Technical Publications

Direction 5357330-1EN (DOC1498472)
Revision 3

Xeleris™ 3.0 and Xeleris™ 3.1

DICOM CONFORMANCE STATEMENT

LIST OF REVISIONS

REV	DATE	DESCRIPTION	PAGES	APPR.
1	August 2010	Initial Release for Xeleris 3	All	M. Mesh
2	February 2013	Xeleris 3.1 release: • Conformance statement overview • Communication protocols updates • Private Multi-Gated Acquisition Module, Table 3-32 • Private Data Dictionary, Table A-2	Preface Chapter 2, Section 2.4 Chapter 3, Section 3.5.8.11 Appendix A	M.Mesh
3	January 2014	Xeleris 3.1 new applications release: • Adopt new document template • Update Private Dictionary • Add new Section (PET Information Object Definition)	All	M.Mesh

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CONFORMANCE STATEMENT OVERVIEW

Throughout this document, Xeleris 3.x refers to the following products:

- **Xeleris 3.0**

- **Xeleris 3.1**

The Xeleris 3.x DICOM implementation allows the user to send images, curves and reports, acquired through a front-end acquisition system, created by Xeleris processing functionality, or received from any other DICOM compliant system, to another DICOM station.

Xeleris 3.x DICOM implementation supports storage commitment for the already transferred data. This guarantees the user that acquired image data, as well as processing results are safely archived for future use.

Xeleris 3.x is capable of receiving DICOM objects from another DICOM compliant station.

Xeleris also allows query and retrieve of data stored in its local database from a remote station and can query and retrieve images stored in a remote DICOM station.

The Xeleris 3.x DICOM implementation also provides a verification mechanism by which a remote application entity (AE) can verify application-level communication with the Xeleris DICOM Server. Also provided is a mechanism by which a Xeleris user can verify application-level communication with a remote DICOM AE.

The DICOM Print Services for Xeleris 3.x are defined in a separate document published by Cedara Inc. (See Reference A in Section 1.6)

The DICOM Media Services for Xeleris 3.x are defined in a separate document published by CDP Ltd. The CDP document "CD Printer 5.6.3 DICOM Conformance Statement" has been attached to the end of this document with permission (Appendix A).

Table 0.1 provides an overview of the network services supported by Xeleris 3.x

Table 0.1 – NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
CT Image Storage	Yes	Yes
MR Image Storage	Yes	Yes
Secondary Capture Image Storage	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	Yes	Yes
Nuclear Medicine Image Storage	Yes	Yes
Enhanced SR	Yes	Yes
Positron Emission Tomography Image Storage	Yes	Yes
Standalone Curve Storage	Yes	Yes
Private SOP Class Storage	No	Yes
Query/Retrieve		
Patient Root Query/Retrieve Information Model - FIND	No	Yes
Patient Root Query/Retrieve Information Model - MOVE	No	Yes

Study Root Query/Retrieve Information Model - FIND	Yes	Yes
Study Root Query/Retrieve Information Model - MOVE	Yes	Yes
Print Management		
Basic Grayscale Print Management Meta SOP Class	Yes	No
Basic Color Print Management Meta SOP Class	Yes	No
Workflow Management		
Storage Commitment Push Model SOP Class	Yes	No

Table 0.2 provides an overview of the Media Storage Application Profiles supported by Xeleris 3.x.

Table 0.2 - MEDIA SERVICES

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk - Recordable		
General Purpose CD-R	Option*	No
DVD		
General Purpose JPEG DVD	Option*	No

Option*: This means that this service can be purchased separately

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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 (NM Image Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a NM Image Information Object.

Section 4 (PET Image Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a PET Image Information Object.

Section 5 (Secondary Capture Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a Secondary Capture Information Model and Multi-Frame Secondary Capture Information Model.

Section 6 (Standalone Curve Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of an Standalone Curve Information Model. Note nevertheless DICOM Standard Curve SOP Class have been retired, Xeleris 3.x is still able to generate objects of this SOP Class.

Section 7 (Storage Commitment PUSH Model Implementation), which is used both for N-action storage commitment requests by the SCU and N-EVENT-REPORT storage commitment notifications by the SCP.

Section 8 (QUERY Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Patient/Study Root Query/Retrieve service.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

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

GEHC DICOM Conformance Statements

@

http://www.ge.com/DICOM

APPLICATION ENTITY SPECIFICATION
(SERVICE CLASSES, INFORMATION OBJECTS, MESSAGE EXCHANGES, ETC.)

Product Implementation:

CT Advantage

MR Advantage

Xeleris 3.0 and 3.1
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Conformance
Statement
Direction:
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DICOM STANDARD

Standard Specification:

DICOM

Part 1

DICOM

2

DICOM

3

DICOM

4

DICOM

Part 16

This document specifies the DICOM implementation. It is entitled:

> *Xeleris 3.0 and Xeleris 3.1*
> *Conformance Statement for DICOM*
> *Direction **5357330-1EN***

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/

Reference A "Conformance Statement for Cedara Hardcopy Server as DICOM Print Management SCU", available free at http://www.merge.com/MergeHealthcare/media/support/cedara/hardcopyserver_dicomprntmngmt.pdf

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

CD-R   Compact Disk Recordable

CSE   Customer Service Engineer

CT   Computed Tomography

DHCP   Dynamic Host Configuration Protocol

DICOM   Digital Imaging and Communications in Medicine

DNS   Domain Name System

FSC   File-Set Creator

FSU   File-Set Updater

FSR   File-Set Reader

HIS   Hospital Information System

IHE   Integrating the Healthcare Enterprise

IOD   Information Object Definition

IPv4   Internet Protocol version 4

IPv6   Internet Protocol version 6

ISO   International Organization for Standards

JPEG   Joint Photographic Experts Group

LUT   Look-up Table

MPEG   Moving Picture Experts Group

MR   Magnetic Resonance Imaging

NM   Nuclear Medicine

O   Optional (Key Attribute)

OSI   Open Systems Interconnection

PACS   Picture Archiving and Communication System

PET   Positron Emission Tomography

PDO   Protocol Data Object

PDU   Protocol Data Unit

R   Required (Key Attribute)

RTO   Review Template Object

RIS   Radiology Information System

SC   Secondary Capture

SCP   Service Class Provider

SCU   Service Class User

SDO   Series Data Object

SOP   Service-Object Pair

SPS   Scheduled Procedure Step

SR   Structured Reporting

TCP/IP   Transmission Control Protocol/Internet Protocol

U   Unique (Key Attribute)

UL   Upper Layer

VR   Value Representation

2. NETWORK CONFORMANCE STATEMENT

2.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the Xeleris 3.x compliance to DICOM requirements for **Networking** features.

Xeleris systems provide sophisticated image processing and storage functions on nuclear image data acquired through the front end acquisition system. In view of the requirements to conform to a global standard that permits interoperability across equipment produced by different vendors, Xeleris system will provide support for DICOM 3.0.

This section details the roles and DICOM Service Classes supported by the Xeleris version 3.x.

The Xeleris DICOM implementation allows the user to send images, curves and reports, acquired through a front-end acquisition system, created by Xeleris processing functionality, or received from any other DICOM compliant system, to another DICOM station. In this situation Xeleris is providing the DICOM C-STORE service as a service class user (SCU).

Xeleris is capable of receiving DICOM objects from another DICOM compliant station. In this situation Xeleris provides the DICOM C-STORE service as a service class provider (SCP).

Xeleris also allows query and retrieve of data stored in its local database from a remote station and can query and retrieve images stored in a remote DICOM station. In this situation Xeleris is providing the DICOM C-FIND and C-MOVE services as a service class provider (SCP) and that of a DICOM C-FIND and C-MOVE service class user (SCU).

Xeleris DICOM implementation supports storage commitment for the already transferred data. This guarantees the user that acquired image data, as well as processing results are safely archived for future use. In this situation Xeleris provides the DICOM Storage Commitment Service as Service Class User (SCU).

The Xeleris DICOM implementation also provides a verification mechanism by which a remote application entity (AE) can verify application-level communication with the Xeleris DICOM Server. Also provided is a mechanism by which a Xeleris user can verify application-level communication with a remote DICOM AE. In these situations, Xeleris provides the DICOM C-ECHO service as both a SCP and SCU, respectively.

2.2 IMPLEMENTATION MODEL

2.2.1 Application Data Flow Diagram

All DICOM functionality on the Xeleris product is logically provided by the CPIPC_DICOM Server AE. The CPIPC_DICOM Server AE is commanded to perform DICOM services through the use of the Xeleris user interface. The CPIPC_DICOM Server AE also listens on a pre-defined port for incoming connections from remote DICOM AEs.

The network application model for the Xeleris 3.x is shown in the following Illustration :
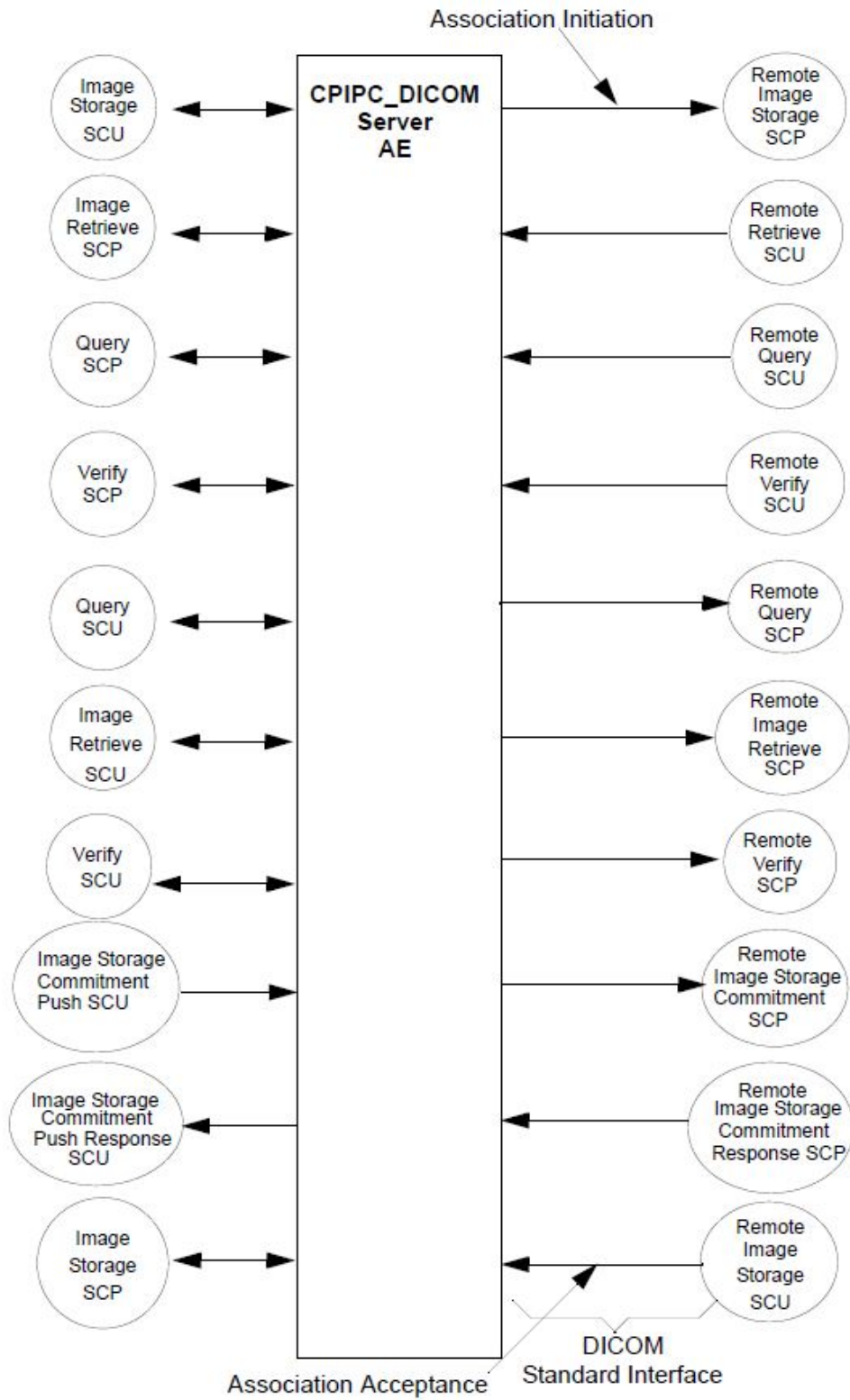
2.2.2 Functional Definition of AE's

The Xeleris CPIPC_DICOM Server Application Entity (AE) initiates the following functions:

- *Store*: Initiates a DICOM association in order to send images to a remote AE. If the remote AE accepts a presentation context applicable to the image(s) being sent, the CPIPC_DICOM Server will send the images via the C-STORE service.

- *Verify*: Initiates a DICOM association in order to send a verification message to a remote AE via a C-ECHO-RQ message.

- *Query*: Initiates a DICOM association in order to query images on a remote AE. If the remote AE accepts a presentation context applicable to the query request(s) being sent, the CPIPC_DICOM Server will receive appropriate query responses via the C-FIND service. Xeleris 3.x does not issue a C-FIND-CANCEL-RQ to terminate initiated query.

- *Retrieve* Initiates a DICOM association in order to fetch images from a remote AE. If the remote AE accepts a presentation context applicable to the retrieve request(s), the remote AE initiates a DICOM association for C-STORE-RQ to the CPIPC_DICOM Server AE. If this is acceptable to the CPIPC_DICOM Server AE, then, the image(s) is (are) sent to the CPIPC_DICOM Server AE. CPIPC_DICOM Server AE can terminate the retrieve by sending a C-CANCEL-MOVE-RQ message.

- *Storage commitment:* Initiates a DICOM association in order to request a storage commitment from a remote AE. If the remote AE supports storage commitment the CPIPC_DICOM Server will request a storage commitment for the image(s) previously sent successfully via the N-ACTION-RQ.

The Xeleris CPIPC_DICOM Server AE responds to the following functions:

- *Store*: Responds to incoming C-STORE -RQ messages by storing the incoming data stream onto the disk.

- *Query*: Responds to incoming C-FIND-RQ messages by searching its local database for the requested attributes and returning a C-FIND-RSP message containing a match and a status of "pending." All other matches are also returned in C-FIND-RSP messages with status of "pending" until the last message which is returned with a status of "success." The remote AE can terminate the query by sending a C-CANCEL-FIND-RQ message.

- *Retrieve*: Responds to incoming C-MOVE-RQ messages by searching its local database for the requested image(s) and returning each via a C-STORE-RQ message. The CPIPC_DICOM Server will return a C-MOVE -RSP message after each image is sent. The status returned is "pending" until the last image is sent, in which case the appropriate status is returned. The remote AE can terminate the retrieve by sending a C-CANCEL-MOVE-RQ message.

- *Verify*: Responds to incoming C-ECHO-RQ messages by returning a C-ECHO-RSP message with a status of "success."

- *Storage Commitment Response*: Responds to incoming N-EVENT_REPORT messages arriving from Remote AE with the status of storage commitment for images previously requested by CPIPC_DICOM Server AE.

2.2.3 Sequencing of Real-World Activities

Xeleris Application Entity receives images acquired through a front-end acquisition station or performs query and retrieves images from PACS or another DICOM station; creates derived images using Xeleris processing functionality ; stores images and then requests Storage Commitment for previously stored images.

2.3 AE SPECIFICATIONS

2.3.1 CPIPC_DICOM Server AE Specification

The CPIPC_DICOM Server 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
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Yes	Yes
Private SOP Class Storage	1.2.840.113619.4.27	No	Yes
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	No	Yes
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	No	Yes
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No

Note: *Standalone Curve Storage has been retired in DICOM, but it is still supported by Xeleris 3.x.

2.3.1.1 Association Establishment Policies

2.3.1.1.1 General

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

Application Context Name	1.2.840.10008.3.1.1.1

The maximum length PDU receive size for the CPIPC_DICOM Server is:

Maximum Length PDU	128000 (Not Configurable)

2.3.1.1.2 Number of Associations

The CPIPC_DICOM Server will initiate a maximum of 4 simultaneous associations to remote nodes.

The CPIPC_DICOM Server will support a maximum of 5 simultaneous associations initiated by remote nodes.

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:

Xeleris 3.x Implementation UID	1.2.840.113619.6.281
Xeleris 3.x Implementation Version Name	Xeleris 3.xxxx

2.3.1.2 Association Initiation Policy

The CPIPC_DICOM Server AE initiates a new association:

- Due to an image send operation being initiated from the Xeleris user interface.

- Due to a Verify operation initiated to determine whether the remote DICOM station is operational.

- Due to image data being Queried from a Remote AE.

- Due to image data being Retrieved from a Remote AE.

- Due to a storage commitment request operation being initiated after successful image transfer.

When the CPIPC_DICOM Server Application Entity initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities

The CPIPC_DICOM Server 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.

2.3.1.2.1 Real-World Activity: Image Send

2.3.1.2.1.1 Associated Real-World Activity

The operator must select elements (study(ies)/ serie(s)/ image(s)/ curve(s)) to be transferred from the Patient Selector. Once these selections have been made, the operator selects any DICOM station as target to initiate image send job(s). DICOM station is added to the list of target repositories if "Send Images" flag is checked in the Remote DICOM Station definition.

All created jobs are registered in the Job Browser where job status is indicated. The status can be QUEUED, ACTIVE, COMPLETED, FAILED and CANCELED. Initial status of each job is QUEUED.

The CPIPC_DICOM Server AE will then initiate an association with the remote AE in order to perform send job. Status of Job becomes ACTIVE. The exception to this is that, if image send fails due to network problems, the current association is closed and another is opened to finish the current send (if possible) and sending the remaining elements.

If all elements selected for transfer of the ACTIVE send job are successfully transferred, job status is changed to COMPLETED.

If transfer of at least one of the selected elements of the ACTIVE job fails, job final status is set to FAILED. Reason of failure is displayed in Job Browser.

Operator may cancel send job(s) from the Job Browser. He selects job(s) and push "Cancel" button. Job final status becomes CANCELED.

2.3.1.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by CPIPC_DICOM Server AE for Activity "Image Send"					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Explicit VR Little Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Stand-alone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Explicit VR Little Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Secondary Image Capture Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Explicit VR Little Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Explicit VR Little Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Explicit VR Little Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None

| | | Implicit VR Little Endian | 1.2.840.10008.1.2 | | |

Note : Stand-alone Curve Storage SOP Class has been retired in DICOM, but it is still supported by Xeleris 3.x.

2.3.1.2.1.2.1 SOP Specific DICOM Conformance Statement for All Storage SOP Classes

This implementation can perform multiple C-STORE operations over a single association. There is not any Time-outs defined in CPIPC_DICOM Server for C-STORE operation.

Upon receiving a C-STORE confirmation containing a Successful status, this implementation will perform the next C-STORE operation. The association will be maintained if possible.

Upon receiving a C-STORE confirmation containing a status other than Successful, this implementation consider the request of the current images store to be a failure but will continue to attempt to send any remaining images in the same association.

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

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code	Related Fields
Failed	A700	Refused: Out of resources	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
	A710	Refused: Write to remote database failed	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
	A720	Refused: Remote DICOM Toolkit problems	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
	A730	Refused: Remote cannot understand received DICOM message	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
	A740	Refused: Cannot find Pixel data	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
	A750	Refused: Remote cannot store data on the archive device	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
	A760	Refused: Default destination for PET RAW data re-direction is not defiled	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
	A780	Refused: Sender is not defined on remote DICOM station	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
	A900	Error: Data set does not match SOP Class	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
	C000	Error: Cannot understand	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None

Warning	B000	Coercion of Data Elements	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
	B006	Elements Discarded	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
	B007	Data Set does not match SOP Class	Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column	None
Success	0000		Final image send job status is set to COMPLETED	None

Note: The error codes A700-A770 are Private Status Codes. Xeleris stations will return one of the above mentioned status codes (Refused and Error) in case of Image Send failure. DICOM PS3.4 provides the flexibility of returning private status codes. Xeleris uses them to provide more information to the Xeleris user in case of an Image Send failure.

If Non-Xeleris stations SCP return the same status code, Xeleris SCU will interpret them as per the table above. The non-Xeleris station's interpretation of the status code will not be considered.

2.3.1.2.2 Real-World Activity: Verify

2.3.1.2.2.1 Associated Real-World Activity

Service personnel invoke the DICOM "Echo" from the Xeleris Configuration. The operator selects one of the remote DICOM stations from list and presses "Echo" Button. The user may also select any remote DICOM station as Source or Destination system in the Patient Selector user interface and choose "Check Status" entry from associated menu. The CPIPC_DICOM server will initiate an association with the remote DICOM AE in order to verify communication at the application level. The status of the verification process is displayed to the user.

2.3.1.2.2.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by CPIPC_DICOIM Server AE for Activity "Verify"					
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 Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

2.3.1.2.2.2.1 SOP Specific DICOM Conformance Statement for Verification SOP Class

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

2.3.1.2.3 Real-World Activity: Query

2.3.1.2.3.1 Associated Real-World Activity

Xeleris implements the query operation in 3 levels. The first level of query provides query results pertaining to the Patient and Study objects only. The second level of query provides results regarding the series for the given Study. The third level of query provides results regarding the images for the both given Study and Series.

The First Level Query operation is initiated by the selection of DICOM station from the pool of source repositories. DICOM station is added to pool of source repositories if "Query/Retrieve" flag is checked in the Remote DICOM Station definition dialog.

Before First Level Query, Verification of Remote station DICOM status is performed. If Verification returns "Online" status only, Query operation proceeds.

The operator can define Search Criteria for the First level Query, if "Filtered" flag is checked in the Remote DICOM Station definition.

If "Filtered" flag is checked and operator selects remote DICOM station as source repository "Filter Dialog" is opened. Operator may define search criteria by "Patient Name", "Patient Id", "Study ID", "Study Description", "Accession Number", "Study Date" and "Modalities in Study" attributes or any combination of them. The operator must push "OK" button to initiate the Query operation.

If "Filtered" flag is not checked, the operator initiates Query operation without any search criteria by selection of the remote DICOM station as source repository. The CPIPC_DICOM Server will then initiate an association with remote AE in order to query remote AE for the given search parameters. The results of the Query operation are indicated in the Patient Selector of Xeleris.

The operator may press on the folder icon of any Study entry from the Patient selector to initiate Second Level Query Operation. The CPIPC_DICOM Server will then initiate an association with remote AE in order to query remote AE for the given Study UID as search criteria. The results of the Query operation are inserted as Series under the expanded Study in the Patient Selector.

The operator may press on the folder icon of any Series entry from the Patient selector to initiate Third Level Query Operation. The CPIPC_DICOM Server will then initiate an association with remote AE in order to query remote AE for the given Study UID and Series UID as search criteria. The results of the Query operation are inserted as Datasets under the expanded Series in the Patient Selector.

No additional search criteria rather than "Study UID" and "Series UID" is provided for the Second Level Query and the Third Level Query.

Note that once initiated the Query operation cannot be cancelled by the operator from Xeleris UI.

Xeleris makes use of the Study Root Query/Retrieve Model to initiate a Query operation. Details of this model are provided in **Section 8** of this document. Note that for each level of query operation, a single association is established.

2.3.1.2.3.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by CPIPC_DICOM Server AE for Activity Query					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

2.3.1.2.3.2.1 SOP Specific DICOM Conformance Statement for the Study Root Query/Retrieve Information Model - FIND SOP Class

The CPIPC_DICOM Server includes matching keys in the queries as described in Section 8

This implementation can perform multiple C-FIND operations over a single association. There is not any Time-outs defined in CPIPC_DICOM Server for C-FIND operations.

Upon receiving a C-FIND confirmation containing a Successful status, this implementation will perform the next C-FIND operation. The association will be maintained if possible.

Upon receiving a C-FIND confirmation containing a Pending status, this implementation will wait for further C-FIND responses from the remote DICOM AE.

Upon receiving a C-FIND confirmation containing a Refused status, this implementation will terminate the association.

Upon receiving a C-FIND confirmation containing a status other than Successful, Pending or Refused, this implementation will consider the current request to be a failure but will continue to attempt to send any remaining query requests with a different association.

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

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	A700	Refused: Out of resources	No results are displayed in the Xeleris Patient Selector
	A900	Error: Identifier does not match SOP Class	No results are displayed in the Xeleris Patient Selector
	C000	Error: Unable to process	No results are displayed in the Xeleris Patient Selector
Success	0000	Matching is complete - No final identifier is supplied	Query results are displayed in the Xeleris Patient Selector
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	No Visible User Output
	FF01	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	No Visible User Output

2.3.1.2.4 Real-World Activity: Retrieve

2.3.1.2.4.1 Associated Real-World Activity

The Xeleris operator initiates invocation of the Retrieve (Fetch) operation by the selection of one or more search results (Study/Series/Image results) on the Patient Selector UI of the remote DICOM station and then by selection the move destination. This mechanism assumes that the operator has preceded the Fetch with a Query operation. The Fetch job is registered in the Job Browser where job status is indicated. The status can be QUEUED, ACTIVE, COMPLETED, FAILED and CANCELED. Initial status of each job is QUEUED.

CPIPC_DICOM Server will then initiate an association with the remote AE in order to fetch DICOM images from the remote AE for the given Study/Series/Image selection. The status of operation becomes ACTIVE.

Xeleris makes use of the Study Root Query\Retrieve Model to initiate a Retrieve (Fetch) operation. Details of this model are provided in Section 5 of this document.

Note that multiple C-MOVE requests may be sent within one association established. There is not any Time-outs defined in CPIPC_DICOM Server for C-MOVE operations.

The final status of Retrieve job is stated according to the final status returned by Retrieve SCP.

Operator may cancel Retrieve job(s) from the Job Browser. He selects job(s) and pushes "Cancel" button. Job final status becomes CANCELED.

2.3.1.2.4.2 Proposed Presentation Context Table

<table>
<tr><th colspan="6">Presentation Context Table – Proposed by CPIPC_DICOM Server AE for Activity "Retrieve"</th></tr>
<tr><th colspan="2">Abstract Syntax</th><th colspan="2">Transfer Syntax</th><th rowspan="2">Role</th><th>Extended</th></tr>
<tr><th>Name</th><th>UID</th><th>Name List</th><th>UID List</th><th>Negotiation</th></tr>
<tr><td>Study Root Query/Retrieve Information Model - MOVE</td><td>1.2.840.10008.5.1.4.1.2.2.2</td><td>Implicit VR Little Endian

Explicit VR Little Endian</td><td>1.2.840.10008.1.2

1.2.840.10008.1.2.1</td><td>SCU</td><td>None</td></tr>
</table>

2.3.1.2.4.2.1 SOP Specific DICOM Conformance Statement for the Study Root Query/Retrieve Information Model - MOVE SOP Class

This implementation can perform multiple C-MOVE operations over a single association.

Upon receiving a C-MOVE confirmation containing a Successful status, this implementation will proceed with next C-MOVE request. When all C-MOVE requests are processed, the implementation will close the association.

Upon receiving a C-MOVE confirmation containing a Pending status, this implementation will wait for further C-MOVE responses from the remote DICOM AE.

Upon receiving a C-MOVE confirmation containing a Refused status, this implementation will terminate the association.

Upon receiving a C-MOVE confirmation containing a status other than Successful, Pending or Warning, this implementation will consider the current request to be a failure.

The C-MOVE-RQ will use the AE Title of the selected as destination remote system Application Entity as the Move Destination AE Title

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

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	A701	Refused: Out of resources - Unable to calculate number of matches	Retrieve Job is moved to FAILED state; Failure Reason is displayed in the Job Browser
	A702	Refused: Out of resources - Unable to perform sub-operations	Retrieve Job is moved to FAILED state; Failure Reason is displayed in the Job Browser
	A801	Refused: Move Destination Unknown	Retrieve Job is moved to FAILED state; Failure Reason is displayed in the Job Browser
	A900	Error: Identifier does not match SOP Class	Retrieve Job is moved to FAILED state; Failure Reason is displayed in the Job Browser
	C000	Error: Unable to process	Retrieve Job is moved to FAILED state; Failure Reason is displayed in the Job Browser
Cancel	FE00	Sub-operations terminated due	Retrieve Job is moved to CANCELLED state

		to a Cancel indication	
Warning	B000	Sub-operations Complete - One or more Failures.	No Visible User Output
Success	0000	Sub-operations Complete - No Failure.	Retrieve Job is moved to COMPLETED state
Pending	FF00	Sub-operations are continuing -	No Visible User Output

2.3.1.2.5 Real-World Activity: Storage Commitment

2.3.1.2.5.1 Associated Real-World Activity

The operator must both select image(s) to be transferred from the Patient Selector and select a destination by pressing the "Destination" button. The CPIPC_DICOM server will then initiate an association with the remote AE in order to send the selected image(s) and will accept interparty responses received from the remote AE. If the destination is configured as storage commitment capable or the destination is configured to use other storage commitment capable devices, the CPIPC_DICOM Server will initiate an association with the remote storage commitment capable AE in order to request a storage commitment for the successfully transferred image(s).

The storage commitment request it will always use a new association for requesting a commitment for the successfully transferred image(s). The storage commitment response will usually require the remote AE to initiate a new association with the CPIPC_DICOM.

The UI shows the status of the storage commitment request progress. The status can be either WAITING FOR COMMITMENT, SUCCESS, or FAILURE. The associated error messages due to a failure can be found in the system log.

2.3.1.2.5.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by CPIPC_DICOM Server AE for Activity "Storage Commitment"					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

2.3.1.2.5.2.1 SOP Specific DICOM Conformance Statement for the Storage Commitment Push Model SOP Class SCU

The storage commitment request (N-ACTION) can perform a storage commitment request for multiple images over a single association. A new association is initiated for the storage commitment request for list of successfully transferred image(s) belonging to the same study. There is not any Time-outs defined in CPIPC_DICOM Server for Storage Commitment N-ACTION request.

Upon receiving a N-ACTION confirmation containing a "Successful" status, the next N_ACTION_RQ operation is performed for the new association.

Upon receiving a N-ACTION confirmation containing a "Failed" status, the association is terminated. The reason for termination is recorded in the system log file.

The CPIPC_DICOM Server AE uses DICOM network storage services to transfer SOP Instances which are to be committed. It does not support the optional Storage Media File-Set ID and UID Attributes in the Storage Commitment N-ACTION for transfer of SOP Instances by media for Storage Commitment.

The CPIPC_DICOM Server AE may request Storage Commitment for Instances of any of the Composite SOP Classes it supports as an SCU (see Section 2.3.1.2.1.2.1).

The Storage Commitment Information Object is described in Section 7

The CPIPC_DICOM Server AE waits for a N-EVENT-REPORT during predefined time limit, which is configurable in user interface. Default value is 24 Hours. If N-EVENT_REPORT is not arrived during this period, storage commitment request status is changed to FAILURE and appropriate error message is logged.

Following are the status codes that are more specifically processed when receiving N-Action responses from a **Storage Commitment** SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	0119	Class-instance conflict	Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser
	0210	Duplicate invocation	Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser
	0115	Invalid argument value	Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser
	0117	Invalid SOP Instance	Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser
	0212	Mistyped argument	Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser
	0123	No such action	Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser
	0118	No such SOP Class	Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser
	0112	No such SOP Instance	Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser
	0110	Processing failure	Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser
Success	0000		Transfer Job is moved to WAITING FOR COMMITMENT state

Upon receiving a N-ACTION confirmation containing a status other than the defined values, the current request is considered to be a failure and will terminate the association. The reason for termination is recorded in the system log file.

As part of the storage commitment implementation, Remote AE (SCP) will initiate an association to this implementation and will send an N-EVENT-REPORT. The attribute of the N-EVENT-REPORT message will include an indication on all images for which a commitment has succeeded and those for which it has failed.

The receipt of a N-EVENT-REPORT on an association that CPIPC_DICOM has initiated is not supported. The Remote AE (SCP) must initiate a new association in order to return the new N-EVENT-REPORT.

2.3.1.3 Association Acceptance Policy

Only those remote DICOM AE added to Xeleris DICOM configuration may connect to the CPIPC_DICOM Server AE. The maximum number of associations accepted in parallel is limited to 5.

The CPIPC_DICOM Server AE responds to image store operations from remote AE's. Any Remote AE can send data (CT/PT/MR/NM/SC/MFSC/ Structure Reports/Standalone Curves) to Xeleris to be stored in the local Xeleris database.

Any remote AE can open an association to the DICOM Server AE for the purpose of application level communication verification.

The CPIPC_DICOM Server AE responds to query requests from remote AE's with matching responses. Any remote AE can also request the CPIPC_DICOM Server AE to retrieve image data from Xeleris, and to send this data to the remote AE.

As part of the storage commitment implementation, the CPIPC_DICOM Server responds to N-EVENT-REPORT received from remote AE.

2.3.1.3.1 Real-World Activity Store Images

2.3.1.3.1.1 Associated Real-World Activity

The DICOM Server AE is always listening for associations. No operator action is required to respond to a Store request.

The real-world activity associated with the Store request is to store the image data in the local database and send a C-STORE -RSP message with the status of "success" for each image that can be stored in the local database. A C-STORE-RSP message with the status "failed" is sent for each image that cannot be stored in the local database.

There is not any Time-outs defined in CPIPC_DICOM Server for Image Storage operation.

2.3.1.3.1.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by CPIPC_DICOM Server AE for Activity "Store Images"					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Private SOP Class Storage	1.2.840.113619.4.27	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Secondary Image Capture Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Implicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

		Explicit VR Little Endian			
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

2.3.1.3.1.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

The CPIPC_DICOM Server provides Level 2 (FULL) Conformance CT, PET, MR and Enhanced SR SOP Classes, and stores all standard and private data elements of received SOP Instances.

The AE provides Digital Signature Level 3 support of above mentioned SOP Classes, as it provides full fidelity storage of received SOP Instances.

The CPIPC_DICOM Server provides Level 1 (BASE) Conformance NM images, Stand-alone Curves, Secondary capture and Multi-frame Secondary Capture Storage SOP Classes, and stores all mandatory (Type 1 and 2) data elements of received SOP Instances. It also stores selected optional (Type 3) data elements, and private data elements for which it has a data dictionary entry, as described in Sections 3, 4, 5, 6 .

The AE provides Digital Signature Level 0 support for above mentioned SOP Classes , as it does not provide Level 2 (FULL) Conformance.

Stand-alone Curve Storage SOP Class has been retired in DICOM, but it is still supported by Xeleris 3.x.

The AE validates that the Attributes of the SOP Instance meet the requirements of the IOD with respect to Value Representation, presence of Type 1 and 2 elements, valid values, and consistency between image attributes and pixel data.

Successfully received SOP Instances may be accessed via the user interface and by DICOM network query retrieve. SOP Instances are stored until manually deleted by the user.

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
Failure	A700	Refused: Out of resources	Returned if the DICOM Server runs out of resources (e.g. memory); error logged.	None
	A710	Refused: Out of Resources	Returned if Dataset not written into the remote database; error logged.	None
	A720	Refused: Out of Resources	Returned if Internal error in the DICOM AE; error logged.	None
	A730	Refused: Out of Resources	Returned if DICOM AE failed to understand DICOM stream; error logged.	None
	A740	Refused: Out of Resources	Returned if DICOM AE failed to access pixel data in the DICOM stream; error logged.	None
	A900	Error: Dataset does not match SOP Class	Returned by DICOM Server if affected SOP Class is not supported by Xeleris, the Store operation failed; error logged.	None

	C000	Error: Cannot Understand	Returned by the DICOM Server if for any other reason, not specified elsewhere in this table, the Store operation failed; error logged.	None
Warning	B000	Coercion of Data Elements	Warning! Dataset does not match SOP Class or Coercion of Data Elements	None
	B007	Data Set does not match SOP Class	Warning! Dataset does not match SOP Class or Coercion of Data Elements	None
	B006	Elements Discarded	Warning! Dataset does not match SOP Class or Coercion of Data Elements	None
Success	0000			None

Note: The error codes A700-A740 are Private Status Codes. Xeleris stations will return one of the above mentioned status codes (Refused and Error) in case of Image Receive Failure. DICOM PS3.4 provides the flexibility of returning private status codes. Xeleris uses them to provide more information to the Xeleris user in case of an Image Receive failure.

2.3.1.3.1.3 Presentation Context Acceptance Criterion

The CPIPC_DICOM Server 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 CPIPC_DICOM Server will select Transfer Syntaxes according to the following priority (highest priority first):

- Explicit VR Little Endian
- Implicit VR Little Endian.

2.3.1.3.2 Real-World Activity Query SCP

2.3.1.3.2.1 Associated Real-World Activity

The CPIPC_DICOM Server AE is always listening for associations. No operator action is required to respond to Query request.

The real-world activity associated with the Query request is to search the local database for all entries that match the request and send a C-FIND-RSP message with the status of "pending" for each matching entry. The exception to this is the last message which is sent with a status of "success."

