Technical Publications

Direction 2193691DNT
Revision 4

STENOSCOP 6000/9000 MDA and MDA Plus CONFORMANCE STATEMENT for DICOM V3.0

GE Medical Systems

REVISION HISTORY

REV	DATE	REASON FOR CHANGE
0	03/25/1997	First version
1	07/08/1997	Implementation STENOSCOP 6000/9000 MDA v5.01
2	17/12/1998	HII remarks
3	07/06/1999	Implementation STENOSCOP 6000/9000 MDA v7.09
4	25/08/1999	IIS Review remarks

LIST OF EFFECTIVE PAGES

SECTION	NUMBER	SECTION	NUMBER
Document Title and Header			

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1 INTRODUCTION

1.0 OVERVIEW

Section1, Introduction, provides general information about the content and scope of this document.

Section2, Conformance Statement, is the DICOM v3.0 Conformance Statement related to this product.Conformance Statement defines the subset of options selected from those offered by the DICOM v3.0 standard.

Section3, MDA 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 for X-Ray Angiographic Image Storage

Section4, MDA 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 for X-Ray Secondary Image Storage

Section5, MDA 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 for Basic GrayScale Print Management

Section6, MDA 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 for Basic Worklist Management

1.1 OVERALL CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the GEMS Conformance Statements and their relationship with the DICOM v3.0 Conformance Statements is shown in Illustration 0-1.

DOCUMENTATION STRUCTURE

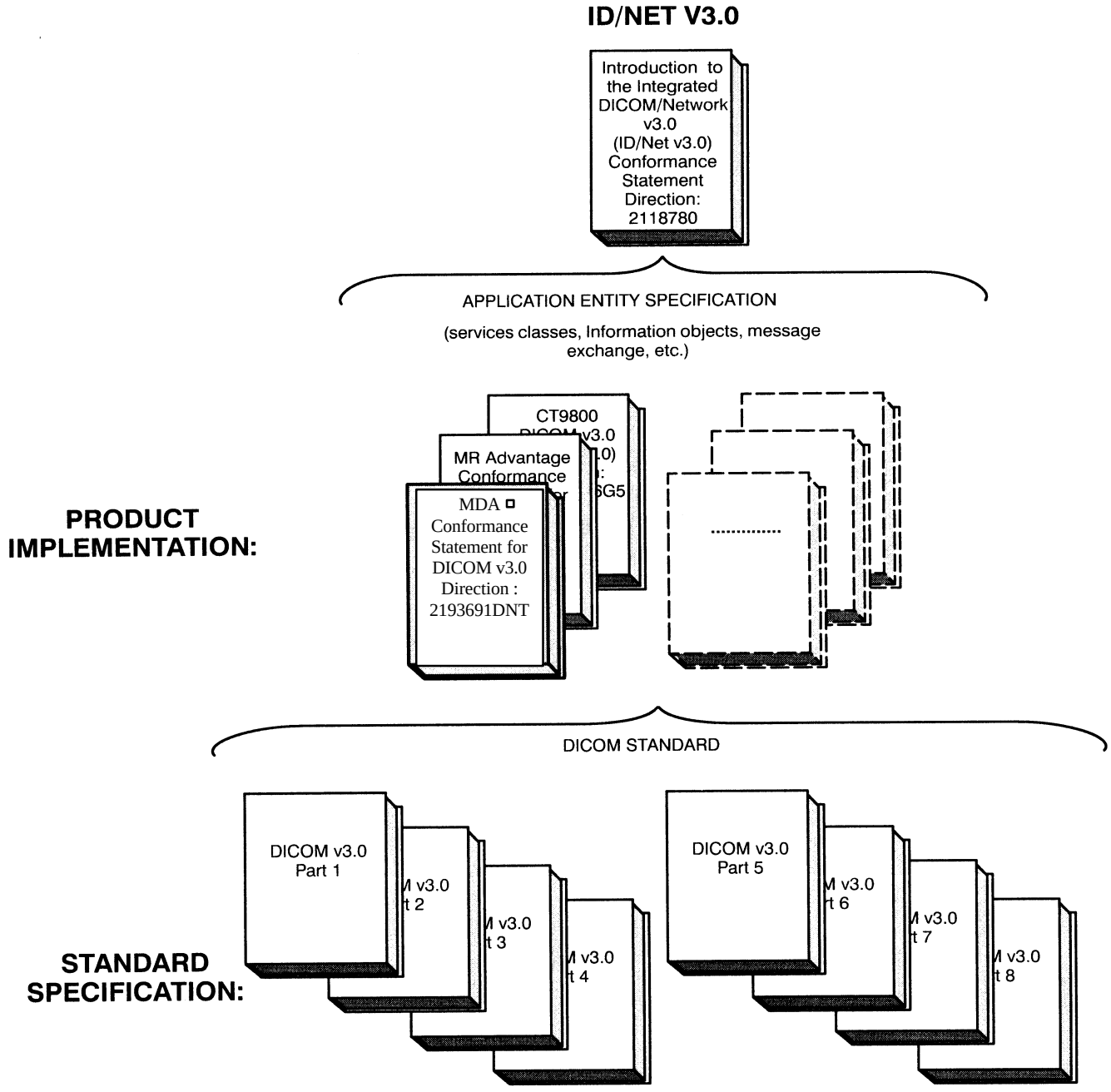


ILLUSTRATION 0-1

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

MDA
Conformance Statement for DICOM v3.0
Direction ***2193691DNT***

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

Introduction to the Integrated DICOM/Network 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 GEMS Conformance Statements.

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

ACR-NEMA/DICOM Representative
NEMA 1300N, 17th Street, Suite 1847
Rosslyn, VA 22209

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
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 Conformance Statement, Direction: 2118780*, to provide an unambiguous specification for GEMS 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 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 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.

- 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.

- 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)

1.5 REFERENCES

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

The information object implementation refers to :

- DICOM PS 3.3 (Information Object Definition).
- Basic Worklist Management Information Object Definition (supplement 10) Part 3
- X-Ray Angiographic Image Information Object Definition (supplement 6) Part 3

1.6 DEFINITIONS

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

1.7 SYMBOLS AND ABBREVIATIONS

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

2 CONFORMANCE STATEMENT

2.0 INTRODUCTION

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

The MDA is a system which acquires, digitalizes and stores X-Ray images coming from a video source. Some patient information are linked to images. In post processing mode, digitalized images can be visualized from the local data base, can be treated and annotated. The MDA provides a DICOM interface for the following services as a Service Class User (SCU): Storage Service Class, Basic Worklist Management Service Class, Print Management Service Class, Verification Service Class

This Conformance Statement (CS) specifies the equipment compliance to DICOM Network Conformance. Note that the format of this section strictly follows the format defined in DICOM Standard PS 3.2 (Conformance). Please refer to that part of the standard while reading this section.

