1.1.481.3 | Yes | Yes |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 | Yes | Yes |
| Study Root Query/Retrieve Information Model – FIND | 1.2.840.10008.5.1.4.1.2.2.1 | Yes | Yes |
| Study Root Query/Retrieve Information Model – MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | Yes | Yes |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Yes | No |
| Verification SOP Class | 1.2.840.10008.1.1 | Yes | Yes |

Notes:

(*) These SOP Classes are only supported for storage (not for viewing/processing)

(**) These SOP Classes are supported for storage; they are also supported for viewing/processing by certain optional applications when installed on the system

(***) Only single-frame XA/RF are supported

4.2.1.2. Association Policies

4.2.1.2.1. General

The DICOM standard application context shall be specified.

Table 5: DICOM Application Context

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

4.2.1.2.2. Number of Associations

The number of simultaneous associations that will be accepted by DICOM Manager is limited on 50.

Table 6: Number of Associations as an Association Initiator for DICOM-Manager

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

Table 7: Number of Associations as an Association Acceptor for DICOM-Manager

| | |
|---|----|
| Maximum number of simultaneous associations | 50 |
|---|----|

4.2.1.2.3. Asynchronous Nature

If the implementation supports negotiation of multiple outstanding transactions this is stated here, along with the maximum number of outstanding transactions supported.

Table 8: Asynchronous Nature as an Association Initiator for DICOM-Manager

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

4.2.1.2.4. Implementation Identifying Information

The value supplied for Implementation Class UID is documented here. If a version name is supplied, this fact is documented here. Policies defining the values supplied for version name may be stated here.

Table 9: DICOM Implementation Class and Version for DICOM-Manager

| | |
|-----------------------------|----------------------|
| Implementation Class UID | 1.3.46.670589.33.1.1 |
| Implementation Version Name | BRCONN_3.0 |

4.2.1.2.5. Communication Failure Handling

The behavior of the AE during communication failure is summarized in Table 10.

Table 10: Communication Failure Behavior

| Exception | Behavior |
|---------------|---|
| ARTIM Timeout | The system stops the ARTIM timer and close the transport connection |

| Exception | Behavior |
|---------------------|---|
| Association Timeout | A release request is sent in order to close the association |

4.2.1.3. Association Initiation Policy

This describes the conditions under which the AE will initiate an association.

The behavior of the AE during association rejection is summarized in Table 11.

Table 11: DICOM Association Rejection Handling

| Result | Source | Reason/Diagnosis | Behavior |
|---|---|--|--------------------------|
| 1 – rejected-permanent | 1 – DICOM UL service-user | 1 – no-reason-given | The connection is closed |
| | | 2 – application-context-name-not-supported | The connection is closed |
| | | 3 – calling-AE-title-not-recognized | The connection is closed |
| | | 7 – called-AE-title-not-recognized | The connection is closed |
| | 2 – DICOM UL service-provider (ACSE related function) | 1 – no-reason-given | The connection is closed |
| | | 2 – protocol-version-not-supported | The connection is closed |
| | 3 – DICOM UL service-provider (presentation related function) | 1 – temporary-congestion | The connection is closed |
| | | 2 – local-limit-exceeded | The connection is closed |
| | 2 – rejected-transient | 1 – DICOM UL service-user | 1 – no-reason-given |
| 2 – application-context-name-not-supported | | | The connection is closed |
| 3 – calling-AE-title-not-recognized | | | The connection is closed |
| 7 – called-AE-title-not-recognized | | | The connection is closed |
| 2 – DICOM UL service-provider (ACSE related function) | | 1 – no-reason-given | The connection is closed |
| | | 2 – protocol-version-not-supported | The connection is closed |
| 3 – DICOM UL service-provider (presentation related function) | | 1 – temporary-congestion | The connection is closed |
| | | 2 – local-limit-exceeded | The connection is closed |

The behavior of the AE on receiving an association abort is summarized in Table 12.

Table 12: DICOM Association Abort Handling

| Source | Reason/Diagnosis | Behavior |
|-------------------------------|---------------------------------|--------------------------|
| 0 – DICOM UL service-user | 0 – reason-not-specified | The connection is closed |
| 2 – DICOM UL service-provider | 0 – reason-not-specified | The connection is closed |
| | 1 – unrecognized-PDU | The connection is closed |
| | 2 – unexpected-PDU | The connection is closed |
| | 4 – unrecognized-PDU parameter | The connection is closed |
| | 5 – unexpected-PDU parameter | The connection is closed |
| | 6 – invalid-PDU-parameter value | The connection is closed |

The behavior of the AE for sending an association abort is summarized in Table 13.

Table 13: DICOM Association Abort Policies

| Source | Reason/Diagnosis | Behavior |
|-------------------------------|--------------------------|---|
| 0 – DICOM UL service-user | 0 – reason-not-specified | When the system tries to disconnect before receiving an association accept but after sending association request When receiving association accept with no presentation context item When receiving association accept where all items in the presentation context item list are not accepted by remote system When an association timeout (configurable per remote device) expired (timeout which determines how long to keep an idle association). When receiving a PDU whose size is bigger than the agreed max PDU size |
| 2 – DICOM UL service-provider | 1 – unrecognized-PDU | When ever the system receives unexpected or unrecognized PDU (according to the DICOM UPPER LAYER PROTOCOL STATE TRANSITION TABLE in chapter 8 of the DICOM standard). |

4.2.1.3.1. (Real-World) Activity – Verification (C-ECHO)

4.2.1.3.1.1. Description and Sequencing of Activities

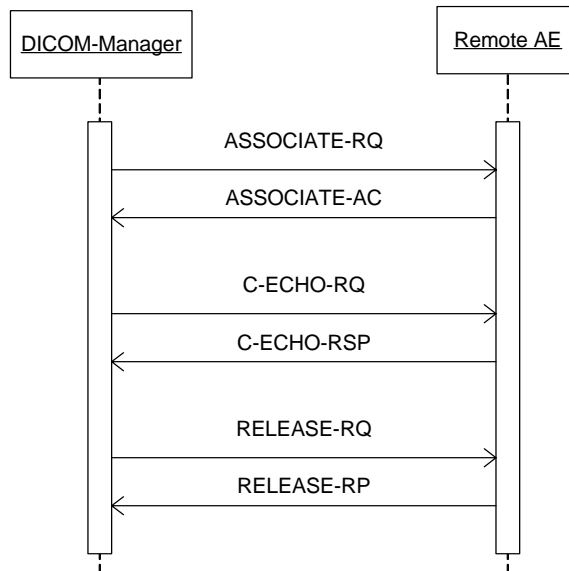


Figure 4: (Real World) Activity – DICOM Manager (C-ECHO SCU)

DICOM Manager initiates an association when the user points to one of the icons in the devices tool-bar, clicks the right mouse button and selects “Verify Connection” operation.

4.2.1.3.1.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by DICOM Manager for (Real-World) Activity – Verification (C-ECHO) are defined in Table 14

Table 14: Proposed Presentation Contexts for (Real-World) Activity – DICOM Manager – C-ECHO SCU

| Presentation Context Table | | | | | |
|----------------------------|-------------------|-----------------|--|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Verification SOP Class | 1.2.840.10008.1.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |

4.2.1.3.1.3. SOP Specific Conformance for SOP Classes

DICOM Manager provides standard conformance to the DICOM V3.0. All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 15.

Table 15: DICOM C-ECHO Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|--------------------|--------|----------------------------------|---|
| Success | 0000 | Success | The SCU has successfully send C-ECHO |
| Other than Success | <>0000 | Problems with sending the C-ECHO | The SCU failed to send the C-ECHO; user is notified |

4.2.1.3.2. (Real-World) Activity – Storage (C_STORE)

4.2.1.3.2.1. Description and Sequencing of Activities

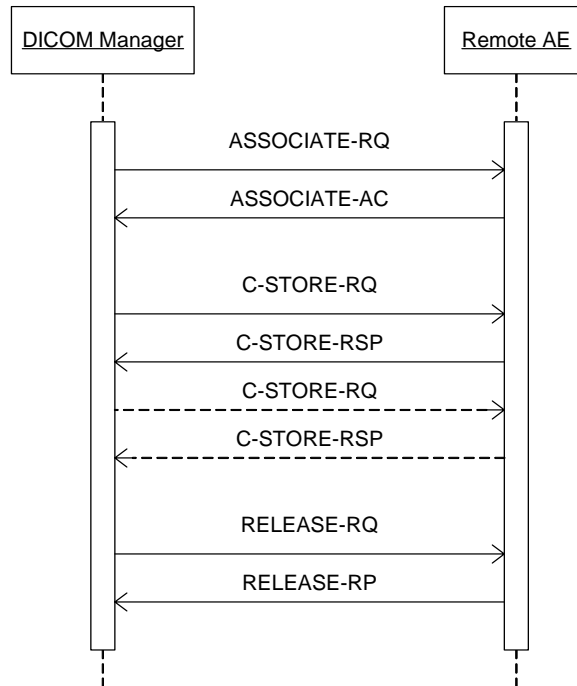


Figure 5: (Real World) Activity – DICOM Manager (C-STORE SCU)

The associated Real-World Activity is a request for retrieval of images from the disk/memory and storage of the images to a remote system using a C-STORE command.

4.2.1.3.2.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by DICOM Manager for (Real-World) Activity – DICOM Manager (C-STORE SCU) are defined in Table 16. Explicit VR Transfer Syntaxes for a specific AE target may be restricted using the configuration utility.

