



Technical Publications

DOC1875590

DoseWatch 2.1 DICOM CONFORMANCE STATEMENT

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CONFORMANCE STATEMENT OVERVIEW

DoseWatch implements DICOM services to facilitate the acquisition, monitoring and reporting of Radiation Exposure in the enterprise. Radiation dose information is either acquired from DICOM Radiation Dose SR instances, DICOM MPPS messages or DICOM image headers. DoseWatch is also able to communicate radiation dose information with other peers using MPPS and RDSR.

Table 0.1 provides an overview of the network services supported by DoseWatch

TABLE 0.1.
NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Computed Radiography Image Storage	No	Yes(**)
Digital X-Ray Image Storage – For Presentation	No	Yes
Digital X-Ray Image Storage – For Processing	No	Yes
Digital Mammography X-Ray Image Storage – For Presentation	No	Yes
Digital Mammography X-Ray Image Storage – For Processing	No	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	No	Yes(**)
Digital Intra-oral X-Ray Image Storage – For Processing	No	Yes(**)
CT Image Storage	No	Yes
Enhanced CT Image Storage	No	Yes(**)
Secondary Capture Image Storage	Yes (*)	Yes
X-Ray Angiographic Image Storage	No	Yes
Enhanced XA Image Storage	No	Yes(**)
X-Ray Radiofluoroscopic Image Storage	No	Yes
Enhanced XRF Image Storage	No	Yes(**)
Nuclear Medicine Image Storage	No	Yes(**)
X-Ray Radiation Dose SR	Yes	Yes
Enhanced SR Storage	Yes(*)	Yes
Radiopharmaceutical Radiation Dose Structured Report	Yes(*)	Yes(**)
Positron Emission Tomography Image Storage	No	Yes(**)
Query/Retrieve		
Patient Root Query/Retrieve Information Model – FIND	Yes	No
Patient Root Query/Retrieve Information Model – MOVE	Yes	No
Study Root Query/Retrieve Information Model – FIND	Yes	No
Study Root Query/Retrieve Information Model – MOVE	Yes	No
Patient/Study Only Query/Retrieve Information Model - FIND	Yes	No
Patient/Study Only Query/Retrieve Information Model - MOVE	Yes	No
Workflow Management		
Modality Performed Procedure Step SOP Class	Yes(*)	Yes
Modality Worklist Information Model – FIND SOP Class	Yes	No

(*) Supports only the forwarding of object produced by a modality. DoseWatch does not produce these objects.

(**) Supported optionally.

DoseWatch does not support any Media Storage Application Profile.

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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 GEHC equipment compliance to the DICOM requirements for the implementation of Networking features.

Section 3 (CT Image Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a CT Image Information Object.

Section 4 (Digital Mammography X-Ray Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a MG Image Information Object.

Section 5 (Secondary Capture Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a Secondary Capture Object.

Section 6 (X-Ray Angiographic Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a XA Image Object.

Section 7 (X-Ray RF Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a RF Image Object.

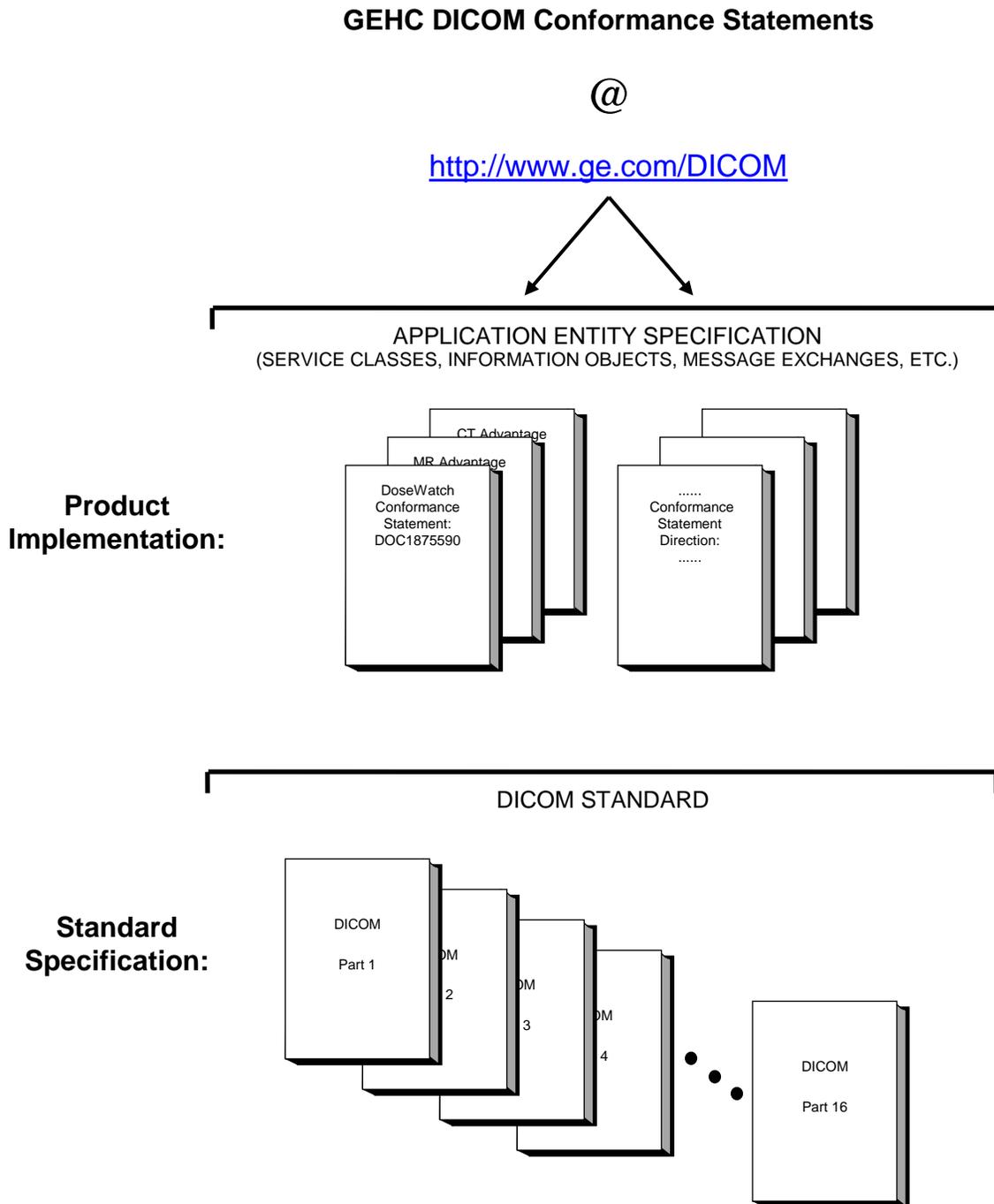
Section 8 (CT/X-Ray Radiation Dose Structured Report Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the storage and implementation of an CT/X-Ray Radiation Dose Structured Report.

Section 9 (Modality Worklist Information Model), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Modality Worklist service.

Section 10 (Query Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Query to a PACS.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the GEHC DICOM Conformance Statements is shown in the Illustration below.



This document specifies the DICOM implementation. It is entitled:

DoseWatch 2.1
Conformance Statement for DICOM
DOC1875590

This DICOM Conformance Statement documents the DICOM Conformance Statement and Technical Specification required to interoperate with the GEHC network interface.

The GEHC 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 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 1752
Rosslyn, VA 22209
USA
Phone: +1.703.841.3200

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 Standard and with the terminology and concepts which are used in that Standard.

1.4 SCOPE AND FIELD OF APPLICATION

It is the intent of this document to provide an unambiguous specification for GEHC implementations. This specification, called a Conformance Statement, includes a DICOM Conformance Statement and is necessary to ensure proper processing and interpretation of GEHC medical data exchanged using DICOM. The GEHC Conformance Statements are available to the public.

The reader of this DICOM Conformance Statement should be aware that different GEHC devices are capable of using different Information Object Definitions. For example, a GEHC 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 GEHC implementation. If the user encounters unspecified private data elements while parsing a GEHC 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 GEHC 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 v3.0), 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 GEHC 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) described 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

NEMA PS3 Digital Imaging and Communications in Medicine (DICOM) Standard, available free at <http://medical.nema.org/>

1.7 DEFINITIONS

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

Application Entity (AE) – an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives

DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title – the externally known name of an *Application Entity*, used to identify a DICOM application to other DICOM applications on the network.

Application Context – the specification of the type of communication used between *Application Entities*. Example: DICOM network protocol.

Association – a network communication channel set up between *Application Entities*.

Attribute – a unit of information in an object definition; a data element identified by a *tag*. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Information Object Definition (IOD) – the specified set of *Attributes* that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The *Attributes* may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Joint Photographic Experts Group (JPEG) – a set of standardized image compression techniques, available for use by DICOM applications.

Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs).

Module – a set of *Attributes* within an *Information Object Definition* that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – first phase of *Association* establishment that allows *Application Entities* to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context – the set of DICOM network services used over an *Association*, as negotiated between *Application Entities*; includes *Abstract Syntaxes* and *Transfer Syntaxes*.

Protocol Data Unit (PDU) – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an *Application Entity* to ensure confidentiality, integrity, and/or availability of exchanged DICOM data.

Service Class Provider (SCP) – role of an *Application Entity* that provides a DICOM network service; typically, a server that performs operations requested by another *Application Entity* (*Service Class User*). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) – role of an *Application Entity* that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance – an information object; a specific occurrence of information exchanged in a *SOP Class*. Examples: a specific x-ray image.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages. Examples: *JPEG* compressed (images), little endian explicit value representation.

Unique Identifier (UID) – a globally unique “dotted decimal” string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person’s name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

1.8 SYMBOLS AND ABBREVIATIONS

AE	Application Entity
AET	Application Entity Title
CAD	Computer Aided Detection
CR	Computed Radiography
CT	Computed Tomography
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DX	Digital X-ray
HIS	Hospital Information System
HL7	Health Level 7 Standard
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
ISO	International Organization for Standards
IO	Intra-oral X-ray
JPEG	Joint Photographic Experts Group
LDAP	Lightweight Directory Access Protocol

LUT	Look-up Table
MG	Mammography (X-ray)
MPPS	Modality Performed Procedure Step
MSPS	Modality Scheduled Procedure Step
MTU	Maximum Transmission Unit (IP)
MWL	Modality Worklist
NM	Nuclear Medicine
O	Optional (Key Attribute)
OCR	Optical Character recognition
OSI	Open Systems Interconnection
PACS	Picture Archiving and Communication System
PET	Positron Emission Tomography
PDU	Protocol Data Unit
Q/R	Query and Retrieve
R	Required (Key Attribute)
RF	Radiofluoroscropy
RIS	Radiology Information System
RT	Radiotherapy
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SPS	Scheduled Procedure Step
SR	Structured Reporting
SSDE	Size-Specific Dose Estimate
TCP/IP	Transmission Control Protocol/Internet Protocol
U	Unique (Key Attribute)
UL	Upper Layer
VL	Visible Light
VR	Value Representation
XA	X-ray Angiography

2. NETWORK CONFORMANCE STATEMENT

2.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the DoseWatch compliance to DICOM requirements for **Networking** features.

The DoseWatch product uses DICOM to receive images, Performed Procedure Steps and Radiation Dose Structured Reports through 3rd-party systems initiated network associations.

DoseWatch is also able to automatically initiate DICOM associations to send radiation dose information to 3rd-party systems using MPPS messages or RDSR objects.

DoseWatch is able to query a Modality Worklist SCP to retrieve modality worklist procedure step for a specific application entity and map those elements to its existing database of exams.

DoseWatch is able to query a PACS to retrieve exams.

2.2 IMPLEMENTATION MODEL

2.2.1 Application Data Flow Diagram

The network application model for the DoseWatch is shown in the following illustrations:

