



Technical Publications

**Direction Number 5492813-1EN
Revision 1**

**Volume Viewer
and its applications (Release 11.4) for AW Pioneer**

**CONFORMANCE STATEMENT
for DICOM**

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RECORD OF CHANGES

Revision	Version	Date	Author	Description of content changed	Reason for change / change control number
1	1	September 11, 2013	Yun LUO	Initial version of document	
1	2	Oct 15,2013	Yun LUO	Fixed review comments from Herve Hoehn	
1	3	Oct 17,2013	Yun LUO	Fixed review comments from Herve Hoehn	

CONFORMANCE STATEMENT OVERVIEW

Volume Viewer is a software application designed to be used on the Advantage Windows workstation, and it's customized for running on AW Pioneer with Chinese support and CT modality images supported only. For networking and media storage features, they are inherited from platform and Media Creator. Volume Viewer uses DICOM images to reconstruct 3-dimensional volumes, and the views of these 3-dimensional volumes displayed by the application can be saved in DICOM format (Secondary Capture or modality reformatted images), which can be loaded and displayed by other GEHC applications (such as the Image Viewer) or by other non-GE applications conformant to the DICOM Standard. Volume Viewer is also capable to load and display Secondary Capture images saved by Volume Viewer or by Filmer, an application running on the same platform which generates some outputs, specifically SC.

Furthermore this application is able to save Key Object Selection to mark selected images.

Table 0.1 provides an overview of the network services supported by Volume Viewer.

Table 0.1 – NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
	Object output (write)	Object input (read)
CT Image Storage	Yes	Yes
Secondary Capture Image Storage	Yes	Yes (only those generated by Volume Viewer or Filmer)
Key Object Selection Document	Yes	No

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1. INTRODUCTION

1.1 OVERVIEW

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

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

Section 2 (Conformance Statement), specifies the GEHC equipment compliance to the DICOM requirements.

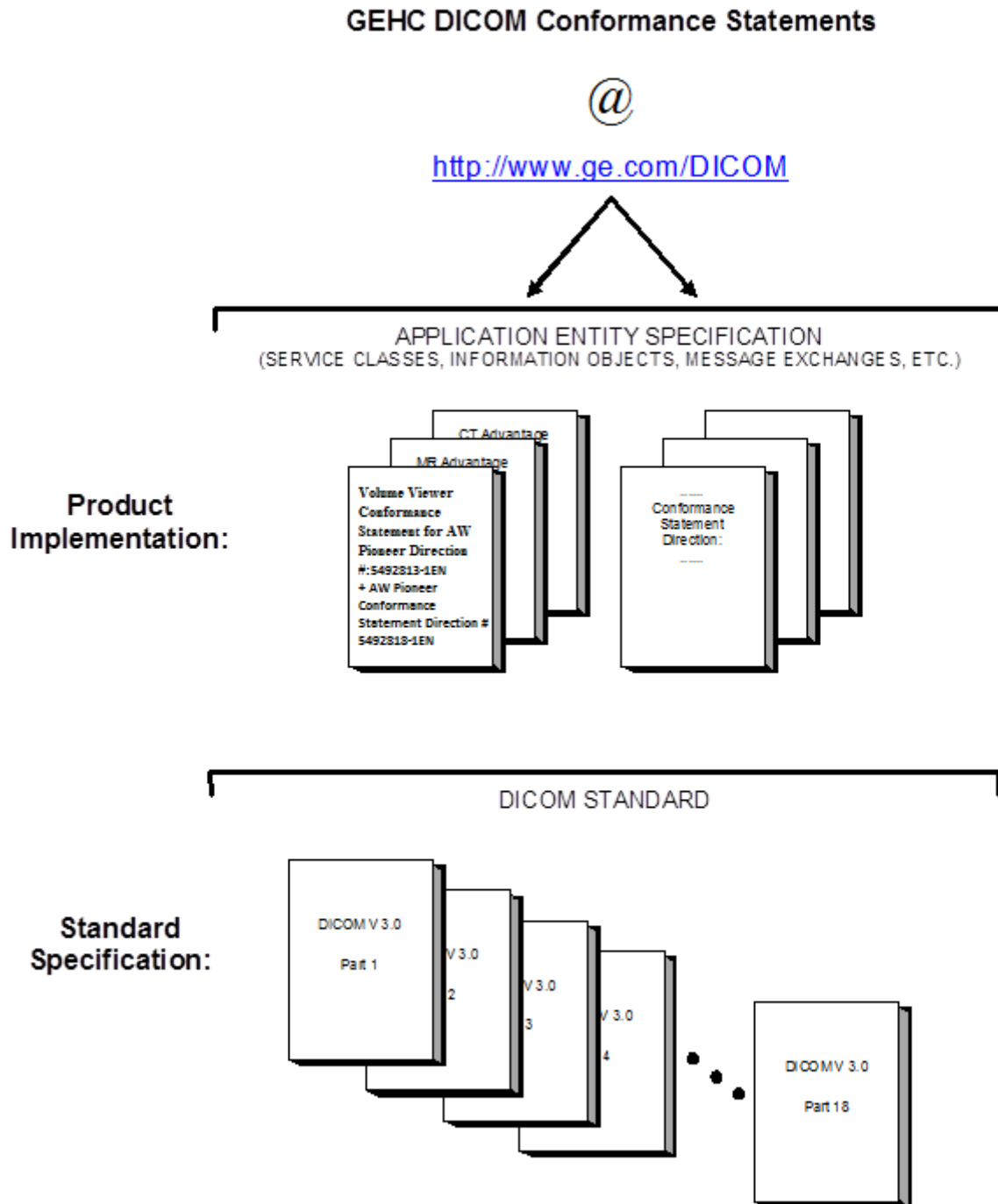
Section 3 (CT Information Object Implementation), specifies the GEHC equipment compliance to DICOM requirements for the implementation of a CT Information Object.

