GE Medical Systems

Technical Publications

Direction 2325766–100

Revision 0

Advantx DLX
Dicom V3.0 (ID/NET V3.0) (ID/NET V3.0)
Dicom Conformance Statement

This document applies to DLX Release C22.XX

do not duplicate

Blank page

TABLE OF CONTENTS

REVISION HISTORY

REV	DATE	REASON FOR CHANGE
0	February 2002	Initial release. (C22.XX DLX Software Release)

LIST OF EFFECTIVE PAGES

PAGE NUMBER	REVISION NUMBER	PAGE NUMBER	REVISION NUMBER	PAGE NUMBER	REVISION NUMBER
Title Page	0				
Table of Contents i thru iv	0				
Revision History v thru vi	0				
Introduction 1–1 thru 1–6	0				
Conformance Statement 2–1 thru 2–10	0				
ADVANTX DLX3 Information Object Definition 3–1 thru 3–16	0				
Secondary Capture Implementation 4–1 thru 4–8	0				
Basic Worklist Management Implementation 5−1 thru 5−6	0				
Modality Performed Procedure Step Implementation 6–1 thru 6–6	0				

SECTION 1 – INTRODUCTION

1–0 OVERVIEW

Section 1, *Introduction*, provides general information about the content and scope of this document.

Section 2, *Conformance Statement*, is the DICOM v3.0 Conformance Statement related to this product. Conformance Statements defines the subset of options selected from those offered by the DICOM v3.0 standard.

Section 3, *DLX3 XRAY Angiographic Information Object Implementation* defines the technical specifications required to interoperate with a DICOM v3.0 network interface. They define the technical details of the Information Object Definitions (IOD's) listed in the Conformance Statement. This section contains also the description of the private elements used in this implementation.

Section 4, *Secondary Capture Image Information Object implementation*, defines the technical specifications required to interoperate with a DICOM v3.0 network interface. They define the technical details of the Information Object definition (IOD's) listed in the Conformance statement.This section contains also the description of the private elements used in this implementation.

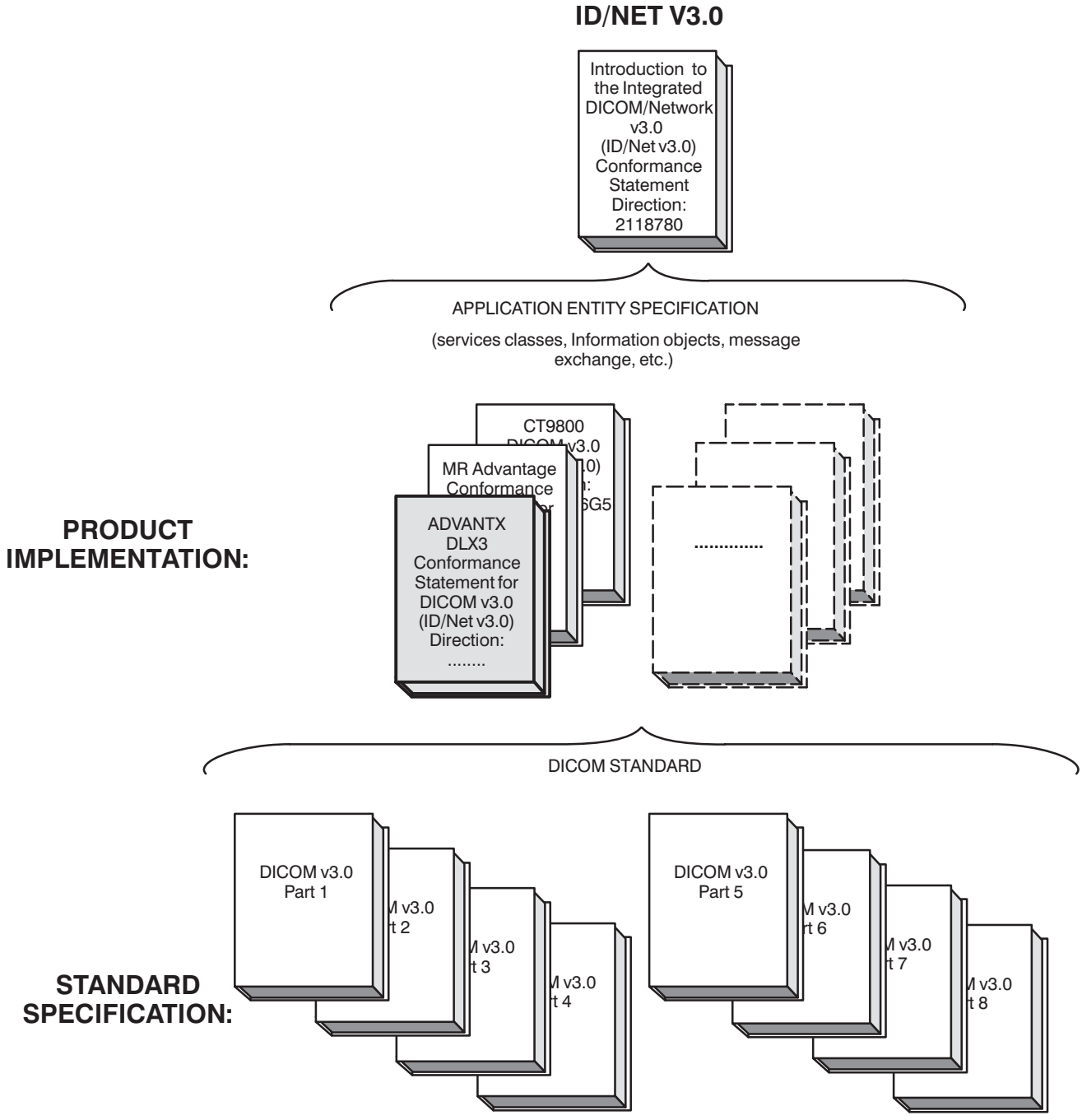
Section 5, *Basic Worklist Management Implementation*, defines the technical specifications required to interoperate with a DICOM v3.0 network interface. They define the technical details of the Information Object Definitions (IOD's) listed in the Conformance Statement.

Section 6, *Modality Performed Procedure Step Implementation*, defines the technical specification required to interoperate with a DICOM v3.0 network interface. They define the technical details of the Information Object Definitions (IOD's) listed in the Conformance Statement. This section contains also the description of the private elements used in this implementation.

1–1 OVERALL CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the ID/Net v3.0 Conformance Statements and their relationship with the DICOM v3.0 Conformance Statements is shown in Illustration 1–1.

ILLUSTRATION 1–1
DOCUMENTATION STRUCTURE



This document specifies the DICOM v3.0 implementation. It is entitled:

ADVANTX DLX
Conformance Statement for DICOM v3.0 (ID/Net v3.0)
Direction .....# 2142506–100

This Conformance Statement documents the DICOM v3.0 Conformance Statement and Technical Specification required to interoperate with the GEMS ID/Net v3.0 network interface. Introductory information, which is applicable to all GEMS ID/Net v3.0 Conformance Statements, is described in the document:

Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)
Conformance Statement
Direction: 2118780.

This Introduction familiarizes the reader with DICOM terminology and general concepts. It should be read prior to reading the individual products' ID/Net v3.0 Conformance Statements.

The ID/Net v3.0 Conformance Statement, contained in this document, also specifies the Lower Layer communications which it supports (e.g., TCP/IP). However, the Technical Specifications are defined in the DICOM v3.0 Part 8 standard.

For more information including Network Architecture and basic DICOM concepts, please refer to the *Introduction.*

For the convenience of software developers, there is "collector" Direction available. By ordering the collector, the Introduction described above and all of the currently published ID/Net v3.0 Product Conformance Statements will be received. The collector Direction is:

ID/Net v3.0 Conformance Statements
Direction: 2117016

For more information regarding DICOM v3.0, copies of the Standard may be obtained by written request or phone by contacting:

NEMA Publication
2101 L Street, N.W., Suite 300
Washington, DC 20037 USA
Phone: (202) 457–8474

1–2 INTENDED AUDIENCE

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM v3.0 Standards and with the terminology and concepts which are used in those Standards.

If readers are unfamiliar with DICOM v3.0 terminology they should first refer to the document listed below, then read the DICOM v3.0 Standard itself, prior to reading this Conformance Statement document.

Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)
Conformance Statement
Direction: 2118780

1−3 SCOPE AND FIELD OF APPLICATION

It is the intent of this document, in conjunction with the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*, to provide an unambiguous specification for GEMS ID/Net v3.0 implementations. This specification, called a Conformance Statement, includes a DICOM v3.0 Conformance Statement and is necessary to ensure proper processing and interpretation of GEMS medical image data exchanged using DICOM v3.0. The GEMS ID/Net v3.0 Conformance Statements are available to the public.

The reader of this Conformance Statement should be aware that different GEMS devices are capable of using different Information Object Definitions. For example, a GEMS CT Scanner may send images using the CT Information Object, MR Information Object, Secondary Capture Object, etc.

Included in this Conformance Statement are the Module Definitions which define all data elements used by this GEMS ID/Net v3.0 implementation. If the user encounters unspecified private data elements while parsing a GEMS Data Set, the user is well advised to ignore those data elements (per the DICOM v3.0 standard). Unspecified private data element information is subject to change without notice. If, however, the device is acting as a "full fidelity storage device", it should retain and retransmit all of the private data elements which are sent by GEMS devices.

1−4 IMPORTANT REMARKS

The use of these Conformance Statements, in conjunction with the DICOM v3.0 Standards, is intended to facilitate communication with GE imaging equipment. However, **by itself, it is not sufficient to ensure that inter–operation will be successful.** The **user (or user's agent)** needs to proceed with caution and address at least four issues:

- **Integration** − The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated Conformance Statements when interoperability with non−GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non-GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.
- **Validation** − Testing the complete range of possible interactions between any GE device and non-GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non-GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non-GE device and the stability of the image data for the intended applications.
  Such a validation is required before any clinical use (diagnosis and/or treatment) is performed. It applies when images acquired on GE imaging equipment are processed/displayed on a non−GE device, as well as when images acquired on non−GE equipment is processed/displayed on a GE console or workstation.

- **Future Evolution** − GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM v3.0 Standard. DICOM v3.0 will incorporate new features and technologies and GE may follow the evolution of the Standard. ID/Net v3.0 is based on DICOM v3.0 as specified in each ID/Net DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM v3.0. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these ID/Net DICOM Conformance Statements.** The **user** should ensure that any non-GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.
- **To be kept informed of the evolution of the implementation described in this document, the User should register on the GE Internet Server, accessible via anonymous ftp, by entering his e−mail address (GE Internet Server Address: ftp.med.ge.com, 192.88.230.11)**
- **Interaction** − It is the sole responsibility of the **non-GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1−5 REFERENCES

A list of references which is applicable to all ID/Net v3.0 Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.*

The information object implementation refers to the XRAY Angiographic Image Object Definition (DICOM v3.0 Standart Supplement 6) to Part 3 (Information Object Definition)

1−6 DEFINITIONS

A set of definitions which is applicable to all ID/Net v3.0 Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.*

1−7 SYMBOLS AND ABBREVIATIONS

A list of symbols and abbreviations which is applicable to all ID/Net v3.0 Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.*

Blank page

SECTION 2 − CONFORMANCE STATEMENT

2−0 INTRODUCTION

This conformance statement (CS) specifies the GE Advantx DLX compliance to DICOM v3.0. It details the DICOM Service Classes and roles which are supported by this product.

