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Revision 1

DICOM Conformance Statement M1000-DM V3.1

Revision History

Revision	Date	Reason for change	Pages
0		First release, based on R2 Conformance Statement M1000-DM V2.3 A (p/n 390-00-321).	
1	June 12, 2002	Updated to incorporate R2 Conformance Statement M1000-DM V3.1 B (p/n 390-00-337)..	14

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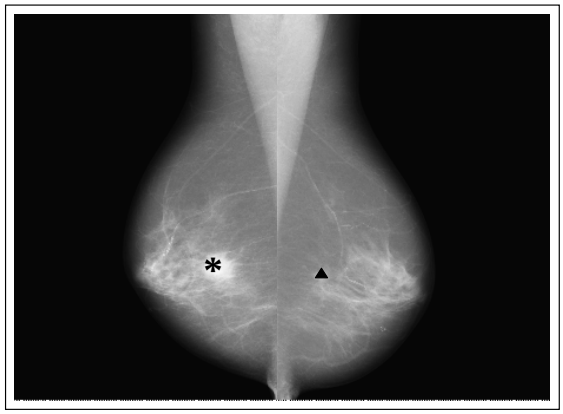
DICOM Conformance Statement M1000-DM, V3.1



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1. INTRODUCTION

The DICOM Conformance Statement for Digital Mammography Processing Unit (DMPU) describes the DICOM services that will be used or provided by the DMPU. This statement is intended as a reference for system integrators who wish to connect the DMPU to other DICOM systems.

WARNING The use of RTSS by this device does not conform to the DICOM standard, as the data in the RTSS object is not radiotherapy related. For this reason the output from this device must not be archived

1.1 DEFINITIONS

Acronym/Terms	Definitions
ACR-NEMA	American College of Radiology-National Electrical Manufacturers Association
AE	Application Entity
ANSI	American National Standards Institute
CAD	Computer-Aided Detection
DICOM	Digital Imaging and Communications in Medicine
DIMSE-C	DICOM Message Service Element-Composite
DIMSE-N	DICOM Message Service Element-Normalized
DMPU	The R2 Digital Mammo Processing Unit
MG for Presentation	Digital X-Ray Mammography image, sensor corrected and enhanced for display
MG for Processing	Digital X-Ray Mammography image, sensor corrected but not peripher-ally enhanced
NEMA	National Electrical Manufacturers Association
RTSS	Radiotherapy Structure Set
RWS	Review Workstation (GE's softcopy reading system)
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair

1.2 RELATED DOCUMENTS

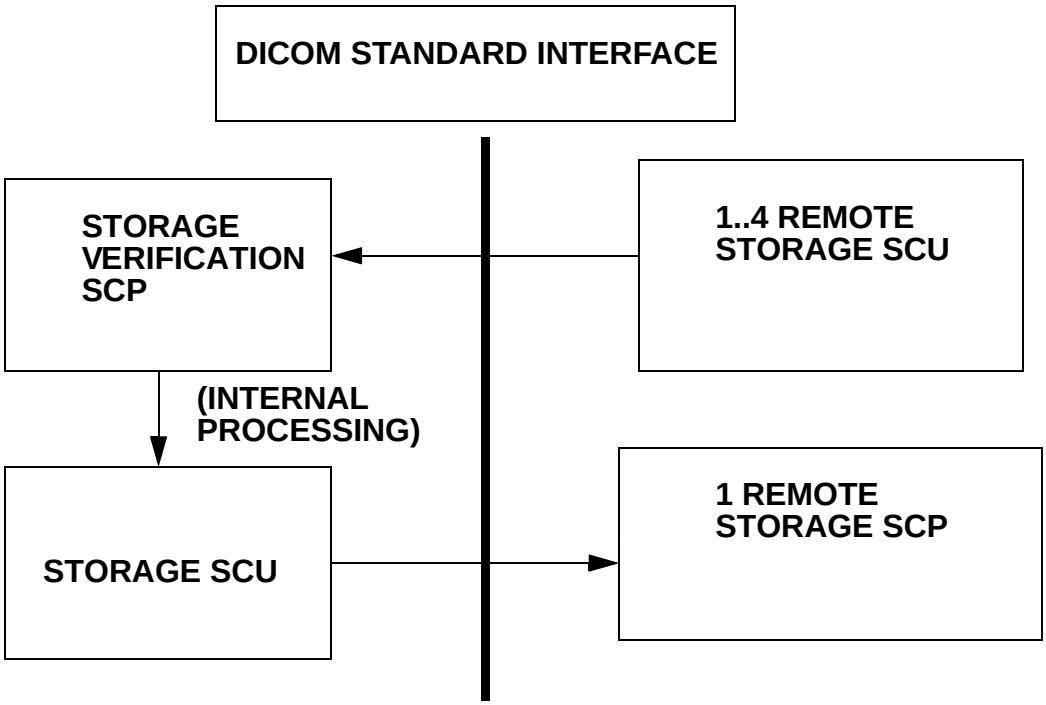
NEMA Standards Publication PS 3-1999, Digital Imaging and Communications in Medicine (DICOM)