2.1 IMPLEMENTATION MODEL

The MDA is a Application Entity (AE) which is :

a SCU which sends images and related patient information to a Storage SCP,

a SCU which sends images to a Generic Print Management SCP

a SCU which requests a worklist from a Basic Worklist Management SCP

a SCU which requests a connection verification to a Verification Service Class SCP

2.1.1 Application Data Flow Diagram

The Basic and Specific Application models for this device are shown in the following Illustration :

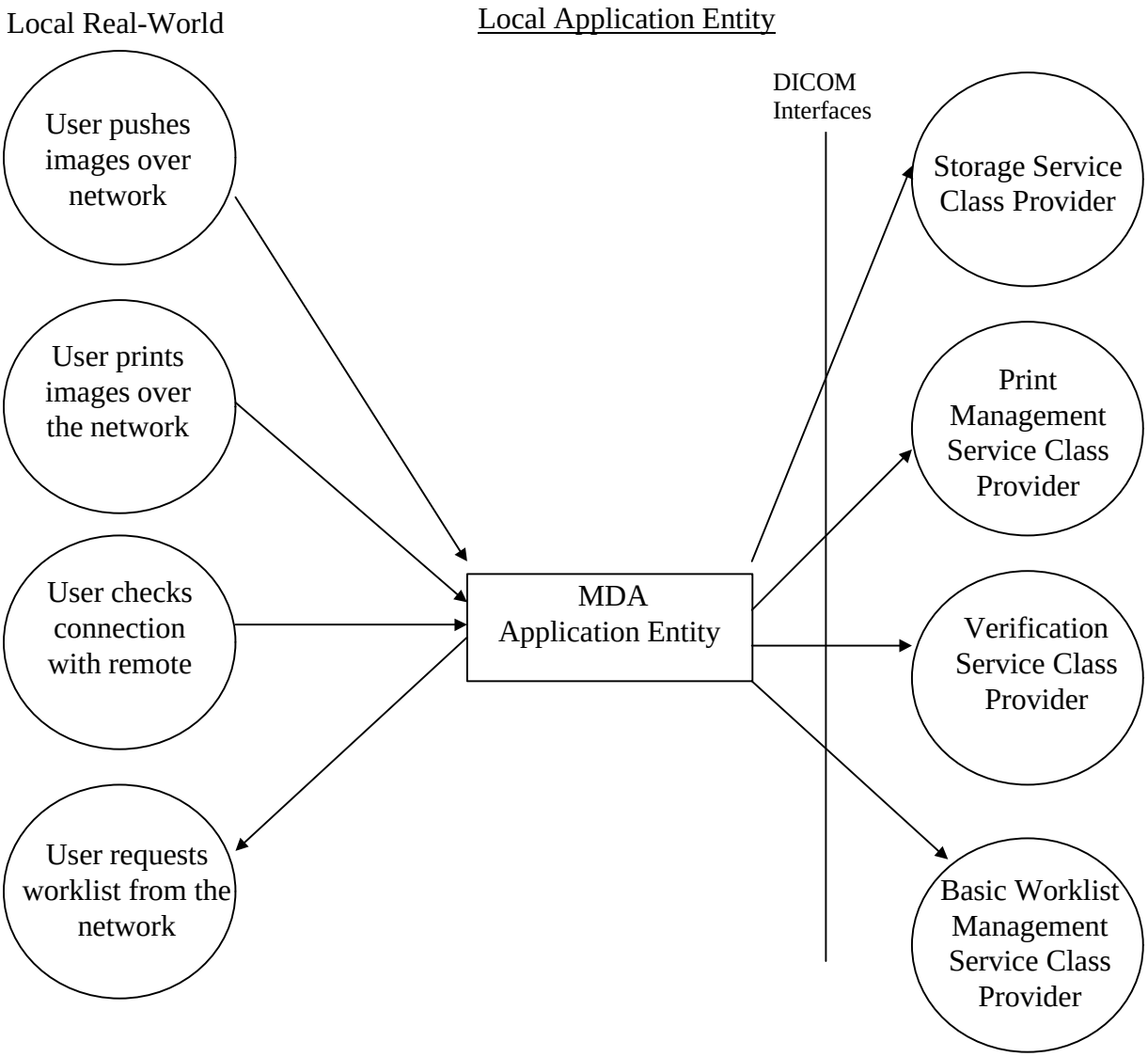


FIGURE 0-1 : APPLICATION DATA FLOW

2.1.2 Functional Definition of AE's

The MDA Application Entity allows to digitalize images issued by a video camera which are stored on a Hard Disk. Images can be treated during the acquisition stage or at the review stage. These treatments are saved. It is possible to the user to add comments on the image. The MDA Application Entity manages Patient information corresponding to those images.

Functionalities provided by the Storage SCU

- DICOM Association Management
- XA or SC Image transfer

Functionalities provided by the Basic Worklist Management SCU

- DICOM Association Management
- Worklist request
- Visualization of the returned worklist and new patient creation

Functionalities provided by Print Management SCU

- DICOM Association Management
- Grayscale Image transfer
- Printer notification

Functionalities provided by Verification SCU

- DICOM Association Management
- Verification request

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
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31
Basic Grayscale Print Managment Meta SOP • Basic Film Session SOP Class • Basic Film Box SOP Class • Basic Grayscale Image Box SOP Class • Printer SOP Class	1.2.840.10008.5.1.1.9 • 1.2.840.10008.5.1.1.1 • 1.2.840.10008.5.1.1.2 • 1.2.840.10008.5.1.1.4 • 1.2.840.10008.5.1.1.16
Verification SOP 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 MDA is size configurable from 1,024 bytes to a maximum of 31,000 bytes.

Maximum Length PDU	31,000 bytes

The SOP Class Extended Negotiation is not supported.

The maximum number of Presentation Context Items that will be proposed is 9 . The user information items sent by this product are :

- Maximum PDU Length
- Implementation UID
- Implementation Version

2.2.1.1.2 Number of Associations

The MDA supports only one association at a time

The MDA does not support multiple associations open simultaneously

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 DICOM v3.0 Implementation is:

MDA Implementation UID	1.2.840.113619.6.31

2.2.1.2 Association Initiation Policy

The MDA will initiate an association for the following real world activities

The user has put in a queue all images he wants to store. An association will be open to process the queue upon his action, sending images to a DICOM Storage SCP

Upon an user action, an image will be sent to a DICOM Print SCP

Upon an user action, a worklist request will be sent to a DICOM Worklist SCP

Upon an user action, a verification request will be sent to a DICOM Verification SCP

Association is kept open until the service is completed

2.2.1.2.1 Real-World Activity Storage

2.2.1.2.1.1 Associated Real-World Activity

The user selects an image of a study or a completed study in the browser menu to be sent to the remote system. Remote system's address is already predefined but the user can change it before starting the Storage Service.

XA Format is always the default format ; if the remote system doesn't support this format, then images will be sent in SC Format.

