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GE Healthcare

Technical Publications

Direction 2011025-001
Revision C

Centricity CARDDAS Xi² DICOM Service V3.0 CONFORMANCE STATEMENT for DICOM

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1. INTRODUCTION

1.1 OVERVIEW

This DICOM Conformance Statement is divided into Sections as described below:

Section 1 (Introduction), which describes the overall structure, intent, and references for this Conformance Statement

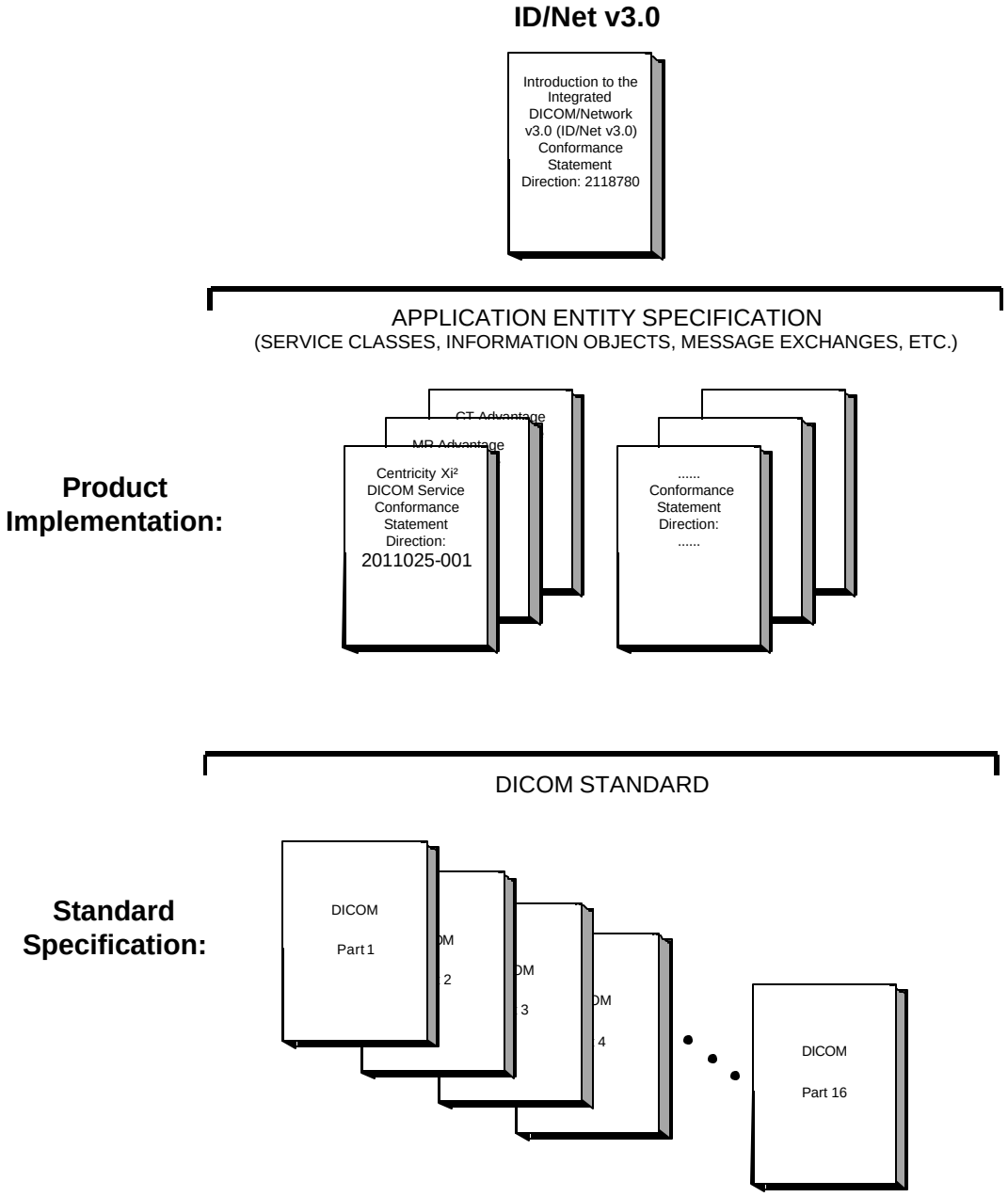
Section 2 (Network Conformance Statement), which specifies the GE Healthcare equipment compliance to the DICOM requirements for the implementation of Networking features.

Section 3 (Modality Worklist Information Model), which specifies the GE Healthcare equipment compliance to DICOM requirements for the implementation of the Modality Worklist Query/Retrieve service.

Section 4 (Modality Performed Procedure Step), which specifies the GE Healthcare equipment compliance to DICOM requirements for the implementation of a Modality Performed Procedure Step Service.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the GE Healthcare Conformance Statements and their relationship with the DICOM Conformance Statements is shown in the Illustration below.



This document specifies the DICOM implementation. It is entitled:

Centricity CARDDAS Xi² DICOM Service 3.0
Conformance Statement for DICOM
Direction 2011025-001

This DICOM Conformance Statement documents the DICOM Conformance Statement and Technical Specification required to interoperate with the GE Healthcare network interface. Introductory information, which is applicable to all GE Healthcare 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' GE Healthcare Conformance Statements.

The GE Healthcare 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 Part 8 standard.

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

For more information regarding DICOM, copies of the Standard may be obtained on the Internet at http://medical.nema.org . Comments on the standard may be addressed to:

DICOM Secretariat
NEMA
1300 N. 17th Street, Suite 1847
Rosslyn, VA 22209 USA

1.3 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 Standards and with the terminology and concepts which are used in those Standards.

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

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

1.4 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 GE Healthcare implementations. This specification, called a Conformance Statement, includes a DICOM Conformance Statement and is necessary to ensure proper processing and interpretation of GE Healthcare medical data exchanged using DICOM. The GE Healthcare Conformance Statements are available to the public.