2. NETWORK CONFORMANCE STATEMENT

2.1 IMPLEMENTATION MODEL

2.1.1 APPLICATION DATA FLOW DIAGRAM

The basic application models for this device are shown in the following illustration:



2.1.2 FUNCTIONAL DEFINITIONS:

The DMPU implements the following DICOM services with an SCP AE and an SCU AE:

Table 1: Services send/Received by DMPU

SOP Class Name	Role	Services to send	Services to receive
Digital Mammography Image Storage - For Processing	SCP	C-STORE Response	C-STORE Request
Digital Mammography Image Storage - For Presentation	SCP	C-STORE Response	C-STORE Request
RT Structure Set Storage	SCU	C-STORE Request	C-STORE Response

Table 1: Services send/Received by DMPU

SOP Class Name	Role	Services to send	Services to receive
Verification SOP Class	SCP	C-ECHO Response	C-ECHO Request

The SCP AE and the SCU AE are automatically brought up when the DMPU is powered on.

The SCP AE waits for association requests from Remote AE:

- Answer to DICOM associations transmitting DICOM Storage SOP classes to be processed by the DMPU.
- Answer to DICOM associations transmitting Verification SOP Class to the DMPU.

The SCU AE sends the processing results (RTSS objects) to Remote AEs for storage (display).

2.1.3 SEQUENCING OF REAL WORLD ACTIVITIES

1. User defines AEs that may send MG images to the DMPU through the Network Configuration tool accessible from the web.
2. User defines the AEs of the RWSs that will receive the processing results from the DMPU.
3. User sends MG for processing images to DMPU through DICOM push.
4. DMPU queues the images for processing.
5. When processing is finished, the processing result is sent to the preconfigured RWSs through DICOM push.

2.2 AE SPECIFICATIONS

2.2.1 SCP AE

The DMPU SCP provides standard conformance to the following DICOM V3.0 SOP classes

Table 2:

SOP Class Name	Role	UID
Digital Mammography Image Storage - For Processing	SCP	1.2.840.10008.5.1.4.1.1.1.2.1
Digital Mammography Image Storage - For Presentation	SCP	1.2.840.10008.5.1.4.1.1.1.2
Verification SOP Class	SCP	1.2.840.10008.1.1

2.2.1.1 ASSOCIATION ESTABLESHMENT POLICIES

2.2.1.1.1 NUMBER OF ASSOCIATIONS

The DMPU SCP AE can have a maximum of 4 open DICOM associations at a time to perform a DICOM store operation or respond to an echo.

2.2.1.1.2 ASYNCHRONOUS NATURE

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

2.2.1.1.3 IMPLEMENTATION IDENTIFICATION

The DMPU's Implementation Class UID is 1.2.840.113986.1 and the implementation version name is the software version number

2.2.1.1.4 REAL WORLD ACTIVITY "ACCEPT AN IMAGE FOR PROCESSING"

2.2.1.1.4.1 ASSOCIATED REAL-WORLD ACTIVITY

The DMPU SCP AE waits for any association. No operator action is required to receive and process an image.

2.2.1.1.4.2 ASSOCIATION ACCEPTANCE POLICY

When the DMPU SCP AE accepts an association, it will receive any images transmitted on that association, validate the images,store valid images on disk and queue them for processing. Association request for image storage will be accepted only from Remote AE's that are preconfigured on the DMPU.

2.2.1.1.4.3 ACCEPTED PRESENTATION CONTEXT TABLE

Abstract Syntax Name	Abstract Syntax UID	Transfer Syntax Name	Transfer Syntax UID	Role	Ext. Negot.
Digital Mammography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Digital Mammography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

2.2.1.1.4.4 SOP SPECIFIC CONFORMANCE FOR DIGITAL MAMMOGRAPHY IMAGE STORAGE - FOR PROCESSING

The DMPU SCP conforms to the SOP's of the Storage Service Class at Level 2 (Full) as described in Section B4.1 of PS3.4 of the DICOM Standard. The following status codes may be sent back to the Remote SCU after performing a Storage request:

Service Status	Status Code	Meaning	Status Code sending Explanation
Refused	A700	Out of Resources	indicates that there was not enough disk space or some other internal resources(such as memory) to store the image. The user should attempt recovery.
Refused	A900	Invalid Dataset	indicates dataset is inconsistent with the SOP class.
Error	0110	Processing Failure	indicates that an internal system call has failed while queuing the image.
Success	0000		indicates image has been stored successfully, and when the following criteria are met, also queued for processing.