Table 16: Proposed Presentation Contexts for (Real-World) Activity – DICOM Manager – C-STORE SCU

| Presentation Context Table | | | | | |
|--|-----------------------------|-----------------|---------------------|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | ELE | 1.2.840.10008.1.2.1 | SCU | None |
| | | ILE | 1.2.840.10008.1.2 | | |
| Digital X-Ray Image Storage – for Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | ELE | 1.2.840.10008.1.2.1 | SCU | None |
| | | ILE | 1.2.840.10008.1.2 | | |

| Presentation Context Table | | | | | |
|--|-------------------------------|-----------------|--|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Digital X-Ray Image Storage – for Processing | 1.2.840.10008.5.1.4.1.1.1.1.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| Multi-frame True Color Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.4 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| General ECG Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.1.2 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| Grayscale Softcopy Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| X-Ray Radiofluoroscopic Image Storage | 1.2.840.10008.5.1.4.1.1.12.2 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| Nuclear Medicine Image Storage | 1.2.840.10008.5.1.4.1.1.20 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| Raw Data Storage | 1.2.840.10008.5.1.4.1.1.66 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| Key Object Selection Document | 1.2.840.10008.5.1.4.1.1.88.59 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| Encapsulated PDF | 1.2.840.10008.5.1.4.1.1.104.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| Positron Emission Tomography Image Storage | 1.2.840.10008.5.1.4.1.1.128 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| RT Image Storage | 1.2.840.10008.5.1.4.1.1.481.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| RT Structure Set Storage | 1.2.840.10008.5.1.4.1.1.481.3 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |

DICOM Manager prefers an explicit Transfer Syntax encoding. If offered a choice of Transfer Syntax's in a Presentation Context, it will apply the following priorities to the choice of Transfer Syntax:

- DICOM Explicit VR Little Endian.
- DICOM Implicit VR Little Endian.

4.2.1.3.2.3. SOP Specific Conformance for SOP Classes

DICOM Manager provides standard conformance to the DICOM V3.0 Storage Service Class as an SCU for SOP Classes mentioned in the previous section.

Multiple C-STORE operations can be performed over a single association. Upon receiving a C-STORE confirmation containing a successful status, this implementation will perform the next C-STORE operation (if this operation is the result of the Series Level Move request). The association will be kept open if possible.

Any unsuccessful status (error or warning), returned in the C-STORE confirmation, results in termination of sending further C-Store requests (if any in the queue) and reporting of the error to the system log file.

There are two timeouts for the association. One timeout, "Association Timeout" is used to close an idle association. For C-Store the default is 120 sec but can be configured per remote node. The other timeout is "Service Timeout" which detects that no data is transmitted over the association and closes it. The default for C-Store is 5 minutes.

The system creates CT, PET, NM, Single and Multi-frame Secondary Capture Images and RT Structure Sets. In section 8.1.1 an overview of the created objects is defined.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 17.

Table 17: DICOM C-STORE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|-------------------------------------|---|
| Success | 0000 | Success | Storage successful. |
| Failure | 0122 | Refused – SOP Class not supported | Message by transfer result – Unknown reason |
| | A700 | Refused – Out of Resources | Message by transfer result – Out of Resources |
| | A900 | Error - Data Set does not match SOP | Message by transfer result – Unknown reason |
| | C000 | Error – Cannot understand | Message by transfer result – Store failed |
| Warning | B000 | Coercion of Data Elements | Warning status is treated as success |
| | B006 | Elements Discarded | Warning status is treated as success |
| | B007 | Data Set does not match | Warning status is treated as success |

4.2.1.3.3. (Real-World) Activity – Storage Commitment

4.2.1.3.3.1. Description and Sequencing of Activities

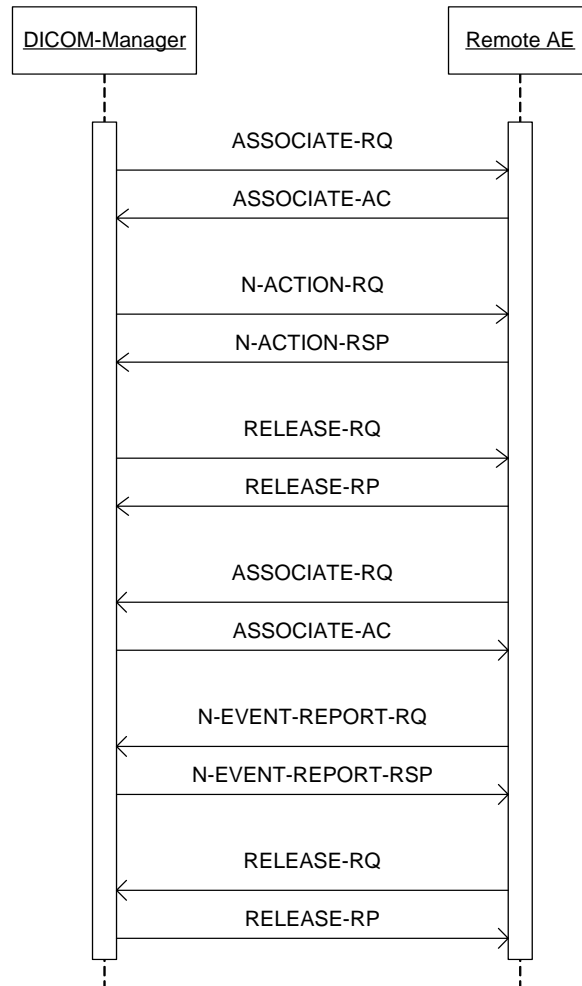


Figure 6: (Real World) Activity – DICOM Manager (Storage Commitment)

DICOM-Manager will attempt to initiate a new association when requested to commit the images that were stored on a remote device, which supports the storage Commitment Service.

The associated real world activity for the N-ACTION is a storage commitment request to the remote storage device.

The associated real world activity for the N-EVENT-REPORT operation is the completion of the storage commitment by the remote device. DICOM-Manager will issue a failure status if it is unable to properly handle the storage commitment report event.

4.2.1.3.3.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association.

In this subsection, the presentation contexts proposed by DICOM Manager for (Real-World) Activity – Storage Commitment are defined in Table 18

Table 18: Proposed Presentation Contexts for (Real-World) Activity – DICOM Manager – Storage Commitment

| Presentation Context Table | | | | | |
|---|----------------------|-----------------|--|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Storage Commitment Push Model SOP Class | 1.2.840.10008.1.20.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |

4.2.1.3.3.3. SOP Specific Conformance for SOP Classes

DICOM-Manager provides standard conformance to the DICOM V3.0 Storage Commitment Service Class using Push Model as an SCU.

Multiple N-ACTION requests can be performed over a single association. Multiple N-EVENT-REPORT requests can be accepted over a single association. After all N-ACTION requests that are waiting in the stack are issued, association will be closed with the timeout of 60 seconds.

A remote system reports about storage commitment completion using N-EVENT-REPORT command. The system can also accept the N-EVENT-REPORT commands over a separate association initiated by the remote system, using reverse role negotiation.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 19 for N-ACTION and in Table 21 for N-EVENT-REPORT

Table 19: DICOM N-ACTION Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|--------------------|--------|------------------------------------|---|
| Success | 0000 | Success | The request for storage commitment is considered successfully stored |
| Other than Success | <>0000 | Problems with sending the N-ACTION | The association is aborted and the request for storage commitment is marked as failed |

Table 20: Storage Commitment N-EVENT-REPORT Behavior

| Event Type Name | Event Type | Behavior |
|--|------------|--|
| Storage Commitment Request Successful | 1 | Successfully committed instances are marked as “transferred” |
| Storage Commitment Request Complete – Failures Exist | 2 | |

Table 21: DICOM N-EVENT-REPORT Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|------------------------|--|
| Success | 0000 | Success | The storage commitment result has been successfully received. |
| Failure | 0211 | Unrecognized Operation | The transaction UID in the N-EVENT-REPORT request is not recognized.. |
| | 0213 | Resource Limitation | The Transaction UID in the N-EVENT-REPORT request has expired. |
| | 0113 | No Such Event Type | An invalid Event Type ID was supplied in the N-EVENT-REPORT. |
| | 0110 | Processing Failure | An internal error occurred during processing |
| | 0115 | Invalid Argument Value | One of more SOP Instance UIDs with the Referenced SOP Sequence (0008.1199) or Failed SOP Sequence (0008,1198) was not included in the Storage Commitment Request associated with this Transaction UID. |

4.2.1.3.4. (Real-World) Activity – DICOM-Manager C-FIND (SCU)

4.2.1.3.4.1. Description and Sequencing of Activities

DICOM-Manager initiates an association when the user clicks on one of the icons in the devices tool-bar.
 The DICOM-Manager searches (C-FIND) by Study Level following by Series level and, optionally (configurable), by Image Level. The association remains open until the user explicitly closes it by clicking again on the device icon - the Query will be closed with a C-Release

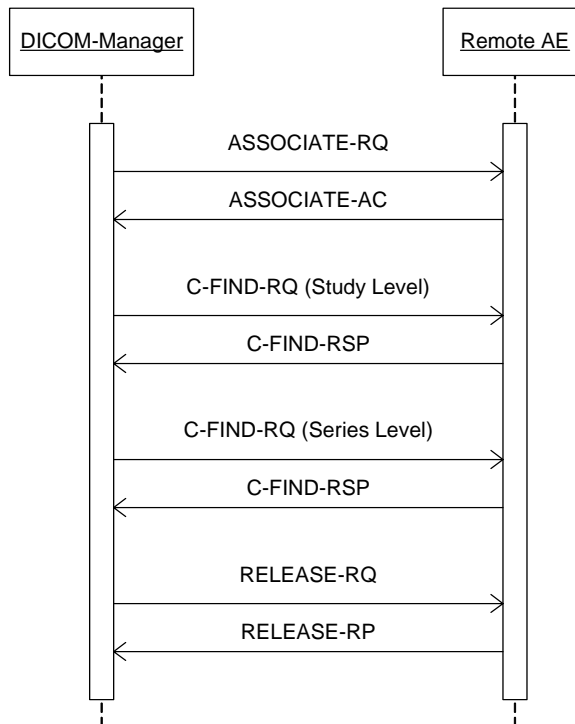


Figure 7: (Real World) Activity – DICOM-Manager C-FIND (SCU)

4.2.1.3.4.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by Archive-Manager for (Real-World) Activity – DICOM-Manager C-FIND (SCU) are defined in Table 22

Table 22: Proposed Presentation Contexts for (Real-World) Activity – Archive-Manager C-FIND (SCU)

| Presentation Context Table | | | | | |
|---|-----------------------------|-----------------|--|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Study Root Query /Retrieve Information Model - FIND | 1.2.840.10008.5.1.4.1.2.2.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |

4.2.1.3.4.3. SOP Specific Conformance for SOP Classes

The DICOM-Manager provides standard conformance to the DICOM V3.0.
 The DICOM-Manager supports the following Study and Series level attributes
 Sub-selection on the received list of patients after query will be done on the local memory.