ILLUSTRATION 2-1 : RETRIEVE A MODALITY WORKLIST FROM A REMOTE SYSTEM

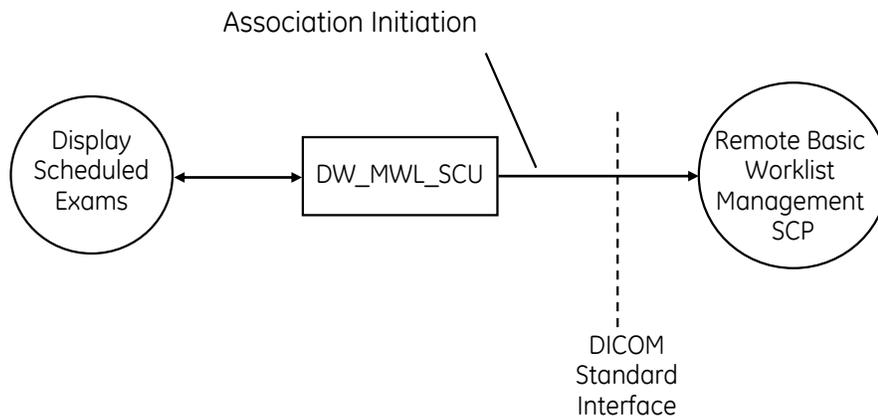


Illustration 2-2 : VERIFICATION REQUEST FROM A REMOTE AE

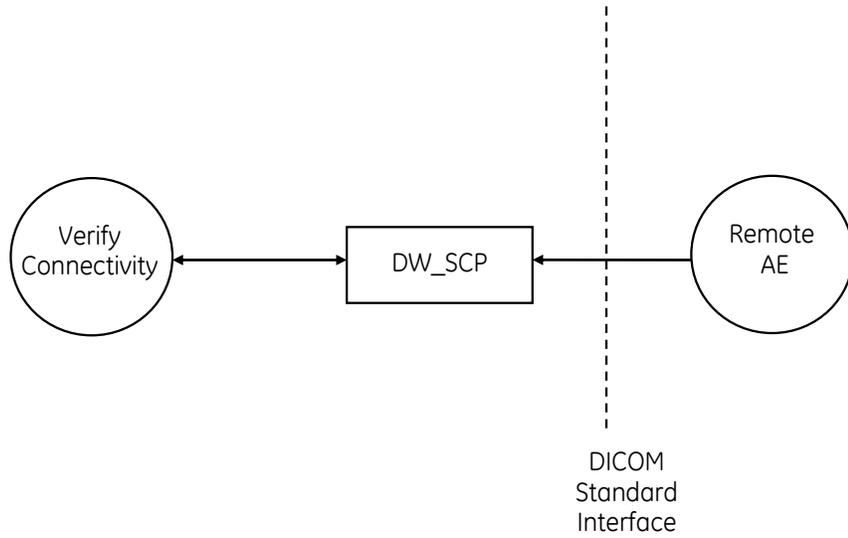


ILLUSTRATION 2-3 : RECEIVE INSTANCES FROM A REMOTE SYSTEM

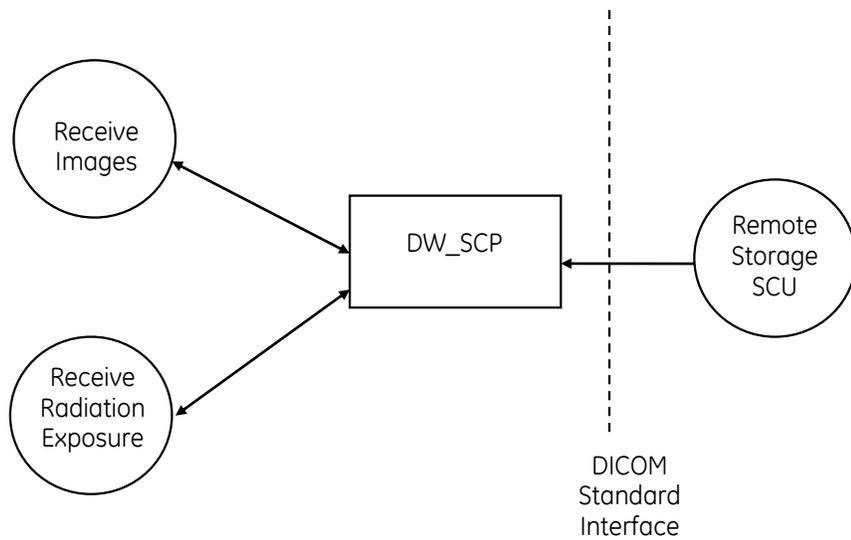


ILLUSTRATION 2-4 : RECEIVE MPPS MESSAGE FROM A REMOTE SYSTEM

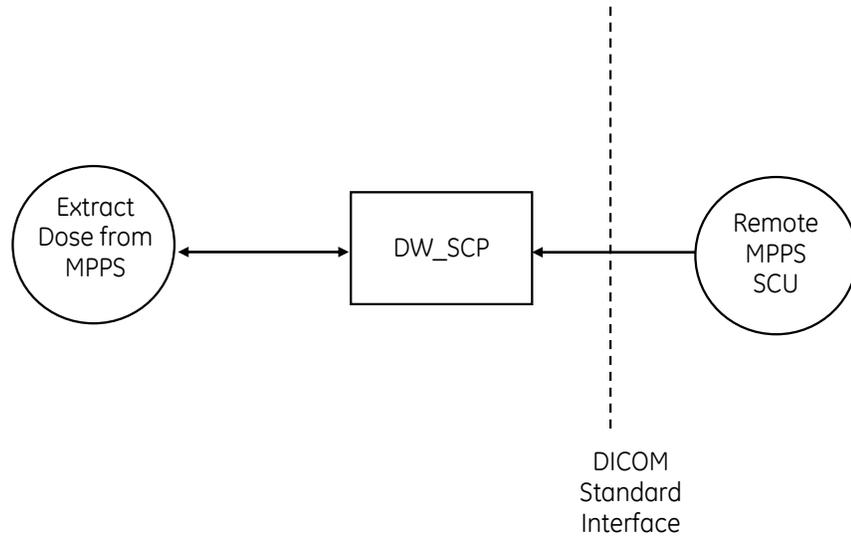


ILLUSTRATION 2-5 : FORWARD MPPS MESSAGE TO A REMOTE SYSTEM

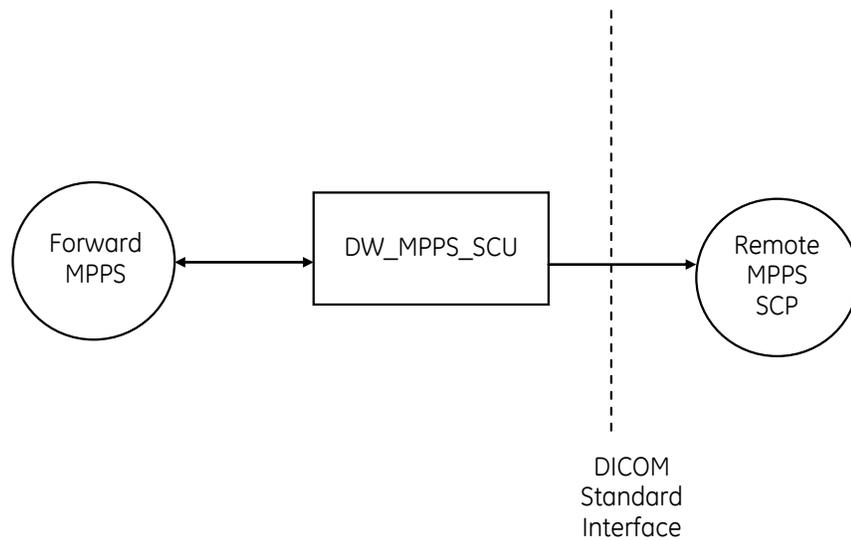


ILLUSTRATION 2-6 FORWARD OR GENERATE SR MESSAGE TO A REMOTE SYSTEM

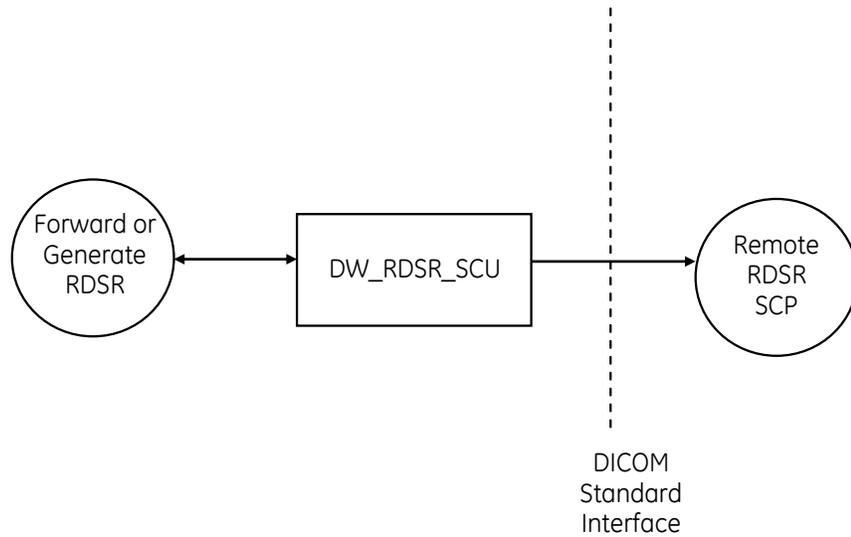
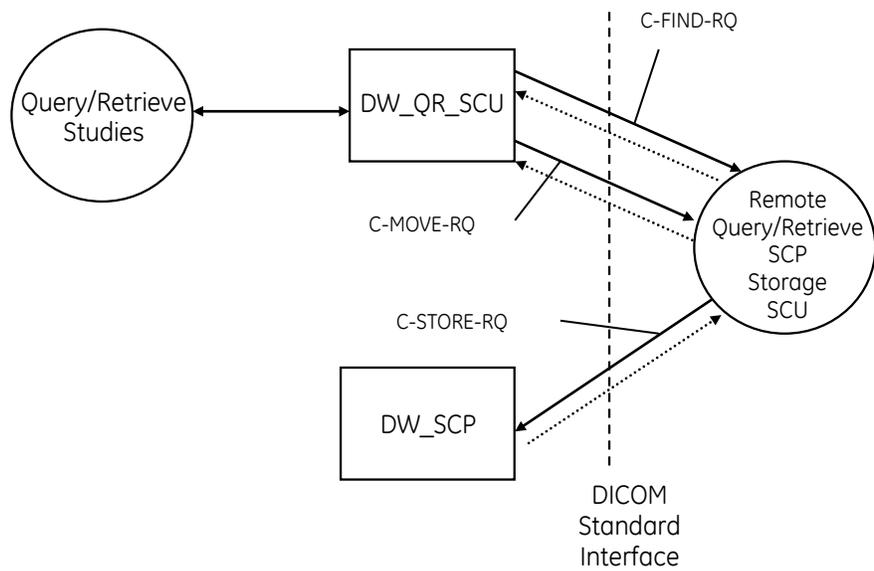


ILLUSTRATION 2-7 QUERY/RETRIEVE STUDIES FROM A PACS



2.2.2 Functional Definition of AE's

Query Modality Worklist: DoseWatch queries the Modality Worklist server to display the scheduled exams for the modalities connected to DoseWatch. A background task also queries the Modality Worklist server to store modality scheduled procedure steps items in its internal database and reuse this content in some processing tasks.

Verification Request from a remote AE: If DoseWatch receives a C-ECHO-RQ message, it will respond with a C-ECHO-RSP message with a status "success".

Receive Instances: DoseWatch receives from a remote system a C-STORE-RQ messages. DoseWatch stores images from modalities, stores images header in its database to process them and extracts dose-related information. In addition, DoseWatch stores localizers images for SSDE calculation. DoseWatch responds with a C-STORE-RSP message. DoseWatch receives Radiation Dose Structured Reports from modalities (with a C-STORE operation), stores them in its database and extracts dose related information.

Receive MPPS: DoseWatch receives Modality Performed Procedure Step messages from modalities, stores them in its database to extract dose related information. MPPS sent with the N-CREATE operation and the N-SET operation are considered. When the N-CREATE MPPS message is received, the DoseWatch wait for a N-SET message before integrating data.

Forward MPPS messages: If configured to do so, DoseWatch forwards MPPS messages to other DICOM systems.

Forward SR messages: If configured to do so, DoseWatch forwards Radiation Dose Structured Reports, Secondary Captures or Enhanced SR received from modalities to other DICOM systems.

Generate RDSR messages: If configured to do so, DoseWatch generate a RDSR message to other DICOM system if the original device is not able to produce such a file.

Query/Retrieve Studies: DoseWatch query a remote server listening at a TCP/IP port for incoming DICOM query messages. The query request (find matching patients or studies or series or images) is made by DoseWatch as Service Class User with a C-FIND-RQ operation. The remote server which acting as Service Class Provider responds (C-FIND-RSP) a list of DICOM objects corresponding to the request. DoseWatch performs a C-MOVE-RQ on the remote server and receive DICOM object on the DoseWatch storage SCP listener.

2.2.3 Sequencing of Real-World Activities

The forwarding of MPPS message to another system is triggered by an incoming DICOM communication (MPPS message).

The forwarding of SR message to another system is triggered by an incoming DICOM communication (images, MPPS message or RDSR instance).

The Query/Retrieve to another system can be triggered by an incoming DICOM communication (images, MPPS message or RDSR instance). In this case it is used to complete the information already received in the system. It can also be triggered periodically (every day) to get information from the day before.

2.3 AE SPECIFICATIONS

DoseWatch configuration allows the definition of up to three Application Entities as SCP to structure DICOM incoming dataflows:

- Each listener handle MPPS, images, RDSR and secondary captures.
- Each listener can be configured for specific scenarios and some SOP Classes can be deactivated if necessary
- The workflows can be dispatched on the three listeners if the user want to separated MPPS / image / RDSR workflows

The DoseWatch system can also communicate dose information within DICOM MPPS messages sent to a remote AE. When doing so, DoseWatch will re-use the AE Title of the modality which originally sent to DoseWatch the images or MPPS message or use a custom AE title defined in the configuration. In the following section, "**DW_MPPS_SCU**" represents this DoseWatch Application Entity.

Additionally, the DoseWatch system can communicate dose information within DICOM RDSR messages sent to a remote AE. DoseWatch will re-use the AE Title of the modality which originally sent to DoseWatch information or use a custom AE title defined in the configuration. In the following section, "**DW_RDSR_SCU**" represents this DoseWatch Application Entity.

Through its **DW_MWL_SCU** Application Entity, the DoseWatch system can query a RIS for scheduled exams to be displayed to end-users.

DoseWatch uses an additional Application entity when it performs query/retrieve to a remote system. The default AET used is "**DW_QR_SCU**" and can be changed if needed.

2.3.1 DW_SCP AE Specification

The DW_SCP Application Entities provides Standard Conformance to the following DICOM SOP Classes as an **SCU** and/or as an **SCP**:

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	No	Yes
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	No	Yes
Digital Mammography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	No	Yes
Digital Mammography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	No	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	No	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	No	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	No	Yes
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	No	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	No	Yes
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	No	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	No	Yes
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	No	Yes
Radiopharmaceutical Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.68	No	Yes
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	No	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	No	Yes
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	No	Yes

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
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The maximum length PDU receive size for the DoseWatch Application Entity is: 16KB

Maximum Length PDU	16KB (Configurable)
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2.3.1.1.2 Number of Associations

The DW_SCP will support a maximum of 50 simultaneous associations initiated by remote nodes. However having more than 8 simultaneous connection per node is not recommended.

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:

DoseWatch Implementation UID	1.2.840.113619.6.326
DoseWatch Implementation Version Name	dosewatch-2.0.10

2.3.1.2 Association Initiation Policy

The DW_SCP Application Entity does not initiate any Association.

2.3.1.3 Association Acceptance Policy

2.3.1.3.1 Real World Activity : Verification request from Remote AE

2.3.1.3.1.1 Associated Real-World Activity

This AE is indefinitely listening for associations. No operator action is required to respond to a verification message. The Real-World Activity associated with the verification request is to send a C-ECHO response message with a status of "success" to the requesting AE.

2.3.1.3.1.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by AE DoseWatch_Receiver for Activity Verification request from Remote AE					
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	SCP	None

2.3.1.3.1.2.1 SOP Specific Conformance to C_ECHO SCP

The DW_SCP provides standard conformance to the DICOM Verification Service Class.

Each ECHO operation supports an “Association Timer” with a timeout value of 60 seconds. This timeout is configurable if necessary.

2.3.1.3.1.3 Presentation Context Acceptance Criterion

The DW_SCP evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for any Real-World Activity.

2.3.1.3.1.4 Transfer Syntax Selection Policies

Within each Presentation Context, the DW_SCP will select the following Transfer Syntax:

- Implicit VR Little Endian

2.3.1.3.2 Real World Activity : “Receive Instances”

2.3.1.3.2.1 Associated Real-World Activity

A modality sends DICOM images or Radiation Dose Structured Reports to DoseWatch. DoseWatch stores localizers images, other images’ headers and RDSR in its database for further processing.

2.3.1.3.2.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by DW_SCP for Activity Receive Instances					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
Digital Mammography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91	SCP	None

		JPEGLossless	1.2.840.10008.1.2.4.70		
Digital Mammography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

		Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70		
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	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
Radiopharmaceutical Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.68	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
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	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
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian JPEG2000LosslessOnly JPEG2000 JPEGLossless	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91 1.2.840.10008.1.2.4.70	SCP	None

2.3.1.3.2.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

The DW_SCP AE does not provide any DICOM retrieve service to remote AE. DICOM Instances are received for the sole purpose of radiation dose calculation and monitoring and are not intended to be displayed, nor retrieved or sent to other remote AE.

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

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Success	0000		The Composite SOP Instance was successfully received, verified, and stored in the system repository.	
Error	0110	Processing Failure	This status is returned due to internal errors such as a processing failure response from the internal system. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.	
Error	B000	One or more failures	This status is returned due to internal errors such as an error when reading the DICOM stream received. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.	

The DW_SCP AE supports Storage Level 0: for most images, only the DICOM header is stored in DoseWatch database; whole DICOM dataset is only stored for localizer images.

2.3.1.3.2.3 Presentation Context Acceptance Criterion

The DW_SCP evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for any Real-World Activity.

2.3.1.3.2.4 Transfer Syntax Selection Policies

Within each Presentation Context, the DoseWatch AE will accept the first proposed transfer syntax that it also supports for that Abstract Syntax.

2.3.1.3.3 Real World Activity : "Receive MPPS"

2.3.1.3.3.1 Associated Real-World Activity

A modality sends DICOM MPPS to DoseWatch. DoseWatch stores them in its database for further processing.

2.3.1.3.3.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by DW_SCP for Activity Receive MPPS					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Performed Procedure Step SOP Class	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

2.3.1.3.3.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

The DW_MPPS_SCP AE does not provide any DICOM retrieve service to remote AE. DICOM Instances are received for the sole purpose of radiation dose calculation and monitoring and are not intended to be displayed, nor retrieved or sent to other remote AE.

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

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Success	0000		The Composite SOP Instance was successfully received, verified, and stored in the system repository.	
Error	0110	Processing Failure	This status is returned due to internal errors such as a processing failure response from the internal database or a filesystem operation. The appropriate Status will be sent in the N-CREATE/N-SET Response. Error indication message is output to the Service Log.	
Error	0121	Missing Attribute Value	This status is returned when the N-CREATE received from the SCU does not contains the Study Instance UID.	Attribute Identifier List (0000,1005) returns the field Study Instance UID
Error	0121	Missing Attribute Value	This status is returned when the N-SET received from the SCU does not contains the field Requested Sop Instance UID (0000,1001)	Attribute Identifier List(0000,1005) returns the field Requested Sop Instance UID

Note: if the SCU does not provide the Affected SOP Instance UID (0000,1000) in the N-CREATE operation, DoseWatch does not consider it as an error and generates one for the SCU. The SCU is in charge to use it and to reuse it for the N-SET operation. The Affected SOP Instance UID starts with the DoseWatch prefix "1.2.840.113619.2.326".

2.3.1.3.3.3 Presentation Context Acceptance Criterion

The DW_MPPS_SCP evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for any Real-World Activity.