2.2.1.2.1.2 Proposed Presentation Context Table

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
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
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.1.2.1.2.1 SOP Specific Conformance Statement for all Storage SOP Classes

Following are the status codes that are more specifically processed when receiving it from a **Storage** SCP equipment :

Service	Status	Further Meaning	Application Behavior When receiving Status	Related Fields Processed if

Status	Codes		Codes	received
Refused	A7xx	Out of resources	Association will be terminated.The user will be notified with a general message of failure	(0000,0902)
Error	Cxxx	Cannot Understand	Association will be terminated.The user will be notified with a general message of failure	(0000,0901) (0000,0902)
	A9xx	Data Set does not match SOP Class	Association will be terminated.The user will be notified with a general message of failure	(0000,0901) (0000,0902)
Warning	B000	Coercion of Data Elements	no action	(0000,0901) (0000,0902)
	B007	Data Set does not match SOP Class	no action	(0000,0901) (0000,0902)
	B006	Elements Discarded	no action	(0000,0901) (0000,0902)
Success			Ready to perform another C-STORE request	None

2.2.1.2.1.2.2 SOP Specific Conformance Statement for Secondary Capture Image Storage SOP Class

None .

Note : No annotations (patient name ,..) are burned in the SC image .

2.2.1.2.1.2.3 SOP Specific Conformance Statement for X-Ray Angiographic Image StorageSOP Class

None .

2.2.1.2.2 Real-World Activity Worklist

2.2.1.2.2.1 Associated Real-World Activity

The user will issue a worklist request to retrieved information from a Basic Worklist management SCP. Remote system's address is already predefined but the user can change it when starting the Worklist Service.

2.2.1.2.2.2 Proposed Presentation Context Table

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.1.2.2.2.1 SOP Specific Conformance Statement for Basic Worklist Management SOP Class

The CFIND_CANCEL message is not implemented. If the user wants to cancel the request, the association will be then aborted .

Following are the status codes that are more specifically processed when receiving it from a Basic Worklist Management SCP equipment :

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Refused	A700	Out of resources	Association will be terminated.The user will be notified with a general message of failure	(0000,0902)
Failed	A900	Identifier Does match SOP class	Association will be terminated.The user will be notified with a general message of failure	(0000,0901) (0000,0902)
	Cxxx	Unable to process	Association will be terminated.The user will be notified with a general message of failure	(0000,0901) (0000,0902)
Pending	FF00	Matches are continuing .	If the time out is elapsed, the association will be terminated. The user will be notified with a general message of failure	Identifier
	FF01	Matches are continuing . Current Match is supplied and any optional keys were supported in the same manner as required keys	If the time out is elapsed, the association will be terminated. The user will be notified with a general message of failure	Identifier
Cancel	FE00	Matching terminated due to Cancel request	Association will be terminated.	None
Success	0000	Matching is complete	New worklist entry will be created on user selection	None

2.2.1.2.3 Real-World Activity Printing

2.2.1.2.3.1 Associated Real-World Activity

The user selects the image on the screen or from the film composer to print on the remote system. Remote system's address is already predefined but the user can change it when starting the Printing Service

2.2.1.2.3.2 Proposed Presentation Context Table

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Film Session	1.2.840.10008.5.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Film Box	1.2.840.10008.5.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Greyscale Image Box	1.2.840.10008.5.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Printer	1.2.840.10008.5.1.1.16	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.1.2.3.2.1 SOP Specific Conformance Statement for all Print SOP Classes

The MDA provides standard conformance to the DICOM Printing Service Classes by supporting a number of service classes described below

2.2.1.2.3.2.2 SOP Specific Conformance Statement for Basic Film Session SOP Class

Following are the status codes that are more specifically processed when receiving it from a Basic Print Management SCP equipment :

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Warning	B600	Memory allocation not supported	none
Success	0000	Film session successfully created	Continuing Printing process

2.2.1.2.3.2.3 SOP Specific Conformance Statement for Basic Film Box SOP Class

Following are the status codes that are more specifically processed when receiving it from a Basic Print Management SCP equipment :

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Warning	B603	Film Session SOP Instance hierarchy does not contain Image Box SOP Instance (empty page)	Association will be terminated. The user will be notified with a specifiy message
Success	0000	Film belonging to the film session are accepted for printing ; if supported, the Print Job instance is created	Continuing Printing process
Failure	C602	Unable to create Print Job SOP Instance ; print queue is full	Association will be terminated. The user will be notified with a specifiy message
	C604	Image position collision : multiple images assigned to single image position	Association will be terminated. The user will be notified with a specifiy message
	C603	Image size is larger than image box size (by using the specified magnification value)	Association will be terminated. The user will be notified with a specifiy message

2.2.1.2.3.2.4 SOP Specific Conformance Statement for Basic Greyscale Image Box SOP Class

Annotations will be burned into the printed image.

Following are the status codes that are more specifically processed when receiving it from a Basic Print Management SCP equipment :

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Failure	C605	Insufficient memory in printer to store the image	Association will be terminated. The user will be notified with a specifiy message

2.2.1.2.3.2.5 SOP Specific Conformance Statement for Printer SOP Class

The N-EVENT-REPORT is used to convey information about the printer to the SCU

Event Type	Event ID	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Normal	1		none	
Warning	2	Printer Status Info	The user will be notified with the content of the field (2110,0020) if received	(2110,0020)
Failure	3	Printer Status Info	Association will be terminated. The user will be notified with the contents of the field (2110,0020) if received	(2110,0020)

2.2.1.2.4 Real-World Activity Verification

2.2.1.2.4.1 Associated Real-World Activity

The user request a connection verification with a remote system. Remote system's address is already predefined but the user can change it when starting the Verification Service

2.2.1.2.4.2 Proposed 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	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.1.2.4.2.1 SOP Specific Conformance Statement for Verification SOP Class

None

2.3 COMMUNICATION PROFILES

2.3.1 Supported Communication Stacks (PS 3.8, PS 3.9)

DICOM Upper Layer is supported using TCP/IP

2.3.2 OSI Stack

Not Supported

2.3.3 TCP/IP Stack

The TCP/IP stack is inherited from a Windows NT Operating System

2.3.3.1 API

Not Applicable

2.3.3.2 Physical Media Support

Ethernet v2.0, IEEE 802.3 .

Fast Ethernet 10/100 Mbyte/s with RJ45 connection .

2.3.4 Point-to-Point Stack

A 50-pin ACR-NEMA connection is not supported by the MDA

2.4 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

2.4.1 Standard Extended /Specialized/Private SOPs

Not Applicable

2.5 CONFIGURATION

Application references four configuration files. The first , merge.ini is found through the MERGE_INI environment variable. There are as follow

Merge.ini: Specifies the other three configuration files and also contains message logging parameters

mergecom.pro : Specifies the run-time parameters for the application

mergecom.app : Defines service lists and applications on other network nodes to which connections are possible.

mergecom .srv : Service and sequence definitions

2.5.1 AE Title/Presentation Address Mapping

The Local AE Title is configurable. This must be done in Service Menu

2.5.2 Configurable Parameters

The following fields are configurable for this AE (local) : Local IP Address, Subnet mask , Gateway , PDU Length, Connection time out. Configuration must be in Service Menu

The following fields are configurable for every remote DICOM AE : Remote AE Title, Responding TCP/IP Port, Remote IP Address , Remote IP name .