2.3.1.3.2.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by CPIPC_DICOM Server AE for Activity "Query SCP"					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Information Mode- 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	SCP	None

Study Root Query/Retrieve Information Mode- FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

2.3.1.3.2.2.1 SOP Specific DICOM Conformance Statement for the Patient Root Query/Retrieve Information Model – FIND and Study Root Query/Retrieve Information Model - FIND SOP Classes

The CPIPC_DICOM Server provides matching against query keys as described in Section 8.

The AE does not support Relational Search.

The AE supports case-insensitive matching for the attributes of Value Representation PN as described in Section 8.2.2

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

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Failure	A700	Refused: Out of resources	Returned if the DICOM Server runs out of resources (e.g. memory); error logged.	None
	C000	Error: Unable to process	Returned by the DICOM Server if for any other reason, not specified elsewhere in this table, the Find operation failed; error logged.	None
Cancel	FE00	Matching terminated due to cancel	Returned if the DICOM Server receives a C-CANCEL-FIND-RQ message; error logged.	None
Success	0000	Matching is complete - No final identifier is supplied		None
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.		
	FF01	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier		

2.3.1.3.2.3 Presentation Context Acceptance Criterion

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

2.3.1.3.2.4 Transfer Syntax Selection Policies

Within each Presentation Context, the CPIPC_DICOM Server will select Transfer Syntaxes according to the following priority (highest priority first):

- Explicit VR Little Endian

- Implicit VR Little Endian.

2.3.1.3.3 Real-World Activity Image Retrieve SCP

2.3.1.3.3.1 Associated Real-World Activity

The DICOM Server AE is always listening for associations. No operator action is required to respond to an Image Retrieve request.

The real-world activity associated with the Image Retrieve request is to send all images corresponding to the C-MOVE request to the specified Move destination AE through a separate association. Xeleris supports Move Destination set with a different AE Title than the one initiating the association for the C-MOVE.

2.3.1.3.3.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by CPIPC_DICOM Server AE for Activity "Image Retrieve SCP"					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
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	SCP	None
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	SCP	None

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

The CPIPC_DICOM Server supports Storage Sub-operations for Instances of any of the Composite SOP Classes it supports as an SCU (see Section 2.3.1).

There is not any Time-out defined in CPIPC_DICOM Server for Image Retrieve SCP operation.

This implementation does not support extended negotiation for the C-MOVE Service, including that for relational-retrieve.

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

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Failure	A701	Refused: Out of resources - Unable to calculate number of matches	Returned if the DICOM Server can't find requested SOP instance(s); error logged.	None
	A702	Refused: Out of resources - Unable to perform sub-operations	Returned if the DICOM Server runs out of resources (e.g. memory); error logged.	None

	A801	Error: Move Destination Unknown	Returned if the DICOM Server has no information on destination AE; error logged.	None
	A900	Error: Identifier does not match SOP Class	Returned if the DICOM Server receives other than the Patient Root Query/Retrieve Information Model or Study Root Query/Retrieve Information Model SOP class.	None
	C000	Error: Unable to process	Returned if the DICOM Server cannot successfully interpret the C-MOVE-RQ message.	None
Cancel	FE00	Sub-operations terminated due to a Cancel indication	Returned if the DICOM Server receives a C-CANCEL-MOVE-RQ message.	None
Warning	B000	Sub-operations Complete - One or more Failures.	Returned upon completion if one or more of the specified images failed to transfer to the destination AE.	None
Success	0000	Sub-operations Complete - No Failure.	Returned after the transfer of the last image.	None
Pending	FF00	Sub-operations are continuing -	Returned after the transfer of each image except for the last.	None

2.3.1.3.3.3 Presentation Context Acceptance Criterion

The CPIPC_DICOM Server evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for Retrieve Image SCP Real-World Activity.

2.3.1.3.3.4 Transfer Syntax Selection Policies

Within each Presentation Context, the CPIPC_DICOM Server will select Transfer Syntaxes according to the following priority (highest priority first):

- Explicit VR Little Endian
- Implicit VR Little Endian

2.3.1.3.4 Real-World Activity Verify SCP

2.3.1.3.4.1 Associated Real-World Activity

The CPIPC_DICOM Server AE is always listening for associations. No operator action is required to respond to a Verification request.

The real-world activity associated with the Verification request is to send a C-ECHO-RSP message with a status of "success" to the requesting AE.

There is not any Time-out defined in CPIPC_DICOM Server for Verify SCP operation.

2.3.1.3.4.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by CPIPC_DICOM Server AE for Activity "Verify SCP"			
Abstract Syntax	**Transfer Syntax**	**Role**	**Extended**

Name	UID	Name List	UID List		Negotiation
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

2.3.1.3.4.2.1 SOP Specific DICOM Conformance Statement for Verification SOP Class

The CPIPC_DICOM Server AE provides standard conformance to the DICOM verification service class.

2.3.1.3.4.3 Presentation Context Acceptance Criterion

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

2.3.1.3.4.4 Transfer Syntax Selection Policies

Within each Presentation Context, the CPIPC_DICOM Server will select Transfer Syntaxes according to the following priority (highest priority first):

- Explicit VR Little Endian
- Implicit VR Little Endian

2.3.1.3.5 Real-World Activity Receive N-EVENT-REPORT from Storage Commitment SCP

2.3.1.3.5.1 Associated Real-World Activity

As part of the storage commitment implementation, Remote AE (SCP) initiates an association to this implementation and sends an N-EVENT-REPORT. The attribute of the N-EVENT-REPORT message includes an indication on all images for which a commitment has succeeded and those for which it has failed.

The receipt of an N-EVENT-REPORT on an association that CPIPC_DICOM Server AE has initiated is not supported. The Remote AE (SCP) must initiate a new association in order to send the new N-EVENT-REPORT.

On reception of a successful N-EVENT-REPORT-RQ notification from the Storage Commitment Provider, the images are flagged as committed in the database and appropriate entry is added to Archive History if Archive functionality is enabled on the Xeleris.

There is not any Time-out defined in CPIPC_DICOM Server for Receive N-EVENT-REPORT operation.

2.3.1.3.5.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by CPIPC_DICOM Server AE for Activity "Receive N-EVENT-REPORT from Storage Commitment SCP"					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

2.3.1.3.5.2.1 SOP Specific DICOM Conformance Statement for the Storage Commitment Push Model SOP Class SCU

The CPIPC_DICOM Server will only accept the SCU role (which must be proposed via SCP/SCU Role Selection Negotiation) within a Presentation Context for the Storage Commitment Push Model SOP Class.

Upon receiving a Storage Commitment N-EVENT-REPORT (Storage Commitment Result), the CPIPC_DICOM Server AE will validate the Transaction UID against its list of outstanding Storage Commitment Request Transaction UIDs. If it matches an outstanding Request, the AE will mark all SOP Instances for which a success status is indicated with an Archived flag, shown on the user interface with "Archived" icon. In addition appropriate entry is added to Archive History if Archive functionality is enabled on the Xeleris.

When at least one Instance associated with a Study is "Archived", the Study on the user interface will also be shown on the user interface with "Archived icon.

If the Storage Commitment Result indicates any failure status, an error message will be written to the error log. Any retry must be manually reinitiated as a new Storage Commitment Request (see Section 2.3.1.2.5). The list of specific Failure Reason Codes that this AE will be able to process is described in Section 7.1.2.1.

Following are the status codes the Application may send back in the **N-Event-Report** response command to the **Storage Commitment** SCP Equipment that sent the N-Event-Report request:

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Failure	0119	Class-instance conflict	SOP Class UID of Notification does not match Storage Commitment Push Model SOP Class	None
	0113	No such event type	Event type ID is not recognized	(0000,0002) (0000,1002)
	0110	Processing failure	Any general error occurred	(0000,0002) (0000,1000)
Success	0000		N-EVENT-REPORT message is successfully processed	None

2.3.1.3.5.3 Presentation Context Acceptance Criterion

The CPIPC_DICOM Server evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for Receive N-EVENT-REPORT from Storage Commitment SCP Real-World Activity.

2.3.1.3.5.4 Transfer Syntax Selection Policies

Within each Presentation Context, the CPIPC_DICOM Server will select Transfer Syntaxes according to the following priority (highest priority first):

- Explicit VR Little Endian
- Implicit VR Little Endian

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.

For Xeleris 3.0 implementation, the TCP/IP stack is inherited from the Windows XP (SP3) Operating System.

For Xeleris 3.1 implementation, the TCP/IP stack is inherited from the Windows Embedded Standard 7 Operating System.

2.4.2 Physical Media Support

Ethernet 802.3 provides the physical network layer for this product.

2.4.3 Additional Protocols

Xeleris 3.0 and Xeleris 3.1 implementations support DHCP Protocol

2.4.4 IPv4 and IPv6 Support

Xeleris 3.0 and Xeleris 3.1 implementations support IPv4 only

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.

Xeleris NM Images are Standard Extended NM Image Storage SOP Class (see Section 3 for a complete description).

Xeleris PET Images are Standard Extended PET Image Storage SOP Class (see Section 4 for a complete description).

Xeleris Secondary Capture Images are Standard Extended Secondary Capture Image Storage SOP Class (see Section 5 or a complete description).

Xeleris Multi-Frame Secondary Capture Images are Standard Extended Multi-Frame Secondary Capture Image Storage SOP Class (see Section 5 for a complete description).

Xeleris Curve Objects are Standard Extended Stand-Alone Curve Storage SOP Class (see Section 6 for a complete description).

2.5.1.2 Private SOP Class

Xeleris does not implement any Private SOP Class but supports Private Storage SOP Class as SCP.

2.5.2 Private Transfer Syntaxes

No Private Transfer Syntax is supported.

2.6 CONFIGURATION

The Xeleris system is configured by GEHC Field Service Engineers. The DICOM configuration items below are configurable or re-configurable by a Field Service Engineer but are not accessible through the Xeleris user interface.

2.6.1 AE Title/Presentation Address Mapping

Xeleris allows for the configuration of the mapping of remote AE titles to IP addresses and ports. The IP address of a remote AE may be in a different subnet (using routing). A router is configurable to ensure communication from one sub-net to another.

This configuration is performed by GEHC Field Service Engineers.

2.6.2 Configurable Parameters

The following fields are configurable for CPIPC_DICOM Server AE (local):

- Local AE Title (default value is XELERIS)

- Local IP Address

- Local Listening Port Number (default value is 104)

- Time limit (in hours) of SCU waiting for a Storage Commitment N-EVENT-REPORT from SCP - default value is 24 Hours

The following fields are configurable for every remote DICOM AE:

- Remote AE Title

- Remote IP Address

- Listening TCP/IP Port Number

- Remote AE functionality flags:
  - Store Images
  - Query/Retrieve
  - Pre-filter
  - PET Raw data destination
  - Storage commit server
  - Storage commit on: (AE Title of one of previously defined Storage Commitment Servers)

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

2.7 SUPPORT OF EXTENDED CHARACTER SETS

The Xeleris 3.x is configurable with a single single-byte extended character set, either the default ISO_IR 100 (Latin alphabet Number 1 supplementary set), or the alternate ISO_IR 101 (Latin alphabet Number 2 supplementary set).

2.8 CODES AND CONTROLLED TERMINOLOGY

2.8.1 Fixed Coded Terminology

The product uses the fixed (non-configurable, non-extensible) coded terminology in Image SOP Instance:

(0040,0555) - Acquisition Context Module (See Section 3.4.6.3)

(0054, 0300) - Radionuclide Code Sequence (See Section 3.4.6.11)

(0054, 0304) - Radiopharmaceutical Code Sequence (See Section 3.4.6.11)

(0054, 0410) - Patient Orientation (See Section 3.4.3.5)

(0054, 0412) - Patient Orientation Modifier (See Section 3.4.3.5)

(0054, 0414) - Patient Gantry Relationship (See Section 3.4.3.5)

(0054, 0200) - View (See Section 3.4.6.13)

2.8.2 Mapped Coded Terminology

The product uses no mapped coded terminology.

2.8.3 Configurable Coded Terminology

The product uses no configurable 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. NM INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

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

3.2 XELERIS 3.X MAPPING OF DICOM ENTITIES

The Xeleris 3.x maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 3-1
MAPPING OF DICOM ENTITIES TO XELERIS 3.X ENTITIES

DICOM IE	Xeleris 3.x Entity
Patient	Patient
Study	Study
Series	Series
Image	Dataset

3.3 IOD MODULE TABLE

The NM 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
NM IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Private Patient	Used	3.4.1.2
	Clinical Trial Subject	Not Used	N/A
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Private Study	Used	3.4.2.3
	Standard Extended Study	Used	3.4.2.4
	Clinical Trial Study	Not Used	N/A
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	N/A
	Private Series	Used	3.4.3.2
	Private NM Series	Used	3.4.3.3
	Standard Extended Series	Used	3.4.3.4
	NM/PET Patient Orientation	Used	3.4.3.5
Frame of Reference	Frame of Reference	Used for images where Image	3.4.4.1

		Type (0008,0008) Value 3 is TOMO or RECON TOMO	
Equipment	General Equipment	Used	3.4.5.1
Image	General Image	Used	3.4.6.1
	Image Pixel	Used	3.4.6.2
	Acquisition Context	Used for Cardiac SPECT images only	3.4.6.3
	Device	Not Used	N/A
	NM Image Pixel	Used	3.4.6.4
	Private Image Pixel	Used	3.4.6.5
	Specimen	Not Used	N/A
	Multi-frame	Used	3.4.6.6
	NM Multi-frame	Used	3.4.6.7
	NM Image	Used	3.4.6.8
	Private Image	Used	3.4.6.9
	Private NM Image	Used	3.4.6.10
	NM Isotope	Used	3.4.6.11
	Private Isotope	Used	3.4.6.12
	NM Detector	Used	3.4.6.13
	Private Detector	Used	3.4.6.14
	NM Tomo Acquisition	Used for Images when Image Type (0008,0008) Value 3 is TOMO, GATED TOMO, RECON TOMO or RECON GATED TOMO	3.4.6.15
	Private Tomo Acquisition	Used for Images when Image Type (0008,0008) Value 3 is TOMO, GATED TOMO, RECON TOMO or RECON GATED TOMO	3.4.6.16
	NM Multi-gated Acquisition	Used for Images when Image Type (0008,0008) Value 3 is GATED, GATED TOMO or RECON GATED TOMO	3.4.6.17
	Private Multi-gated Acquisition	Used for Images when Image Type (0008,0008) Value 3 is GATED, GATED TOMO or RECON GATED TOMO	3.4.6.18
	NM Phase	Used for Images when Image Type (0008,0008) Value 3 is DYNAMIC	3.4.6.19
	NM Reconstruction	Used for Images when Image Type (0008,0008) Value 3 is RECON TOMO or RECON GATED TOMO	3.4.6.20
	Private SPECT Reconstruction Module	Used for Images when Image Type (0008,0008) Value 3 is	3.4.6.21

	RECON TOMO or RECON GATED TOMO	
Private SPECT Backprojection Module	Used for Images when Image Type (0008,0008) Value 3 is RECON TOMO or RECON GATED TOMO	3.4.6.22
Private SPECT Oblique Reformat Module	Used for Images when Image Type (0008,0008) Value 3 is RECON TOMO or RECON GATED TOMO	3.4.6.23
Overlay Plane	Not Used	N/A
Multi-frame Overlay	Not Used	N/A
VOI LUT	Used	3.4.6.24
SOP Common	Used	3.4.6.25

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 NM 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 values they may take and where these values are obtained from when generating the instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

Private attributes are defined in private modules, each of which follow the related Standard module. Private data element tags are assigned following the rules given in Part 5 of the DICOM v3.0 Standard, and are identified using the (gggg, xxnn) format, where xx represents a reserved block of element numbers within the group gggg.

Private Modules contain *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Modules.

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	Patient's full name
Patient ID	(0010,0020)	2	Primary hospital identification number or code for the patient
Issuer of Patient ID	(0010,0021)	3	Not Used
Issuer of Patient ID Qualifiers Sequence	(0010,0024)	3	Not Used
Patient's Birth Date	(0010,0030)	2	Birth date of the patient. Sent as ZERO LENGTH value if value is not retrieved from input images.
Patient's Sex	(0010,0040)	2	Sex of the named patient

			Enumerated Values: M = male F = female O = other Sent as ZERO LENGTH value if value is not retrieved from input images
Other Patient IDs	(0010,1000)	3	Other identification numbers or codes used to identify the patient.
Other Patient Names	(0010,1001)	3	Other names used to identify the patient.
Ethnic Group	(0010,2160)	3	Ethnic group or race of the patient.
Patient Comments	(0010,4000)	3	User-defined additional information about the patient.

3.4.1.2 Private Patient Module

TABLE 3-4
PRIVATE PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator ID	Attribute Description
Patient Object Name	(0009,xx40)	GEMS_GENIE_1	Name of the Database Patient Object
Patient Flags	(0009,xx41)	GEMS_GENIE_1	Defines patient information.
Patient Creation Date	(0009,xx42)	GEMS_GENIE_1	Date of Patient Entity creation
Patient Creation Time	(0009,xx43)	GEMS_GENIE_1	Time of Patient Entity creation

3.4.2 Study Entity Modules

3.4.2.1 General Study Module

TABLE 3-5
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Unique identifier for the Study. Internally generated for locally created study or when any Study attributes is modified by user in Xeleris UI.
Study Date	(0008,0020)	2	Creation date of study entity.
Study Time	(0008,0030)	2	Creation time of study entity.
Referring Physician's Name	(0008,0090)	2	Name of the patient's referring physician Only Sent as ZERO LENGTH value if value is not retrieved from input images or from user input.
Study ID	(0020,0010)	2	User or equipment generated Study identifier.
Accession Number	(0008,0050)	2	A RIS generated number that identifies the order for the Study. Sent as ZERO LENGTH value if value is not retrieved from input images or from user input.
Study Description	(0008,1030)	3	Study Description
Name of Physician(s) Reading Study	(0008,1060)	3	Name of Physician(s) Reading Study

3.4.2.2 Patient Study Module

TABLE 3-6
PATIENT STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Age	(0010,1010)	3	Age of the Patient.
Patient's Size	(0010,1020)	3	Length or size of the Patient, in meters, Default Value is "0".
Patient's Weight	(0010,1030)	3	Weight of the Patient, in kilograms; Default Value is "0".
Occupation	(0010,2180)	3	Patient Occupation.
Additional Patient's History	(0010,21B0)	3	Additional information about the Patient's medical history.

3.4.2.3 Private Study Module

TABLE 3-7
PRIVATE STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator ID	Attribute Description
Study Name	(0009,xx10)	GEMS_GENIE_1	Name of the Database Study Object
Study Flags	(0009,xx11)	GEMS_GENIE_1	Defines study information.
Study Type	(0009,xx12)	GEMS_GENIE_1	Defines type of study.
Study Comments	(0013,xx26)	GEMS_GENIE_1	User-defined additional information about the study.
Protocol Data Sequence	(0033,xx50)	GEMS_XELPRV_01	SQ with items encoding Protocol data

			Object (PDO) attributes; May contain 0 or more items
>Object Type	(0033,xx08)	GEMS_XELPRV_01	Private object type Always set to "PROTOCOL DATA"
>Modified	(0033,xx10)	GEMS_XELPRV_01	Modified Flag; Default value is 0, not modified.
>Name	(0033,xx11)	GEMS_XELPRV_01	Name of Database Object
>Database Object Unique ID	(0033,xx16)	GEMS_XELPRV_01	Database UID of PDO; contains value of PDO UID tag (0033, xx52) generated at time of object creation.
>Date	(0033,xx17)	GEMS_XELPRV_01	Date
>Time	(0033,xx18)	GEMS_XELPRV_01	Time
>ObjectFlags	(0033,xx19)	GEMS_XELPRV_01	Protocol Data Flags
>ProtocolName	(0033,xx1A)	GEMS_XELPRV_01	Protocol Name
>Relevant data UID	(0033,xx1B)	GEMS_XELPRV_01	Contains value of Study Id.
>BulkData	(0033,xx1C)	GEMS_XELPRV_01	Bulk Data
>IntData	(0033,xx1D)	GEMS_XELPRV_01	Int Data
>DoubleData	(0033,xx1E)	GEMS_XELPRV_01	Double Data
>StringData	(0033,xx1F)	GEMS_XELPRV_01	String Data
>BulkDataFormat	(0033,xx20)	GEMS_XELPRV_01	Bulk Data Format
>IntDataFormat	(0033,xx21)	GEMS_XELPRV_01	Int Data Format
>DoubleDataFormat	(0033,xx22)	GEMS_XELPRV_01	Double Data Format
>StringDataFormat	(0033,xx23)	GEMS_XELPRV_01	String Data Format
>Description	(0033,xx24)	GEMS_XELPRV_01	Description
>Internal SOPClassUID	(0033,xx51)	GEMS_XELPRV_01	PDO Private SOP Class UID
>Internal Instance UID	(0033,xx52)	GEMS_XELPRV_01	PDO Instance UID; Internally generated
ReviewTemplatesSequence	(0033,xx60)	GEMS_XELPRV_01	SQ with items encoding Private Review Templates Objects (RTO) attributes; May contain 0 or more items
>Object Type	(0033,xx08)	GEMS_XELPRV_01	Private object type. Contains String "REVIEW DATA"
>Modified	(0033,xx10)	GEMS_XELPRV_01	Modified Flag
>Name	(0033,xx11)	GEMS_XELPRV_01	Name of Database Object
>StudyId	(0033,xx14)	GEMS_XELPRV_01	Study Id
>Database Object Unique ID	(0033,xx16)	GEMS_XELPRV_01	Database UID of RTO contains value of RTO UID tag (0033,xx62) generated at time of object creation
>Date	(0033,xx17)	GEMS_XELPRV_01	Creation Date
>Time	(0033,xx18)	GEMS_XELPRV_01	Creation Time
>RTName	(0033,xx28)	GEMS_XELPRV_01	Review Template Name
>RTSpecification	(0033,xx29)	GEMS_XELPRV_01	Review Template Specification
>RTFlags	(0033,xx2A)	GEMS_XELPRV_01	Review Templates Flags
>DataValidationSpec	(0033,xx2B)	GEMS_XELPRV_01	Data Validation Spec

>Description	(0033,xx2C)	GEMS_XELPRV_01	Description
>IconDescription	(0033,xx2D)	GEMS_XELPRV_01	Icon Description
>Internal SOP Class UID	(0033,xx61)	GEMS_XELPRV_01	RTO Private SOP Class UID
>Internal InstanceUID	(0033,xx62)	GEMS_XELPRV_01	RTO Instance UID; Internally generated

3.4.2.4 Standard Extended Study Module

TABLE 3-8
STANDARD EXTENDED STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Comments	(0032,4000)	3	Comments for Study

3.4.3 Series Entity Modules

3.4.3.1 General Series Module

TABLE 3-9
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Type of equipment that originally acquired the data used to create the images in this Series. Defined Terms used for data created on this system: NM = Nuclear Medicine OT = Other
Series Instance UID	(0020,000E)	1	Unique identifier of the Series. Internally generated for locally created series or when any Series attribute is modified by user in Xeleris UI.
Series Number	(0020,0011)	2	A number that identifies this Series. Internally generated.
Laterality	(0020,0060)	2C	Laterality of (paired) body part examined. Enumerated Values: R = right L = left
Series Date	(0008,0021)	3	Date the Series started.
Series Time	(0008,0031)	3	Time the Series started.
Protocol Name	(0018,1030)	3	User-defined description of the conditions under which the Series was performed.
Series Description	(0008,103E)	3	Description of the Series
Operators' Name	(0008,1070)	3	Name(s) of the operator(s) supporting the Series.
Body Part Examined	(0018,0015)	3	Text description of the part of the body examined.
Request Attributes Sequence	(0040,0275)	3	Sequence that contains attributes from the Imaging Service Request. The sequence may have one or more Items.
>Requested Procedure ID	(0040,1001)	1C	Identifier that identifies the Requested Procedure in the Imaging Service Request. Required if procedure was scheduled. May be present otherwise.
>Scheduled Procedure Step ID	(0040,0009)	1C	Identifier that identifies the Scheduled Procedure Step.

			Required if procedure was scheduled.
>Scheduled Procedure Step Description	(0040,0007)	3	Institution-generated description or classification of the Scheduled Procedure Step to be performed.
Performed Procedure Step ID	(0040,0253)	3	User or equipment generated identifier of that part of a Procedure that has been carried out within this step. Not sent for DERIVED NM Images.

3.4.3.2 Private Series Module

TABLE 3-10
PRIVATE SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator ID	Attribute Description
Series Flags	(0009,xx21)	GEMS_GENIE_1	Defines series information.
Seriesdata Sequence	(0033,xx70)	GEMS_XELPRV_01	SQ with items encoding Series Data Object (SDO) attributes; May contain 0 or more items.
>Object Type	(0033,xx08)	GEMS_XELPRV_01	Data Object Type. Contains string "SERIES DATA"
>Modified	(0033,xx10)	GEMS_XELPRV_01	Modified Flag
>Name	(0033,xx11)	GEMS_XELPRV_01	Name of Database Object
>Database Object Unique ID	(0033,xx16)	GEMS_XELPRV_01	Database UID of SDO; contains value of SDO UID tag (0033, xx72) generated at time of object creation
>Date	(0033,xx17)	GEMS_XELPRV_01	SDO Creation Date
>Time	(0033,xx18)	GEMS_XELPRV_01	SDO Creation Time
>SeriesDataFlags	(0033,xx19)	GEMS_XELPRV_01	Series Data Flags
>ProtocolName	(0033,xx1A)	GEMS_XELPRV_01	Name of Protocol created SDO
>RelevantDataUID	(0033,xx1B)	GEMS_XELPRV_01	UID of SOP Instance relative to SDO
>BulkData	(0033,xx1C)	GEMS_XELPRV_01	SDO parameter(s) stored as binary buffer(s)
>IntData	(0033,xx1D)	GEMS_XELPRV_01	List of SDO parameters stored as integers
>DoubleData	(0033,xx1E)	GEMS_XELPRV_01	List of SDO parameters stored as doubles
>StringData	(0033,xx1F)	GEMS_XELPRV_01	List of SDO parameters stored as list of strings
>BulkDataFormat	(0033,xx20)	GEMS_XELPRV_01	Format of bulk parameters; contains information about name and size of bulk buffers
>IntDataFormat	(0033,xx21)	GEMS_XELPRV_01	Format of integer parameters; contains information about name and number of integers in list
>DoubleDataFormat	(0033,xx22)	GEMS_XELPRV_01	Format of double parameters; contains information about name and number of doubles in list
>StringDataFormat	(0033,xx23)	GEMS_XELPRV_01	Format of string parameters; contains information about name and number of strings in list
>Description	(0033,xx24)	GEMS_XELPRV_01	User or equipment generated SDO description

>DoubleDataSQ	(0033,xx73)	GEMS_XELPRV_01	Sequence of items to store SDO parameters as lists of doubles. May contain 0 or more items.
>>DoubleData	(0033,xx1E)	GEMS_XELPRV_01	List of SDO parameters stored as doubles
>Series Data Private SOP Class UID	(0033,xx71)	GEMS_XELPRV_01	SDO Private SOP Class UID
>Series Data Instance UID	(0033,xx72)	GEMS_XELPRV_01	SDO Instance UID; Internally generated in time of object creation

3.4.3.3 Private NM Series Module

TABLE 3-11
PRIVATE NM SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator ID	Attribute Description
Series Object Name	(0009,xx20)	GEMS_GENIE_1	Name of the Database Series Object.
User Orientation	(0009,xx22)	GEMS_GENIE_1	User specified patient orientation.
Initiation Type	(0009,xx23)	GEMS_GENIE_1	Acquisition initiation type. The Defined Terms are: 0 = started on count rate 1 = started after time delay 2 = started manually
Initiation Delay	(0009,xx24)	GEMS_GENIE_1	Acquisition start delay time.
Initiation Count Rate	(0009,xx25)	GEMS_GENIE_1	Acquisition start count rate
Number Energy Sets	(0009,xx26)	GEMS_GENIE_1	Number of energy sets in this Series.
Number Detectors	(0009,xx27)	GEMS_GENIE_1	Number of detectors.
Number R-R Windows	(0009,xx28)	GEMS_GENIE_1	Number of R-R Interval Windows.
Number MG Time Slots	(0009,xx29)	GEMS_GENIE_1	Number of R-R Interval time bins.
Number View Sets	(0009,xx2A)	GEMS_GENIE_1	Number of view sets in this Series.
Trigger History UID	(0009,xx2B)	GEMS_GENIE_1	UID of Private Trigger Object relevant to the Series.
Series Comments	(0009,xx2C)	GEMS_GENIE_1	User-defined additional information about the series.
Distance Prescribed	(0009,xx2E)	GEMS_GENIE_1	User prescribed whole body scanning distance.
Table Direction	(0009, xx2F)	GEMS_GENIE_1	Table Direction
Series Type	(0011,xx0A)	GEMS_GENIE_1	Defines type of series. The Defined Terms are: 0 = static 1 = whole body 3 = multi-gated 6 = dynamic 9 = tomographic 15 = results
Effective Series Duration	(0011,xx0B)	GEMS_GENIE_1	Calculated duration of series acquisition.
Number Beats	(0011,xx0C)	GEMS_GENIE_1	Number of physiological triggers during

			acquisition.

3.4.3.4 Standard Extended Series Module

TABLE 3-12
STANDARD EXTENDED SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient Position	(0018,5100)	3	Patient position descriptor relative to the Equipment. The Defined Terms are: HFP = Head First-Prone HFS = Head First-Supine HFDR = Head First-Decubitus Right HFDL = Head First-Decubitus Left FFDR = Feet First-Decubitus Right FFDL = Feet First-Decubitus Left FFP = Feet First-Prone FFS = Feet First-Supine Attribute is copied from the input images. Not sent, if another Patient Position is used for acquisition.

3.4.3.5 NM/PET Patient Orientation Module

TABLE 3-13
NM/PET PATIENT ORIENTATION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient Orientation Code Sequence	(0054,0410)	2	Describes the orientation of the patient with respect to gravity. Zero or one item shall be present in the sequence.
>Include Code Sequence Macro			See Table 3-14
> Patient Orientation Modifier Code Sequence	(0054,0412)	2C	Patient Orientation Modifier. Required if needed to fully specify the orientation of the patient with respect to gravity. Zero or one item shall be present in the sequence. Always sent if Patient Orientation Code Sequence contains at least one item.
>>Include 'Code Sequence Macro'			See Table 3-15
Patient Gantry Relationship Code Sequence	(0054,0414)	2	Describes the orientation of the patient with respect to the gantry. Zero or one item shall be present in the sequence
>Include Code Sequence Macro			See Table 3-16

TABLE 3-14
PATIENT ORIENTATION CODE SEQUENCE VALUES (BASELINE ID 19)

Code Value	Coding Scheme Designator	Code Meaning
F-10440	99SDM	erect

| F-10450 | 99SDM | recumbent |
| F-10460 | 99SDM | semi-erect |

TABLE 3-15
PATIENT ORIENTATION MODIFIER CODE SEQUENCE VALUES (BASELINE ID 20)

Code Value	Coding Scheme Designator	Code Meaning
F-10310	99SDM	prone
F-10316	99SDM	semi-prone
F-10317	99SDM	right lateral decubitus
F-10318	99SDM	lateral decubitus
F-10319	99SDM	left lateral decubitus
F-10320	99SDM	standing
F-10326	99SDM	anatomical
F-10330	99SDM	kneeling
F-10336	99SDM	knee-chest
F-10340	99SDM	supine
F-10346	99SDM	lithotomy
F-10348	99SDM	Trendelenburg
F-10349	99SDM	inverse Trendelenburg
F-10380	99SDM	frog
F-10390	99SDM	stooped-over
F-103A0	99SDM	sitting
F-10410	99SDM	curled-up

TABLE 3-16
PATIENT GANTRY RELATIONSHIP CODE SEQUENCE VALUES (BASELINE ID 21)

Code Value	Coding Scheme Designator	Code Meaning
F-10470	99SDM	headfirst
F-10480	99SDM	feet-first
F-10516	99SDM	oblique
F-10515	99SDM	transverse

3.4.4 Frame Of Reference Entity Modules

3.4.4.1 Frame Of Reference Module

This section specifies the Attributes necessary to uniquely identify a Frame Of Reference which insures the spatial relationship of Images within a Series. It also allows Images across multiple Series to share the same Frame Of Reference. This Frame Of Reference (or coordinate system) shall be constant for all Images related to a specific Frame Of Reference.

Xeleris systems group spatially and/or temporally related Images in the same Series. Acquisition data created on other systems may be missing frame of reference information, and for these cases Xeleris fills this attribute with Series UID.

TABLE 3-17
FRAME OF REFERENCE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Frame of Reference UID	(0020,0052)	1	Uniquely identifies the frame of reference for a Series.
Position Reference Indicator	(0020,1040)	2	Part of the patient's anatomy used as a reference. Always sends as ZERO length value.

3.4.5 Equipment Entity Modules

3.4.5.1 General Equipment Module

TABLE 3-18
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Manufacturer of the equipment that produced the composite instances. Possible Values: "GE MEDICAL SYSTEMS" "GE MEDICAL SYSTEMS, NUCLEAR" (for NM IOD) "GE MEDICAL SYSTEMS, PET " (for PET IOD)
Institution Name	(0008,0080)	3	Institution where the equipment that produced the composite instances is located.
Station Name	(0008,1010)	3	User defined name identifying the machine that produced the composite instances
Manufacturer's Model Name	(0008,1090)	3	Manufacturer's model name of the equipment that produced the composite instances.
Device Serial Number	(0018,1000)	3	Manufacturer's serial number of the equipment that produced the composite instances.
Software Versions	(0018,1020)	3	Manufacturer's designation of software version of the equipment that produced the composite instances.

3.4.6 Image Entity Modules

3.4.6.1 General Image Module

TABLE 3-19
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020,0013)	2	A number that identifies this image.
Patient Orientation	(0020,0020)	2C	Not sent for NM (not required)
Content Date	(0008,0023)	2C	The date the image pixel data creation started.
Content Time	(0008,0033)	2C	The time the image pixel data creation started
Image Type	(0008,0008)	3	See 3.4.6.8.1.

Acquisition Date	(0008,0022)	3	The date the acquisition of data that resulted in this image started
Acquisition Time	(0008,0032)	3	The time the acquisition of data that resulted in this image started
Image Comments	(0020,4000)	3	User-defined comments about the image Contains additional information about image.

3.4.6.2 Image Pixel Module

TABLE 3-20
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	See 3.4.6.4 for NM Images
Photometric Interpretation	(0028,0004)	1	See 3.4.6.4 for NM Images
Rows	(0028,0010)	1	Number of rows in the image.
Columns	(0028,0011)	1	Number of columns in the image
Bits Allocated	(0028,0100)	1	See 3.4.6.4 for NM Images
Bits Stored	(0028,0101)	1	See 3.4.6.4 for NM Images
High Bit	(0028,0102)	1	See 3.4.6.4 for NM Images
Pixel Representation	(0028,0103)	1	Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values used: 0000H = unsigned integer. 0001H=2's complement
Pixel Data	(7FE0,0010)	1	A data stream of the pixel samples that comprise the Image.
Planar Configuration	(0028,0006)	1C	Not Used (number of Samples per Pixel is always 1)
Pixel Aspect Ratio	(0028,0034)	1C	Not Used
Smallest Image Pixel Value	(0028,0106)	3	The minimum actual pixel value encountered in this image.
Largest Image Pixel Value	(0028,0107)	3	The maximum actual pixel value encountered in this image.

3.4.6.3 Acquisition Context Module

TABLE 3-21
ACQUISITION CONTEXT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Acquisition Context Sequence	(0040,0555)	2	A sequence of Items that describes the conditions present during the acquisition of the data of the SOP Instance. Zero or more items may be included in this sequence
>Concept Name Code Sequence	(0040,A043)	1	A concept that constrains the meaning of (i.e. defines the role of) the Observation Value. This sequence contains 1 item

>>*Include 'Code Sequence Macro'*			(109054, DCM, "Patient State") is supported as defined in TID 3470
>Concept Code Sequence	(0040,A168)	1C	This is the Value component of a Name/Value pair when the Concept implied by Concept Name Code Sequence (0040,A043) is a Coded Value. This sequence contains 1 item
>>*Include 'Code Sequence Macro'*			DCID (3101) NM Procedural State Values is supported as defined in TID 3470: The following values are used: (F-01604 ,SRT ,"Resting State") (F-05019 ,SRT, "Cardiac Stress State") (109092 ,DCM ,"Reinjection State") (109093 ,DCM ,"Redistribution State") (109094 ,DCM ,"Delayed Redistribution State")

3.4.6.4 NM Image Pixel Module

This section specifies the Attributes that describe the pixel data of a NM image.