Advantx DLX is an Integrated Digital Vascular Imaging System for both Angiography and Cardiac applications. It uses DICOM services to export images to remote workstations.

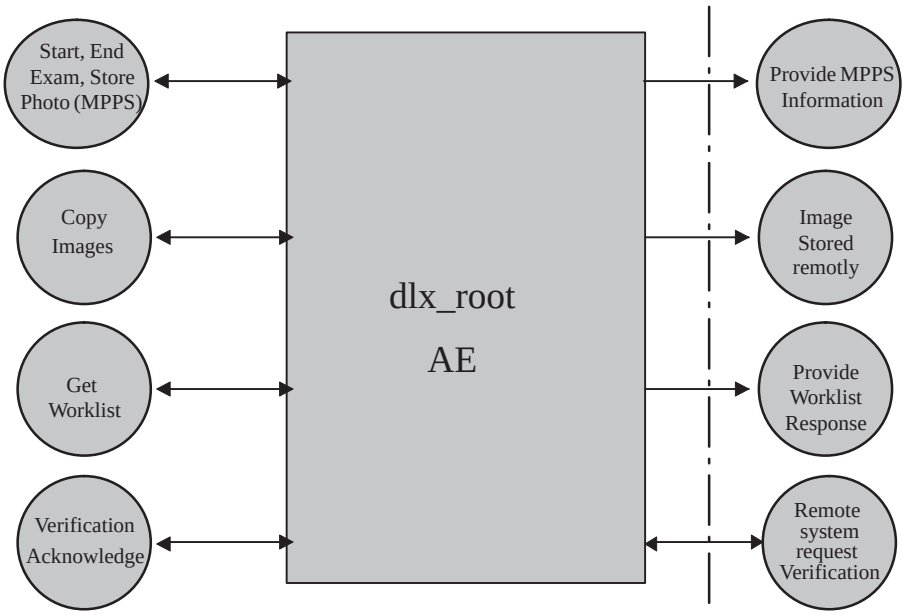
Note that the format of this section strictly follows the format of DICOM Standard Part 2 (Conformance) Annex A. Please refer to that part of the standard while reading this section.

2−1 IMPLEMENTATION MODEL

2−1−1 Application Data Flow Diagram

The Basic and Specific Application models for this device are shown in Illustration 2–1.

ILLUSTRATION 2–1
SPECIFIC AE APPLICATION MODEL



The dlx_root Application Entity (AE) is an application which handles DICOM protocol communication. dlx_root AE is automatically brought up when the Digital Angiographic system (DLX) is powered on.

All remote DICOM's AE must be manually configured on the DLX, usually at the software installation time, by a GE field engineer.

There are 3 local real world activities: Copy Image (CI), Get Worklist (GW) and Verification which can cause the dlx_root AE to initiate a DICOM association.

CI consists of an operator selecting one or several images to be sent on one or several Remote System(s). Selection of Images is done from the Operator console screens (known as BROWSER and VIEWER); selection of Remote Systems and visualisation of the status of the transfer is done on a specific menu (known as TRANSFER menu). Remote Workstation can be any DICOM compliant WorkStation.

GW consists of an operator request for the transfer of a list of Patient/Exam entries from a predefined remote HIS/RIS system. The remote workstation can be any DICOM compliant HIS/RIS system supporting XA modality.

Verification consists of an operator request for the verification of the availability of a remote station.

Query strings may be entered for the following items:

- Patient Name
- Patient ID
- Accession Number
- Procedure ID

Also a date range for the query may be specified.

Note: It is optional for a WL SCP that supports query for Accession Number and Procedure ID. However DLX supports filtering on these fields even if WL SCP doesn't.

If Modality Performed Procedure Step (MPPS) is enabled then starting, ending an exam or storing a photo during post processing will generate automatically an MPPS message to be sent to the programmed MPPS server. The remote server can be any DICOM compliant MPPS SCP.

2–1–2 Functional Definition of AE's

The dlx_root Application Entity supports the following three SCU functions (one at a time):

1. Copy Images:
   - Access to patient demographics and Pixel Data in the local database.
   - Build a DICOM format data set.
   - Initiate a DICOM association to send the image(s).

2. Get Worklist:
   - Build a DICOM formatted basic worklist management data request.
   - Initiate a DICOM association to send the request.
   - Wait for worklist response(s).
   - Access the local database to add new patient/exam demographic data.
   - Close the open Association.

3. Verification
   - Initiate a DICOM association.
   - Close the association.

4. Send MPPS
   - Build a DICOM formatted MPPS message.
   - Initiate a DICOM association.
   - Send MPPS message.
   - Close connection.

The dlx_root Application Entity also serves a default SCP function, the verification (Echo) Service Class request, independently from the other SCU functions.

2−1−3 Sequencing of Real−World Activities

Not Applicable

2−2 AE SPECIFICATIONS

2−2−1 AE Specification

This Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as an **SCU**:

SOP Class Name	SOP Class UID
X−Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Modality Worklist	1.2.840.10008.5.1.4.31
Modality Preformed Procedure Step	1.2.840.10008.3.1.2.3.3
Verification	1.2.840.10008.1.1

X–Ray Angiographic Image Storage is implemented as a Standard Extended SOP Class. It contains type 3 private Data Elements.

Standard conformance as an SCP is not applicable for this Application Entity.

This Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classs as an SCP :

SOP Class Name	SOP Class UID
Verification Service Class	1.2.840.10008.1.1

2−2−1−1 Association Establishment Policies

2−2−1−1−1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

Application Context Name	1.2.840.10008.3.1.1.1

The Maximum Length PDU negotiation is included in all association establishment requests.

The maximum length PDU for an association initiated by the dlx_root AE is:

Maximum Length PDU	16 Kbytes

The SOP class Extended Negotiation is not supported.

The maximum number of Presentation Contexts Items that will be proposed is 2.

The user info items sent by this product are:

- Maximum PDU Length
- Implementation UID

Note: Max PDU length can be configured at installation time.

2−2−1−1−2 Number of Associations

The dlx_root AE will Initiate only one DICOM association to perform an image storage or a Worklist transfer as an SCU to a remote host.

The dlx_root AE will not support multiple SCU associations simultaneously. The verification SCP association can be open simultaneously to another SCU association.

2−2−1−1−3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2−2−1−1−4 Implementation Identifying Information

The Implementation UID for this ID/Net v3.0 Implementation is:

AdvantX DLX Implementation UID	1.2.840.113619.6.90

2−2−1−2 Association Initiation Policy

dlx_root AE attempts to initiate a new association for each image it attempts to transfer. This association corresponds to one Real–World Activity: Copy Image (CI) or Get Worklist (GW).

2−2−1−2−1 Real−World Activity ”Copy Image”

2−2−1−2−1−1 Associated Real−World Activity

The operator selects a destination by selecting an Host in the ‘TRANSFER’ menu (by default the last selected host is active).

Then he selects Image(s) to be sent by selection in both BROWSER (at patient level), or VIEWER (at sequence or photo level).

This operation will cause:

- the dlx_root AE to initiate a DICOM association.
- the dlx_root AE to emit a C–ECHO command to check if the remote AE is available.
- the DLX to build a DICOM image from its compressed raw data.
- the dlx_root AE to initiate a DICOM association, select the appropriate Abstract and Transfer syntax from those accepted by the remote AE.
- the dlx_root AE to emit C–STORE command to send the image.

2−2−1−2−1−2 Proposed Presentation Contexts

Presentation Context Table − Proposed					
Abstract Syntax		Transfer Syntax		Role	Expanded
Name	UID	Name List	UID List		Negotiation
XRAY Angio Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2−2−1−2−1−2−1 SOP Specific Conformance Statement for Image Storage SOP Class

This implementation performs a single C–STORE operation over an association.

If the AE doesn't receive a C–ECHO confirmation, this implementation will terminate the association. The transfer is considered as failed, no association for C–STORE will be attempted.
Upon receiving a C–ECHO confirmation containing an Error, Refused or Warning status, this implementation will consider the result as OK. This is because the only purpose of the C–ECHO is to check that the remote AE responds, whatever is the C–ECHO status. This implementation doesn't require that remote AE implements Verification SOP class as a SCP.

Upon receiving a C–STORE confirmation containing an Error or a Refused status, this implementation will terminate the association. The current C–STORE is considered as failed.

Upon receiving a C–STORE confirmation containing a Warning Status, this implementation will treat it as an Error or Refused response.

Each C–STORE operation supports an " Association Timer ". This timer starts when the association request is sent and stops when the association is established. This timer is set to 60 seconds.

Each C–STORE operation supports an " Operation Inactivity Timer ". This timer starts once a C–STORE request has been issued and stops once a C–STORE confirmation has been received. This Timer is set to 60 minutes.

If any of the 2 timers expires, the connection is closed and the operation is considered as failed.

Note: Several hosts can be selected at the same time in the DLX User Interface. This ensures multi–destination storage, each user selected XA and SC IOD being sent to each selected host (one remote AE at a time i.e. an item is queued to host1, then queued again to host2,..., queued to hostN).

2−2−1−2−2 Real−World Activity "Get Worklist"

2−2−1−2−2−1 Associated Real−World Activity

The Worklist option has to be enabled by the system installation procedure.

The operator selects a destination host through a service menu.

The worklist transfer can be initiated from the Patient Viewer Dialogue by pressing the "Worklist" soft key.

This operation will cause:

- the dlx_root AE to initiate a DICOM association.
- the dlx_root AE to emit a C–ECHO request to check if the remote AE is available. Finally the association is closed.
- the DLX to build a Basic Worklist C–FIND Request.
- the dlx_root AE to initiate a DICOM association, select the appropriate Abstract and Transfer Syntax from those accepted by the remote AE.
- the dlx_root AE to emit the C–FIND Request.
- the dlx_root AE to receive C–FIND (Worklist) Response(s).
- the DLX to add new entry items to the local database if they are not existing yet.
- the dlx_root AE to close the association.

2–2–1–2–2–2 Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax		Role	Expanded
Name	UID	Name List	UID List		Negotiation
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2–2–1–2–2–2–1 SOP Specific Conformance Statement for Worklist SOP Class

This implementation performs a single C–FIND operation over one association.

If the AE does not receive a C–ECHO confirmation, this implementation will terminate the association. The Worklist request is considered as failed.

Upon receiving a C–ECHO confirmation containing an Error, Refused or Warning status, this implementation will consider the result OK. This is because the only purpose of the C–ECHO is to check that the remote AE responds.

Each C–ECHO and C–FIND operation supports an “Association Timer”. This timer starts when the association request is sent and the stops when the association is established. This timer is set to 30 seconds.

The C–ECHO operation supports an “Operation Inactivity Timer”. This timer starts when the C–ECHO request is sent and it stops when the C–ECHO response is received. This timer is also set to 30 seconds.

Upon receiving a C–FIND response containing an error status this implementation will terminate the association issuing a close request. The current C–FIND is considered as failed.

Each C–FIND operation supports an “Operation Inactivity Timer”. This timer starts when the C–FIND request is sent and it stops when the C–FIND final response received. This timer is set to 60 seconds.

If any of the timers expires, the connection is closed and the operation is considered as failed.