Configuration files should NEVER be changed. Doing so could break DICOM conformance. Contact GEMS Field Service Engineer before changing fields

2.6 SUPPORT OF EXTENDED CHARACTER SETS

Extended character ISO IR 100 set are supported

3 X-RAY ANGIOGRAPHY IMAGE (XA) IOD

3.0 INTRODUCTION

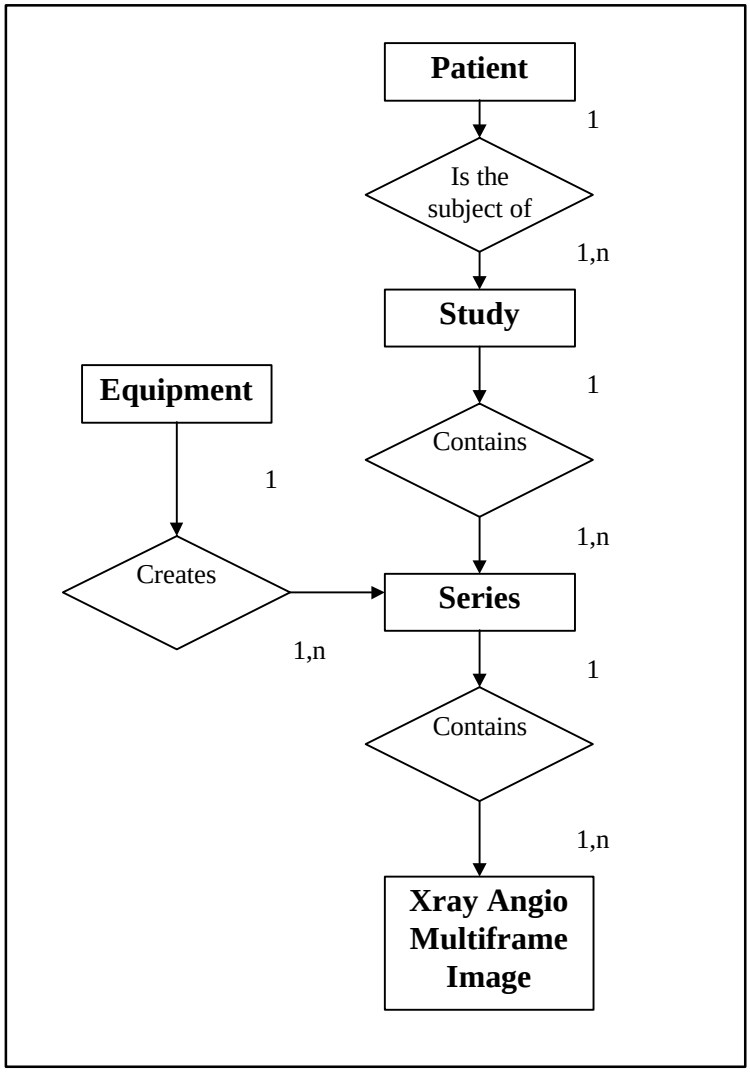
This section specifies the use of the DICOM v3.0 XRay Angiographic Image IOD to represent the information included in Xray Angiographics images produced by this implementation. Corresponding attributes are conveyed using the module construct.

3.1 XA IMAGE IOD IMPLEMENTATION

This section defines the implementation of XA image information object. It refers to the DICOM v3.0 standard, PS 3.3 - 1998

3.2 XA IMAGE IOD ENTITY- RELATIONSHIP MODEL

FIGURE 0-1: XRAY ANGIOGRAPHIC IMAGE ENTITY RELATIONSHIP DIAGRAM



3.2.1 Entities Description

Refer to DICOM standard PS 3.3 – 1998 for a description of the entities contained within this information object

3.2.2 MDA Mapping of DICOM Entities

DICOM entities map to the MDA entities in respect of the following :

DICOM	MDA
Patient Entity	Patient Entity
Study Entity	Study Entity
Serie Entity	No match, there is one to one relationship between DICOM Study and Serie
Multiframe Image Entity	Sequence Entity
Frame	Image

3.3 XA IMAGE IOD MODULE TABLE

The following modules are supported by the X-Ray Angiographic Image Storage.

Entity Name	Module Name	Usage
Patient	Patient	Mandatory
Study	General Study	Mandatory
Series	General Series	Mandatory
Equipment	General Equipment	Mandatory
Image	General Image	Mandatory
	Image Pixel	Mandatory
	Cine	Conditional
	MultiFrame	Conditional
	Mask	Conditional
	X-Ray Image	Mandatory
	X-Ray Acquisition	Mandatory
	XA Positioner	Mandatory
	Display Shutter	Optional
	SOP Common	Mandatory

3.4 INFORMATION MODULE DEFINITION

3.4.1 Module Patient

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Patient Name	(0010,0010)	2	Filled with the Patient name
Patient ID	(0010,0020)	2	Filled with the Patient ID
Patient Birth Date	(0010,0030)	2	Filled with the Patient Birth Date
Patient Sex	(0010,0040)	2	Filled with the Patient Sex
Patient Comments	(0010,4000)	3	

3.4.2 Module General Study

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Study Instance UID	(0020,000D)	1	
Study Date	(0008,0020)	2	Filled with the study date
Study Time	(0008,0030)	2	Filled with the study time
Study ID	(0020,0010)	2	Filled with a study ID
Accession Number	(0008,0050)	2	A RIS generated number which identifies the order for the Study. In case of no connection : no value, zero length
Study Description	(0008,1030)	3	

Note : Referring Physician's Name (0008, 0090) is not sent .

3.4.3 Module General Series

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Modality	(0008,0060)	1	Value = " XA "
Series Instance UID	(0020, 000E)	1	
Performing Physician's Name	(0008,1050)	3	

Series Number	(0020,0011)	2	Filled with the series number
Series Date	(0008,0021)	3	
Series Time	(0008,0031)	3	

3.4.4 Module General Equipment

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Manufacturer	(0008,0070)	2	Value = " GE MEDICAL SYSTEMS "
Manufacturer's Model Name	(0008,1090)	3	Value = " MDA"
Device Serial Number	(0018,1000)	3	
Software Versions	(0018,1020)	3	Filled with the software revision
Institution Name	(0080,0080)	3	
Station Name	(0008,1010)	3	Empty sent

3.4.5 Module General Image

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Image Number	(0020,0013)	2	Filled with the image number
Image Date	(0008,0023)	2C	Same as Acquisition Date
Image Time	(0008,0033)	2C	Same as Acquisition Time
Image Type	(0008,0008)	3	refer Module X-Ray Image
Acquisition Date	(0008,0022)	3	
Acquisition Time	(0008,0032)	3	
Lossy Image Compression	(0028,2110)	3	Value = NO , No lossy Compression

Note : Patient Orientation (0020,0020) is not sent .