TABLE 3-22
NM IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Number of samples (planes) in this image. The value always set to 1.
Photometric Interpretation	(0028,0004)	1	Specifies the intended interpretation of the pixel data Enumerated Values supported : MONOCHROME2
Bits Allocated	(0028,0100)	1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. Enumerated Values supported : 8, 16.
Bits Stored	(0028,0101)	1	Number of bits stored for each pixel sample. Value equal to Bit Allocated (0028,0100)
High Bit	(0028,0102)	1	Most significant bit for pixel sample data. Value equal to Bit Stored (0028,0101) – 1
Pixel Spacing	(0028,0030)	2	Physical distance in the patient between the center of each pixel, specified by a numeric pair – adjacent row spacing (delimiter) adjacent column spacing, in mm.

3.4.6.5 Private Image Pixel Module

TABLE 3-23
PRIVATE IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator Id	Attribute Description

Picture Name	(0011,xx30)	GEMS_GENIE_1	Name of the database Picture Object
Byte Order	(0011,xx38)	GEMS_GENIE_1	Defines pixel data byte order.
Compression Type	(0011,xx39)	GEMS_GENIE_1	Compression information
Picture Format	(0011,xx3A)	GEMS_GENIE_1	Xeleris IAP image format
Pixel Scale	(0011,xx3B)	GEMS_GENIE_1	Internal Pixel Scale. Set to 1.0.
Pixel Offset	(0011,xx3C)	GEMS_GENIE_1	Internal Pixel Offset. Set to 0.0.
Viewing Name	(0011,xx40)	GEMS_GENIE_1	Name of the database Viewing Object
Orientation Angle	(0011,xx41)	GEMS_GENIE_1	Orientation Angle
Rotation Angle	(0011,xx42)	GEMS_GENIE_1	Rotation Angle
Window Inverse Flag	(0011,xx43)	GEMS_GENIE_1	Window Inverse Flag
Threshold Center	(0011,xx44)	GEMS_GENIE_1	Threshold Center
Threshold Width	(0011,xx45)	GEMS_GENIE_1	Threshold Width
Interpolation Type	(0011,xx46)	GEMS_GENIE_1	Interpolation Type
Where Name	(0011,xx50)	GEMS_GENIE_1	Name of the database Where Object
FScalar	(0013,xx15)	GEMS_GENIE_1	Scaling Factor for Floating Point pixel data

3.4.6.6 Multi-Frame Module

TABLE 3-24
MULTI-FRAME MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Number of Frames	(0028,0008)	1	Number of frames in a Multi-frame Image.
Frame Increment Pointer	(0028,0009)	1	See 3.4.6.7.1 for further specialization.

3.4.6.7 NM Multi-frame Module

TABLE 3-25
NM MULTI-FRAME MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Frame Increment Pointer	(0028,0009)	1	See 3.4.6.7.1 for further specialization.
Energy Window Vector	(0054,0010)	1C	Defines energy set window to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Energy Window Vector (0054,0010).
Number of Energy Windows	(0054,0011)	1	Number of energy set windows in SOP Instance. Possible values: 1, 2, 3 or 4.
Detector Vector	(0054,0020)	1C	Defines detector to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Detector Vector (0054,0020).
Number of Detectors	(0054,0021)	1	Number of detectors in SOP Instance. Possible values: 1 or 2.
Phase Vector	(0054,0030)	1C	Defines phase to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Phase Vector

			(0054,0030).
Number of Phases	(0054,0031)	1C	Number of phases in SOP Instance. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Phase Vector (0054,0030). Supported values: 1, 2, 3, 4, 5
Rotation Vector	(0054,0050)	1C	Defines rotation to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Rotation Vector (0054,0050).
Number of Rotations	(0054,0051)	1C	Number of Rotations in SOP Instance. Always set to 1. Sent if Image Type (0008,0008), Value 3 is TOMO ,GATED TOMO, RECON TOMO or RECON GATED TOMO.
R-R Interval Vector	(0054,0060)	1C	Defines R-R Interval to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for R-R Interval Vector (0054,0060).
Number of R-R Intervals	(0054,0061)	1C	Number of R-R Intervals in SOP Instance. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for R-R Interval Vector (0054,0060).
Time Slot Vector	(0054,0070)	1C	Defines time slot, within cardiac cycle, to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Time Slot Vector (0054,0070).
Number of Time Slots	(0054,0071)	1C	Number of time slots in SOP Instance. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Time Slot Vector (0054,0070).
Slice Vector	(0054,0080)	1C	An array which contains the spatial slice number for each frame. Required if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Slice Vector (0054,0080).
Number of Slices	(0054,0081)	1C	Number of slices. Required if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Slice Vector (0054,0080)
Angular View Vector	(0054,0090)	1C	Defines angular view number to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Angular View Vector (0054,0090).
Time Slice Vector	(0054,0100)	1C	Defines frame numbers within each phase. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Time Slice Vector (0054,0100).

3.4.6.7.1 Frame Increment Pointer

The Frame Increment Pointer (0028,0009) defines which frame index vectors are present in the NM Image instance. The Frame Increment Pointer is supported per the DICOM specification for all image types defined in Table 3-26

TABLE 3-26
ENUMERATED VALUES FOR FRAME INCREMENT POINTER

Image Type (0008,0008), Value 3	Frame Increment Pointer (0028,0009)
STATIC or WHOLE BODY	0054H 0010H \ 0054H 0020H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020).
DYNAMIC	0054H 0010H \ 0054H 0020H \ 0054H 0030H \ 0054H 0100H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), Phase Vector (0054,0030), Time Slice Vector (0054,0100)
GATED	0054H 0010H \ 0054H 0020H \ 0054H 0060H \ 0054H 0070H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), R-R Interval Vector (0054,0060), Time Slot Vector (0054,0070)
TOMO	0054H 0010H \ 0054H 0020H \ 0054H 0050H \ 0054H 0090H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), Rotation Vector (0054,0050), Angular View Vector (0054,0090)
GATED TOMO	0054H 0010H \ 0054H 0020H \ 0054H 0050H \ 0054H 0060H \ 0054H 0070H \ 0054H 0090H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), Rotation Vector (0054,0050), R-R Interval Vector (0054,0060), Time Slot Vector (0054,0070), Angular View Vector (0054,0090).
RECON TOMO	0054H 0080H Sequencing is by Slice Vector (0054,0080)
RECON GATED TOMO	0054H 0060H \ 0054H 0070H \ 0054H 0080H Sequencing is by R-R Interval Vector (0054,0060), Time Slot Vector (0054,0070), Slice Vector (0054,0080)

3.4.6.8 NM Image Module

TABLE 3-27
NM IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	See 3.4.6.8.1 for specialization.
Image ID	(0054,0400)	3	User or equipment generated Image identifier.
Counts Accumulated	(0018,0070)	2	Sum of all gamma events for all frames in the image.
Acquisition Termination Condition	(0018,0071)	3	Description of how the data collection was stopped. Defined Terms are used: CNTS = counts DENS = density MANU = manual TIME = time

			TRIG = physiological trigger
Table Height	(0018,1130)	3	Table Height - Height of table at acquisition start.
Table Traverse	(0018,1131)	3	Location of the patient table (or gantry relative to the table) in mm.
Actual Frame Duration	(0018,1242)	1C	Elapsed time for one frame acquisition in msec.. Sent when the Image Type (0008,0008), Value 3, is equal to STATIC or WHOLE BODY.
Count Rate	(0018,1243)	3	Maximum count rate achieved during the acquisition in counts/sec
Corrected Image	(0028,0051)	3	Corrections are applied to all frames in the image. Sent for RECON TOMO and RECON GATED TOMO data only. Defined Terms: ATTN = attenuation corrected SCAT = scatter corrected
Whole Body Technique	(0018,1301)	3	The type of scan performed. Sent if Image Type (0008,0008), Value 3, contains the value WHOLE BODY. Enumerated Values used: 1PS = one pass 2PS = two pass PCN= patient contour following employed MSP= multiple static frames collected into a whole body frame.
Scan Velocity	(0018,1300)	2C	The speed of the camera motion over the body in mm/sec. Sent as ZERO Length value if Image Type (0008,0008) Value 3 contains the value WHOLE BODY and the WHOLEBODY is acquired in the Step-and-Shoot technique, where the table does not move during acquisition.
Scan Length	(0018,1302)	2C	Size of the imaged area in the direction of scanning motion, in mm. Sent as ZERO Length value if Image Type (0008,0008) Value 3 contains the value WHOLE BODY and the WHOLEBODY is acquired in the Step-and-Shoot technique, where the table does not move during acquisition.
Trigger Source or Type	(0018,1061)	3	Text indicating trigger source Which Defined Terms are used: EKG

3.4.6.8.1 Image Type

The following values of Image Type (0008,0008) are sent :

Value 1 shall have the following Enumerated Values:

- ORIGINAL   identifies an Original Image
- DERIVED   identifies a Derived Image

Value 2 shall have the following Enumerated Value:

- PRIMARY   identifies a Primary Image

The following Enumerated Values of Value 3 are created/supported:

- STATIC
- DYNAMIC
- GATED
- WHOLE BODY
- TOMO
- GATED TOMO
- RECON TOMO
- RECON GATED TOMO

The following Enumerated Values of Value 4 are created/supported:

- EMISSION
- TRANSMISSION

3.4.6.9 Private Image Module

TABLE 3-28
PRIVATE IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator Id	Attribute Description
Workstation DICOM data Identifier	(0009,xx01)	GEMS_GENIE_1	Contains always "GEMS_GENIE"
Dataset UID	(0009,xx1E)	GEMS_GENIE_1	Dataset UID. For NM ,PET and SC IODs.
Dataset Name	(0011,xx12)	GEMS_GENIE_1	Dataset Name. For NM ,PET and SC IODs.
Processing Parent UID	(0011,xx32)	GEMS_GENIE_1	Processing Parent UID. For NM and PET IODs.
Source Translator	(0013,xx11)	GEMS_GENIE_1	Source Translator. Default value = 4. For NM ,SC and MFSC IODs.
Annotation Sequence	(0019, xx5F)	GEMS_GENIE_1	Annotations attached to image; May contain 0 or more Items
>Modified	(0019, xx60)	GEMS_GENIE_1	Modified Flag
>Name	(0019, xx61)	GEMS_GENIE_1	Name of Database Annotation Object
>Aid	(0019, xx62)	GEMS_GENIE_1	Database Annotation Unique ID
>DatabaseAnnotationMapping	(0019, xx63)	GEMS_GENIE_1	Database Annotation Mapping
>DatabaseObjectClassID	(0019, xx64)	GEMS_GENIE_1	Internal Database Annotation Object Class ID
>DatabaseObjectUniqueID	(0019, xx65)	GEMS_GENIE_1	Internal Database Annotation Object UID
>TextFgColour	(0019, xx66)	GEMS_GENIE_1	Annotation Text Foreground Color
>TextBgColour	(0019, xx67)	GEMS_GENIE_1	Annotation Text Background Color
>MarkerColour	(0019, xx68)	GEMS_GENIE_1	Annotation Marker Color
>LineColour	(0019, xx69)	GEMS_GENIE_1	Annotation Line Color

>LineThickness	(0019, xx6A)	GEMS_GENIE_1	Annotation Line Thickness
>Font	(0019, xx6B)	GEMS_GENIE_1	Annotation Font
>TextBackingMode	(0019, xx6C)	GEMS_GENIE_1	Annotation Text Backing Mode
>TextJustification	(0019, xx6D)	GEMS_GENIE_1	Annotation Text Justification
>TextShadowOffsetX	(0019, xx6E)	GEMS_GENIE_1	Annotation Text Shadow Offset X
>TextShadowOffsetY	(0019, xx6F)	GEMS_GENIE_1	Annotation Text Shadow Offset Y
>GeomColour	(0019, xx70)	GEMS_GENIE_1	Annotation Geometry Color
>GeomThickness	(0019, xx71)	GEMS_GENIE_1	Annotation Geometry Thickness
>GeomLineStye	(0019, xx72)	GEMS_GENIE_1	Annotation Geometry Line Style
>GeomDashLength	(0019, xx73)	GEMS_GENIE_1	Annotation Geometry Dash Length
>GeomFillPattern	(0019, xx74)	GEMS_GENIE_1	Annotation Geometry Fill Pattern
>MarkerSize	(0019, xx75)	GEMS_GENIE_1	Annotation Marker Size
>Interactivity	(0019, xx76)	GEMS_GENIE_1	Annotation Interactivity
>TextLoc	(0019, xx77)	GEMS_GENIE_1	Annotation Text Location
>TextString	(0019, xx78)	GEMS_GENIE_1	Annotation Text String
>TextAttachMode	(0019, xx79)	GEMS_GENIE_1	Annotation Text Attach Mode
>TextCursorMode	(0019, xx7A)	GEMS_GENIE_1	Annotation Text Cursor Mode
>LineCtrlSize	(0019, xx7B)	GEMS_GENIE_1	Annotation Line Ctrl Size
>LineType	(0019, xx7C)	GEMS_GENIE_1	Annotation Line Type
>LineStyle	(0019, xx7D)	GEMS_GENIE_1	Annotation Line Style
>LineDashLength	(0019, xx7E)	GEMS_GENIE_1	Annotation Line Dash Length
>LinePtCount	(0019, xx7F)	GEMS_GENIE_1	Annotation Line Points Count
>LinePts	(0019, xx80)	GEMS_GENIE_1	Annotation Line Points List
>LineAttachMode	(0019, xx81)	GEMS_GENIE_1	Annotation Line Attach Mode
>MarkerType	(0019, xx82)	GEMS_GENIE_1	Annotation Marker Type
>MarkerLoc	(0019, xx83)	GEMS_GENIE_1	Annotation Marker Location
>MarkerAttachMode	(0019, xx84)	GEMS_GENIE_1	Annotation Line Marker Attach Mode
>FrameNumber	(0019, xx86)	GEMS_GENIE_1	Annotation Frame Number
OrigSOPInstance UID	(0033,xx07)	GEMS_GENIE_1	List of SOP UIDs of Xeleris associated datasets encapsulated into the NM ,SC and MFSC IODs.
ROI Sequence	(0057,xx01)	GEMS_XELPRV_01	ROI created on image; may contain 0 or more items.
> ROIObjectSOPClassUID	(0057,xx02)	GEMS_XELPRV_01	ROI SOP Class UID, contains value "1.2.840.10008.5.1.4.1.1.9"
> ROIObjectInstanceUID	(0057,xx03)	GEMS_XELPRV_01	ROI SOP Instance UID; internally generated.
>Index	(0057,xx10)	GEMS_XELPRV_01	Index of ROI
>Dimensions	(0057,xx11)	GEMS_XELPRV_01	ROI Dimensions. Contain value: 1

>Points	(0057,xx12)	GEMS_XELPRV_01	Number of Points
>Type	(0057,xx13)	GEMS_XELPRV_01	ROI Type
>Description	(0057,xx14)	GEMS_XELPRV_01	ROI Description
>DValueRepresentation	(0057,xx15)	GEMS_XELPRV_01	Data Value Representation; Contains value: 3
>ROI Label	(0057,xx16)	GEMS_XELPRV_01	ROI Label
>Data	(0057,xx17)	GEMS_XELPRV_01	List of ROI Shape points
>Modified	(0057,xx41)	GEMS_XELPRV_01	Modified
>DatabaseObjectName	(0057,xx42)	GEMS_XELPRV_01	Name of ROI Database Object
>DatabaseObjectClass ID	(0057,xx45)	GEMS_XELPRV_01	ROI Database Object Class
>DatabaseObjectUID	(0057,xx46)	GEMS_XELPRV_01	ROI Object SOP Instance UID; internally generated
>Normal Colour	(0057,xx47)	GEMS_XELPRV_01	ROI Normal Color
>NameFont	(0057,xx48)	GEMS_XELPRV_01	ROI Name Font
>FillPattern	(0057,xx49)	GEMS_XELPRV_01	ROI Fill Pattern
>LineStyle	(0057,xx4A)	GEMS_XELPRV_01	ROI Line Style
>LineDashLength	(0057,xx4B)	GEMS_XELPRV_01	ROI Line Dash Length
>LineThickness	(0057,xx4C)	GEMS_XELPRV_01	ROI Line Thickness
>Interactivity	(0057,xx4D)	GEMS_XELPRV_01	ROI Interactivity Flag
>Name Position	(0057,xx4E)	GEMS_XELPRV_01	ROI Name Position
>NameDisplay	(0057,xx4F)	GEMS_XELPRV_01	ROI Name Display Flag
>Label	(0057,xx50)	GEMS_XELPRV_01	ROI Label; contains the same value as ROI Label attribute (0057,xx16)
>BpSeg	(0057,xx51)	GEMS_XELPRV_01	ROI BpSeg
>BpSegpairs	(0057,xx52)	GEMS_XELPRV_01	ROI BpSegpairs
>SeedSpace	(0057,xx53)	GEMS_XELPRV_01	ROI Seed Space
>Seeds	(0057,xx54)	GEMS_XELPRV_01	ROI Seeds
>Shape	(0057,xx55)	GEMS_XELPRV_01	ROI Shape
>ShapeTilt	(0057,xx56)	GEMS_XELPRV_01	ROI Shape Tilt
>ShapePtsSpace	(0057,xx59)	GEMS_XELPRV_01	ROI Shape Points Space
>ShapeCtrlPtsCount	(0057,xx5A)	GEMS_XELPRV_01	ROI Shape Control Points Count
>Shap CtrlPts	(0057,xx5B)	GEMS_XELPRV_01	ROI Shape Control Points List
>ShapeCPSpace	(0057,xx5C)	GEMS_XELPRV_01	ROI Shape Control Points Space
>ROIFlags	(0057,xx5D)	GEMS_XELPRV_01	ROI Flags
>FrameNumber	(0057,xx5E)	GEMS_XELPRV_01	ROI Frame Number
>DatasetROI Mapping	(0057,xx60)	GEMS_XELPRV_01	Dataset ROI Mapping

3.4.6.10   Private NM Image Module

TABLE 3-29
PRIVATE NM IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator Id	Attribute Description
Dataset UID List	(0009,xx45)	GEMS_GENIE_1	Dataset UID List

Radio Nuclide Name	(0011,xx0D)	GEMS_GENIE_1	Name of radionuclide used.
Database Object Name	(0011,xx10)	GEMS_GENIE_1	Name of the Database Dataset Object.
Dataset Modified	(0011,xx11)	GEMS_GENIE_1	Dataset Modified Flag
Dataset Type	(0011,xx13)	GEMS_GENIE_1	Defines type of dataset. The Defined Terms are: 0 = static 2 = whole body 8 = dynamic 11 = multi-gated 12 = tomographic planar 13 = transaxial 14 = sagittal 15 = coronal 16 = oblique VLA 17 = oblique HLA 18 = oblique SA 22 = sinogram 43 = linogram
Completion Time	(0011,xx14)	GEMS_GENIE_1	Completion Time
Detector Number	(0011,xx15)	GEMS_GENIE_1	Detector number image was acquired by.
Energy Number	(0011,xx16)	GEMS_GENIE_1	Energy set number.
RR Interval Window Number	(0011,xx17)	GEMS_GENIE_1	R-R interval number.
MG Bin Number	(0011,xx18)	GEMS_GENIE_1	Multi-gated time bin number.
Radius Of Rotation	(0011,xx19)	GEMS_GENIE_1	Distance to the center of detector rotation.
Detector Count Zone	(0011,xx1A)	GEMS_GENIE_1	FOV zone for count-based acquisition termination criteria. The Defined Terms are: 0 = none specified 1 = total (all) counts 2 = counts in energy set 3 = counts inside an ROI 4 = counts outside an ROI
Image Orientation	(0011,xx1F)	GEMS_GENIE_1	Orientation of the image. The Defined Terms are: 0 = no rotation, no mirroring 1 = no rotation, mirrored
Table Orientation	(0011,xx26)	GEMS_GENIE_1	Orientation of the table for whole body acquisition. The Defined Terms are: 0 = direction in/out

			1 = direction left/right
ROI Top Left	(0011,xx27)	GEMS_GENIE_1	Acquisition count zone ROI, top left coordinate.
ROI Bottom Right	(0011,xx28)	GEMS_GENIE_1	Acquisition count zone ROI, bottom right coordinate.
View X Adjustment	(0011,xx2C)	GEMS_GENIE_1	View X Adjustment
View Y Adjustment	(0011,xx2D)	GEMS_GENIE_1	View Y Adjustment
Pixel Overflow Flag	(0011,xx2E)	GEMS_GENIE_1	Pixel Overflow Flag (Starcam)
Pixel Overflow Level	(0011,xx2F)	GEMS_GENIE_1	Pixel Overflow Level
Acquisition Parent UID	(0011,xx31)	GEMS_GENIE_1	Acquisition Parent UID
Energy Correct Name	(0011,xx33)	GEMS_GENIE_1	Name of applied energy correction.
Spatial Correct Name	(0011,xx34)	GEMS_GENIE_1	Name of applied spatial correction.
Tuning Calib Name	(0011,xx35)	GEMS_GENIE_1	Name of applied tuning calibration data.
Uniformity Correct Name	(0011,xx36)	GEMS_GENIE_1	Name of associated uniformity correction.
Acquisition Specific Correct Name	(0011,xx37)	GEMS_GENIE_1	Name(s) of associated acquisition specific correction(s).
Dataset Flags	(0011,xx3F)	GEMS_GENIE_1	Defines dataset information.
Period	(0011,xx55)	GEMS_GENIE_1	Period
Elapsed Time	(0011,xx56)	GEMS_GENIE_1	Elapsed Time
FOV	(0011,xx57)	GEMS_GENIE_1	FOV
Digital FOV	(0013,xx10)	GEMS_GENIE_1	Digital FOV
RAL Flags	(0013,xx12)	GEMS_GENIE_1	RAL Flags
Xeleris Frame Sequence	(0055,xx65)	GEMS_GENIE_1	Xeleris Frame Sequence. Present for historical reasons. Always contains 0 items.
Trigger History Modified Flag	(0033,xx30)	GEMS_GENIE_1	Triggers Modification Flag
Database Object Name	(0033,xx31)	GEMS_GENIE_1	Name of Database Trigger History Object
Trigger History Software Version	(0033,xx32)	GEMS_GENIE_1	Trigger History Software Version
Number of Triggers	(0033,xx33)	GEMS_GENIE_1	Number of Triggers
Trigger Size	(0033,xx34)	GEMS_GENIE_1	Size of one Trigger data slot
Trigger Data Size	(0033,xx35)	GEMS_GENIE_1	Size of Trigger Data Size
Trigger Data	(0033,xx36)	GEMS_GENIE_1	Buffer with trigger data information
Trigger History Description	(0033,xx37)	GEMS_GENIE_1	Trigger History Description
Trigger History Flags	(0033,xx38)	GEMS_GENIE_1	Trigger History Flags
Trigger History Private Instance UID	(0033,xx39)	GEMS_GENIE_1	Trigger History Object identifier. Internally Generated
Trigger History SOP Class UID	(0033,xx3A)	GEMS_GENIE_1	Internal SOP Class UID value, set to "1.2.840.10008.5.1.4.1.1.20" for historical reasons

3.4.6.11 NM Isotope Module

This section contains Attributes that describe the isotope administered for the acquisition.

TABLE 3-30
NM ISOTOPE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Energy Window Information Sequence	(0054,0012)	2	Sequence of Items that describe the energy window groups used. May contain o or more items. The number of items shall be equal to Number of Energy Windows (0054,0011)
> Energy Window Name	(0054,0018)	3	A user defined name which describes this Energy Window.
>Energy Window Range Sequence	(0054,0013)	3	Sequence describing window energy limits. May contain up to 4 items.
>> Energy Window Lower Limit	(0054,0014)	3	The lower limit of the energy window in KeV.
>> Energy Window Upper Limit	(0054,0015)	3	The upper limit of the energy window in KeV.
Radiopharmaceutical Information Sequence	(0054,0016)	2	Information on radiopharmaceutical(s) used. May contains 0 or more items
> Radionuclide Code Sequence	(0054,0300)	2	Sequence that identifies the radionuclide. May contain0 or more items.
>> Include 'Code Sequence Macro'			See Table 3-31
> Radiopharmaceutical Volume	(0018,1071)	3	Volume of injection in cubic cm.
> Radionuclide Total Dose	(0018,1074)	3	Total amount of radionuclide injected in MBq.
> Radiopharmaceutical	(0018,0031)	3	Name of the radiopharmaceutical
> Radiopharmaceutical Code Sequence	(0054,0304)	3	Sequence that identifies the radiopharmaceutical. If presented, this sequence contains exactly one item.
>> Include 'Code Sequence Macro'			See Table 3-32

TABLE 3-31
RADIONUCLIDE CODE SEQUENCE VALUES (BASELINE ID 18)

Code Value	Coding Scheme Designator	Code Meaning
C-105A1	99SDM	^11^Carbon
C-107A1	99SDM	^13^Nitrogen
C-111A1	99SDM	^18^Fluorine
C-114A4	99SDM	^123^Iodine
C-114A6	99SDM	^125^Iodine
C-114B1	99SDM	^131^Iodine
C-122A5	99SDM	^133^Barium
C-128A2	99SDM	^68^Germanium
C-131A2	99SDM	^67^Gallium
C-138A9	99SDM	^201^Thallium

C-144A3	99SDM	^57^Cobalt
C-145A4	99SDM	^111^Indium
C-155A1	99SDM	^22^Sodium
C-159A2	99SDM	^82^Rubidium
C-163A8	99SDM	^99m^Technetium
C-172A8	99SDM	^133^Xenon
C-173A7	99SDM	^85^Krypton
C-178A8	99SDM	^153^Gadolinium

TABLE 3-32
RADIOPHARMACEUTICAL CODE SEQUENCE VALUES (BASELINE ID 25)

Code Value	Coding Scheme Designator	Code Meaning
C-B1000	SRT	Diagnostic radioisotope
C-B1010	SRT	Therapeutic radioisotope
C-B1011	SRT	Sodium chromate Cr^51^
C-B1012	SRT	Chromium^51^ albumin
C-B1013	SRT	Chromium^51^ chloride
C-B1016	SRT	Copper^64^ versenate
C-B1017	SRT	Copper^64^ acetate
C-B1018	SRT	Copper^67^ ceruloplasmin
C-B1021	SRT	Cyanocobalamin Co^57^
C-B1022	SRT	Cyanocobalamin Co^58^
C-B1023	SRT	Cyanocobalamin Co^60^
C-B1031	SRT	Fluorodeoxyglucose F^18^
C-B1032	SRT	Sodium fluoride F^18^
C-B1037	SRT	Rubidium chloride Rb^82^
C-B103C	SRT	Ammonia N^13^
C-B1041	SRT	Gallium^67^ citrate
C-B1051	SRT	Colloidal gold Au^198^
C-B1061	SRT	Indium^111^ pentetate
C-B1062	SRT	Disodium indium^111^
C-B1063	SRT	Colloidal Indium^111^
C-B1065	SRT	Indium^111^-Fe(OH)>3<
C-B1066	SRT	Indium^111^ red cell label
C-B1067	SRT	Indium^111^ transferrin
C-B1068	SRT	Indium^113^ bleomycin

C-B1069	SRT	Indium^113^ chloride
C-B1070	SRT	Indium^113^ pentetate
C-B1071	SRT	Indium^113^ oxoquinoline WBC label
C-B1072	SRT	Indium^113^ oxoquinoline platelet label
C-B1073	SRT	Indium^113^ oxoquinoline RBC label
C-B1081	SRT	Sodium iodide I^123^
C-B1082	SRT	Fibrinogen I^123^
C-B1083	SRT	Oleic acid I^125^
C-B1084	SRT	Iodinated I^125^ albumin
C-B1085	SRT	Rose Bengal sodium I^131^
C-B1086	SRT	Sodium iodide I^131^
C-B1087	SRT	Iodocholesterol I^131^
C-B1088	SRT	Iothalamate sodium I^125^
C-B1089	SRT	Iodinated I^131^ albumin
C-B1090	SRT	Iodinated I^131^ aggregated albumin
C-B1091	SRT	Iodohippurate I^131^ sodium
C-B1092	SRT	Diiodofluorecein I^131^
C-B1093	SRT	Iodinated I^125^ oleic acid and triolein
C-B1094	SRT	Iodinated I^125^ levothyroxine
C-B1095	SRT	Iodohippurate I^123^ sodium
C-B1096	SRT	Iodinated I^125^ povidone
C-B1097	SRT	Iodinated I^125^ Rose Bengal
C-B1098	SRT	Iodinated I^125^ sealed source
C-B1099	SRT	Iodinated I^125^ sodium iodine
C-B1100	SRT	Iodinated I^125^ human serum albumin
C-B1105	SRT	Iodohippurate I^125^ sodium
C-B1108	SRT	Iofetamine I^123^ hydrochloride
C-B1109	SRT	Iodine^131^ polyvinylpyrrolidone
C-B1111	SRT	Iodinated I^131^ gamma globulin
C-B1121	SRT	Ferrous citrate Fe^59^
C-B1122	SRT	Ferrous chloride Fe^59^
C-B1123	SRT	Ferrous sulfate Fe^59^
C-B1124	SRT	Iron Fe^59^ labeled dextran
C-B1140	SRT	Chromic phosphate P^32^
C-B1142	SRT	Sodium phosphate P^32^
C-B1150	SRT	Potassium chloride K^43^
C-B1151	SRT	Potassium carbonate K^42^

C-B1152	SRT	Potassium chloride K^42^
C-B1171	SRT	Selenomethionione Se^75^
C-B1172	SRT	Selenium^75^ HCAT
C-B1175	SRT	Sodium chloride Na^24^
C-B1176	SRT	Sodium chloride Na^22^
C-B1180	SRT	Strontium chloride Sr^85^
C-B1181	SRT	Strontium chloride Sr^87^
C-B1182	SRT	Strontium nitrate Sr^85^
C-B1183	SRT	Strontium nitrate Sr^87^
C-B1200	SRT	Technetium Tc^99m^ aggregated albumin
C-B1203	SRT	Technetium Tc^99m^ microaggregated albumin
C-B1204	SRT	Technetium Tc^99m^ albumin colloid
C-B1205	SRT	Technetium Tc^99m^ albumin microspheres
C-B1206	SRT	Sodium pertechnetate Tc^99m^
C-B1207	SRT	Technetium Tc^99m^ disofenin
C-B1208	SRT	Technetium Tc^99m^ mebrofenin
C-B1209	SRT	Technetium Tc^99m^ lidofenin
C-B1210	SRT	Technetium Tc^99m^ iron ascorbate
C-B1211	SRT	Technetium Tc^99m^ stannous etidronate
C-B1212	SRT	Technetium Tc^99m^ medronate
C-B1213	SRT	Technetium Tc^99m^ oxidronate
C-B1214	SRT	Technetium Tc^99m^ pentetate
C-B1215	SRT	Technetium Tc^99m^ pyro and polyphosphates
C-B1216	SRT	Technetium Tc^99m^ serum albumin
C-B1220	SRT	Technetium Tc^99m^ sodium glucoheptonate
C-B1221	SRT	Technetium Tc^99m^ succimer
C-B1222	SRT	Technetium Tc^99m^ sulfur colloid
C-B1223	SRT	Technetium Tc^99m^ exametazine
C-B1224	SRT	Technetium Tc^99m^ tagged red cells
C-B1225	SRT	Technetium Tc^99m^ N-substituted iminodiacetate
C-B1231	SRT	Thallous chloride Tl^201^
C-B1251	SRT	Pentetate calcium trisodium Yb^169^
C-B1300	SRT	Carbon^14^ triolein
C-B1302	SRT	Carbon^14^ D-xylose
C-B1304	SRT	Cholyl-carbon^14^ glycine
Y-X1743	99SDM	FDG -- fluorodeoxyglucose

Y-X1744	99SDM	FDOPA -- fluoroDOPA
Y-X1745	99SDM	F- -- Fluorine
Y-X1746	99SDM	NH3 -- Ammonia
Y-X1747	99SDM	H2O --water
Y-X1748	99SDM	O2 -- Oxygen
Y-X1749	99SDM	[150]CO -- carbon monoxide
Y-X1750	99SDM	[150]CO2 -- carbon dioxide
Y-X1751	99SDM	OAc -- Acetate
Y-X1752	99SDM	Palmitate
Y-X1753	99SDM	[11C]CO -- carbon monoxide
Y-X1754	99SDM	[11C]CO2 -- carbon dioxide
Y-X1755	99SDM	Rubidium cation
Y-X1756	99SDM	FluoroSpiperone
Y-X1757	99SDM	L-2-Fluorotyrosine
Y-X1758	99SDM	Misonidazole
Y-X1759	99SDM	[11C]Butanol
Y-X1760	99SDM	Deoxyglucose
Y-X1761	99SDM	Glucose
Y-X1762	99SDM	Methionine
Y-X1763	99SDM	N-MethylSpiperone
Y-X1764	99SDM	Raclopride
Y-X1765	99SDM	Thymidine
Y-X1766	99SDM	L-1-Tyrosine
Y-X1767	99SDM	[15O]Butanol
Y-X1768	99SDM	EDTA
Y-X1769	99SDM	PTSM
PHRM-MIBI	CSMC-AIM	Technetium Tc^99m^ sestamibi
PHRM-TETRO	CSMC-AIM	Technetium Tc^99m^ tetrofosmin

3.4.6.12 Private Isotope Module

TABLE 3-33
PRIVATE ISOTOPE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator Id	Attribute Description
Xeleris Energy Window Information Sequence	(0055,xx12)	GEMS_GENIE_1	Private Energy Sequence. The number of items in the Xeleris Energy Window sequence is the same as tag value of tag (0054,0011)
>Xeleris Energy Window Range Sequence	(0055,xx13)	GEMS_GENIE_1	May contain from 0 to 4 items.

>>Energy Offset	(0011,xx1C)	GEMS_GENIE_1	Energy window offset as a percentage of the energy peak.
>>Energy Range	(0011,xx1D)	GEMS_GENIE_1	Energy Range The Defined Terms are: 0 = low energy range, X-series detector 1 = high energy range, X-series detector 2 = GE 511 Camera Range 3 = Unknown
>>AutoTrack Peak	(0013,xx16)	GEMS_GENIE_1	Optima Auto Track energy peak.
>>AutoTrack Width	(0013,xx17)	GEMS_GENIE_1	Optima Auto Track energy width.