Table 23: Supported Study and Series Query Level Attributes

| Query Level | Query Key | | | Value | Type of matching |
|-------------|--------------------------------------|-----------|----|--------------|------------------|
| | Name | Tag | VR | | |
| Study | Specific Character Set | 0008,0005 | CS | None | None |
| | Study Date | 0008,0020 | DA | User Input | S, U, R |
| | Study Time | 0008,0030 | TM | | None |
| | Accession Number | 0008,0050 | SH | User Input | S |
| | Query/Retrieve Level | 0008,0052 | CS | STUDY | S |
| | Modalities in Study | 0008,0061 | CS | User Input | S |
| | Referring Physician's Name * | 0008,0090 | PN | User Input | S, U, * |
| | Study Description | 0008,1030 | LO | User Input | S, U, * |
| | Patient's Name * | 0010,0010 | PN | User Input | S, U, * |
| | Patient ID | 0010,0020 | LO | User Input | S, U, * |
| | Patient's Birth Date | 0010,0030 | DA | | None |
| | Patient's Birth Time | 0010,0032 | TM | | None |
| | Patient's Sex | 0010,0040 | CS | | None |
| | Study Instance UID | 0020,000D | UI | | None |
| | Study ID | 0020,0010 | SH | | None |
| | Number of Study Related Series | 0020,1206 | IS | | None |
| | Number of Study Related Images | 0020,1208 | IS | | None |
| | Performed Procedure Step Description | 0040,0254 | LO | | None |
| Series | Specific Character Set | 0008,0005 | CS | | None |
| | Series Date | 0008,0021 | DA | | None |
| | Series Time | 0008,0031 | TM | | None |
| | Query/Retrieve Level | 0008,0052 | CS | SERIES | S |
| | Modality | 0008,0060 | CS | | None |
| | Manufacturer | 0008,0070 | LO | | None |
| | Series Description | 0008,103E | LO | | None |
| | Body Part Examined | 0018,0015 | CS | | None |
| | Protocol Name | 0018,1030 | LO | | None |
| | Study Instance UID | 0020,000D | UI | Parent Study | None |
| | Series Instance UID | 0020,000E | UI | | None |
| | Series Number | 0020,0011 | IS | | None |
| | Number of Series Related Instances | 0020,1209 | IS | | None |
| | Performed Procedure Step Start Date | 0040,0244 | DA | | None |
| | Performed Procedure Step Start Time | 0040,0245 | TM | | None |

| Query Level | Query Key | | | Value | Type of matching |
|-------------|------------------------------|-----------|----|-------|------------------|
| | Name | Tag | VR | | |
| Image | Request Attributes Sequence | 0040,0275 | SQ | | None |
| | >Requested Procedure ID | 0040,1001 | SH | | None |
| | >Scheduled Procedure Step ID | 0040,0009 | SH | | None |
| | Specific Character Set | 0008,0005 | CS | | None |
| | Image Type | 0008,0008 | CS | | None |
| | Instance Creation Date | 0008,0012 | DA | | None |
| | Instance Creation Time | 0008,0013 | TM | | None |
| | SOP Class UID | 0008,0016 | UI | | None |
| | SOP Instance UID | 0008,0018 | UI | | None |
| | Query/Retrieve Level | 0008,0052 | CS | IMAGE | S |
| | Contrast Bolus Agent | 0018,0010 | LO | | None |
| | Slice Thickness | 0018,0050 | DS | | None |
| | KVP | 0018,0060 | DS | | None |
| | Series Instance UID | 0020,000E | UI | | None |
| | Instance Number | 0020,0013 | IS | | None |
| | Patient Orientation | 0020,0020 | CS | | None |
| | Image Orientation Patient | 0020,0037 | DS | | None |
| | Slice Location | 0020,1041 | DS | | None |
| | Sample per Pixel | 0028,0002 | US | | None |
| | Photometric Interpretation | 0028,0004 | CS | | None |
| | Rows | 0028,0010 | US | | None |
| | Columns | 0028,0011 | US | | None |
| | Pixel Spacing | 0028,0030 | DS | | None |

* Note: The column Type of Matching of the table should be read as follows: The types of Matching supported by the C-FIND SCP. A “S” indicates the identifier attribute can specify Single Value Matching, a “R” will indicate Range Matching, a “*” will denote wildcard matching, an “U” will indicate universal matching, and “L” will indicate that UID lists are supported for matching. “NONE” indicates that no matching is supported, but that values for this element in the database can be returned.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 24

Table 24: DICOM C-FIND Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|-----------------|----------------------|
| Success | 0000 | Success | Matching successful. |
| Failure | A700 | Refused | Out of Resources |
| | A900 | Failed | Unknown reason |
| | C000 | Failed | Unknown reason |

4.2.1.3.5. (Real-World) Activity – DICOM-Manager C-MOVE (SCU)

4.2.1.3.5.1. Description and Sequencing of Activities

DICOM-Manager initiates an association when an image processing application asks for image loading from a specified source device using a proprietary IPC protocol.

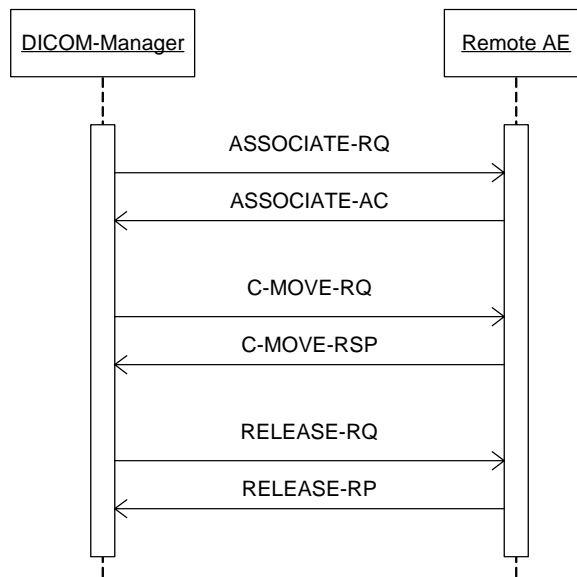


Figure 8: (Real World) Activity – DICOM-Manager C-MOVE (SCU)

4.2.1.3.5.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by Memory-Manager for (Real-World) Activity – Memory-Manager C-MOVE (SCU) are defined in Table 25.

Table 25: Proposed Presentation Contexts for (Real-World) Activity – DICOM-Manager C-MOVE (SCU)

| Presentation Context Table | | | | | |
|--|-----------------------------|-----------------|--|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Study Root Query/Retrieve Information Model - MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | ILE ELE | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 | SCU | None |

4.2.1.3.5.3. SOP Specific Conformance for SOP Classes

DICOM-Manager provides standard conformance to the DICOM V3.0 Query/Retrieve Service Class as an SCU for the SOP Class Study Root Query/Retrieve Information Model – Move.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 26.

Table 26: DICOM C-MOVE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|--|--|
| Success | 0000 | Success | Storage successful. |
| Failure | A701 | Refused – Out of Resources | Message by transfer result – Refused Unknown reason |
| | A702 | Refused – Out of Resources | Message by transfer result – Refused Store Failed |
| | A801 | Refused – Move Destination Unknown | Message by transfer result – Refused Unknown target |
| | A900 | Error – Identifier Does Not Match SOP Class | Message by transfer result – Failed Unknown reason |
| | C000 | Error – Unable to Process | Message by transfer result – Failed Store Failed |
| Warning | B000 | Sub-operations complete – One or more failures | When ever one of the store operations failed |
| Cancel | FE00 | Cancel | Message by transfer result – Refused Connection closed on timeout. |

4.2.1.4. Association Acceptance Policy

Each AE specification shall contain a description of the association acceptance policies of the AE. This describes the conditions under which the AE will accept an association.

The AE association rejection policies are summarized in Table 27.

Table 27: DICOM Association Rejection Policies

| Result | Source | Reason/Diagnosis | Explanation |
|------------------------|---|--|---|
| 1 – rejected-permanent | 1 – DICOM UL service-user | 2 – application-context-name-not-supported | When receiving association request and the application context name is not supported |
| | | 3 – calling-AE-title-not-recognized | When receiving association request and the calling AE title is not supported |
| | | 7 – called-AE-title-not-recognized | When receiving association request and the called AE title is not supported |
| | 2 – DICOM UL service-provider (ACSE related function) | 1 – no-reason-given | When receiving association request and all of the items in the presentation context item list are not supported by the system |
| | | 2 – protocol-version-not-supported | When receiving an association request and the protocol version received is not supported |

The behavior of the AE on receiving an association abort is summarized in Table 28:

Table 28: DICOM Association Abort Handling

| Source | Reason/Diagnosis | Behavior |
|-------------------------------|---------------------------------|--------------------------|
| 0 – DICOM UL service-user | 0 – reason-not-specified | The connection is closed |
| 2 – DICOM UL service-provider | 0 – reason-not-specified | The connection is closed |
| | 1 – unrecognized-PDU | The connection is closed |
| | 2 – unexpected-PDU | The connection is closed |
| | 4 – unrecognized-PDU parameter | The connection is closed |
| | 5 – unexpected-PDU parameter | The connection is closed |
| | 6 – invalid-PDU-parameter value | The connection is closed |

The behavior of the AE for sending an association abort is summarized in Table 28:

Table 29: DICOM Association Abort Policies

| Source | Reason/Diagnosis | Behavior |
|---------------------------|--------------------------|---|
| 0 – DICOM UL service-user | 0 – reason-not-specified | When an association timeout (configurable per remote device) expired (timeout which determines how long to keep an idle association). When receiving a PDU whose size is bigger than the agreed max PDU size |

| Source | Reason/Diagnosis | Behavior |
|-------------------------------|----------------------|---|
| 2 – DICOM UL service-provider | 1 – unrecognized-PDU | When ever the system receives unexpected or unrecognized PDU (according to the DICOM UPPER LAYER PROTOCOL STATE TRANSITION TABLE in chapter 8 of the DICOM standard). |

4.2.1.4.1. (Real-World) Activity – DICOM Manager (C-ECHO SCP)

4.2.1.4.1.1. Description and Sequencing of Activities

A remote system requests verification from DICOM Manager using the C-ECHO command.