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

Included in this DICOM Conformance Statement are the Module Definitions which define all data elements used by this GE Healthcare implementation. If the user encounters unspecified private data elements while parsing a GE Healthcare Data Set, the user is well advised to ignore those data elements (per the DICOM 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 re-transmit all of the private data elements which are sent by GE Healthcare devices.

1.5 IMPORTANT REMARKS

The use of these DICOM Conformance Statements, in conjunction with the DICOM 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), and of this introduction and associated DICOM 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 Standard. DICOM will incorporate new features and technologies and GE may follow the evolution of the Standard. The GE Healthcare protocol is based on DICOM as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these 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.

1.6 REFERENCES

A list of references which is applicable to all GE Healthcare 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 DICOM PS 3.3 (Information Object Definition).
DEFINITIONS

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

2. NETWORK CONFORMANCE STATEMENT

2.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the compliance to DICOM conformance requirements for the relevant **Networking** features on this GE Healthcare product. 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.

The Centricity CARDDAS Xi² DICOM Service 3.0 is a software solution to integrate DICOM-based medical devices into the Centricity CARDDAS Xi² CVIS cardiological department solution.

The Centricity CARDDAS Xi² DICOM Service is an open system, with all of its interfaces defined by international and industry standards. DICOM is the fundamental standard through which the Centricity CARDDAS Xi² DICOM Service communicates with other devices. DICOM protocols are used for sending demographic data to and receiving study data from the connected devices.

2.2 IMPLEMENTATION MODEL

2.2.1 Application Data Flow Diagram

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

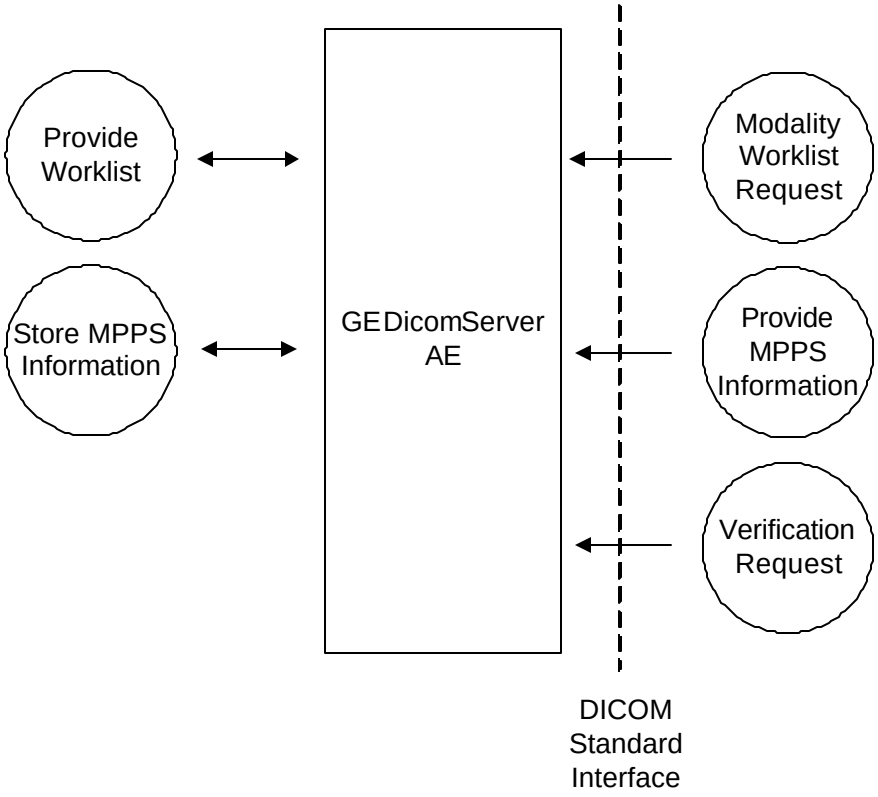


FIGURE 1 CENTRICITY CARDDAS XI² DICOM SERVICE 3.0 IMPLEMENTATION MODEL DATA FLOW DIAGRAM

The GEDicomServer Application Entity (AE) is an application, which handles DICOM protocol communication. GEDicomServer is part of the Centricity CARDDAS Xi² –System.

All remote DICOM AEs must be manually configured at the Centricity CARDDAS Xi² DICOM Service, usually during software installation, by a GE field engineer.

If any of the configured AE's asks for a worklist, the Centricity CARDDAS Xi² DICOM Service provides a list with all Scheduled Procedures. This list will be built up based on the query details of the MWL request.

For backwards compatibility, the DICOM worklist functionality for a certain AE may be limited, by configuration, as follows:

If any of the configured AE's asks for a worklist, the Centricity CARDDAS Xi² DICOM Service sends a list with the actually planned patient for this AE. At any time in the Centricity CARDDAS Xi² –System, there is only one or no patient scheduled for this AE. So, all query –input from an AE is ignored and only the AE Title counts. Every worklist includes a maximum of one patient/Requested Procedure.

If an AE has retrieved/selected a patient (Requested Procedure) from the worklist and after the examination was performed, the study data can be sent by the AE via MPPS to the Centricity CARDDAS Xi² DICOM Service. The data get stored in the Centricity CARDDAS Xi² database.