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

Section 5 (KOS Information Object Implementation), specifies the GEHC equipment description of the implementation of the Key Object Selection information Object.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

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



This document specifies the DICOM implementation. It is entitled:

*Volume Viewer Applications for AW Pioneer
Conformance Statement for DICOM
Direction: 5492813-1EN*

This DICOM Conformance Statement documents the DICOM Conformance Statement and Technical Specification required interoperating 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
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1.3 INTENDED AUDIENCE

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM Standards and with the terminology and concepts, which are used in those Standards.

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), 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) reflected on by these DICOM Conformance Statements.** The **user** should ensure that any non-GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.
- **Interaction** - It is the sole responsibility of the **non-GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1.6 REFERENCES

NEMA PS3:	Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/
AW Pioneer DCS:	AW Pioneer DICOM Conformance Statement, direction number 5492818-1EN.

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
CR	Computed Radiography
CT	Computed Tomography
DICOM	Digital Imaging and Communications in Medicine
GEHC	General Electric HealthCare
GSPS	Grayscale Softcopy Presentation State
IOD	Information Object Definition
KO	Key Object Selection
LUT	Look-up Table

O	Optional (Key Attribute)
PACS	Picture Archiving and Communication System
R	Required (Key Attribute)
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SR	Structured Reporting
U	Unique (Key Attribute)
VAV	Volume Auto View, application on CT scanner to display the 3D volume while the CT images are reconstructed during an acquisition
VR	Value Representation

1.9 TERMS DEFINITIONS

In the following conformance statement, the following terms describe the use of each of the DICOM tags. When Volume Viewer is loading DICOM data files, we use the following terms:

- **Ignored:** the software will ignore the value of the tag
- **Used:** the software might use at some point the value of this tag; the value could be used for computations, for display, or to regenerate the value of a secondary capture
- **Mandatory:** the software will need a valid value for this tag; this value will be used for computations and an invalid value will prevent the software to load the data

When Volume Viewer is saving some reformatted or secondary capture images, we use the following terms:

- **Removed:** the tag is removed of the module and will be absent from the data set
- **Generated:** the software will generate a value, generally by computing a new value
- **Copied:** the software will try as much as possible to duplicate the value found in the source images if the value is the same on all the source images; if the value is not constant, the tag will be absent from the data set if “Ignored” at load or possibly regenerated if “Used” at load

2. CONFORMANCE STATEMENT

Volume Viewer, also referred to as VoxelTool, is a software application designed to be used on the Advantage Windows workstation, and it is customized to support Chinese UI and restricted to load CT images only. This means that networking and media storage features are inherited from this platform. Volume Viewer uses DICOM images to reconstruct 3-dimensional volumes. The views of 3-dimensional volumes displayed by the application are saved in DICOM format (Secondary Capture or modality reformatted images). These images can be loaded and displayed by other GEHC applications (such as the Image Viewer) or by other non-GE applications conformant to the DICOM Standard.