Badly formatted C–FIND response(s) from the SCP will result in the initiatiation of a C–FIND cancel request. In the dlx_root AE, the C–FIND cancel operation is not implemented as an additional operator choice.

On completion of operation the dlx_root AE places the status (flag) of the final Worklist update operation on DLX into the Abort flag of the close association request. That way the Worklist provider can get a final success feed back of the complete HIS/RIS data transfer operation. This flag setting doesn't change the basic DICOM association management functionality.

2−2−1−2−3 Real–world Activity "Verification"

2−2−1−2−3−1 Associated Real−World Activity

The operator selects a destination by selecting an host in the TRANSFER menu (by default the last selected host is active).

Then he presses on the "host verification" button or on the "worklist verification"button if he wants to test the worklist server.

These operations will cause:

- the dlx_root AE to initiate a DICOM association.
- the dlx_root AE to emit a C–ECHO command to check if the remote AE is available.

2−2−1−2−3−2 Proposed Presentation contexts

Presentation Context Table − Proposed					
Abstract Syntax		Transfer Syntax		Role	Expanded
Name	UID	Name List	UID List		Negotiation
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2−2−1−2−4 Real−world Activity "MPPS"

2−2−1−2−4−1 Associated Real−World Activity

The MPPS option has to be enabled by the system installation procedure.

The operator selects a destination host through a service menu

The MPPS transfer is initiated automatically any time when the user starts an exam, stops it, or produces a store photo event.

This operation will cause:

- the dlx_root AE to initiate a DICOM association.
- the dlx_root AE to emit a C–ECHO request to check if the remote AE is available. Finally the association is closed.
- the dlx_root AE to initiate a DICOM association, select the appropriate Abstract and Transfer Syntax from those accepted by the remote AE.
- the dlx_root AE to emit a N–Create_Request or and N–Set Request depending on the state of the MPPS to send.
- the dlx_root AE to receive a success or failure response from MPPS SCP.
- the dlx_root AE to remove the successfully sent MPPS message from the queue.
- the dlx_root AE to close the association.

2−2−1−2−4−2 Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax		Role	Expanded
Name	UID	Name List	UID List		Negotiation
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2−2−1−2−4−2−1 SOP Specific Conformance Statement for MPPS SOP Class

This implementation performs a single N–Create or N–Set operation over an association.

If the AE doesn't receive a C–ECHO confirmation, this implementation will terminate the association.

The transfer is considered as failed, no association for N–Create or N–Set will be attempted. Upon receiving a C–ECHO confirmation containing an Error, Refused or Warning status, this implementation will consider the result as OK. This is because the only purpose of the C–ECHO is to check that the remote AE responds, whatever is the C–ECHO status.

Upon receiving an N–Create or N–Set confirmation containing an Error or a Refused status, this implementation will terminate the association, except if the error code is 0111H which conveys a "Duplicate SOP Instance" error message. For this implementation the duplication of SOP instance means that the MPPS were already created by this application but for some reason (e.g. network failure) the success of creation was not registered, no other checks are performed to find any other possible root cause of this error message. In the case of all the other errors the current N–Create or N–Set is considered as failed.

Upon receiving an N–Create or N–Set confirmation containing a Warning Status, this implementation will treat it as an Error or Refused response.

Each N–Create or N–Set operation supports an " Association Timer ". This timer starts when the association request is sent and stops when the association is established. This timer is set to 120 seconds.

Each N–Create or N–Set operation supports an " Operation Inactivity Timer ". This timer starts once a N–Create or N–Set request has been issued and stops once corresponding confirmation has been received. This Timer is set to 5 minutes.

If any of the 2 timers expires, the connection is closed and the operation is considered as failed.

If once an operation failed, no further attempts are made until user intervention.

2−2−1−3 Association Acceptance Policy

The dlx_root AE provides only DICOM Verification Service Class.

2−2−1−3−1 Real−World Activity "Verification acknowledge"

DLX echoes to a Verification request from any DICOM node. This function is transparent to the user (no user interface, no message logged on screen).

2−2−1−3−1−1 Associated Real−World Activity

2−2−1−3−1−2 Accepted Presentation Contexts

Presentation Context Table − Accepted					
Abstract Syntax		Transfer Syntax		Role	Expanded
Name	UID	Name List	UID List		Negotiation
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

2−2−1−3−1−2−1 SOP Specific Conformance Statement for Verification SOP Class

The dlx_root AE provides standard conformance to the DICOM Verification Service Class.

2–3 COMMUNICATION PROFILES

2–3–1 Supported Communication Stacks (parts 8,9)

DICOM Upper Layer (Part 8) is supported using TCP/IP.

2–3–2 TCP/IP Stack

The TCP/IP stack is inherited from a UNIX Operating System.

2–3–2–1 API

Not applicable to this product.

2–3–2–2 Physical Media Support

Ethernet v2.0, IEEE 802.3.

2–3–3 Point–to–Point Stack

A 50–pin ACR–NEMA connection is not applicable to this product.

2–4 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

Refer to Section 3 for the description of AdvantX DLX Private DICOM Data Dictionary

Refer to Section 4 for the description of Secondary capture Private DICOM Data Dictionary

2–5 CONFIGURATION

2–5–1 AE Title/Presentation Address Mapping

The Local AE Title is configurable. This must be configured by a GEMS Field Service Engineer during an installation.

2–5–2 Configurable Parameters

The following fields are configurable for this AE (local):

- Local AE Title
- Local IP Address

The following fields are configurable for every remote DICOM AE:

- Remote AE Title
- Responding TCP/IP Port
- Remote IP Address

Note: All configuration must be performed by a GE Field Engineer.

2–6 SUPPORT OF EXTENDED CHARACTER SETS

This implementation supports the following extended character set:
ISO–IR–100

SECTION 3 − XA INFORMATION OBJECT IMPLEMENTATION

3−0 INTRODUCTION

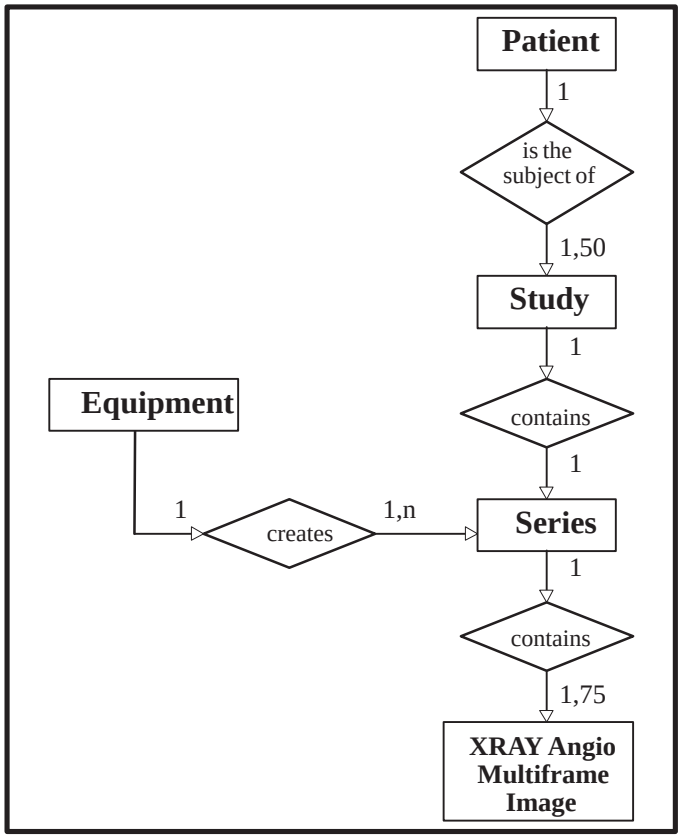
This section specifies the use of the DICOM v3.0 XRAY Angiographic Image IOD to represent the information included in XRAY Angiographic images produced by this implementation. Corresponding attributes are conveyed using the module construct.

3−1 XA IMAGE IOD IMPLEMENTATION

This section defines the implementation of XA image information object. It refers to the DICOM V3.0 Standard, Supplement 4 (Oct 21, 1995) to Part 3 (Information Object definition).

3−2 XA IMAGE IOD ENTITY−RELATIONSHIP MODEL

ILLUSTRATION 3–1
XRAY ANGIOGRAPHIC IMAGE ENTITY RELATIONSHIP DIAGRAM



The Entity–Relationship diagram for the XRAY Angiographic Image interoperability schema is shown in Illustration 3–1. In this figure, the following diagrammatic convention is established to represent the information organisation:

- each entiy is represented by a rectanglar box.
- each relationship is represented by a diamond shaped box.
- the fact that a relationship exists between two enties is depicted by lines connecting the corresponding entity boxes to the relationsip boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown.

3–2–1 Entities Description

Refer to DICOM Standard Supplement 4 (Oct 21, 1995) to Part 3 (Information Object Definitions) for a descripion of the entities contained within this Information object.

3–2–2 DLX Mapping of DICOM entities

DICOM entities map to the DLX entities in respect to the following:

DICOM	DLX
Patient Entity	Patient Entity
Study Entity	Examination Entity
Series Entity	no match, there is a one to one relationship between DICOM Study and Series
Multiframe Image Entity	Sequence Entity
Frame	Image

3–3 XA IMAGE IOD MODULE TABLE

Within an entity of the DICOM v3.0 XRAY Angio Image Information Object Definition, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module acilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 3–1 identifies the defined modules within the entities which comprise the DICOM v3.0 XRAY Angio Image Information object Definition. Modules are identified by Module Name.

See DICOM v3.0 Part 3 for a complete definition of the entities, modules, and attributes.

TABLE 3–1
XRAY ANGIOGRAPHIC IMAGE INFORMATION OBJECT DEFINITION (IOD) MODULE TABLE

IE	Module Name	Reference
Patient	Patient	3−4−1−1
Study	General Study	3−4−2−1
	Patient Study	3−4−2−2
Series	General Series	3−4−3−1
Equipment	General Equipment	3−4−4−1
Image	General Image	3−4−5−1
	Image Pixel	3−4−5−2
	Cine	3−4−5−3
	Multi−Frame	3−4−5−4
	Frame Pointers	3−4−5−5
	Mask	3−4−5−6
	Display Shutter	3−4−5−7
	Device	3−4−5−8
	X−Ray Image	3−4−5−9
	X−Ray Acquisition	3−4−5−10
	X−Ray Collimator	3−4−5−11
	XA Positioner	3−4−5−12
	X−Ray Table	3−4−5−13
	Curve	3−4−5−14
	SOP Common	3−4−5−15

3−4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM v3.0 Standard Part 3 (Information Object Definition) for a description of each of the entities and modules contained within the XRAY Angiographic Information Object.

Modules contain also **type 3 Private elements**.

3−4−1 Patient Entity Module

3−4−1−1 Patient Module

Attribute Name	Element Tag	TP	Notes
Patient's Name	0010, 0010	2	From user interface, restricted to 48 char.
Patient ID	0010, 0020	2	From user interface, restricted to 64 char.
Patient's Birth Date	0010, 0030	2	From user interface, no value if wrong format
Patient's Sex	0010, 0040	2	From user interface, "M", "F" or "O"
Patient DOB	0011, xx01	3	Patient Date of Birth in free form.