2.2.2 Functional Definition of AEs

The GEDicomServer Application Entity supports the following three SCP functions:

1. Send Worklist

   - Verify the configuration for the requesting AE in the internal database
   - Accept a DICOM association to receive a worklist response
   - Search for scheduled Examinations (Requests)
   - Build a DICOM formatted basic wo rklist management response
   - Send the response message to the remote AE

2. Store MPPS Information

   - Verify the configuration for the requesting AE in the internal database
   - Accept a DICOM MPPS N-CREATE message
   - Verify the StudyInstanceUID
   - Create a local database for the study data
   - Send the response – message to the AE
   - Accept multiple DICOM MPPS-N-SET commands
   - Verify the configuration for this AE
   - Verify the StudyInstanceUID
   - Check the MPPS –state
   - IF IN PROGRESS: Update the local database
   - IF COMPLETE: Move study to Centricity CARDDAS Xi² Database

3. Verification

   - Responds to incoming C-ECHO-RQ messages by returning a C ECHO-RSP message with a status of "SUCCESS"

2.2.3 Sequencing of Real-World Activities

Non Applicable.

2.3 AE SPECIFICATIONS

2.3.1 GEDicomServer AE Specification

This Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCP**:

SOP Class Name	SOP Class UID
Modality Worklist Information Model FIND	1.2.840.10008.5.1.4.31

Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3
Verification SOP Class	1.2.840.10008.1.1

2.3.1.1 Association Establishment Policies

2.3.1.1.1 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 GEDicomServer is:

Maximum Length PDU	**>16K**

The SOP Class Extended Negotiation is not supported.

The maximum number of Presentation Context Items that will b e proposed is 8

The user information Items sent by this product are:

- Maximum PDU Length
- Implementation UID
- Implementation Version Name

2.3.1.1.2 Number of Associations

The Centricity CARDDAS Xi² DICOM Service supports multiple associations as an SCP. By default, the maximum number of simultaneous associations is 24.

2.3.1.1.3 Asynchronous Nature

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

2.3.1.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

GEDicomServer Implementation UID	**1.2.840.113619.6.121**

The Implementation Version Name for this DICOM Implementation is:

GEDicomServer Implementation Version Name	MSPDICOM_V300

2.3.1.2 Association Initiation Policy

Not applicable

2.3.1.3 Association Acceptance Policy

2.3.1.3.1 Real-World Activity Modality Worklist Request

2.3.1.3.1.1 Associated Real-World Activity

The GEDicomServer Application Entity will accept an association from a remote Application Entity to query the GEDicomServer Application Entity for information about Scheduled Patients / Requested Procedures for the requesting Application Entity.

2.3.1.3.1.2 Accepted Presentation Context Table

Presentation Context Table - Accepted					
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 Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

2.3.1.3.1.2.1 SOP Specific DICOM Conformance Statement for Modality Worklist Information Model - FIND SOP Class

Following are the status codes the Application may send back to the SCU Equipment after performing the requested Worklist Query:

Service Status	Status Codes	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Failure	C001	Unable to process	Requesting AE not configured Database Error	None

			Cannot Build Response	
Success	0000	Matching is complete - No final identifier is supplied		None
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	None

2.3.1.3.1.3 Presentation Context Acceptance Criterion

There are no special criteria for accepting Query/Retrieve Presentation Contexts.

2.3.1.3.1.4 Transfer Syntax Selection Policies

Within each Presentation Context, the Centricity CARDDAS Xi² Dicom Service Application Entity will accept the first proposed transfer syntax that is supported.

2.3.1.3.2 Real-World Activity Modality Performed Procedure Step

2.3.1.3.2.1 Associated Real-World Activity

The GEDicomServer Application Entity will accept an association from a remote Application Entity (SCU) to create an instance of the Modality Performed Procedure Step SOP Class and to provide information about a specific real-world Performed Procedure Step that is under control of the SCU. For this purpose the N-CREATE and N-SET commands are used.

2.3.1.3.2.2 Accepted Presentation Context Table

Presentation Context Table – Accepted by GEDicomServer for Modality Performed Procedure Step					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

2.3.1.3.2.2.1 SOP Specific DICOM Conformance Statement for Modality Performed Procedure Step SOP Class

The AE includes attributes in the Modality Performed Procedure Step N-CREATE / N-SET as described in section 4.2.1.1. For details about Return States and command specific behavior refer to section 4.2.1.2.

SOP Class	SOP Class UID	DIMSE Service Element	SCP Usage
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	N-CREATE	Used (Mandatory)
		N-SET	Used (Mandatory)

2.3.1.3.2.3 Presentation Context Acceptance Criterion

There are no special criteria for accepting MPPS Presentation Contexts.

2.3.1.3.2.4 Transfer Syntax Selection Policies

Within each Presentation Context, the Centricity CARDDAS Xi² DICOM Service AE will accept the first proposed transfer syntax that is supported.

2.4 COMMUNICATION PROFILES

2.4.1 Supported Communication Stacks (PS 3.8, PS 3.9)

DICOM Upper Layer (PS 3.8) is supported using TCP/IP.

2.4.2 OSI Stack

OSI stack not supported

2.4.3 TCP/IP Stack

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

2.4.3.1 API

Not applicable to this product.

2.4.3.2 Physical Media Support

DICOM is indifferent to the Physical medium over which TCP/IP executes (e.g. Ethernet V2.0, IEEE 802.3, ATM, FDDI)

2.4.4 Point-to-Point Stack

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

2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

2.5.1 Standard Extended /Specialized/Private SOPs

2.5.1.1 Standard Extended/Specialized/Private MPPS SOP Class

Additional private Tags could be configured to be recognized by the Centricity CARDDAS Xi² Dicom Service.

2.6 CONFIGURATION

2.6.1 AE Title/Presentation Address Mapping

n.a

2.6.2 Configurable Parameters

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

- Local AE Title
- Local Listening Port Number

The following fields are configurable for every remote DICOM AE:

- Remote AE Title

The following fields are configurable:

- Maximum Length PDU
- Number of simultaneous associations
- Additional private tags in the MPPS SOP-Class

Note: A GE Field Engineer must perform all configurations.