Additionally, the complete information of a 3-dimensional volume can be saved in DICOM format using 3D Save State based on Secondary Capture objects. These objects can be loaded on Volume Viewer at a later date for follow-up processing.

Volume Viewer is capable to save Key Object Selection objects to mark the images with high relevance for diagnosis.

Volume Viewer is a post processing application running on AW Pioneer platform, and all networking features are provided by these, while Volume Viewer loads, displays, processes and saves diagnostically relevant data.

For a complete description of the networking conformance, refer to the AW Pioneer conformance statement (see section 1.6 REFERENCES).

The **goal of this document** is to give a detailed description of:

- the DICOM CT IODs that are required to reconstruct a 3-dimensional volume and post processed reformatted CT IODs written by the application (section 3),
- the DICOM SC IODs written by the application (section 4),
- the DICOM KOS IODs written by the application (section 5),

SOP Class Name	SOP Class UID	Input	Output	Remarks
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	VV does not read SC images as such. However, Save State are implemented as SC objects and can be read and written, but the image pixels are not meaningful in this case and only the private elements are actually used (see section 4.5.1 for more information on 3D State).
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	No	Yes	Key Object Selection

2.1 IMPLEMENTATION IDENTIFYING INFORMATION

Application Name	Implementation Class UID
All applications	1.2.840.113619.6.362

2.2 SUPPORT OF EXTENDED CHARACTER SETS

All applications fully support the following character set,

- ISO_IR 100 (Latin alphabet No. 1) extended character set.
- ISO_IR 192 (UTF 8)
- GB18030

Note: The character set in the generated DICOM file is as same as the character set in the original DICOM file.

3. CT INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

This section specifies the use of the DICOM CT Image IOD to represent CT images information, read and written by this implementation.

Corresponding attributes are conveyed using the module construct. The contents of this section are:

3.2 - IOD Entity-Relationship Model

3.3 - IOD Module Table

3.4 - IOD Module Definition

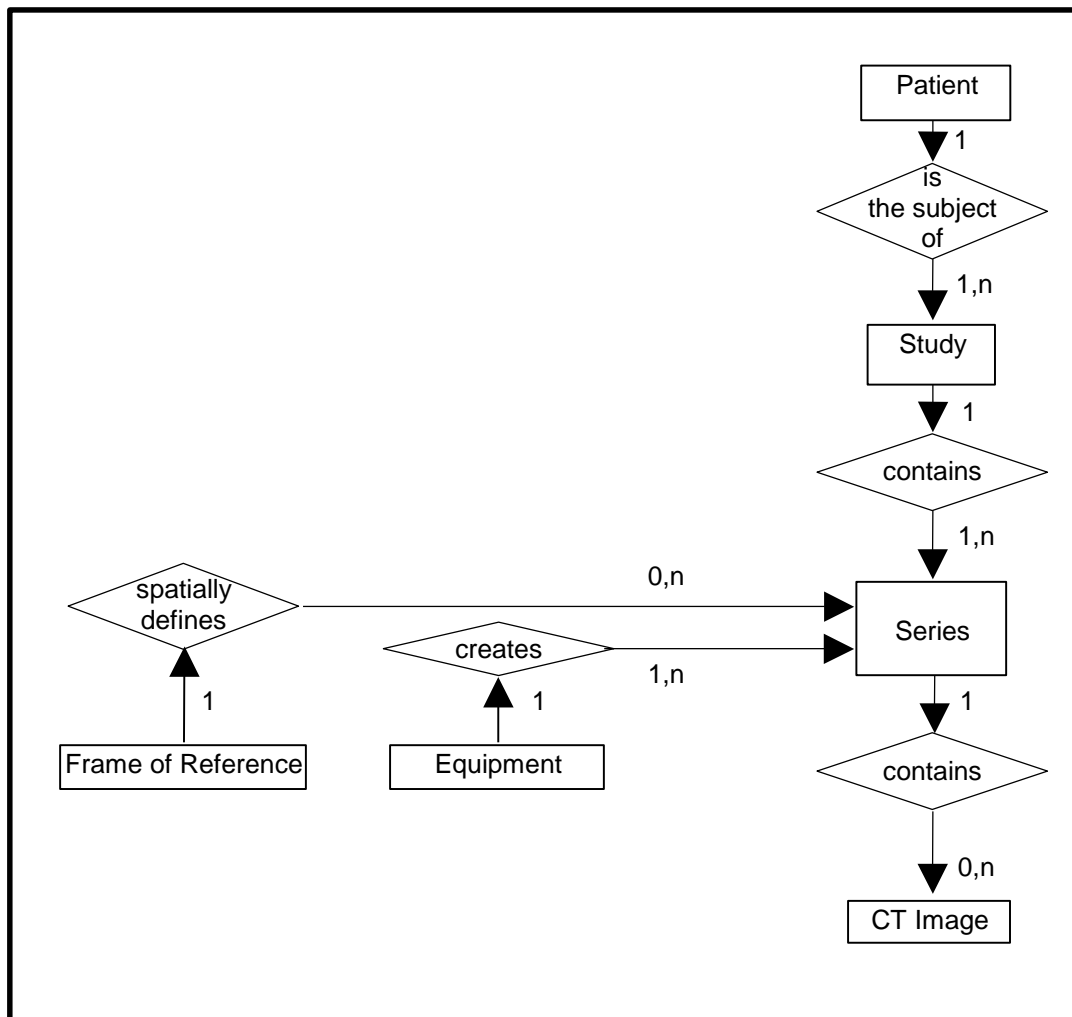
3.2 CT ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the CT Image interoperability schema is shown in Illustration 3.2-1. In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box,
- each relationship is represented by a diamond shaped box,
- The fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to n Images per Series, but the Patient to Study relationship has 1 Patient for each Study (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 3.2-1
CT IMAGE ENTITY RELATIONSHIP DIAGRAM



3.2.1 ENTITY DESCRIPTIONS

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

3.2.2 Volume Viewer Mapping of DICOM entities

TABLE 3.2-1
MAPPING OF DICOM ENTITIES TO VOLUME VIEWER ENTITIES

DICOM	Volume Viewer Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image

3.3 IOD MODULE TABLE

Within an entity of the DICOM CT IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 3.3-1 identifies the defined modules within the entities which comprise the DICOM CT IOD. Modules are identified by Module Name.

See DICOM Part 3 for a complete definition of the entities, modules, and attributes.

**TABLE 3.3-1
 CT IMAGE IOD MODULES**

Entity Name	Module Name	Reference
Patient	Patient	3.4.1.1
	Clinical Trial Subject	Not used / Not copied
Study	General Study	3.4.2.1
	Patient Study	3.4.2.2
	Clinical Trial Study	Not used / Not copied
Series	General Series	3.4.3.1
	Clinical Trial Series	Not used / Not copied
Frame of Reference	Frame of Reference	3.4.4.1
Equipment	General Equipment	3.4.5.1
Image	General Image	3.4.6.1
	Image Plane	3.4.6.2
	Image Pixel	3.4.6.3
	Contrast/Bolus	3.4.6.4
	Device	Not used / Not copied
	Specimen	Not used / Not copied
	CT Image	3.4.9.1
Overlay Plane	Not used / Not copied	
	VOI LUT	3.4.7.1
	SOP Common	3.4.8.1

3.4 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 CT Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

If an element is not listed below, it means that it will be ignored at reading and not copied at writing.