2.3.1.3.3.4 Transfer Syntax Selection Policies

Within each Presentation Context, the DoseWatch AE will accept the first proposed transfer syntax that it also supports for that Abstract Syntax.

2.3.2 DW_MPPS_SCU AE Specification

The DW_MPPS_SCU Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCU**:

SOP Class Name	SOP Class UID	SCU	SCP
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Yes	No

2.3.2.1 Association Establishment Policies

2.3.2.1.1 General

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

Application Context Name	1.2.840.10008.3.1.1.1
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The maximum length PDU receive size for the DW_MPPS_SCU is: 16KB

Maximum Length PDU	16KB (Configurable)
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2.3.2.1.2 Number of Associations

The DW_MPPS_SCU AE will initiate a maximum of 1 simultaneous associations to remote nodes (association will be established when a DICOM MPPS message is processed or when an exam is created in the database, depending on the configuration of the device in DoseWatch).

2.3.2.1.3 Asynchronous Nature

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

2.3.2.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

DoseWatch Implementation UID	1.2.840.113619.6.326
DoseWatch Implementation Version Name	dosewatch-2.0.10

2.3.2.2 Association Initiation Policy

When the DW_MPPS_SCU Application Entity initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities; i.e., there is only a single, comprehensive Presentation Context Negotiation proposed for the AE.

The DW_MPPS_SCU AE proposes only a single Transfer Syntax in each Presentation Context; i.e., for each Abstract Syntax in the following Presentation Context Tables, the AE proposes one Presentation Context for each specified Transfer Syntax.

2.3.2.2.1 Real-World Activity "Forward MPPS"

2.3.2.2.1.1 Associated Real-World Activity

2.3.2.2.1.1.1 Direct Forwarding Rules

For modalities sending MPPS to DoseWatch, DoseWatch can be configured to forward the received MPPS to a destination AE specified per MPPS source directly at the end of the DICOM.

2.3.2.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE DW_MPPS_SCU for Activity “Forward MPPS”					
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	1.2.840.10008.1.2	SCU	None

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

2.3.2.2.1.2.1.1 MPPS N-CREATE

The DW_MPPS_SCU AE includes attributes in the Modality Performed Procedure Step N-CREATE sent by the modality.

Following are the status codes that are more specifically processed when receiving an N-CREATE response from a MPPS SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	*	*	Status Processing error “F” is associated to the send request. DICOM status is available in the DICOM logs of DoseWatch or in the gateway logs.
Success	0000		N-CREATE message is sent.

2.3.2.2.1.2.1.2 MPPS N-SET

DoseWatch always send COMPLETED status for N-SET messages when the MPPS is generated by DoseWatch.

The AE includes attributes in the Modality Performed Procedure Step N-SET sent by the modality.

Following are the status codes that are more specifically processed when receiving an N-SET response from a MPPS SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	*	*	Status Processing error “F” is associated to the send request. DICOM status is available in the DICOM logs of DoseWatch or in the gateway logs.
Success	0000		N-SET message is sent. Status “C” is set to the send request.

2.3.3 DW_RDSR_SCU AE Specification

The DW_RDSR_SCU Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCU**:

SOP Class Name	SOP Class UID	SCU	SCP
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Yes	No
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No

2.3.3.1 Association Establishment Policies

2.3.3.1.1 General

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

Application Context Name	1.2.840.10008.3.1.1.1
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The maximum length PDU size for the DW_RDSR_SCU is: 16KB

Maximum Length PDU	16KB(configurable)
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2.3.3.1.2 Number of Associations

The DW_RDSR_SCU AE will initiate a maximum of 1 simultaneous associations to remote nodes (association will be established when a DICOM RDSR message is processed or when an exam is created in the database, depending on the configuration of the device in DoseWatch).

2.3.3.1.3 Asynchronous Nature

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

2.3.3.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

DoseWatch Implementation UID	1.2.840.113619.6.326
DoseWatch Implementation Version Name	dosewatch-2.0.10

2.3.3.2 Association Initiation Policy

When the DW_RDSR_SCU Application Entity initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities; i.e., there is only a single, comprehensive Presentation Context Negotiation proposed for the AE.

The DW_RDSR_SCU AE proposes only a single Transfer Syntax in each Presentation Context; i.e., for each Abstract Syntax in the following Presentation Context Tables, the AE proposes one Presentation Context for each specified Transfer Syntax.

2.3.3.2.1 Real-World Activity "Forward SR"

2.3.3.2.1.1 Associated Real-World Activity

2.3.3.2.1.1.1 Post Process Forwarding Rules

When configured to do so, DoseWatch will create a RDSR Instance upon receiving DICOM images, secondary captures, RDSR and/or MPPS from a modality. After the corresponding exam is created in the database, this RDSR instance shall be sent to the

destination AE specified in DoseWatch configuration. In that case only a RDSR file is generated, no Secondary capture nor enhanced SR are generated.

2.3.3.2.1.1.2 Direct Forwarding Rules

For modalities sending RDSR to DoseWatch, DoseWatch can be configured to forward the received RDSR, RRDSR, secondary capture or enhanced SR to a destination AE specified per RDSR source directly at the end of the DICOM association (in this case, it does not depend on the persistence of the study in the database).

2.3.3.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE DW_RDSR_SCU for Activity “Forward SR”					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Radiopharmaceutical Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.68	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.3.3.2.1.2.1 SOP Specific DICOM Conformance Statement for X-Ray Radiation Dose Storage Classes, Enhanced SR and Secondary Capture Image Storage

Following are the status codes that are more specifically processed when receiving a response from a RDSR SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	*	*	Status Processing error “F” is associated to the send request. DICOM status is available in the DICOM logs of DoseWatch or in the gateway logs.
Success	0000		RDSR/RRDSR/SC/Enhanced SR message is sent.

2.3.4 DW_MWL_SCU AE Specification.

The DW_MWL_SCU Application Entity (real application entity is the AE Title defined for the device configured in DoseWatch) provides Standard Conformance to the following DICOM SOP Classes as an **SCU** and/or as an **SCP**:

SOP Class Name	SOP Class UID	SCU	SCP
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	No

2.3.4.1 Association Establishment Policies

2.3.4.1.1 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 receive size for the DW_MWL_SCU AE is: 16KB

Maximum Length PDU	16KB(configurable)
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2.3.4.1.2 Number of Associations

The DW_MWL_SCU AE will initiate a maximum of 1 simultaneous association to remote nodes.

The DW_MWL_SCU AE does not accept DICOM associations.

2.3.4.1.3 Asynchronous Nature

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

2.3.4.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

DoseWatch Implementation UID	1.2.840.113619.6.326
DoseWatch Implementation Version Name	dosewatch-2.0.10

2.3.4.2 Association Initiation Policy

When the DW_MWL_SCU Application Entity initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities; i.e., there is only a single, comprehensive Presentation Context Negotiation proposed for the AE.

The DW_MWL_SCU proposes only a single Transfer Syntax in each Presentation Context; i.e., for each Abstract Syntax in the following Presentation Context Tables, the AE proposes one Presentation Context for each specified Transfer Syntax.

2.3.4.2.1 Real-World Activity “Display Scheduled Exams”

2.3.4.2.1.1 Associated Real-World Activity

On a regular basis (configurable) or upon user request, the DoseWatch system shall query the DICOM Modality Worklist server associated to each modality selected in DoseWatch configuration.

DoseWatch queries the worklist provider using each modality AE Title or can use its own AE Title, hence the association is kept open until each modality’s worklist has been queried.

2.3.4.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE DW_MWL_SCU for Activity “Display Scheduled Exams”					
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 (see note below)	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

Note: Implicit VR Little endian Transfer Syntax can be forced for a given device.

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

The DW_MWL_SCU AE includes matching keys in the Modality Worklist queries as described in Section 2.3.4.2.1.2.1.1.

Modality Scheduled Procedure Steps returned by the SCP are either displayed in the Scheduled Studies Worklist of DoseWatch or stored in the database for further processing. A Modality Worklist Request is sent by DoseWatch when the final user requests the list of scheduled studies or every 5 minutes by a batch job.

Following are the status codes that are more specifically processed when receiving messages from a **Modality Worklist** SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	*	*	The resulting list is considered as empty (not displayed or not stored). Details of the error are available in the DICOM or application logs.
Success	0000	Matching is complete - No final identifier is supplied	
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	Receiving of matches continues.

DoseWatch does not generate C-FIND-CANCEL commands.

2.3.4.2.1.2.1.1 Modality Worklist Query Details

The following DICOM tags are sent in the Modality Worklist query:

- ScheduledProcedureStepSequence/ScheduledProcedureStepStartDate with the current date or the X days to come (specified in the UI)
- ScheduledProcedureStepStartTime with the value “000000-235959”
- ScheduledStationAETitle with the AE Title that has initiated the DICOM association

The complete detail of the query sent can be found in section 9.

2.3.4.3 Association Acceptance Policy

The DW_MWL_SCU Application Entity does not accept any DICOM associations.

2.3.5 DW_QR_SCU AE Specification.

The DW_QR_SCU Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCU** and/or as an **SCP**:

SOP Class Name	SOP Class UID	SCU	SCP
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	No
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	No
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Patient/Study Only Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.3.1	Yes	No
Patient/Study Only Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2	Yes	No

2.3.5.1 Association Establishment Policies

2.3.5.1.1 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 receive size for the DW_QR_SCU AE is: 16KB

Maximum Length PDU	16KB(configurable)
---------------------------	---------------------------

2.3.5.1.2 Number of Associations

The DW_QR_SCU AE will initiate a maximum of 1 simultaneous association to remote nodes.

The DW_QR_SCU AE does not accept DICOM associations.

2.3.5.1.3 Asynchronous Nature

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

2.3.5.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

DoseWatch Implementation UID	1.2.840.113619.6.326
DoseWatch Implementation Version Name	dosewatch-2.0.10

2.3.5.2 Association Initiation Policy

When the DW_QR_SCU Application Entity initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities; i.e., there is only a single, comprehensive Presentation Context Negotiation proposed for the AE.

The DW_QR_SCU proposes only a single Transfer Syntax in each Presentation Context; i.e., for each Abstract Syntax in the following Presentation Context Tables, the AE proposes one Presentation Context for each specified Transfer Syntax.

2.3.5.2.1 Real-World Activity “Query/Retrieve Exams”

2.3.5.2.1.1 Associated Real-World Activity

When configured, DoseWatch can query a query/retrieve provider (i.e. PACS, Workstation...) to complete information previously received from a modality. This may be triggered upon the reception of specific type of file (MPPS, Images, RDSR...) or periodically to retrieve examinations for specific day or specific modality.

2.3.5.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE DW_QR_SCU for Activity “Query/Retrieve Exams”					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	yes(1)
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	yes(1)
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	yes(1)
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	yes(1)
Patient/Study Only Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	yes(1)
Patient/Study Only Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	yes(1)

(1) One extended negotiation is added for the relational-query support. If not supported DoseWatch use the hierarchical mode.

2.3.5.2.1.2.1 SOP Specific DICOM Conformance Statement for the Patient Root Query/Retrieve Information Model - MOVE , Study Root Query/Retrieve Information Model - MOVE and Patient/Study Only Query/Retrieve Information Model - MOVE SOP Classes

The C-MOVE-RQ will use the AE Title of the DoseWatch Application Entity as the Move Destination AE Title.

The DoseWatch does not generate any C-MOVE-CANCEL operation.

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

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	*	*	The resulting list is considered as empty (not displayed or not stored). Details of the error are available in the DICOM or application logs.
Success	0000	Matching is complete - No final identifier is supplied	
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	Receiving of matches continues.

2.3.5.2.1.2.1.1 Query Retrieve Details

The DoseWatch performs in the same association a C-FIND and C-MOVE on the entities returned by the C-FIND. Usually the C-FIND query is controlled by a template configured in the DoseWatch. This template describe the keys to query (described in section 10).

2.3.5.3 Association Acceptance Policy

The DW_QR_SCU Application Entity does not accept any DICOM associations.

2.4 COMMUNICATION PROFILES

2.4.1 Supported Communication Stacks

The DICOM Upper Layer Protocol is supported using TCP/IP, as specified in DICOM PS3.8.

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

TLS configuration is supported on the DICOM Listener with TLSv1 and SSLv3 protocols.

2.4.2 Physical Media Support

The DoseWatch product is a software only solution and is expected to run with a 10/100 Mb/s or 1Gb/s auto-sensing Ethernet interface. Additional or alternate network interfaces may be available.

2.4.3 Additional Protocols

The DoseWatch DICOM Stack is based on the standard JAVA Network stack and support the DHCP protocol.

2.4.4 IPV4 and IPv6 Support

The DoseWatch DICOM Stack is based on the standard JAVA Network stack and support IPV4 protocol.

2.5 EXTENSIONS / SPECIALIZATIONS/ PRIVATIZATIONS

2.5.1 Standard Extended / Specialized / Private SOP Classes

2.5.1.1 Standard Extended SOP Classes

The product provides Standard Extended Conformance to all supported SOP Classes, through the inclusion of additional Type 3 Standard Elements and Private Data Elements.

Some private data elements can be read and processed by DoseWatch provided that they are specified in the source system DICOM Conformance Statement.

DoseWatch does not create any Private Data Elements.

2.5.1.2 Private SOP Classes

DoseWatch can be configured to support private SOP classes for storage.Private Transfer Syntaxes

No Private Transfer Syntax is supported.

2.6 CONFIGURATION

The exact method for configuring each configurable item is specified in other DoseWatch documentation. The following sections only describe some items that are configurable.

2.6.1 AE Title/Presentation Address Mapping

2.6.2 Configurable Parameters

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

- Local AE Title
- Local Listening Port Number

The table below provides the default DoseWatch AE Titles and TCP port numbers:

Application Entity	AE Title	TCP Port
DoseWatch DICOM Modality Worklist SCU	DoseWatch uses connected devices' AET or DW_MWL_SCU	n/a
DoseWatch AEs	DW_SCP	2001
	DW_MPPS_SCP (optional)	2002
	DW_RDSR_SCP (optional)	2003
DoseWatch MPPS sender	When forwarding MPPS, DoseWatch uses MPPS origin's	n/a

	AET or DW_MPPS_SCU	
DoseWatch RDSR Sender	When forwarding RDSR, DoseWatch uses RDSR origin's AET or DW_RDSR_SCU	n/a
DoseWatch Query/Retrieve SCU	DW_QR_SCU	n/a

The following fields are configurable for every remote DICOM AE:

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

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

2.7 SUPPORT OF EXTENDED CHARACTER SETS

The DoseWatch supports ISO_IR 100 (Latin alphabet Number 1 supplementary set) as default and character sets such as ISO 2022 IR 13 and ISO 2022 IR 87 for Japanese are supported. Other character sets may be supported but have not been tested.

2.8 CODES AND CONTROLLED TERMINOLOGY

The product uses no coded terminology.

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. CT INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

This section specifies the use of the DICOM CT Image IOD to represent the information included in CT Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

3.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product’s database and user interface.

TABLE 3-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/CTStudy
Series	Series/CTSeries
Image	DicomRawImage

3.3 IOD MODULE TABLE

The Computed Tomography Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 3.5.

TABLE 3-2
CT IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
Series	General Series	Used	3.4.3.1
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Used	3.4.5
	Image Plane	Used	3.4.5.2
	Image Pixel	Used	3.4.5.3
	Contrast/Bolus	Used Required if contrast media was used in this image	3.4.5.4
	CT Image	Used	3.4.5.5
	SOP Common	Used	3.4.5.6

3.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the CT Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

3.4.1 Patient Entity Modules

3.4.1.1 Patient Module

TABLE 3-3
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Extracted for every DICOM Type received. Shall be formatted with LAST_NAME^FIRST_NAME^MIDDLE_NAME^SUFFIX^PREFIX Max length 255 characters for each subfields.
Patient ID	(0010,0020)	2	Extracted for every DICOM Type received. Max length 255 characters.
Issuer of Patient ID	(0010,0021)	3	Max length 50 characters, issuer of patient ID has to be declared in DoseWatch before receiving data. Named "Domain" in DoseWatch – IHE denomination. If not configured, a default domain configured in DoseWatch is used.
Patient's Birth Date	(0010,0030)	2	Used and combined with Patient's Birth Time into a single value: date value in database.
Patient's Birth Time	(0010,0032)	3	Used and combined with Patient's Birth Date into a single value: date value in database
Patient's Sex	(0010,0040)	2	Used, possible values used are O: other, F: female, M: male.