2.7 SUPPORT OF EXTENDED CHARACTER SETS

The Centricity CARDDAS Xi² DICOM Service supports the ISO_IR 100 (ISO 8859-1:1987 Latin alphabet N 1. supplementary set) and the ISO_IR 192 (ISO 10646-1, 10646-2, and their associated supplements and extensions for Unicode character set[*]) as extended character sets. Any incoming SOP instance that is encoded using another extended character set will be stored in the local database but data may be unreadable because of the foreign character set.

2.8 CODES AND CONTROLLED TERMINOLOGY

2.8.1 Configurable Coded Terminology

The product allows configuration of the following sets of coded terminology:

Context Group	Default Value Set	Use
Acquisition Protocol Equipment Settings	None	Value of Scheduled Protocol Code Sequence (0040,0008) from selected Modality Worklist Scheduled Procedure Step is matched to this group for protocol-assisted equipment set-up. Selected value from this group is used in Modality Performed Procedure Step Performed Protocol Code Sequence (0040,0260)
Discontinuation Reason Codes	CID 9300	Selected value from this group is used in Modality Performed Procedure Step Performed Procedure Step Discontinuation

[*] Refer to: CP-252; DICOM Correction Proposal Form; Define support for Unicode and Chinese Character sets; 26-Mar-2003.

		Reason Code Sequence (0040,0281)

Procedures for configuring these Context Groups are found in the product Service Manual.

2.9 SECURITY PROFILES

The product does not conform to any defined DICOM Security Profiles.

It is assumed that the product is used within a secured environment. It is assumed that a secured environment includes at a minimum:

1. Firewall or router protections to ensure that only approved external hosts have network access to the product.
2. Firewall or router protections to ensure that the product only has network access to approved external hosts and services.
3. Any communications with external hosts and services outside the locally secured environment use appropriate secure network channels (such as a Virtual Private Network (VPN)).

3. MODALITY WORKLIST INFORMATION MODEL DEFINITION

3.1 INTRODUCTION

This section specifies the use of the DICOM Modality Worklist Information Model used to organize data and against which a Modality Worklist Query will be performed. The contents of this section are:

3.2 - Information Model Description

3.3 - Information Model Entity-Relationship Model

3.4 - Information Model Module Table

3.5- Information Model Keys

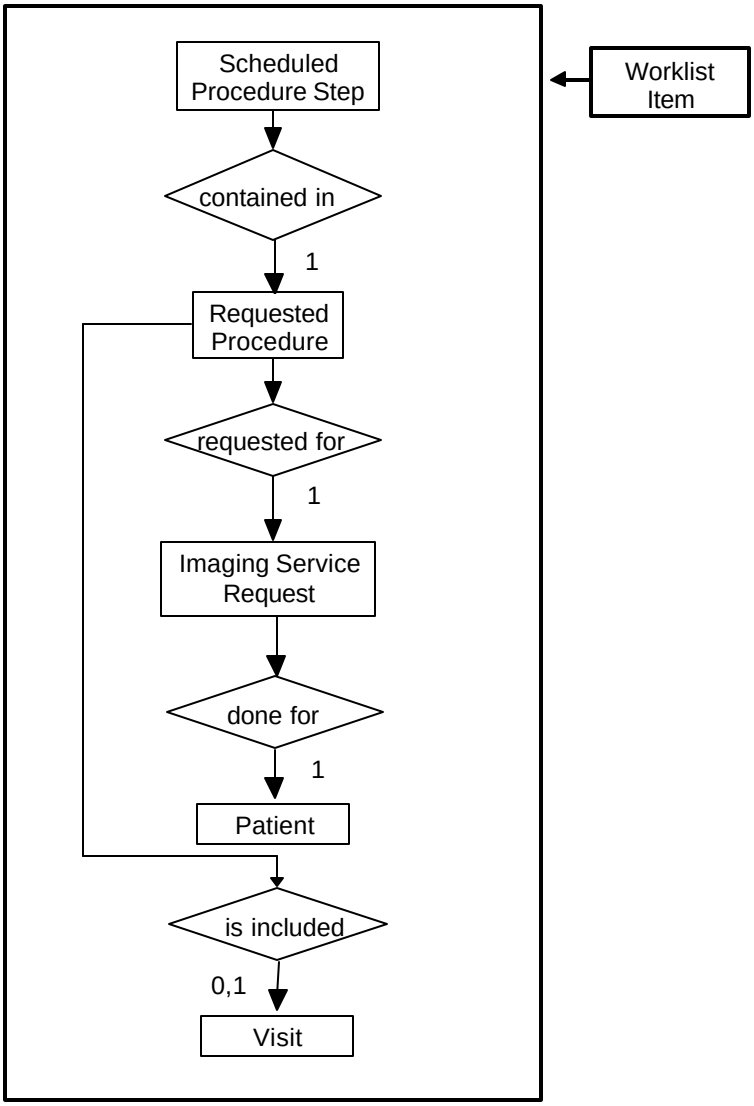
3.2 MODALITY WORKLIST INFORMATION MODEL DESCRIPTION

3.3 MODALITY WORKLIST INFORMATION MODEL ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Modality Worklist Information Model schema is shown in Illustration 3.3-1. It represents the information that composes a Worklist Item. 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 exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

ILLUSTRATION 3.3-1
MODALITY WORKLIST INFORMATION MODEL E/R DIAGRAM



3.3.1 ENTITY DESCRIPTIONS

Please refer to DICOM Standard PS 3.3. (Information Object Definitions) and PS 3.4 (Service Class Specifications) for a description of each of the Entities contained within the Modality Worklist Information Model.