3.4.6 Module Image Pixel

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes

Sample per Pixel	(0028,0002)	1	refer to Module X-Ray Image
Photometric Interpretation	(0028,0004)	1	refer to Module X-Ray Image
Rows	(0028,0010)	1	Value = 576
Columns	(0028,0011)	1	Value = 576
Bits Allocated	(0028,0100)	1	refer to Module X-Ray Image
Bits Stored	(0028,0101)	1	refer to Module X-Ray Image
High Bit	(0028,0102)	1	refer to Module X-Ray Image
Pixel Representation	(0028,0103)	1	refer to Module X-Ray Image
Pixel Data	(7FE0,0010)	1	A data stream of the pixel samples which comprise the Image

3.4.7 Module Cine

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Frame Time	(0018,1063)	1C	1000/Cine Rate (ms) .
Start Trim	(0008,2142)	3	Value = 1
Stop Trim	(0008,2143)	3	The frame number of the last frame of a multi-frame image to be displayed.
Cine Rate	(0018,0040)	3	Number of frames per second.
Effective Duration	(0018,0072)	3	Time (in sec) that data was actually taken for the entire multi-frame image.
Actual Frame Duration	(0018,1242)	3	Value = 40 ms.

3.4.8 Module Multi-Frame

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Number of Frame	(0028,0008)	1	Number of frame in a Multi-frame Image.
Frame Increment Pointer	(0028,0009)	1	Value = 00181063

3.4.9 Module Mask

The following attributes are supported by the MDA.

Only provided the mask is present

Attribute Name	Element Tag	Type	Notes

Mask Substraction Sequence	(0028,6100)	1	Defines a sequence which describe mask subtraction operations for a multi-frame image.
Mask Operation	(0028,6101)	1	Value = AVG_SUB
Mask Frame Numbers	(0028,6110)	1C	Specifies the frame numbers of the pixel data used to generate this mask.
Mask Sub-pixel Shift	(0028,6114)	3	A pair of floating point numbers specifying the fractional vertical and horizontal pixel shift applied to the mask before subtracting it from the contrast frame.
Recommended Viewing Mode	(0028,1090)	2	value = SUB

3.4.10 Module X-Ray Image

The following attributes are supported by the MDA.

Attribute Name	**Element Tag**	**Type**	**Notes**
Frame Increment Pointer	(0028,0009)	1C	Value = 00181063
Image Type	(0008,0008)	1	Value = " ORIGINAL\ PRIMARY\ SINGLE PLANE "
Pixel intensity Relationship	(0028,1040)	1	Value = LIN
Samples per Pixel	(0028,0002)	1	Value = 1
Photometric Interpretation	(0028,0004)	1	Value = " MONOCHROME2 "
Bits Allocated	(0028,0100)	1	Value = 8
Bits Stored	(0028,0101)	1	Value = 8
High Bit	(0028,0102)	1	Value = 7
Pixel Representation	(0028,0103)	1	Value = 0

3.4.11 Module X-Ray Acquisition

The following attributes are supported by the MDA.

Attribute Name	**Element Tag**	**Type**	**Notes**
KVP	(0018,0060)	2	No Value, zero length.
Radiation Setting	(0018,1155)	1	Identifies the general level of X-Ray dose exposure. Value = " SC "

Exposure Time	(0018,1150)	2	No Value, zero length.
X-Ray Tube Current	(0018,1151)	2	No Value, zero length.

3.4.12 Display Shutter Module

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Shutter Shape	(0018,1600)	1	Value = CIRCULAR
Center of Circular Shutter	(0018,1610)	1C	Value = 576/2 (rows),576/2(columns)
Radius of Circular Shutter	(0018,1612)	1C	Value = 576/2

3.4.13 Module XA Positioner

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Positioner Primary Angle	(0018,1510)	2	No Value, zero length.
Positioner Secondary Angle	(0018,1511)	2	No Value, zero length.
Positioner Motion	(0018,1500)	2	No Value, zero length. Not sent in case of mono-frame

3.4.14 Module VOI LUT

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Window Center	(0028,1050)	3	processed from contrast and brightness
Window Width	(0028,1051)	3	processed from contrast and brightness

3.4.15 Module SOP Common

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
SOP Class UID	(0008,0016)	1	1.2.840.10008.5.1.4.1.1.12.1
SOP Instance UID	(0008,0018)	1	

Note : Specific Character Set (0008,0005) is not sent .

4 SECONDARY CAPTURE (SC) IMPLEMENTATION

4.0 INTRODUCTION

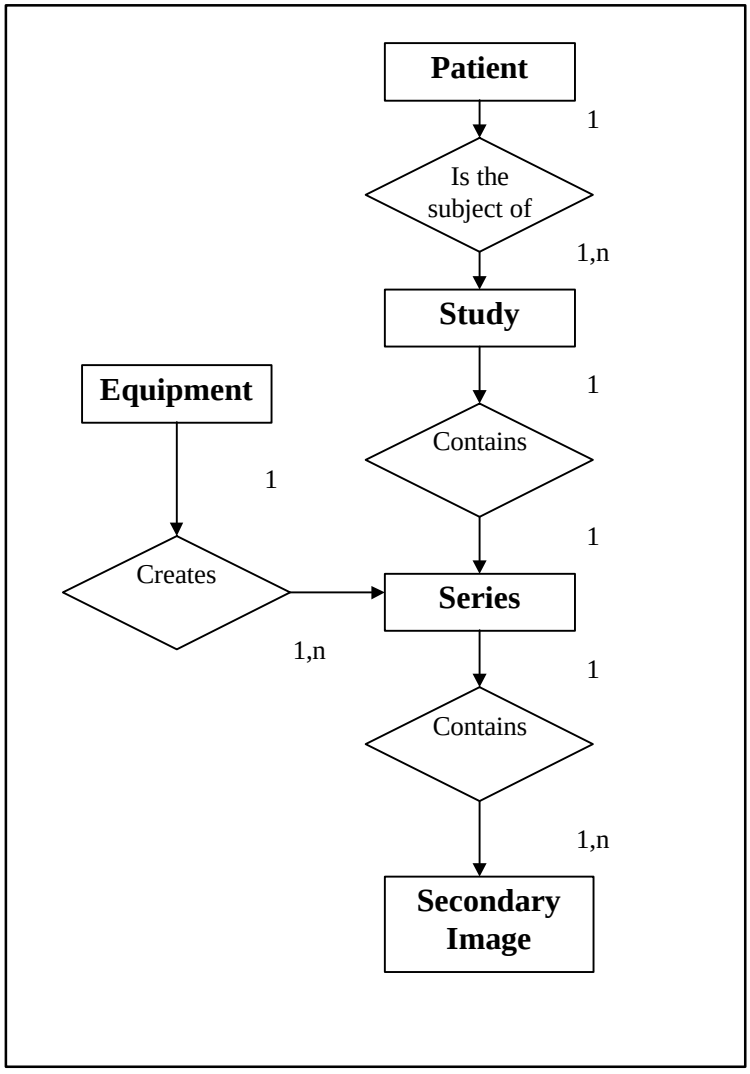
This section specifies the use of the DICOM v3.0 XRay Angiographic Image IOD to represent the information included in Secondary Capture images produced by this implementation. Corresponding attributes are conveyed using the module construct.