3.4.2 Study Entity Modules

3.4.2.1 General Study Module

TABLE 3-4
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Used: max value 255 characters.
Study Date	(0008,0020)	2	Used: combined with Study Time. Use the timezone of DoseWatch to persist the study. Another field exists in DoseWatch and the date is also stored in GMT.
Study Time	(0008,0030)	2	Used: combined with Study Date.

Referring Physician's Name	(0008,0090)	2	Used: Extracted for every DICOM Type received. Shall be formatted with LAST_NAME^FIRST_NAME^MIDDLE_NAME^SUFFIX^PREFIX Max length 255 characters for each subfields.
Study ID	(0020,0010)	2	Used: max 255 characters.
Accession Number	(0008,0050)	2	Used: max 255 characters.
Study Description	(0008,1030)	3	Used: max 255 characters. Attached to site in DoseWatch and modality type for statistics.
Name of Physician(s) Reading Study	(0008,1060)	3	Used: Extracted for every DICOM Type received. Shall be formatted with LAST_NAME^FIRST_NAME^MIDDLE_NAME^SUFFIX^PREFIX Max length 255 characters for each subfields.
Referenced Study Sequence	(0008,1110)	3	Used to read referenced SOP Instance UID
>Include 'SOP Instance Reference Macro'			

3.4.2.2 Patient Study Module

TABLE 3-5
PATIENT STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Size	(0010,1020)	3	Unit: centimeter.
Patient's Weight	(0010,1030)	3	Unit: kilogram.

3.4.3 Series Entity Modules

3.4.3.1 General Series Module

Table 3-6
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Modality managed by DoseWatch: CT, XA, MG, RF, NM
Series Instance UID	(0020,000E)	1	Used: max 255 characters.
Series Number	(0020,0011)	2	Used: max int length 11.
Series Date	(0008,0021)	3	Used: combined with Series Time. Use the timezone of DoseWatch to persist the Series.
Series Time	(0008,0031)	3	Used: combined with Series Date.
Performing Physicians' Name	(0008,1050)	3	Used: Extracted for every DICOM Type received. Shall be formatted with LAST_NAME^FIRST_NAME^MIDDLE_NAME^SUFFIX^PREFIX In DoseWatch, stored at study level.
Protocol Name	(0018,1030)	3	Used: max 255 characters.

Series Description	(0008,103E)	3	Used: max 255 characters. Attached in DoseWatch with the type of modality for statistics.
Operators' Name	(0008,1070)	3	Used: Extracted for every DICOM Type received. Shall be formatted with LAST_NAME^FIRST_NAME^MIDDLE_NAME^SUFFIX^PREFIX In DoseWatch, stored at study level.
Body Part Examined	(0018,0015)	3	Stored as a target region.
Patient Position	(0018,5100)	2C	Used values stored are HFP= head first-prone, HFS=head first-supine, HFDR= head first-decubitus right, HFDL = head first-decubitus left, FFP = feet first-prone, FFS, FFDR, FFDL.
Request Attributes Sequence	(0040,0275)	3	Used.
>Requested Procedure ID	(0040,1001)	1C	Used.
>Accession Number	(0008,0050)	3	Used.
>Referenced Study Sequence	(0008,1110)	3	Used.
>> <i>Include 'SOP Instance Reference Macro'</i>			
>Requested Procedure Description	(0032,1060)	3	Used.
>Requested Procedure Code Sequence	(0032,1064)	3	Used.

3.4.4 Equipment Entity Modules

3.4.4.1 General Equipment Module

TABLE 3-7
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Used sometimes when data are retrieved from a PACS to use the right data dictionary.
Institution Name	(0008,0080)	3	Used: max 255 characters.
Institution Address	(0008,0081)	3	Used: max 255 characters.
Station Name	(0008,1010)	3	Used sometimes when data are retrieved from a PACS to use the right data dictionary.
Institutional Department Name	(0008,1040)	3	Used: max 255 characters.
Manufacturer's Model Name	(0008,1090)	3	Used sometimes when data are retrieved from a PACS to use the right data dictionary.
Software Versions	(0018,1020)	3	Used.
Pixel Padding Value	(0028,0120)	1C	Not Used.

3.4.5 Image Entity Modules

3.4.5.1 General Image Module

TABLE 3-8
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020,0013)	2	Used.
Image Type	(0008,0008)	3	See 3.4.5.5.1. Used: store only images starting with ORIGINAL\PRIMARY\AXIAL or ORIGINAL\PRIMARY\LOCALIZER
Acquisition Number	(0020,0012)	3	Used.

3.4.5.2 Image Plane Module

TABLE 3-9
IMAGE PLANE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Pixel Spacing	(0028,0030)	1	Used for the SSDE Feature.
Image Orientation (Patient)	(0020,0037)	1	Used for the SSDE Feature.
Image Position (Patient)	(0020,0032)	1	Used for the SSDE Feature.

3.4.5.3 Image Pixel Module

TABLE 3-10
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Used to read image by SSDE feature.
Rows	(0028,0010)	1	Used to read image by SSDE feature.
Columns	(0028,0011)	1	Used to read image by SSDE feature.
Bits Allocated	(0028,0100)	1	Used to read image by SSDE feature.
Bits Stored	(0028,0101)	1	Used to read image by SSDE feature.
High Bit	(0028,0102)	1	Used to read image by SSDE feature.
Pixel Representation	(0028,0103)	1	Used to read image by SSDE feature.
Pixel Data	(7FE0,0010)	1	PixelData are kept when the image is a localizer. Removed by default but can be kept when configured.

3.4.5.4 Contrast/Bolus Module

TABLE 3-11
CONTRAST/BOLUS MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Contrast/Bolus Agent			Extracted from OCR in the contrast screenshot.
Contrast/Bolus Agent Sequence	(0018,0012)	3	Used.
> Contrast/Bolus Agent Number	(0018,9337)	3	Used.
> Contrast/Bolus Volume	(0018,1041)	3	Used.
Contrast/Bolus Route			Extracted from OCR in the contrast screenshot.
Contrast/Bolus Volume			Extracted from OCR in the contrast screenshot.
Contrast/Bolus Start Time			Extracted from OCR in the contrast screenshot.
Contrast/Bolus Stop Time			Extracted from OCR in the contrast screenshot.
Contrast/Bolus Total Dose			Extracted from OCR in the contrast screenshot.
Contrast Flow Rate(s)	(0018,1046)	3	Used.
Contrast Flow Duration(s)			Extracted from OCR in the contrast screenshot.
Contrast/Bolus Ingredient			Extracted from OCR in the contrast screenshot.
Contrast/Bolus Ingredient Concentration			Extracted from OCR in the contrast screenshot.

3.4.5.5 CT Image Module

TABLE 3-12
CT IMAGE MODULE ATTRIBUTES

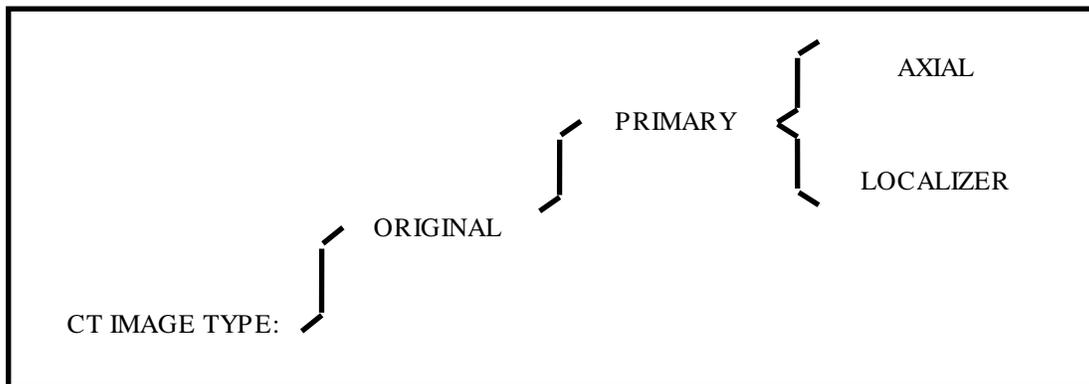
Attribute Name	Tag	Type	Use
Image Type	(0008,0008)	1	See 3.4.5.5.1. Used: store only images starting with ORIGINAL\PRIMARY\AXIAL or ORIGINAL\PRIMARY\LOCALIZER
Bits Allocated	(0028,0100)	1	Used to read image by SSDE feature.
Bits Stored	(0028,0101)	1	Used to read image by SSDE feature.
High Bit	(0028,0102)	1	Used to read image by SSDE feature.
Rescale Intercept	(0028, 1052)	1	Used to read image by SSDE feature.
Rescale Slope	(0028,1053)	1	Used to read image by SSDE feature.
KVP	(0018,0060)	2	Read and stored at CTseries level.
Acquisition Number	(0020,0012)	2	Read and stored at CTseries level.
Scan Options	(0018,0022)	3	Read and stored at CTseries level.
Data Collection Diameter	(0018,0090)	3	Read and stored at CTseries level.
Data Collection Center (Patient)	(0018,0090)	3	Read and stored at CTseries level.
Reconstruction Diameter	(0018,1100)	3	Read and stored at CTseries level.
Distance Source to Detector	(0018,1110)	3	Read and stored at CTseries level.
Distance Source to Patient	(0018,1111)	3	Read and stored at CTseries level.
Gantry/Detector Tilt	(0018,1120)	3	Read and stored at CTseries level.
Table Height	(0018,1130)	3	Read and stored at CTseries level.

Rotation Direction	(0018,1140)	3	Read and stored at CTseries level.
Exposure Time	(0018,1150)	3	Read and stored at CTseries level.
X-ray Tube Current	(0018,1151)	3	Read and stored at CTseries level.
Exposure	(0018,1152)	3	Read and stored at CTseries level.
Filter Type	(0018,1160)	3	Read and stored at CTseries level.
Generator Power	(0018,1170)	3	Read and stored at CTseries level.
Focal Spot	(0018,1190)	3	Read and stored at CTseries level.
Convolution Kernel	(0018,1210)	3	Read and stored at CTseries level.
Revolution Time	(0018,9305)	3	Read and stored at CTseries level.
Single Collimation Width	(0018,9306)	3	Read and stored at CTseries level.
Total Collimation Width	(0018,9307)	3	Read and stored at CTseries level.
Table Speed	(0018,9309)	3	Read and stored at CTseries level.
Table Feed per Rotation	(0018,9310)	3	Read and stored at CTseries level.
Spiral Pitch Factor	(0018,9311)	3	Read and stored at CTseries level.
CTDIvol	(0018,9345)	3	Read and stored at CTseries level.
CTDI Phantom Type Code Sequence	(0018,9346)	3	Read and stored at CTseries level.

3.4.5.5.1 Image Type

For CTSeries DoseWatch supports the following type of images.

ILLUSTRATION 3-1
CT IMAGE TYPE DECISION TREE



3.4.5.6 SOP Common Module

TABLE 3-13
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Used: max 255 characters.
SOP Instance UID	(0008,0018)	1	Used: max 255 characters.
Specific Character Set	(0008,0005)	1C	Used to read the object received, see 2.7.
Instance Number	(0020,0013)	3	Used.

3.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

3.6 DEVICES SUPPORTED BY DOSEWATCH

Here is the list of devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
General Electric	BrightSpeed Elite 16 Slices
	BrightSpeed Elite 4/8 Slices
	Brivo CT385
	Discovery CT590 RT
	Discovery CT750 HD
	Discovery IQ
	Discovery NM/CT 670
	Discovery PET/CT 610
	Discovery PET/CT 690/600
	Discovery PET/CT 710
	Discovery PET/CT LS
	Discovery RX
	Discovery ST
	Discovery ST 16
	Discovery STE
	HiSpeed DX/i
	HiSpeed DX/iB
	HiSpeed LX/i
	HiSpeed QX/i
	LightSpeed 16
	LightSpeed Plus
	LightSpeed Pro16
	LightSpeed Pro32
	LightSpeed QX/i
	LightSpeed RT16
	LightSpeed RT4
	LightSpeed Ultra
	LightSpeed VCT
	LightSpeed VCT XT
	LightSpeed VCT XTe
	LightSpeed Xtra
	Optima CT520
	Optima CT540
	Optima CT580
	Optima CT660
Optima NM/CT 640	
Revolution CT	
Revolution EVO	
Revolution GSI	
NeuroLogica	CereTom
NewTom	5G

Philips	BrightView XCT	
	Brilliance Big Bore	
	Brilliance-16	
	Brilliance-40	
	Brilliance-6	
	Brilliance-64	
	GEMINI GXL 16	
	GEMINI TF	
	iCT	
	iCT 128	
	Ingenuity	
	MX 16-Slice	
	Mx 8000 IDT	
	Siemens	Biograph 128 (mCT)
		Biograph 16
Biograph 20 (mCT)		
Biograph 6		
Biograph 64		
SOMATOM Definition		
SOMATOM Definition AS		
SOMATOM Definition Edge		
SOMATOM Definition Flash		
SOMATOM Emotion 16		
SOMATOM Emotion 6		
SOMATOM Force		
SOMATOM Perspective		
SOMATOM Sensation 16		
SOMATOM Sensation 40		
SOMATOM Sensation 64		
SOMATOM Sensation Open		
Symbia Intevo		
Symbia T16		
Symbia T2		
Symbia T6		
Toshiba	Activion 16	
	Aquilion	
	Aquilion LB	
	Aquilion ONE	
	Aquilion PRIME	
	Astelion	

4. DIGITAL MAMMOGRAPHY X-RAY INFORMATION OBJECT IMPLEMENTATION

4.1 INTRODUCTION

This section specifies the use of the DICOM Digital Mammography X-Ray Image IOD to represent the information included in MG Images received by this implementation. Corresponding attributes are conveyed using the module construct.

All field listed below are fields stored in database. Not all fields are displayed but they can all be exported into data exports for statistics needs.

4.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 4-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/MGStudy
Series	Series/MGSeries
Image	DicomRawImage

4.3 IOD MODULE TABLE

The MG Image Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 4.5.

TABLE 4-2
MG IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
Series	General Series	Used	3.4.3.1
	DX Series	Used	4.4.1.1
	Mammography Series	Used	4.4.1.2
Frame of Reference	Frame of Reference	Used Required if multiple images are obtained without releasing breast compression	4.4.2.1
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Used	3.4.5.1

Image Pixel	Used	4.4.3.1
Contrast/Bolus	Used	3.4.5.4
DX Anatomy Imaged	Used	4.4.3.2
DX Image	Used	4.4.3.3
DX Detector	Used	4.4.3.4
X-Ray Collimator	Used	4.4.3.5
DX Positioning	Used	4.4.3.6
X-Ray Acquisition Dose	Used	4.4.3.7
X-Ray Generation	Used	4.4.3.8
X-Ray Filtration	Used	4.4.3.9
X-Ray Grid	Used	4.4.3.10
Mammography Image	Used	4.4.3.11
VOI LUT	Used	4.4.3.12
SOP Common	Used	3.4.5.6

4.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the Digital Mammography X-Ray Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional expected. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from when generating the instance as well as what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

4.4.1 Series Entity Modules

4.4.1.1 DX Series Module

TABLE 4-3
DX SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Used: shall be MG.
Presentation Intent Type	(0008,0068)	1	Used.

4.4.1.2 Mammography Series Module

TABLE 4-4
MAMMOGRAPHY SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Value is MG.
Request Attributes Sequence	(0040,0275)	3	Used.

>Requested Procedure ID	(0040,1001)	1C	Used.
>Accession Number	(0008,0050)	3	Used.
>Requested Procedure Description	(0032,1060)	3	Used.