3.3.2 Centricity CARDDAS Xi² DICOM Service Mapping of DICOM entities

TABLE 3.3-1
MAPPING OF DICOM ENTITIES TO CENTRICITY CARDDAS XI² DICOM SERVICE ENTITIES

DICOM	Centricity CARDDAS Xi² DICOM Service Entity
Scheduled Procedure Step	Examination
Requested Procedure	Examination
Imaging Service Request	Examination
Visit	Admission

Patient	Patient

3.4 INFORMATION MODEL MODULE TABLE

Within an entity of the DICOM Modality Worklist Information Model, 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 3.4-1 identifies the defined modules within the entities, which comprise the DICOM Modality Worklist Information Model. Modules are identified by Module Name.

See DICOM PS 3.3 and PS 3.4 for a complete definition of the entities, modules, and attributes.

TABLE 3.4-1
MODALITY WORKLIST INFORMATION MODEL MODULES

Entity Name	Module Name	Reference
Scheduled Procedure Step	SOP Common	3.5.2.1
	Scheduled Procedure Step	3.5.2.2
Requested Procedure	Requested Procedure	3.5.3.1
Imaging Service Request	Imaging Service Request	3.5.4.1
Visit	Visit Identification	3.5.5.1
	Visit Status	3.5.5.2
	Visit Relationship	3.5.5.3
Patient	Patient Identification	3.5.6.1
	Patient Demographic	3.5.6.2
	Patient Medical	3.5.6.3

3.5 INFORMATION MODEL KEYS

The following Module descriptions are included to specify what data elements are supported and what type of matching can be applied. It should be noted that they are the same ones as defined in the DICOM Standard PS 3.4 (Service Class Specifications).

3.5.1 Supported Matching

Following matching types are supported according to the Attribute description in the tables below:

- Single Value Matching
- Wild Card Matching (* and ?)
- Range Matching

3.5.2 Scheduled Procedure Step Entity

3.5.2.1 SOP Common Module

TABLE 0-1
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Specific Character Set	(0008,0005)	-	1C	Supported: "ISO_IR 100" and "ISO_IR 192"

3.5.2.2 Scheduled Procedure Step Module

TABLE 0-2
SCHEDULED PROCEDURE STEP MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Scheduled Procedure Step Sequence	(0040,0100)	R	1	
>Scheduled Station AE Title	(0040,0001)	R	1	Query Matching: • Single Value Matching
>Scheduled Procedure Step Start Date	(0040,0002)	R	1	Query Matching: • Single Value Matching • Range Matching
>Scheduled Procedure Step Start Time	(0040,0003)	R	1	Query Matching: • Single Value Matching • Range Matching
>Modality	(0008,0060)	R	1	Query Matching: • Single Value Matching
>Scheduled Performing Physician's Name	(0040,0006)	R	2	= Centricity CARDDAS Xi² "1st Physician"
>Scheduled Procedure Step Description	(0040,0007)	O	1C	
>Scheduled Station Name	(0040,0010)	O	2	
>Scheduled Procedure Step Location	(0040,0011)	O	2	
>Scheduled Protocol Code Sequence	(0040,0008)	O	1C	
>>Code Value	(0008,0100)	O	1C	
>>Coding Scheme Version	(0008,0103)	O	3	
>>Coding Scheme Designator	(0008,0102)	O	1C	
>>Code Meaning	(0008,0104)	O	3	
>Pre-Medication	(0040,0012)	O	2C	Not supported
>Scheduled Procedure Step ID	(0040,0009)	O	1	
>Requested Contrast Agent	( )	O	2C	Not supported

>Scheduled Procedure Step Status	( )	O	3	Not supported

3.5.3 Requested Procedure Entity

3.5.3.1 Requested Procedure Module

TABLE 0-3
REQUESTED PROCEDURE MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Requested Procedure ID	(0040,1001)	O	1	Query Matching: • Single Value Matching • Wild Card Matching = Centricity CARDDAS Xi² Examination No.
Requested Procedure Description	(0032,1060)	O	1C	
Requested Procedure Code Sequence	(0032,1064)	O	1C	
>Code Value	(0008,0100)	O	1C	
>Coding Scheme Designator	(0008,0102)	O	1C	
>Coding Scheme Version	(0008,0103)	O	3	
>Code Meaning	(0008,0104)	O	3	
Study Instance UID	(0020,000D)	O	1	
Referenced Study Sequence	(0008,1110)	O	2	Not supported
>Referenced SOP Class UID	(0008,1150)	O	1C	-
>Referenced SOP Instance UID	(0008,1155)	O	1C	-
Requested Procedure Priority	(0040,1003)	O	2	Not supported
Patient Transport Arrangements	(0040,1004)	O	2	Not supported

3.5.4 Imaging Service Request Entity

3.5.4.1 Imaging Service Request Module

TABLE 0-4
IMAGING SERVICE REQUEST MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Accession Number	(0008,0050)	O	2	Query Matching: • Single Value Matching = Filler Order Number
Requesting Physician	(0032,1032)	O	2	

Referring Physician's Name	(0008,0090)	O	2	
Placer Order Number / Imaging Service Request	(0040,2016)	O	2	Placer Order Number = Filler Order Number

3.5.5 Visit Entity

3.5.5.1 Visit Identification

TABLE 0-5
VISIT IDENTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Admission ID	(0038,0010)	O	2	Centricity CARDDAS Xi² Admission No.