3.4.1 Common Patient Entity Modules

3.4.1.1 Patient Module

This section specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

**TABLE 3.4-1
 PATIENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Used / Copied
Patient ID	(0010,0020)	2	Used / Copied
Issuer of Patient ID	(0010,0021)	3	Ignored / Copied
Patient's Birth Date	(0010,0030)	2	Used / Copied
Patient's Sex	(0010,0040)	2	Used / Copied
Referenced Patient Sequence	(0008,1120)	3	Ignored / Removed
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Patient's Birth Time	(0010,0032)	3	Ignored / Copied
Other Patient IDs	(0010,1000)	3	Ignored / Copied
Other Patient Names	(0010,1001)	3	Ignored / Copied
Other Patient IDs Sequence	(0010,1002)	3	Ignored / Copied
Ethnic Group	(0010,2160)	3	Ignored / Copied
Patient Comments	(0010,4000)	3	Ignored / Copied

3.4.2 Common Study Entity Modules

The following Study IE Modules are common to all Composite Image IODs which reference the Study IE. These Modules contain Attributes of the patient and study that are needed for diagnostic interpretation of the image.

3.4.2.1 General Study Module

This section specifies the Attributes which describe and identify the Study performed upon the Patient.

**TABLE 3.4-2
 GENERAL STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Mandatory / Copied
Study Date	(0008,0020)	2	Used / Copied
Study Time	(0008,0030)	2	Used / Copied
Referring Physician's Name	(0008,0090)	2	Used / Copied
Study ID	(0020,0010)	2	Used / Copied
Accession Number	(0008,0050)	2	Used / Copied
Study Description	(0008,1030)	3	Used / Copied
Physician(s) of Record	(0008,1048)	3	Ignored / Copied
Name of Physician(s) Reading Study	(0008,1060)	3	Ignored / Copied
Referenced Study Sequence	(0008,1110)	3	Ignored / Copied
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Procedure Code Sequence	(0008,1032)	3	Ignored / Copied
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	1C	

3.4.2.2 Patient Study Module

This section defines Attributes that provide information about the Patient at the time the Study was performed.

**TABLE 3.4-3
 PATIENT STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	Ignored / Copied
Patient's Age	(0010,1010)	3	Used / Copied
Patient's Size	(0010,1020)	3	Ignored / Copied
Patient's Weight	(0010,1030)	3	Used / Copied
Occupation	(0010,2180)	3	Ignored / Copied
Additional Patient's History	(0010,21B0)	3	Used / Copied

3.4.3 Common Series Entity Modules

The following Series IE Modules are common to all Composite Image IODs which reference the Series IE.

3.4.3.1 General Series Module

This section specifies the Attributes, which identify and describe general information about the Series within a Study.

**TABLE 3.4-4
 GENERAL SERIES MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Used / Copied Defined Terms: CT = Computed Tomography embedded in CT IOD images
Series Instance UID	(0020,000E)	1	Mandatory / Generated To generate a unique ID, the process concatenates the Implementation Root UID, serial number (computed from the MAC address), the process ID number, the timestamp and a counter incremented each time.
Series Number	(0020,0011)	2	Used / Generated
Laterality	(0020,0060)	2C	Ignored / Generated: "" (empty as the software cannot know semantically the laterality)
Series Date	(0008,0021)	3	Used / Generated: current date
Series Time	(0008,0031)	3	Used / Generated: current time
Performing Physicians' Name	(0008,1050)	3	Used / Copied
Protocol Name	(0018,1030)	3	Used / Copied
Series Description	(0008,103E)	3	Used / Generated
Operators' Name	(0008,1070)	3	Used / Generated The generated value is the current user's full name or the value of GECOS environment variable or if both were empty then it is the operator name from the original image.
Referenced Performed Procedure Step Sequence	(0008,1111)	3	Ignored / Removed on AW
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Body Part Examined	(0018,0015)	3	Ignored / Copied