3.4.6.13 NM Detector Module

TABLE 3-34
NM DETECTOR MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Detector Information Sequence	(0054,0022)	2	Sequence of Items that describe the detectors used. Zero or more Items may be included in this sequence. The number of items is equal to Number of Detectors (0054,0021).
> Collimator/Grid Name	(0018,1180)	3	Label describing the collimator used, e.g. LEGP LEHR, etc.
> Collimator Type	(0018,1181)	2	Collimator type. Defined Terms: PARA = Parallel (default) PINH = Pinhole FANB = Fan-beam CONE = Cone-beam SLNT = Slant hole ASTG = Astigmatic DIVG = Diverging NONE = No collimator UNKN = Unknown
> Field of View Shape	(0018,1147)	3	Defined Terms used: RECTANGLE ROUND
> Field of View Dimension(s)	(0018,1149)	3	Dimensions of the field of view in mm.
> Focal Distance	(0018,1182)	2	Focal distance, in mm. Default value is 0.
> X Focus Center	(0018,1183)	3	Center of focus along a row.
> Y Focus Center	(0018,1184)	3	Center of focus along a column.
> Zoom Center	(0028,0032)	3	The amount of offset from (0, 0) applied to each pixel in the image before application of the zoom factor, specified by a numeric pair (in mm).
> Zoom Factor	(0028,0031)	3	The amount of magnification applied to each pixel in the image. Typical Range 1.0 to 4.0

> Center of Rotation Offset	(0018,1145)	3	Offset between detector center and mechanical center
> Gantry/Detector Tilt	(0018,1120)	3	Angle of tilt in degrees of the detector.
> Distance Source to Detector	(0018,1110)	2C	Distance in mm from transmission source to the detector face. Sent if Image Type (0008,0008) Value 4 is TRANSMISSION and Value 3 is not any of: TOMO, GATED TOMO, RECON TOMO or RECON GATED TOMO.
> Start Angle	(0054,0200)	3	Position of the detector about the patient for the start of the acquisition, in degrees. Sent if Image Type (0008,0008), Value 3, is other than TOMO, GATED TOMO, RECON TOMO or RECON GATED TOMO
> Radial Position	(0018,1142)	3	Not sent
> Image Orientation (Patient)	(0020,0037)	2C	The direction cosines of the first row and the first column with respect to the patient. Set for first frame in dataset
> Image Position (Patient)	(0020,0032)	2C	The x, y, and z coordinates of the upper left hand corner (center of the first voxel transmitted) of the image, in mm. Set for first frame in dataset.
> View Code Sequence	(0054,0220)	3	Sequence that describes the projection of the anatomic region of interest on the image receptor. May contain 0 or 1 item
>>Include 'Code Sequence Macro'			See Table 3-35

TABLE 3-35
VIEW CODE SEQUENCE VALUES (BASELINE ID 26)

Code Value	Coding Scheme Designator	Code Meaning
G-5206	SRT	Right anterior oblique
G-5207	SRT	Left anterior oblique
G-5208	SRT	Right posterior oblique
G-5209	SRT	Left posterior oblique
G-5210	SRT	Oblique axial
G-5212	SRT	Sagittal-oblique axial
G-5215	SRT	Anterior projection
G-5216	SRT	Posterior projection
G-5220	SRT	Medial-lateral
G-5221	SRT	Lateral-medial
G-5222	SRT	Right lateral projection
G-5223	SRT	Left lateral projection
G-5224	SRT	Medial-lateral oblique

G-5225	SRT	Latero-medial oblique
G-A104	SRT	Lateral
G-A117	SRT	Transverse
G-A138	SRT	Coronal
G-A145	SRT	Sagittal
G-A147	SRT	Axial
G-A186	SRT	Short Axis
G-A18A	SRT	Vertical Long Axis
G-A18B	SRT	Horizontal Long Axis

3.4.6.14 Private Detector Module

TABLE 3-36
PRIVATE DETECTOR MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator Id	Attribute Description
Xeleris Detector Information Sequence	(0055,xx22)	GEMS_GENIE_1	Xeleris detector information. May contain one or more items.
>Use FOV Mask	(0011,xx23)	GEMS_GENIE_1	Flag shows whether FOV mask used during image acquisition. The Defined Terms are: 0 = no mask used 1 = FOV mask used
>FOV Mask Y Cutoff Distance	(0011,xx24)	GEMS_GENIE_1	Hexagonal FOV mask Y cutoff angle.
>FOV Mask Cutoff Angle	(0011,xx25)	GEMS_GENIE_1	Hexagonal FOV mask cutoff angle.
>Uniformity Mean	(0011,xx29)	GEMS_GENIE_1	Uniformity Mean value
>FOV Shape	(0011,xx3E)	GEMS_GENIE_1	GEHC NM system detector type. The Defined Terms are: 1 = 400AC 6 = Optima 7 = MAXXUS 8 = Millennium MPS 9 = Millennium MPR 10 = Millennium MG 12 = Other 13 = VARICAM 14 = DST 21 = Optima V3.0 22 = MAXXUS V3.0 23 = Millennium MPS V3.0 24= Millennium MPR V3.0 25 = Millennium MG V3.0 27 = Discovery NM530c

>Transmission Scan Time	(0013,xx18)	GEMS_GENIE_1	Attenuation correction transmission scan duration.
>Transmission Mask Width	(0013,xx19)	GEMS_GENIE_1	Attenuation correction transmission scan mask width.
>Copper Attenuator Thickness	(0013,xx1A)	GEMS_GENIE_1	Thickness of transmission scan copper attenuator.
>Tomo View Offset	(0013,xx1E)	GEMS_GENIE_1	Tomo view detector offset (vector)
>Start Angle	(0035,xx01)	GEMS_GENIE_1	Detector start angle

3.4.6.15 NM Tomo Acquisition Module

Describe the conditions under which this module is present in this implementation. Module applies to a TOMO Multi-frame Image. This module is present when the Image Type (0008,0008) Value 3, is equal to TOMO, GATED TOMO, RECON TOMO, or RECON GATED TOMO.

TABLE 3-37
NM TOMO ACQUISITION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Rotation Information Sequence	(0054,0052)	2	Sequence of Items that describe TOMO rotational groups. Contain only 1 item.
> Start Angle	(0054,0200)	1	Position of the detector about the patient for the start of the acquisition, in degrees.
> Angular Step	(0018,1144)	1	The angular scan arc step between views of the TOMO acquisition, in degrees
> Rotation Direction	(0018,1140)	1	Direction of rotation of the detector about the patient. Enumerated Values: CW = clockwise (decreasing angle) CC = counter-clockwise (increasing angle).
> Scan Arc	(0018,1143)	1	The effective angular range of the scan data in degrees.
> Actual Frame Duration	(0018,1242)	1	Nominal acquisition time per angular position, in msec.
> Radial Position	(0018,1142)	3	Radial distance of the detector from the center of rotation, in mm. Sent as a single value which is an average value for this rotation.
> Distance Source to Detector	(0018,1110)	2C	Distance in mm from transmission source to the detector face. Sent if Image Type (0008,0008) Value 4 is TRANSMISSION.
> Number of Frames in Rotation	(0054,0053)	1	Number of angular views in this rotation.
> Table Traverse	(0018,1131)	3	Table longitudinal position at acquisition start .in mm.
> Table Height	(0018,1130)	3	The distance in mm of the top of the patient table to the center of rotation.
Type of Detector Motion	(0054,0202)	3	Describes the detector motion during acquisition. Enumerated Values used: STEP AND SHOOT = Interrupted motion, acquire only while stationary. Used as Default for data arrived to Xeleris without this attribute or with empty value.

| | | | CONTINUOUS = Gantry motion and acquisition are simultaneous and continuous. |
| | | | ACQ DURING STEP = Interrupted motion, acquisition is continuous. |

3.4.6.16 Private Tomo Acquisition Module

TABLE 3-38
PRIVATE TOMO ACQUISITION MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator Id	Attribute Description
Rotational Continuous Speed	(0009,xx33)	GEMS_GENIE_1	Rotational Continuous Speed
Gantry Locus Type	(0009,xx35)	GEMS_GENIE_1	Locus type of gantry motion during acquisition. The Defined Terms are: 0 = circular 1 = elliptical
Num ECT Phases	(0015,xx12)	GEMS_GENIE_1	Number of ECT Phases
Num WB Scans	(0015,xx13)	GEMS_GENIE_1	Number of WB Scans
Det Ang Separation	(0013,xx1B)	GEMS_GENIE_1	Detector Ang Separation
Xeleris Rotation Information Sequence	(0055,xx52)	GEMS_GENIE_1	May contain one or more items.
>ECT Phase Num	(0015,xx14)	GEMS_GENIE_1	ECT Phase Number
>WB Scan Num	(0015,xx15)	GEMS_GENIE_1	WB Scan Number
>Comb Head Number	(0015,xx16)	GEMS_GENIE_1	Comb Head Number
>Axial Acceptance Angle	(0013,xx1C)	GEMS_GENIE_1	Axial Acceptance Angle
>Theta Acceptance Value	(0013,xx1D)	GEMS_GENIE_1	Theta Acceptance Value

3.4.6.17 NM Multi-gated Acquisition Module

Describe the conditions under which this module is present in this implementation Module applies to a GATED Multi-frame Image. This module is present when the Image Type (0008,0008) Value 3, is equal to GATED, GATED TOMO, or RECON GATED TOMO.

TABLE 3-39
NM MULTI-GATED ACQUISITION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Beat Rejection Flag	(0018,1080)	3	Heart beat duration sorting has been applied. Enumerated Values: Y = yes N = no
Skip Beats	(0018,1086)	3	Number of beats skipped after a detected arrhythmia
Heart Rate	(0018,1088)	3	Average number of heart beats per minute for the collection period for these frames
Gated Information Sequence	(0054,0062)	2C	Sequence of Items that describe R-R intervals. Sent if the Frame Increment Pointer (0028,0009) contains the Tag for R-R Interval Vector (0054,0060)

			May contain 0 or more items. The number of items shall be equal to Number of R-R Intervals (0054,0061).
> Data Information Sequence	(0054,0063)	2	Sequence of Items that describe gating criteria. May contain 0 or 1 item.
>> Frame Time	(0018,1063)	1	Nominal time per individual frame in msec
>> Low R-R Value	(0018,1081)	3	R-R interval lower limit for beat rejection, in msec
>> High R-R Value	(0018,1082)	3	R-R interval upper limit for beat rejection, in msec
>> Intervals Acquired	(0018,1083)	3	Number of heartbeats that fall within Low R-R Value (0018,1081) and High R-R Value (0018,1082), and were therefore accepted and contribute gamma events to this R-R Interval.
>> Intervals Rejected	(0018,1084)	3	Number of heartbeats that fall outside Low R-R (0018,1081) and High R-R Value (0018,1082), and do not contribute gamma events to this R-R Interval.
>> Time Slot Information Sequence	(0054,0072)	2C	Sequence of Items that describe Time Slot Information. Sent if the Frame Increment Pointer (0028,0009) contains the Tag for Time Slot vector (0054,0070) Contains 1 or more items if it presents, the number of items is equal to Number of Time Slots (0054,0071).
>>> Time Slot Time	(0054,0073)	3	The total amount of time, in msec, that the acquisition accumulates gamma events into this frame.

3.4.6.18 Private Multi-gated Acquisition Module

TABLE 3-40
PRIVATE MULTI-GATED ACQUISITION MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator Id	Attribute Description
Starting Heart Rate	(0009,xx37)	GEMS_GENIE_1	Heart rate at start of acquisition.
Track Beat Average	(0009,xx2D)	GEMS_GENIE_1	Heart rate tracking used during acquisition.
Percent Cycle Imaged	(0009,xx3A)	GEMS_GENIE_1	Percent Cycle Imaged
Preceding Beat	(0015,xx17)	GEMS_GENIE_1	Preceding Beat
Series Average Heart Rate	(0017,xx01)	GEMS_XELPRV_01	Series Average Heart Rate
Image AverageHeartRate	(0017,xx02)	GEMS_XELPRV_01	Image Average Heart Rate
Series AcceptedBeats	(0017,xx03)	GEMS_XELPRV_01	Series Accepted Beats
Image AcceptedBeats	(0017,xx04)	GEMS_XELPRV_01	Image Accepted Beats
Series RejectedBeats	(0017,xx05)	GEMS_XELPRV_01	Series Rejected Beats
Image RejectedBeats	(0017,xx06)	GEMS_XELPRV_01	Image Rejected Beats
Xeleris Gated Information Sequence	(0055,xx62)	GEMS_GENIE_1	May contain 0 or more items.
>Xeleris Data Information Sequence	(0055,xx63)	GEMS_GENIE_1	May contain 0 or more items.
>>RR Window Width	(0009,xx38)	GEMS_GENIE_1	Width of RR acceptance window

			as percentage of rate.
>>RR Window Offset	(0009,xx39)	GEMS_GENIE_1	Offset of RR acceptance window as percentage of rate.
>>Accepted Beat Time	(0013,xx20)	GEMS_GENIE_1	Accepted Beat Time

3.4.6.19 NM Phase Module

This section contains Attributes that describe dynamic phases of a dynamic acquisition image performed on the patient. This module is present when the Image Type (0008,0008) Value 3, is equal to DYNAMIC.

TABLE 3-41
NM PHASE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Phase Information Sequence	(0054,0032)	2C	Sequence of Items that describes each dynamic phase. Sent if the Frame Increment Pointer (0028,0009) contains the Tag for Phase Vector (0054,0030). May contains up to 4 items.
> Phase Delay	(0054,0036)	1	Time paused between the last frame of the previous phase and the first frame of this phase, in msec.
> Actual Frame Duration	(0018,1242)	1	Nominal time of acquisition per individual frame, in msec.
> Pause Between Frames	(0054,0038)	1	Time paused between each frame of this phase (in msec).
> Number of Frames in Phase	(0054,0033)	1	Number of frames in this phase.
>Trigger Vector	(0054,0210)	3	An array of trigger times when gating information is acquired simultaneously with the dynamic image data.
>Number of Triggers in Phase	(0054,0211)	1C	The number of entries in the Trigger Vector (0054,0210) for this phase. Required if Trigger Vector (0054,0210) is present.

3.4.6.20 NM Reconstruction Module

This section contains Attributes that describe Nuclear Medicine reconstructed volumes. Reconstructed volumes are created by applying a transformation (reconstruction) process to the acquired TOMO frames. This module is present only when the Image Type (0008,0008), Value 3, is equal to RECON TOMO or RECON GATED TOMO.

TABLE 3-42
NM RECONSTRUCTION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Spacing Between Slices	(0018,0088)	2	Spacing between slices, in mm, measured from center-to-center of each slice along the normal to the first image.
Slice Thickness	(0018,0050)	2	Nominal slice thickness, in mm.
Slice Progression Direction	(0054,0500)	3	Describes the anatomical direction that slices are progressing as the slices are considered in order (as defined by the Slice Vector (0054,0080)). Meaningful only for cardiac images. When View Code Sequence (0054,0220)

			indicates a short axis view, then Enumerated Values are: APEX_TO_BASE BASE_TO_APEX

3.4.6.21 Private SPECT Reconstruction Module

<p align="center">TABLE 3-43
PRIVATE SPECT RECONSTRUCTION MODULE ATTRIBUTES</p>

Attribute Name	Tag	Private Creator Id	Attribute Description
Image Size	(0011,xx61)	GEMS_GENIE_1	Image Size
Linear FOV	(0011,xx62)	GEMS_GENIE_1	Linear FOV
Spatial Offset	(0011,xx63)	GEMS_GENIE_1	Spatial Offset
Spatial Orientation	(0011,xx64)	GEMS_GENIE_1	Spatial Orientation
ReferenceDatasetUID	(0011,xx65)	GEMS_GENIE_1	Reference Dataset UID
Starcam Reference Dataset	(0011,xx66)	GEMS_GENIE_1	Starcam Reference Dataset
Reference Frame Number	(0011,xx67)	GEMS_GENIE_1	Reference Frame Number
Cursor Length	(0011,xx68)	GEMS_GENIE_1	Cursor Length
Number of Cursors	(0011,xx69)	GEMS_GENIE_1	Number of Cursors
Cursor Coordinates	(0011,xx6A)	GEMS_GENIE_1	Cursor Coordinates
Recon Options Flag	(0011,xx6B)	GEMS_GENIE_1	Recon Options Flag
Motion Threshold	(0011,xx6C)	GEMS_GENIE_1	Motion Threshold
Motion Curve UID	(0011,xx6D)	GEMS_GENIE_1	Motion Curve UID
UnifDateTime	(0013,xx23)	GEMS_GENIE_1	Unif Date Time

3.4.6.22 Private SPECT Backprojection Module

<p align="center">TABLE 3-44
PRIVATE SPECT BACKPROJECTION MODULE ATTRIBUTES</p>

Attribute Name	Tag	Private Creator Id	Attribute Description
Recon Type	(0011,xx6E)	GEMS_GENIE_1	Recon Type
Pre Filter Type	(0011,xx6F)	GEMS_GENIE_1	Pre Filter Type
Back Proj Filter Type	(0011,xx71)	GEMS_GENIE_1	Back Proj Filter Type
Recon Arc	(0011,xx72)	GEMS_GENIE_1	Recon Arc
Recon Pan AP Offset	(0011,xx73)	GEMS_GENIE_1	Recon Pan AP Offset
Recon Pan LR Offset	(0011,xx74)	GEMS_GENIE_1	Recon Pan LR Offset
Recon Area	(0011,xx75)	GEMS_GENIE_1	Recon Area
Start View	(0011,xx76)	GEMS_GENIE_1	Start View
Attenuation Type	(0011,xx77)	GEMS_GENIE_1	Attenuation Type
Dual Energy Processing	(0011,xx78)	GEMS_GENIE_1	Dual Energy Processing
Pre Filter Param	(0011,xx79)	GEMS_GENIE_1	Pre Filter Param
Pre Filter Param 2	(0011,xx7A)	GEMS_GENIE_1	Pre Filter Param 2
BackProjFilterParam	(0011,xx7B)	GEMS_GENIE_1	Back Proj Filter Param
Back Proj Filter Param 2	(0011,xx7C)	GEMS_GENIE_1	Back Proj Filter Param 2

Attenuation Coef	(0011,xx7D)	GEMS_GENIE_1	Attenuation Coef
Ref Slice Width	(0011,xx7E)	GEMS_GENIE_1	Ref Slice Width
Ref Trans Pixel Volume	(0011,xx7F)	GEMS_GENIE_1	Ref Trans Pixel Volume
Attenuation Threshold	(0011,xx81)	GEMS_GENIE_1	Attenuation Threshold
Interpolation Distance	(0011,xx82)	GEMS_GENIE_1	Interpolation Distance
Interpolation Center X	(0011,xx83)	GEMS_GENIE_1	Interpolation Center X
Interpolation Center Y	(0011,xx84)	GEMS_GENIE_1	Interpolation Center Y
Quant Filter Flag	(0011,xx85)	GEMS_GENIE_1	Quant Filter Flag
Head Conversion	(0011,xx86)	GEMS_GENIE_1	Head Conversion
Slice Width Pixels	(0011,xx87)	GEMS_GENIE_1	Slice Width Pixels

3.4.6.23 Private SPECT Oblique Reformat Module

TABLE 3-45
PRIVATE SPECT OBLIQUE REFORMAT MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator Id	Attribute Description
Rfmtr Trans Ref	(0011,xx88)	GEMS_GENIE_1	Rfmtr Trans Ref
Rfmtr Trans Ref mm	(0011,xx89)	GEMS_GENIE_1	Rfmtr Trans Ref mm
Two Line Trans Ref	(0011,xx8A)	GEMS_GENIE_1	Two Line Trans Ref
Three–D Zero	(0011,xx8B)	GEMS_GENIE_1	Three–D Zero
Three–D Zero Length	(0011,xx8C)	GEMS_GENIE_1	Three–D Zero Length
Three–D Zero In	(0011,xx8D)	GEMS_GENIE_1	Three–D Zero In
Threshold	(0013,xx21)	GEMS_GENIE_1	Threshold
LinearDepth	(0013,xx22)	GEMS_GENIE_1	Linear Depth

3.4.6.24 VOI LUT Module

TABLE 3-46
VOI LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Window Center	(0028,1050)	1C	Window Center for display. Only single value is present. Calculated from actually acquired maximal and minimal pixel values. Always sent
Window Width	(0028,1051)	1C	Window Width for display. Only single value is present. Calculated from actually acquired maximal and minimal pixel values. Always sent.

3.4.6.25 SOP Common Module

TABLE 3-47
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Uniquely identifies the SOP Class. Always set to "1.2.840.10008.5.1.4.1.1.20"
SOP Instance UID	(0008,0018)	1	Uniquely identifies the SOP Instance. Internally generated.
Specific Character Set	(0008,0005)	1C	Not used when the default character set (ISO 646) is used. Set to ISO_IR 100 = Latin

				Alphabet No. 1 when extended character sets are used.
Instance Creation Date	(0008,0012)	3		Date of instance creation.
Instance Creation Time	(0008,0013)	3		Time of instance creation.
Instance Creator UID	(0008,0014)	3		Set to the Implementation UID (see Section 2.3.1.1.4)
Instance Number	(0020,0013)	3		A number that identifies this Composite object instance.

3.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

The Product supports the Standard Extended and Private Attributes defined in the following sections in Standard Extended NM SOP Instances as Type 3 data elements.

3.5.1 Standard Extended Attributes

The Product supports the following attributes, not specified in the NM IOD, in SOP Instances as Type 3 data elements.

TABLE 3-48
STANDARD EXTENDED ATTRIBUTES

Information Entity Name	Attribute Name	Tag	Use
Study	Study Comments	(0032,4000)	User-defined Study notes
Series	Patient Position	(0018,5100)	Patient position descriptor relative to the Equipment.

3.5.2 Private Group GEMS_GENIE_1

TABLE 3-49
PRIVATE GROUP GEMS_GENIE_1

Attribute Name	Tag	VR	VM	Attribute Description and Use
Private Creator Identification	(0009,00xx)	LO	1	GEMS_GENIE_1
Workstation DICOM data Identifier	(0009,xx01)	SH	1	Contains always "GEMS_GENIE"
Study Name	(0009,xx10)	LO	1	Name of the Database Study Object
Study Flags	(0009,xx11)	SL	1	Defines study information.
Study Type	(0009,xx12)	SL	1	Defines type of study.
Dataset UID	(0009,xx1E)	UI	1	Dataset UID
Series Object Name	(0009,xx20)	LO	1	Name of the Database Series Object.
Series Flags	(0009,xx21)	SL	1	Defines series information.
User Orientation	(0009,xx22)	SH	1	User specified patient orientation.
Initiation Type	(0009,xx23)	SL	1	Acquisition initiation type.
Initiation Delay	(0009,xx24)	SL	1	Acquisition start delay time.
Initiation Count Rate	(0009,xx25)	SL	1	Acquisition start count rate
Number Energy Sets	(0009,xx26)	SL	1	Number of energy sets in this Series.
Number Detectors	(0009,xx27)	SL	1	Number of detectors.
Number RR Windows	(0009,xx28)	SL	1	Number of R-R Interval Windows.
Number MG Time Slots	(0009,xx29)	SL	1	Number of R-R Interval time bins.
Number View Sets	(0009,xx2A)	SL	1	Number of view sets in this Series.
Trigger History UID	(0009,xx2B)	LO	1	UID of Private Trigger Object relevant to the Series.
Series Comments	(0009,xx2C)	LO	1	User-defined additional information about the series.
Track Beat Average	(0009,xx2D)	SL	1	Heart rate tracking used during

				acquisition.
Distance Prescribed	(0009,xx2E)	FD	1	User prescribed whole body scanning distance.
Table Direction	(0009,xx2F)	SL	1	Table Direction
Rotational Continuous Speed	(0009,xx33)	FD	1	Rotational Continuous Speed
Gantry Locus Type	(0009,xx35)	UL	1	Locus type of gantry motion during acquisition.
Starting Heart Rate	(0009,xx37)	SL	1	Heart rate at start of acquisition.
RR Window Width	(0009,xx38)	SL	1	Width of RR acceptance window as percentage of rate.
RR Window Offset	(0009,xx39)	SL	1	Offset of RR acceptance window as percentage of rate.
Percent Cycle Imaged	(0009,xx3A)	SL	1	Percent Cycle Imaged
Patient Object Name	(0009,xx40)	PN	1	Name of the Database Patient Object
Patient Flags	(0009,xx41)	SL	1	Defines patient information.
Patient Creation Date	(0009,xx42)	DA	1	Date of Patient Entity creation
Patient Creation Time	(0009,xx43)	TM	1	Time of Patient Entity creation
Dataset UID List	(0009,xx45)	LT	1	Dataset UID List
Private Creator Identification	(0011,00xx)	LO	1	GEMS_GENIE_1
Series Type	(0011,xx0A)	SL	1	Defines type of series.
Effective Series Duration	(0011,xx0B)	SL	1	Calculated duration of series acquisition.
Num Beats	(0011,xx0C)	SL	1	Number of physiological triggers during acquisition.
Radio Nuclide Name	(0011,xx0D)	LO	1	Name of radionuclide used.
Database Object Name	(0011,xx10)	LO	1-n	Name of the Database Dataset Object.
Dataset Modified	(0011,xx11)	SL	1-n	Dataset Modified Flag
Dataset Name	(0011,xx12)	LO	1-n	Dataset Name
Dataset Type	(0011,xx13)	SL	1	Defines type of dataset.
Completion Time	(0011,xx14)	LO	1	Completion Time
Detector Number	(0011,xx15)	SL	1-n	Detector number image was acquired by.
Energy Number	(0011,xx16)	SL	1-n	Energy set number.
RR Interval Window Number	(0011,xx17)	SL	1-n	R-R interval number.
MG Bin Number	(0011,xx18)	SL	1-n	Multi-gated time bin number.
Radius Of Rotation	(0011,xx19)	FD	1-n	Distance to the center of detector rotation.
Detector Count Zone	(0011,xx1A)	SL	1-n	FOV zone for count-based acquisition termination criteria
Energy Offset	(0011,xx1C)	SL	1	Energy window offset as a percentage of the energy peak.
Energy Range	(0011,xx1D)	SL	1	Energy Range
Image Orientation	(0011,xx1F)	SL	1-n	Orientation of the image.
Use FOV Mask	(0011,xx23)	SL	1	Flag shows whether FOV mask used during image acquisition.
FOV Mask Y Cutoff Distance	(0011,xx24)	SL	1	Hexagonal FOV mask Y cutoff angle.
FOV Mask Cutoff Angle	(0011,xx25)	SL	1	Hexagonal FOV mask cutoff angle.
Table Orientation	(0011,xx26)	SL	1-n	Orientation of the table for whole body acquisition.
ROI Top Left	(0011,xx27)	SL	1-n	Acquisition count zone ROI, top left coordinate.
ROI Bottom Right	(0011,xx28)	SL	1-n	Acquisition count zone ROI, bottom right coordinate.
Uniformity Mean	(0011,xx29)	SL	1	Uniformity Mean value
View X Adjustment	(0011,xx2C)	FD	1-n	View X Adjustment
View Y Adjustment	(0011,xx2D)	FD	1-n	View Y Adjustment
Pixel Overflow Flag	(0011,xx2E)	SL	1-n	Pixel Overflow Flag (Starcam)
Pixel Overflow Level	(0011,xx2F)	SL	1-n	Pixel Overflow Level

Picture Object Name	(0011,xx30)	LO	1-n	Name of the database Picture Object
Acquisition Parent UID	(0011,xx31)	LO	1-n	Acquisition Parent UID
Processing Parent UID	(0011,xx32)	LO	1-n	Processing Parent UID
Energy Correct Name	(0011,xx33)	LO	1-n	Name of applied energy correction.
Spatial Correct Name	(0011,xx34)	LO	1-n	Name of applied spatial correction.
Tuning Calib Name	(0011,xx35)	LO	1-n	Name of applied tuning calibration data.
Uniformity Correct Name	(0011,xx36)	LO	1-n	Name of associated uniformity correction.
Acquisition Specific Correction Name	(0011,xx37)	LT	1	Name(s) of associated acquisition specific correction(s).
Byte Order	(0011,xx38)	SL	1-n	Defines pixel data byte order.
Compression Type	(0011,xx39)	SL	1-n	Compression information
Picture Format	(0011,xx3A)	SL	1-n	Xeleris IAP image format
Pixel Scale	(0011,xx3B)	FD	1-n	Internal Pixel Scale. Set to 1.0.
Pixel Offset	(0011,xx3C)	FD	1-n	Internal Pixel Offset. Set to 0.0.
FOV Shape	(0011,xx3E)	SL	1	GEHC NM system detector type.
Dataset Flags	(0011,xx3F)	SL	1-n	Defines dataset information.
Viewing Object Name	(0011,xx40)	LO	1-n	Name of the database Viewing Object
Orientation Angle	(0011,xx41)	SL	1-n	Orientation Angle
Rotation Angle	(0011,xx42)	FD	1-n	Rotation Angle
Window Inverse Flag	(0011,xx43)	SL	1-n	Window Inverse Flag
Threshold Center	(0011,xx44)	FD	1-n	Threshold Center
Threshold Width	(0011,xx45)	FD	1-n	Threshold Width
Interpolation Type	(0011,xx46)	SL	1-n	Interpolation Type
Where Object Name	(0011,xx50)	LO	1-n	Name of the database Where Object
Period	(0011,xx55)	FD	1-n	Period
Elapsed Time	(0011,xx56)	FD	1-n	Elapsed Time
FOV	(0011,xx57)	FD	1-n	FOV
Image Size	(0011,xx61)	SL	1-n	Image Size
Linear FOV	(0011,xx62)	FD	1-n	Linear FOV
Spatial Offset	(0011,xx63)	FD	1-n	Spatial Offset
Spatial Orientation	(0011,xx64)	FD	1-n	Spatial Orientation
Reference Dataset UID	(0011,xx65)	LO	1-n	Reference Dataset UID
Starcam Reference Dataset	(0011,xx66)	LO	1-n	Starcam Reference Dataset
Reference Frame Number	(0011,xx67)	SL	1-n	Reference Frame Number
Cursor Length	(0011,xx68)	SL	1-n	Cursor Length
Number of Cursors	(0011,xx69)	SL	1-n	Number of Cursors
Cursor Coordinates	(0011,xx6A)	SL	1-n	Cursor Coordinates
Recon Options Flag	(0011,xx6B)	SL	1-n	Recon Options Flag
Motion Threshold	(0011,xx6C)	FD	1-n	Motion Threshold
Motion Curve UID	(0011,xx6D)	UI	1-n	Motion Curve UID
Recon Type	(0011,xx6E)	SL	1-n	Recon Type
Pre Filter Type	(0011,xx6F)	SL	1-n	Pre Filter Type
Back Proj Filter Type	(0011,xx71)	SL	1-n	Back Proj Filter Type
Recon Arc	(0011,xx72)	SL	1-n	Recon Arc
Recon Pan AP Offset	(0011,xx73)	FD	1-n	Recon Pan AP Offset
Recon Pan LR Offset	(0011,xx74)	FD	1-n	Recon Pan LR Offset
Recon Area	(0011,xx75)	FD	1-n	Recon Area
Start View	(0011,xx76)	SL	1-n	Start View
Attenuation Type	(0011,xx77)	SL	1-n	Attenuation Type
Dual Energy Processing	(0011,xx78)	SL	1-n	Dual Energy Processing
Pre Filter Param	(0011,xx79)	SH	1-n	Pre Filter Param
Pre Filter Param 2	(0011,xx7A)	SH	1-n	Pre Filter Param 2
Back Proj Filter Param	(0011,xx7B)	SH	1-n	Back Proj Filter Param
Back Proj Filter Param 2	(0011,xx7C)	SH	1-n	Back Proj Filter Param 2

Attenuation Coef	(0011,xx7D)	SH	1-n	Attenuation Coef
Ref Slice Width	(0011,xx7E)	SL	1-n	Ref Slice Width
Ref Trans Pixel Volume	(0011,xx7F)	FD	1-n	Ref Trans Pixel Volume
Attenuation Threshold	(0011,xx81)	SH	1-n	Attenuation Threshold
Interpolation Distance	(0011,xx82)	FD	1-n	Interpolation Distance
Interpolation Center X	(0011,xx83)	FD	1-n	Interpolation Center X
Interpolation Center Y	(0011,xx84)	FD	1-n	Interpolation Center Y
Quant Filter Flag	(0011,xx85)	SL	1-n	Quant Filter Flag
Head Conversion	(0011,xx86)	SL	1-n	Head Conversion
Slice Width Pixels	(0011,xx87)	SL	1-n	Slice Width Pixels
Rfmtr Trans Ref	(0011,xx88)	SL	1-n	Rfmtr Trans Ref
Rfmtr Trans Ref mm	(0011,xx89)	FD	1-n	Rfmtr Trans Ref mm
Two Line Trans Ref	(0011,xx8A)	SL	1-n	Two Line Trans Ref
Three–D Zero	(0011,xx8B)	SL	1-n	Three–D Zero
Three–D Zero Length	(0011,xx8C)	SL	1-n	Three–D Zero Length
Three–D Zero In	(0011,xx8D)	SL	1-n	Three–D Zero In
Private Creator Identification	(0013,00xx)	LO	1	GEMS_GENIE_1
Digital FOV	(0013,xx10)	FD	1-n	Digital FOV
Source Translator	(0013,xx11)	SL	1	Source Translator. Default value = 4.
RAL Flags	(0013,xx12)	SL	1-n	RAL Flags
Fscalar	(0013,xx15)	FD	1-n	Scaling Factor for Floating Point pixel data
AutoTrack Peak	(0013,xx16)	SL	1	Optima Auto Track energy peak.
AutoTrack Width	(0013,xx17)	SL	1	Optima Auto Track energy width.
Transmission Scan Time	(0013,xx18)	FD	1	Attenuation correction transmission scan duration.
Transmission Mask Width	(0013,xx19)	FD	1	Attenuation correction transmission scan mask width.
Copper Attenuator Thickness	(0013,xx1A)	FD	1	Thickness of transmission scan copper attenuator.
Det Ang Separation	(0013,xx1B)	FD	1	Detector Ang Separation
Axial Acceptance Angle	(0013,xx1C)	SL	1	Axial Acceptance Angle
Theta Acceptance Value	(0013,xx1D)	SL	1	Theta Acceptance Value
Tomo View Offset	(0013,xx1E)	FD	1-n	Tomo view detector offset (vector)
Accepted Beats Time	(0013,xx20)	FD	1-n	Accepted Beat Time
Threshold	(0013,xx21)	FD	1-n	Threshold
Linear Depth	(0013,xx22)	FD	1-n	Linear Depth
Unif Date Time	(0013,xx23)	LO	1-n	Unif Date Time
Study Comments	(0013,xx26)	LT	1	User-defined additional information about the study.
Private Creator Identification	(0015,00xx)	LO	1	GEMS_GENIE_1
Num ECT Phases	(0015,xx12)	SL	1	Number of ECT Phases
Num WB Scans	(0015,xx13)	SL	1	Number of WB Scans
ECT Phase Num	(0015,xx14)	SL	1	ECT Phase Number
WB Scan Num	(0015,xx15)	SL	1	WB Scan Number
Comb Head Number	(0015,xx16)	SL	1	Comb Head Number
Preceding Beat	(0015,xx17)	UL	1	Preceding Beat
Private Creator Identification	(0019,00xx)	LO	1	GEMS_GENIE_1
Annotation Sequence	(0019,xx5F)	SQ	1	Annotations attached to image; May contain 0 or more Items
Modified	(0019,xx60)	SL	1	Modified Flag
Name	(0019,xx61)	LO	1	Name of Database Annotation Object
Aid	(0019,xx62)	LO	1	Database Annotation Unique ID
DatasetAnnotationMapping	(0019,xx63)	LO	1-n	Database Annotation Mapping

DatabaseObjectClassID	(0019,xx64)	LO	1	Internal Database Annotation Object Class ID
DatabaseObjectUniqueID	(0019,xx65)	LO	1	Internal Database Annotation Object UID
TextFgColour	(0019,xx66)	LO	1	Annotation Text Foreground Color
TextBgColour	(0019,xx67)	LO	1	Annotation Text Background Color
MarkerColour	(0019,xx68)	LO	1	Annotation Marker Color
LineColour	(0019,xx69)	LO	1	Annotation Line Color
LineThickness	(0019,xx6A)	SL	1	Annotation Line Thickness
Font	(0019,xx6B)	LT	1	Annotation Font
TextBackingMode	(0019,xx6C)	SL	1	Annotation Text Backing Mode
TextJustification	(0019,xx6D)	SL	1	Annotation Text Justification
TextShadowOffsetX	(0019,xx6E)	SL	1	Annotation Text Shadow Offset X
TextShadowOffsetY	(0019,xx6F)	SL	1	Annotation Text Shadow Offset Y
GeomColour	(0019,xx70)	LT	1	Annotation Geometry Color
GeomThickness	(0019,xx71)	SL	1	Annotation Geometry Thickness
GeomLineStyle	(0019,xx72)	SL	1	Annotation Geometry Line Style
GeomDashLength	(0019,xx73)	SL	1	Annotation Geometry Dash Length
GeomFillPattern	(0019,xx74)	SL	1	Annotation Geometry Fill Pattern
MarkerSize	(0019,xx75)	SL	1	Annotation Marker Size
Interactivity	(0019,xx76)	SL	1	Annotation Interactivity
TextLoc	(0019,xx77)	FD	1-n	Annotation Text Location
TextString	(0019,xx78)	LT	1	Annotation Text String
TextAttachMode	(0019,xx79)	SL	1-n	Annotation Text Attach Mode
TextCursorMode	(0019,xx7A)	SL	1-n	Annotation Text Cursor Mode
LineCtrlSize	(0019,xx7B)	SL	1	Annotation Line Ctrl Size
LineType	(0019,xx7C)	SL	1-n	Annotation Line Type
LineStyle	(0019,xx7D)	SL	1	Annotation Line Style
LineDashLength	(0019,xx7E)	SL	1	Annotation Line Dash Length
LinePtCount	(0019,xx7F)	SL	1-n	Annotation Line Points Count
LinePts	(0019,xx80)	FD	1-n	Annotation Line Points List
LineAttachMode	(0019,xx81)	SL	1-n	Annotation Line Attach Mode
MarkerType	(0019,xx82)	SL	1-n	Annotation Marker Type
MarkerLoc	(0019,xx83)	FD	1-n	Annotation Marker Location
MarkerAttachMode	(0019,xx84)	SL	1-n	Annotation Marker Attach Mode
FrameNumber	(0019,xx86)	UL	1	Annotation Frame Number
Private Creator Identification	(0033,00xx)	LO	1	GEMS_GENIE_1
Orig SOP Instance UID	(0033,xx07)	LO	1-n	List of SOP UIDs of Xeleris associated datasets encapsulated into the DICOM NM Information Image.
Trigger History Modified Flag	(0033,xx30)	SL	1	Triggers Modification Flag
Database Object Name	(0033,xx31)	LO	1	Name of Database Trigger History Object
Trigger History Software Version	(0033,xx32)	LO	1	Trigger History Software Version
Number of Triggers	(0033,xx33)	SL	1	Number of Triggers
Trigger Size	(0033,xx34)	SL	1	Size of one Trigger data slot
Trigger Data Size	(0033,xx35)	SL	1	Size of Trigger Data Size
Trigger Data	(0033,xx36)	OB	1	Buffer with trigger data information
Trigger History Description	(0033,xx37)	LO	1	Trigger History Description
Trigger History Flags	(0033,xx38)	SL	1	Trigger History Flags
Trigger History Prvate Instance UID	(0033,xx39)	LO	1	Trigger History Object identifier. Internally Generated
Trigger History SOP Class UID	(0033,xx3A)	LO	1	Internal SOP Class UID value, set to "1.2.840.10008.5.1.4.1.1.20" for historical reasons

Private Creator Identification	(0035,00xx)	LO	1	GEMS_GENIE_1
Start Angle	(0035,xx01)	FD	1	Detector start angle
Private Creator Identification	(0055,00xx)	LO	1	GEMS_GENIE_1
Xeleris Energy Window Information Sequence	(0055,xx12)	SQ	1	Private Energy Sequence. The number of items in the Xeleris Energy Window sequence is the same as tag value of tag (0054,0011)
Xeleris Energy Window Range Sequence	(0055,xx13)	SQ	1	Private Energy Window Range Sequence. May contain from 0 to 4 items.
Xeleris Detector Information Sequence	(0055,xx22)	SQ	1	Xeleris detector information Sequence. May contain one or more items.
Xeleris Rotation Information Sequence	(0055,xx52)	SQ	1	Xeleris Rotation Information Sequence. May contain one or more items.
Xeleris Gated Information Sequence	(0055,xx62)	SQ	1	Xeleris Gated Information Sequence. May contain 0 or more items.
Xeleris Data Information Sequence	(0055,xx63)	SQ	1	Xeleris Data Information Sequence. May contain 0 or more items.
Frame Sequence	(0055,xx65)	SQ	1	Xeleris Frame Sequence. Present for historical reasons. Always contains 0 items.