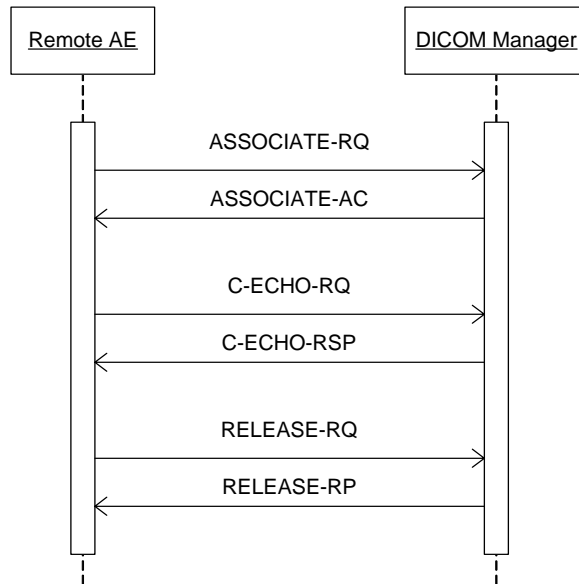


Figure 9: (Real World) Activity – DICOM Manager (C-ECHO SCP)

4.2.1.4.1.2. Accepted Presentation Contexts

Any of the presentation contexts shown in Table 30 is acceptable to DICOM Manager (C-ECHO SCP).

Table 30: Acceptable Presentation Contexts for <(Real-World) Activity – DICOM Manager (C-ECHO SCP)

| Presentation Context Table | | | | | |
|----------------------------|-------------------|-----------------|--|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Verification SOP Class | 1.2.840.10008.1.1 | ILE ELE | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 | SCU | None |

4.2.1.4.1.3. SOP Specific Conformance for SOP Classes

DICOM Manager (C-ECHO SCP) provides standard conformance to the DICOM V3.0 verification SOP Class.

The behavior of an Application Entity SOP class is summarized as shown in Table 31. The standard as well as the manufacturer specific status codes and their corresponding behavior shall be specified.

Table 31: DICOM Manager (C-ECHO SCP) Status Response

| Service Status | Code | Further Meaning | Description |
|--------------------|--------|------------------------------------|--|
| Success | 0000 | Success | C-ECHO command was successful received |
| Other than Success | <>0000 | Problems with receiving the C-ECHO | Problems with receiving the C-ECHO |

4.2.1.4.2. (Real-World) Activity – DICOM Manager (C-STORE SCP)

4.2.1.4.2.1. Description and Sequencing of Activities

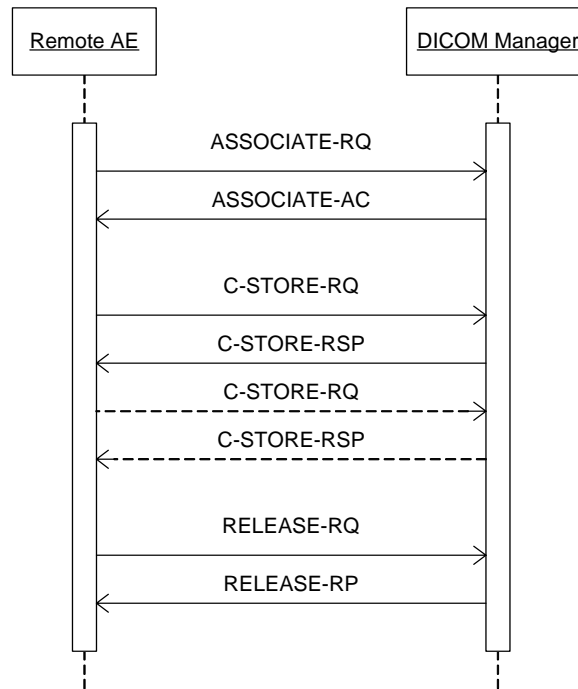


Figure 10: (Real World) Activity – DICOM Manager C-STORE (SCP)

The real world activity associated with the C-STORE operation is the storage of the image in the memory of the system upon which DICOM Manager is running in order to make it available for immediate processing by applications. DICOM Manager will issue a failure status if it is unable to store the image in the memory.

4.2.1.4.2.2. Accepted Presentation Contexts

Any of the Presentation Contexts shown in Table 32 is acceptable to the DICOM Manager C-STORE as SCP.

Table 32: Acceptable Presentation Contexts for (Real-World) Activity – DICOM Manager (C-STORE SCP)

| Presentation Context Table | | | | | |
|--|-------------------------------|-----------------|--|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| Digital X-Ray Image Storage – for Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| Digital X-Ray Image Storage – for Processing | 1.2.840.10008.5.1.4.1.1.1.1.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |

| Presentation Context Table | | | | | |
|--|-------------------------------|-----------------|--|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| Multi-frame True Color Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.4 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| General ECG Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.1.2 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| Grayscale Softcopy Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| X-Ray Radiofluoroscopic Image Storage | 1.2.840.10008.5.1.4.1.1.12.2 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| Nuclear Medicine Image Storage | 1.2.840.10008.5.1.4.1.1.20 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| Raw Data Storage | 1.2.840.10008.5.1.4.1.1.66 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| Encapsulated PDF | 1.2.840.10008.5.1.4.1.1.104.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| Positron Emission Tomography Image Storage | 1.2.840.10008.5.1.4.1.1.128 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| RT Image Storage | 1.2.840.10008.5.1.4.1.1.481.1 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| RT Structure Set Storage | 1.2.840.10008.5.1.4.1.1.481.3 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCP | None |

4.2.1.4.2.3. SOP Specific Conformance for SOP Classes

DICOM Manager provides standard conformance to the DICOM V3.0 Storage Service Class as a SCP.

DICOM Manager conforms to the SOPs of the Storage Service Class at Level 2 (Full). In case of a successful C-STORE, the stored image may be accessed by the processing applications

The user determines the duration of the storage.

If the DICOM Manager returns one of the following status codes, it means that the C-Store has been unsuccessful.

Table 33: Memory-Server C-STORE (SCP) Status Response

| Service Status | Code | Further Meaning | Description |
|----------------|------|-----------------|---|
| Success | 0000 | Successful | When ever the store operation succeeded |
| Failure | C000 | Failed | When ever the store operation failed |

4.2.1.4.3. (Real-World) Activity – DICOM Manager (C-FIND SCP)

4.2.1.4.3.1. Description and Sequencing of Activities

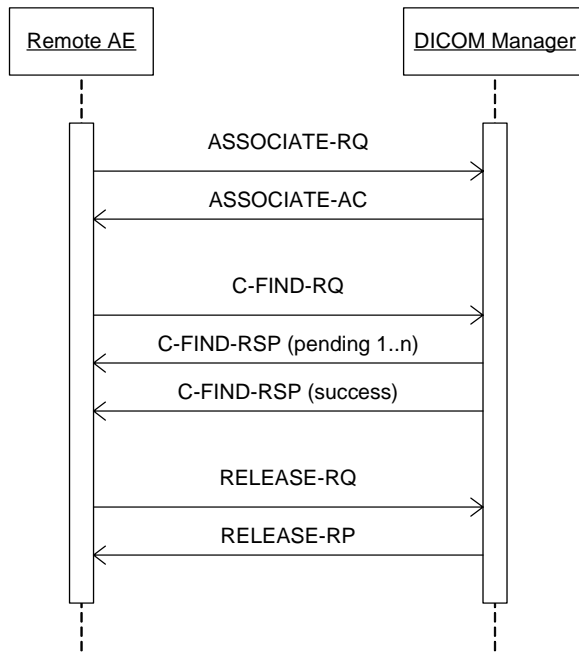


Figure 11: (Real World) Activity – Disk-Server (C-FIND SCP)

The Real World activity associated with the C-FIND command is an examination of the disk content. DICOM Manager will issue a failure status if it is unable to process the query request.

4.2.1.4.3.2. Proposed Presentation Contexts

Any of the Presentation Contexts show in Table 34 is acceptable to the DICOM Manager (C-FIND SCP).

Table 34: Proposed Presentation Contexts for <(Real-World) Activity – DICOM Manager (C-FIND SCP)

| Presentation Context Table | | | | | |
|--|-----------------------------|-----------------|--|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Study Root Query/Retrieve Information Model - FIND | 1.2.840.10008.5.1.4.1.2.2.1 | ILE ELE | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 | SCP | None |

4.2.1.4.3.3. SOP Specific Conformance for SOP Classes

DICOM Manager provides standard conformance to the DICOM V3.0 Query/Retrieve Service Class as an SCP for the following SOP Class: Study Root Query/Retrieve Information Model - FIND, UID=1.2.840.10008.5.1.4.1.2.2.1.

Disk-Server does not support Relational Search.

All Required (R) and Unique (U) Study, Series and Image level keys for the Study Root Query/Retrieve Information Model are supported.

Unsupported fields will not be returned in the C-FIND response.

C-FIND-CANCEL is supported. However, some C-FIND responses may be forwarded before the C-FIND-CANCEL takes effect.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 35

Table 35: DICOM C-Find Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|------------------------|-------------------------------------|
| Success | 0000 | Matching complete | Matching successful |
| Failure | C000 | General failure status | When ever the find operation failed |

4.2.1.4.4. (Real-World) Activity – DICOM Manager (C-MOVE SCP)

4.2.1.4.4.1. Description and Sequencing of Activities

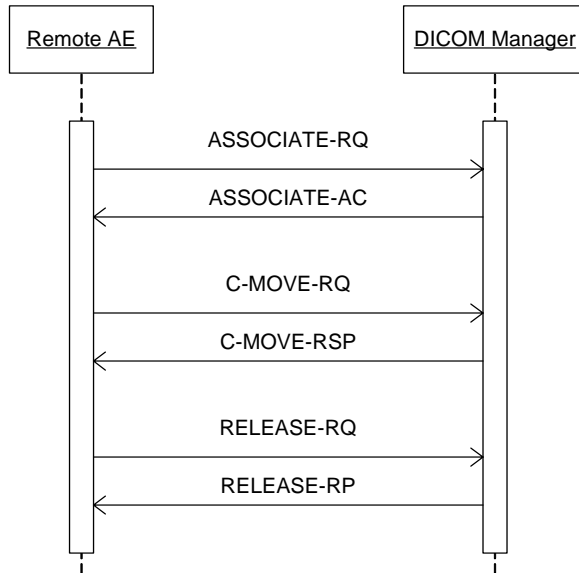


Figure 12: (Real World) Activity – DICOM Manager (C-MOVE SCP)

The Real World activity associated with the C-MOVE command is retrieval of images from the disk and storage of the images to a remote system using a C-STORE command. DICOM Manager will issue a failure status if it is unable to process the transfer request

4.2.1.4.4.2. Proposed Presentation Contexts

Any of the Presentation Contexts show in Table 36 is acceptable to the DICOM Manager (C-MOVE SCP).