3−4−2 Study Entity Module

3−4−2−1 General Study

Attribute Name	Element Tag	TP	Notes
Study Instance UID	0020, 000D	1	Restricted to 64 char.
Study Date	0008, 0020	2	YYYYMMDD, restricted to 8 char.
Study Time	0008, 0030	2	HHMMSS.XXX, restricted to 10 char.
Referring Physicians' Name	0008, 0090	2	From user interface, restricted to 48 char.
Study ID	0020, 0010	2	From user interface, restricted to 64 char.
Accession number	0008, 0050	2	May have a value if comming from worklist already filled, restricted to 16 char.
Study Description	0008, 1030	3	From user interface, restricted to 16 char.

3−4−2−2 Patient Study

Attribute Name	Element Tag	TP	Notes
Patient's Size	0010, 1020	3	From user interface.
Patient's Weight	0010, 1030	3	From user interface, restricted to 16 char.
Additional Patient's History	0010, 21B0	3	From user interface, restricted to 252 char.
Patient address	0010, 1040	3	From user interface, restricted to 252 char.
Patient telephone	0010, 2154	3	From user interface, restricted to 32 char.

3−4−3 Series Entity Module

3−4−3−1 General Series

Attribute Name	Element Tag	TP	Notes
Modality	0008, 0060	1	XA
Series Instance UID	0020, 000E	1	Restricted to 64 char. Study instance UID + '.1'
Series Number	0020, 0011	2	1
Series Date	0008, 0021	3	YYYYMMDD, restricted to 8 char.
Series Time	0008, 0031	3	HHMMSS.XXX, restricted to 10 char.
Performing Physician's Name	0008, 1050	3	From user interface, restricted to 48 char.
Series Description	0008, 103E	3	From user interface, restricted to 16 char.
Operators' Name	0008, 1070	3	From user interface, restricted to 48 char.
Referenced Study Component Sequence	0008,1111	3	Sent only if MPPS is turned on and sequence items are available
>Referenced SOP Class UID	0008,1150	1C	1.2.840.10008.3.1.2.3.3
>Referenced SOP Instance UID	0008,1155	1C	Associated MPPS UID sent
Protocol Name	0018,1030	3	Sent only if MPPS is turned on, WL SCP supported SPS description is sent back

Attribute Name	Element Tag	TP	Notes
Performed Procedure Step ID	0040,0253	3	Sent only if MPPS is turned on
Performed Procedure Step Start Date	0040,0244	3	Sent only if MPPS is turned on
Performed Procedure Step Start Time	0040,0245	3	Sent only if MPPS is turned on
Performed Procedure Step Description	0040,0254	3	Sent only if MPPS is turned on, WL SCP supported SPS description is sent back
Requested Attributes Sequence	0040,0275	3	Sent only if MPPS is turned on and sequence items are available
>Requested Procedure ID	0040,1001	1C	Sent only if MPPS is turned on, WL SCP supported value sent back
>Scheduled Procedure Step ID	0040,0009	1C	Sent only if MPPS is turned on, WL SCP supported value sent back
>Scheduled Procedure Step Description	0040,0007	3	Sent only if MPPS is turned on, WL SCP supported value sent back

3–4–4 Equipment Entity Module

3–4–4–1 General Equipment

Attribute Name	Element Tag	TP	Notes
Manufacturer	0008, 0070	3	GE MEDICAL SYSTEMS
Institution Name	0008, 0080	3	Generated by DLXINSTAL during acquisition
Institution Address	0008, 0081	3	
Manufacturer Model Name	0008, 1090	3	DLX
Device Serial Number	0018, 1000	3	Identifier entered in DLXINSTAL
Software versions	0018, 1020	3	Database version, internal to DLX

3−4−5 Image Entity Module

3−4−5−1 General Image

Attribute Name	Element Tag	TP	Notes
Image Number	0020,0013	2	Image number in the Series
Image Date	0008,0023	2C	YYYYMMDD, restricted to 8 char.
Image Time	0008,0033	2C	HHMMSS.XXX, restricted to 10 char.
Image Type	0008,0008	3	ORIGINAL\PRIMARY\ either SINGLE PLANE, BIPLANE A or BIPLANE B
Acquisition Date	0008,0022	3	YYYYMMDD, restricted to 8 char.
Acquisition Time	0008,0032	3	HHMMSS.XXX, restricted to 10 char.
Patient Orientation	0020,0020	2	No value, Zero length
Image comments	0020,4000	3	From user interface, restricted to 16 char.
Referenced Image Sequence	0008, 1140	3	In case of DLX biplane acquisition, used to identify the related plane Image (LATeral if FRonTal or FRonTal if LATeral)
>Referenced SOP Class UID	0008, 1150	1C	1.2.840.10008.5.1.4.1.1.12.1
>Referenced SOP Instance UID	0008, 1155	1C	Restricted to 64 char. Series_UID if monoplane, Series_UID + '.1' if frontal from biplane, Series_UID + '.2' if lateral from biplane
Lossy Image Compression	0028, 2110	3	00
Side_mark	0019, xx1D	3	represents patient orientation as 2 characters located on the left and right side of the displayed frame. Encoding is the following : 0 : not defined 1, 4, 6 : Left of the patient is on the left side of the frame 2, 3, 5 : Right of the patient is on the left side of the frame
Station name	0008, 1010	3	User defined name identifying the machine that produced the digital images.

3−4−5−2 Image Pixel

Attribute Name	Element Tag	TP	Notes
Samples per Pixel	0028, 0002	1	1
Photometric Interpretation	0028, 0004	1	MONOCHROME1 if reverse video, or MONOCHROME2 otherwise
Rows	0028, 0010	1	512 or 1024
Columns	0028, 0011	1	512 or 1024
Bits Allocated	0028, 0100	1	8 or 16
Bits Stored	0028, 0101	1	8 or 10
High Bit	0028, 0102	1	7 or 9
Pixel Representation	0028, 0103	1	0
Window Center	0028, 1050	1C	Value is 128 for 8 bit XA multi–frame images. Value is 512 for 10 bit XA multi–frame images
Window Width	0028, 1051	1C	Value is 256 for 8 bit XA multi–frame images. Value is 1024 for 10 bit XA multi–frame images
Pixel Data	7FE0, 0010	1	

3−4−5−3 Cine

Attribute Name	Element Tag	TP	Notes
Frame Time Vector	0018, 1065	1C	Generated by acquisition system
Start Trim	0008, 2142	1	Generated by acquisition system
Stop Trim	0008, 2143	1	Generated by acquisition system
Recommended Display Frame Rate	0008, 2144	1	Generated by acquisition system
Frame Delay	0018, 1066	1	0.0
Cine Rate	0018, 0040	1	Generated by acquisition system

3−4−5−4 Multi−Frame

Attribute Name	Element Tag	TP	Notes
Number of Frames	0028, 0008	1	Generated by acquisition system
Frame Increment pointer	0028, 0009	1	0018, 1065

3−4−5−5 Frame Pointers

Attribute Name	Element Tag	TP	Notes
Representative Frame Number	0028, 6010	3	Initialized as the frame number located at the 1/3rd of the multiframe image.
Cur_spatial_filter_strength	0019, xx17	3	
Zoom_factor	0019, xx18	3	1, 2 or 4
X_zoom	0019, xx19	3	coordinate of the center of the zoomed area
Y_zoom	0019, xx1A	3	coordinate of the center of the zoomed area
Text_annotation	70nn, xx04	3	There could be up to 5 annoatation per images
Box	70nn, xx05	3	Coordinates of the lower left corner of the first character of the annotation (x, y)
Arrow end	70nn, xx07	3	Coordinates of extrems of the arrow (x, y), the arrow always starts from the annotation text. Arrows is always a staight line. (0,0) value means 'no arrow' is attached to the annotation.

3−4−5−6 Mask

Attribute Name	Element Tag	TP	Notes
Mask Subtraction Sequence	0028, 6100	1	
>Mask Operation	0028, 6101	1	NONE or AVG_SUB
>Applicable Frame Range	0028, 6102	3	generated by acquisition system
>Mask Frame Numbers	0028, 6110	1C	Number of mask image: from user interface or generated by acquisition system (depending on acquisition mode)
>Mask Sub−pixel shift	0028, 6114	3	Xpixel shift / Ypixel shift: from user interface
Recommended viewing mode	0028, 1090	2	SUB/NAT
Percentage_landscape	0019, xx1E	3	Percentage of mask applied

3−4−5−7 Display Shutter

Attribute Name	Element Tag	TP	Notes
Shutter Shape	0018, 1600	1	CIRCULAR or RECTANGULAR. Combined Rectangular and Circular could exist and is represented by both RECTANGULAR/CIRCULAR attributes.
Display Shutter Left Vertical Edge	0018, 1602	1C	From user interface
Display Shutter Right Vertical Edge	0018, 1604	1C	From user interface
Display Shutter Upper Horizontal Edge	0018, 1606	1C	From user interface
Display Shutter Lower Horizontal Edge	0018, 1608	1C	From user interface
Center of Circular Display Shutter	0018, 1610	1C	From user interface
Radius of Circular Display Shutter	0018, 1612	1C	From user interface

3−4−5−8 Device

Attribute Name	Element Tag	TP	Notes
Device Sequence	0050, 0010	3	
>Code Value	0008, 0100	1C	BALL or CATHETER
>Coding Scheme Designator	0008, 0102	1C	99DEV
>Device Diameter	0050, 0016	3	Set in DLXINSTAL for BALL, from user interface for CATHETER
>Device Diameter Units	0050, 0017	2C	MM

3−4−5−9 X−Ray Image

Attribute Name	Element Tag	TP	Notes
Frame Increment pointer	0028, 0009	1C	
Lossy Image Compression	0028,2110	1C	00
Image Type	0008, 0008	1	ORIGINAL\PRIMARY\ either SINGLE PLANE, BI-PLANE A or BIPLANE B
Pixel Intensity Relationship	0028, 1040	1	Value LIN or EDR. In EDR mode, it should be possible to modify the edge enhancement filters and WW/WL. Spatial measurement should also be possible.
Samples per Pixel	0028,0002	1	1
Photometric interpretation	0028,0004	1	MONOCHROME1 if reverse video, MONOCHROME2 otherwise
Bits allocated	0028, 0100	1	8 or 16
Bits stored	0028, 0101	1	8 or 10
High Bit	0028, 0102	1	7 or 9
Pixel Representation	0028, 0103	1	0
Reference Image Sequence	0008, 1140	1C	Used to identify the related plane Image in case of Bi-plane acquisition (LATeral if FRonTal or FRonTal if LATeral)
>Reference SOP class UID	0008, 1150	1C	1.2.840.10008.5.1.4.1.1.12.1
>Reference SOP instance UID	0008, 1155	1C	Restricted to 64 char. Series_UID if monoplane, Series_UID + '.2' if frontal from biplane, Series_UID + '.1' if lateral from biplane
R Wave Pointer	0028, 6040	3	
Scan Options	0018, 0022	3	EKG or STEP, or CHASE, or ROTA or no value
Calibration Image	0050, 0004	3	No value, zero length