3.5.3 Private Group GEMS_XELPRV_01

TABLE 3-50
PRIVATE GROUP GEMS_XELPRV_01

Attribute Name	Tag	VR	VM	Attribute Description and Use
Private Creator Identification	(0017,00xx)	LO	1	GEMS_XELPRV_01
Series AverageHeartRate	(0017,xx01)	IS	1	Series Average Heart Rate
Image AverageHeartRate	(0017,xx02)	IS	1	Image Average Heart Rate
Series AcceptedBeats	(0017,xx03)	IS	1	Series Accepted Beats
Image AcceptedBeats	(0017,xx04)	IS	1	Image Accepted Beats
Series RejectedBeats	(0017,xx05)	IS	1	Series Rejected Beats
Image RejectedBeats	(0017,xx06)	IS	1	Image Rejected Beats
Private Creator Identification	(0033,00xx)	LO	1	GEMS_XELPRV_01
Object Type	(0033,xx08)	CS	1	Private object type. Possible values: "PROTOCOL DATA" (PDO) "REVIEW DATA" (RTO) "SERIES DATA" (SDO)
Modified Flag	(0033,xx10)	SL	1	Modified Flag; Default value is 0, not modified (PDO, RTO, SDO).
Name	(0033,xx11)	LO	1	Name of Database Object (PDO, RTO, SDO)
StudyId	(0033,xx14)	LO	1	Parent Study Id (RTO)
Database Object Unique ID	(0033,xx16)	LO	1	Database UID of private Object; • PDO - contains value of PDO UID tag (0033,xx52) generated at time of object creation. • RTO - contains value of RTO UID tag (0033,xx62) generated at time of object creation • SDO - contains value of SDO UID tag (0033, xx72) generated at time of object creation
Date	(0033,xx17)	SH	1	Private Object Creation Date (PDO, RTO,

				SDO)
Time	(0033,xx18)	SH	1	Private Object Creation Time (PDO, RTO, SDO)
Object Flags	(0033,xx19)	UL	1	Private Object Flags (PDO, SDO)
ProtocolName	(0033,xx1A)	LO	1	Name of Protocol created Private Object (PDO, SDO)
Relevant Data UID	(0033,xx1B)	LO	1	Identifier of the Parent Database Object • PDO – contains Study Id • SDO - contains SOP Instance UID of relative object
BulkData	(0033,xx1C)	OB	1	Private Object parameter(s) stored as binary buffer(s) (PDO, SDO)
IntData	(0033,xx1D)	SL	1-n	List of Private Object parameters stored as integers (PDO, SDO)
DoubleData	(0033,xx1E)	FD	1-n	List of Private Object parameters stored as doubles (PDO, SDO)
StringData	(0033,xx1F)	OB	1	List of Private Object parameters stored as list of strings (PDO, SDO)
BulkDataFormat	(0033,xx20)	OB	1	Format of bulk parameters; contains information about name and size of bulk buffers (PDO, SDO)
IntDataFormat	(0033,xx21)	OB	1	Format of integer parameters; contains information about name and number of integers in list (PDO, SDO)
DoubleDataFormat	(0033,xx22)	OB	1	Format of double parameters; contains information about name and number of doubles in list (PDO, SDO)
StringDataFormat	(0033,xx23)	OB	1	Format of string parameters; contains information about name and number of strings in list (PDO, SDO)
Description	(0033,xx24)	LT	1	User or equipment generated Private Object description (PDO, SDO)
RTName	(0033,xx28)	LO	1	Review Template Name (RTO)
RTSpecification	(0033,xx29)	LT	1	Review Template Specification (RTO)
RTFlags	(0033,xx2A)	UL	1	Review Templates Flags (RTO)
DataValidationSpec	(0033,xx2B)	LT	1	Data Validation Spec (RTO)
Description	(0033,xx2C)	LT	1	Review Template Description (RTO)
Icon Description	(0033,xx2D)	LT	1	Icon Description (RTO)
ProtocolDataSequence	(0033,xx50)	SQ	1	SQ with items encoding Private Protocol data Object (PDO) attributes; ; May contain 0 or more items
Internal Protocol Data SOPClassUID	(0033,xx51)	UI	1	PDO Private SOP Class UID
Internal Protocol Data Instance UID	(0033,xx52)	UI	1	PDO Instance UID; Internally generated
ReviewTemplateSequence	(0033,xx60)	SQ	1	SQ with items encoding Private Review Templates Objects (RTO) attributes; May contain 0 or more items
Internal Review Template SOPClassUID	(0033,xx61)	UI	1	RTO Private SOP Class UID
Internal Review Template InstanceUID	(0033,xx62)	UI	1	RTO Instance UID; Internally generated
Series Data Sequence	(0033,xx70)	SQ	1	SQ with items encoding Private Series Data Object (SDO) attributes; May contain 0 or more items.
Internal Seriesdata SOPClassUID	(0033,xx71)	UI	1	SDO Private SOP Class UID
Internal Seriesdata InstanceUID	(0033,xx72)	UI	1	SDO Instance UID; Internally generated in

				time of object creation
Double Data SQ	(0033,xx73)	SQ	1	Sequence of items to store Private Object parameters as lists of doubles (SDO). May contain 0 or more items.
Private Creator Identification	(0057,00xx)	LO	1	GEMS_XELPRV_01
ROI Sequence	(0057,xx01)	SQ	1	ROI created on image; may contain 0 or more items.
ROIObjectSOPClassUID	(0057,xx02)	UI	1	ROI SOP Class UID, contains value "1.2.840.10008.5.1.4.1.1.9"
ROIObjectInstanceUID	(0057,xx03)	UI	1	ROI SOP Instance UID; internally generated.
Index	(0057,xx10)	IS	1	Index of ROI
Dimensions	(0057,xx11)	US	1	ROI Dimensions. Contain value: 1
ShapePtsCount	(0057,xx12)	US	1	Number of Points
TypeOfData	(0057,xx13)	CS	1	ROI Type
Description	(0057,xx14)	LO	1	ROI Description
DValueRepresentation	(0057,xx15)	US	1	Data Value Representation; Contains value: 3
ROILabel	(0057,xx16)	LO	1	ROI Label
Data	(0057,xx17)	OW	1	List of ROI Shape points
Modified	(0057,xx41)	SL	1	Modified
Database Object Name	(0057,xx42)	LO	1	Name of ROI Database Object
Database Object Name Class ID	(0057,xx45)	LO	1	ROI Database Object Class
Database Object UID	(0057,xx46)	LO	1	ROI Object SOP Instance UID; internally generated
Normal Colour	(0057,xx47)	LO	1	ROI Normal Color
Name Font	(0057,xx48)	LT	1	ROI Name Font
Fill Pattern	(0057,xx49)	SL	1	ROI Fill Pattern
Line Style	(0057,xx4A)	SL	1	ROI Line Style
Line Dash Length	(0057,xx4B)	SL	1	ROI Line Dash Length
LineThickness	(0057,xx4C)	SL	1	ROI Line Thickness
Interactivity	(0057,xx4D)	SL	1	ROI Interactivity Flag
NamePos	(0057,xx4E)	SL	1	ROI Name Position
NameDisplay	(0057,xx4F)	SL	1	ROI Name Display Flag
Label	(0057,xx50)	LO	1	ROI Label; contains the same value as ROI Label attribute (0057,xx16)
BpSeq	(0057,xx51)	SL	1-n	ROI BpSeg
BpSeqPairs	(0057,xx52)	US	1-n	ROI BpSegpairs
SeedSpace	(0057,xx53)	SL	1	ROI Seed Space
Seeds	(0057,xx54)	FD	1-n	ROI Seeds
Shapes	(0057,xx55)	SL	1-n	ROI Shape
ShapeTilt	(0057,xx56)	FD	1-n	ROI Shape Tilt
ShapePtsSpace	(0057,xx59)	SL	1-n	ROI Shape Points Space
ShapeCtrlPtsCount	(0057,xx5A)	SL	1	ROI Shape Control Points Count
ShapeCtrlPts	(0057,xx5B)	FD	1-n	ROI Shape Control Points List
ShapeCPSpace	(0057,xx5C)	SL	1	ROI Shape Control Points Space
ROIFlags	(0057,xx5D)	UL	1	ROI Flags
FrameNumber	(0057,xx5E)	UL	1	ROI Frame Number
DatasetROIMapping	(0057,xx60)	LO	1-n	Dataset ROI Mapping

3.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Xeleris 3.x does not support any coded terminology

4. PET INFORMATION OBJECT IMPLEMENTATION

4.1 INTRODUCTION

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

4.2 XELERIS 3.X MAPPING OF DICOM ENTITIES

The Xeleris 3.x maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 4-1
MAPPING OF DICOM ENTITIES TO XELERIS 3.X ENTITIES

DICOM IE	Xeleris 3.x Entity
Patient	Patient
Study	Study
Series	Series
Image	Dataset

4.3 IOD MODULE TABLE

The PET 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
PET IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used (same description as for NM IOD)	3.4.1.1
	Clinical Trial Subject	Not Used	N/A
	Private Patient	Used (same description as for NM IOD)	3.4.1.2
Study	General Study	Used (same description as for NM IOD)	3.4.2.1
	Patient Study	Used (same description as for NM IOD)	3.4.2.2
	Private Study	Used (same description as for NM IOD)	3.4.2.3
	Standard Extended Study	Used (same description as for NM IOD)	3.4.2.4
	Clinical Trial Study	Not Used	N/A
Series	General Series	Used (same description as for NM IOD)	3.4.3.1
	Clinical Trial Series	Not Used	N/A
	Standard Extended Series	Used (same description as for NM IOD)	3.4.3.4
	PET Series	Used	4.4.1.1
	PET Isotope	Used	4.4.1.2
	Private Series	Used (same description as for NM IOD)	3.4.3.2
	Private PET Series	Used	4.4.1.3
	PET Multi-gated Acquisition	Not Used	N/A
	NM/PET Patient Orientation	Used (same description as for NM IOD)	3.4.3.5
Frame of Reference	Frame of Reference	Used	4.4.2.1
Equipment	General Equipment	Used (same description as for NM IOD)	3.4.5.1

Image	General Image	Used	4.4.3.1
	Image Plane	Used	4.4.3.2
	Image Pixel	Used	4.4.3.3
	Standard Extended Image	Used	4.4.3.4
	Device	Not Used	N/A
	PET Image	Used	4.4.3.5
	Overlay Plane	Not Used	N/A
	VOI LUT	Used	4.4.3.6
	Acquisition Context	Used (same description as for NM IOD)	3.4.6.3
	SOP Common	Used	4.4.3.7
	Private Image	Used (same description as for NM IOD)	3.4.6.9
	Private PET Image	Used	4.4.3.8

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 PET 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 values they may take and where these values are obtained from when generating the 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 PET Series Module

TABLE 4-3
PET SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Series Date	(0008,0021)	1	Date the Series started.
Series Time	(0008,0031)	1	Time the Series started.
Units	(0054,1001)	1	Pixel value units. Defined Terms: CNTS, NONE, CM2, PCNT, CPS, BQML, MGMINML, UMOLMINML, MLMING, MLG, 1CM, UMOLML, PROPCNTS, PROPCPS, MLMINML, MLML, GML, STDDEV
Counts Source	(0054,1002)	1	The primary source of counts. Enumerated Values: EMISSION TRANSMISSION
Series Type	(0054,1000)	1	A multi-valued indicator of the type of Series. See 4.4.1.1.1for specialization.
Reprojection Method	(0054,1004)	2C	Method for projecting volumetric data onto planar projection. Required if Series Type (0054,1000), Value 2 is REPROJECTION. Defined Terms: SUM MAX PIXEL

Number of R-R Intervals	(0054,0061)	1C	The maximum number of R-R Intervals that may exist in this Series. Not Used (creation of data with Series Type = GATED is not supported)
Number of Time Slots	(0054,0071)	1C	The maximum number of Time Slots that may exist in this Series. Not Used (creation of data with Series Type = GATED is not supported)
Number of Time Slices	(0054,0101)	1C	The maximum number of Time Slices that may exist in this Series. Not Used (creation of data with Series Type = DYNAMIC is not supported)
Number of Slices	(0054,0081)	1	The maximum number of Slices that may exist in this Series.
Corrected Image	(0028,0051)	2	One or more values that indicate which, if any, corrections have been applied to the images in this series.
Randoms Correction Method	(0054,1100)	3	Type of randoms correction processing.
Attenuation Correction Method	(0054,1101)	3	A textual description of the attenuation correction processing.
Scatter Correction Method	(0054,1105)	3	A textual description of the scatter correction processing.
Decay Correction	(0054,1102)	1	The real-world event to which images in this Series were decay corrected.
Reconstruction Diameter	(0018,1100)	3	Diameter, in mm, of the region within which the data was used in creating the reconstruction of the image.
Convolution Kernel	(0018,1210)	3	Textual description of the convolution kernel(s) used to reconstruct the data
Reconstruction Method	(0054,1103)	3	Textual description of reconstruction Processing.
Acquisition Start Condition	(0018,0073)	3	Description of how the data collection was started
Acquisition Start Condition Data	(0018,0074)	3	Count density, change in count density, or physiological triggers causing data collection to start.
Acquisition Termination Condition	(0018,0071)	3	Description of how the data collection for the series was stopped.
Acquisition Termination Condition Data	(0018,0075)	3	Number of counts, count density, change in count density, or physiological triggers causing the termination.
Field of View Shape	(0018,1147)	3	Shape of the field of view of the PET camera.
Field of View Dimensions	(0018,1149)	3	Dimensions of the field of view, in mm. Transverse detector diameter followed by axial width.
Gantry/Detector Tilt	(0018,1120)	3	Angle of tilt in degrees of the gantry.
Type of Detector Motion	(0054,0202)	3	Describes the detector motion during acquisition.
Collimator Type	(0018,1181)	2	Collimator Type
Axial Mash	(0054,1201)	3	Number of adjacent axial lines of response mashed together.
Transverse Mash	(0054,1202)	3	Number of adjacent transverse lines of response mashed together.

Coincidence Window Width	(0054,1210)	3	The width of the coincidence timing window, in nsec.

4.4.1.1.1 Series Type

The following values of Series Type (0054,1000) are generated:
Value 1 Enumerated Values:
- STATIC
- WHOLE BODY

Value 2 Enumerated Values:
- IMAGE
- REPROJECTION

4.4.1.2 PET Isotope Module

TABLE 4-4
PET ISOTOPE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Usage
Radiopharmaceutical Information Sequence	(0054,0016)	2	Information on radiopharmaceutical(s) used. Contains only 1 item.
> Radionuclide Code Sequence	(0054,0300)	2	Sequence that identifies the radionuclide. May contain 0 or 1 item.
>> *Include 'Code Sequence Macro'*			*Baseline Context ID is 4020*
> Radiopharmaceutical Volume	(0018,1071)	3	Volume of injection in cubic cm.
> Radiopharmaceutical Start Time	(0018,1072)	3	Time of start of injection.
> Radiopharmaceutical Stop Time	(0018,1073)	3	Time of end of injection.
> Radionuclide Total Dose	(0018,1074)	3	The radiopharmaceutical dose administered to the patient measured in Becquerels (Bq) at the Radiopharmaceutical Start Time (0018,1072).
> Radiopharmaceutical	(0018,0031)	3	Name of the radiopharmaceutical.
> Radiopharmaceutical Code Sequence	(0054,0304)	3	Sequence that identifies the radiopharmaceutical. May contain 0 or 1 item
>> *Include 'Code Sequence Macro'*			*Baseline Context ID is 4021*

4.4.1.3 Private PET Series Module

TABLE 4-5
PRIVATE PET SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator ID	Attribute Description
Series Type	(0011,xx0A)	GEMS_GENIE_1	Defines type of series. The Defined Terms are: 8 = Transaxial Tomo 12 = Orthogonal Reformat 13 = Oblique 3P Reformat 14 = Oblique 2L Reformat 15 = Results 24 = Reprojection

4.4.2 Frame Of Reference Entity Modules

4.4.2.1 Frame Of Reference Module

This section specifies the Attributes necessary to uniquely identify a Frame Of Reference which insures the spatial relationship of Images within a Series. It also allows Images across multiple Series to share the same Frame Of Reference. This Frame Of Reference (or coordinate system) shall be constant for all Images related to a specific Frame Of Reference.

A hybrid PT/CT (PT/MR) scan is composed of a single NM scan partnered with one or more CT (MR)scans. The two modalities share the same imaging space and the body imaged by the two modalities is represented, in most of the cases, by spatially aligned images. There are situations for which optimal PT imaging and optimal CT(MR) imaging impose changing the table height during the hybrid scan. In this case, the imaging space of both modalities remains the same, but the PT and CT(MR) images of the body are no longer spatially aligned. In order to prevent accidental fusion of such images, the same Frame Of Reference UID value shared by two series of different modalities will show that the images are spatially related and that the imaged body was scanned spatially aligned between the two images.

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TABLE 4-6
FRAME OF REFERENCE MODULE ATTRIBUTES

</div>

Attribute Name	Tag	Type	Attribute Description
Frame of Reference UID	(0020,0052)	1	Uniquely identifies the frame of reference for a Series.
Position Reference Indicator	(0020,1040)	2	Part of the patient's anatomy used as a reference.

4.4.3 Image Entity Modules

4.4.3.1 General Image Module

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TABLE 4-7
GENERAL IMAGE MODULE ATTRIBUTES

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Attribute Name	Tag	Type	Attribute Usage
Instance Number	(0020,0013)	2	A number that identifies this image.
Patient Orientation	(0020,0020)	2C	Patient Orientation
Content Date	(0008,0023)	2C	The date the image pixel data creation started.
Content Time	(0008,0033)	2C	The time the image pixel data creation started
Image Type	(0008,0008)	3	See 4.4.3.5 for PET Images
Acquisition Date	(0008,0022)	3	See 4.4.3.5 for PET Images
Acquisition Time	(0008,0032)	3	See 4.4.3.5 for PET Images
Image Comments	(0020,4000)	3	Contains additional information about image.

4.4.3.2 Image Plane Module

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TABLE 4-8
IMAGE PLANE MODULE ATTRIBUTES

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Attribute Name	Tag	Type	Attribute Usage
Pixel Spacing	(0028,0030)	1	Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm.
Image Orientation (Patient)	(0020 ,0037)	1	The direction cosines of the first row and the first column with respect to the patient.
Image Position (Patient)	(0020,0032)	1	The x, y, and z coordinates of the upper left hand corner (center of the first voxel transmitted) of the image, in mm
Slice Thickness	(0018,0050)	2	Nominal slice thickness, in mm
Slice Location	(0020,1041)	3	Relative position of the image plane expressed in mm.

4.4.3.3 Image Pixel Module

TABLE 4-9
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Usage
Samples per Pixel	(0028,0002)	1	See 4.4.3.5 for PET Images
Photometric Interpretation	(0028,0004)	1	See 4.4.3.5 for PET Images
Rows	(0028,0010)	1	Number of rows in the image
Columns	(0028,0011)	1	Number of columns in the image
Bits Allocated	(0028,0100)	1	See 4.4.3.5 for PET Images
Bits Stored	(0028,0101)	1	See 4.4.3.5 for PET Images
High Bit	(0028,0102)	1	See 4.4.3.5 for PET Images
Pixel Representation	(0028,0103)	1	Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values used: 0000H = unsigned integer. 0001H = 2's complement
Pixel Data	(7FE0, 0010)	1	A data stream of the pixel samples that comprise the Image.
Planar Configuration	(0028,0006)	1C	Not Used (number of Samples per Pixel is always 1)
Pixel Aspect Ratio	(0028,0034)	1C	Not Used
Smallest Image Pixel Value	(0028,0106)	3	The minimum actual pixel value encountered in this image.
Largest Image Pixel Value	(0028,0107)	3	The maximum actual pixel value encountered in this image.

4.4.3.4 Standard Extended Image Module

TABLE 4-10
STANDARD EXTENDED IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image ID	(0054,0400)	3	User or equipment generated Image identifier.
Spacing Between Slices	(0018,0088)	3	Spacing between slices, in mm. The spacing is measured from the center-to-center of each slice.
Table Height	(0018,1130)	3	The distance in mm of the top of the patient table to the center of rotation.

4.4.3.5 PET Image Module

TABLE 4-11
PET IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	See 4.4.3.5.1
Samples per Pixel	(0028,0002)	1	Always set be 1.
Photometric Interpretation	(0028,0004)	1	Always set to MONOCHROME2
Bits Allocated	(0028,0100)	1	Shall be 16.
Bits Stored	(0028,0101)	1	Shall be 16.
High Bit	(0028,0102)	1	Shall have only the Enumerated Value of one less than the value sent in Bits Stored.
Rescale Intercept	(0028,1052)	1	The value b in relationship between stored values (SV) and pixel value units (U) defined in Units (0054,1001): U = m*SV+b. Always set to 0.

Rescale Slope	(0028,1053)	1	The value **m** in the equation specified in Rescale Intercept (0028,1052).
Frame Reference Time	(0054,1300)	1	The time that the pixel values in the image occurred.
Trigger Time	(0018,1060)	1C	Time interval, in msec, from the start of the trigger to the Not Used (creation of data with Series Type = GATED is not supported)
Frame Time	(0018,1063)	1C	Nominal duration per individual frame, in msec. Not Used (creation of data with Series Type = GATED is not supported)
Low R-R Value	(0018,1081)	1C	R-R interval lower limit for beat rejection, in msec. Not Used (creation of data with Series Type = GATED is not supported)
High R-R Value	(0018,1082)	1C	R-R interval upper limit for beat rejection, in msec. Not Used (creation of data with Series Type = GATED is not supported)
Lossy Image Compression	(0028,2110)	1C	Specifies whether an Image has undergone lossy compression.
Image Index	(0054,1330)	1	An index identifying the position of this image within a PET Series.
Acquisition Date	(0008,0022)	2	The date the acquisition of data that resulted in this image started
Acquisition Time	(0008,0032)	2	The time the acquisition of data that resulted in this image started
Actual Frame Duration	(0018,1242)	2	Elapsed time of the data acquisition for this image, in msec.
Slice Sensitivity Factor	(0054,1320)	3	The slice-to-slice sensitivity correction factor that was used to correct this image.
Decay Factor	(0054,1321)	1C	The decay factor that was used to scale image. Required if Decay Correction (0054,1102) is other than NONE.
Dose Calibration Factor	(0054,1322)	3	Factor that was used to scale this image from counts/sec to Bq/ml using a dose calibrator.

4.4.3.5.1 Image Type

The following values of Image Type (0008,0008) are generated:
Value 1 Enumerated Values:
− DERIVED   identifies a Derived Image
Value 2 Enumerated:
− PRIMARY   identifies a Primary Image

4.4.3.6 VOI LUT module

TABLE 4-12
VOI LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
VOI LUT Sequence	(0028,3010)	1C	Not Used
Window Center	(0028,1050)	1C	Window Center for display. Only single value is present. Required if VOI LUT Sequence (0028,3010) is not present.

Window Width	(0028,1051)	1C	Window Width for display. Only single value is present. Required if Window Center (0028,1050) is sent.

4.4.3.7 SOP Common Module

TABLE 4-13
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Uniquely identifies the SOP Class. "1.2.840.10008.5.1.4.1.1.128"
SOP Instance UID	(0008,0018)	1	Uniquely identifies the SOP Instance.
Specific Character Set	(0008,0005)	1C	Not used when the default character set (ISO 646) is used. Set to ISO_IR 100 = Latin Alphabet No. 1 when extended character sets are used.
Instance Creation Date	(0008,0012)	3	Date of instance creation.
Instance Creation Time	(0008,0013)	3	Time of instance creation.
Instance Creator UID	(0008,0014)	3	Set to the Implementation UID (see Section 2.3.1.1.4)
Instance Number	(0020,0013)	3	See 4.4.3.1 for more specialization

4.4.3.8 Private PET Image Module

TABLE 4-14
PRIVATE PET IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description
RadioPharmaceticalTotalDose	(0009,xx38)	GEMS_PETD_01	RadioPharmaceticalTotalDose
MeasuredDateTime	(0009,xx39)	GEMS_PETD_01	MeasuredDateTime
AdminDateTime	(0009,xx3B)	GEMS_PETD_01	AdminDateTime
PostInjectionActivity	(0009,xx3C)	GEMS_PETD_01	PostInjectionActivity
PostInjectionDateTime	(0009,xx3D)	GEMS_PETD_01	PostInjectionDateTime
Reference coordinates	(0009,xx7F)	GEMS_PETD_01	Reference coordinates
Recon left	(0009,xx91)	GEMS_PETD_01	Recon left
Recon posterior	(0009,xx92)	GEMS_PETD_01	Recon posterior
Imageset UID	(0009,xx46)	GEMS_GENIE_1	Unique Identifier of PET Imageset
Dataset Type	(0011,xx13)	GEMS_GENIE_1	Defines type of dataset. The Defined Terms are: 13 = Transaxial 14 = Coronal 15 = Sagittal 28 = Oblique 44= MIP_3D 45 = SUM Reprojection

4.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

The Product supports the Standard and Private Attributes defined in the following sections in Standard Extended PET SOP Instances as Type 3 data elements.

4.5.1 Standard Expended Attributes

The Product supports the following attributes, not specified in the PET IOD, in SOP Instances as Type 3 data elements.

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TABLE 4-15
STANDARD EXTENDED ATTRIBUTES

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Information Entity Name	Attribute Name	Tag	Use
Image	Image ID	(0054,0400)	User or equipment generated Image identifier.
	Table Height	(0018,1130)	The distance in mm of the top of the patient table to the center of rotation.
	Spacing Between Slices	(0018,0088)	Spacing between slices, in mm. The spacing is measured from the center-to-center of each slice.

4.5.2 Private Group GEMS_GENIE_1

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TABLE 4-16
PRIVATE GROUP GEMS_GENIE_1

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Attribute Name	Tag	VR	VM	Attribute Description
Private Creator Identification	(0009,00xx)	LO	1	GEMS_GENIE_1
Imageset UID	(0009,xx46)	UI	1	Unique Identifier of PET Imageset
Private Creator Identification	(0011,00xx)	LO	1	GEMS_GENIE_1
Series Type	(0011,xx0A)	SL	1	Defines type of series.
Dataset Type	(0011,xx13)	SL	1	Defines type of dataset.

4.5.3 Private Group GEMS_PETD_01

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TABLE 4-17
PRIVATE GROUP GEMS_PETD_01

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Attribute Name	Tag	VR	VM	Attribute Description
Private Creator Identification	(0009,00xx)	LO	1	GEMS_PETD_01
RadioPharmaceticalTotalDose	(0009,xx38)	FL	1	RadioPharmaceticalTotalDose
MeasuredDateTime	(0009,xx39)	DT	1	MeasuredDateTime
AdminDateTime	(0009,xx3B)	DT	1	AdminDateTime
PostInjectionActivity	(0009,xx3C)	FL	1	PostInjectionActivity
PostInjectionDateTime	(0009,xx3D)	DT	1	PostInjectionDateTime
Reference coordinates	(0009,xx7F)	DS	3	Reference coordinates
Recon bp center left	(0009,xx91)	FL	1	Recon bp center left
Recon bp center posterior	(0009,xx92)	FL	1	Recon bp center posterior

4.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Xeleris 3.x does not support any coded terminology

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 produced by this implementation. Corresponding attributes are conveyed using the module construct.

Screen Save images created on the Xeleris 3.x system are stored as DICOM Secondary Capture images and Multi-frame Secondary Capture images.

The creation of the following secondary captures IODs is supported:

- Single frame secondary Capture Image IOD
- Multi-frame Grayscale Byte Secondary Capture Image IOD
- Multi-frame True Color Secondary Capture Image IOD

5.2 XELERIS 3.X MAPPING OF DICOM ENTITIES

The Xeleris 3.x maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 5-1
MAPPING OF DICOM ENTITIES TO XELERIS 3.X ENTITIES

DICOM IE	Xeleris 3.x Entity
Patient	Patient
Study	Study
Series	Series
Image	Dataset

5.3 IOD MODULE TABLE

The Secondary Capture 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 5.5 .

TABLE 5-2
SC IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used (same description as for NM IOD)	3.4.1.1
	Clinical Trial Subject	Not Used	N/A
	Private Patient	Used (same description as for NM IOD)	3.4.1.2
Study	General Study	Used (same description as for NM IOD)	3.4.2.1
	Patient Study	Used (same description as for NM IOD)	3.4.2.2
	Private Study	Used (same description as for NM IOD)	3.4.2.3
	Standard Extended Study	Used (same description as for NM IOD)	3.4.2.4
	Clinical Trial Study	Not Used	N/A
Series	General Series	Used	5.4.1.1
	Clinical Trial Series	Not Used	N/A
	Standard Extended Series	Used (for SC IOD only)	5.4.1.2

	Private Series	Used (same description as for NM IOD)	3.4.3.2
	Private SC Series	Used	5.4.1.3
Equipment	General Equipment	Used	5.4.2.1
	SC Equipment	Used	5.4.2.2
Image	General Image	Used	5.4.3.1
	Image Pixel	Used	5.4.3.2
	Device	Not Used	N/A
	Specimen	Not Used	N/A
	SC Image	Used	5.4.3.3
	Overlay Plane	Not Used	N/A
	Modality LUT	Not Used	N/A
	VOI LUT	Not Used	N/A
	SOP Common	Used	5.4.3.4
	Cine	Used (for MFSC IOD only)	5.4.3.5
	Multi-Frame	Used (for MFSC IOD only)	5.4.3.6
	SC Multi-Frame Image	Used (for MFSC IOD only)	5.4.3.7
	SC Multi-Frame Vector	Used (for MFSC IOD only)	5.4.3.8
	Private Image	Used (same description as for NM IOD)	3.4.6.9
	Private SC Image	Used (for SC IOD only)	5.4.3.9
	Private 4DMSpect	Used (for SC IOD only created by 4DM SPECT Processing Protocol)	5.4.3.10

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 generated by Xeleris 3.0 at time of object creation. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take when generating the 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 Series Entity Modules

5.4.1.1 General Series Module

TABLE 5-3
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	For specification, see SC Equipment Module (Section 5.4.2.2)
Series Instance UID	(0020,000E)	1	Unique identifier of the Series.
Series Number	(0020,0011)	2	Series Number
Laterality	(0020,0060)	2C	Laterality. Always set to ZERO-LENGTH value.
Series Date	(0008,0021)	3	Date the Series started.
Series Time	(0008,0031)	3	Time the Series started.
Protocol Name	(0018,1030)	3	User-defined description of the conditions under which the Series was performed.
Series Description	(0008,103E)	3	Description of the Series.

Performing Physicians' Name	(0008,1050)	3	Name of the physician(s) administering this Series.
Operators' Name	(0008,1070)	3	Name(s) of the operator(s) supporting the Series.
Body Part Examined	(0018,0015)	3	Body Part Examined

5.4.1.2 Standard Extended Series Module

TABLE 5-4
STANDARD EXTENDED SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient Position	(0018,5100)	3	Patient position descriptor relative to the equipment. Always set to ZERO_LENGTH Value.

5.4.1.3 Private SC Series Module

TABLE 5-5
PRIVATE SC SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator ID	Attribute Description
Series Object Name	(0009,xx20)	GEMS_GENIE_1	Name of the Database Series Object. For SC IOD only
Series Flags	(0009,xx21)	GEMS_GENIE_1	Defines series information For SC IOD only.
Series Type	(0011,xx0A)	GEMS_GENIE_1	Defines type of series. The Defined Terms are: 0 = SC Series 25 = MFSC Series 15= Results

5.4.2 Equipment Entity Modules

5.4.2.1 General Equipment Module

This module is used to describe information of the equipment generating the current derived instance

TABLE 5-6
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Manufacturer of the equipment that produced the SC instances. Values used : "GE MEDICAL SYSTEMS, NUCLEAR" " GE MEDICAL SYSTEMS, CT" " GE MEDICAL SYSTEMS, PET" " GE MEDICAL SYSTEMS, MRI"
Institution Name	(0008,0080)	3	Institution where the equipment that produced the composite instances is located.
Station Name	(0008,1010)	3	User defined name identifying the machine that produced the composite instances.
Manufacturer's Model Name	(0008,1090)	3	Manufacturer's model name of the equipment that produced the composite instances.
Device Serial Number	(0018,1000)	3	Manufacturer's serial number of the equipment that produced the composite instances.
Software Version(s)	(0018,1020)	3	Manufacturer's designation of software version of the equipment that produced the composite instances.

5.4.2.2 SC Equipment Module

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TABLE 5-7
SC EQUIPMENT MODULE ATTRIBUTES

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Attribute Name	Tag	Type	Attribute Description
Conversion Type	(0008,0064)	1	Defined Terms used: WSD = Workstation image conversion
Modality	(0008,0060)	3	SC Images created by Volumetrix generally have this attribute set to the value found in the original image. Defined Terms: NM = Nuclear Medicine CT = Computed Tomography PT = Positron emission tomography (PET) MR = Magnetic Resonance OT = Other
Secondary Capture Device ID	(0018,1010)	3	Secondary Capture Device ID
Secondary Capture Device Manufacturer	(0018,1016)	3	Secondary Capture Device Manufacturer
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	3	Secondary Capture Device Manufacturer's Model Name
Secondary Capture Device Software Version	(0018,1019)	3	Secondary Capture Device Software Version

5.4.3 Image Entity Modules

5.4.3.1 General Image Module

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TABLE 5-8
GENERAL IMAGE MODULE ATTRIBUTES

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Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020,0013)	2	A number that identifies this image.
Patient Orientation	(0020,0020)	2C	Patient direction of the rows and columns of the image. Always sent as ZERO LENGTH.
Content Date	(0008,0023)	2C	The date the image pixel data creation started. Send for MFSC IOD only.
Content Time	(0008,0033)	2C	The time the image pixel data creation started. Send for MFSC IOD only.
Acquisition Date	(0008,0022)	3	The date the creation of data that resulted in this image started.
Acquisition Time	(0008,0032)	3	The time the creation of data that resulted in this image started.
Derivation Description	(0008,2111)	3	A text description of how this image was derived. Composed of two parts separated by "$$". First part is specific description generated by user and the second part is a description of the nature of the results and/or processing that generated the secondary capture object.
Burned In Annotation	(0028, 0301)	3	Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. Enumerated Values : YES NO
Image Comments	(0020,4000)	3	User-defined comments about the image.
Image Type	(0008,0008)	3	See 5.4.3.1.1

5.4.3.1.1 Image Type

The following Enumerated Value of Value 1 is created:
– DERIVED   identifies a Derived Image
The following Enumerated Value of Value 2 is created:
– SECONDARY   identifies a Secondary Image

5.4.3.2 Image Pixel Module

TABLE 5-9
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Number of samples (planes) in this image. Set to 1 if Photometric Interpretation (0028,0004) is MONOCHROME2 Set to 3 if Photometric Interpretation (0028,0004) is RGB
Photometric Interpretation	(0028,0004)	1	Specifies the intended interpretation of the pixel data Defined Terms supported: • MONOCHROME2 - used for Single frame secondary Capture Image IOD and Multi-frame Grayscale Byte Secondary Capture Image IOD • RGB - used for Single frame secondary Capture Image IOD and Multi-frame True Color Secondary Capture Image IOD
Rows	(0028,0010)	1	Number of rows in the image.
Columns	(0028,0011)	1	Number of columns in the image.
Bits Allocated	(0028,0100)	1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. Enumerated Values supported : 8
Bits Stored	(0028,0101)	1	Number of bits stored for each pixel sample. Value equal to Bit Allocated (0028,0100)
High Bit	(0028,0102)	1	Most significant bit for pixel sample data. Value equal to Bit Stored (0028,0101) - 1
Pixel Representation	(0028,0103)	1	Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values: 0000H = unsigned integer.
Pixel Data	(7FE0,0010)	1	A data stream of the pixel samples that comprise the Image.
Planar Configuration	(0028,0006)	1C	Indicates whether the pixel data are sent color-by-plane or color-by-pixel. For RGB data. Enumerated Values: 0000H = color-by-pixel
Smallest Image Pixel Value	(0028,0106)	3	The minimum actual pixel value encountered in this image. Always set to 0.
Largest Image Pixel Value	(0028,0107)	3	The maximum actual pixel value encountered in this image. Always set to 255.