3.5.5.2 Visit Status

TABLE 0-6
VISIT STATUS MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Current Patient Location	(0038,0300)	O	2	Always empty

3.5.5.3 Visit Relationship

TABLE 0-7
VISIT RELATIONSHIP MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Referenced Patient Sequence	(0008,1120)	O	2	Always empty

3.5.6 Patient Entity

3.5.6.1 Patient Identification

TABLE 0-8
PATIENT IDENTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note

Patient's Name	(0010,0010)	R	1	Query Matching: • Single Value Matching • Wild Card Matching "Lastname^Firstname^…" or "Lastname, Firstname" for Philips Inturis
Patient ID	(0010,0020)	R	1	Query Matching: • Single Value Matching = Centricity CARDDAS Xi² Patient ID

3.5.6.2 Patient Demographic

TABLE 0-9
PATIENT DEMOGRAPHIC MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Patients Birth Date	(0010,0030)	O	2	
Patient's Sex	(0010,0040)	O	2	"M", "F" or "O"
Patient's Weight	(0010,1030)	O	2	Weight [kg]
Patient's Size	(0010,1020)	O	2	Size [m]

3.5.6.3 Patient Medical

TABLE 0-10
PATIENT MEDICAL MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Patient State	(0038,0500)	O	2	Always empty
Pregnancy Status	(0010,21C0)	O	2	Always empty
Medical Alerts	(0010,2000)	O	2	Always empty
Contrast Allergies	(0010,2110)	O	2	Always empty
Special Needs	(0038,0050)	O	2	Always empty

4. MODALITY PERFORMED PROCEDURE STEP SOP CLASS DEFINITION

4.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the supported Modality Performed Procedure Step SOP Classes, the optional attributes and service elements supported, the valid range of values for mandatory and optional attributes, and the status code behavior.

This section contains:

4.2 – Modality Performed Procedure Step SOP Class

4.2 MODALITY PEFORMED PROCEDURE STEP SOP CLASS DEFINITIONS

4.2.1 Modality Performed Procedure Step SOP Class

4.2.1.1 IOD Description

4.2.1.1.1 IOD modules

Module	Reference	Module Description
SOP Common	4.2.1.1.2	Contains SOP Common information
Performed Procedure Step Releationship	4.2.1.1.3	
Performed Procedure Step Information	4.2.1.1.4	
Image Acquisition Result	4.2.1.1.5	
Radiation Dose Module	4.2.1.1.6	
Philips Inturis Private Exposure Module	4.2.1.1.7	
GE Healthcare Advantx DLX Private Radiation Dose Module	4.2.1.1.8	
GE Healthcare Innova Private Radiation Dose Module	4.2.1.1.9	

All other optional modules are ignored.

4.2.1.1.2 SOP Common

Attribute Name	Tag	N-CREATE	N-SET	Attribute Description
Specific Character Set	(0008,0005)	X	-	

4.2.1.1.3 Performed Procedure Step Relationship

Attribute name	Tag	N-CREATE	N-SET	Attribute Description
Scheduled Step Attribute Sequence	(0040,0270)	X	-	
>Study Instance UID	(0020,000D)	X	-	
>Referenced Study Sequence	(0008,1110)	X	-	
>>Referenced SOP Class UID	(0008,1150)	X	-	
>>Referenced SOP Instance UID	(0008,1155)	X	-	
>Accession Number	(0008,0050)	X	-	
>Placer Order Number/Imaging Service Request	(0040,2006)	X	-	
>Filler Order Number/Imaging Service Request	(0040,2007)	X	-	
>Requested Procedure ID	( )	X	-	
>Requested Procedure Description	( )	X	-	
>Scheduled Procedure Step ID	(0040,0009)	X	-	
>Scheduled Procedure Step Description	(0040,0007)	X	-	
>Scheduled Action Item (Protocol) Code Sequence	(0040,0008)	X	-	
>>Code Value	(0008,0100)	X	-	
>>Coding Scheme designator	(0008,0101)	X	-	
>>Coding Scheme Version	(0008,0103)	X	-	
>> Code Meaning	(0008,0104)	X	-	
Patient's Name	(0010,0010)	X	-	
Patient ID	(0010,0020)	X	-	
Patient's Birth Date	(0010,0030)	X	-	
Patient's Sex	(0010,0040)	X	-	
Referenced Patient Sequence	(0008,1120)	X	-	
>Referenced SOP Class UID	(0008,1150)	X	-	
>Referenced Instance UID	(0008,1155)	X	-	

4.2.1.1.4 Performed Procedure Step Information

Attribute Name	Tag	N-CREATE	N-SET	Attribute Description
Performed Procedure Step ID	(0040,0253)	X	-	
Performed Station AE Title	(0040,0241)	X	-	
Performed Station Name	(0040,0242)	X	-	
Parformed Location	(0040,0243)	X	-	
Performed Procedure Start Date	(0040,0244)	X	-	
Performed Procedure Start Time	(0040,0245)	X	-	
Performed Procedure Step Status	(0040,0252)	X	X	
Performed Procedure Step Description	(0040,0254)	X	X	

Performed Procedure Type Description	(0040,0255)	X	X	
Performed Procedure Code Sequence	(0008,1032)	X	X	
>Code Value	(0008,0100)	X	X	
>Coding Scheme Designator	(0008,0102)	X	X	
>Codin g Scheme Version	(0008,0103)	X	X	
>Code Meaning	(0008,0004)	X	X	
Performed Procedure Step End Date	(0040,0250)	X	X	
Performed Procedure Step End Time	(0040,0251)	X	X	
Comments on the Performed Procedure Step	(0040,0280)	X	X	
Performed Procedure Step Discontinuation Reason Code Sequence	(,)	X	X	
>Code Value	(0008,0100)	X	X	
>Coding Scheme Designator	(0008,0102)	X	X	
>Coding Scheme Version	(0008,0103)	X	X	
>Code Meaning	(0008,0104)	X	X	