4.4.2 Frame Of Reference Entity Modules

4.4.2.1 Frame Of Reference Module

TABLE 4-5
FRAME OF REFERENCE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Frame of Reference UID	(0020,0052)	1	Used.

4.4.3 Image Entity Modules

4.4.3.1 Image Pixel Module

TABLE 4-6
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Used.
Photometric Interpretation	(0028,0004)	1	Used.
Rows	(0028,0010)	1	Used.
Columns	(0028,0011)	1	Used.
Bits Allocated	(0028,0100)	1	Used.
Bits Stored	(0028,0101)	1	Used.
High Bit	(0028,0102)	1	Used.
Pixel Representation	(0028,0103)	1	Used.
Pixel Data	(7FE0,0010)	1	Removed by default but can be kept by configuration if needed.
Pixel Padding Range Limit	(0028,0121)	1C	Used.

4.4.3.2 DX Anatomy Imaged Module

TABLE 4-7
DX ANATOMY IMAGED MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Laterality	(0020,0062)	1	Used.

4.4.3.3 DX Image Module

TABLE 4-8
DX IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	Used: Image type with the following keywords are kept : ORIGINAL\PRIMARY + : -LEFT

			-RIGHT -TOMO -5000 -LOW_ENERGY -HIGH_ENERGY -RECOMBINED -CESM -PROJECTION
Samples per Pixel	(0028,0002)	1	Used: Value is 1.
Photometric Interpretation	(0028,0004)	1	Used.
Bits Allocated	(0028,0100)	1	Used.
Bits Stored	(0028,0101)	1	Used.
High Bit	(0028,0102)	1	Used.
Pixel Representation	(0028,0103)	1	Used: Value is 0000H.
Pixel Intensity Relationship	(0028,1040)	1	Used.
Pixel Intensity Relationship Sign	(0028,1041)	1	Used.
Rescale Intercept	(0028,1052)	1	Used.
Rescale Slope	(0028,1053)	1	Used.
Rescale Type	(0028,1054)	1	Used.
Presentation LUT Shape	(2050,0020)	1	Used.
Lossy Image Compression	(0028,2110)	1	Used.
Acquisition Device Processing Description	(0018,1400)	3	Used.
Acquisition Device Processing Code	(0018,1401)	3	Used.
Patient Orientation	(0020,0020)	1	Used.
Burned In Annotation	(0028,0301)	1	Used.
Window Center	(0028,1050)	1C	Used.
Window Width	(0028,1051)	1C	Used.
Window Center & Width Explanation	(0028,1055)	3	Used.

4.4.3.4 DX Detector Module

TABLE 4-9
DX DETECTOR MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Detector Type	(0018,7004)	2	Used.
Detector Configuration	(0018,7005)	3	Used.
Detector Description	(0018,7006)	3	Used.
Detector ID	(0018,700A)	3	Used.
Date of Last Detector Calibration	(0018,700C)	3	Used.
Detector Binning	(0018,701A)	3	Used.
Detector Conditions Nominal Flag	(0018,7000)	3	Used.

Detector Temperature	(0018,7001)	3	Used.
Sensitivity	(0018,6000)	3	Used.
Detector Element Physical Size	(0018,7020)	3	Used.
Detector Element Spacing	(0018,7022)	3	Used.
Detector Active Shape	(0018,7024)	3	Used.
Detector Active Dimension(s)	(0018,7026)	3	Used.
Field of View Shape	(0018,1147)	3	Used.
Field of View Dimension(s)	(0018,1149)	3	Used.
Field of View Origin	(0018,7030)	1C	Used.
Field of View Rotation	(0018,7032)	1C	Used.
Field of View Horizontal Flip	(0018,7034)	1C	Used.
Imager Pixel Spacing	(0018,1164)	1	Used.

4.4.3.5 X-Ray Collimator Module

TABLE 4-10
X-RAY COLLIMATOR MODULE

Attribute Name	Tag	Type	Attribute Description
Collimator Shape	(0018,1700)	1	Used.
Collimator Left Vertical Edge	(0018,1702)	1C	Used.
Collimator Right Vertical Edge	(0018,1704)	1C	Used.
Collimator Upper Horizontal Edge	(0018,1706)	1C	Used.
Collimator Lower Horizontal Edge	(0018,1708)	1C	Used.

4.4.3.6 DX Positioning Module

TABLE 4-11
DX POSITIONING MODULE

Attribute Name	Tag	Type	Attribute Description
View Position	(0018,5101)	3	Used.
Distance Source to Patient	(0018,1111)	3	Used.
Distance Source to Detector	(0018,1110)	3	Used.
Estimated Radiographic Magnification Factor	(0018,1114)	3	Used.
Positioner Type	(0018,1508)	2	Used.
Positioner Primary Angle	(0018,1510)	3	Used.
Detector Secondary Angle	(0018,1531)	3	Used.
Body Part Thickness	(0018,11A0)	3	Used.
Compression Force	(0018,11A2)	3	Used.

4.4.3.7 X-Ray Acquisition Dose Module

TABLE 4-12
X-RAY ACQUISITION DOSE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
KVP	(0018,0060)	3	Used.
X-Ray Tube Current	(0018,1151)	3	Used.
Exposure Time	(0018,1150)	3	Used.
Exposure	(0018,1152)	3	Used.
Exposure in μ As	(0018,1153)	3	Used.
Distance Source to Detector	(0018,1110)	3	Used.
Distance Source to Patient	(0018,1111)	3	Used.
Body Part Thickness	(0018,11A0)	3	Used.
Relative X-Ray Exposure	(0018,1405)	3	Used.
Entrance Dose	(0040,0302)	3	Used.
Entrance Dose in mGy	(0040,8302)	3	Used.
Distance Source to Entrance	(0040,0306)	3	Used.
Comments on Radiation Dose	(0040,0310)	3	Used.
Organ Dose	(0040,0316)	3	Used.
Organ Exposed	(0040,0318)	3	Used generally BREAST.
Anode Target Material	(0018,1191)	3	Used.
Filter Material	(0018,7050)	3	Used.

4.4.3.8 X-Ray Generation Module

TABLE 4-13
X-RAY GENERATION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
KVP	(0018,0060)	3	Used.
X-Ray Tube Current	(0018,1151)	3	Used.
Exposure Time	(0018,1150)	3	Used.
Exposure	(0018,1152)	3	Used.
Exposure in μ As	(0018,1153)	3	Used.
Exposure Control Mode	(0018,7060)	3	Used.
Exposure Control Mode Description	(0018,7062)	3	Used.
Exposure Status	(0018,7064)	3	Used.
Focal Spot	(0018,1190)	3	Used.
Anode Target Material	(0018,1191)	3	Used.

4.4.3.9 X-Ray Filtration Module

TABLE 4-14
X-RAY FILTRATION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Filter Type	(0018,1160)	3	Used.
Filter Material	(0018,7050)	3	Used.

4.4.3.10 X-Ray Grid Module

TABLE 4-15
X-RAY GRID MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Grid	(0018,1166)	3	Used.

4.4.3.11 Mammography Image Module

TABLE 4-16
MAMMOGRAPHY IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Positioner Type	(0018,1508)	1	Used.
Distance Source to Detector	(0018,1110)	3	Used.
Distance Source to Patient	(0018,1111)	3	Used.
Positioner Primary Angle	(0018,1510)	3	Used.
Image Laterality	(0020,0062)	1	Used.
Organ Exposed	(0040,0318)	1	Used: value is BREAST.

4.4.3.12 VOI LUT Module

TABLE 4-17
VOI LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
VOI LUT Sequence	(0028,3010)	1C	Used.
>LUT Descriptor	(0028,3002)	1	Used.
>LUT Explanation	(0028,3003)	3	Used.
>LUT Data	(0028,3006)	1	Used.
Window Center	(0028,1050)	1C	Used.
Window Width	(0028,1051)	1C	Used.
Window Center & Width Explanation	(0028,1055)	3	Used.

4.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

4.6 DEVICES SUPPORTED BY DOSEWATCH

Here is the list of devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
Fuji	AMULET
General Electric	Senographe 2000D
	Senographe Essential
	Senographe Pristina
	Senographe DS
Hologic	Selenia Dimensions
	Selenia Dimensions 2D
	Lorad Selenia
IMS	Raffaello Giotto Image
Philips	MicroDose L30
	MicroDose L50
	MammoDiagnost DR
Planmed	Planmed Nuance
Siemens	MAMMOMAT Inspiration
Volpara	Volpara Server

5. SECONDARY CAPTURE INFORMATION OBJECT IMPLEMENTATION

5.1 INTRODUCTION

This section specifies the use of the DICOM SC Image IOD to represent the information included in SC Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

DoseWatch use secondary captures of type Dose Report for example series 996 and 999 for GE CT, store them as images and process OCR on them if needed.

Secondary captures are used to extract information not available in other cases. They are used for CT studies, MG Studies, RF Studies and XA Studies.

5.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 5-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/CTStudy Study/MGStudy Study/RFStudy Study/XAStudy
Series	Series/CTSeries Series/MGSeries Series/RFSeries Series/XASeries
Image	DicomRawImage

5.3 IOD MODULE TABLE

The Secondary Capture Information Object Definition comprises the modules of the following table.

TABLE 5-2
SC IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Not Used	
	Clinical Trial Series	Not Used	
Equipment	General Equipment	Not Used	
	SC Equipment	Not Used	
Image	General Image	Not Used	
	Image Pixel	Used	5.4.1.1
	Device	Not Used	
	SC Image	Not Used	
	Overlay Plane	Not Used	
	Modality LUT	Not Used	
	VOI LUT	Not Used	
	SOP Common	Not Used	

5.4 INFORMATION MODULE DEFINITIONS

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

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes expected. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

5.4.1 Image Entity Modules

5.4.1.1 Image Pixel Module

TABLE 5-3
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Used to open image and perform OCR.
Photometric Interpretation	(0028,0004)	1	Used to open image and perform OCR.
Rows	(0028,0010)	1	Used to open image and perform OCR.
Columns	(0028,0011)	1	Used to open image and perform OCR.
Bits Allocated	(0028,0100)	1	Used to open image and perform OCR.
Bits Stored	(0028,0101)	1	Used to open image and perform OCR.
High Bit	(0028,0102)	1	Used to open image and perform OCR.
Pixel Representation	(0028,0103)	1	Used to open image and perform OCR.
Pixel Data	(7FE0,0010)	1	Used to open image and perform OCR.
Planar Configuration	(0028,0006)	1C	Used to open image and perform OCR.
Pixel Aspect Ratio	(0028,0034)	1C	Used to open image and perform OCR.
Smallest Image Pixel Value	(0028,0106)	3	Used to open image and perform OCR.
Largest Image Pixel Value	(0028,0107)	3	Used to open image and perform OCR.
Pixel Padding Range Limit	(0028,0121)	1C	Used to open image and perform OCR.

5.4.1.2 Secondary captures used with OCR

OCR is used to extract specific information which can be found in the pixel data.

For GE CT systems the following secondary captures are used :

- series 996 is used to extract contrast information.
- series 999 is used to extract dose information.

For GE OEC systems, the series 1 is used to extract dose information.

For Toshiba systems, the series 9000 (may differ depend of the system or examination) is used to extract dose information.

For Siemens CT, the series 501 is used to extract contrast information.

6. X-RAY ANGIOGRAPHIC INFORMATION OBJECT IMPLEMENTATION

6.1 INTRODUCTION

This section specifies the use of the DICOM X-Ray Angiographic Image IOD to represent the information included in X-Ray Angiographic Images received by this implementation. Corresponding attributes are conveyed using the module construct.

The DICOM fields read for X-Ray Angiographic is limited in DoseWatch and completed with the usage of private interfaces for certain modalities.

6.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 6-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/XAStudy
Series	Series/XAStudy
Image	DicomRawImage

6.3 IOD MODULE TABLE

The X-Ray Angiographic Image Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 6.5.

TABLE 6-2
X-RAY ANGIOGRAPHIC IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	
Frame of Reference	Synchronization	Not Used	
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Not Used	
	Image Pixel	Not Used	
	Contrast/Bolus	Used	3.4.5.4
	Cine	Not Used	

Multi-Frame	Not Used	
Frame Pointers	Not Used	
Mask	Not Used	
Display Shutter	Not Used	
Device	Not Used	
Intervention	Not Used	
X-Ray Image	Not Used	
X-Ray Acquisition	Used	6.4.1.1
X-Ray Collimator	Not Used	
X-Ray Table	Not Used	
XA Positioner	Used	6.4.1.2
DX Detector	Not Used	
Overlay Plane	Not Used	
Multi-Frame Overlay	Not Used	
Modality LUT	Not Used	
VOI LUT	Not Used	
SOP Common	Used	3.4.5.6

6.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the X-Ray Angiographic Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes expected. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

6.4.1 Image Entity Modules

6.4.1.1 X-Ray Acquisition Module

**TABLE 6-3
X-RAY ACQUISITION MODULE**

Attribute Name	Tag	Type	Attribute Description
KV	(0018,0060)	2	Used.
X-Ray Tube Current	(0018,1151)	2C	Used.
Exposure Time	(0018,1150)	2C	Used.
Exposure	(0018,1152)	2C	Used.
Average Pulse Width	(0018,1154)	3	Used.
Radiation Mode	(0018,115A)	3	Used.
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	Used.

6.4.1.2 XA Positioner Module

TABLE 6-4
XA POSITIONER MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Distance Source to Detector	(0018,1110)	3	Used.
Positioner Primary Angle	(0018,1510)	2	Used.
Positioner Secondary Angle	(0018,1511)	2	Used.

6.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

6.6 DEVICES SUPPORTED BY DOSEWATCH

Here is the list of devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
General Electric	Brivo OEC 865
	Discovery IGS 730
	Discovery IGS 740
	Innova
	Innova 2000
	Innova 2100-IQ
	Innova 2121-IQ
	Innova 3100
	Innova 3100-IQ
	Innova 3131-IQ
	Innova 4100
	Innova 4100-IQ
	Innova IGS 520
	Innova IGS 530
	Innova IGS 540
	Innova IGS 620
	Innova IGS 630
	OEC 7900
	OEC 9800
	OEC 9900
Optima CL323i	
Other	Diamentor
Philips	Allura Xper
	Allura Xper FD10
	Allura Xper FD10/10
	Allura Xper FD20
	Allura Xper FD20/10
	Allura Xper FD20/20
	Allura Clarity
	BV Endura
BV Pulsara	

	Integris Allura
	Integris H5000
	Integris V5000
	Veradius
Siemens	ARCADIS Avantic
	ARCADIS Orbic (3D)
	ARCADIS Varic
	Artis Q
	Artis Q.zen
	Artis Zee
	Artis Zeego
	AXIOM Artis
	AXIOM Artis dBA
	AXIOM Artis dBC
	AXIOM Artis dFA
	AXIOM Artis dFC
	AXIOM Artis dMP
	AXIOM Artis dTA
	AXIOM Artis FA
	AXIOM Artis FC
	AXIOM Artis MP
	AXIOM Artis U
Cios Alpha	
Swissray	ddRFormula
Thales	Duet DRF
Toshiba	DFP-8000D
	Infinix i-Series
	INFX-8000C
	Ultimax-i
Ziehm	Ziehm Solo
	Ziehm Vision
	Ziehm Vision FD

7. X-RAY RF INFORMATION OBJECT IMPLEMENTATION

7.1 INTRODUCTION

This section specifies the use of the DICOM X-Ray RF Image IOD to represent the information included in XRF Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

All field listed below are fields stored in database. Not all fields are displayed but they can all be exported into data exports for statistics needs.

7.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 7-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/RFStudy
Series	Series/RFSeries
Image	DicomRawImage

7.3 IOD MODULE TABLE

The XRF Image Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 7.5.