Table 36: Proposed Presentation Contexts for <(Real-World) Activity – DICOM Manager (C-MOVE SCP)

| Presentation Context Table | | | | | |
|--|-----------------------------|-----------------|--|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Study Root Query/Retrieve Information Model - MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | ILE ELE | 1.2.840.10008.1.2 1.2.840.10008.1.2.1 | SCP | None |

4.2.1.4.4.3. SOP Specific Conformance for SOP Classes

DICOM Manager provides standard conformance to the DICOM V3.0 Query/Retrieve Service Class as an SCP for the following SOP Class: Study Root Query/Retrieve Information Model - MOVE, UID=1.2.840.10008.5.1.4.1.2.2.2.
Prioritization of C-MOVE requests is not supported.

DICOM Manager does not support relational C-MOVE requests.
All images requested in the C-MOVE will be sent over a single association (the association will not be established and torn down for each image).

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 37

Table 37: DICOM C-MOVE Command Response Status Handling Behavior

| Service Status | Code | Further Meaning | Behavior |
|----------------|------|--|--|
| Success | 0000 | Matching complete | When ever the move operation succeeded. |
| Failure | A801 | Refused – Move Destination Unknown | When ever the move destination is unknown to the system. |
| | C000 | Error – Unable to Process | When ever the move operation failed. |
| Warning | B000 | Sub-operations Complete – One or more Failures | When ever one of the store operations failed. |
| Pending | FF00 | Pending | For every store response received. |
| Cancel | FE00 | Cancel | When receiving a cancel move request. |

4.2.2. Print-Manager Specifications

4.2.2.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 38: SOP Classes for Print-Manager

| 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 Box SOP Class | 1.2.840.10008.5.1.1.2 | Yes | No |
| >Basic Film Session SOP Class | 1.2.840.10008.5.1.1.1 | Yes | No |
| >Basic Grayscale Image Box SOP Class | 1.2.840.10008.5.1.1.4 | Yes | No |
| >Printer SOP Class | 1.2.840.10008.5.1.1.16 | No | No |
| Basic Color Print Management (Meta) | 1.2.840.10008.5.1.1.18 | Yes | No |
| >Basic Film Box SOP Class | 1.2.840.10008.5.1.1.2 | Yes | No |
| >Basic Film Session SOP Class | 1.2.840.10008.5.1.1.1 | Yes | No |
| >Basic Color Image Box SOP Class | 1.2.840.10008.5.1.1.4.1 | Yes | No |
| >Printer SOP Class | 1.2.840.10008.5.1.1.16 | No | No |

4.2.2.2. Association Policies

4.2.2.2.1. General

The maximum PDU Size that the Print-Manager will use is configurable, with a minimum of 2 Kbytes.

Table 39: DICOM Application Context

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

4.2.2.2.2. Number of Associations

Print-Manager can have only one open connection at a given time.

Table 40: Number of Associations as an Association Initiator for Print-Manager

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

Table 41: Number of Associations as an Association Acceptor for Print-Manager

| | |
|---|---|
| Maximum number of simultaneous associations | 0 |
|---|---|

4.2.2.2.3. Asynchronous Nature

Print-Manager will only allow a single outstanding operation on an association.

Table 42: Asynchronous Nature as an Association Initiator for Print-Manager

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

4.2.2.2.4. Implementation Identifying Information

The value supplied for Implementation Class UID and Version Name is documented here.

Table 43: DICOM Implementation Class and Version for Print-Manager

| | |
|-----------------------------|----------------------|
| Implementation Class UID | 1.3.46.670589.33.1.1 |
| Implementation Version Name | BRCONN_3.0 |

4.2.2.3. Association Initiation Policy

4.2.2.3.1. (Real-World) Activity – Print Manager>

4.2.2.3.1.1. Description and Sequencing of Activities

Print-Manager initiates an association when a print job is submitted to a DICOM printer (when the user click on the print button in the film view). The association is left open after the job is completed for a configurable time-out (so that if there are other jobs to the same printer, they will be done on the same association. Jobs to different printers are performed simultaneously.

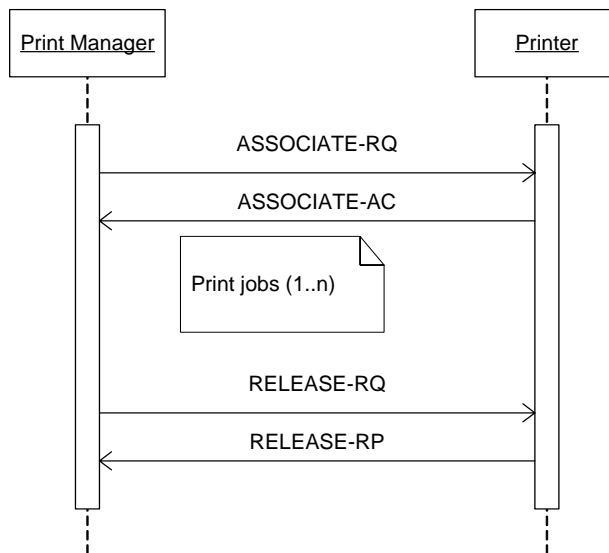


Figure 13: (Real World) Activity – Print-Manager Initiates

Normally, when the job is completed and there are no other jobs to the same printer, the print manager does close the association with an A-RELEASE request. If a TCP/IP connection timeout occurs, then the association is closed. In this case, a new association is set up when needed.

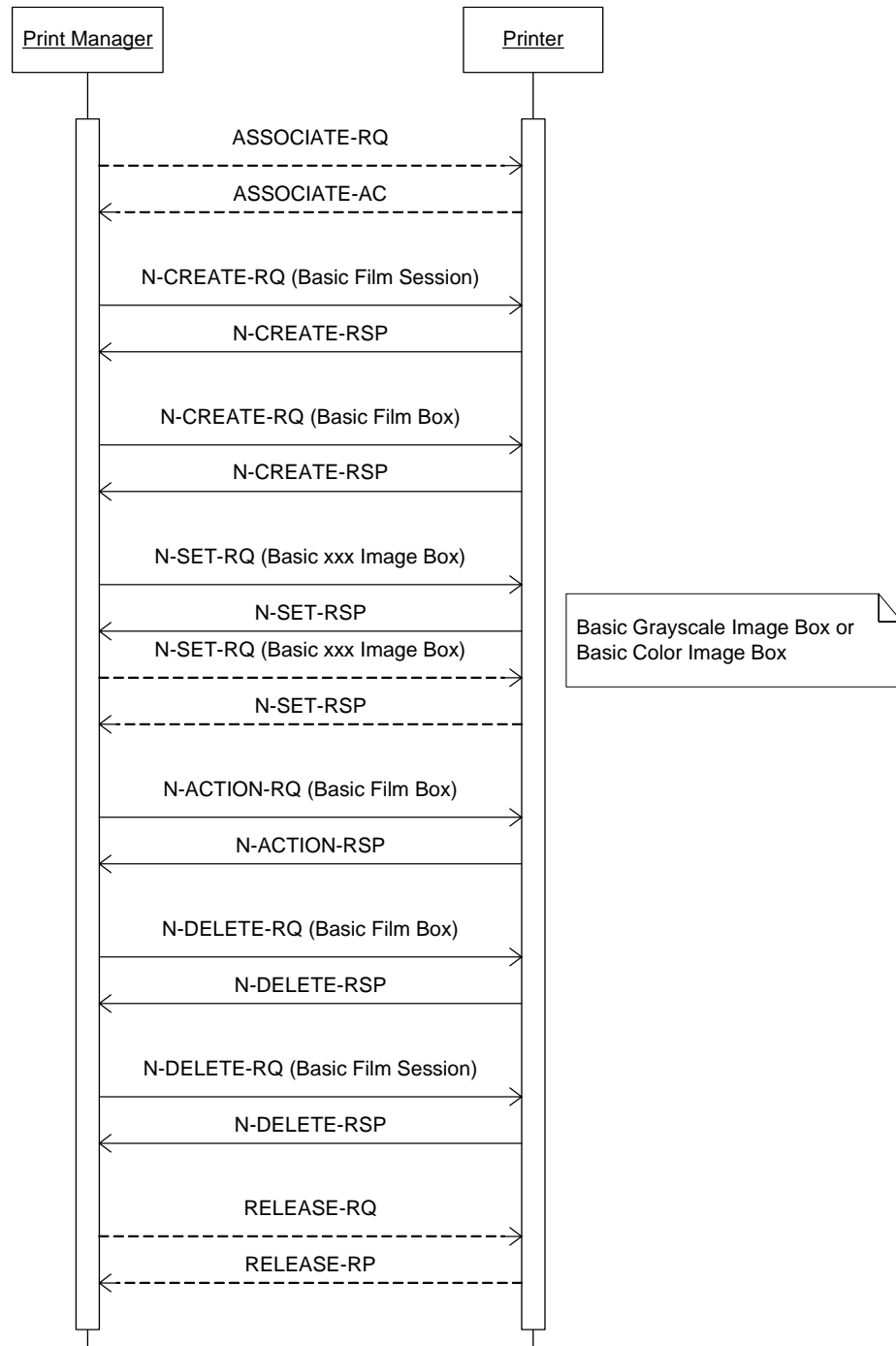


Figure 14: (Real World) Activity – Print-Manager

4.2.2.3.1.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the

presentation contexts proposed by Print-Manager for (Real-World) Activity – Print Image are defined in Table 44

Table 44: Proposed Presentation Contexts for (Real-World) Activity – Print Image

| Presentation Context Table | | | | | |
|---|------------------------|-----------------|--|------|----------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Extended Negotiation |
| Name | UID | Name List | UID List | | |
| Basic Grayscale Print Management (Meta) | 1.2.840.10008.5.1.1.9 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |
| Basic Color Print Management (Meta) | 1.2.840.10008.5.1.1.18 | ELE ILE | 1.2.840.10008.1.2.1 1.2.840.10008.1.2 | SCU | None |

Recommended abbreviations to be used for the module tables are:
 ALWAYS the attribute is always present with a value
 ANAP the Attribute is Not Always Present

Recommended abbreviations to be used for the source of the data values in the tables are:
 AUTO the attribute value is generated automatically
 CONFIG the attribute value source is a configurable parameter

4.2.2.3.1.3. SOP Specific Conformance Basic Film Session SOP Class

The Printer process conforms to the Basic Film Session Sop Class.
 The following DIMSE service element is supported:

N-CREATE
 N-DELETE

The following table lists the supported attributes for the N-CREATE DIMSE.