4.2.1.1.5 Image Acquisition Result

Attribute Name	Tag	N-CREATE	N-SET	Attribute Description
Modality	(0008,0060)	X	-	
Study Id	(0020,0010)	X	-	
Performed Action Item (Protocol) Code Sequence	(0040,0260)	X	X	
>Code Value	(0008,0100)	X	X	
>Coding Scheme Designator	(0008,0102)	X	X	
>Coding Scheme Version	(0008,0103)	X	X	
>Code Meaning	(0008,0004)	X	X	
Performed Series Sequence	(0040,0340)	X	X	
>Performed Physician's Name	(0008,1050)	X	X	
>Protocol Name	(0018,1030)	X	X	
>Operators's Name	(0008,1070)	X	X	
>Series Instance UID	(0020,000E)	X	X	
>Series Description	(0008,103E)	X	X	
>Retrieve AE title	(0008,0054)	X	X	
>Referenced Image Sequence	(0008,1140)	X	X	
>>Referenced SOP Class UID	(0008,1150)	X	X	
>>Referenced SOP Instance UID	(0008,1155)	X	X	
>Referenced Standalone SOP Instance Sequence	(0040,0220)	X	X	
>>Referenced SOP Class	(0008,1150)	X	X	
>>Referenced SOP Instance UID	(0008,1155)	X	X	

4.2.1.1.6 Radiation Dose Module

Attribute Name	Tag	N-CREATE	N-SET	Attribute Description
Total Time of Fluoroscopy	(0040,0300)	X	X	
Total Number of Exposures	(0040,0301)	X	X	
Distance Source to Detector (SID)	(018,1110)	X	X	
Distance Source to entrance	(0040,0306)	X	X	
Entrance Dose	(0040,0302)	X	X	Entrance DOSE in dGy Total dose delivered to the patient during the Performed Procedure Step.
Entrance Dose in mGy	(0040,8302)	X	X	Entrance DOSE in mGy Total dose delivered to the patient during the Performed Procedure Step.
Exposed area	(0040,0303)	X	X	
Image Area Dose Product	(0018,115E)	X	X	
Comments on Radiation Dose	(040,0310)	X	X	
Philips Inturis Extension				
Private Creator Group 0041	*(0041,00xx)*	*X*	*X*	*INTEGRIS 1.0*
Accumulated Fluoroscopy Dose	*(0041,xx20)*	*X*	*X*	
Accumulated Exposure Dose	*(0041,xx30)*	*X*	*X*	
Total dose	*(0041,xx40)*	*X*	*X*	
Total Number of Frames	*(0041,xx41)*	*X*	*X*	

4.2.1.1.7 Philips Inturis Private Exposure Module

Attribute Name	Tag	N-CREATE	N-SET	Attribute Description
>Private Creator	*(0041,00xx)*	*X*	*X*	*INTEGRIS 1.0*
Exposure Information Sequenz	*(0041,xx50)*	*X*	*X*	
>Private Creator Group 0009	*(0009,00xx)*	*X*	*X*	*INTEGRIS 1.0*
> Exposure Channel	*(0009,xx08)*	*X*	*X*	
> Exposure Start Time	*(0009,xx32)*	*X*	*X*	
> Scan Options	*(0018, 0022)*	*X*	*X*	
>KVP	*(0018,0060)*	*X*	*X*	

> Distance Source to Detector (SID)	*(0018,1110)*	*X*	*X*	
>Exposure Time	*(0018,1150)*	*X*	*X*	
> X-Ray Tupe Current	*(0018,1151)*	*X*	*X*	
>Intensifier Size	*(0018,1162)*	*X*	*X*	
>Positioner Primary Angel	*(0018,1510)*	*X*	*X*	
>Positioner Secondary Angle	*(0018,1511)*	*X*	*X*	
> Private Creator Group 0019	*(0019,00xx)*	*X*	*X*	*INTEGRIS 1.0*
> APR Name	*(0019,xx00)*	*X*	*X*	
> Frame Rate	*(0019,xx40)*	*X*	*X*	
>Private Creator Group 0029	*(0029,00xx)*	*X*	*X*	*INTEGRIS 1.0*
Number of Exposure Results	*(0029,xx08)*	*X*	*X*	

4.2.1.1.8 GE Healthcare Advantx DLX Private Radiation Dose Module

Attribute Name	Tag	N-CREATE	N-SET	Attribute Description
>Private Creator	*(027,00xx)*	*X*	*X*	*GEMS_DLX_DOSE_01*
Private Radiation Dose Seqence	*(0027,xx01)*	*X*	*X*	
>Run Number	*(0027,xx02)*	*X*	*X*	
>Run Time	*(0027,xx03)*	*X*	*X*	
>Number of Frames	*(0027,xx04)*	*X*	*X*	
>Frames per Second	*(0027xx05)*	*X*	*X*	
>Plane	*(0027,xx06)*	*X*	*X*	
>KV	*(0027,xx07)*	*X*	*X*	
>MA	*(0027,xx08)*	*X*	*X*	
>Mas	*(0027,xx09)*	*X*	*X*	
>Ms	*(0027,xx10)*	*X*	*X*	
>Angulation	*(0027,xx11)*	*X*	*X*	
>Rotation	*(0027,xx12)*	*X*	*X*	
>Focal Distance	*(0027,xx13)*	*X*	*X*	
>Image Intensifier Mode	*(0027,xx14)*	*X*	*X*	

4.2.1.1.9 GE Healthcare Innova Private Radiation Dose Module

Private Creator Identification (*GEMS_DL_STUDY_01*)

Attribute Name	Tag	N-CREATE	N-SET	Attribute Description
Private Creator Code	*(0015,00xx)*	*X*	*X*	*"GEMS_DL_STUDY_01"*
Fluoro DAP	*(0015,xx82)*	*X*	*X*	*Fluoro DAP (Dose Area Product)*