5.4.3.3 SC Image Module

TABLE 5-10
SC IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Pixel Spacing	(0028,0030)	1C	Not sent. Secondary Capture images created by product are not calibrated images.
Date of Secondary Capture	(0018,1012)	3	The date the Secondary Capture Image was captured.
Time of Secondary Capture	(0018,1014)	3	The time the Secondary Capture Image was captured.

5.4.3.4 SOP Common Module

TABLE 5-11
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Uniquely identifies the SOP Class. Possible values: "1.2.840.10008.5.1.4.1.1.7" "1.2.840.10008.5.1.4.1.1.7.2" "1.2.840.10008.5.1.4.1.1.7.4"
SOP Instance UID	(0008,0018)	1	Uniquely identifies the SOP Instance. Internally generated.
Specific Character Set	(0008,0005)	1C	Not used when the default character set (ISO 646) is used. Set to "ISO_IR 100" when extended character sets are used.
Instance Creation Date	(0008,0012)	3	Date the SOP Instance was created.
Instance Creation Time	(0008,0013)	3	Time the SOP Instance was created.
Instance Creator UID	(0008,0014)	3	Set to the Implementation UID (see Section 2.3.1.1.4)
Instance Number	(0020,0013)	3	A number that identifies this Composite object instance

5.4.3.5 Cine Module

TABLE 5-12
CINE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Preferred Playback Sequencing	(0018,1244)	3	Describes the preferred playback sequencing for a multi-frame image. Enumerated Values: 0 = Looping (1,2...n,1,2,...n,1,2,....n,...) 1 = Sweeping (1,2,...n,n-1,...2,1,2,...n,...)
Frame Time	(0018,1063)	1C	Nominal time (in msec) per individual frame. Required if Frame Increment Pointer (0028,0009) points to Frame Time.
Recommended Display Frame Rate	(0008,2144)	3	Recommended rate at which the frames of a Multi-frame image should be displayed in frames/second.
Cine Rate	(0018,0040)	3	Number of frames per second.

5.4.3.6 Multi-Frame Module

TABLE 5-13
MULTI-FRAME MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Number of Frames	(0028,0008)	1	Number of frames in a Multi-frame Image.
Frame Increment Pointer	(0028,0009)	1	Contains the Data Element Tags of one or more frame index vectors. See 5.4.3.7 for specialization

5.4.3.7 SC Multi-Frame Image Module

TABLE 5-14
SC MULTI-FRAME IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Burned in Annotation	(0028,0301)	1	Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. Enumerated Values : YES NO

Presentation LUT Shape	(2050,0020)	1C	Specifies an identity transformation for the Presentation LUT, such that the output of all grayscale transformations defined in the IOD containing this Module are defined to be P-Values. Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1. Enumerated Value: IDENTITY - output is in P-Values.
Rescale Intercept	(0028,1052)	1C	The value b in the relationship between stored values (SV) in Pixel Data (7FE0,0010) and the output units specified in Rescale Type (0028,1054). Output units = m*SV + b. Enumerated Value: 0 Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1.
Rescale Slope	(0028,1053)	1C	The value m in the equation specified in Rescale Intercept (0028,1052). Enumerated Value: 1. Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1.
Rescale Type	(0028,1054)	1C	Specifies the output units of Rescale Slope (0028,1053) and Rescale Intercept (0028,1052). Enumerated Value: US = Unspecified. Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1.
Frame Increment Pointer	(0028,0009)	1C	Contains the Data Element Tag of the attribute which is used as the frame increment in Multi-frame pixel data - Frame Time (0018, 1063).

5.4.3.8 SC Multi-Frame Vector Module

This section specifies the IOD Attributes that may be the target of the Frame Increment Pointer (0028,0009) for SC Multi-frame images.

Attributes of this module are not included into MFSC Images created by Xeleris 3.x , because Frame Increment Pointer (0028,0009) always points to Frame Time attribute (0018, 1063), which is used as the frame increment in Multi-frame pixel data.

5.4.3.9 Private SC Image Module

TABLE 5-15
PRIVATE SC IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description
Database Object Name	(0011,xx10)	GEMS_GENIE_1	Name of the Database Dataset Object.
Dataset Modified	(0011,xx11)	GEMS_GENIE_1	Dataset Modified Flag .
Dataset Type	(0011,xx13)	GEMS_GENIE_1	Defines type of dataset. The Defined Terms are: 6 = Grayscale SC 30 = RGB SC
Dataset Flags	(0011,xx3F)	GEMS_GENIE_1	Defines dataset information.
Threshold Center	(0011,xx44)	GEMS_GENIE_1	Default Value: 2048.0
Threshold Width	(0011,xx45)	GEMS_GENIE_1	Default Value: 4096.0
Interpolation Type	(0011,xx46)	GEMS_GENIE_1	Default value: 2
FOV	(0011,xx57)	GEMS_GENIE_1	FOV

5.4.3.10 Private 4DMSpect Results Module

TABLE 5-16
PRIVATE 4DMSPECT RESULTS MODULE ATTRIBUTES

Attribute Name	Tag	Private Creator	Attribute Description
Invia Results Bulk	(1817,xx01)	INVIA_RESULTS	4DM SPECT Protocol results stored as bulk.

5.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

The Product supports the Standard and Private Attributes defined in the following sections in Standard Extended SC SOP Instances as Type 3 data elements.

5.5.1 Standard Extended Attributes

The Product supports the following attributes, not specified in the SC IOD, in SOP Instances as Type 3 data elements.

TABLE 5-17
STANDARD EXTENDED ATTRIBUTES

Information Entity Name	Attribute Name	Tag	Use
Series	Patient Position	(0018,5100)	Patient position descriptor relative to the Equipment.

5.5.2 Private Group GEMS_GENIE_1

TABLE 5-18
PRIVATE GROUP GEMS_GENIE_1

Attribute Name	Tag	VR	VM	Attribute Description
Private Creator Identification	(0009,00xx)	LO	1	GEMS_GENIE_1
Series Object Name	(0009,xx20)	LO	1	Name of the Database Series Object.
Series Flags	(0009,xx21)	SL	1	Defines series information.
Private Creator Identification	(0011,00xx)	LO	1	GEMS_GENIE_1
Series Type	(0011,xx0A)	SL	1	Defines type of series.
Database Object Name	(0011,xx10)	LO	1-n	Name of the Database Dataset Object.
Dataset Modified	(0011,xx11)	SL	1-n	Dataset Modified Flag
Dataset Type	(0011,xx13)	SL	1	Defines type of dataset. The Defined Terms are: 6 = Grayscale SC 30 = RGB SC For SC IOD only
Dataset Flags	(0011,xx3F)	SL	1-n	Defines dataset information.
Threshold Center	(0011,xx44)	FD	1-n	
Threshold Width	(0011,xx45)	FD	1-n	
Interpolation Type	(0011,xx46)	SL	1-n	
FOV	(0011,xx57)	FD	1-n	FOV

5.5.3 Private Group INVIA_RESULTS

TABLE 5-19
PRIVATE GROUP INVIA_RESULTS

Attribute Name	Tag	VR	VM	Attribute Description and Use

Private Creator Identification	(1817,0010)	LO	1	INVIA_RESULTS
InviaResultsBulk	(1817,xx01)	OB	1	4DM SPECT Protocol results stored as bulk.

5.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Xeleris 3.x does not support any coded terminology

6. STANDALONE CURVE INFORMATION OBJECT IMPLEMENTATION

6.1 INTRODUCTION

This section specifies the use of the DICOM Standalone Curve IOD to represent the information included in Curve data produced by this implementation. Xeleris 3.x Curve objects include time activity curves, image profile histograms, and acquisition energy spectrum histograms Corresponding attributes are conveyed using the module construct.

6.2 XELERIS 3.X MAPPING OF DICOM ENTITIES

The Xeleris3.x maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 6-1
MAPPING OF DICOM ENTITIES TO XELERIS 3.X ENTITIES

DICOM IE	Xeleris 3.x Entity
Patient	Patient
Study	Study
Series	Series
Curve	Curve

6.3 IOD MODULE TABLE

The Standalone Curve 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
STANDALONE CURVE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used (same description as for NM IOD)	3.4.1.1
	Clinical Trial Subject	Not Used	N/A
	Private Patient	Used (same description as for NM IOD)	3.4.1.2
Study	General Study	Used (same description as for NM IOD)	3.4.2.1
	Patient Study	Used (same description as for NM IOD)	3.4.2.2
	Private Study	Used (same description as for NM IOD)	3.4.2.3
	Standard Extended Study	Used (same description as for NM IOD)	3.4.2.4
	Clinical Trial Study	Not Used	N/A
Series	General Series	Used (same description as for NM IOD)	3.4.3.1
	Clinical Trial Series	Not Used	N/A
	Private Series	Used (same description as for NM IOD)	3.4.3.2
Equipment	General Equipment	Used (same description as for NM IOD)	3.4.5.1
Curve	Curve Identification	Used	6.4.1.1
	Standard Curve	Used	6.4.1.2
	Private Curve	Used	6.4.1.3
	SOP Common	Used	6.4.1.4

6.4 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 supported. 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. 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 Curve Entity Modules

6.4.1.1 Curve Identification Module

TABLE 6-3
CURVE IDENTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Curve Number	(0020,0024)	2	Curve Index.
Curve Date	(0008,0025)	3	Creation date
Curve Time	(0008,0035)	3	Creation time

6.4.1.2 Standard Curve Module

TABLE 6-4
STANDARD CURVE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Curve Dimensions	(5000,0005)	1	Curve Dimensions
Number of Points	(5000,0010)	1	Number of Points
Type of Data	(5000,0020)	1	Type of Data: • TAC - for discrete interval plots HIST for discrete interval bar graphs PROF for image profile plots • ROI - for ROI objects
Data Value Representation	(5000,0103)	1	Data Value Representation: set to 0003H = Floating Point Double (DICOM type FD)
Curve Data	(5000,3000)	1	Curve Data
Curve Description	(5000,0022)	3	Curve Legend or Curve Name
Axis Units	(5000,0030)	3	Units of measure for the axes; one value for each dimension. The order for the units is the same order as the dimensions for the curve data in Curve Data (50xx,3000) - (x-units/y-units). Defined Terms Used: SEC CNTS BPM DEG GM M2
Axis Labels	(5000,0040)	3	Set to defaults for export. Not used for import.
Minimum Coordinate Value	(5000,0104)	3	value 1 = x, value 2 = y
Maximum Coordinate Value	(5000,0105)	3	value 1 = x, value 2 = y

Curve Label	(5000,2500)	3	Curve Label (Curve Legend or Curve Name)

6.4.1.3 Private Curve Module

<div align="center">

TABLE 6-5
PRIVATE CURVE MODULE ATTRIBUTES

</div>

Attribute Name	Tag	Private Creator	Attribute Description
Modified	(5001,xx01)	GEMS_GENIE_1	Modified
Name	(5001,xx02)	GEMS_GENIE_1	Name
Cid	(5001,xx03)	GEMS_GENIE_1	Cid
Srid	(5001,xx04)	GEMS_GENIE_1	Srid
CurveSOPClassUID	(5001,xx05)	GEMS_GENIE_1	Internal Curve SOP Class UID.
CurveInstanceUID	(5001,xx06)	GEMS_GENIE_1	Internally Generated
CurveType	(5001,xx07)	GEMS_GENIE_1	CurveType
GraphType	(5001,xx08)	GEMS_GENIE_1	GraphType
Legend	(5001,xx09)	GEMS_GENIE_1	Legend
XUnits	(5001,xx0A)	GEMS_GENIE_1	XUnits
YUnits	(5001,xx0B)	GEMS_GENIE_1	YUnits
Edit	(5001,xx0C)	GEMS_GENIE_1	Edit
Suspend	(5001,xx0D)	GEMS_GENIE_1	Suspend
StyleLine	(5001,xx0E)	GEMS_GENIE_1	StyleLine
StyleFill	(5001,xx0F)	GEMS_GENIE_1	StyleFill
StyleColour	(5001,xx10)	GEMS_GENIE_1	StyleColour
StyleWidth	(5001,xx11)	GEMS_GENIE_1	StyleWidth
StylePoint	(5001,xx12)	GEMS_GENIE_1	StylePoint
StylePColour	(5001,xx13)	GEMS_GENIE_1	StylePColour
StylePSize	(5001,xx14)	GEMS_GENIE_1	StylePSize
Segments	(5001,xx15)	GEMS_GENIE_1	Segments
SegType	(5001,xx16)	GEMS_GENIE_1	SegType
SegStart	(5001,xx17)	GEMS_GENIE_1	SegStart
SegEnd	(5001,xx18)	GEMS_GENIE_1	SegEnd
SegStyleLine	(5001,xx19)	GEMS_GENIE_1	SegStyleLine
SegStyleFill	(5001,xx1A)	GEMS_GENIE_1	SegStyleFill
SegStyleColour	(5001,xx1B)	GEMS_GENIE_1	SegStyleColour
SegStyleWidth	(5001,xx1C)	GEMS_GENIE_1	SegStyleWidth
SegStylePoint	(5001,xx1D)	GEMS_GENIE_1	SegStylePoint
SegStylePColour	(5001,xx1E)	GEMS_GENIE_1	SegStylePColour
SegStylePSize	(5001,xx1F)	GEMS_GENIE_1	SegStylePSize
SegName	(5001,xx20)	GEMS_GENIE_1	SegName
SegAllowDirInt	(5001,xx21)	GEMS_GENIE_1	SegAllowDirInt
TextAnnots	(5001,xx22)	GEMS_GENIE_1	TextAnnots
TxtX	(5001,xx23)	GEMS_GENIE_1	TxtX
TxtY	(5001,xx24)	GEMS_GENIE_1	TxtY
TxtText	(5001,xx25)	GEMS_GENIE_1	TxtText
TxtName	(5001,xx26)	GEMS_GENIE_1	TxtName
ROIName	(5001,xx30)	GEMS_GENIE_1	ROIName
DerivedFromImageUID	(5001,xx31)	GEMS_GENIE_1	DerivedFromImageUID
DerivedFromImages	(5001,xx32)	GEMS_GENIE_1	DerivedFromImages
CurveFlags	(5001,xx33)	GEMS_GENIE_1	CurveFlags
CurveName	(5001,xx34)	GEMS_GENIE_1	CurveName
DatasetName	(5001,xx35)	GEMS_GENIE_1	DatasetName
CurveUID	(5001,xx36)	GEMS_GENIE_1	CurveUID
ROIArea	(5001,xx37)	GEMS_GENIE_1	ROIArea

6.4.1.4 SOP Common Module

<p align="center">TABLE 6-6
SOP COMMON MODULE ATTRIBUTES</p>

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Uniquely identifies the SOP Class. Always "1.2.840.10008.5.1.4.1.1.9"
SOP Instance UID	(0008,0018)	1	Uniquely identifies the SOP Instance. Internally generated.
Specific Character Set	(0008,0005)	1C	Not used when the default character set (ISO 646) is used. Set to "ISO_IR 100" when extended character sets are used.
Instance Creation Date	(0008,0012)	3	Date the SOP Instance was created.
Instance Creation Time	(0008,0013)	3	Time the SOP Instance was created.
Instance Creator UID	(0008,0014)	3	Uniquely identifies device which created the SOP Instance. Set to the Implementation UID (see Section 2.3.1.1.4)
Instance Number	(0020,0013)	3	A number that identifies this Composite object instance

6.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

The Product supports the Private Attributes defined in the following sections in Standard Extended Standalone Curve SOP Instances as Type 3 data elements.

6.5.1 Private Group GEMS_GENIE_1

<p align="center">TABLE 6-7
PRIVATE GROUP GEMS_GENIE_1</p>

Attribute Name	Tag	VR	VM	Attribute Description and Use
Private Creator Identification	(5001,00xx)	LO	1	GEMS_GENIE_1
Modified	(5001,xx01)	SL	1	Modified
Name	(5001,xx02)	LO	1	Name
Cid	(5001,xx03)	SL	1	Cid
Srid	(5001,xx04)	SL	1	Srid
SOPClassUID	(5001,xx05)	LO	1	Internal Curve SOP Class UID.
SOPInstanceUID	(5001,xx06)	LO	1	Internally Generated
CurveType	(5001,xx07)	SL	1	CurveType
GraphType	(5001,xx08)	SL	1	GraphType
Legend	(5001,xx09)	LO	1	Legend
XUnits	(5001,xx0A)	LO	1	XUnits
YUnits	(5001,xx0B)	LO	1	YUnits
Edit	(5001,xx0C)	SL	1	Edit
Suspend	(5001,xx0D)	SL	1	Suspend
StyleLine	(5001,xx0E)	SL	1	StyleLine
StyleFill	(5001,xx0F)	SL	1	StyleFill
StyleColour	(5001,xx10)	LO	1	StyleColour
StyleWidth	(5001,xx11)	SL	1	StyleWidth
StylePoint	(5001,xx12)	SL	1	StylePoint
StylePColour	(5001,xx13)	LO	1	StylePColour
StylePSize	(5001,xx14)	SL	1	StylePSize
Segments	(5001,xx15)	SL	1	Segments
SegType	(5001,xx16)	SL	1-n	SegType
SegStart	(5001,xx17)	FD	1-n	SegStart
SegEnd	(5001,xx18)	FD	1-n	SegEnd
SegStyleLine	(5001,xx19)	SL	1-n	SegStyleLine
SegStyleFill	(5001,xx1A)	SL	1-n	SegStyleFill
SegStyleColour	(5001,xx1B)	LO	1	SegStyleColour
SegStyleWidth	(5001,xx1C)	SL	1-n	SegStyleWidth

SegStylePoint	(5001,xx1D)	SL	1-n	SegStylePoint
SegStylePColour	(5001,xx1E)	LO	1	SegStylePColour
SegStylePSize	(5001,xx1F)	SL	1-n	SegStylePSize
SegName	(5001,xx20)	LO	1	SegName
SegAllowDirInt	(5001,xx21)	SL	1-n	SegAllowDirInt
TextAnnots	(5001,xx22)	SL	1	TextAnnots
TxtX	(5001,xx23)	FD	1-n	TxtX
TxtY	(5001,xx24)	FD	1-n	TxtY
TxtText	(5001,xx25)	LO	1	TxtText
TxtName	(5001,xx26)	LO	1	TxtName
ROIName	(5001,xx30)	LO	1	ROIName
DerivedFromImageUID	(5001,xx31)	LO	1	DerivedFromImageUID
DerivedFromImages	(5001,xx32)	SL	1-n	DerivedFromImages
CurveFlags	(5001,xx33)	UL	1	CurveFlags
CurveName	(5001,xx34)	LO	1	CurveName
DatasetName	(5001,xx35)	LO	1	DatasetName
CurveUID	(5001,xx36)	LO	1	CurveUID
ROIArea	(5001,xx37)	FD	1-n	ROIArea

6.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Xeleris 3.x does not support any coded terminology

7. STORAGE COMMITMENT PUSH MODEL IMPLEMENTATION

7.1 STORAGE COMMITMENT PUSH MODEL INFORMATION OBJECT DEFINITION

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the attributes contained within the Storage Commitment Information Object.

The Storage Commitment Information Object is used both for N-ACTION Storage Commitment Requests by the SCU and N-EVENT-REPORT Storage Commitment Notifications by the SCP.

7.1.1 STORAGE COMMITMENT MODULE FOR N-ACTION

TABLE 7-1
STORAGE COMMITMENT MODULE FOR N-ACTION

Attribute Name	Tag	SCU Use
Transaction UID	(0008,1195)	Internally Generated
Storage Media File-Set ID	(0088,0130)	Not used
Storage Media File-Set UID	(0088,0140)	Not used
Referenced SOP Sequence	(0008,1199)	May contain 1 or more items
>Referenced SOP Class UID	(0008,1150)	Storage SOP classes supported as SCU (see Section 2.3.1)
>Referenced SOP Instance UID	(0008,1155)	SOP Instance UID of the Image which Storage Commitment is required for.
>Storage Media File-Set ID	(0088,0130)	Not used
>Storage Media File-Set UID	(0088,0140)	Not used

7.1.2 STORAGE COMMITMENT MODULE FOR N-EVENT-REPORT

TABLE 7-2
STORAGE COMMITMENT MODULE FOR N-EVENT-REPORT

Attribute Name	Tag	SCU Use
Transaction UID	(0008,1195)	Used to identify the N-ACTION Request which N-EVENT-REPORT is relevant to.
Retrieve AE Title	(0008,0054)	Not Used
Storage Media File-Set ID	(0088,0130)	Not used
Storage Media File-Set UID	(0088,0140)	Not used
Referenced SOP Sequence	(0008,1199)	Used to identify the images which storage commitment was successful and mark them as Archived.
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
>Retrieve AE Title	(0008,0054)	Not Used
>Storage Media File-Set ID	(0088,0130)	Not used
>Storage Media File-Set UID	(0088,0140)	Not used

Failed SOP Sequence	(0008,1198)	Used to identify the images which storage commitment was failed to prevent marking them as Archived.
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
>Failure Reason	(0008,1197)	See Section 7.1.2.1 for the list of processed values.

7.1.2.1 Processing of Failure Reason when received in a N-Event-Report

When receiving a N-Event-Report request with a Event Type ID equal to 2, meaning that Storage Commitment is complete, but failure exists, following is the set of value that this Storage Commitment SCU AE is able to process:

Failure Reason	Meaning	Application Behavior When Receiving Reason Code
0110H	Processing failure	Error logged
0112H	No such object instance	Error logged
0213H	Resource limitation	Error logged
0122H	Referenced SOP Class not supported	Error logged
0119H	Class / Instance conflict	Error logged
0131H	Duplicate transaction UID	Error logged

8. QUERY IMPLEMENTATION

8.1 XELERIS 3.X MAPPING OF DICOM ENTITIES

The Xeleris 3.x maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 8-1
MAPPING OF DICOM ENTITIES TO XELERIS 3.X ENTITIES

DICOM	Xeleris 3.x Entity
Patient	Patient
Study	Study
Series	Series
Image	Dataset

8.2 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.

8.2.1 Common Query Keys

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

TABLE 8-2
Q/R PATIENT LEVEL COMMON RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	SCU Use	SCP Use
Specific Character Set	(0008,0005)	-	See 8.2.1.1.1	See 8.2.1.1.1
Query Retrieve Level	(0008,0052)	-	Set to level of query: STUDY SERIES IMAGE	Matched to level of query PATIENT STUDY SERIES IMAGE
Retrieve AE Title	(0008,0054)	-	Attribute is not requested. Returned value is ignored	Always returned with AE Title of CPIPC_DICOM Server as defined in DICOM Configuration
Storage Media File-set ID	(0088,0130)	-	Attribute is not requested. Returned value is ignored	Not Used
Storage Media File-set UID	(0088,0140)	-	Attribute is not requested. Returned value is ignored	Not Used

8.2.1.1 Q/R Common Attribute Descriptions

8.2.1.1.1 Specific Character Set

As an SCU, the attribute Specific Character Set (0008,0005) is not sent, unless a patient name is sent with a matching key that includes a non-ASCII character; in that case, the default ISO_IR 100 (Latin alphabet Number 1 supplementary set) 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. Query response item text attributes, including patient name, that include non-ASCII characters will be displayed as described in Section 2.7.

As an SCP, Specific Character Set will not be sent in Query responses unless an item text attribute, including patient name, includes a non-ASCII character; in that case, the default ISO_IR 100 (Latin alphabet Number 1 supplementary set) extended character set identifier will be sent.

8.2.2 Patient Level – Patient Root

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

TABLE 8-3
PATIENT LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCP Use
Patient's Name	(0010,0010)	R	Matched. Matching performed without regard to the PN VR individual component values. Wild Card Value matching is supported.
Patient ID	(0010,0020)	U	Matched. Single Value matching is supported.

8.2.3 Study Level – Patient Root

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

TABLE 8-4
STUDY LEVEL ATTRIBUTES FOR THE PATIENT ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCP Use
Study Date	(0008,0020)	R	Matched. Range of date matching is supported
Study Time	(0008,0030)	R	Returned.
Accession Number	(0008,0050)	R	Matched. Single Value and Wildcard Value matching are supported.
Study ID	(0020,0010)	R	Matched. Single Value and Wildcard Value matching are supported.
Study Instance UID	(0020,000D)	U	Matched. Single Value matching is supported.
Modalities in Study	(0008,0061)	O	Matched. Single Value and Wildcard Value matching are supported.. If contains multiple modalities value, perform Wildcard Value matching .
Study Description	(0008,1030)	O	Matched. Single Value and Wildcard Value Matching are supported.

8.2.4 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 8-5
STUDY LEVEL ATTRIBUTES FOR THE STUDY ROOT
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCU Use	SCP Use
Study Date	(0008,0020)	R	Matching Key. Range Date matching is available.	Matched. Range of date Matching is supported.
Study Time	(0008,0030)	R	Requested.	Returned.
Accession Number	(0008,0050)	R	Matching key. Single Value or Wildcard Value may be used.	Matched. Single Value and Wildcard Value Matching are supported.
Patient's Name	(0010,0010)	R	Matching key. Wildcard Value may be used.	Matched. Matching performed without regard to the PN VR individual component values. Wildcard Value matching is supported.
Patient ID	(0010,0020)	R	Matching key. Single Value may be used.	Matched. Single Value Matching is supported.
Study ID	(0020,0010)	R	Matching key. Single Value or Wildcard Value may be used.	Matched. Single Value and Wildcard Value Matching are supported.
Study Instance UID	(0020,000D)	U	Requested.	Matched. Single Value Matching is supported.
Modalities in Study	(0008,0061)	R	Matching Key. Possible query values: "NM", "PT", "CT", "MR","*"	Matched. Single Value and Wildcard Value Matching are supported.
Study Description	(0008,1030)	O	Matching key. Single Value or Wildcard Value may be used.	Matched. Single Value and Wildcard Value Matching are supported..

8.2.5 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 8-6
SERIES LEVEL ATTRIBUTES FOR THE
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCU Use	SCP Use
Modality	(0008,0060)	R	Requested	Matched. Single Value and Wildcard Value Matching are supported.
Series Number	(0020,0011)	R	Requested	Matched. Single Value Matching is supported.
Series Instance UID	(0020,000E)	U	Requested	Matched. Single Value Matching is supported.
Series Date	(0008,0021)	O	Requested	Returned.

Series Time	(0008,0031)	O	Requested	Returned.
Series Description	(0008,103E)	O	Requested	Returned.
Number of Series Related Instances	(0020,1209)	O	Requested	Not Used
Study Instance UID	(0020,000D)	U	Unique key. Single value is used in request.	Returned. Single Key Matching is used.

8.2.6 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 8-7
IMAGE LEVEL ATTRIBUTES FOR THE
QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCU Use	SCP Use
Image Number	(0020,0013)	R	Requested	Matched. Single Value Matching is supported.
SOP Instance UID	(0008,0018)	U	Requested	Matched. Single Value Matching is supported.
Image ID	(0054,0400)	O	Requested	Returned.
Image Index	(0054,1330)	O	Requested	Not Used
Image Type	(0008,0008)	O	Attribute is not requested. Returned value is ignored	Returned.
Rows	(0028,0010)	O	Requested	Returned.
Columns	(0028,0011)	O	Requested	Returned.
Number of Frames	(0028,0008)	O	Requested	Returned.
Completion Flag	(0040,A491)	O	Requested if remote system supports Structure Reports	Not Used
Verification Flag	(0040,A493)	O	Requested if remote system supports Structure Reports	Not Used
Verifying Observer Sequence	(0040,A073)	O	Requested if remote system supports Structure Reports	Not Used
>Verification Date Time	(0040,A030)	O	Requested if Verifying Observer Sequence is requested	Not Used
>Verifying Observer Name	(0040,A075)	O	Requested if Verifying Observer Sequence is requested	Not Used
Concept Name Code Sequence	(0040,A043)	O	Requested if remote system supports Structure Reports	Not Used
>Code Value	(0008,0100)	O	Requested if Concept Name Code Sequence is requested	Not Used
>Coding Scheme Designator	(0008,0102)	O	Requested if Concept Name Code Sequence is requested	Not Used
Study Instance UID	(0020,000D)	U	Unique key. Single value is used in request.	Returned. Single Key Matching is used.
Series Instance UID	(0020,000E)	U	Unique key. Single value is used in request.	Returned. Single Key Matching is used.

APPENDIX A: CD PRINTER 5.6.3 DICOM CONFORMANCE STATEMENT

CD Printer 5.6.3

DICOM Conformance Statement

	Date:	
Written by: Yael Nuss	07/06/2010	**CDP Ltd.**
Reviewed by: Vladimir Zotov	09/06/2010	**Petach Tikva, Israel**
Approved by: Ofir Sagi	10/06/2010	
Document No. 200-149-007		

Revision History			
Rev	**Description**	**Date**	**Approval**
1.0	Initial version	10/06/2010	Ofir Sagi

1.   DICOM CONFORMANCE STATEMENT OVERVIEW

The CD Printer system is a DICOM media burning service provider for medical images and other object instances.

The CD Printer provides the following DICOM data exchange features:

- It receives instances sent to it by remote systems (e.g. PACS, workstations or imaging modalities) and stores them in a database.

- It provides additional services for instances distribution.

- It is able to write DICOM CD-ROM disks.

- It is able to write DICOM DVD disks.
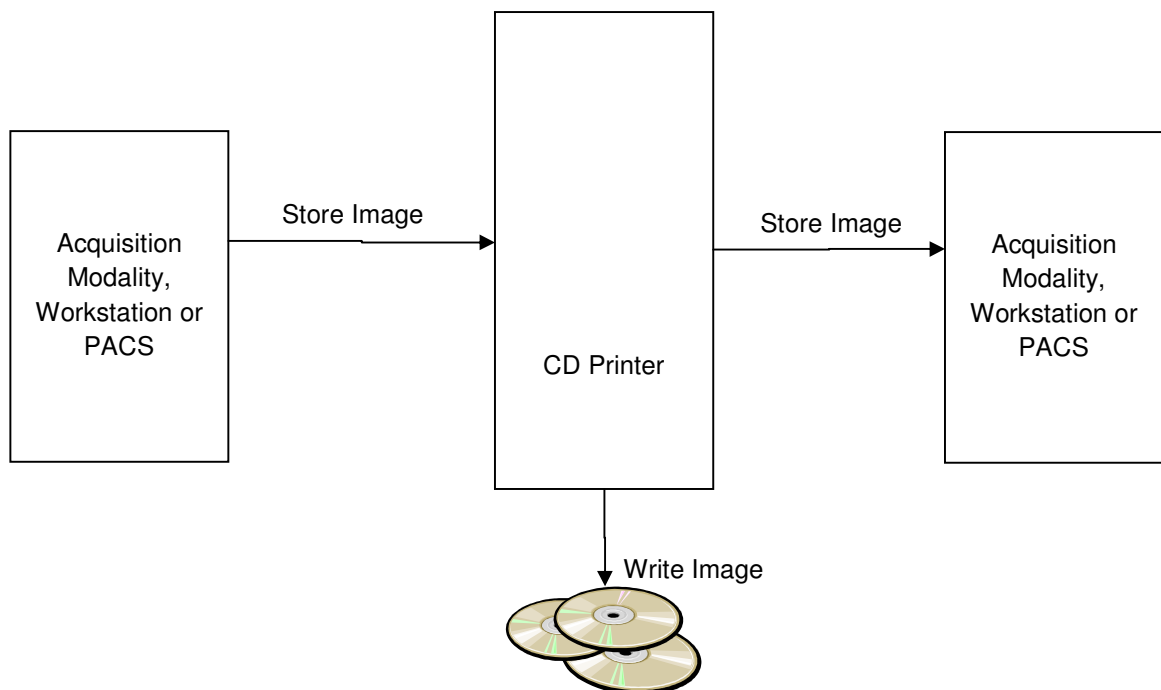
Figure 1: CD Printer in a DICOM Network

CD Printer allows the operator also to monitor queues and burning process of the images received. CD Printer includes DICOM media viewer software in root of each burned media. Some advanced analysis and processing applications are primarily designed for images generated by Philips equipment when sent to the CD Printer. **Table 5** shows limitation for internal viewing option.

This version of DICOM Conformance Statement applies to the CD Printer version 5.6.2.

Table 1 presents an overview of all network services and the applicable SOP classes as provided by CD Printer.

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	**UID**		
Storage			
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29	Yes	Yes
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30	Yes	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes
Digital Mammography Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital Mammography Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	Yes
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	Yes	Yes
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes

Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	Yes	Yes
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Yes	Yes
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	Yes
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	Yes
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	Yes
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	Yes
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	Yes
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes	Yes
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	Yes	Yes
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11	Yes	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Yes	Yes
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	Yes	Yes
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
X-Ray Radio-fluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Yes	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	Yes

Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	Yes
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes	Yes
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	Yes
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Yes	Yes
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	Yes
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	Yes
Structured Reporting			
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Yes	Yes
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	Yes	Yes
Workflow Management			
Verification	1.2.840.10008.1.1	No	Yes

Table 1: All Network Services

Table 2 lists the Supported Media Storage Application Profiles (with roles).

Media Storage Application Profile	Roles			Supported Media
	Write Files (FSC)	Read Files (FSR)	Update Files (FSU)	
CD – R Disk				
General Purpose CD-R	Yes	No	No	CD +R/-R
Private General Purpose CD-DVD	Yes	No	No	CD +R/-R
DVD Disk				
General Purpose DVD-JPEG	Yes	No	No	DVD +R/-R and +RW/-RW
Private General Purpose CD-DVD	Yes	No	No	DVD +R/-R and +RW/-RW

Table 2: Media Services

> *Note:* *Private General Purpose CD-DVD Media Storage Application Profile allows creating DICOM CD and DVD without transfer syntax control of writing DICOM Instance files. Usage of Private or Standard Profile is configurable.*
>
> *CD Printer can be configured to not control content and format of distributing on media data. In such case data will be written "as is" (as received from remote DICOM node) and all responsibility for normality of data format and contents shall be borne by the source of the information from which the data was received by CD Printer.*
>
> *CD Printer can be configured explicitly to change format of distributing on media data by system administrator of CD Printer. In such case all responsibility for normality of data format and contents shall be borne by the system administrator.*

The supported Transfer Syntaxes UID's by the CD Printer System for all **Storage** SOP Classes are showed in the **Table 3**.

Transfer Syntaxes Name	Transfer Syntaxes UID
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1
JPEG Baseline (Process 1): Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
JPEG Extended (Process 2 & 4): Lossy JPEG 12 Bit Compression	1.2.840.10008.1.2.4.51
JPEG Lossless Compression (Process 14)	1.2.840.10008.1.2.4.70
RLE Compression	1.2.840.10008.1.2.5

Table 3: Transfer Syntaxes for all Storage SOP Classes - Images

The supported Transfer Syntaxes UID's by the CD Printer System for all NOT Storage SOP Classes as: **Structured Reporting** and **Workflow Management**, are showed in **Table 4**.

Transfer Syntaxes Name	Transfer Syntaxes UID
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1

Table 4: Transfer Syntaxes for all NOT Storage SOP Classes – Non-Images

Table 5 gives an overview of the image formats that can be viewed or stored.

Photometric Interpretation	Storage	Viewing
MONOCHROME1	+	+
MONOCHROME2	+	+
RGB	+	+
YBR_FULL	+	-
YBR_FULL_422	+	+
YBR_PARTIAL_422	+	-
PALETTE COLOR	+	+
Other	+	-

Table 5: Support for Photometric Interpretation

2.   TABLE OF CONTENTS

3.   INTRODUCTION

3.1   INTENDED USE

This DICOM Conformance Statement is intended for:
- (potential) customers
- system integrators of medical equipment
- marketing staff interested in system functionality
- software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

3.2   REMARKS

The DICOM Conformance Statement is contained in chapter 1 through 8 and follows the contents and structuring requirements of the DICOM Standard PS 3.2.

This DICOM Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

Interoperability

Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment.

It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

Validation

Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this DICOM Conformance Statement.

Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant DICOM Conformance Statements. If the DICOM Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of instance and instance related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

New versions of the DICOM Standard

The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery.

The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

3.3   DEFINITIONS, TERMS AND ABBREVIATIONS

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3 and PS 3.4.