3−4−5−10 X−Ray Acquisition

Attribute Name	Element Tag	TP	Notes
KVP	0018, 0060	2	Generated by acquisition system
Field of view Shape	0018, 1147	3	ROUND
Field of View Dimension	0018, 1149	3	Generated by acquisition system, multiplied by 25.4
Grid	0018, 1166	3	IN
Radiation Mode	0018, 115A	3	PULSED
Radiation Setting	0018, 1155	1	GR
Exposure Time	0018, 1150	2C	Generated by acquisition system
X−ray Tube Current	0018, 1151	2C	Restricted to 8 char.
Intensifier Size	0018,1162	3	Set in DLXINSTAL, multiplied by 25.4
Adx_procedure_name	0019, xx07	3	free text information
Adx_exam_name	0019, xx08	3	free text information
Adx_patient_size	0019 , xx09	3	LOW, MEDIUM, ADULT
Acq_Record View	0019, 000A	3	1 Frontal, 2 Lateral 3 Biplane

Attribute Name	Element Tag	TP	Notes
Adx_injector_delay	0019, xx10	3	delay in start of injection in 1/10th of seconds
Adx_auto_inject	0019, xx11	3	1 if autoinjection, 0 if not
Adx_acq_mode	0019, xx14	3	0,1 for vascular 2..7 for cardiac 8..13 for DSA stepping 14..19, 26 for Bolus Chasing 20..25 for HSS acquisition
Adx_camera_rotation _enable	0019, xx15	3	0 —> disable 1 —> enable Value sent by acquisition system Advantx–E 0 if generated by acquisition system Advantx1
Adx_reverse_sweep	0019, xx16	3	Value Meaning 0 No reverse sweep on frontal and lateral 1 No reverse sweep on lateral, only vertical reverse sweep on frontal, 2 No reverse sweep on lateral, only horizontal reverse sweep on frontal, 3 No reverse sweep on lateral, vertical and horizontal reverse sweep on frontal, 4 Only vertical reverse sweep on lateral, no reverse sweep on frontal, 5 Only vertical reverse sweep on lateral, only vertical reverse sweep on frontal, 6 Only vertical reverse sweep on lateral, only horizontal reverse sweep on frontal, 7 Only vertical reverse sweep on lateral, vertical and horizontal reverse sweep on frontal, 8 Only horizontal reverse sweep on lateral, no reverse sweep on frontal, 9 Only horizontal reverse sweep on lateral, only vertical reverse sweep on frontal, 10 Only horizontal reverse sweep on lateral, only horizontal reverse sweep on frontal, 11 Only horizontal reverse sweep on lateral, vertical and horizontal reverse sweep on frontal, 12 Vertical and horizontal reverse sweep on lateral, no reverse sweep on frontal, 13 Vertical and horizontal reverse sweep on lateral, only vertical reverse sweep on frontal, 14 Vertical and horizontal reverse sweep on lateral, only horizontal reverse sweep on frontal, 15 Vertical and horizontal reverse sweep on lateral, vertical and horizontal reverse sweep on frontal. Values sent by acquisition system Advantx–E 0 if generated by acquisition system Advantx1

Attribute Name	Element Tag	TP	Notes
Adx_focus	0019, xx1B	3	focus on frontal plane
Adx_dose	0019, xx1C	3	0, 1, 2, 3 for dose A, B, C, D
Adx_exposure_duration	0019, xx1F	3	in ms.
IP address	0019, xx20	3	IP Address of the machine that sends the serie

3−4−5−11 X−Ray Collimator

Attribute Name	Element Tag	TP	Notes
Collimator shape	0018,1700	1	value : CIRCULAR
Center of circular collimator	0018,1710	1C	512\512 or 256\256
Radius of circular Collimator	0018,1712	1C	Set in DLXINSTAL

3−4−5−12 XA Positioner

Attribute Name	Element Tag	TP	Notes
Distance Source to Patient	0018, 1111	3	Value sent by acquisition system Advantx–E 0 if generated by acquisition system Advantx1
Distance Source to detector	0018, 1110	3	Value sent by acquisition system Advantx–E 0 if generated by acquisition system Advantx1
Estimated Radiographic Magnification factor	0018, 1114	3	(0018, 1110) divided by (0018, 1111)
Positioner Motion	0018, 1500	2C	STATIC or DYNAMIC
Positioner Primary Angle	0018, 1510	2	Calculated with (0019, 0006), (0019, 0001), (0019, 0002), (0019, 0003)
Positioner Secondary Angle	0018, 1511	2	Calculated with (0019, 0006), (0019, 0001), (0019, 0002), (0019, 0003)
Positioner Primary Angle Increment	0018, 1520	2C	Generated by acquisition system
Positioner Secondary Angle Increment	0018, 1521	2C	Generated by acquisition system
Angle_value_1	0019, xx01	3	Positioner angle for L arm in degrees
Angle_value_2	0019, xx02	3	Positioner angle for P arm in degrees
Angle_value_3	0019, xx03	3	Positioner angle for C arm in degrees
Angle_label_1	0019, xx04	3	L
Angle_label_2	0019, xx05	3	CAU, CRA
Angle_label_3	0019, xx06	3	LAO, RAO

3−4−5−13 X−Ray table

Attribute Name	Element Tag	TP	Notes
Table Motion	0018, 1134	2	DYNAMIC or STATIC
Table Vertical Increment	0018, 1135	2C	0
Table Longitudinal Increment	0018, 1137	2C	Generated by acquisition system
Table Lateral Increment	0018, 1136	2C	0
Table Vertical position	0019, xx21	3	Vertical position of table in mm with respect to GEMS defined origin.
Table Longitudinal position	0019, xx22	3	Longitudinal position of table in mm with respect to GEMS defined origin.
Table Lateral position	0019, xx23	3	Vertical position of table in mm with respect to GEMS defined origin.

3−4−5−14 Curve

Attribute Name	Element Tag	TP	Notes
Curve Dimensions	50xx, 0005	1	1 for PHYSIO, 2 for ROI
Number of points	50xx, 0010	1	Generated by acquisition system for PHYSIO, from user interface for ROI
Type of Data	50xx, 0020	1	ROI or PHYSIO
Data Value Representation	50xx, 0103	1	0
Curve Data	50xx, 3000	1	
Curve Description	50xx, 0022	3	only if Type of Data (50xx, 0020) = ROI, then DIASTOLE or SYSTOLE

Curves can be either Cardiac Contours (1 diastolic and 1 systolic per multiframe image), or a physiological curve (e.g. EKG). For a Multiframe Image, there could be 2 Cardiac contour and 2 physiological curves.

3−4−5−15 SOP Common

Attribute Name	Element Tag	TP	Notes
SOP Class UID	0008, 0016	1	1.2.840.10008.5.1.4.1.1.12.1
SOP Instance UID	0008, 0018	1	Restricted to 64 char. Series_UID if monoplane, Series_UID + '.1' if frontal from biplane, Series_UID + '.2' if lateral from biplane
Specific Character	0008, 0005	1C	ISO_IR 100

3−5 PRIVATE DATA DICTIONARY

Attribute Name	Data Element Tag	VR	VM
Private Creator PATIENT_01	**0011, 00xx**	**LO**	**1**
Patient DOB	0011, xx01	LT	1
Private Creator Series_01	**0019,00xx**	**LO**	**1**
Angle_value_1	0019, xx01	DS	1
Angle_value_2	0019, xx02	DS	1
Angle_value_3	0019, xx03	DS	1
Angle_label_1	0019, xx04	CS	1
Angle_label_2	0019, xx05	CS	1
Angle_label_3	0019, xx06	CS	1
Adx_procedure_name	0019, xx07	ST	1
Adx_exam_name	0019, xx08	ST	1
Adx_patient_size	0019, xx09	SH	1
Acq_record view	0019, 000A	IS	1
Adx_injector_delay	0019, xx10	DS	1
Adx_auto_inject	0019, xx11	CS	1
Adx_acq_mod	0019, xx14	IS	1
Adx_camera_rotation_enable	0019, xx15	CS	1
Adx_reverse_sweep	0019, xx16	CS	1
Cur_spatial_filter_strength	0019, xx17	IS	1
Zoom_factor	0019, xx18	IS	1
X_zoom	0019, xx19	IS	1
Y_zoom	0019, xx1A	IS	1
Adx_focus	0019, xx1B	DS	1
Adx_dose	0019, xx1C	CS	1
Side_mark	0019, xx1D	IS	1
Percentage_landscape	0019, xx1E	IS	1
Adx_exposure_duration	0019, xx1F	DS	1
IP address	0019, xx20	SH	1
Table vertical position	0019, xx21	DS	1
Table longitudinal position	0019, xx22	DS	1
Table lateral position	0019, xx23	DS	1
Private Creator ANNOT_01	**70nn,00xx**	**LO**	**1**
Text_annotation	70nn, xx04	ST	1
Box	70nn, xx05	IS	2
Arrow end	70nn, xx07	IS	2

Attribute Name	Data Element Tag	Value
Private Creator PATIENT_01	0011,00xx	DLX_PATNT_01
Private Creator SERIE_01	0019,00xx	DLX_SERIE_01
Private Creator ANNOT_01	70nn,00xx	DLX_ANNOT_01

Blank page

SECTION 4 − SECONDARY CAPTURE IMPLEMENTATION

4−0 INTRODUCTION

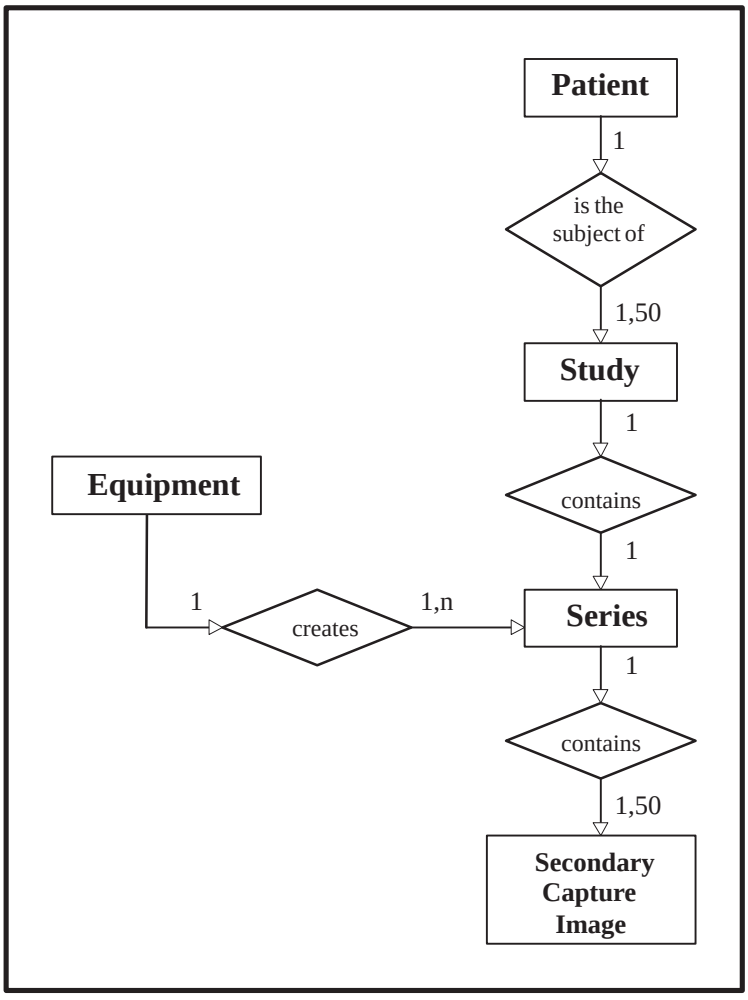
This section specifies the use of the DICOM v3.0 Secondary Capture Image IOD to represent the information included in Secondary Capture images produced by this implementation. Corresponding attributes are conveyed using the module construct.