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

FIGURE 0-1: SC IMAGE ENTITY RELATIONSHIP DIAGRAM



4.2.1 Entities Description

Refer to DICOM standard PS 3.3 – 1998 for a description of the entities contained within this information object

4.2.2 MDA Mapping of DICOM Entities

DICOM entities map to the MDA entities in respect of the following :

DICOM	MDA
Patient Entity	Patient Entity
Study Entity	Study Entity
Serie Entity	No Match, there is one to one relationship between DICOM study and series
Secondary Image Entity	Sequence of **one** Image

4.3 SC IMAGE IOD MODULE TABLE

The following modules are supported by the Secondary Capture Image Storage.

Entity Name	**Module Name**	**Usage**
Patient	Patient	Mandatory
Study	General Study	Mandatory
Series	General Series	Mandatory
Equipment	General Equipment	Optional
	SC Equipment	Mandatory
Image	General Image	Mandatory
	Image Pixel	Mandatory
	SC Image	Mandatory
	SOP Common	Mandatory

4.3.1 Module Patient

The following attributes are supported by the MDA.

Attribute Name	**Element Tag**	**Type**	**Notes**
Patient Name	(0010,0010)	2	Filled with the Patient name
Patient ID	(0010,0020)	2	Filled with the Patient ID
Patient Birth Date	(0010,0030)	2	Filled with the Patient Birth Date

Patient Sex	(0010,0040)	2	Filled with the Patient Sex
Patient Comments	(0010,4000)	3	

4.3.2 Module General Study

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Study Instance UID	(0020,000D)	1	
Study Date	(0008,0020)	2	Filled with the study date
Study Time	(0008,0030)	2	Filled with the study time
Study ID	(0020,0010)	2	Filled with a study ID
Accession Number	(0008,0050)	2	A RIS generated number which identifies the order for the Study. In case of no connection : no values, zero length
Study Description	(0008,1030)	3	

4.3.3 Module General Series

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Modality	(0008,0060)	1	Value = “ XA ”
Series Instance UID	(0020, 000E)	1	
Performing Physician’s Name	(0008,1050)	3	
Series Number	(0020,0011)	2	Filled with the series number
Series Date	(0008,0021)	3	
Series Time	(0008,0031)	3	

4.3.4 Module General Equipment

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Manufacturer	(0008,0070)	2	Value = “ GE MEDICAL SYSTEMS”

Manufacturer's Model Name	(0008,1090)	3	Value = " MDA "
Device Serial Number	(0018,1000)	3	
Software Versions	(0018,1020)	3	Filled with the software revision
Institution Name	(0080,0080)	3	
Station Name	(0008,1010)	3	Empty sent

4.3.5 Module SC Equipment

The following attributes are supported by the MDA.

Attribute Name	**Element Tag**	**Type**	**Notes**
Conversion Type	(0008,0064)	1	Value = " DV " for Digitized Video

4.3.6 Module General Image

The following attributes are supported by the MDA.

Attribute Name	**Element Tag**	**Type**	**Notes**
Image Number	(0020,0013)	2	Filled with the image number
Image Date	(0008,0023)	2C	Same as Acquisition Date
Image Time	(0008,0033)	2C	Same as Acquisition Time
Image Type	(0008,0008)	3	Value = " ORIGINAL \ SECONDARY \ SINGLE_ PLANE "
Acquisition Date	(0008,0022)	3	
Acquisition Time	(0008,0032)	3	
Lossy Image Compression	(0028,2110)	3	Value = NO , No lossy Compression

Note : Patient Orientation (0020,0020) is not sent .

4.3.7 Module Image Pixel

The following attributes are supported by the MDA.

Attribute Name	**Element Tag**	**Type**	**Notes**
Sample per Pixel	(0028,0002)	1	Value = 1
Photometric Interpretation	(0028,0004)	1	Value = MONOCHROME2.

Rows	(0028,0010)	1	Value = 576
Columns	(0028,0011)	1	Value = 576
Bits Allocated	(0028,0100)	1	Value = 8
Bits Stored	(0028,0101)	1	Value = 8
High Bit	(0028,0102)	1	Value = 7
Pixel Representation	(0028,0103)	1	Value = 0
Pixel Data	(7FE0,0010)	1	A data stream of the pixel samples which comprise the Image

4.3.8 Module SC Image

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Date of Secondary Capture	(0018,1012)	3	The date the Secondary Capture Image was captured.
Time of Secondary Capture	(0018,1014)	3	The time the Secondary Capture Image was captured.

4.3.9 Module VOI LUT

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
Window Center	(0028,1050)	3	processed from contrast and brightness
Window Width	(0028,1051)	3	processed from contrast and brightness

4.3.10 Module SOP Common

The following attributes are supported by the MDA.

Attribute Name	Element Tag	Type	Notes
SOP Class UID	(0008,0016)	1	1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	(0008,0018)	1	will be changed each time the image is sent over the network

Note : Specific Character Set (0008,0005) is not sent .

5 BASIC GRAYSCALE PRINT MANAGEMENT

5.0 INTRODUCTION

This section specifies the use of the DICOM v3.0 Basic Grayscale Print Management Meta - SOP Class.