The word Philips in this document refers to Philips Medical Systems.

The following acronyms and abbreviations may be used in this document.

AE	Application Entity
BOT	Basic Offset Table
CD	Compact Disc
CD-R	CD-Recordable
CT	Computed Tomography
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DVD-JPEG	Digital Video Disc – JPEG
EBE	DICOM Explicit VR Big Endian
ELE	DICOM Explicit VR Little Endian
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
GUI	Graphical User Interface
HIPAA	Health Insurance Portability and Accountability Act
HASP	Hardware Security Key

ILE	DICOM Implicit VR Little Endian
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
JPEG	Joint Photographic Experts Group
MR	Magnetic Resonance
N/A	Not applicable
NEMA	National Electrical Manufacturers Association
PDU	Protocol Data Unit
PMS(N)	Philips Medical Systems (Nederland B.V.)
Q/R	Query/Retrieve (Service Class)
RWA	Real-World Activity
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
VR	Value Representation
UID	Unique Identifier

3.4   REFERENCES

[DICOM] Digital Imaging and Communications in Medicine (DICOM), Part 1 – 18 (NEMA PS 3.1 – PS 3.18),
National Electrical Manufacturers Association (NEMA)
Publication Sales 1300 N. 17th Street, Suite 1847
Rosslyn, Virginia. 22209, United States of America

4.   NETWORKING

This section contains networking related services vs. the media related ones in Chapter 5.

4.1   IMPLEMENTATION MODEL

The implementation model consists of the following sections:

– The Application Data Flow Diagram, specifying the relationship between the CD Printer Application Entities and the "external world" or Real-World activities,

– A functional description of the CD Printer Application Entities, and the sequencing constraints among them.

4.1.1   APPLICATION DATA FLOW

The CD Printer communication is based on the DICOM v3.0 standard. This enables the CD Printer to communicate with any DICOM v3.0 compliant products (e.g., modalities, workstations, PACS, hardcopy units). The CD Printer can function both as a server and as a client. Thus it can send DICOM objects to other stations, and other stations can receive from the CD Printer and send DICOM objects to it. The DICOM objects are transferred in the DICOM v3.0 protocol based on TCP/IP as a transport layer.

The CD Printer implements and provides DICOM services using the following Application Entities:

• Storage Provider AE.

• Distribution Manager AE

• Media AE (No Network AE, See Chapter 5).

Figure 2 shows the CD Printer application data flow as a functional overview of the CD Printer AE's. As depicted in **Figure 2**, the CD Printer AE's incorporate the following functionality.

• After RWA Request Verification, the Storage Provider AE and Archive-Manager AE act as a C-ECHO SCP it receives a Verification request and responds successfully to the requesting SCU.

• After RWA Storage Data Flow, the Storage Provider AE acts as C-STORE SCP. It receives requests for instance storage from external AE, converts it into assigned destination transfer syntax and collects the instances on its disk.

• After RWA Forward Data Flow, the Distribution Manager AE acts as C-STORE SCU. It provides a non-standard service for dispatching instances that originate in one AE to one or more target AE(s). Once a data collection is ready for distribution, the Distribution Manager AE further checks to see if there are any Forward-Rules defined for the data collection. For each Forward-Rule that

the Distribution Manager AE found, the Distribution Manager AE initiates an association with the target AE and transmits the instances to it.

- Forwarding of received data to the Media AE is performed by the Distribution Manager AE according to special Forward-Rule.

The CD Printer stores received data only temporarily. The data is removed automatically after distribution (forwarding and/or media burning).
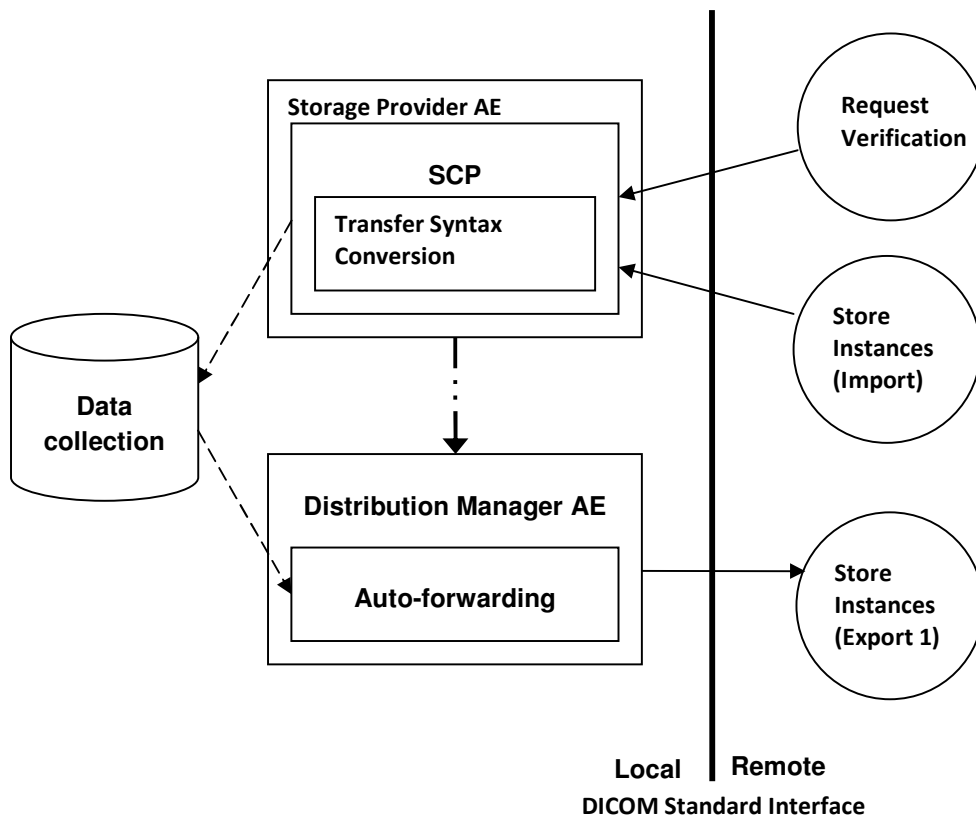

Figure 2: Networking Application Data Flow Diagram

4.1.2 FUNCTIONAL DEFINITION OF AE'S

This section describes in general the functions to be performed by the Application Entities (AE's), and the DICOM services used to accomplish these functions.

4.1.2.1 FUNCTIONAL DEFINITION OF STORAGE PROVIDER AE

The Storage Provider constantly waits for association requests from external applications.

For each association it verifies the access privileges that was defined for the requesting AE, decides whether to accept the association runs in a separate thread.

The Storage Provider accepts association for verify connectivity and import instances.

Verification Service Class

The Storage Provider AE can perform the Verification service as SCP (RWA Request Verification).

A remote SCU shall request an association with the Storage Provider AE for Verification SOP class. After accepting the association, the AE shall receive and respond to the Verification request to check the network connection to the AE and make sure that the AE is up and running, and release the association when requested successfully.

Storage Service Class

The Storage Provider AE waits for incoming associations and can perform the Storage service as SCP (RWA Store Instances, Import).

Incoming associations are approved or rejected according to the settings in the Storage Provider AE control database.

A remote SCU shall request an association with the Storage Provider AE for Storage SOP classes. After accepting the association, the Storage Provider AE shall receive the Storage requests, store the data in the data collection storage, send the applicable Storage responses, and release the association when requested.

The received instances are divided into collections by patient identification for which Patient's Name (0010,0010) and Patient ID (0010,0020) are used.

The division can be passed round by sending of Storage requests to special AE Title that contains MULTIPATIENT key word. In the case all received from one remote SCU AE Title to the same special AE Title data will be collected into one data set. The collection can include examinations of different patients. The data can be sent in one or several associations. The collection will be closed in accordance to defined transmission completion Timeout.

The Storage Provider AE can convert received instances from source transfer syntax into destination transfer syntax, if this is assigned by configuration.

4.1.2.2 FUNCTIONAL DEFINITION OF DISTRIBUTION MANAGER AE

The CD Printer provides a unique Forward-Rules feature that enables to use it as a DICOM network hub. When instances are stored, the CD Printer can forward these instances to other AE's according to these Forward-Rules. In this case the CD Printer acts as a C-STORE SCP (Storage Provider AE) and a C-STORE SCU (Distribution Manager AE).

The Distribution Manager AE can forward receive instances to one or more target AE(s).

Once a data collection is ready for distribution, the Distribution Manager AE further checks if there are any Forward-Rules defined for the data collection (for the called AE Title or received objects). For each Forward-Rule that the Distribution Manager AE found, the Distribution Manager AE initiates an association with the target AE and transmits the instances to it.

<u>Storage Service Class</u>
The Distribution Manager AE can perform the Storage service as SCU (RWA Store Instances, Export 1) if there are any Forward-Rules defined for the called AE Title or received objects.

The Distribution Manager AE shall request an association with the selected remote SCP for one applicable Storage SOP class. When the association is accepted, the Distribution Manager AE shall send the Storage request, receive the Storage responses and act accordingly, and release the association. Such sequence of actions will be repeated for each instance of the stored data collection.

The Distribution Manager AE can forward receive from the Storage Provider AE data to the Media AE for CD producing and to the Archive-Manager AE for processing, populating its local database and storage of the data according to special Forward-Rule.

4.1.3   SEQUENCING OF REAL WORLD ACTIVITIES

This section contains a description of specific sequencing as well as potential constraints of Real-World Activities, including any applicable user interactions, as performed by AE-s of the CD Printer.

The CD Printer has no way of knowing when it has a complete study or what constitutes a complete study. If it receives an instance query while also receiving storage requests, the query response may not include all of the instances that are in the study. The completion of receiving data set is controlled by configurable transmission completion Timeout.

> *Note: The transmission completion Timeout is not term defined by DICOM standard and is not described in the conformance statement. See CD PRINTER Administrator Guide for full explanation of the setting, it specification and usage.*
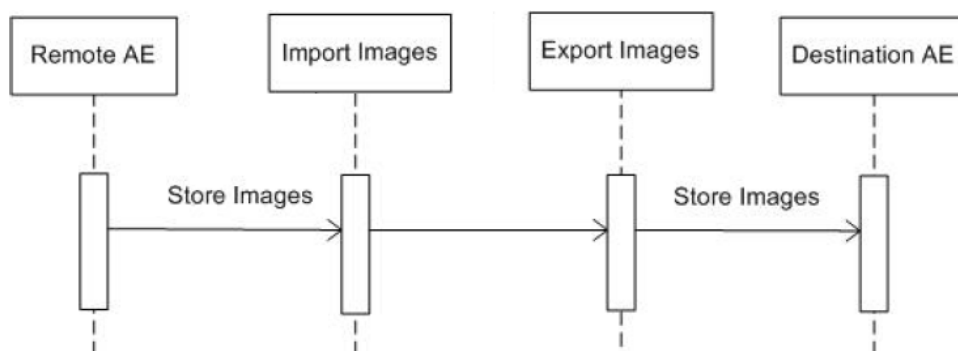
Figure 3: RWA Sequencing for Retrieve Local Instances

4.2   AE SPECIFICATIONS

4.2.1   STORAGE PROVIDER AE

Every detail of this specific Application Entity shall be completely specified under this section.

Depending on configuration, the Storage Provider AE may be accessible for remote AE simultaneously under several AE Titles, each representing the one Application Entity.

4.2.1.1 SOP CLASSES

This Application Entity provides extended Standard Conformance to the following SOP classes.

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	UID		
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29	No	Yes
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30	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
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	No	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	No	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	No	Yes
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	No	Yes
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	No	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes

Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
Multi-frame Single Bit Secondary Capture Image Storage *	1.2.840.10008.5.1.4.1.1.7.1	No	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	No	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	No	Yes
Multi-frame True Color Secondary Capture Image Storage *	1.2.840.10008.5.1.4.1.1.7.4	No	Yes
Standalone Overlay Storage *	1.2.840.10008.5.1.4.1.1.8	No	Yes
Standalone Curve Storage *	1.2.840.10008.5.1.4.1.1.9	No	Yes
12-lead ECG Waveform Storage *	1.2.840.10008.5.1.4.1.1.9.1.1	No	Yes
General ECG Waveform Storage *	1.2.840.10008.5.1.4.1.1.9.1.2	No	Yes
Ambulatory ECG Waveform Storage *	1.2.840.10008.5.1.4.1.1.9.1.3	No	Yes
Hemodynamic Waveform Storage *	1.2.840.10008.5.1.4.1.1.9.2.1	No	Yes
Cardiac Electrophysiology Waveform Storage *	1.2.840.10008.5.1.4.1.1.9.3.1	No	Yes
Basic Voice Audio Waveform Storage *	1.2.840.10008.5.1.4.1.1.9.4.1	No	Yes
Standalone Modality LUT Storage *	1.2.840.10008.5.1.4.1.1.10	No	Yes
Standalone VOI LUT Storage *	1.2.840.10008.5.1.4.1.1.11	No	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	No	Yes
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	No	Yes
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	No	Yes
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	No	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	No	Yes
X-Ray Radio-fluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	No	Yes
X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	No	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	No	Yes
Spatial Registration Storage *	1.2.840.10008.5.1.4.1.1.66.1	No	Yes
Spatial Fiducials Storage *	1.2.840.10008.5.1.4.1.1.66.2	No	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	No	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	No	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	No	Yes
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	No	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	No	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	No	Yes

Video Photographic Image Storage *	1.2.840.10008.5.1.4.1.1.77.1.4.1	No	Yes
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	No	Yes
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	No	Yes
Stereometric Relationship Storage *	1.2.840.10008.5.1.4.1.1.77.1.5.3	No	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	No	Yes
RT Image Storage *	1.2.840.10008.5.1.4.1.1.481.1	No	Yes
RT Dose Storage *	1.2.840.10008.5.1.4.1.1.481.2	No	Yes
RT Structure Set Storage *	1.2.840.10008.5.1.4.1.1.481.3	No	Yes
RT Beams Treatment Record Storage *	1.2.840.10008.5.1.4.1.1.481.4	No	Yes
RT Plan Storage *	1.2.840.10008.5.1.4.1.1.481.5	No	Yes
RT Brachy Treatment Record Storage *	1.2.840.10008.5.1.4.1.1.481.6	No	Yes
RT Treatment Summary Record Storage *	1.2.840.10008.5.1.4.1.1.481.7	No	Yes
Basic Text SR *	1.2.840.10008.5.1.4.1.1.88.11	No	Yes
Enhanced SR *	1.2.840.10008.5.1.4.1.1.88.22	No	Yes
Comprehensive SR *	1.2.840.10008.5.1.4.1.1.88.33	No	Yes
Mammography CAD SR *	1.2.840.10008.5.1.4.1.1.88.50	No	Yes
Key Object Selection Document *	1.2.840.10008.5.1.4.1.1.88.59	No	Yes
Chest CAD SR *	1.2.840.10008.5.1.4.1.1.88.65	No	Yes
Verification	1.2.840.10008.1.1	No	Yes

Table 6: SOP Classes for Storage Provider AE

> Note: Any SOP specific behavior is documented later in the Conformance Statement in the applicable SOP specific conformance section.

> Note: Marked as * SOP Class instances are not supported for viewing or presentation by DICOM media viewer software, only supported for storage.

> Note: Enhanced IOD Modules, Synchronization, Cardiac Synchronization, Respiratory Synchronization, Bulk Motion Synchronization, Supplemental Palette Color Lookup Table, Multi-frame Functional Groups, Multi-frame Dimension, MR Pulse Sequence and XA/XRF Multi-frame Presentation are not supported for viewing or presentation, only supported for storage. Some of them are supported partially.

4.2.1.2 ASSOCIATION POLICIES

This section contains a description of the General Association Establishment and Acceptance policies of the AE.

4.2.1.2.1   GENERAL

Storage Provider accepts Associations for the following purposes:

- To allow remote applications to verify application level communication with Storage Provider; refer to Request Verification section.

- To allow remote applications to store instances in the Storage Provider database (i.e. instance import); refer to Store Instances (Import) section.

The maximum PDU size, which can be received the Storage Provider, is configurable (default value is 16kBytes).

Application Context Name	1.2.840.10008.3.1.1.1

Table 7: DICOM Application Context

4.2.1.2.2   NUMBER OF ASSOCIATIONS

The Storage Provider manages an association resources pool. Each incoming association is assigned to one of the pool members. The size of this pool is configurable and the maximum size is limited only by the underling operating system and by hardware limits (default is 5).

When the maximum number of associations is reached, Storage Provider will reject associations.

Maximum number of simultaneous associations	Configurable

Table 8: Number of Associations as an Association Acceptor for Storage Provider

Nevertheless, the number of simultaneous associations shall be limited by the available resources (CPU, memory, disk space).

4.2.1.2.3   ASYNCHRONOUS NATURE

Asynchronous communication is not supported.

4.2.1.2.4   IMPLEMENTATION IDENTIFYING INFORMATION

Following Implementation Class UID and Version Name are defined.

Implementation Class UID	1.2.826.0.1.3680043.8.195
Implementation Version Name:	CDP_V3

Table 9: DICOM Implementation Class and Version for Storage Provider AE

4.2.1.3 ASSOCIATION INITIATION POLICY

Storage Provider never initiates an association.

4.2.1.4 ASSOCIATION ACCEPTANCE POLICY

Storage Provider shall accept Associations for the following purposes:

- To allow remote applications to verify application level communication with Storage Provider; refer to Request Verification section.

- To allow remote applications to store instances in the Storage Provider database (i.e. instance import); refer to Store Instances (Import) section.

The Storage Provider will acknowledge an association from an external AE if the following conditions are met all conditions:

- The association request application context is DICOM,

- The requesting AE title is configured in the Storage Provider control database,

- The requesting AE network node matches the configured node,

- The responding AE title in the association request matches the one of defined Storage Provider AE titles,

- The number of active associations has not reached the maximum concurrent associations limit.

4.2.1.4.1   REQUEST VERIFICATION

4.2.1.4.1.1   DESCRIPTION AND SEQUENCING OF ACTIVITIES

The Storage Provider AE shall accept associations from systems that wish to verify application level communication using the C-ECHO command.

The real-world activity associated with the C-ECHO request is verification activity made by an external AE wishing to verify that the network connection is operating properly and that the Storage Provider is up and running.
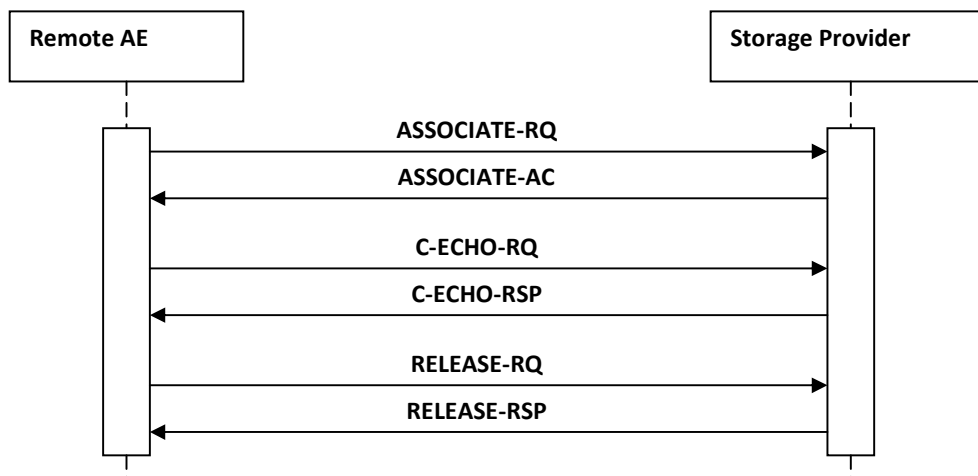

Figure 4: Sequencing of RWA Request Verification

4.2.1.4.1.2   ACCEPTED PRESENTATION CONTEXTS

The Storage Provider will accept any number of Verification SOP classes that are listed in **Table 6**, provided that the requesting application configured and granted storage access.

The Storage Provider accepts presentation contexts with multiple transfer syntaxes, presentation contexts differing only by their transfer syntax as well as duplicate presentation contexts.

There is no check for duplicate contexts, and these will therefore be accepted.

The Storage Provider does not limit the number of accepted presentation contexts.

In the unlikely event that the Storage Provider runs out of resources while trying to accept multiple presentation contexts, the Storage Provider will gracefully reject the association.

The Storage Provider shall be able to accept the presentation contexts as specified in **Table 10**.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1.1	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

Table 10: Acceptable Presentation Contexts for Request Verification

4.2.1.4.1.3   SOP SPECIFIC CONFORMANCE FOR SOP CLASS VERIFICATION

The Storage Provider AE provides standard conformance to the Verification service class.

4.2.1.4.2   STORE INSTANCES (IMPORT)

4.2.1.4.2.1   DESCRIPTION AND SEQUENCING OF ACTIVITIES

The Storage Provider AE shall accept associations from systems that wish to store instances in the data collection storage using the C-STORE command to store the instances on the Storage Provider disk.

The instances are divided into collections by patient identification for which Patient's Name (0010,0010) and Patient ID (0010,0020) are used.

The Storage Provider AE will issue a failure status in the following cases:

- The Storage Provider AE is unable to store the instances on the disk.

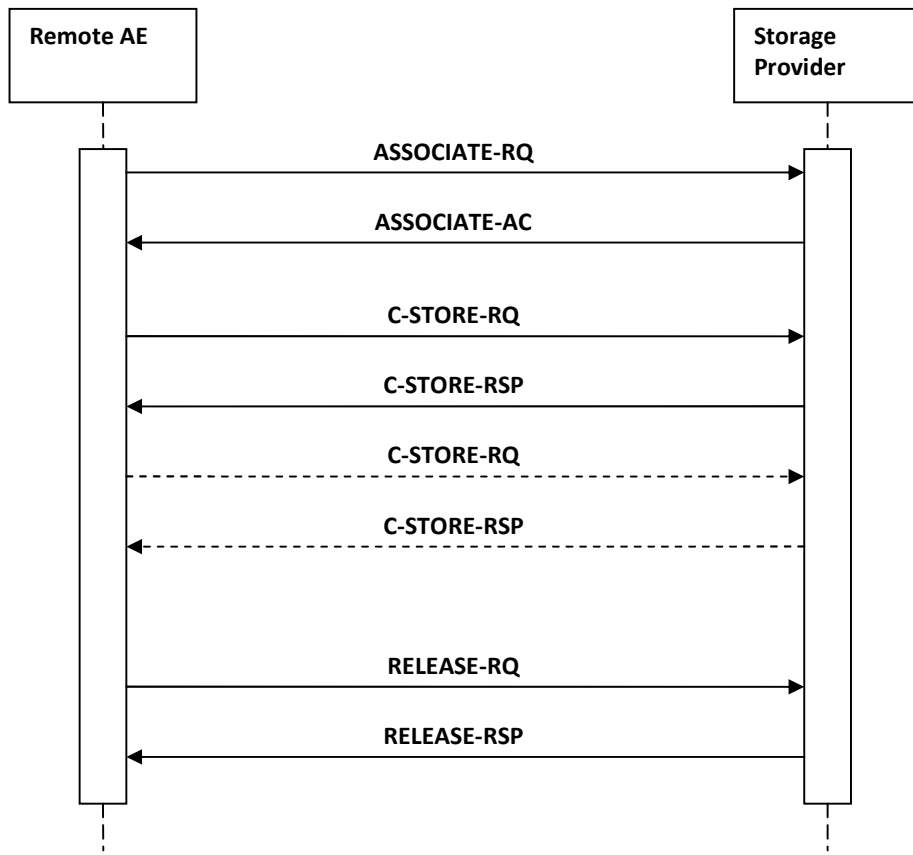- The SOP class used for transmission does not match the instance structure and data.

Figure 5: Sequencing of RWA Store Instances (Import)

4.2.1.4.2.2   ACCEPTED PRESENTATION CONTEXTS

The Storage Provider AE will accept any number of Storage SOP Classes that are listed in **Table 11**, provided that the requesting application configured and granted storage access.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List (note)**	**UID List**		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Digital X-Ray Image Storage – for Presentation	1.2.840.10008.5.1.4.1.1.1.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Digital X-Ray Image Storage – for Processing	1.2.840.10008.5.1.4.1.1.1.1.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Digital Mammography Image Storage - for Presentation	1.2.840.10008.5.1.4.1.1.1.2	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Digital Mammography Image Storage - for Processing	1.2.840.10008.5.1.4.1.1.1.2.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Digital Intra-oral X-Ray Image Storage - for Presentation	1.2.840.10008.5.1.4.1.1.1.3	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Digital Intra-oral X-Ray Image Storage - for Processing	1.2.840.10008.5.1.4.1.1.1.3.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

		Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5		
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Ultrasound Multi- frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Ultrasound Multi- frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	ILE ELE Lossy 8 Lossy 12	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51	SCP	None

		JPEG LL RLE	1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Multi-frame Single Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Hemodynamic ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

Standalone modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
X-Ray Radio-fluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Ophthalmic Photographic 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
Ophthalmic Photographic 16	1.2.840.10008.5.1.4.1.1.77.1.5.2	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

Bit Image Storage		Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5		
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	ILE ELE Lossy 8 Lossy 12 JPEG LL RLE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5	SCP	None
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	ILE ELE	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	ILE	1.2.840.10008.1.2	SCP	None

		ELE	1.2.840.10008.1.2.1		

Table 11: Acceptable Presentation Contexts for Store Instances (Import)

> *Note: Read for Lossy 8 = JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression.*
>
> *Read for Lossy 12 = JPEG Extended (Process 2 & 4): Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression (Process 4 only).*
>
> *Read for JPEG LL = JPEG Lossless Compression (Process 14).*
>
> *Read for RLE = RLE Compression.*

The Storage Provider accepts presentation contexts with multiple transfer syntaxes, the presentation contexts differing only by their Transfer Syntax as well as duplicate presentation contexts.

There is no check for duplicate contexts, and these will therefore be accepted.

The Storage Provider AE does not limit the number of accepted presentation contexts.

In the unlikely event that the Storage Provider AE runs out of resources while trying to accept multiple presentation contexts, the CD Printer will gracefully reject the association.

The Storage Provider AE supports Transfer Syntaxes for Storage as can be seen in **Table 11**, and supports for all other SOP Classes, other than Storage only the ILE and ELE Transfer Syntaxes, as can be seen in **Table 4**.

On accepting of presentation contexts with multiple transfer syntaxes the Storage Provider selects proposed Transfer Syntax that loads network less (Usually it is *JPEG Extended (Process 2 & 4)* Transfer Syntax). It is responsibility of device specialists for proper configuration of sending DICOM devices to provide DICOM images within lossy, lossless or native format.

4.2.1.4.2.3   SOP SPECIFIC CONFORMANCE FOR STORAGE SOP CLASSES

The DICOM standard does not guarantee that the Storage Provider AE applications can process the received instances. This depends on the presence and consistency of a set of attributes in these instances. The conditions for running the Storage Provider AE applications shall be specified in separate Annexes.

The Storage Provider AE conforms to the SOP's of the Storage Service Class at Level 2 (Full) conformance.

The Storage Provider AE does not attempt any extended negotiation.

The Storage Provider AE does not discard any elements.

The Storage Provider takes no further action in case of warnings or errors in the C-STORE operations. The store response status is saved in the extended log.

After instances receiving Storage Provider AE can convert the transfer syntax according to **Table 12**.

Transfer Syntax	Received Source	ILE	ELE	RLE	JPEG Lossless	JPEG Baseline (Process 1)	JPEG Extended (Process 2 & 4)
Stored Destination							
ILE		N/A	+	+	+	+	+
ELE		+	N/A	+	+	+	+
RLE		+	+	N/A	-	-	-
JPEG Lossless		+	+	-	N/A	+	+
JPEG Baseline (Process 1)		-	-	-	-	N/A	-
JPEG Extended (Process 2 & 4)		-	-	-	-	-	N/A

Table 12: Transfer Syntax Conversion

> *Note: JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression.*
>
> *JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression.*
>
> *JPEG Extended (Process 2 & 4): Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression (Process 4 only).*

Table 13 gives an overview of the image formats that can be stored.

Photometric Interpretation	Storage	Viewing
MONOCHROME1	+	N/A
MONOCHROME2	+	N/A
RGB	+	N/A
YBR_FULL	+	N/A
YBR_FULL_422	+	N/A
PALETTE COLOR	+	N/A
Other	+	N/A

Table 13: Support for Photometric Interpretation

> *Note: The Storage Provider AE does not have internal viewing option.*

Following are the details regarding the specific conformance, including response behavior to all applicable status codes, both from an application level and communication errors.

Service Status	Further Meaning	Error Code	Behavior
Success	Storage is complete	0000	The instance(s) shall be stored in the CD Printer database.
Error	Cannot understand	C000	The instance(s) cannot be parsed. Storage Provider shall send a notification, log the condition, and wait next store request.

Table 14: DICOM Command Response Status Handling Behavior

Exception	Behavior
ARTIM Time-out	The association shall be dropped. Storage Provider waits next association.
Association Time-out SCU	The association shall be dropped. Storage Provider waits next association.
Association aborted	The association shall be dropped. Storage Provider waits next association.

Table 15: DICOM Command Communication Failure Behavior

4.2.2   DISTRIBUTION MANAGER AE

Every detail of this specific Application Entity shall be completely specified under this section.

> *Note:*   *Configuring of Storage Provider AE to convert format of received data from original Transfer Syntax to Implicit Little Endian is compulsory condition for usage of data distribution via DICOM protocol.*

4.2.2.1 SOP CLASSES

This Application Entity provides Standard Conformance to the following SOP classes.

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	**UID**		
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29	Yes	No
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30	Yes	No
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	No
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	No
Digital Mammography Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	No
Digital Mammography Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	No
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	No
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	No

CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	No
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	No
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	No
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	No
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	Yes	No
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes	No
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	No
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	No
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	No
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	Yes	No
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Yes	No
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	No
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	No
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	No
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	No
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	No
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes	No
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	Yes	No
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11	Yes	No
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	No
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Yes	No
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	Yes	No
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	Yes	No
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	No
X-Ray Radio-fluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No

X-Ray Angiographic Bi-Plane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Yes	No
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	No
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	No
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Yes	No
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	No
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	No
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	No
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes	No
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	No
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	No
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes	No
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	No
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Yes	No
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Yes	No
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	No
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	No
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	No
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	No
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	No
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	No
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	No
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	No
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Yes	No
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Yes	No
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes	No
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Yes	No
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Yes	No
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	Yes	No
Verification	1.2.840.10008.1.1	Yes	No

Table 16: SOP Classes for Distribution Manager AE

> *Note:* *Any SOP specific behavior is documented later in the Conformance Statement in the applicable SOP specific conformance section.*

4.2.2.2 ASSOCIATION POLICIES

This section contains a description of the General Association Establishment and Acceptance policies of the AE.

4.2.2.2.1 GENERAL

The Distribution Manager AE will initiate associations as a result of Forward-Rules.

The Distribution Manager AE attempts to establish an association once. If this attempt fails or if the association is unexpectedly terminated, the Distribution Manager AE tries to establish an association for next exporting instance. After last instance export attempt the Distribution Manager AE displays a transferring error in the GUI and stops the related activity if only for one instance the store operation fails. The Distribution Manager AE will retry the forwarding operation during the time interval, as written in the Distribution Manager AE configuration file.

The maximum PDU size, which can be transmitted by the CD Printer, is 16kBytes.

Application Context Name	1.2.840.10008.3.1.1.1

Table 17: DICOM Application Context

4.2.2.2.2 NUMBER OF ASSOCIATIONS

The Distribution Manager will not initiate more than one association. The association may be used to issue store request.

Maximum number of simultaneous associations	1

Table 18: Number of Associations as an Association Initiator for Distribution Manager

4.2.2.2.3 ASYNCHRONOUS NATURE

Asynchronous communication is not supported.

4.2.2.2.4 IMPLEMENTATION IDENTIFYING INFORMATION

Following Implementation Class UID and Version Name are defined.

Implementation Class UID	1.2.840.113704.7.1.20011113
Implementation Version Name:	CDP_LTD_V1

Table 19: DICOM Implementation Class and Version for Distribution Manager AE

4.2.2.3 ASSOCIATION INITIATION POLICY

Distribution Manager shall initiate associations in the following cases:

- As a result of a received data collection for which there is an active Forward-Rule, the Distribution Manager will attempt to initiate an association to the target AE and transmit the instances to it.

- Multiple Forward-Rules can be defined for a data collection.

- Forward-Rules are processed in sequence post the association termination.

4.2.2.3.1   STORE INSTANCES (EXPORT 1)

4.2.2.3.1.1   DESCRIPTION AND SEQUENCING OF ACTIVITIES

The RWA Store Instances (Export 1) involves the storage of instances from the local Storage Provider data collection storage to a remote system.

The Distribution Manager AE initiates Store Instances (Export 1) after receiving of data collection from an external AE by Storage Provider AE for which collection or data there is one or more active Forward-Rules defined in the Distribution Manager control database.

Forward-Rules make the CD Printer act as a hub in the DICOM applications network. This mechanism enables the distribution of instances that originate from one AE to other AE's.

Once a data collection is render to Distribution Manager AE, the AE checks if there are any active Forward-Rules for the called AE Title or received objects.

For each Forward-Rule that the Distribution Manager AE found, it initiates an association with the target AE stated in that rule and transmits the instances to it.

The associations will be initiated in sequence, one after the other for each instance within data collection.

The sending process will be repeated for each target AE.

If several Forward-Rules direct to Distribution Manager to send one data collection to one target AE, the collection will be sent to the target AE once.

The Distribution Manager AE attempts to forward the instance once. If this attempt fails, the Distribution Manager AE tries to forward the next instance. After last instance export attempt the Distribution Manager AE displays a transferring error in the GUI and stops the related activity if only for a one instance the store operation fails.