Patient Position	(0018,5100)	2C	Used / Copied 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
Smallest Pixel Value in Series	(0028,0108)	3	Ignored / Removed
Largest Pixel Value in Series	(0028,0109)	3	Ignored / Removed
Request Attributes Sequence	(0040,0275)	3	Ignored / Copied (Entire sequence copied)
>Requested Procedure ID	(0040,1001)	1C	
>Accession Number	(0008,0050)	3	
>Issuer of Accession Number Sequence	(0008,0051)	3	
>Study Instance UID	(0020,000D)	3	
>Referenced Study Sequence	(0008,1110)	3	
>Requested Procedure Description	(0032,1060)	3	
>Requested Procedure Code Sequence	(0032,1064)	3	
>Reason for the Requested Procedure	(0040,1002)	3	
>Reason for Requested Procedure Code Sequence	(0040,100A)	3	
>Scheduled Procedure Step ID	(0040,0009)	1C	
>Scheduled Procedure Step Description	(0040,0007)	3	
>Scheduled Protocol Code Sequence	(0040,0008)	3	
Performed Procedure Step ID	(0040,0253)	3	Ignored / Removed on AW
Performed Procedure Step Start Date	(0040,0244)	3	Ignored / Removed on AW
Performed Procedure Step Start Time	(0040,0245)	3	Ignored / Removed on AW
Performed Procedure Step Description	(0040,0254)	3	Ignored / Removed on AW
Performed Protocol Code Sequence	(0040,0260)	3	Ignored / Removed on AW

3.4.4 Common Frame Of Reference Entity Modules

The following Frame of Reference IE Module is common to all Composite Image IODs which reference the Frame of Reference IE.

3.4.4.1 Frame Of Reference Module

Images should share the same Frame Of Reference UID as a necessary condition to be in the same 3D model. However, this is not sufficient, because images have also to share the same geometry (be parallel with compatible centers), have the same size, the same pixel size, the same tilt, the same study ID, the same reconstruction algorithm (Convolution Kernel), the same patient name.

**TABLE 3.4-5
 FRAME OF REFERENCE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Frame of Reference UID	(0020,0052)	1	Mandatory / Copied
Position Reference Indicator	(0020,1040)	2	Ignored / Copied

3.4.5 Common Equipment Entity Modules

The following Equipment IE Module is common to all Composite Image IODs which reference the Equipment IE.

3.4.5.1 General Equipment Module

This section specifies the Attributes which identify and describe the piece of equipment which produced a Series of Images.

As Voxtool can simulate the generation of an image by the scanner, we have chosen to copy this module, but to omit the fields that could be altered by the reformation

**TABLE 3.4-6
 GENERAL EQUIPMENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Used / Copied
Institution Name	(0008,0080)	3	Used / Copied
Institution Address	(0008,0081)	3	Ignored / Copied
Station Name	(0008,1010)	3	Used / Copied
Institutional Department Name	(0008,1040)	3	Ignored / Copied
Manufacturer's Model Name	(0008,1090)	3	Used / Copied
Device Serial Number	(0018,1000)	3	Ignored / Copied
Software Versions	(0018,1020)	3	Ignored / Copied
Spatial Resolution	(0018,1050)	3	Ignored / Removed
Date of Last Calibration	(0018,1200)	3	Ignored / Copied
Time of Last Calibration	(0018,1201)	3	Ignored / Copied
Pixel Padding Value	(0028,0120)	3	Ignored / Copied

3.4.6 Common Image Entity Modules

The following Image IE Modules are common to all Composite Image IODs which reference the Image IE.

3.4.6.1 General Image Module

This section specifies the Attributes which identify and describe an image within a particular series.

**TABLE 3.4-7
 GENERAL IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient Orientation	(0020,0020)	2C	Ignored / Removed See 3.4.6.1.1.1
Content Date	(0008,0023)	2C	Used / Generated: current date
Content Time	(0008,0033)	2C	Used / Generated: current time
Image Type	(0008,0008)	3	Used / Generated. See 3.4.9.1.1.1.
Acquisition Number	(0020,0012)	3	Used / Copied if unique across source series, set empty otherwise
Acquisition Date	(0008,0022)	3	Used / Copied: the oldest acquisition date if different
Acquisition Time	(0008,0032)	3	Used / Copied: the oldest acquisition time if different
Referenced Image Sequence	(0008,1140)	3	Ignored / Removed
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Derivation Description	(0008,2111)	3	Ignored / Removed. See 3.4.6.1.1.2
Source Image Sequence	(0008,2112)	3	Ignored / Removed. See 3.4.6.1.1.2
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Images in Acquisition	(0020,1002)	3	Ignored / Removed
Image Comments	(0020,4000)	3	Ignored / Removed
Quality Control Image	(0028,0300)	3	Ignored / Removed
Burned In Annotations	(0028,0301)	3	Ignored / Generated
Lossy Image Compression	(0028,2110)	3	Used / Copied See 3.4.6.1.1.3.
Lossy Image Compression Ratio	(0028,2112)	3	Ignored / Copied

3.4.6.1.1 General Image Attribute Descriptions

3.4.6.1.1.1 Patient Orientation

Since the coordinates of the image are always written, this field is never used and not present in the generated images.