TABLE 7-2
XRF IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
Series	General Series	Used	3.4.3.1
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Used	7.4.1.1
	Image Pixel	Used	4.4.3.1
	Contrast/Bolus	Used	3.4.5.4
	X-Ray Image	Used	7.4.1.2
	X-Ray Acquisition	Used	7.4.1.3
	X-Ray Collimator	Used	7.4.1.4
	XRF Positioner	Used	7.4.1.5

X-Ray Tomo Acquisition	Used	7.4.1.6
DX Detector	Used	7.4.1.7
Modality LUT	Used	7.4.1.8
VOI LUT	Used	7.4.1.9
SOP Common	Used	3.4.5.6

7.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the X-Ray RF Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes expected. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

7.4.1 Image Entity Modules

7.4.1.1 General Image Module

TABLE 7-3
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020,0013)	2	Used.
Patient Orientation	(0020,0020)	2C	Used.
Content Date	(0008,0023)	2C	Used.
Content Time	(0008,0033)	2C	Used.
Image Type	(0008,0008)	3	Used.
Acquisition Date	(0008,0022)	3	Used.
Acquisition Time	(0008,0032)	3	Used.
Derivation Description	(0008,2111)	3	Used.
>Patient Orientation	(0020,0020)	1C	Used.
Quality Control Image	(0028,0300)	3	Used.
Burned In Annotation	(0028,0301)	3	Used.
Lossy Image Compression	(0028,2110)	3	Used.

7.4.1.2 X-Ray Image Module

TABLE 7-4
X-RAY IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Lossy Image Compression	(0028,2110)	1C	Used.
Image Type	(0008,0008)	1	Used.
Pixel Intensity Relationship	(0028,1040)	1	Used.

Samples per Pixel	(0028,0002)	1	Used.
Photometric Interpretation	(0028,0004)	1	Used.
Bits Allocated	(0028,0100)	1	Used.
Bits Stored	(0028,0101)	1	Used.
High Bit	(0028,0102)	1	Used.
Pixel Representation	(0028,0103)	1	Used.
Anatomic Region Sequence	(0008,2218)	3	Used.
> Include 'Code Sequence Macro'			
Reference Image Sequence	(0008,1140)	1C	Used.
>Referenced SOP Class UID	(0008,1150)	1	Used.
Derivation Description	(0008,2111)	3	Used.
Acquisition Device Processing Description	(0018,1400)	3	Used.

7.4.1.3 X-Ray Acquisition Module

TABLE 7-5
X-RAY ACQUISITION MODULE

Attribute Name	Tag	Type	Attribute Description
KV	(0018,0060)	2	Used.
X-Ray Tube Current	(0018,1151)	2C	Used.
X-Ray Tube Current in microA	(0018,8151)	3	Used.
Exposure Time	(0018,1150)	2C	Used.
Exposure	(0018,1152)	2C	Used.
Exposure in microAs	(0018,1153)	3	Used.
Grid	(0018,1166)	3	Used.
Field of View Shape	(0018,1147)	3	Used.
Field of View Dimension(s)	(0018,1149)	3	Used.
Imager Pixel Spacing	(0018,1164)	3	Used.
Pixel Spacing	(0028,0030)	1C	Used.
Focal Spot	(0018,1190)	3	Used.
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	Used.

7.4.1.4 X-Ray Collimator

TABLE 7-6
X-RAY COLLIMATOR MODULE

Attribute Name	Tag	Type	Attribute Description
Collimator Shape	(0018,1700)	1	Used.
Vertices of the Polygonal Collimator	(0018,1720)	1C	Used.

7.4.1.5 XRF Positioner Module

TABLE 7-7
XRF POSITIONER MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Distance Source to Detector	(0018,1110)	3	Used.
Distance Source to Patient	(0018,1111)	3	Used.

7.4.1.6 X-Ray Tomo Acquisition Module

TABLE 7-8
X-RAY TOMO ACQUISITION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Tomo Layer Height	(0018,1460)	1	Used.
Tomo Angle	(0018,1470)	3	Used.
Tomo Time	(0018,1480)	3	Used.
Tomo Type	(0018,1490)	3	Used.
Tomo Class	(0018,1491)	3	Used.
Number of Tomosynthesis Source Images	(0018,1495)	3	Used.

7.4.1.7 DX Detector Module

TABLE 7-9
DX DETECTOR MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Detector Type	(0018,7004)	2	Used.
Detector Configuration	(0018,7005)	3	Used.
Detector ID	(0018,700A)	3	Used.
Detector Binning	(0018,701A)	3	Used.
Detector Conditions Nominal Flag	(0018,7000)	3	Used.
Detector Temperature	(0018,7001)	3	Used.
Sensitivity	(0018,6000)	3	Used.
Detector Element Physical Size	(0018,7020)	3	Used.
Detector Element Spacing	(0018,7022)	3	Used.
Detector Active Shape	(0018,7024)	3	Used.
Detector Active Dimension(s)	(0018,7026)	3	Used.
Field of View Shape	(0018,1147)	3	Used.
Field of View Dimension(s)	(0018,1149)	3	Used.
Field of View Origin	(0018,7030)	1C	Used.
Field of View Rotation	(0018,7032)	1C	Used.
Field of View Horizontal Flip	(0018,7034)	1C	Used.
Imager Pixel Spacing	(0018,1164)	1	Used.
Pixel Spacing	(0028,0030)	1C	Used.

7.4.1.8 Modality LUT module

TABLE 7-10
MODALITY LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality LUT Sequence	(0028,3000)	1C	Used.
>LUT Descriptor	(0028,3002)	1	Used.
>LUT Explanation	(0028,3003)	3	Used.
>LUT Data	(0028,3006)	1	Used.
Rescale Slope	(0028,1052)	1C	Used.
Rescale Intercept	(0028,1053)	1C	Used.
Rescale Type	(0028,1054)	1C	Used.

7.4.1.9 VOI LUT module

TABLE 7-11
VOI LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
VOI LUT Sequence	(0028,3010)	1C	Used.
>LUT Descriptor	(0028,3002)	1	Used.
>LUT Explanation	(0028,3003)	3	Used.
>LUT Data	(0028,3006)	1	Used.
Window Center	(0028,1050)	1C	Used.
Window Width	(0028,1051)	1C	Used.
Window Center & Width Explanation	(0028,1055)	3	Used.

7.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary proprietary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

7.6 DEVICES SUPPORTED BY DOSEWATCH

Here are devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
ADORA	Adora
AGFA	DR 400
	DR 600
	DX-D 100
	DX-D 300
	DX-D 500
	DX-D 600
Carestream	DR 9500
	DRX-1

	DRX-Mobile Retrofit
	DRX-Evolution
	DRX-Revolution
Control-X Medical LTD	Perform-X AT
Fuji	DR-ID 300CL
	FCR Go 2
	FDR AcSelerate
	FDR Go
EOS Imaging	EOS
Fujifilm	DR-ID 300CL

	FCR Go 2
	FDR AcSelerate
	FDR Go
	SonialVision G4
General Electric	Brivo XR385
	Connexity
	Definium 5000
	Definium 6000
	Definium 8000
	Definium AMX 700
	Discovery XR650
	Discovery XR656
	Optima XR200amx
	Optima XR220amx
	Optima XR646
	Precision 500D
	Revolution XRd
General Medical Merate	Opera Swing
	Opera T90
	Opera T2000tr
Hologic	Fluoroscan InSight
Instrumentarium	ORTHOPANTOMOGRAPH® OP300
Kodak	DR 3500
Konica Minolta	AeroDR X30
	AeroDR X70
Mecall	EIDOS RF4300
OrthoScan	OrthoScan HD Mini C-arm
Philips	DigitalDiagnost
	DigitalDiagnost R1.5.3.1
	EasyDiagnost Eleva DRF
	Essenta DR Compact
	Juno DRF
	MobileDiagnost wDR

	MultiDiagnost Eleva
	PCR Eleva CosimaX
	ProGrade
PrimaX	CLISSIS EXEL DRF
	Kalos
Samsung	GF50
	XGEO GC85A
Shimadzu	MobileDaRt Evolution
	UD150V-40
Siemens	AXIOM Aristos FX Plus
	AXIOM Aristos MX
	AXIOM Aristos TX
	AXIOM Aristos VX
	AXIOM Iconos MD
	AXIOM Sireskop SD
	Fluorospot Compact FD
	Luminos
	Luminos Agile
	Luminos dRF
	Luminos Fusion
	Mobilett Mira
	Mobilett Mira Max
	Mobilett XP Digital
	Multix Fusion
	Uroskop Access
	Uroskop Omnia
Ysio	
Ysio Max	
STEPHANIX	Evolution HV
	D²RS
Xograph	buckyStar
	Triathlon T3

8. CT/X-RAY RADIATION DOSE STRUCTURED REPORT INFORMATION OBJECT IMPLEMENTATION

8.1 INTRODUCTION

This section specifies the use of the DICOM CT/X-Ray Radiation Dose SR IOD to represent results **produced and received** by this implementation. Corresponding attributes are conveyed using the module construct.

8.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 8-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study
Series	Series
Document	DicomMessage

8.3 IOD MODULE TABLE

The CT/X-Ray Radiation Dose Structured Report Information Object Definitions comprise the modules of the following tables.

The contents of the SR Document Content are constrained by the supported template, as identified in Section 8.4.3.4.1. Standard, Standard Extended and Private templates are further described in Section 8.5.

TABLE 8-2
STRUCTURE REPORT IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
Series	SR Document Series	Used	8.4.2.1
Equipment	General Equipment	Used	3.4.4.1(for SR Reading) 8.4.1.1 (for SR production)
Document	SR Document General	Used	8.4.3.1
	SR Document Content	Used	8.4.3.2
	SOP Common	Used	8.4.3.3

8.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the SR Information Objects.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported and expected . Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from when generating the instance as well as what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

8.4.1 Equipment Entity Modules

8.4.1.1 General Equipment Module

TABLE 8-3
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Use "GE Medical Systems".
Institution Name	(0008,0080)	3	Use the name of the institution if provided by the original modality.
Institution Address	(0008,0081)	3	Use the address of the institution if provided by the original modality.
Station Name	(0008,1010)	3	Use the station name provided by the original modality as it is useful for the receiver.
Institutional Department Name	(0008,1040)	3	Use the department name if provided by the original modality.
Manufacturer's Model Name	(0008,1090)	3	Use "DoseWatch".

8.4.2 Series Entity Modules

8.4.2.1 SR Document Series Module

TABLE 8-4
SR DOCUMENT SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Used.
Series Instance UID	(0020,000E)	1	Used.
Series Number	(0020,0011)	1	Used.
Series Date	(0008,0021)	3	Used.
Series Time	(0008,0031)	3	Used.
Series Description	(0008,103E)	3	Used.
Referenced Performed Procedure Step Sequence	(0008,1111)	2	Used.
> 'Referenced SOP Class / Instance UIDs'			

8.4.3 Document Entity Modules

8.4.3.1 SR Document General Module

TABLE 8-5
SR DOCUMENT GENERAL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020,0013)	1	Used.
Referenced Request Sequence	(0040,A370)	1C	Used.
>Study Instance UID	(0020,000D)	1	Used.
>Referenced Study Sequence	(0008,1110)	2	Used.
>>Include 'SOP Instance Reference Macro'			
>Accession Number	(0008,0050)	2	Used.
>Placer Order Number/Imaging Service Request	(0040,2016)	2	Used.
>Filler Order Number/Imaging Service Request	(0040,2017)	2	Used.
>Requested Procedure ID	(0040,1001)	2	Used.
>Requested Procedure Description	(0032,1060)	2	Used.
>Requested Procedure Code Sequence	(0032,1064)	2	Used.
>>Include 'Code Sequence Macro'			
Performed Procedure Code Sequence	(0040,A372)	2	Used.
>Include 'Code Sequence Macro'			

8.4.3.2 SR Document Content Module

TABLE 8-6
SR DOCUMENT CONTENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Content Template Sequence	(0040,A504)	1C	Used.
>Mapping Resource	(0008,0105)	1	Used.
>Template Identifier	(0040,DB00)	1	Used.
Value Type	(0040,A040)	1	Used.
Continuity of Content	(0040,A050)	1C	Used.
Concept Name Code Sequence	(0040,A043)	1C	Used.
>Include 'Code Sequence Macro'			
Content Sequence	(0040,A730)	1C	Used.
> Relationship Type	(0040,A010)	1	
> Insert SR DocumentContent Module			Recursive inclusion to create document content tree. See section 8.4.3.4 for the list of supported templates

8.4.3.3 SOP Common Module

TABLE 8.4-5
SOP COMMON MODULE ATTRIBUTES USED FOR RDSR GENERATION

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Used: max 255 characters.
SOP Instance UID	(0008,0018)	1	Used: max 255 characters.
Specific Character Set	(0008,0005)	1C	Used to read the object received, see 2.7.
Instance Number	(0020,0013)	3	Used.
>Purpose of Reference Code Sequence	(0040,A170)	1	Use (109101, DCM, "Acquisition Equipment")
>>Include 'Code Sequence Macro'			
>Manufacturer	(0008,0070)	1	Use the Manufacturer of the device which sent the examination
>Station Name	(0008,1010)	3	Use the station of the device which sent the examination as configured in DoseWatch
>Manufacturer's Model Name	(0008,1090)	3	Use the Manufacturer's Model Name of the device which sent the examination

8.4.3.4 SR Document Content Descriptions

8.4.3.4.1 Content Template

The product supports the following root Templates for SR SOP Instances created, processed, or displayed by the product.

TABLE 8-7
SR ROOT TEMPLATES

SOP Class	Template ID	Template Name	Use
X-Ray Radiation Dose SR	10001	X-Ray Radiation Dose	Create/Display
	10011	CT Radiation Dose	Create/Display

Refer to section 8.5 for a detailed description of the supported templates.

8.5 STANDARD, STANDARD EXTENDED AND PRIVATE TEMPLATES

The Product supports the Standard Extended and Private Templates defined in the following sections.

8.5.1 Standard Templates

The Product supports the following standard templates for SOP Instances created by this product.

8.5.1.1 Template ID 10001 X-Ray Radiation Dose

This Template defines the structure of the X-Ray Radiation Dose SR **produced** by DoseWatch. The template declared in DoseWatch can be easily changed if needed. Currently the SR Generated is defined only for XA modalities. There is no SR generated for MG or RF modalities.