In addition, the DMPU uses the following rules to determine if an image is analyzed. An image not analyzed is ignored, and the return status for the storage request is SUCCESS (0000).

- The images received are stored for DMPU's processing only. After DMPU processing is completed the images will be deleted.
- Only images with Detector ID (0018, 700A) matching the configured licensed devices are accepted and processed. Images not acquired on licensed devices are ignored.
- Only images with Series Date (0008, 0021) within the licensed acquisition time frame are accepted and processed.
- Only images with the following view names (0054, 0211) are accepted and processed: CC, FB, XCC, XCCL, XCCM, MLO, ML, LM, LMO, SIO.
- Only images with magnification factor (0018,1114) equal to 1.0 are accepted and processed.
- Only images with Imager Pixel Spacing (0018, 1164) of 90-110 microns on both horizontal and vertical sides are accepted and processed.
- Only images with Image Laterality (0020,0062) of "L" or "R" are accepted and processed.

2.2.1.1.4.5 DICOM CONFORMANCE STATEMENT FOR SOP CLASS OF DIGITAL MAMMOGRAPHY IMAGE STORAGE - FOR PRESENTATION

The DMPU Conforms to the SOP's of the Storage Service Class at Level 2(Full) as described in Section B4.1 of PS3.4 of the DICOM Standard Document. Instances of this SOP class are accepted, and a status of success is returned, but the images are discarded and not processed.

2.2.2 SCU AE

The DMPU SCU AE provides standard conformance to the following DICOM V3.0 SOP class.

Table 3:

SOP Class Name	Role	UID
RT Structure Set Storage	SCU	1.2.840.10008.1.4.1.1.481.3

2.2.2.1 ASSOCIATION ESTABLESHMENT POLICIES

2.2.2.1.1 GENERAL

The DICOM Application Context Name (ACN) is:

Table 4:

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 number of Presentation Context Items that will be proposed is 1.

2.2.2.1.2 NUMBER OF ASSOCIATIONS

The DMPU SCU AE initiates only one DICOM association at a time to perform a DICOM store operation as a SCU to a Remote Host AE.

2.2.2.1.3 ASYNCHRONOUS NATURE

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

2.2.2.1.4 IMPLEMENTATION IDENTIFICATION

The DMPU's Implementation Class UID is 1.2.840.113986.1 and the implementation version name is the software version number.

2.2.2.1.5 REAL-WORLD ACTIVITY "SENDING PROCESSING RESULTS TO REMOTE AE"

2.2.2.1.5.1 ASSOCIATED REAL-WORLD ACTIVITY

When the processing result from the CAD algorithm becomes available, the SCU AE will be activated

- To initiate a DICOM association, negotiate with thew Remote AE an appropriate Abstract and Transfer Syntax.
- To initiate a C-STORE command to send the RTSS object, if the negotiating is successful.

2.2.2.1.5.2 ASSOCIATION INITIATION POLICY

The SCU AE initiates a new association to push an RTSS object to a Remote DICOM AE.

2.2.2.1.5.3 PROPOSED PRESENTATION CONTEXT

The following presentation contexts are used by DMPU SCU AE to initiate an association.

Table 5:

Abstract Syntax Name	Abstract Syntax UID	Transfer Syntax Name	Transfer Syntax UID	Role	Ext. Negot
RT Structure Set Storage	1.2.840.10008 .5.1.4.1.1.481. 3	DICOM Implicit VR Lit- tle Endian	1.2.840.10008 .1.2	SCU	None

2.2.2.1.5.4 SOP SPECIFIC DICOM CONFORMANCE STATEMENT

The Radiotherapy Structure Set is not used for the purpose of Radiotherapy. The IOD description is private to R2 and GE.

3. COMMUNICATION PROFILES

3.0.1 SUPPORTED COMMUNICATION STACKS (PS3.8, PS3.9)

DICOM Upper Layer (PS3.8) is supported using TCP/IP.

3.0.2 OSI STACK

OSI stack not supported/

3.0.3 PHYSICAL MEDIA SUPPORT

Not Applicable

3.0.4 TCP/IP STACK

The TCP/IP stack is inherited from the LINUX Operating System.

3.0.5 API

Not Applicable.

3.0.6 PHYSICAL MEDIA

10/100BaseT ethernet with RJ45 connector.

4. CONFIGURATION

4.1 SYSTEM PARAMETERS

The following system parameters are pre-defined and not configurable:

4.1.1 STORAGE SCP:

- Application Title: DicomInbox
- port 1115

4.1.2 STORAGE SCU:

- Application Title: DicomOutbox

4.2 OTHER DEVICES

4.2.1 STORAGE SCU

The following parameters are configurable for each input device:

- Application Title
- Hostname
- IP address
- Processing result destination
- Priority

4.2.2 RTSS STORAGE SCP

- Application Title
- Hostname
- IP address

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