4−1 SC IMAGE IOD IMPLEMENTATION

This section defines the implementation of SC image information object. It refers to the DICOM V3.0 Standard, Part 3 (Information Object definition).

4−2 SC IMAGE IOD ENTITY−RELATIONSHIP MODEL

ILLUSTRATION 4–1
SC IMAGE ENTITY RELATIONSHIP DIAGRAM



The Entity–Relationship diagram for the SC Image interoperability schema is shown in Illustration 4–1. The following diagrammatic convention is established to represent the information organisation:

- each entity is represented by a rectanglar box.
- each relationship is represented by a diamond shaped box.
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown.

4−2−1 Entities Description

Refer to DICOM Standard Part 3 (Information Object Definitions) for a descripion of each of the entities contained within the Secondary Capture Image Information Object Definition.

4−2−2 DLX Mapping of DICOM entities

DICOM entities map to the DLX entities in respect to the following:

DICOM	DLX
Patient Entity	Patient Entity
Study Entity	Examination Entity
Serie Entity	no match, there is a one to one relationship between DICOM Study and Serie
Secondary Image Entity	Photo Entity

4−3 SC IMAGE IOD MODULE TABLE

Within an entity of the DICOM v3.0 XRAY Angio Image Information Object Definition, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 4–1 identifies the defined modules within the entities which comprise the DICOM v3.0 XRAY Angio Image Information object Definition. Modules are identified by Module Name.

See DICOM v3.0 Part 3 for a complete definition of the entities, modules, and attributes.

TABLE 4–1
SC IMAGE INFORMATION OBJECT DEFINITION (IOD) MODULE TABLE

IE	Module Name	Reference
Patient	Patient	4−4−1−1
Study	General Study	4−4−2−1
	Patient Study	4−4−2−2
Series	General Series	4−4−3−1
Equipment	SC Equipment	4−4−4−1
Image	General Image	4−4−5−1
	Image Pixel	4−4−5−2
	Overlay Plane	4−4−5−3
	SOP Common	4−4−5−4

4–4 MODULE LIBRARY

Please refer to DICOM v3.0 Standard Part 3 (Information Object Definition) for a description of each of the entities and modules contained within the SC Information Object.

Modules contain also **type 3 Private elements**.

See DICOM v3.0 Part 3 for a complete definition of the entities, modules, and attributes.

4–4–1 Patient Entity Module

4–4–1–1 Patient Module

Attribute Name	Element Tag	TP	Notes
Patient's Name	0010, 0010	2	From user interface, restricted to 48 char.
Patient ID	0010, 0020	2	From user interface, restricted to 64 char.
Patient's Birth Date	0010, 0030	2	From user interface, no value if wrong format
Patient's Sex	0010, 0040	2	From user interface, "M", "F" or "O"
Patient DOB	0011, xx01	3	Patient Date of birth in free form.

4–4–2 Study Entity Module

4–4–2–1 General Study

Attribute Name	Element Tag	TP	Notes
Study Instance UID	0020, 000D	1	Restricted to 64 char.
Study Date	0008, 0020	2	YYYYMMDD, restricted to 8 char.
Study Time	0008, 0030	2	HHMMSS.XXX, restricted to 10 char.
Referring Physicians' Name	0008, 0090	2	From user interface, restricted to 48 char.
Study ID	0020, 0010	2	From user interface, restricted to 64 char.
Accession number	0008, 0050	2	May have a value if comming from worklist already filled, restricted to 16 char.
Study Description	0008, 1030	3	From user interface, restricted to 16 char.

4–4–2–2 Patient Study

Attribute Name	Element Tag	TP	Notes
Patient's Size	0010, 1020	3	From user interface.
Patient's Weight	0010, 1030	3	From user interface, restricted to 16 char.
Additional Patient's History	0010, 21B0	3	From user interface, restricted to 252 char.
Patient address	0010, 1040	3	From user interface, restricted to 252 char.
Patient telephone	0010, 2154	3	From user interface, restricted to 32 char.

4–4–3 Series Entity Module

4–4–3–1 General Series

Attribute Name	Element Tag	TP	Notes
Modality	0008, 0060	1	value : XA
Series Instance UID	0020, 000E	1	Restricted to 64 char. Study instance UID + '.1'
Series Number	0020, 0011	2	value : 1
Series Date	0008, 0021	3	YYYYMMDD, restricted to 8 char.
Series Time	0008, 0031	3	HHMMSS.XXX, restricted to 10 char.
Performing Physician's Name	0008, 1050	3	From user interface, restricted to 48 char.
Series Description	0008, 103E	3	From user interface, restricted to 16 char.
Operators' Name	0008, 1070	3	From user interface, restricted to 48 char.
Patient position	0018, 5100	2C	No value, Zero length

4–4–4 Equipment Entity Module

4–4–4–1 SC Equipment Module

Attribute Name	Element Tag	TP	Notes
Conversion Type	0008, 0064	1	WSD
Modality	0008, 0060	3	XA
Manufacturer	0008, 0070	3	GE MEDICAL SYSTEMS
Institution name	0008, 0080	3	Generated by DLXINSTAL during acquisition
Institution Address	0008, 0081	3	
Secondary Capture Device Manufacturer	0018, 1016	3	GE MEDICAL SYSTEMS
Secondary Capture Device Manufacturer's Model Name	0018, 1018	3	DLX

4−4−5 Image Entity Module

4−4−5−1 General Image

Attribute Name	Element Tag	TP	Notes
Image Number	0020,0013	2	Image number in the serie
Image Date	0008,0023	2C	YYYYMMDD, restricted to 8 char.
Image Time	0008,0033	2C	HHMMSS.XXX, restricted to 10 char.
Image Type	0008,0008	3	DERIVED\SECONDARY\ either SINGLE PLANE, BIPLANE A or BIPLANE B
Patient Orientation	0020,0020	2C	No value, Zero length
Referenced Image Sequence	0008, 1140	3	Used to reference the associated plane Secondary Capture in case of Biplane Acquisition
>Referenced SOP Class UID	0008, 1150	1C	1.2.840.10008.5.1.4.1.1.7
>Referenced SOP Instance UID	0008, 1155	1C	Restricted to 64 char. Photo_UID + '.2' if frontal plane photo, Photo_UID + '.1' if lateral plane photo
>Referenced Frame Number	0008,1160	3	Provides the number of frame of the originating Sequence from which the SC was generated.
Source Image Sequence	0008, 2112	3	used to reference the original acquisition
>Referenced SOP Class UID	0008, 1150	1C	1.2.840.10008.5.1.4.1.1.12.1
>Referenced SOP Instance UID	0008, 1155	1C	Restricted to 64 char. Series_UID + '.1' if frontal plane photo, Series_UID + '.2' if lateral plane photo
Image comments	0020, 4000	3	From user interface, restricted to 16 char.

4–4–5–2 Image Pixel

Attribute Name	Element Tag	TP	Notes
Samples per Pixel	0028, 0002	1	1
Photometric Interpretation	0028, 0004	1	MONOCHROME1 if reverse video, or MONOCHROME2 otherwise
Rows	0028, 0010	1	512 or 1024
Columns	0028, 0011	1	512 or 1024
Bits Allocated	0028, 0100	1	16
Bits Stored	0028, 0101	1	8
High Bit	0028, 0102	1	7
Pixel Representation	0028, 0103	1	0
Window Center	0028, 1050	1C	Value is 128 for SC images.
Window Width	0028, 1051	1C	Value is 256 for SC images.
Pixel Data	7FE0, 0010	1	

4–4–5–3 Overlay Plane Module

Attribute Name	Element Tag	TP	Notes
Rows	60nn, 0010	1	512 or 1024
Columns	60nn, 0011	1	512 or 1024
Overlay type	60nn, 0040	1	G
Origin	60nn, 0050	2	1,1
Bits Allocated	60nn, 0100	1	1
Bit Position	60nn, 0102	1	8..15
Gray Palette color lookup table descriptor	60nn, xx01	3	'**1,1,8**',to describe a lookup table of **1** entry, with the ovl value mapped on the **1rst** entry of the lookup table, and with lookup table data coded on **8** bits (0.255). For complete description, refer to Palette color lookup table descriptor of Image pixel module (tag 0028,1101)
Gray Palette color lookup table data	60nn, xx02	3	**0** for black overlay **255** for white overlay For complete description, refer to Palette color lookup table data of Image pixel module (tag 0028,1201)

4−4−5−4 SOP Common

Attribute Name	Element Tag	TP	Notes
SOP Class UID	0008, 0016	1	1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	0008, 0018	1	Restricted to 64 char. Series_UID + '.1' if frontal plane photo, Series_UID + '.2' if lateral plane photo
Specific Character Set	0008, 0005	1C	ISO−IR−100

4−5 PRIVATE DATA DICTIONARY FOR SECONDARY CAPTURE

Attribute Name	Data Elemenr Tag	VR	VM
Private Creator PATIENT_01	**0011,00xx**	**LO**	**1**
Patient DOB	0011, xx01	LT	1

Attribute name	Data Element Tag	Value
Private Creator PATIENT_01	0011,00xx	DLX_PATNT_01

SECTION 5 – BASIC WORKLIST MANAGEMENT IMPLEMENTATION

5–0 INTRODUCTION

This section specifies the use of the Basic Worklist Management Information Objects to transfer the Worklist from the Information System to the Application Entity where the task is performed.

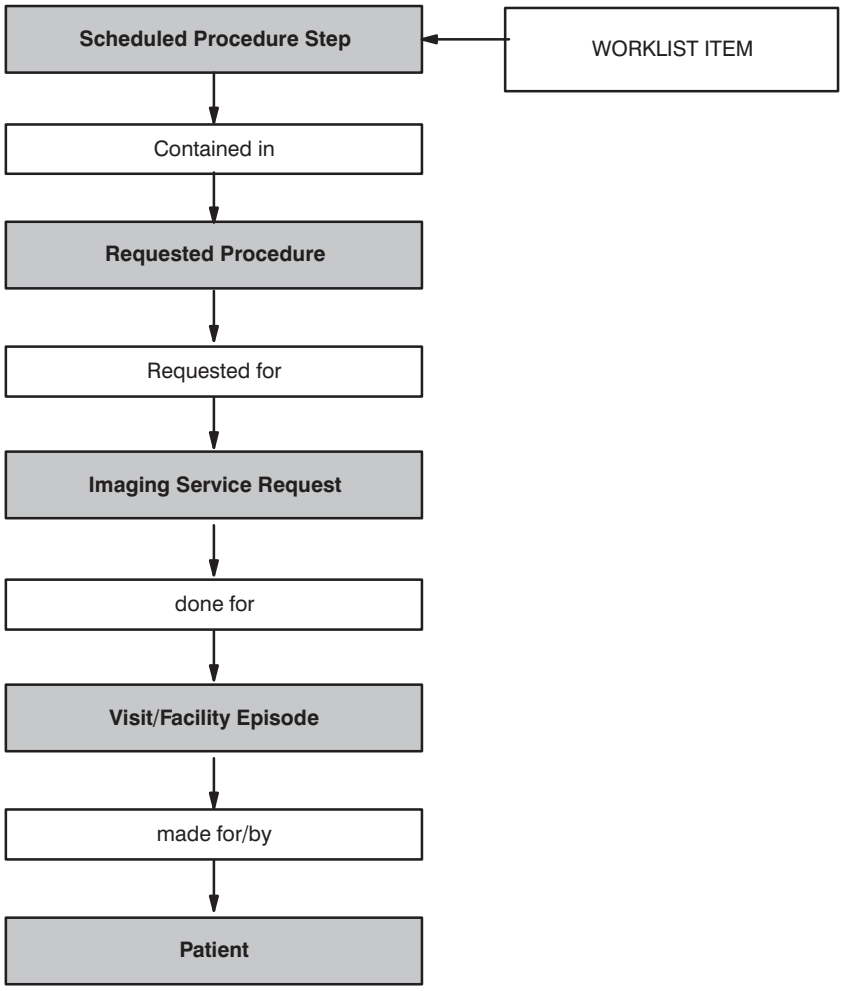
5–1 WORKLIST INFORMATION MODEL IMPLEMENTATION

This section defines the implementation of the Basic Worklist Information Object. It refers to the DICOM V3.0 Standard, Basic Worklist Management – Supplement 10 (August 11, 1995) to Part 3 (Information Object definition).