record_dap	*(0015,xx84)*	*X*	*X*	*Cine DAP (Dose Area Product)* *record_dap* *Cumulative dose area product for the record acquisitions performed during the Performed Procedure Step.*
record_time	*(0015,xx85)*	*X*	*X*	*Cine Total Time* *Total time of record acquisitions during the Performed Procedure Step.*
Frontal: dose_front	*(0015,xx92)*	*X*	*X*	*Cumulated dose for all frontal acquisitions under a Performed Procedure Step.*
Frontal: total_dap_front	*(0015,xx93)*	*X*	*X*	*Cumulative dose area product for the Performed Procedure Step for frontal plane*
Frontal: fluoro_dap_front	*(0015,xx94)*	*X*	*X*	*Cumulative dose area product for the fluoro acquisitions performed during the Performed Procedure Step. on frontal plane*
Frontal: fluoro_time_front	*(0015,xx95)*	*X*	*X*	*total frontal fluoro acquisition time under a Performed Procedure Step.*
Frontal: record_dap_front	*(0015,xx96)*	*X*	*X*	*Cumulative dose area product for the record acquisitions performed on frontal plane during the Performed Procedure Step.*
Frontal: record_time_front	*(0015,xx97)*	*X*	*X*	*Total frontal record time under Performed Procedure Step.*
lateral: dose_lat	*(0015,xx98)*	*X*	*X*	*cumulated dose for all lateral acquisitions under a Performed Procedure Step.*
lateral: total_dap_lat	*(0015,xx99)*	*X*	*X*	*Cumulative dose area product for the Performed Procedure Step for lateral plane*
lateral: fluoro_dap_lat	*(0015,xx9A)*	*X*	*X*	*Cumulative dose area product for the fluoro acquisitions performed during the Performed Procedure Step on lateral plane*
lateral: fluoro_time_lat	*(0015,xx9B)*	*X*	*X*	*Total lateral flouro acquisition time under a study.*
lateral: record_dap_lat	*(0015,xx9C)*	*X*	*X*	*Cumulative dose area product for the record acquisitions performed on lateral plane during the Performed Procedure Step.*
lateral: record_time_lat	*(0015,xx9D)*	*X*	*X*	*Total lateral record time under a Performed Procedure Step.*

Private Creator Identification (*GEMS_DLX_DOSE_01*)

Attribute Name	Tag	N-CREATE	N-SET	Attribute Description
Private Creator Code	*(0027,00xx)*	*X*	*X*	*"GEMS_DLX_DOSE_01"*

Private Radiation Dose Seqence	*(0027,xx01)*	*X*	*X*	
Run Number	*(0027,xx02)*	*X*	*X*	
Run Time	*(0027,xx03)*	*X*	*X*	*(NbOf Frames – 1) x FrameTime*
Number of Frames	*(0027,xx04)*	*X*	*X*	
Frames per Second	*(0027,yy05)*	*X*	*X*	
Plane	*(0027,xx06)*	*X*	*X*	
KV	*(0027,xx07)*	*X*	*X*	
mA	*(0027,xx08)*	*X*	*X*	
mAs	*(0027,xx09)*	*X*	*X*	
ms	*(0027,xx10)*	*X*	*X*	
Angulation	*(0027,xx11)*	*X*	*X*	*The Value shall always be the first frame value*
Rotation	*(0027,xx12)*	*X*	*X*	*The Value shall always be the first frame value*
Focal Distance	*(0027,xx13)*	*X*	*X*	*To be sent in [cm]*
Field of View	*(0027,xx14)*	*X*	*X*	*To be sent in [cm]*
Table Vertical Position	*(0027,xx15)*	*X*	*X*	*Absolute Vertical position of the table in mm with respect to the table referential. Down moving is positive. The value of this attribute applies to the first frame of the Multi-frame image.*

4.2.1.2 DIMSE Service Group

DIMSE Service Element	Usage SCP
N-CREATE	M
N-SET	M

4.2.1.2.1 N-CREATE

4.2.1.2.1.1 Status

Service Status	Status Codes	Further Meaning	Status Code Explanation
Failure	0110H	Internal processing Error	Internal errors in the Network-Subsystem (e.g. database not available). The Association is rejected.
Failure	0120H	Missing Type-1 Arguments	The Centricity CARDDAS Xi² – System cannot store the study in the database

4.2.1.2.1.2 Behavior

The Centricity CARDDAS Xi² DICOM Service creates a local database to store the Modality Performed Procedure Step SOP Instance received by an N-CREATE command. The data is stored in the global Centricity CARDDAS Xi² – System when receiving an N-SET with a Status equal to "COMPLETED" or "DISCONTINUED".

For each SCU unlimited Modality Performed Procedure Step SOP Instances may exist at the SCP. Every time the Centricity CARDDAS Xi² DICOM Service receives an N-CREATE command, a new Instance get created and all data related to this instance stored in a local database.

There is no limitation about sending an MPPS for a study more than once, but it can be configured at the Centricity CARDDAS Xi² – System to disable the overwriting of existing data (Dose information).

If the Performed Procedure Step Status (0040,0252) is not "IN PROGRESS", an error is tracked without any further action, but without a following N-SET the data will not be transferred to the Centricity CARDDAS Xi² – System.

4.2.1.2.2 N-SET

4.2.1.2.2.1 Status

Service Status	Status Codes	Further Meaning	Status Code Explanation
Failure	0110H	Internal processing Error, e.g. procedure state not found.	The data is rejected.
Failure	0112H	N_SET without leading N_CREATE.	The data is rejected.
Failure	0105H	No such attribute. Failed to read the requested SOP Instance UID.	The data is rejected.
Failure	0106H	Invalid attribute value; e.g. Attribute value is NULL.	The data is rejected.
Failure	0211H	Unrecognized operation. Unknown Procedure State.	The Centricity CARDDAS Xi²-System cannot store the study in the database.

4.2.1.2.2.2 Behavior

The Centricity CARDDAS Xi² DICOM Service updates all attributes in the local database when receiving an N-SET. As long as the Performed Procedure Step Status (0040,0252) is "IN PROGRESS", the SCU may continue to send N-SET – commands to update the attributes in the current instance.

If Performed Procedure Step Status (0040,0252) is "COMPLETED" or "DISCONTINUED", the data is stored to the Centricity CARDDAS Xi² – System. At this time, the Modality Performed Procedure Step SOP Instance is destroyed.