TABLE 8-8 TID 10001.
PROJECTION X-RAY RADIATION DOSE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113701, DCM, "X-Ray Radiation Dose Report")	1	M		Root node
2	>	HAS CONCEPT MOD	CODE	EV (121058, DCM, "Procedure reported")	1	M		DT (113704, DCM, "Projection X-Ray")
3	>>	HAS CONCEPT MOD	CODE	EV (G-C0E8, SRT, "Has Intent")	1	M		DCID 3629 "Procedure Intent". Always use (R-002E9 ,SRT, "Combined Diagnostic and Therapeutic Procedure") in XA Modalities
5	>		INCLUDE	DTID 1002 "Observer Context"	2	M		See TID 1002. Observer context for device and TID 1002. Observer context for person
6	>	HAS OBS CONTEXT	CODE	EV (113705, DCM, "Scope of Accumulation")	1	M		(113014 ,DCM, "Study") Always used
7	>>	HAS PROPERTIES	UIDREF	DCID 10001 "UID Types"	1	M		Use Study Instance UID
11	>	CONTAINS	INCLUDE	DTID 10002 "Accumulated X-Ray Dose"	1	MC	IFF Single Plane system	\$Plane = EV (113622, DCM, "Single Plane") See TID 10002. Accumulated X-Ray Dose
12	>	CONTAINS	INCLUDE	DTID 10002 "Accumulated X-Ray Dose"	1	MC	IFF Biplane system	\$Plane = EV (113620, DCM, "Plane A") See TID 10002. Accumulated X-Ray Dose
13	>	CONTAINS	INCLUDE	DTID 10002 "Accumulated X-Ray Dose"	1	MC	IFF Biplane system	\$Plane = EV (113621, DCM, "Plane B") See TID 10002. Accumulated X-Ray Dose
14	>	CONTAINS	INCLUDE	DTID 10003 "Irradiation Event X-Ray Data"	1-n	MC		See TID 10003. Irradiation Event X-Ray Data
18	>	CONTAINS	CODE	EV (113854, DCM, "Source of Dose Information")	1	M		(113856 ,DCM, "Automated Data Collection") is always used

TABLE 8-9 TID 1002.
OBSERVER CONTEXT FOR DEVICE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1		HAS OBS CONTEXT	CODE	EV (121005, DCM, "Observer Type")	1	MC	IF Observer type is device	"Device" is used
3		HAS OBS CONTEXT	INCLUDE	DTID 1004 "Device Observer Identifying Attributes"	1	MC	IF Row 1 value = (121007, DCM, "Device")	See TID 10004. Accumulated Fluoroscopy and Acquisition Projection X-Ray Dose

Table 8-10 TID 1004.
DEVICE OBSERVER IDENTIFYING ATTRIBUTES

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			UIDREF	EV (121012, DCM, "Device Observer UID")	1	M		DoseWatch UID is used "1.2.840.113619.2.326"
2			TEXT	EV (121013, DCM, "Device Observer Name")	1	U		Use the AET of the device as configured in DoseWatch
3			TEXT	EV (121014, DCM, "Device Observer Manufacturer")	1	U		Use the manufacturer of the device as configured in DoseWatch
4			TEXT	EV (121015, DCM, "Device Observer Model Name")	1	U		Use the model name as configured in DoseWatch

TABLE 8-11 TID 1002.
OBSERVER CONTEXT FOR PERSON

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1		HAS OBS CONTEXT	CODE	EV (121005, DCM, "Observer Type")	1	MC	IF Observer type is device	"Person" is used
2		HAS OBS CONTEXT	INCLUDE	DTID 1003 "Person Observer Identifying Attributes"	1	MC	IF Row 1 value = (121006, DCM, "Person") or Row 1 is absent	See TID 1003. Person Observer Identifying Attributes

TABLE 8-12 TID 1003.
PERSON OBSERVER IDENTIFYING ATTRIBUTES

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			PNAME	EV (121008, DCM, "Person Observer Name")	1	M		Use the name of the operator who performed the study
3			CODE	EV (121010, DCM, "Person Observer's Role in the Organization")	1	U		Use "Radiologic Technologist"
4			CODE	EV (121011, DCM, "Person Observer's Role in this Procedure")	1	U		Use "Assisting"

TABLE 8-13 TID 10002.
ACCUMULATED X-RAY DOSE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113702, DCM, "Accumulated X-Ray Dose Data")	1	M		
2	>	HAS CONCEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	1	M		Value : Plane A, Plane B or Single Plane
10	>	CONTAINS	INCLUDE	DTID 10004 "Accumulated Fluoroscopy and Acquisition Projection X-Ray Dose"	1	MC	IFF TID (10001) Row 4 = (113957, DCM, "Fluoroscopy-Guided Projection Radiography System") or TID (10001) Row 2 = (113704, DCM, "Projection X-Ray") and TID (10001) Row 4 is absent)	See TID 10004. Accumulated Fluoroscopy and Acquisition Projection X-Ray Dose
12	>	CONTAINS	INCLUDE	DTID 10007 "Accumulated Total Projection Radiography Dose"	1	MC	IFF TID (10001) Row 4 = (113958, DCM, "Integrated Projection Radiography System") or TID (10001) Row 4 = (113957, DCM, "Fluoroscopy-Guided Projection Radiography System") or TID (10001) Row 2 = (113704, DCM, "Projection X-Ray") and TID (10001) Row 4 is absent)	See TID 10007. Accumulated Total Projection Radiography Dose

TABLE 8-14 TID 10003.
IRRADIATION EVENT X-RAY DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113706, DCM, "Irradiation Event X-Ray Data")	1	M		
2	>	HAS CONCEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	1	M		Value : Plane A, Plane B or Single Plane
3	>	CONTAINS	UIDREF	EV (113769, DCM, "Irradiation Event UID")	1	M		Use a DoseWatch generated UID
6	>	CONTAINS	DATETIME	DT (111526, DCM, "DateTime Started")	1	M		Use the series date if provided by the device. Left empty if nothing was provided
7	>	CONTAINS	CODE	EV (113721, DCM, "Irradiation Event Type")	1	M		Use Fluoroscopy, Stationary Acquisition, Stepping Acquisition or Rotational Acquisition

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
8	>	CONTAINS	TEXT	EV (125203, DCM, "Acquisition Protocol")	1	U		Use the series' protocol name provided. If nothing provided the node won't be added
14	>	CONTAINS	CODE	EV (113745, DCM, "Patient Table Relationship")	1	U		Use values defined in DCID 21 "Patient Equipment Relationship"
15	>	CONTAINS	CODE	EV (113743, DCM, "Patient Orientation")	1	U		Use values defined in DCID 19 "Patient Orientation"
16	>	CONTAINS	CODE	EV (113744, DCM, "Patient Orientation Modifier")	1	M		Use values defined in DCID 20 "Patient Orientation Modifier"
17	>	CONTAINS	CODE	EV (123014, DCM, "Target Region")	1	M		Use values defined in DCID 4031 "Common Anatomic Regions"
18	>	CONTAINS	NUM	EV (122130, DCM, "Dose Area Product")	1	MC		UNITS = EV (Gy.m2, UCUM, "Gy.m2")
20	>	CONTAINS	NUM	EV (111638, DCM, "Patient Equivalent Thickness")	1	U		Units = EV (mm, UCUM, "mm")
28	>	CONTAINS	INCLUDE	DTID 10003B "Irradiation Event X-Ray Source Data"	1	MC		See TID 10003B. Irradiation Event X-Ray Data
29	>	CONTAINS	INCLUDE	DTID 10003C "Irradiation Event X-Ray Mechanical Data"	1	MC		See TID 10003C. Irradiation Event X-Ray Mechanical Data

TABLE 8-15 TID 10003B.
IRRADIATION EVENT X-RAY SOURCE DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	EV (113738, DCM, "Dose (RP) ")	1	MC		UNITS = EV (Gy, UCUM, "Gy")
3			CODE	EV (113780, DCM, "Reference Point Definition")	1	MC	IF Row 1 is present and Row 2 is not present	DCID 10025 "Radiation Dose Reference Points"
5			CODE	EV(113732, DCM, "Fluoro Mode")	1	UC	IFF TID (1003) Row 7 value = (P5-06000,SRT,"Fluoroscropy")	Can be (113630,DCM,"Continuous") Or (113631,DCM,"Pulsed")
6			NUM	EV (113791, DCM, "Pulse Rate")	1	MC	IFF Row 5 value = (113631,DCM,"Pulsed")	UNITS = EV({pulse}/s, UCUM, "pulse/s") Give the frames per second given by the device
7			NUM	EV (113768, DCM, "Number of Pulses")	1	MC	IFF Row 5 is not present or Row 5 is present and equals (113631, DCM, "Pulsed")	UNITS = EV (1, UCUM, "no units")
9			NUM	EV (113793, DCM, "Pulse Width")	1	U		UNITS = EV (ms, UCUM, "ms")

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
10			NUM	EV (113742, DCM, "Irradiation Duration")	1	U		UNITS = EV (s, UCUM, "ms")
11			NUM	EV (113733, DCM, "KVP")	1	M		UNITS = EV (kV, UCUM, "kV")
12			NUM	EV (113734, DCM, "X-Ray Tube Current")	1	MC		UNITS = EV (mA, UCUM, "mA")
14			NUM	EV (113824, DCM, "Exposure Time")	1	MC		UNITS = EV (ms, UCUM, "ms")
16			NUM	EV (113766, DCM, "Focal Spot Size")	1	U		UNITS = EV (mm, UCUM, "mm")
18			CONTAINER	EV (113771, DCM, "X-Ray Filters")	2	U		
19	>	CONTAINS	CODE	EV (113772, DCM, "X-Ray Filter Type")	1	U		Can be Strip filter Wedge filter Butterfly filter Flat filter No Filter
20	>	CONTAINS	CODE	EV (113757, DCM, "X-Ray Filter Material")	1	U		Use values in DCID 10006 "X-Ray filter Materials"
21	>	CONTAINS	NUM	EV (113758, DCM, "X-Ray Filter Thickness Minimum")	1	U		Filled with what device sent. Display two decimals
22	>	CONTAINS	NUM	EV (113773, DCM, "X-Ray Filter Thickness Maximum")	1	U		Filled with what device sent. Display two decimals
23			NUM	EV (113790, DCM, "Collimated Field Area")	1	U		UNITS = EV (m2, UCUM, "m2"). Display two decimals
24			NUM	EV (113788, DCM, "Collimated Field Height")	1	U		UNITS = EV (mm, UCUM, "mm"). Display two decimals
25			NUM	EV (113789, DCM, "Collimated Field Width")	1	U		UNITS = EV (mm, UCUM, "mm"). Display two decimals
26			CODE	EV (111635, DCM, "X-Ray Grid")	1-n	U		Can be (111641,DCM, Fixed Grid) (111642,DCM,Focused Grid) (111643,DCM,Reciprocatin g grid) (111644,DCM,Parallel Grid) (111645,DCM, Crossed Grid) (111646,DCM,No grid)

TABLE 8-16 TID 10003C.
IRRADIATION EVENT X-RAY MECHANICAL DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
2			NUM	EV (112011, DCM, "Positioner Primary Angle")	1	UC	XOR Row 6	UNITS = EV (deg, UCUM, "deg"). Display two decimals.
3			NUM	EV (112012, DCM, "Positioner Secondary Angle")	1	UC	XOR Row 6	UNITS = EV (deg, UCUM, "deg"). Display two decimals.
4			NUM	EV(113739, DCM, "Positionner Primary End Angle")	1	UC	IFF TID (10003) Row 7 value = (1136313, DCM, "Rotational Acquisition")	UNITS = EV (deg, UCUM, "deg")
5			NUM	EV(113740, DCM, "Positionner Secondary End Angle")	1	UC	IFF TID (10003) Row 7 value = (1136313, DCM, "Rotational Acquisition")	UNITS = EV (deg, UCUM, "deg")
7			NUM	EV(113754, DCM, "Table Head Tilt Angle")	1	U		UNITS = EV (deg, UCUM, "deg")
8			NUM	EV(113755, DCM, "Table Horizontal Rotation Angle")	1	U		UNITS = EV (deg, UCUM, "deg")
9			NUM	EV(113756, DCM, "Table Cradle Tilt Angle")	1	U		UNITS = EV (deg, UCUM, "deg")
11			NUM	DCID 10008 "Dose Related Distance Measurements"	1-n	U		UNITS = EV (mm, UCUM, "mm") Table 8-19 CID 10008.

TABLE 8-17 TID 10004.
ACCUMULATED FLUOROSCOPY AND ACQUISITION PROJECTION X-RAY DOSE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	EV (113726, DCM, "Fluoro Dose Area Product Total")	1	MC	IF TID (10003) Row 7 value = (P5-06000, SRT, "Fluoroscopy") for at least one irradiation event	UNITS = EV (Gy.m2, UCUM, "Gy.m2") Re-use the data the modality sent
2			NUM	EV (113728, DCM, "Fluoro Dose (RP) Total")	1	MC	IF TID (10003) Row 7 value = (P5-06000, SRT, "Fluoroscopy") for at least one irradiation event AND any of the values of TID (10001) Row 18 are not (113858, DCM, "MPPS Content").	UNITS = EV (Gy, UCUM, "Gy") Re-use the data the modality sent
3			NUM	EV (113730, DCM, "Total Fluoro Time")	1	MC	IF TID (10003) Row 7 value = (P5-06000, SRT,	UNITS = EV (s, UCUM, "s")

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
							"Fluoroscopy") for at least one irradiation event.	Re-use the data the modality sent
4			NUM	EV (113727, DCM, "Acquisition Dose Area Product Total")	1	M		UNITS = EV (Gy.m2, UCUM, "Gy.m2") Re-use the data the modality sent
5			NUM	EV (113729, DCM, "Acquisition Dose (RP) Total")	1	MC	IF any of the values of TID (10001) Row 18 are not (113858, DCM, "MPPS Content"). May be present otherwise.	UNITS = EV (Gy, UCUM, "Gy") Re-use the data the modality sent
6			NUM	EV (113855, DCM, "Total Acquisition Time")	1	M		UNITS = EV (s, UCUM, "s") Re-use the data the modality sent

TABLE 8-18 TID 10007.
ACCUMULATED TOTAL PROJECTION RADIOGRAPHY DOSE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	EV (113722, DCM, "Dose Area Product Total")	1	M		UNITS = EV (Gy.m2, UCUM, "Gy.m2")
2			NUM	EV (113725, DCM, "Dose (RP) Total")	1	MC	IF TID (10001) Row 4 = (113958, DCM, "Integrated Projection Radiography System") or any of the values of TID (10001) Row 18 are not (113858, DCM, "MPPS Content").	UNITS = EV (Gy, UCUM, "Gy")
5			CODE	EV (113780, DCM, "Reference Point Definition")	1	MC	IF any of (113725, DCM, "Dose (RP) Total"), (113728, DCM, "Fluoro Dose (RP) Total") or (113729, DCM, "Acquisition Dose (RP) Total") are present, and Row 6 is not present.	DCID 10025 "Radiation Dose Reference Points"
6			TEXT	EV (113780, DCM, "Reference Point Definition")	1	MC	IF any of (113725, DCM, "Dose (RP) Total"), (113728, DCM, "Fluoro Dose (RP) Total") or (113729, DCM, "Acquisition Dose (RP) Total") are present, and Row 5 is not present.	

TABLE 8-19 CID 10008.
DOSE RELATED DISTANCE MEASUREMENTS

Code Scheme Designator	Code Value	Code Meaning	Comment
DCM	113748	Distance Source to Isocenter	Display two decimals
DCM	113737	Distance Source to Reference Point	Display two decimals
DCM	113750	Distance Source to Detector	Display two decimals
DCM	113751	Table Longitudinal Position	

Code Scheme Designator	Code Value	Code Meaning	Comment
DCM	113752	Table Lateral Position	
DCM	113753	Table Height Position	
DCM	113759	Table Longitudinal End Position	
DCM	113760	Table Lateral End Position	
DCM	113761	Table Height End Position	

8.5.1.2 Template ID 10011 CT Radiation Dose

This Template defines the CT Radiation Dose Report generated by the DoseWatch. This template is easily editable in the software if needed.

TABLE 8-20 TID 10011.
CT Radiation Dose

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113701, DCM, "X-Ray Radiation Dose Report")	1	M		Root node
2	>	HAS CONCEPT MOD	CODE	EV (121058, DCM, "Procedure reported")	1	M		EV (P5-08000, SRT, "Computed Tomography X-Ray")
3	>>	HAS CONCEPT MOD	CODE	EV (G-C0E8, SRT, "Has Intent")	1	M		DCID 3629 "Procedure Intent"
4	>		INCLUDE	DTID 1002 "Observer Context"	2	M		See TID 1002. Observer context for device and TID 1002. Observer context for person
5	>	HAS OBS CONTEXT	DATETIME	EV (113809, DCM, "Start of X-Ray Irradiation")	1	M		Based on the study start of X-Ray Irradiation if provided. If not the the study date is used
6	>	HAS OBS CONTEXT	DATETIME	EV (113810, DCM, "End of X-Ray Irradiation")	1	M		Based on the study end of X-Ray Irradiation if provided. If not the the study date is used
7	>	HAS OBS CONTEXT	CODE	EV (113705, DCM, "Scope of Accumulation")	1	M		DCID 10000 "Scope of Accumulation" Use (113014,DCM,"Study")
8	>>	HAS PROPERTIES	UIDREF	DCID 10001 "UID Types"				Use (110180,DCM, "Study Instance UID")
9	>	CONTAINS	INCLUDE	DTID 10012 "CT Accumulated Dose Data"	1	M		See TID 10012. CT Accumulated Dose Data
14	>	CONTAINS	INCLUDE	DTID 10013 "CT Irradiation Event Data"	1-n	M		Iterate of all series received to display : protocol, target region, Irradiation event UID, exposure time, scanning length, nominal single collimation width, number of X-Ray- Sources ... See TID 10013.

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
								CT Irradiation Event Data
15	>	CONTAINS	CODE	EV (113854, DCM, "Source of Dose Information")	1	M		Use Automated Data Collection

The table below lists the fields used for CT Accumulated Dose Data. They are all based on information given by the modality.