Note: Result of query – in compliance with the DICOM standard– depends on whether the WL SCP supports or not the optinal query fields (Access number, Procedure ID). If WL SCP doesn't support these fields, there turned worklist will not be filtered by these parameters.

5–2 WORKLIST INFORMATION MODEL ENTITY – RELATIONSHIP DIAGRAM

ILLUSTRATION 5–1



The Entity–Relationship diagram for the Basic Worklist Management interoperability schema is shown in Illustration 5–1. In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by the gray rectangular box.
- each relationship is represented by the white rectangular box.
- the fact that a relationship exists between the two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

5−2−1 Entities Description

Refer to DICOM Standard Supplement 10 (August 11, 1995) to Part 3 (Information Object Definitions) for a description of the entities contained within this Information object.

5−3 BASIC WORKLIST INFORMATION MODULE TABLE

Within an entity of the DICOM v3.0 Basic Worklist Information Object Definition, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into data sets.

Table 5–1 identifies the defined modules within the entities which comprise the DICOM v3.0 Basic Worklist Management Information Object. Modules are identified by Module Name.

See DICOM v3.0 Part 3 for a complete definition of the entities, modules and attributes.

TABLE 5–1
BASIC WORKLIST MANAGEMENT INFORMATION MODULE TABLE

IE	Module Name	Reference
Patient	Patient Identification Module	5−4−1−1
	Patient Demographic Module	5−4−1−2
	Patient Medical Module	5−4−1−3
Visit/Facility Episode	Visit Identification Module	5−4−2−1
	Visit Status Module	5−4−2−2
	Visit Relationship Module	5−4−2−3
Imaging Service Request	Imaging Service Request Module	5−4−3−1
Requested Procedure	Requested Procedure Module	5−4−4−1
Scheduled Procedure Step	Scheduled Procedure Step Module	5−4−5−1
	SOP Common Module	5−4−5−2

5−4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM v3.0 Standard Part 3 (Information Object Definition) and the supplements for a description of each of the entities and modules contained within the Basic Worklist Management Information Object.

Modules do not contain any **type 3 Private Elements**.

5−4−1 Patient Entity Module

5−4−1−1 Patient Identification Module

Attribute Name	Element Tag	Expected matching key type	Expected Returned key type	Mapped into the image	Notes
Patient's Name	0010, 0010	R	1	Yes	User entered value expanded by "*" mark at the end is sent Truncated to 20. A "^" character is added to separate last name and first name in database
Patient ID	0010, 0020	R	1	Yes	User entered value is sent Truncated to 18 characters.
Other Patient IDs	0010, 1000	O	3	No	Zero length sent.

5−4−1−2 Patient Demographic Module

Attribute Name	Element Tag	Expected matching key type	Expected Returned key type	Mapped into the image	Notes
Patient's Address	0010, 1040	O	3	Yes	Truncated to 252 characters. Each line is truncated to 30 characters. Add "||" after each line, then concatenate them in database.
Patients Telephone Numbers	0010, 2154	O	3	Yes	Truncated to 32 characters.
Patient's Birth Date	0010, 0030	O	2	Yes	Truncated to 24 characters.
Patient's Sex	0010, 0040	O	2	Yes	'0' if "M", '1' otherwise.
Patient's Size	0010, 1020	O	3	Yes	Truncated to 16 characters. Multiplied by 100. (Unit = cm)
Patient's Weight	0010, 1030	O	2	Yes	Truncated to 16 characters.
Ethnic Group	0010, 2160	O	3	No	Zero length sent
Patient Comments	0010, 4000	O	3	No	Zero length sent

5–4–1–3 Patient Medical Module

Attribute Name	Element Tag	Expected matching key type	Expected Returned key type	Mapped into the image	Notes
Additional Patient History	0010, 21B0	O	3	Yes	Truncated to 252 characters.
Medical Alerts	0010, 2000	O	2	No	Zero length sent
Pregnancy Status	0010, 21C0	O	2	No	Zero length sent

5–4–2 Visit/Facility Episode Entity Module

5–4–2–1 Visit Identification Module

Attribute Name	Element Tag	Expected matching key type	Expected Returned key type	Mapped into the image	Notes
Institution Name	0008, 0080	O	3	Yes	Truncated to 48 characters.
Admission ID	0038, 0010	O	2	No	

5–4–2–2 Visit Status Module

Attribute Name	Element Tag	Expected matching key type	Expected Returned key type	Mapped into the image	Notes
Current Patient Location	0038, 0300	O	2	No	Zero length sent

5–4–2–3 Visit Relationship Module

This Module is not sent as the necessary information is not available.

5−4−3 Imaging Service Request Entity Module

5−4−3−1 Imaging Service Request Module

Attribute Name	Element Tag	Expected matching key type	Expected Returned key type	Mapped into the image	Notes
Referring Physician's Name	0008, 0090	O	2	Yes	Truncated to 48 characters.
Accession Number	0008, 0050	O	1	Yes	User entered value is sent Truncated to 16 characters. '\' and control characters are replaced by space character.
Requesting Physician	0032, 1032	O	2	No	Zero length sent.
Requesting Service	0032, 1033	O	3	No	Zero length sent.
Imaging Service Request Comments	0040, 2400	O	1C	No	Zero length sent.

5−4−4 Requested Procedure Entity Module

5−4−4−1 Requested Procedure Module

Attribute Name	Element Tag	Expected matching key type	Expected Returned key type	Mapped into the image	Notes
Requested Procedure ID	0040, 1001	O	1	Yes	User entered value is sent Truncated to 64 characters. "0" if empty.
Study Instance UID	0020, 000D	O	1	Yes	Truncated to 62 characters. Affected by database if empty.
Requested Procedure Description	0032, 1060	O	1C	Yes	Truncated to 16 characters.
Requested Procedure Code Sequence	0032, 1064	O	1C	No	Explicit length of sequence sent.
>Code Value	0008, 0100	O	1C	No	Zero length sent.
>Code Scheme Designator	0008, 0102	O	1C	No	Zero length sent.
>Code Meaning	0008, 0104	O	3	No	Zero length sent.
Names of Intended Recipients of Results	0040, 1010	O	3	No	Zero length sent.
Requested Procedure Comments	0040, 1400	O	3	No	Zero length sent.

5−4−5 Scheduled Procedure Step Entity Module

5−4−5−1 Scheduled Procedure Step Module

Attribute Name	Element Tag	Expected matching key type	Expected Returned key type	Mapped into the image	Notes
Scheduled Procedure Step Sequence	0040, 0100	R	1	No	
>Scheduled Station AE title	0040, 0001	R	1	No	Zero length sent
>Scheduled Station Name	0040, 0010	O	2	No	Zero length sent
>Scheduled Procedure Step Start Date	0040, 0002	R	1	No	User entered value is sent
>Scheduled Procedure Step Start Time	0040, 0003	R	1	No	Zero length sent
>Scheduled Performing Physician's Name	0040, 0006	R	2	Yes	Truncated to 20 characters
>Scheduled Procedure Step ID	0040, 0009	O	1	No	
>Modality	0008, 0060	R	1	No	Modality value = "XA" (*)
>Scheduled Procedure Step Description	0040, 0007	O	1C	No	Zero length sent
>Scheduled Action Item Code Sequence	0040, 0008	O	1C	No	Explicit length of sequence sent.
>>Code Value	0008, 0100	O	1C	No	Zero length sent.
>>Code Scheme Designator	0008, 0102	O	1C	No	Zero length sent.
>>Code Meaning	0008, 0104	O	3	No	Zero length sent.
>Scheduled Procedure Step Location	0040, 0011	O	2	No	Zero length sent.

(*) This means that matching is requested upon the provided value.

5−4−5−2 SOP Common Module

Attribute Name	Element Tag	Expected matching key type	Expected Returned key type	Mapped into the image	Notes
Specific Character Set Start Date	0008, 0005	O	1C	Yes	"ISO_IR 100" value is sent

Note: Incoming worklist files MUST NOT contain study UID with a length over 62 characters.

SECTION 6 − MODALITY PERFORMED PROCEDURE STEP IMPLEMENTATION

6−0 INTRODUCTION

This section specifies the use of the DICOM v3.0 MPPS IOD to represent the information included in MPPS messages produced by this implementation. Corresponding attributes are conveyed using the module construct.

6−1 MPPS IOD IMPLEMENTATION

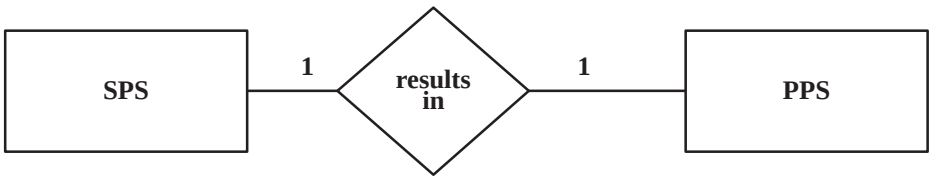
This section defines the implementation of MPPS information object. It refers to the DICOM V3.0 Standard, (1999) to Part 4, Annex F7 (MODALITY PERFORMED PROCEDURE STEP SOP CLASS).