Table 45: Basic Film Session Presentation Module

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|------------------|-----------|----|-----------------------|-------------------|--------|
| Number of Copies | 2000,0010 | IS | 1..20 | ALWAYS | CONFIG |
| Print Priority | 2000,0020 | CS | Printer configuration | ANAP | CONFIG |
| Medium Type | 2000,0030 | CS | Printer configuration | ALWAYS | CONFIG |
| Film Destination | 2000,0040 | CS | Printer configuration | ALWAYS | CONFIG |

The behavior on successful and unsuccessful transfer is given in the table below.

Table 46: DICOM Command Response Status Handling Behavior for Basic Film Session N-CREATE

| Service Status | Error Code | Further Meaning | Behavior |
|----------------|------------|-----------------------------------|-------------------------|
| Success | 0000 | Film Session successfully created | The print job continues |

| Service Status | Error Code | Further Meaning | Behavior |
|----------------|------------|---------------------------------|---|
| * | B600 | Memory Allocation not supported | The print job continues and the warning is logged |

Table 47: DICOM Command Response Status Handling Behavior for Basic Film Session N-DELETE

| Service Status | Error Code | Further Meaning | Behavior |
|----------------|------------|-----------------------------------|--|
| Success | 0000 | Film Session successfully created | The SCP has completed the operation successfully |
| * | | <> 0000 | On any other status then success, the job remains in the queue manager, with status failed |

4.2.2.3.1.4. SOP Specific Conformance Basic Film Box SOP Class

The Printer process conforms to the Basic Film Box Sop Class.
The following DIMSE service elements are supported:

N-CREATE
N-ACTION
N-DELETE

The following table lists the supported attributes for the N-CREATE DIMSE

Table 48: Basic Film Box Presentation Module

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|---------------------------|-----------|----|-----------------------|-------------------|--------|
| Image Display Format | 2010,0010 | ST | Printer configuration | ALWAYS | CONFIG |
| Film Orientation | 2010,0040 | CS | PORTRAIT; LANDSCAPE | ALWAYS | CONFIG |
| Film Size ID | 2010,0050 | CS | Printer configuration | ALWAYS | CONFIG |
| Configuration Information | 2010,0150 | ST | Printer configuration | ANAP | CONFIG |
| Trim | 2010,0140 | CS | NO | ALWAYS | CONFIG |

Table 49: Basic Film Box Relationship Module

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|----------------------------------|-----------|----|----------------------------|-------------------|--------|
| Referenced Film Session Sequence | 2010,0500 | SQ | | ALWAYS | AUTO |
| >Referenced SOP Class UID | 0008,1150 | UI | UID of Parent Film Session | ALWAYS | AUTO |
| >Referenced SOP Instance UID | 0008,1155 | UI | | ALWAYS | AUTO |

The behavior on successful and unsuccessful transfer is given in the table below.

Table 50: DICOM Command Response Status Handling Behavior for Basic Film Box N-CREATE

| Service Status | Error Code | Further Meaning | Behavior |
|----------------|------------|-------------------------------|---|
| Success | 0000 | Film Box successfully created | The SCP has completed the operation successfully. |

| Service Status | Error Code | Further Meaning | Behavior |
|----------------|------------|---|---|
| Warning | B605 | Requested Min Density or Max Density outside of Printer's operating Range | The print job continues and the warning is logged. |
| Failure | C616 | There is an existing Film Box that has not been printed | The print job is marked as failed and the reason is logged. |

N-ACTION DIMSE does not create any Data Set Attributes.
The behavior on successful and unsuccessful transfer is given in the table below.

Table 51: DICOM Command Response Status Handling Behavior for Basic Film Box N-ACTION

| Service Status | Error Code | Further Meaning | Behavior |
|----------------|------------|---|--|
| Success | 0000 | Film accepted for printing | The print job continues. |
| Warning | B603 | Film Box SOP Instance Hierarchy does not contain Image Box SOP Instances | The print job continues and the warning is logged and reported to the user. |
| | B604 | Image Size is larger than Image Box Size – The Image has been de-magnified | The print job continues and the warning is logged and reported to the user. |
| | B609 | Image Size is larger than Image Box Size – The Image has been cropped to fit | The print job continues and the warning is logged and reported to the user. |
| | B60A | Image Size or combined Print Image Size is larger than Image Box Size – The Image or combined Print Image has been decimated to fit | The print job continues and the warning is logged and reported to the user. |
| Failure | C602 | Unable to create Print Job SOP Instance – Print Queue is full | The print job is marked as failed and the reason is logged and reported to the user. |
| | C603 | Image Size is larger than Image Box Size | The print job is marked as failed and the reason is logged and reported to the user. |
| | C613 | Combined Print Image Size is larger than Image Box Size | The print job is marked as failed and the reason is logged and reported to the user. |

N-DELETE DIMSE does not create any Data Set Attributes.
The behavior on successful and unsuccessful transfer is given in the table below.

Table 52: DICOM Command Response Status Handling Behavior for Basic Film Box N-DELETE

| Service Status | Error Code | Further Meaning | Behavior |
|----------------|------------|-----------------------------------|--|
| Success | 0000 | Film Session successfully created | The SCP has completed the operation successfully |
| * | | <> 0000 | On any other status than success, the job remains in the queue manager, with status failed |

4.2.2.3.1.5. SOP Specific Conformance Basic Grayscale Image Box SOP Class

The Printer process conforms to the Basic Grayscale Image Box Sop Class.
The following DIMSE service element is supported:

N-SET

The following table lists the supported attributes for the N-SET DIMSE

Table 53: Basic Grayscale Image Box SOP Class - N-SET-RQ - Pixel Presentation Module

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|--------------------------------|-----------|-------|------------------|-------------------|--------|
| Image Position | 2020,0010 | US | 1 | ALWAYS | AUTO |
| Basic Grayscale Image Sequence | 2020,0110 | SQ | | ALWAYS | AUTO |
| >Samples per Pixel | 0028,0002 | US | 1/3 | ALWAYS | AUTO |
| >Photometric Interpretation | 0028,0004 | CS | MONOCHROME2/ RGB | ALWAYS | AUTO |
| >Rows | 0028,0010 | US | | ALWAYS | AUTO |
| >Columns | 0028,0011 | US | | ALWAYS | AUTO |
| >Pixel Aspect Ratio | 0028,0034 | IS | | ALWAYS | AUTO |
| >Bits Allocated | 0028,0100 | US | 8, 16 | ALWAYS | AUTO |
| >Bits Stored | 0028,0101 | US | | ALWAYS | AUTO |
| >High Bit | 0028,0102 | US | | ALWAYS | AUTO |
| >Pixel Representation | 0028,0103 | US | 0 | ALWAYS | AUTO |
| >Pixel Data | 7FE0,0010 | OB/OW | | ALWAYS | AUTO |

The behavior on successful and unsuccessful transfer is given in the table below.

Table 54: DICOM Command Response Status Handling Behavior for Basic Grayscale Image Box N-SET

| Service Status | Error Code | Further Meaning | Behavior |
|----------------|------------|---|---|
| Success | 0000 | Image successfully stored in Image Box | The print job continues. |
| Warning | B604 | Image Size is larger than Image Box Size – The Image has been de-magnified | The print job continues and the warning is logged and reported to the user. |
| | B605 | Requested Min Density or Max Density outside of Printer's operating Range | The print job continues and the warning is logged and reported to the user. |
| | B609 | Image Size is larger than Image Box Size – The Image has been cropped to fit | The print job continues and the warning is logged and reported to the user. |
| | B60A | Image Size or combined Print Image Size is larger than Image Box Size – The Image or combined Print Image has been decimated to fit | The print job continues and the warning is logged and reported to the user. |
| Error | C603 | Image Size is larger than Image Box Size | The print job is marked as failed and the reason is logged and reported to the user |
| | C605 | Insufficient Memory in Printer to store the Image | The print job is marked as failed and the reason is logged and reported to the user |
| | C613 | Combined Print Image Size is larger than Image Box Size | The print job is marked as failed and the reason is logged and reported to the user |

4.2.2.3.1.6. SOP Specific Conformance Basic Color Image Box SOP Class

The Printer process conforms to the Basic Grayscale Image Box Sop Class. The following DIMSE service element is supported:

N-SET

The following table lists the supported attributes for the N-SET DIMSE

Table 55: Basic Color Image Box SOP Class - N-SET-RQ - Pixel Presentation Module

| Attribute Name | Tag | VR | Value | Presence of Value | Source |
|-----------------------------|-----------|----|-----------------------|-------------------|--------|
| Image Position | 2020,0010 | US | 1 | ALWAYS | AUTO |
| Polarity | 2020,0020 | CS | Printer configuration | ALWAYS | AUTO |
| Basic Color Image Sequence | 2020,0111 | SQ | | ALWAYS | AUTO |
| >Samples per Pixel | 0028,0002 | US | 3 | ALWAYS | AUTO |
| >Photometric Interpretation | 0028,0004 | CS | RGB | ALWAYS | AUTO |
| >Planar Configuration | 0028,0006 | US | 0,1 | ALWAYS | AUTO |
| >Rows | 0028,0010 | US | | ALWAYS | AUTO |
| >Columns | 0028,0011 | US | | ALWAYS | AUTO |
| >Pixel Aspect Ratio | 0028,0034 | IS | | ALWAYS | AUTO |
| >Bits Allocated | 0028,0100 | US | 8 | ALWAYS | AUTO |
| >Bits Stored | 0028,0101 | US | 8 | ALWAYS | AUTO |
| >High Bit | 0028,0102 | US | 7 | ALWAYS | AUTO |
| >Pixel Representation | 0028,0103 | US | 0 | ALWAYS | AUTO |
| >Pixel Data | 7FE0,0010 | OW | | ALWAYS | AUTO |

The behavior on successful and unsuccessful transfer is given in the Table 56

Table 56: DICOM Command Response Status Handling Behavior for Basic Color Image Box N-SET

| Service Status | Further Meaning | Error Code | Behavior |
|----------------|-----------------|---|--|
| Success | 0000 | Image successfully stored in Image Box | The print job continues. |
| Warning | B604 | Image Size is larger than Image Box Size – The Image has been de-magnified | The print job continues and the warning is logged and reported to the user. |
| | B605 | Requested Min Density or Max Density outside of Printer's operating Range | The print job continues and the warning is logged and reported to the user. |
| | B609 | Image Size is larger than Image Box Size – The Image has been cropped to fit | The print job continues and the warning is logged and reported to the user. |
| | B60A | Image Size or combined Print Image Size is larger than Image Box Size – The Image or combined Print Image has been decimated to fit | The print job continues and the warning is logged and reported to the user. |
| Error | C603 | Image Size is larger than Image Box Size | The print job is marked as failed and the reason is logged and reported to the user. |
| | C605 | Insufficient Memory in Printer to store the Image | The print job is marked as failed and the reason is logged and reported to the user. |
| | C613 | Combined Print Image Size is larger than Image Box Size | The print job is marked as failed and the reason is logged and reported to the user. |

4.2.2.4. Association Acceptance Policy

Print-Manager never accepts an association.