3.4.6.1.1.2 Derivation Description and Source Image Sequence

These tags are not yet used.

3.4.6.1.1.3 Lossy Image Compression

Volume Viewer does not use compression when saving images, nor it decompresses images. So this field is just copied.

3.4.6.2 Image Plane Module

This section specifies the Attributes which define the transmitted pixel array of a two dimensional image plane.

**TABLE 3.4-8
 IMAGE PLANE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Pixel Spacing	(0028,0030)	1	Mandatory / Generated
Image Orientation (Patient)	(0020,0037)	1	Mandatory / Generated
Image Position (Patient)	(0020,0032)	1	Mandatory / Generated See 3.4.6.2.1
Slice Thickness	(0018,0050)	2	Used / Generated
Slice Location	(0020,1041)	3	Ignored / Generated

3.4.6.2.1 Image Position

The Image Position is treated as the position of the upper left hand corner of the first pixel of the image at the middle of the slice for images coming from GE (Manufacturer is “GE MEDICAL SYSTEMS”), except if the Manufacturer Model Name is “RT Innovation”.

Otherwise, the Image Position is treated as the position of the center of the first pixel of the image at the middle of the slice.

3.4.6.3 Image Pixel Module

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

**TABLE 3.4-9
 IMAGE PIXEL MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Mandatory (expect “1”) / Generated “1”
Photometric Interpretation	(0028,0004)	1	Mandatory (expect “MONOCHROME2” and reject “MONOCHROME1”) / Generated “MONOCHROME2” or “MONOCHROME1”
Rows	(0028,0010)	1	Mandatory (expect from 256 to 1024) / Generated (256, 512, 1024)
Columns	(0028,0011)	1	Mandatory (expect from 256 to 1024) / Generated (256, 512, 1024)
Bits Allocated	(0028,0100)	1	Ignored (expect “16”) / Generated “16”
Bits Stored	(0028,0101)	1	Mandatory (expect “16”) / Generated “16”
High Bit	(0028,0102)	1	Ignored (expect “15”) / Generated “15”
Pixel Representation	(0028,0103)	1	Ignored (expect “1”) / Generated “1”
Pixel Data	(7FE0,0010)	1	
Planar Configuration	(0028,0006)	1C	Ignored / Removed (see Samples per Pixels)

Pixel Aspect Ratio	(0028,0034)	1C	Ignored / Removed (Image Plane is mandatory for CT)
Smallest Image Pixel Value	(0028,0106)	3	Ignored / Removed
Largest Image Pixel Value	(0028,0107)	3	Ignored / Removed
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	Ignored / Removed
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Ignored / Removed
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Ignored / Removed
Red Palette Color Lookup Table Data	(0028,1201)	1C	Ignored / Removed
Green Palette Color Lookup Table Data	(0028,1202)	1C	Ignored / Removed
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Ignored / Removed

3.4.6.4 Contrast/Bolus Module

This section specifies the Attributes that describe the contrast / bolus used in the acquisition of the Image.

3.4.6.4.1 Contrast annotation mark (+c)

The “+c” annotation appears if a contrast agent is present (0018,0010) in the data set and the Contrast/Bolus Route contains “IV” or something different than “Oral”. This means that if the Contrast/Bolus Route contains “Oral”, the “+c” annotation will not appear.