6−2 MPPS IOD ENTITY – RELATIONSHIP DIAGRAM

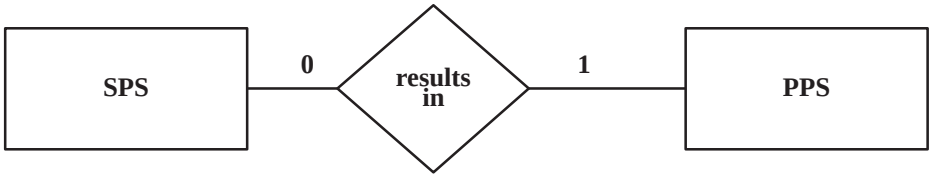
The dlx_root AE implements the following 3 cases:

ILLUSTRATION 6–1

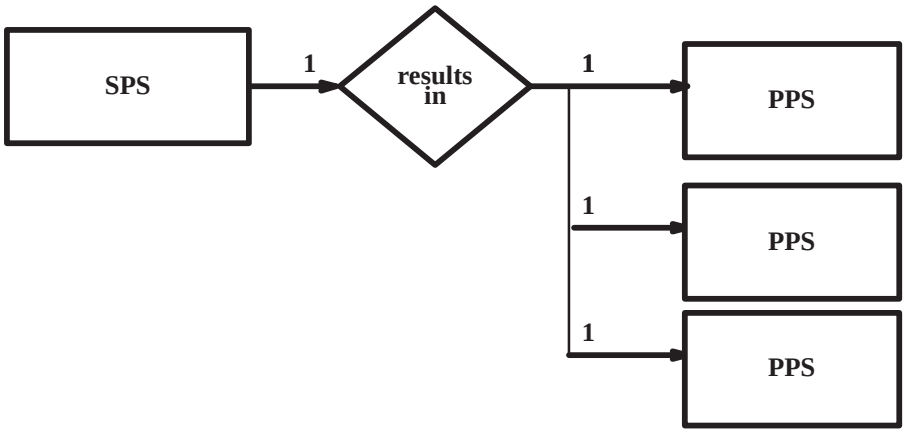
1. Simple Case



2. Unscheduled case



3. Append case



The Entity–Relationship diagram for the MPPS IOD schema is shown in Illustration 6–1. In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box.
- each relationship is represented by a diamond shaped box.
- the fact that a relationship exist between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are defined with the number of possible entities in the relationship shown, except that in Append case the number of resulted MPPS are not restricted. (However there are certain circumstances – e.g. in the case of a network problem, or SCP failure – when the number of MPPS is limited to 256.

6−2−1 Entities Description

Refer to DICOM Standard (1999) to Part 4, Annex F7 (MODALITY PERFORMED PROCEDURE STEP SOP CLASS) for a description of the entities contained within this Information object.

6−3 MPPS IOD MODULE TABLE

Within an entity of the DICOM v3.0 Modality Performed Procedure Step Information Object Definition, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 6–1 identifies the defined modules within the entities that comprise the DICOM v3. Modality Performed Procedure Step Information Object Definition. Modules are identified by Module Name.

See DICOM v3.0 Part 3 for a complete definition of the entities, modules, and attributes.

TABLE 6–1
MODALITY PERFORMED PROCEDURE STEP INFORMATION MODULE TABLE

Module Name	Reference
SOP Common	6−4−1
Performed Procedure Step Relationship	6−4−2
Performed Procedure Step Information	6−4−3
Image Acquisition Results	6−4−4
Radiation Dose	6−4−5
Billing and material management codes	6−4−6
Private Radiation Dose	6−4−7

6−4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM v3.0 Standard Part 3 (Information Object Definition) for a description of each of the entities and modules contained within the MPPS Information Object.

Modules contain also **type 3 Private elements**.

6–4–1 SOP Common

Attribute Name	Tag Value	Req. Type N–CREATE (SCU/SCP)	Req. Type N–SET (SCU/SCP)	Notes
Specific Character Set	(0008,0005)	1C/1C (Required if an extended or replacement character set is used)	Not allowed	"ISO_IR 100" value is sent in any case

6–4–2 Performed Procedure Step Relationship

Attribute Name	Tag Value	Req. Type N–CREATE (SCU/SCP)	Req. Type N–SET (SCU/SCP)	Notes
Scheduled Step Attribute Sequence	(0040,0270)	1/1	Not allowed	Contains only one sequence
>Study Instance UID	(0020,000D)	1/1	Not allowed	*
>Referenced Study Sequence	(0008,1110)	2/2	Not allowed	Contains one element or zero length in unscheduled case or if WL SCP doesn't support
>>Referenced SOP Class UID	(0008,1150)	1C/1 (Required if Sequence Item is present)	Not allowed	See above
>>Referenced SOP Instance UID	(0008,1155)	1C/1 (Required if Sequence Item is present)	Not allowed	See above
>Accession Number	(0008,0050)	2/2	Not allowed	*
>Requested Procedure ID	(0040,1001)	2/2	Not allowed	**
>Requested Procedure description	(0032,1060)	2/2	Not allowed	**
>Scheduled Procedure Step ID	(0040,0009)	2/2	Not allowed	*
>Scheduled Procedure Step Description	(0040,0007)	2/2	Not allowed	*
>Scheduled Action Item Code Sequence	(0040,0008)	2/2	Not allowed	*
>>Code Value	(0008,0100)	1C/1 (Required if Sequence Item is present)	Not allowed	*
>>Coding Scheme Designator	(0008,0102)	1C/1 (Required if Sequence Item is present)	Not allowed	*

Attribute Name	Tag Value	Req. Type N−CREATE (SCU/SCP)	Req. Type N−SET (SCU/SCP)	Notes
>> Code Meaning	(0008,0104)	3/3	Not allowed	*
Patient Name	(0010,0010)	2/2	Not allowed	Restricted to 48 char
Patient ID	(0010,0020)	2/2	Not allowed	**
Patient's Birth Date	(0010,0030)	2/2	Not allowed	**
Patient's Sex	(0010,0040)	2/2	Not allowed	**

* filled only if worklist SCP supported the values, zero length sent if type 2 and has no value

** WL supported value is sent back, data can be modified on DLX console

6−4−3 Performed Procedure Step Information

Attribute Name	Tag Value	Req. Type N−CREATE (SCU/SCP)	Req. Type N−SET (SCU/SCP)	Notes
Performed Procedure Step ID	(0040,0253)	1/1	Not allowed	Uniquely generated ID
Performed Station AE Title	(0040,0241)	1/1	Not allowed	Configured AE title retrieved
Performed Station Name	(0040,0242)	2/2	Not allowed	0 length data sent
Performed Location	(0040,0243)	2/2	Not allowed	0 length data sent
Performed Procedure Step Start date	(0040,0244)	1/1	Not allowed	System date of MPPS N−Create is sent
Performed Procedure Step Start time	(0040,0245)	1/1	Not allowed	System time of MPPS N−Create is sent
Performed Procedure Step Status	(0040,0252)	1/1	3/1	IN PROGRES, COMPLETED or DISCONTINUED is sent
Performed Procedure Step Description	(0040,0254)	2/2	3/1	Scheduled Procedure Step Description (0040,0007) is copied to here if recived from WL
Performed Procedure Type Description	(0040,0255)	2/2	3/2	0 length data sent
Procedure Code Sequence	(0008,1032)	2/2	3/2	0 length sent
Performed Procedure Step End Date	(0040,0250)	2/2	3/1	System date of MPPS N−Set – when (0040,0252) with COMPLETED − is sent
Performed Procedure Step End Time	(0040,0251)	2/2	3/1	System time of MPPS N−Set – when (0040,0252) with COMPLETED − is sent

6−4−4 Image Acquisition Results

Attribute Name	Tag Value	Req. Type N−CREATE (SCU/SCP)	Req. Type N−SET (SCU/SCP)	Notes
Modality	(0008,0060)	1/1	Not allowed	"XA"
Study ID	(0020,0010)	2/2	Not allowed	Requested Procedure ID (0040,1001)
Performed Action Item Code Sequence	(0040,0260)	2/2	3/2	Scheduled Action Item Code Sequence is mapped
>Code Value	(0008,0100)	1C/1 (Required if Sequence Item is present)	Not allowed	See above
>Coding Scheme Designator	(0008,0102)	1C/1 (Required if Sequence Item is present)	Not allowed	See above
>Code Meaning	(0008,0104)	3/3	Not allowed	See above
Performed Series Sequence	(0040,0340)	2/2	3/1	Sequence contains 1 element
>Performing Physician's Name	(0008,1050)	2C/2 (Required if Sequence Item is present)	2C/2 (Required if Sequence Item is present)	The contents of the Physician field of Exam Information Window shall be sent
>Protocol Name	(0018,1030)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)	Scheduled Procedure Step Description (0040,0007) is copied to here
>Operator's Name	(0008,1070)	2C/2 (Required if Sequence Item is present)	2C/2 (Required if Sequence Item is present)	The same as (0008,1050)
>Series Instance UID	(0020,000E)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)	Study Instance UID+".1" is sent
>Series Description	(0008,103E)	2C/2 (Required if Sequence Item is present)	2C/2 (Required if Sequence Item is present)	Scheduled Procedure Step Description (0040,0007) is copied to here
>Retrieve AE Title	(0008,0054)	2C/2 (Required if Sequence Item is present)	2C/2 (Required if Sequence Item is present)	0 length sent
>Referenced Image Sequence	(0008,1140)	2C/2 (Required if Sequence Item is present)	2C/2 (Required if Sequence Item is present)	Sequence shall contain as many items as many images were generated from Start Exam or Resume Exam. If none were generated this will have 0 length

Attribute Name	Tag Value	Req. Type N−CREATE (SCU/SCP)	Req. Type N−SET (SCU/SCP)	Notes
>>Referenced SOP Class UID	(0008,1150)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)	1.2.840.10008.5.1.4.1.1.12.1 or 1.2.840.10008.5.1.4.1.1.7 (run or photo)
>>Referenced SOP Instance UID	(0008,1155)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)	(0008,0018) tag of DICOM image sent
>Referenced Standalone SOP Instance Sequence	(0040,0220)	2C/2 (Required if Sequence Item is present)	2C/2 (Required if Sequence Item is present)	0 length sent

6−4−5 Radiation Dose

This Module is not sent, as the necessary information is not available.

6−4−6 Billing and material management codes

This Module is not sent, as the necessary information is not available.

6−4−7 Private Radiation Dose

Attribute Name	Tag Value	Req. Type N−CREATE (SCU/SCP)	Req. Type N−SET (SCU/SCP)	Notes (VR)
Private Creator Dose_01	(0027,00xx)	3	3	GEMS_DLX_DOSE_01
Private Radiation Dose Sequence	(0027,xx01)	3	3	* (SQ)
>Run Number	(0027,xx02)	Not present	3	1..N (IS)
>Run Time	(0027,xx03)	Not present	3	HHMMSS (TM)
>Number of Frames	(0027,xx04)	Not present	3	(IS)
>Frames per Second	(0027,xx05)	Not present	3	(DS)
>Plane	(0027,xx06)	Not present	3	FR, LT, BI (CS)
>KV	(0027,xx07)	Not present	3	(DS)
>MA	(0027,xx08)	Not present	3	(DS)
>Mas	(0027,xx09)	Not present	3	(DS)
>Ms	(0027,xx10)	Not present	3	(DS)
>Angulation	(0027,xx11)	Not present	3	(DS)
>Rotation	(0027,xx12)	Not present	3	(DS)
>Focal Distance	(0027,xx13)	Not present	3	(DS)
>Image Intensifier Mode	(0027,xx14)	Not present	3	(DS)

* Sequence contains as many elements as many images were created during exam (N), in N–Create zero length sent.

GE Medical Systems

GE Medical Systems: Telex 3797371
P.O. Box 414, Milwaukee, Wisconsin 53201 U.S.A.
(Asia, Pacific, Latin America, North America)

GE Medical Systems — Europe: Telex 698626
283, rue de la Miniére, B.P. 34, 78533 Buc Cedex
France