4.3. Network Interfaces

4.3.1. Physical Network Interface

The Workspace application provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of [DICOM].

Extended Brilliance Workspace inherits its TCP/IP stack from Windows XP (i.e. the operating system platform).

Extended Brilliance Workspace supports a single network interface: Ethernet ISO.8802-3.

With standard supported physical medium include:

- IEEE 802.3 10BASE-TX
- IEEE 802.3 100BASE-TX (Fast Ethernet)
- IEEE 802.3 1000BASE-X (Fiber Optic Gigabit Ethernet).

4.3.2. Additional Protocols

Additional protocols such as used for network management are listed here.

4.4. Configuration

The Extended Brilliance Workspace system is configured by means of a configuration program. This program is accessible at start-up of the Extended Brilliance Workspace system. It is password protected and intended to be used by the administrator onsite or Philips Customer Support Engineers only.

4.4.1. AE Title/Presentation Address Mapping

This mapping (including IP and port numbers) is defined during the system Networking Procedure.

Configurable are the parameters:

- Calling AE Titles
- Called AE Titles
- Maximum PDU size
- Manufacturer
- Model
- Version
- Association timeout
- ARTIM timer
- Large Archive – Force Filter when querying this device
- Archived – Mark studies as Archived when copying them to this device
- Supported Move/Query levels
- Disable explicit transfer syntaxes to be proposed at the association negotiation
- Enable generation of DICOM overlays (“burn-in” instead)

4.4.1.1. Local AE Titles

The local AE title mapping and configuration shall be specified. The default AE titles are based on the system host name defined by the service engineer as part of the system configuration. The following table shall be used:

Table 57: AE Title Configuration Table

| Application Entity | Default AE Title | Default TCP/IP Port |
|--------------------|---------------------------------------|---------------------|
| DICOM-Manager | <hostname> <hostname><localfolder> | 104 |
| Print-Manager | <hostname> | |

4.4.1.2. Remote AE Title/Presentation Address Mapping

Remote AE Title, IP-Address and Port-number are freely configurable.

4.4.2. Parameters

The specification of important operational parameters, their default value and range (if configurable) is specified here.

Table 58: Configuration Parameters table

| Parameter | Configurable | Default Value |
|--|--------------|---------------|
| General Parameters | | |
| Release Timeout | Yes | 30 seconds |
| Port-Number | Yes | 104 |
| Maximum PDU size the AE can receive | Yes | 16352 |
| Maximum PDU size the AE can send | Yes | 16352 |
| Transfer Syntax support, ILE, ELE There is a configuration option to turn off Explicit VR support | Yes | ILE, ELE |
| Storage / Retrieve Timeout | Yes | 5 Minutes |
| Artim timeout | Yes | 5 Minutes |
| Max association number | Yes | 50 |

Printers are configurable by a selection of the default printer types. Every printer type has a fixed configuration, but can be extended with new ones. The default printer settings are defined in the printer configuration file.

5. MEDIA INTERCHANGE

5.1. Implementation Model

AE Provides Standard Conformance to the DICOM Media Storage Service and File Format (PS 3.10) and the Media Storage Application Profiles (PS 3.11)

5.1.1. Application Data Flow Diagram

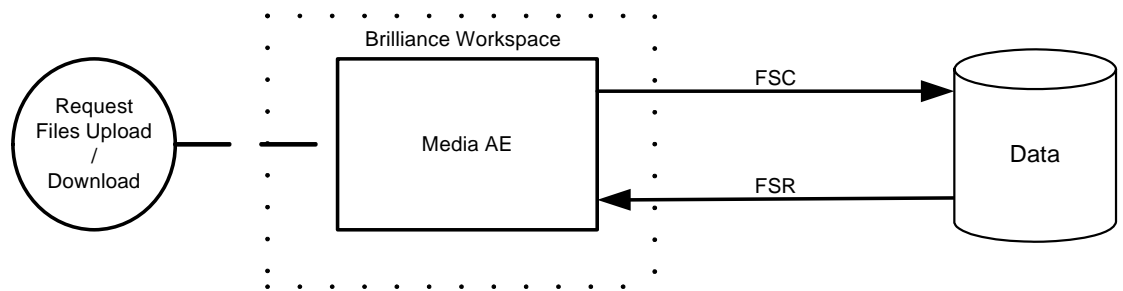


Figure 15: Media Interchange Application Data Flow Diagram

The Media AE will act as a FSR when reading the directory of the medium.
The Media AE will act as a FSC when writing the selected images in a patient folder onto the CD-R medium.

5.1.2. Functional Definitions of AE's

The Media AE includes the following service class.

Media Storage Service Class

The Media AE can perform the Media Storage service as SCU, with capabilities for RWA Display Directory (as FSR), RWA Write Images (as FSC), and RWA Read Images (as FSR). The Extended Brilliance Workspace can create and read CD-R and read CD.

5.1.3. Sequencing of Real World Activities

A Real World Activity of the Media AE is:

The user selects a set of object to write these to the CD. Then the CD will be created with the selected objects. Once the CD has been created, the user can read this CD on the Extended Brilliance Workspace or for transport to another device for reading.

Another Real World Activity of the Media AE is:

A CD from another system or previously created can be read by the Extended Brilliance Workspace. But the Extended Brilliance Workspace cannot append to this created CD.

5.1.4. File Meta Information for Implementation Class and Version

Table 59: DICOM Implementation Class and Version for Media AE

| | |
|-----------------------------|----------------------|
| Implementation Class UID | 1.2.46.670589.33.1.1 |
| Implementation Version Name | BRCONN_3.0 |

5.2. AE Specifications

5.2.1. Media AE - Specification

The supported Application Profiles, their Roles and the Service Class options, all defined in DICOM terminology, are listed in the following table.

Table 60: AE Related Application Profiles, Real-World Activities, and Roles

| Supported Application Profile | Real-World Activity | Roles | SC Option |
|-------------------------------|---------------------|-------|-------------|
| CT/MR studies on CD-R | Write Images | FSC | Interchange |
| | Read Images | FSR | Interchange |
| STD-GEN-CD | Write Images | FSC | Interchange |
| | Read Images | FSR | Interchange |

5.2.1.1. File Meta Information for the Media AE

The Application Entity title is registered into the DICOM File Meta Information header and is supported by the CD-writer (CD write option) acting as a FSC.

5.2.1.2. Real-World Activities

The SOP instances provided by the RWA are written to the CD-R media and a corresponding DICOMDIR is created.

5.2.1.2.1. Display Directory

When a database open action is initiated on the CD-R then the Media AE acts as an FSR using the interchange option to read the DICOMDIR of the CD or CD-R media.

This will result in an overview of the patients, studies, series and images on the Extended Brilliance Workspace screen.

5.2.1.2.1.1. Media Storage Application Profile

As depicted in Table 60, the Media AE supports the RWA Display Directory for the Application Profile.

The mandatory DICOMDIR keys are required for the correct display of directory information. The display is structured according the DICOM Composite Information Model: Patient, Study, Series, and Image.

5.2.1.2.2. Write Images

When an image transfer to CD-R is initiated then the Media AE acts as an FSC using the interchange option to export SOP Instances from the local database to a CD-R medium.

5.2.1.2.2.1. Media Storage Application Profile

As depicted in Table 60, the Media AE supports the RWA Write Images for the Application Profile.

The DICOMDIR file will be extended when new images are written. In case some attributes are not present in an image but are specified as mandatory in the DICOMDIR definition in DICOM Media, a generated value will be filled in.

Implementation remarks and restrictions

When writing the DICOMDIR records, key values are generated when no value of the corresponding attribute is supplied, according to the following tables.

Table 61: Generated Keys

| Key | Tag | Generated Value |
|--------------------|-------------|-----------------|
| Study Keys | | |
| Study Date | (0008,0020) | |
| Study Time | (0008,0030) | |
| Series Keys | | |
| Series Number | (0020,0011) | 1 |
| Image Keys | | |
| Instance Number | (0020,0013) | 1 |

The data selected to write to the media must fit on the currently inserted media. If it does not fit, an error is generated and it is up to the operator to re-select a smaller amount of data to be written to the media. The system will not request additional media or write across multiple media.