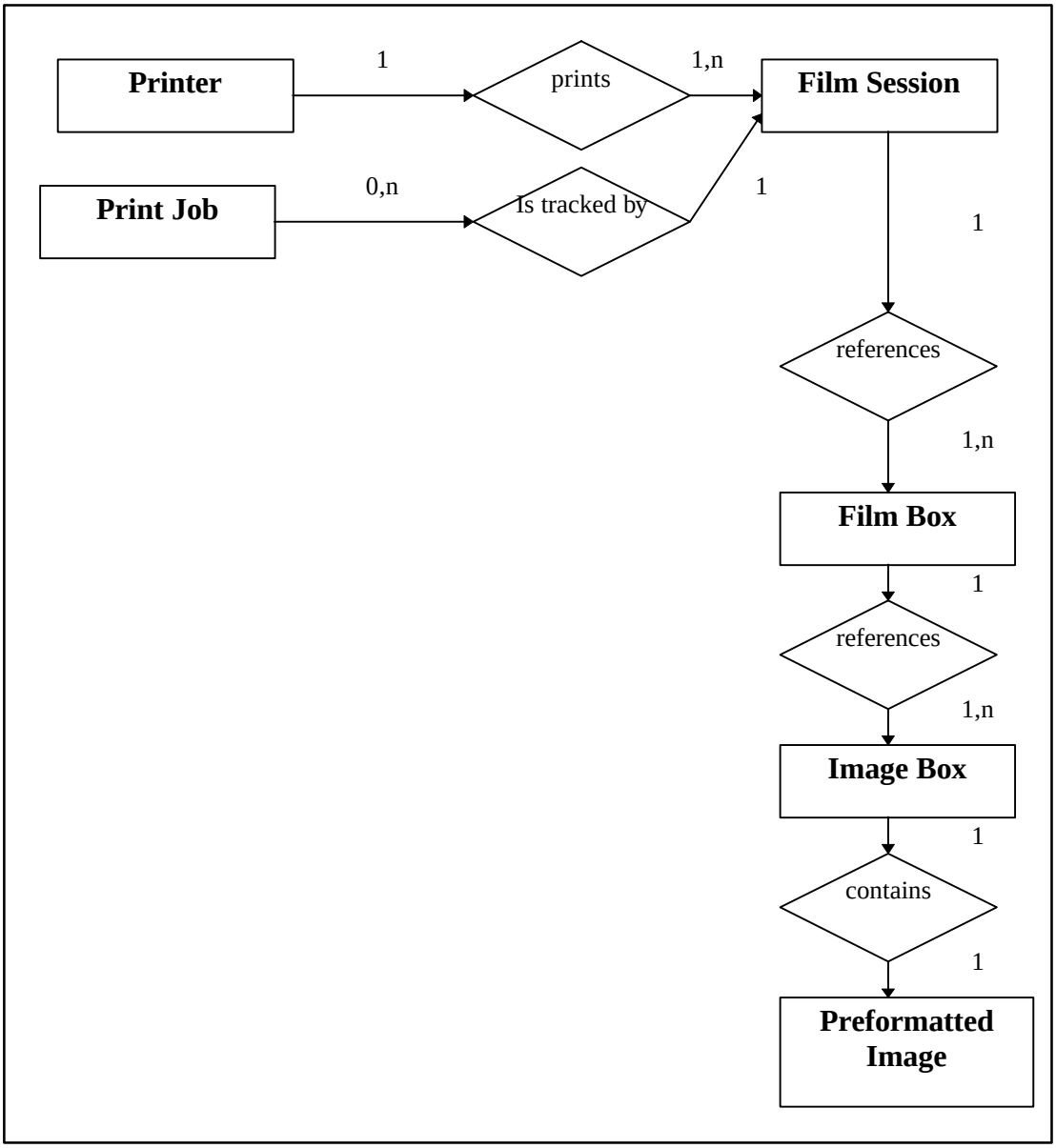
List of supported SOP Classes : Basic Film session, Basic Film Box, Basic Grayscale Image Box, Printer

5.1 PRINT INFORMATION MODEL IMPLEMENTATION

This section defines the implementation of Basic Grayscale Print Management information object. It refers to the DICOM v3.0 standard Part 3, 4 - Basic Grayscale Print Management

5.2 PRINT INFORMATIONRELATIONSHIP MODEL

FIGURE 0-1: BASIC GRAYSCALE PRINT MANAGEMENT ENTITY RELATIONSHIP DIAGRAM



5.2.1 Entities Description

Refer to DICOM standard Part 3 (Information Object Definition) for a description of the entities contained within this information object

5.3 DIMSE SERVICE USED

5.3.1 Basic Film Session SOP Class

DICOM Commands Sent	Attribute name	Element Tag	Notes
N-CREATE	Number of Copies	(2000,0010)	1

	Print Priority	(2000,0020)	MED
	Medium Type	(2000,0030)	on user selection
	Film Destination	(2000,0040)	PROCESSOR
	Film Session Label	(2000,0050)	" MDA DICOM PRINT "
	Memory Allocation	(2000,0060)	0
	Reference SOP Class UID	(0008,1150)	1.2.840.10008.5.1.1.1

Note : No other services (N_SET , N_DELETE , …) are implemented .

5.3.2 Basic Film Box SOP Class

DICOM Commands Sent	Attribute name	Element Tag	Notes
N-CREATE	Image Display Format	(2010,0010)	Value = STANDARD\C,R
	Reference Film Session Sequence	(2010,0500)	Value = 00081150 and 00081155
	>Reference SOP Class UID	(0008,1150)	1.2.840.10008.5.1.1.2
	>Reference SOP Instance UID	(0008,1155)	
	Film Orientation	(2010,0040)	PORTRAIT
	Film Size ID	(2010,0050)	One of the following Value : 8INX10IN 10INX12IN 24CMX24CM 10INX14IN 11INX14IN 24CMX30CM 14INX14IN 14INX17IN 10INX14IN
	Border Density	(2010,0100)	BLACK
	Empty Image Density	(2010,0110)	BLACK
	Trim	(2010,0140)	NO
	Configuration Information	(2010,0150)	" NOT SET " (not configurable) .
N-ACTION	None		

Note : No other services are implemented .

5.3.3 Basic Greyscale Image Box SOP Class

DICOM Commands Sent	Attribute name	Element Tag	Notes
N-SET	Image Position	(2020,0010)	
	Polarity	(2020,0020)	NORMAL
	Performatted Grayscale Image Sequence	(2020,0110)	
	>Samples Per Pixel	(0028,0002)	Value = 1
	>Photometric Interpretation	(0028,0004)	Value = “ MONOCHROME2 ”
	>Rows	(0028,0010)	value = 576
	>Columns	(0028,0011)	value = 576
	>Pixel Aspect Ratio	(0028,0034)	Not sent
	>Bits Allocated	(0028,0100)	value = 8
	>Bits Stored	(0028,0101)	value = 8
	>High Bit	(0028,0102)	value = 7
	>Pixel Representation	(0028,0103)	value = 0
	>Pixel Data	(7FE0,0010)	

No other services are implemented .

5.3.4 Printer SOP Class

When receiving the N-EVENT-REPORT from the SCP

DICOM Commands Received	Attribute name	Element Tag	Notes
N-EVENT-REPORT	Printer Status Info	(2110,0010)	Printer Status will be notified to the user

Note : No other services are implemented .