TABLE 8-21 TID 10012.
CT ACCUMULATED DOSE DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113811, DCM, "CT Accumulated Dose Data")	1	M		
2	>	CONTAINS	NUM	EV (113812, DCM, "Total Number of Irradiation Events")	1	M		UNITS = EV {{events}, UCUM, "events")
3	>	CONTAINS	NUM	EV (113813, DCM, "CT Dose Length Product Total")	1	M		UNITS = EV (mGy.cm, UCUM, "mGy.cm")
7	>>	HAS CONCEPT MOD	CODE	EV (G-C036, SRT, "Measurement Method")	1	M		Use "AAPM 204 Sum of Lateral and AP Dimension"

The table below lists the fields used for each irradiation events. They are all based on information given by the modality.

TABLE 8-22 TID 10013.
CT IRRADIATION EVENT DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113819, DCM, "CT Acquisition")	1	M		
2	>	CONTAINS	TEXT	EV (125203, DCM, "Acquisition Protocol")	1	U		Use the serie protocol name
3	>	CONTAINS	CODE	EV (123014, DCM, "Target Region")	1	M		DCID 4030 "CT, MR and PET Anatomy Imaged" Not displayed if the modality did not send it
4	>	CONTAINS	CODE	EV (113820, DCM, "CT Acquisition Type")	1	M		Value can be : Constant Angle Acquisition Spiral Acquisition Stationary Acquisition Sequenced Acquisition
6	>	CONTAINS	UIDREF	EV (113769, DCM, "Irradiation Event UID")	1	M		Use a UID generated by DoseWatch
7	>	CONTAINS	CONTAINER	EV (113822, DCM, "CT Acquisition Parameters")	1	M		
8	>>	CONTAINS	NUM	EV (113824, DCM, "Exposure Time")	1	M		UNITS = EV (s, UCUM, "s")

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
9	>>	CONTAINS	INCLUDE	DTID 10014 "Scanning Length"	1	M		
10	>>	CONTAINS	NUM	EV (113826, DCM, "Nominal Single Collimation Width")	1	M		UNITS = EV (mm, UCUM, "mm")
11	>>	CONTAINS	NUM	EV (113827, DCM, "Nominal Total Collimation Width")	1	M		UNITS = EV (mm, UCUM, "mm")
12	>>	CONTAINS	NUM	EV (113828, DCM, "Pitch Factor")	1	MC	IF row 4 equals (P5- 08001, SRT, "Spiral Acquisition") or equals (113804, DCM, "Sequenced Acquisition")	UNITS = EV {ratio}, UCUM, "ratio")
13	>>	CONTAINS	NUM	EV (113823, DCM, "Number of X-Ray Sources")	1	M		UNITS = EV {{X-Ray sources}, UCUM, "X-Ray sources")
14	>>	CONTAINS	CONTAINER	EV (113831, DCM, "CT X-Ray Source Parameters")	1-n	M		
15	>>>	CONTAINS	TEXT	EV (113832, DCM, "Identification of the X-Ray Source")	1	M		
16	>>>	CONTAINS	NUM	EV (113733, DCM, "KVP")	1	M		UNITS = EV (kV, UCUM, "kV")
17	>>>	CONTAINS	NUM	EV (113833, DCM, "Maximum X-Ray Tube Current")	1	M		UNITS = EV (mA, UCUM, "mA")
18	>>>	CONTAINS	NUM	EV (113734, DCM, "X- Ray Tube Current")	1	M		UNITS = EV (mA, UCUM, "mA")
19	>>>	CONTAINS	NUM	EV (113834, DCM, "Exposure Time per Rotation")	1	MC	IF row 4 does not equal (113805, DCM, "Constant Angle Acquisition")	UNITS = EV (s, UCUM, "s")
21	>	CONTAINS	CONTAINER	EV (113829, DCM, "CT Dose")	1	MC	IF row 4 does not equal (113805, DCM, "Constant Angle Acquisition")	
22	>>	CONTAINS	NUM	EV (113830, DCM, "Mean CTDIvol")	1	M		UNITS = EV (mGy, UCUM, "mGy")
23	>>	CONTAINS	CODE	EV (113835, DCM, "CTDIw Phantom Type")	1	M		DCID 4052 "Phantom Devices"
26	>>	CONTAINS	NUM	EV (113838, DCM, "DLP")	1	M		UNITS = EV (mGy.cm, UCUM, "mGy.cm")
28	>>>	HAS CONCEPT MOD	CODE	EV (G-C036, SRT, "Measurement Method")	1	MC		DCID 10011 "Effective Dose Evaluation Method"
30	>>	CONTAINS	NUM	EV (113930, DCM, "Size Specific Dose Estimation")	1-n	U		UNITS = EV (mGy, UCUM, "mGy")

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
31	>>>	HAS CONCEPT MOD	CODE	EV (G-C036, SRT, "Measurement Method")	1	M		Use "AAPM 204 Sum of Lateral and AP Dimension"
32	>>>>	INFERRED FROM	NUM	EV (113931, DCM, "Measured Lateral Dimension")	1	MC	IF row 31 equals (113934, DCM, "AAPM 204 Lateral Dimension") or (113936, DCM, "AAPM 204 Sum of Lateral and AP Dimension")	UNITS = EV (mm, UCUM, "mm")
33	>>>>	INFERRED FROM	NUM	EV (113932, DCM, "Measured AP Dimension")	1	MC	IF row 31 equals (113935, DCM, "AAPM 204 AP Dimension") or (113936, DCM, "AAPM 204 Sum of Lateral and AP Dimension")	UNITS = EV (mm, UCUM, "mm")
34	>>>>	INFERRED FROM	NUM	EV (113933, DCM, "Derived Effective Diameter")	1	MC	IF row 31 equals (113934, DCM, "AAPM 204 Lateral Dimension") or (113935, DCM, "AAPM 204 AP Dimension") or (113936, DCM, "AAPM 204 Sum of Lateral and AP Dimension") or (113937, DCM, "AAPM 204 Effective Diameter Estimated From Patient Age")	UNITS = EV (mm, UCUM, "mm") Calculated with (Measured Lateral Dimension* Measured AP Dimension)^1/2

9. MODALITY WORKLIST QUERY IMPLEMENTATION

9.1 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.

9.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 9-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM	DoseWatch Entity
Scheduled Procedure Step	N/A
Requested Procedure	N/A
Imaging Service Request	N/A
Visit	N/A
Patient	Patient

9.3 WORKLIST QUERY MODULE TABLE

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

TABLE 9-2
MODALITY WORKLIST INFORMATION MODEL MODULES

Entity Name	Module Name	Reference
Scheduled Procedure Step	SOP Common	9.4.1.1
	Scheduled Procedure Step	9.4.1.2
Requested Procedure	Requested Procedure	9.4.2.1
Imaging Service Request	Imaging Service Request	9.4.3.1
Visit	Visit Identification	9.4.4.1
	Visit Status	9.4.4.2
Patient	Patient Identification	9.4.5.1
	Patient Demographic	9.4.5.2
	Patient Medical	9.4.5.3

9.4 WORKLIST QUERY MODULE DEFINITIONS

Please refer to DICOM Standard PS 3.3. (Information Object Definitions) for a description of each of the query key attributes contained within the Modality Worklist Information Model.

9.4.1 Common Scheduled Procedure Step Entity Modules

9.4.1.1 SOP Common Module

TABLE 9-3
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Specific Character Set	(0008,0005)	O	1C	

9.4.1.1.1 Specific Character Set

The attribute Specific Character Set (0008,0005) will not be sent, unless Patient Name is sent with a matching key that includes a non-ASCII character; in that case, the configured extended character set identifier will be sent. Only non-ASCII characters that may be entered from the console keyboard, as described in Section 2.7, may be included in the matching key value.

The AE will use any Specific Character Set value returned in a Scheduled Procedure Step Identifier in the images created pursuant to that Scheduled Procedure Step. Text attributes, including Patient and Physician names, that include non-ASCII characters will be displayed as described in Section 2.7.

9.4.1.2 Scheduled Procedure Step Module

TABLE 9-4
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	Requested.
>Scheduled Procedure Step Start Date	(0040,0002)	R	1 *	Requested.
>Scheduled Procedure Step Start Time	(0040,0003)	R	1 *	Requested.
>Modality	(0008,0060)	R	1 *	Requested.
>Scheduled Performing Physician's Name	(0040,0006)	R	2	Requested.
>Scheduled Procedure Step Description	(0040,0007)	O	1C *	Requested.
>Scheduled Station Name	(0040,0010)	O	2	Requested.

>Scheduled Procedure Step Location	(0040,0011)	O	2	Requested.
>Scheduled Protocol Code Sequence	(0040,0008)	O	1C	Requested.
>Pre-Medication	(0040,0012)	O	2C	Requested.
>Scheduled Procedure Step ID	(0040,0009)	O	1	Requested.
>Requested Contrast Agent	(0032,1070)	O	2C	Requested.
>Scheduled Procedure Step Status	(0040,0020)	O	3	Requested.

Note: * in the *Expected Return Key Type* column indicates that this information is displayed on screen, if available.

9.4.1.2.1 Scheduled Station AE Title

The AE title used to query the worklist on the RIS is either the AET of the modality as it is set up in DoseWatch or a DoseWach AET specified in the configuration. The first case allows no further configuration on the RIS to perform the query.

9.4.2 Common Requested Procedure Entity Modules

9.4.2.1 Requested Procedure Module

TABLE 9-5
REQUESTED PROCEDURE MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Requested Procedure ID	(0040,1001)	O	1	Requested.
Requested Procedure Description	(0032,1060)	O	1C *	Requested.
Study Instance UID	(0020,000D)	O	1	Requested.
Requested Procedure Priority	(0040,1003)	O	2	Requested.
Patient Transport Arrangements	(0040,1004)	O	2	Requested.

Note: * in the *Expected Return Key Type* column indicates that this information is displayed on screen, if available.

9.4.3 Common Imaging Service Request Entity Modules

9.4.3.1 Imaging Service Request Module

TABLE 9-6
IMAGING SERVICE REQUEST MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Accession Number	(0008,0050)	0	2 *	Requested.
Requesting Physician	(0032,1032)	0	2	Requested.
Referring Physician's Name	(0008,0090)	0	2	Requested.
Placer Order Number / Imaging Service Request	(0040,2016)	0	3	Requested.
Filler Order Number / Imaging Service Request	(0040,2017)	0	3	Requested.

Note: * in the *Expected Return Key Type* column indicates that this information is displayed on screen, if available.

9.4.4 Common visit Entity Modules

9.4.4.1 Visit Identification

TABLE 9-7
VISIT IDENTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Admission ID	(0038,0010)	0	2	Requested.

9.4.4.2 Visit Status

TABLE 9-8
VISIT STATUS MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Current Patient Location	(0038,0300)	0	2	Requested.

9.4.5 Common Patient Entity Modules

9.4.5.1 Patient Identification

TABLE 9-9
PATIENT IDENTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Patient's Name	(0010,0010)	R	1 *	Requested.
Patient ID	(0010,0020)	R	1 *	DoseWatch search into database for existing patient to display the dose records and dose alerts prior examination.
Issuer of Patient ID	(0010,0021)	O	3*	DoseWatch search into database for existing patient to display the dose records and dose alerts prior examination.

Note: * in the *Expected Return Key Type* column indicates that this information is displayed on screen, if available.

9.4.5.2 Patient Demographic

TABLE 9-10
PATIENT DEMOGRAPHIC MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Patients Birth Date	(0010,0030)	O	2 *	Requested.
Patient's Sex	(0010,0040)	O	2 *	Requested.
Confidentiality constraint on patient data	(0040,3001)	O	2	Requested.
Patient's Size	(0010,1020)	O	3	Requested.

Note: * in the *Expected Return Key Type* column indicates that this information is displayed on screen, if available.

9.4.5.3 Patient Medical

TABLE 9-11
PATIENT MEDICAL MODULE ATTRIBUTES

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

10. QUERY IMPLEMENTATION

10.1 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 10-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM	DoseWatch Entity
Patient	Patient
Study	Study
Series	Serie
Image	DicomRawImage/ DicomMessage

10.2 INFORMATION MODEL KEYS

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Query/Retrieve Information Model.

10.2.1 Common Query Keys

The query key attributes specified in this section are used at all levels and in all classes of query.

TABLE 10-2
Q/R PATIENT LEVEL COMMON RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	SCU Use
Specific Character Set	(0008,0005)	-	See 2.7
Query Retrieve Level	(0008,0052)	-	Set to level of query: PATIENT STUDY SERIES IMAGE
Retrieve AE Title	(0008,0054)	-	Used

10.2.1.1 Q/R Common Attribute Descriptions

10.2.2 Patient Level

This section defines the keys at the Patient Level of the Patient Root and Patient/Study Only Query/Retrieve Information Models that are supported by this implementation.

TABLE 10-3
PATIENT LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCU Use
Patient's Name	(0010,0010)	R*	Used in Query. The name comes from a previous study and triggered with a post processing element. Elements to query are described in a template.
Patient ID	(0010,0020)	U*	Used in Query. The id comes from a previous study and triggered with a post processing element. Elements to query are described in a template.
Patient's Birth Date	(0010,0030)	O*	Used in Query. The name comes from a previous study and triggered with a post processing element. Elements to query are described in a template.
Patient's Sex	(0010,0040)	O*	Used in Query. The sex comes from a previous study and triggered with a post processing element. Elements to query are described in a template.
Issuer of Patient Id	(0010,0021)	O	Used in Query. The issuer of patient id come from a previous study or DoseWatch configuration and triggered with a post processing element. Elements to query are described in a template.

Note: * in the *Type* column indicates that this information is displayed on screen, if available.

10.2.3 Study Level – Patient Root, Patient/Study Only

This section defines the keys at the Study Level of the Patient Root and Patient/Study Only Query/Retrieve Information Models that are supported by this implementation.

TABLE 10-4
STUDY LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCU Use
Study Date	(0008,0020)	R*	Used.
Study Time	(0008,0030)	R*	Used.
Accession Number	(0008,0050)	R*	Used.
Study ID	(0020,0010)	R*	Used.
Study Instance UID	(0020,000D)	U	Used.
Modalities in Study	(0008,0061)	O*	Used.
Issuer of Patient ID	(0010,0021)	O	Used.

Note: * in the *Type* column indicates that this information is displayed on screen, if available.

10.2.4 Study Level – Study Root

This section defines the keys at the Study Level of the Study Root Query/Retrieve Information Model that are supported by this implementation.

TABLE 10-5
STUDY LEVEL ATTRIBUTES FOR THE STUDY ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCU Use
Study Date	(0008,0020)	R*	Used.
Study Time	(0008,0030)	R*	Used.
Accession Number	(0008,0050)	R*	Used.
Study ID	(0020,0010)	R*	Used.
Patient's Name	(0010,0010)	R*	Used.
Patient ID	(0010,0020)	R*	Used.
Study Instance UID	(0020,000D)	U	Used.
Modalities in Study	(0008,0061)	O*	Used.
Referring Physician's Name	(0008,0090)	O	Used.

Note: * in the *Type* column indicates that this information is displayed on screen, if available.

10.2.5 Series Level

This section defines the keys at the Series Level of the Patient Root and Study Root Query/Retrieve Information Models that are supported by this implementation.

TABLE 10-6
SERIES LEVEL ATTRIBUTES FOR THE
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCU Use
Modality	(0008,0060)	R*	Used
Series Number	(0020,0011)	R*	Used
Series Instance UID	(0020,000E)	U	Used
Number of Series Related Instances	(0020,1209)	O	Used

Note: * in the *Type* column indicates that this information is displayed on screen, if available

10.2.6 Image Level

This section defines the keys at the Image Level of the Patient Root and Study Root Query/Retrieve Information Models that are supported by this implementation.

TABLE 10-7
IMAGE LEVEL ATTRIBUTES FOR THE
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCU Use
Instance Number	(0020,0013)	R*	Used
SOP Instance UID	(0008,0018)	U	Used
SOP Class UID	(0008,0016)	O	Used

Note: * in the *Type* column indicates that this information is displayed on screen, if available

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