5.2.1.3. DICOMDIR keys

Table 62: Supported attributes in the DICOMDIR

| Dicom Tag | Description |
|---|-----------------------------------|
| 0002,0000 | Group 0002 Length |
| 0002,0001 | File Meta Information Version |
| 0002,0002 | UI Media Storage Sop Class UID |
| 0002,0003 | UI Media Storage Sop Instance UID |
| 0002,0010 | UI Transfer Syntax UID |
| 0002,0012 | UI Implementation Class UID |
| 0002,0013 | Implementation Version Name |
| 0002,0016 | Source Application Entity Title |
| File Set and Directory Information | |
| 0004,1130 | File Set ID |
| 0004,1200 | First Directory Record Offset |
| 0004,1202 | Last Directory Record Offset |
| 0004,1212 | File Set Consistency Flag |
| 0004,1220 | Directory Record Sequence |
| Patient level | |
| 0004,1400 | Offset Of The Next Dir Record |
| 0004,1410 | Record In Use Flag |

| Dicom Tag | Description |
|-----------|--|
| 0004,1420 | Offset Of Ref Lower Level Dir Ent |
| 0004,1430 | Directory Record Type |
| 0010,0010 | Patient's Name |
| 0010,0020 | Patient ID |
| | Study level |
| 0004,1400 | Offset Of The Next Dir Record |
| 0004,1410 | Record In Use Flag |
| 0004,1420 | Offset Of Ref Lower Level Dir Ent |
| 0004,1430 | Directory Record Type |
| 0008,0005 | Specific Character Set |
| 0008,0020 | Study Date |
| 0008,0030 | Study Time |
| 0008,0050 | Accession Number |
| 0008,0054 | Retrieve AE Title |
| 0008,0061 | Modalities in Study |
| 0008,0090 | Referring Physician's Name |
| 0010,0030 | Patient's Birth Date |
| 0010,0040 | Patient's Sex |
| 0040,A120 | DateTime |
| 0008,1030 | Study Description |
| 0020,000D | Study Instance UID |
| 0020,0010 | Study ID |
| 0020,1206 | Number Of Study Related Series |
| 0020,1208 | Number Of Study Related Images |
| | Series level |
| 0004,1400 | Offset Of The Next Dir Record |
| 0004,1410 | Record In Use Flag |
| 0004,1420 | Offset Of Ref Lower Level Dir Ent |
| 0004,1430 | Directory Record Type |
| 0008,0060 | Modality |
| 0008,0070 | Manufacturer |
| 0020,000E | Series Instance UID |
| 0020,0011 | Series Number |
| 0020,1209 | Number of Series Related Instances |
| | Image level |
| 0004,1400 | Offset Of The Next Dir Record |
| 0004,1410 | Record In Use Flag |
| 0004,1420 | Offset Of Ref Lower Level Dir Ent |
| 0004,1430 | Directory Record Type |
| 0004,1500 | Referenced File ID |
| 0004,1510 | Referenced Sop Class UID In File |
| 0004,1511 | Ref Sop Instance UID In File |
| 0004,1512 | Referenced Transfer Syntax UID in FILE |
| 0008,0008 | Image Type |
| 0018,0010 | Contrast/Bolus Agent |
| 0008,0016 | SOP Class UID |
| 0008,0018 | SOP Instance UID |
| 0008,0023 | Content Date |
| 0008,0033 | Content Time |
| 0018,0050 | Slice Thickness |
| 0018,0060 | KVP |
| 0020,0013 | Instance Number |
| 0020,0032 | Image Position (Patient) |
| 0020,0037 | Image Orientation (Patient) |
| 0020,0052 | Frame of Reference UID |

| Dicom Tag | Description |
|-----------|----------------------------|
| 0028,0002 | Samples per Pixels |
| 0028,0004 | Photometric Interpretation |
| 0028,0010 | Rows |
| 0028,0011 | Columns |
| 0028,0030 | Pixel Spacing |
| 0028,0100 | Bits Allocated |

5.2.1.3.1. Read Images

When an image transfer from CD or CD-R is initiated then the Media AE acts as an FSR using the interchange option to import SOP Instances from the CD or CD-R medium.

5.2.1.3.1.1. Media Storage Application Profile

As depicted in Table 60, the Media AE supports the RWA Read Images for the Application Profile.

The mandatory attributes of the DICOM images are required for the correct storage of the images in the Extended Brilliance Workspace internal image database. Optional attributes and Retired/Private attributes are stored too – if present; this is equivalent with the level 2 (Full) conformance for the Storage service class in the Network support;

5.3. Augmented and Private Application Profiles

This section is used for the description of augmented and private Application Profiles.

5.3.1. Augmented Application Profiles

None.

5.3.2. Private Application Profiles

None.

5.4. Media Configuration

Any configuration issues may be found in the Networking Section 4.4 Configuration.

6. SUPPORT OF CHARACTER SETS

Any support for character sets beyond the default character repertoire in Network and Media services shall be described here.

Table 63, Supported DICOM Character Sets

| Character Set Description | Defined Term | ESC Sequence | ISO Registration Number | Code Element | Character Set |
|--|--------------|--------------|-------------------------|--------------|-------------------------------|
| Single-byte Character Sets without Code Extensions | | | | | |
| Default repertoire | - | - | ISO-IR 6 | G0 | ISO 646 |
| Latin alphabet No. 1 | ISO_IR 100 | - | ISO-IR 6 | G0 | ISO 646 |
| | | - | ISO-IR 100 | G1 | Supplementary set of ISO 8859 |

7. SECURITY

7.1. Security Profiles

None supported.

7.2. Association Level Security

None supported

7.3. Application Level Security

None supported

8. ANNEXES

8.1. IOD Contents

8.1.1. Created SOP Instances

8.1.1.1. General Rules

This section specifies the IODs created by the Extended Brilliance Workspace.

Abbreviations used for the IOD tables are,

COPY the module is copied from the source images
 ALWAYS the module is always present (created)
 CONDITIONAL the module exists under specified condition

The Extended Brilliance Workspace reflects the fact that the IOD created by the workstation are always based on some source images after the viewing/processing applied and the modified images are saved. Most of the attributes or even the whole modules (Patient, General Study, etc.) are just copied from the source images. The base of the copied attribute is the DICOM Standard.

The following table lists the modules that are always copied from the source images when the created SOP Class IOD is the same as the source SOP Class IOD,

Table 64, Modules Copied to the Derived IODs Table

| Information Entity | Module Name | Reference | Presence of Module |
|--------------------|-------------------------------|-----------|--------------------|
| Patient | Patient Module | | COPY |
| | Clinical Trial Subject Module | | COPY |
| Study | General Study Module | | COPY |
| | Patient Study Module | | COPY |
| | Clinical Trial Study Module | | COPY |
| Series | General Series Module | | ALWAYS CREATED |
| | Clinical Trial Series Module | | COPY |
| Frame of Reference | Frame of Reference Module | | COPY |
| Equipment | General Equipment Module | | COPY |

8.1.1.2. SC Image IOD Modules

Table 65, SC Image IOD Modules Table

| Information Entity | Module Name | Presence of Module |
|--------------------|--------------------------|--------------------|
| Patient | Patient Module | COPY |
| Study | General Study Module | COPY |
| | Patient Study Module | COPY |
| Series | General Series Module | ALWAYS |
| Equipment | General Equipment Module | COPY |

| Information Entity | Module Name | Presence of Module |
|--------------------|----------------------|---|
| Image | SC Equipment Module | ALWAYS |
| | General Image Module | ALWAYS |
| | Image Pixel Module | ALWAYS |
| | SC Image Module | ALWAYS |
| | Overlay Plane | CONDITIONAL - if present in the displayed image |
| | Modality LUT | CONDITIONAL – if Bits Stored > 8 |
| | VOI LUT Module | CONDITIONAL – if Bits Stored > 8 |
| | SOP Common Module | ALWAYS |

8.1.1.3. Key Object Selection Document IOD Modules

Table 66, Key Object Selection Document IOD Modules Table

| Information Entity | Module Name | Reference | Presence of Module |
|--------------------|-----------------------------------|-----------|--------------------|
| Patient | Patient Module | | COPY |
| Study | General Study Module | | COPY |
| | Patient Study Module | | COPY |
| Series | Key Object Document Series Module | | ALWAYS |
| Equipment | General Equipment Module | | COPY |
| Document | Key Object Document | | ALWAYS |
| | SR Document Content | | ALWAYS |
| | SOP Common Module | | ALWAYS |

8.1.1.4. Encapsulated PDF IOD Modules

Table 67, Encapsulated PDF IOD Modules Table

| Information Entity | Module Name | Reference | Presence of Module |
|--------------------|------------------------------|-----------|--------------------|
| Patient | Patient Module | | COPY |
| | Specimen Identification | | COPY |
| Study | General Study Module | | COPY |
| | Patient Study Module | | COPY |
| Series | Encapsulated Document Series | | ALWAYS |
| Equipment | General Equipment Module | | COPY |
| | SC Equipment Module | | ALWAYS |
| Image | Encapsulated Document | | ALWAYS |
| | SOP Common Module | | ALWAYS |

8.1.2. Usage of Attributes from Received IOD's

The following attributes must be present in the received IOD to be accepted,

For all IODs,

- SOP Class UID (0008,0016)
- Study Instance UID (0020,000D)
- Series Instance UID (0020,000E)

For Image IODs,

- Pixel Data (7FE0,0010) - size is not 0
- Rows (0028,0010)
- Columns (0028,0011)
- Bits Allocated (0028,0100)

8.1.3. Attribute Mapping

Not Applicable

8.1.4. Coerced/Modified fields

In the received IODs, the following attributes may be modified under certain conditions,

Table 68, Modified Attributes

| Attribute | Tag | When Modified |
|------------------|-----------|---|
| Patient name | 0010,0010 | if empty will be set to "Unknown" |
| Patient Id | 0010,0020 | if empty will be set to "Unknown" |
| Rows | 0028,0010 | fixed if rows* coloums doesnt match pixel data size |
| Sop Instance UID | 0008,0018 | generate new if missing |

8.2. Data Dictionary of Private Attributes

Not Applicable.

8.3. Coded Terminology and Templates

Extended Brilliance Workspace used the following Content groups and Templates.

Table 141, Content groups

| Content groups Name | Content ID |
|------------------------------|------------|
| Patient Orientation | CID 19 |
| Patient Orientation Modifier | CID 20 |
| Patient Gantry Relationship | CID 21 |
| PET Radionuclide | CID 4020 |
| PET Radiopharmaceuticals | CID 4021 |
| Route of Administration | CID 11 |
| Nuclear Medicine Projections | CID 26 |
| NM Procedural State Values | CID 3101 |

Table 141, Used Templates

| Template Name | Template ID |
|------------------------|-------------|
| NM Acquisition Context | TID 3470 |

8.4. Grayscale Image Consistency

Not applicable.

8.5. Standard Extended/Specialized/Private SOPs

No Specialized or Private SOP Classes are supported.

8.6. Private Transfer Syntaxes

No Private Transfer Syntaxes are supported