The Distribution Manager AE will retry to forward the whole instance collection during the time interval, as written in the Distribution Manager AE configuration file.
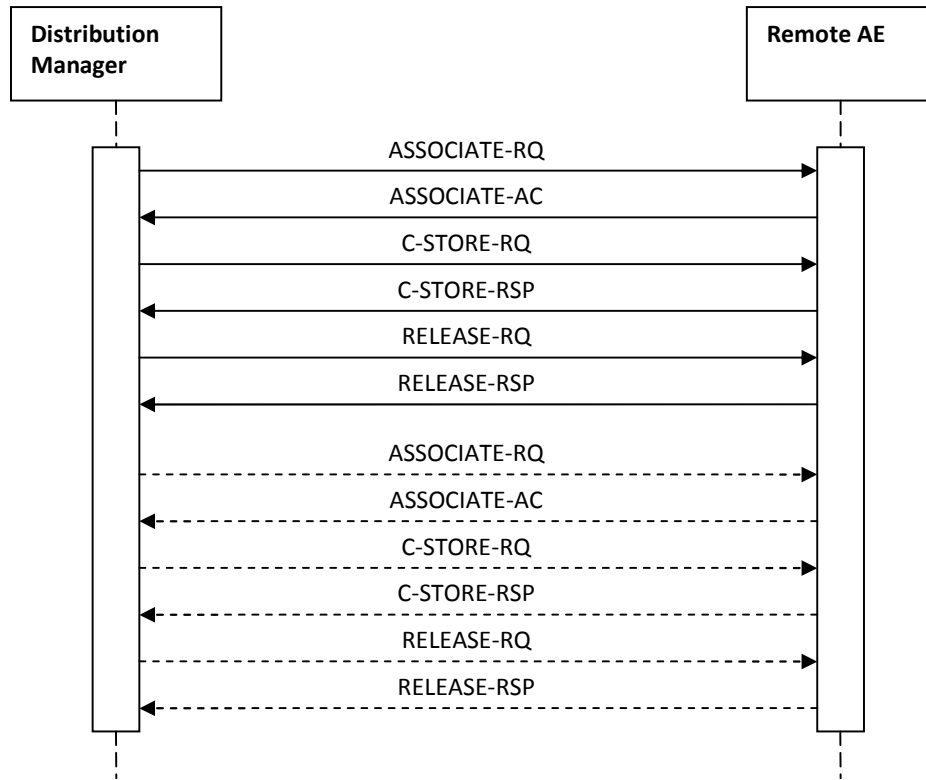

Figure 6: Sequencing of RWA Store Instances (Export 1)

4.2.2.3.1.2   PROPOSED PRESENTATION CONTEXTS

Each time an association is initiated, the association initiator proposes one Presentation Context to be used on that association. The Presentation Contexts proposed by the Distribution Manager AE for export instances are defined in **Table 20**.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List (note)**	**UID List**		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	ILE	1.2.840.10008.1.2	SCU	None
Digital X-Ray Image Storage – for Presentation	1.2.840.10008.5.1.4.1.1.1.1	ILE	1.2.840.10008.1.2	SCU	None
Digital X-Ray Image Storage – for Processing	1.2.840.10008.5.1.4.1.1.1.1.1	ILE	1.2.840.10008.1.2	SCU	None
Digital Mammography Image Storage - for Presentation	1.2.840.10008.5.1.4.1.1.1.2	ILE	1.2.840.10008.1.2	SCU	None
Digital Mammography Image Storage - for Processing	1.2.840.10008.5.1.4.1.1.1.2.1	ILE	1.2.840.10008.1.2	SCU	None
Digital Intra-oral X-Ray Image Storage - for Presentation	1.2.840.10008.5.1.4.1.1.1.3	ILE	1.2.840.10008.1.2	SCU	None
Digital Intra-oral X-Ray Image Storage - for Processing	1.2.840.10008.5.1.4.1.1.1.3.1	ILE	1.2.840.10008.1.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	ILE	1.2.840.10008.1.2	SCU	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	ILE	1.2.840.10008.1.2	SCU	None
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	ILE	1.2.840.10008.1.2	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	ILE	1.2.840.10008.1.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	ILE	1.2.840.10008.1.2	SCU	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	ILE	1.2.840.10008.1.2	SCU	None
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	ILE	1.2.840.10008.1.2	SCU	None
Nuclear Medicine	1.2.840.10008.5.1.4.1.1.5	ILE	1.2.840.10008.1.2	SCU	None

Image Storage (Ret.)					
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	ILE	1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	ILE	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ILE	1.2.840.10008.1.2	SCU	None
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	ILE	1.2.840.10008.1.2	SCU	None
Multi-frame Single Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	ILE	1.2.840.10008.1.2	SCU	None
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	ILE	1.2.840.10008.1.2	SCU	None
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	ILE	1.2.840.10008.1.2	SCU	None
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	ILE	1.2.840.10008.1.2	SCU	None
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	ILE	1.2.840.10008.1.2	SCU	None
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	ILE	1.2.840.10008.1.2	SCU	None
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	ILE	1.2.840.10008.1.2	SCU	None
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	ILE	1.2.840.10008.1.2	SCU	None
Hemodynamic ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	ILE	1.2.840.10008.1.2	SCU	None
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	ILE	1.2.840.10008.1.2	SCU	None
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	ILE	1.2.840.10008.1.2	SCU	None
Standalone modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	ILE	1.2.840.10008.1.2	SCU	None
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11	ILE	1.2.840.10008.1.2	SCU	None

Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	ILE	1.2.840.10008.1.2	SCU	None
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	ILE	1.2.840.10008.1.2	SCU	None
Pseudo-Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	ILE	1.2.840.10008.1.2	SCU	None
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	ILE	1.2.840.10008.1.2	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	ILE	1.2.840.10008.1.2	SCU	None
X-Ray Radio-fluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	ILE	1.2.840.10008.1.2	SCU	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	ILE	1.2.840.10008.1.2	SCU	None
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29	ILE	1.2.840.10008.1.2	SCU	None
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30	ILE	1.2.840.10008.1.2	SCU	None
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	ILE	1.2.840.10008.1.2	SCU	None
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	ILE	1.2.840.10008.1.2	SCU	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	ILE	1.2.840.10008.1.2	SCU	None
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	ILE	1.2.840.10008.1.2	SCU	None
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	ILE	1.2.840.10008.1.2	SCU	None
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	ILE	1.2.840.10008.1.2	SCU	None
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	ILE	1.2.840.10008.1.2	SCU	None
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	ILE	1.2.840.10008.1.2	SCU	None
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	ILE	1.2.840.10008.1.2	SCU	None

Ophthalmic Photographic 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	ILE	1.2.840.10008.1.2	SCU	None
Ophthalmic Photographic 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	ILE	1.2.840.10008.1.2	SCU	None
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	ILE	1.2.840.10008.1.2	SCU	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	ILE	1.2.840.10008.1.2	SCU	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	ILE	1.2.840.10008.1.2	SCU	None
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	ILE	1.2.840.10008.1.2	SCU	None
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	ILE	1.2.840.10008.1.2	SCU	None
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	ILE	1.2.840.10008.1.2	SCU	None
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	ILE	1.2.840.10008.1.2	SCU	None
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	ILE	1.2.840.10008.1.2	SCU	None
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	ILE	1.2.840.10008.1.2	SCU	None
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	ILE	1.2.840.10008.1.2	SCU	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	ILE	1.2.840.10008.1.2	SCU	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	ILE	1.2.840.10008.1.2	SCU	None
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	ILE	1.2.840.10008.1.2	SCU	None
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	ILE	1.2.840.10008.1.2	SCU	None
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	ILE	1.2.840.10008.1.2	SCU	None

Table 20: Proposed Presentation Contexts for Store Instances (Export 1)

4.2.2.3.1.3   SOP SPECIFIC CONFORMANCE FOR STORAGE SOP CLASSES

Important remarks about the exported instances:

- The Distribution Manager does not attempt any extended negotiation.

- The Distribution Manager continues sending the remaining instances after unsuccessful C-STORE responses.

- The Distribution Manager takes no further action in case of warnings or errors in the C-STORE operations during transferring attempt. After finishing of transferring attempt a user error will be displayed in the GUI if only for a one instance the store operation fails.

- The Distribution Manager AE sends the instances using the same transfer syntax as they were stored by the Storage Provider AE.

Configuring of Storage Provider AE to convert format of received data from original Transfer Syntax to Implicit Little Endian is compulsory condition for usage of data distribution via DICOM protocol.

Following are the details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors.

Service Status	Further Meaning	Error Code	Behavior
Success	Storage is complete	0000	Continues with next store until completed thereafter the store job is marked as completed and the association is released.
Refused	Out of Resources	A7xx	Continues with next store until end of data collection. The store job is marked as failed. The job status is reported to user.
Error	Data set does not match SOP Class	A9xx	Continues with next store until end of data collection. The store job is marked as failed. The job status is reported to user.
	Cannot understand	Cxxx	Continues with next store until end of data collection. The store job is marked as failed. The job status is reported to user.
Warning	Coercion of Data Elements	B000	Continues with next store until completed thereafter the store job is marked as completed and the association is released.
	Elements discarded	B006	Continues with next store until completed thereafter the store job is marked as completed and the association is released.
	Data set does not match SOP class	B007	Continues with next store until completed thereafter the store job is marked as completed and the association is released.

Table 21: DICOM Command Response Status Handling Behavior

Exception	Behavior
ARTIM Time-out	Continues with next store until end of data collection. The store job is marked as failed. The job status is reported to user.
Reply Time-out	Continues with next store until end of data collection. The store job is marked as failed. The job status is reported to user.
Association Time-out SCU	Continues with next store until end of data collection.

Exception	Behavior
	The store job is marked as failed. The job status is reported to user.
Association aborted	Continues with next store until end of data collection. The store job is marked as failed. The job status is reported to user.

Table 22: DICOM Command Communication Failure Behavior

4.2.2.4 ASSOCIATION ACCEPTANCE POLICY

Distribution Manager never accepts an association.

4.3   NETWORK INTERFACES

4.3.1   PHYSICAL NETWORK INTERFACE

The CD Printer applications provide DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of [DICOM].

CD Printer supports a single network interface: Ethernet ISO.8802-3. With standard supported physical medium include:

- IEEE 802.3 10BASE-TX

- IEEE 802.3 100BASE-TX (Fast Ethernet)

- IEEE 802.3 1000BASE-X (Fiber Optic Gigabit Ethernet).

4.3.2   OSI STACK

OSI Stack is not supported

4.3.3   TCP/IP

TCP/IP stack is inherited from the Operating System.

The CD Printer is available on Windows 2000 Professional operating system (i.e. the operating system platform).

4.3.4   PHYSICAL MEDIA SUPPORT

The CD Printer is indifferent to the physical media over which TCP/IP operates. It inherits the medium from the operating system upon which it executes.

The CD Printer is available on Windows 2000 Professional.

4.3.5 POINT -TO-POINT STACK

Point-to-Point stack is not supported.

4.4 CONFIGURATION

The CD Printer uses a centralized control database for configuration.

The CD Printer for Windows 2000 uses InterBase v. 7.5.

CD Printer system is configured by means of a configuration program. This program is accessible during operating of the CD Printer system. It is password protected and intended to be used by Philips Customer Support Engineers only.

The configuration program shall prompt the Customer Support Engineer to enter configuration information as required by the CD Printer applications.

4.4.1 AE TITLE/PRESENTATION ADDRESS MAPPING

AE Title / Presentation-Address mapping is stored in The CD Printer control database and is configured using administration utilities.

How this is performed is described in this section.

4.4.1.1 LOCAL AE TITLES

The local AE title mapping and configuration shall be specified. Default AE titles are listed in **Table 23**.

Application Entity	Default AE Title	Default TCP/IP Listening Port
Storage Provider	CDP_PRINTER	104
Distribution Manager	CDP_SENDER	Not applicable

Table 23: AE Title Configuration Table

The AE titles in the CD Printer can be changed independently.

Number of defined AE titles for Storage Provider is unlimited.

4.4.1.2 REMOTE AE TITLE/PRESENTATION ADDRESS MAPPING

All relevant remote applications able to setup a DICOM association towards CD Printer applications must be configured at CD Printer configuration time. The Customer Support Engineer must provide the following information for each remote application:

- The Application Entity Title.

- The host name/IP address on which the remote application resides.

The following information must be provided for all relevant remote applications that are able to accept DICOM associations from CD Printer:

- The Application Entity Title.

- The host name/IP address on which the remote application resides.

- The port number at which the remote application accepts association requests.

4.4.2 PARAMETERS

The specification of important operational parameters, their default value and range (if configurable) is specified here.

The configuration parameters are given in **Table 24**, categorized in the following sections:

- General Parameters of CD Printer AE's.

- Local Configurable Parameters of the CD Printer AE's.

- Remote Configurable Parameters of the CD Printer AE's.

Parameter	Configurable	Default Value
General Parameters of CD Printer		
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout - ARTIM)	Yes	10 sec.
General DIMSE level time-out values	Yes	30 sec.
Time-out waiting for response to TCP/IP connect request. (Low-level timeout) [1]	No	-
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout) [1]	No	-
Time-out for waiting for data between TCP/IP packets. (Low-level timeout) [1]	No	-
Any changes to default TCP/IP settings, such as configurable stack parameters [1]	No	-
Local Configurable Parameters of the CD Printer AE		
Size constraint in maximum object size (see note)	No	-
Maximum PDU size the AE can receive	Yes	16 kBytes Min 4 kBytes Max 64 kBytes
Maximum PDU size the AE can send	Yes	16 kBytes Min 4 kBytes Max 64 kBytes
AE specific DIMSE level time-out values	Yes	30 sec.
Number of simultaneous associations by Service and/or SOP class	Yes	5
SOP class support	No	As listed in the DCS
Transfer Syntax support [2]	No	As listed in the DCS
Remote Configurable Parameters of the CD Printer AE		
Size constraint in maximum object size (see note)	No	-
Maximum PDU size the AE can receive	No	No limit
Maximum PDU size the AE can send	No	No limit
AE specific DIMSE level time-out values	Yes	30 sec.
Number of simultaneous associations by Service and/or SOP class	No	No limit
SOP class support	No	As listed in the DCS
Transfer Syntax support	No	As listed in the DCS
Storage Commitment request must be sent after Storage request	N/A	-
Storage Commitment time-out (synchronous to asynchronous)	N/A	-
Export of pure DICOM instances (i.e. only the standard DICOM attributes as defined in the related IOD) or extended DICOM instances (with additional Standard DICOM, Private and Retired attributes)	No	allow all attributes

Support of overlays for DICOM node not supporting Presentation State objects [3]	No	-
Support of overlays for DICOM node supporting Presentation State objects [3]	No	-
Support of overlays for CD [3]	No	-

Table 24: Configuration Parameters table

> *Note 1:   The parameters depend on operation system configuration.*

> *Note 2:   The JPEG Baseline transfer syntax is only supported for monochrome images. The RLE Lossless Image Compression transfer syntax is only supported for RGB; therefore JPEG Baseline may NOT be configured for systems that are capable of handling storage of color images too and RLE Lossless Image Compression may NOT be configured for systems that are capable of handling storage of monochrome images too.*

> *Note 3:   The CD Printer Copy-tool supports only storing functions for overlays.*

The CD Printer configuration is done using administration utilities. Please refer to Installation Manual and Administration's Manual for complete documentation.

In addition, the CD Printer provides a variety of dynamic application configurations for managing the instances distributing:

- Forward Rules provide a robust mechanism for instances distribution enabling to use the CD Printer as a DICOM network hub.

Important implementation remarks and restrictions:

Forward-Rules are a set of rules that is used to select the received by Storage Provider AE instances, for the Receiver application (Distribution Manager AE) to send studies to the CD Printer (Media AE), other locations on the network (DICOM), or any combination thereof.

> *Note: Configuring of Storage Provider AE to convert format of received data from original Transfer Syntax to Implicit Little Endian is compulsory condition for usage of data distribution via DICOM protocol.*

For complete documentation of the CD Printer Forward-Rules please refer to the CD Printer Administration's Manual.
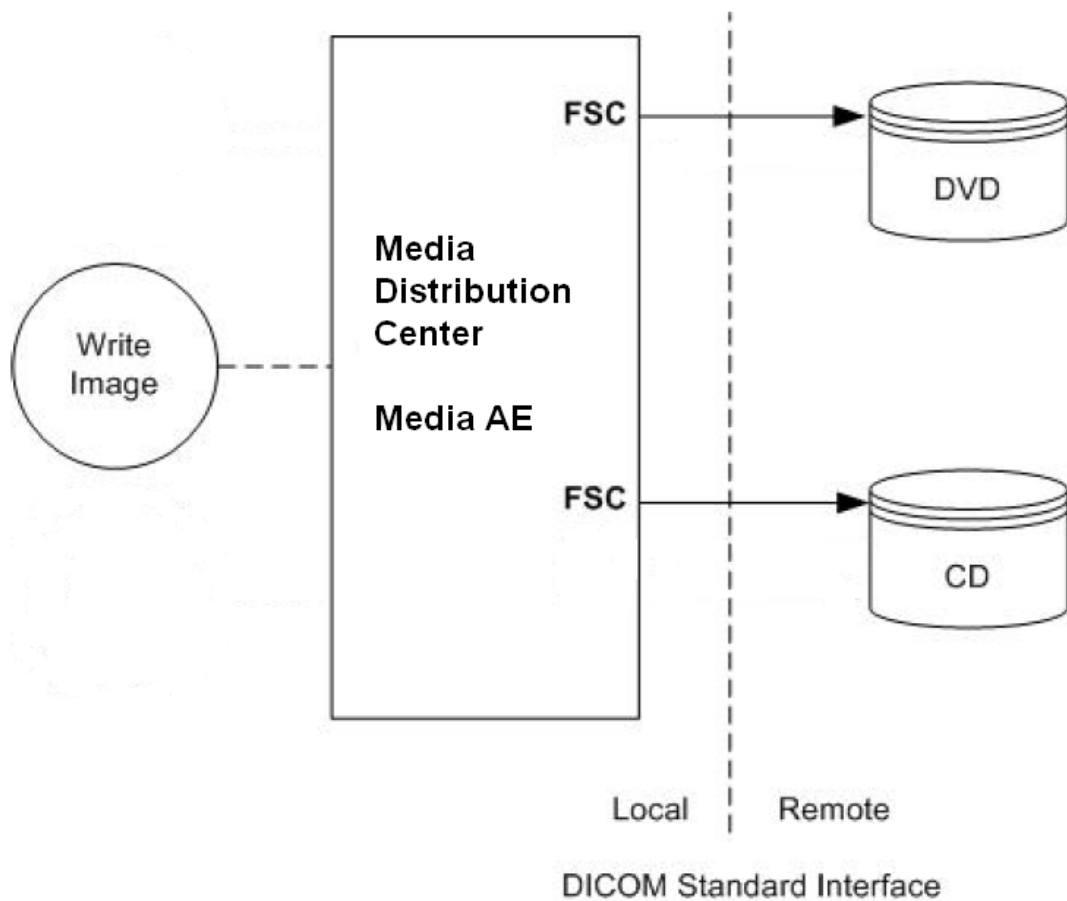
5.   MEDIA INTERCHANGE

5.1   IMPLEMENTATION MODEL

5.1.1   APPLICATION DATA FLOW

The Media AE will act as a FSC for a CD-R and DVD, when writing the selected instances in a data folder onto the medium.

Figure 7 shows the Media Interchange Application Data Flow as a functional overview of the CD Printer AE for CD-R and DVD.

Figure 7: Media Interchange Application Data Flow Diagram

- The Media AE exports DICOM instances (Images, Presentation States, Structured Reports, etc.) to a disk Storage medium. It is associated with local real-world activity "Write Image". "Write Image" is performed upon Distribution Manager AE delivery of DICOM data collection (set of patients, studies, series or instances).

- Throughout this section, the term "Media" refers to any of the media: CD-R, CD-RW, DVD-R, DVD+R, DVD-RW and DVD+RW.

The Media AE can be configured for automatic selection of creating media.

5.1.2   FUNCTIONAL DEFINITION OF AE'S

This section describes in general the functions to be performed by the AE, and the DICOM services used to accomplish these functions.

5.1.2.1 FUNCTIONAL DEFINITION OF MEDIA AE

Distribution Manager AE will pass the DICOM data collection to Media AE. Media AE will select appropriate media in accordance to total volume of data collection, target media capacity and allowance of automatic media selection. The data collection will be divided into one or more export jobs in accordance to total volume of data collection and selected media capacity. The contents of each export job will be written to a single media. Executing of export job is performed automatically. Each media is automatically labeled with appropriate information.

> Note: Label content and view are customizable and depend on local needs. For more details see Administrator Guide of the CD Printer.

The Media AE includes DICOM media viewer software in root of each burned media. The DICOM media viewer software supports images with the following DICOM Photometric Interpretations as shows in **Table 25**.

Photometric Interpretation	Import	Export	Viewing
MONOCHROME1	NO	YES	YES
MONOCHROME2	NO	YES	YES
RGB	NO	YES	YES
YBR_FULL	NO	YES	NO
YBR_FULL_422	NO	YES	YES
YBR_PARTIAL_422	NO	YES	NO
PALETTE COLOR	NO	YES	YES
YBR_RCT	NO	YES	NO
YBR_ICT	NO	YES	NO

Table 25: Photometric interpretations supported by Media AE

The CD Printer Media AE includes the following service class.

Media Storage Service Class for CD and DVD

The Media AE can perform the CD-R Media Storage service as SCU, with capabilities for RWA Write Instances (as FSC).

For DVD the Media AE can perform the Media Storage service as SCU, with capabilities for RWA Write Instances (as FSC).

5.1.3   SEQUENCING OF REAL WORLD ACTIVITIES

Whenever a CD or DVD has to written the Media AE first reads required DICOM instances from CD Printer temporary storage and builds the DICOMDIR for the instances set. The Media AE will compile the DICOMDIR, required DICOM instances and unique high quality self-playing image viewing and manipulation program (DiagNET) into a CD or DVD media image; this CD or DVD media image will be written to CD or DVD.
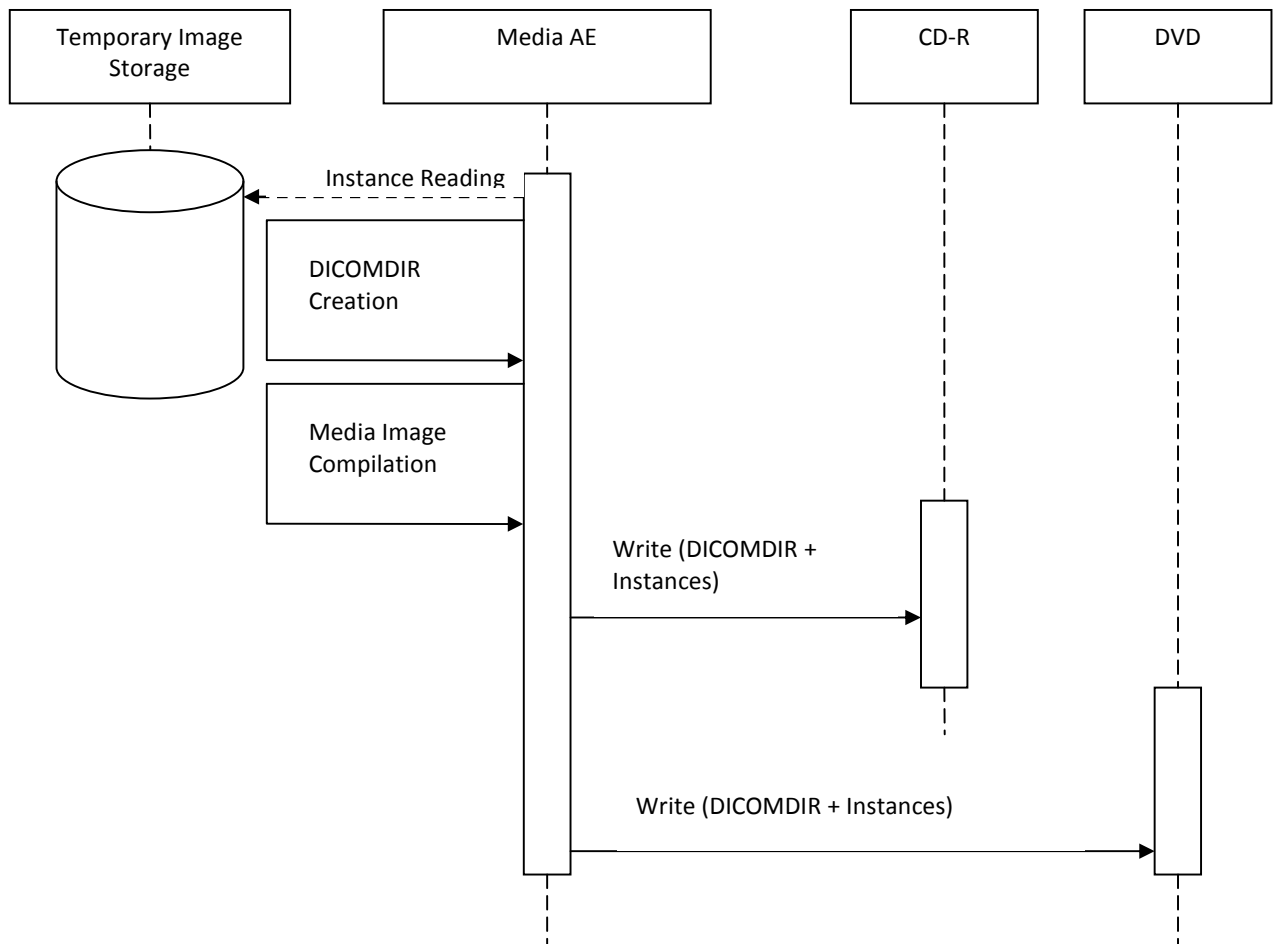

Figure 8: Sequencing of RWA Write Instances

5.1.4 FILE META INFORMATION FOR IMPLEMENTATION CLASS AND VERSION

This section is used to list the values assigned to the File Meta Information attributes (ref. [DICOM] PS 3.10) that pertain to the Implementation Class and Version.

The Implementation Class UID and the Implementation Version Name in the File Meta Header are specified in following table.

File Meta Information Version	00,01
Implementation Class UID	1.2.826.0.1.3680043.8.195.0.20041017
Implementation Version Name:	CDP_V3

Table 26: DICOM Implementation Class and Version for Media AE

5.2 AE SPECIFICATIONS

5.2.1 MEDIA AE

The Media AE provides Standard Conformance to the DICOM Media Storage Service and File Format ([DICOM] PS 3.10), the Media Storage Application Profile STD-GEN-CD ([DICOM] PS 3.11) and the Media Storage Application Profile STD-GEN-DVD-JPEG ([DICOM] PS 3.11) and Private Conformance to the Media Storage Application Profile PRI-GEN-CD-DVD (5.3.2 chapter in the document) for Writing.

The supported Application Profiles, their Roles and the Service Class (SC) options, all defined in DICOM terminology, are listed in **Table 27**.

Supported Application Profile	Real-World Activity	Roles	SC Option
PRI-GEN-CD-DVD	Write Instances	FSC	Interchange
STD-GEN-CD	Write Instances	FSC	Interchange
STD-GEN-DVD-JPEG	Write Instances	FSC	Interchange

Table 27: AE Related Application Profiles, Real-World Activities, and Roles for CD-R and DVD

Supported media profiles per media are shown in **Table 28**.

Media	CD	DVD+RW / DVD+R / DVD-R / DVD-RW
Application Profile	STD-GEN-CD / PRI-GEN-CD-DVD	STD-GEN-DVD-JPEG / PRI-GEN-CD-DVD

Table 28: Media Profiles supported by Media AE

> Note: Private General Purpose PRI-GEN-CD-DVD Media Storage Application Profile allows creating DICOM CD and DVD without transfer syntax control of writing DICOM Instance files. Usage of Private or Standard Profile is configurable.
>
> The CD Printer can be configured to not control content and format of distributing on media data. In such case data will be written "as is" (as received from remote DICOM node) and all

responsibility for normality of data format and contents shall be borne by the source of the information from which the data was received by CD Printer.

The CD Printer and/or Media AE can be configured explicitly to change format of distributing on media data by system administrator of The CD Printer. In such case all responsibility for normality of data format and contents shall be borne by the system administrator.

Media AE supports multi-patient CD-R / DVD disks for Writing.

5.2.1.1 FILE META INFORMATION FOR THE MEDIA AE

The Media AE has no specific File Meta Information.

5.2.1.2 REAL-WORLD ACTIVITIES

5.2.1.2.1   WRITE INSTANCES

When an instance transfer to CD-R or DVD is initiated then the Media AE acts as an FSC using the interchange option to export SOP Instances from the temporary location to a CD-R or DVD medium.

The contents of the export job will be written together with corresponding DICOMDIR and DICOM media viewer software to media. The user can cancel an export job in the job queue and manage the queue by changing priority of the jobs.

5.2.1.2.1.1   MEDIA STORAGE APPLICATION PROFILE

As depicted in **Table 27**, the Media AE supports the RWA Write Instances for the STD-GEN-CD, STD-GEN-DVD-JPEG and PRI-GEN-CD-DVD Application Profile.

5.2.1.2.1.1.1   OPTIONS

All existing in received instance Optional, Retired and Private Attributes are kept, stored and exported.

The DICOMDIR file will be created for the whole set of instances during creating of media image. In case some attributes are not present in an instance but are specified as mandatory in the DICOMDIR definition in DICOM Media, a generated value will be filled in.

Implementation remarks and restrictions

When writing the DICOMDIR records, key values are generated when no value of the corresponding attribute is supplied, according to **Table 29**.

Key	Tag	Generated Value
Patient Keys		
Patient ID	(0010,0020)	At import CD Printer creates a value based on the Accession Number, if the Patient ID does not exists or has empty value. If Accession Number attribute does not exist or has empty value, attribute value is created on base of the Study Instance UID for each new study written to the CD-R/ DVD (even if this study belongs to a patient recorded earlier).
Study Keys		
Study Date	(0008,0020)	Current date
Study Time	(0008,0030)	Current time
Study ID	(0020,0010)	"UNKNOWN"

Key	Tag	Generated Value
Series Keys		
Series Number	(0020,0011)	1

Table 29: Generated Keys

The Media AE writes DICOMDIR using Explicit Little Endian transfer syntax always regardless of applied Media Storage Application Profile.

The Media AE supports all Storage SOP Classes listed in **Table 6**. Put attention to note about SOP Classes supported for presentation (viewing).

The Media AE supports all Transfer Syntaxes represented in list of Acceptable Presentation Contexts for Store Instances (Import) depicted in **Table 11**.

> *Note: DICOM instances are exported within Transfer Syntaxes in accordance to configuration.*

CD Printer can write data on volumes of the media.

CD Printer writes next disk if data is spanning over more CD-R / DVD disks.

CD Printer can be configured to automatic selection of appropriate media.

CD Printer will select DVD media for data set that was initially proposed for writing on CD if total volume of exporting data set exceeds CD media capacity.

CD Printer will select CD media for data set that was initially proposed for writing on DVD if total volume of exporting data set is less than CD media capacity.

The unique high quality self-playing image viewing and manipulation program (DiagNET) will be written on each medium.

5.3   AUGMENTED AND PRIVATE APPLICATION PROFILES

This section is used for the description of Augmented and Private Application Profiles.

5.3.1   AUGMENTED APPLICATION PROFILES

None

5.3.2   PRIVATE APPLICATION PROFILES

5.3.2.1 PRIVATE APPLICATION PROFILE PRI-GEN-CD-DVD

5.3.2.1.1   PRI-GEN-CD-DVD PRIVATE APPLICATION PROFILE

The Application Profile Class is intended to be used for the interchange of Composite SOP Instances via CD-R and DVD media for general purpose applications. Objects from multiple modalities may be included on the same media.

The Media Storage SOP Class is detailed in **Table 30**.

Application Profile	Identifier	Description
Private General Purpose CD-DVD Interchange	PRI-GEN-CD-DVD	Handles interchange of Composite SOP Instances such as Images, Structured Reports, Presentation States and Waveforms, either uncompressed (including Implicit Little Endian format) or with lossless or lossy JPEG.

Table 30: AE Related Application Profiles, Real-World Activities, and Roles for CD-R and DVD

5.3.2.1.2   CLINICAL CONTENT

This Application Profile Class facilitates the interchange of images and related data on CD or DVD media. Typical interchange would be between acquisition devices, archives and workstations.

This Application Profile Class facilitates the creation of a multi-modality and multi-patient medium for image interchange, useful for clinical, patient record, teaching and research applications, within and between institutions.

5.3.2.1.3   ROLES AND SERVICE CLASS OPTIONS

5.3.2.1.3.1   FILE SET CREATOR

File Set Creator generates a File Set under this Interchange Class of Application Profile and generates the Basic Directory SOP Class in the DICOMDIR file with all the subsidiary Directory Records related to the Instance SOP Classes stored in the File Set.

5.3.2.1.4   SOP CLASSES AND TRANSFER SYNTAXES

This Application Profile is proposed for support of any Standard, Standard Extended and Private SOP Classes and any Standard Transfer Syntaxes.

> Note: In fact the Media AE receives export jobs that contain data received by Storage Provider AE. So created media will contain only supported by the Storage Provider AE SOP Classes and in format of only supported by the Storage Provider AE Transfer Syntaxes.

DICOMDIR file (Class UID of the object is 1.2.840.10008.1.3.10) should be coded using Explicit Little Endian transfer syntax.

5.3.2.1.5   PHYSICAL MEDIUM AND MEDIUM FORMAT

The PRI-GEN-CD-DVD application profile requires the 120 mm CD-R physical medium with the ISO/IEC 9660 Media Format or the 120 mm DVDRAM medium, as defined in PS 3.12.

5.3.2.1.6   DIRECTORY INFORMATION IN DICOMDIR

The PRI-GEN-CD-DVD application profile has the same requirements to DICOMDIR content that General Purpose CD-R and DVD Interchange Profiles have, as defined in PS 3.11 (Annex D) of DICOM Standard.

5.3.2.1.7   OTHER PARAMETERS

None

5.3.2.1.8   SECURITY PARAMETERS

None

5.4   MEDIA CONFIGURATION

The Media AE uses initialization file (PRINTER.INI) for configuration.

The Media AE is configured by means of any text editor. This configuration is intended to be made by Philips Customer Support Engineers only.

5.4.1   GENERAL PARAMETERS OF MEDIA AE

5.4.1.1 AUTOMATIC SELECTION OF TARGET MEDIA

Distribution Manager AE initiates export to specific media. The Media AE will perform the export to the specified media or will automatically select more appropriate media for the export task.

AutoMediaSelect parameter in [Printer] section defines when such automatic selection will be performed (value shall be equal 1) or will not be performed (value shall be equal 0).

Default value defines operating without automatic media selection (parameter has 0 value).

5.4.1.2 NUMBER OF SUPPORTED MEDIA TYPES

Different configuration of CD Printer can support different media types. This depends on installed hardware and license.

Number of attributes can be specified individually for each media type. The attributes form the so-called configuration set.

MediaCount parameter in [MediaList] section defines a number of such media configuration sets.

Default value defines is 2 (CD-R and DVD).

5.4.2   MEDIA SPECIFIC PARAMETERS OF MEDIA AE

The parameters are specified in [MediaList] section.

The parameters can be specified individually for each media type (CD-R, DVD). The parameter names end by a number of the media type in the list (a number shall be in range from 1 up to value of Number of Supported Media Types parameter). The number is represented by N symbol in explanations below.

The media specific parameters, their default value and range are specified in **Table 31**.

Parameter	Default Value for CD-R	Default Value for DVD	Note
The type of the media that is recognized by burning software (MediaTypeN parameter)	CDR	DVDR	Depends on installed hardware
Capacity in megabytes of data that can be stored to the media (MediaCapacityN parameter)	650	4000	The value is used for data collection splitting to several discs and automatic media selection. The value is typically smaller than the physical capacity of the media allowing additional files (such as DICOMDIR and DiagNET viewer) to be included.
Data representation type for regular burning (MediaRepresentationTypeN parameter)	2	2	Possible values are 0, 1, 2 and 3. See full description below.

Table 31: Configuration Parameters table

The data representation type parameter specifies representation of data for regular burning and applying Media Storage Application Profile as result from using data representation:

- 0 value defines that received by Media AE data will be stored "as is" without changing of Transfer Syntax. So data can be stored in any Transfer Syntax. The setting dictates usage of PRI-GEN-CD-DVD application profile in media creating.

- 1 value defines that received by Media AE data will be stored within Implicit Little Endian Transfer Syntax. The Transfer Syntax does not correspond to standard application profiles. The setting dictates usage of PRI-GEN-CD-DVD application profile in media creating.

- 2 value defines that received by Media AE data will be stored within Explicit Little Endian Transfer Syntax. The Transfer Syntax corresponds to STD-GEN-CD and STD-GEN-DVD-JPEG standard application profiles. So STD-GEN-CD application profile will be used in CD-R creating and STD-GEN-DVD-JPEG will be used in DVD creating.

- 3 value defines that received by Media AE data will be stored within compression Transfer Syntaxes. The Transfer Syntax corresponds to STD-GEN-DVD-JPEG standard application profile for DVD creating and does not correspond to STD-GEN-CD standard application profile for CD creating. So PRI-GEN-CD-DVD application profile will be used in CD-R creating and STD-GEN-DVD-JPEG will be used in DVD creating.

Note: The Media AE reserves the right to switch applying application profile in cases of creating media changing via automatic media selection and errors in Transfer Syntax conversion of data and Private SOP Class IOD-s.

6.   SUPPORT OF CHARACTER SETS

CD Printer supports All Extended Character Sets.

> *Note:*   *If an extended or replacement character set is used in one of the attributes, the attributes will be stored and exported "as is". The CD Printer processes coded part of the attributes as binary data.*

> *Note:*   *The CD Printer uses default language character set of operation system for non-Unicode programs. In the reason the attributes, coded with Extended Character Set, may be unreadable in internal applications of CD Printer.*

7.   SECURITY

7.1   SECURITY PROFILES

None supported.

7.2   ASSOCIATION LEVEL SECURITY

The CD Printer accepts associations only from known applications or an application whose "calling AE Title" is defined in its configuration file.

The CD Printer will reject association requests from unknown applications, i.e. applications that offer an unknown "calling AE title". An application entity (AE) is known if – and only if – it is defined during configuration of the CD Printer, which is done via the configuration application.

7.3   APPLICATION LEVEL SECURITY

The CD Printer supports security measure for secure authentication of a node.

The CD Printer will reject association requests from applications on unknown nodes, i.e. nodes that offer an unknown "IP Address". A node is known if – and only if – it is defined during configuration of the CD Printer, which is done via the configuration application.

8.   ANNEXES

8.1   IOD CONTENTS

8.1.1   CREATED SOP INSTANCES

Not applicable.

8.1.2   ATTRIBUTE MAPPING

Not applicable.

8.1.3   COERCED/MODIFIED FIELDS

8.1.3.1 COERCED FIELDS

Coerced fields and conditions for the coercion are listed in **Table 32**.

Attribute Name	Tag	Coercion Conditions
Patient ID	(0010,0020)	Value is missing in received instance.
Study Date	(0008,0020)	Value is missing in received instance.
Study Time	(0008,0030)	Value is missing in received instance.
Study ID	(0020,0010)	Value is missing in received instance.
Series Number	(0020,0011)	Value is missing in received instance.

Table 32: Coerced fields and conditions for the coercion

8.1.3.2 MODIFIED FIELDS

None

8.2   DATA DICTIONARY OF PRIVATE ATTRIBUTES

Not applicable.

8.3   CODED TERMINOLOGY AND TEMPLATES

Not applicable.

8.4   GRAYSCALE IMAGE CONSISTENCY

The high-resolution display monitor attached to the product must be earlier calibrated by using the device specific tools.

8.5   STANDARD EXTENDED/SPECIALIZED/PRIVATE SOPS

Not applicable.

8.6   PRIVATE TRANSFER SYNTAXES

None