6 BASIC WORKLIST MANAGEMENT

6.0 INTRODUCTION

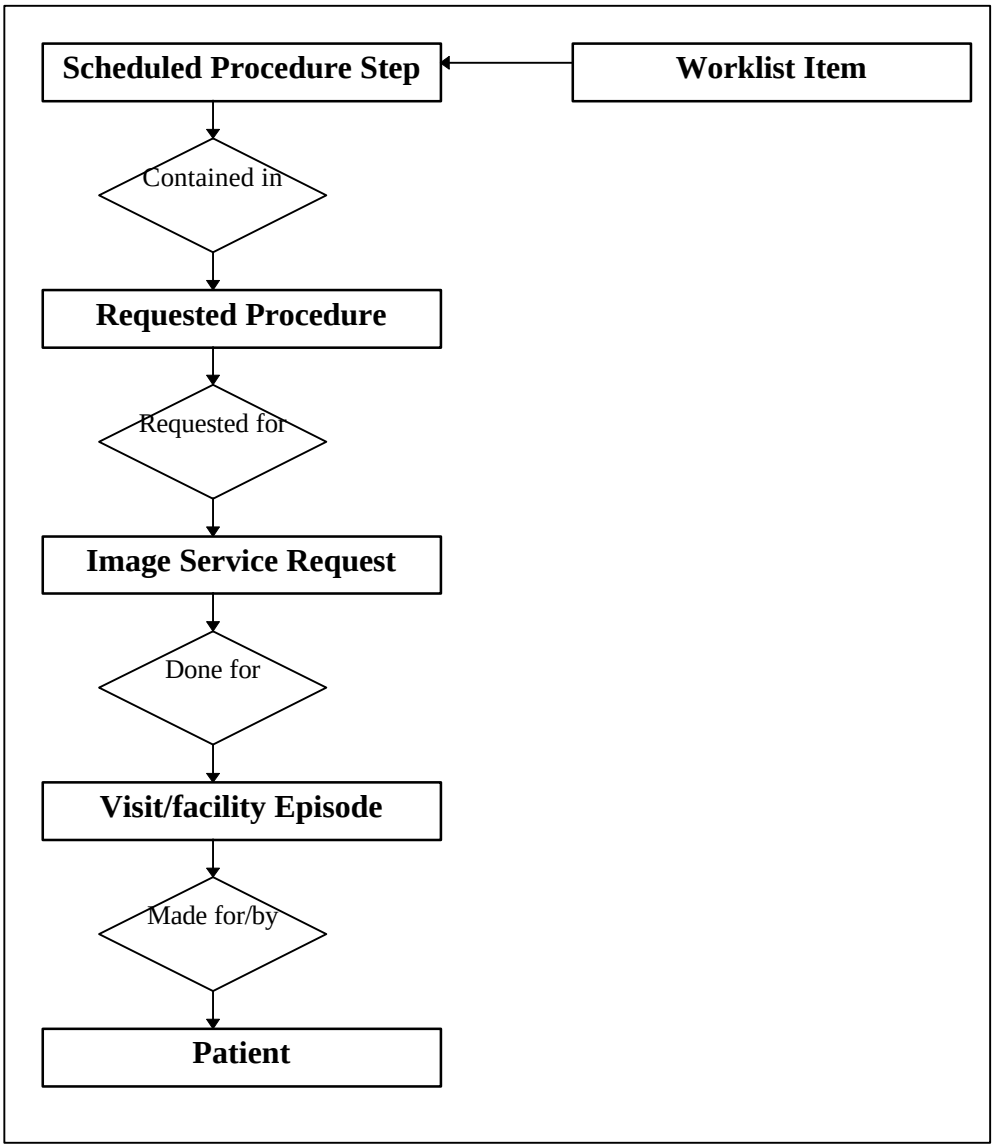
This section specifies the use of the DICOM v3.0 Basic Worklist Management Information Objects to transfer the Worklist form the Information System to the Application Entity where the task is performed..

6.1 WORKLIST INFORMATION MODEL IMPLEMENTATION

This section defines the implementation of Worklist information object. It refers to the DICOM v3.0 standard, Basic Worklist Management .

6.2 WORKLIST INFORMATIONRELATIONSHIP MODEL

FIGURE 0-1: WORKLIST ENTITY RELATIONSHIP DIAGRAM



6.2.1 Entities Description

Refer to DICOM standart for a description of the entities contained within this information object

6.3 BASIC WORKLIST MODULE TABLE

The following modules are supported by the MDA

Entity Name	Module Name
Patient	Patient Identification
	Patient Demographic
Visit/Facility Episode	Visit identification
Imaging Service Request	Imaging Service Request
Requested Procedure	Requested Procedure
Schedule Procedure Step	Scheduled Procedure Step
	SOP Common

6.3.1 Module Patient Identification

(*) Universal Matching

If the value specified for the attribute in a request is zero, then all entities shall match this attribute according to its response type (i.e Rp Type = 3 is optional)

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

Attribute Name	Element Tag	RpType	Notes	Browser Display	Notes
Patient's Name	(0010,0010)	1	No value, zero length (*)	Yes , in the Browser	Mapped into the image
Patient ID	(0010,0020)	1	No value, zero length (*)	Yes , in the Browser	Mapped into the image

6.3.2 Module Patient Demographic

Attribute Name	Element Tag	RpType	Notes	Browser Display	Notes
Patient's Address	(0010, 1040)	3	No value, zero length (*)	NO	
Patient's Telephone Numbers	(0010,2154)	3	No value, zero length (*)	NO	
Patient's Birth Date	(0010,0030)	2	No value, zero length (*)	Yes , in the Patient Data Sum up screen	Mapped into the image

Patient's Sex	(0010,0040)	2	No value, zero length (*)	Yes , in the Patient Data Sum up screen	Mapped into the image
Patient's Size	(0010,1020)	3	No value, zero length (*)	NO	
Patient's Weight	(0010,1030)	3	No value, zero length (*)	NO	

6.3.3 Module Patient Medical

Attribute Name	Element Tag	RpType	Notes	Browser Display	Notes
Addictional Patient History	(0010,21B0)	3	No value, zero length (*)	NO	

6.3.4 Module Visit Identification

Attribute Name	Element Tag	RpType	Notes	Browser Display	Notes
Institution Name	(0008, 0080)	3	No value, zero length (*)	NO	Mapped into the image
Admission ID	(0038,0010)	1	No value, zero length (*)	NO	

6.3.5 Module Imaging Service Request

Attribute Name	Element Tag	RpType	Notes	Browser Display	Notes
Referring Physician's Name	(0008, 0090)	2	No value, zero length (*)	NO	
Accession Number	(0008,0050)	1	No value, zero length (*)	Yes , in the Patient Data Sum up screen	Mapped into the image

6.3.6 Module Requested Procedure

Attribute Name	Element Tag	RpType	Notes	Browser Display	Notes
Requested Procedure ID	(0040,1001)	1	No value, zero length (*)	Yes , in the Patient Data Sum up screen	
Study Instance UID	(0020,000D)	1	No value, zero length (*)	NO	Mapped into the image
Requested Procedure Description	(0032,1060)	1C	No value, zero length (*)	Yes , in the Browser	Modified and Mapped in the image as Description

6.3.7 Module Schedule Procedure Step Module

Attribute Name	Element Tag	RpType	Notes	Browser Display	Notes
Scheduled Procedure Step Sequence	(0040,0100)	1	No value, zero length (*)	NO	
> Scheduled Station AE	(0040,0001)	1	No value, zero length (*)	NO	
> Scheduled Station Name	(0040,0010)	2	No value, zero length (*)	NO	
> Scheduled Procedure Step Start Date	(0040,0002)	1	Value = date of today (**)	Yes , in the Patient Data Sum up screen	
> Scheduled Procedure Step Start Time	(0040,0003)	1	No value, zero length (*)	NO	
> Scheduled Performing Physician's Name	(0040,0006)	2	No value, zero length (*)	Yes , in the Browser	Modified and Mapped in the image as Performing Physicians name
> Scheduled Procedure Step ID	(0040,0009)	1	No value, zero length (*)	NO	
> Modality	(0008,0060)	1	Value = " XA " (**)	NO	Mapped into the image

6.3.8 Module Schedule Procedure Step Module

Attribute Name	Element Tag	RpType	Notes	Browser Display	Notes
Specific Character Set	(0008,0005)	1C	Value = ISO_IR 100 (**)	NO	