**TABLE 3.4-10
 CONTRAST/BOLUS MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Contrast/Bolus Agent	(0018,0010)	2	Used / Copied
Contrast/Bolus Agent Sequence	(0018,0012)	3	Ignored / Copied
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	3	
Contrast/Bolus Route	(0018,1040)	3	Used / Copied
Contrast/Bolus Administration Route Sequence	(0018,0014)	3	Ignored / Copied
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	3	
>Additional Drug Sequence	(0018,002A)	3	
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	3	
Contrast/Bolus Volume	(0018,1041)	3	Ignored / Copied
Contrast/Bolus Start Time	(0018,1042)	3	Ignored / Copied
Contrast/Bolus Stop Time	(0018,1043)	3	Ignored / Copied
Contrast/Bolus Total Dose	(0018,1044)	3	Ignored / Copied
Contrast Flow Rate(s)	(0018,1046)	3	Ignored / Copied
Contrast Flow Duration(s)	(0018,1047)	3	Ignored / Copied
Contrast/Bolus Ingredient	(0018,1048)	3	Ignored / Copied
Contrast/Bolus Ingredient Concentration	(0018,1049)	3	Ignored / Copied

3.4.7 Common Lookup Table Modules

3.4.7.1 VOI LUT module

This section specifies the Attributes that describe the VOI LUT.

**TABLE 3.4-11
 VOI LUT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
VOI LUT Sequence	(0028,3010)	3	Ignored / Removed
>LUT Descriptor	(0028,3002)	1C	
>LUT Explanation	(0028,3003)	3	
>LUT Data	(0028,3006)	1C	
Window Center	(0028,1050)	1C	Used at load (ignored if multiple values and defaults to an automatic W/L is computed on the whole series). At save, a value generated from the current value used in the saved view.

Window Width	(0028,1051)	1C	Used at load (ignored if multiple values and defaults to an automatic W/L is computed on the whole series). At save, a value generated from the current value used in the saved view.
Window Center & Width Explanation	(0028,1055)	3	Ignored / Removed

3.4.8 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

3.4.8.1 SOP Common Module

This section defines the Attributes, which are required for proper functioning and identification of the associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD.

**TABLE 3.4-12
 SOP COMMON MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Used / Generated: "1.2.840.10008.5.1.4.1.1.2"
SOP Instance UID	(0008,0018)	1	Used / Generated To generate a unique ID, the process concatenates the Implementation Root UID, serial number (computed from the MAC address), the process ID number, the timestamp and a counter incremented each time.
Specific Character Set	(0008,0005)	1C	Used / Copied Support ISO IR 100, ISO IR 192 and GB18030 character set Note: Character set cannot be changed in the generated derived images.
Instance Creation Date	(0008,0012)	3	Ignored / Generated: current date
Instance Creation Time	(0008,0013)	3	Ignored / Generated: current time
Instance Creator UID	(0008,0014)	3	Ignored / Removed
Time zone Offset From UTC	(0008,0201)	3	Ignored / Removed
Instance Number	(0020,0013)	3	Used / Generated
SOP Instance Status	(0100,0410)	3	Ignored / Removed
SOP Authorization Date and Time	(0100,0420)	3	Ignored / Removed
SOP Authorization Comment	(0100,0414)	3	Ignored / Removed
Authorization Equipment Certification Number	(0100,0416)	3	Ignored / Removed
Contributing Equipment Sequence	(0018,A001)	3	Ignored / Generated
>Purpose of Reference Code Sequence	(0040,A170)	1	Ignored / Generated Following triplets are used when generating: (109101, DCS, Acquisition Equipment) (109102, DCS, Processing Equipment)
>>Code Value	(0008,0100)	1C	Ignored / Generated

>>Code Scheme Designator	(0008,0102)	1C	Ignored / Generated
>>Code Meaning	(0008,0104)	1C	Ignored / Generated
>Manufacturer	(0008,0070)	1	Ignored / Generated
>Institution Name	(0008,0080)	3	Ignored / Generated
>Institution Address	(0008,0081)	3	Ignored / Generated
>Station Name	(0008,1010)	3	Ignored / Generated
>Manufacturer's Model Name	(0008,1090)	3	Ignored / Generated
>Device Serial Number	(0018,1000)	3	Ignored / Generated
>Software Versions	(0018,1020)	3	Ignored / Generated

3.4.9 CT Modules

This Section describes CT Series, Equipment, and Image Modules. These Modules contain Attributes that are specific to CT Image IOD.

3.4.9.1 CT Image Module

The table in this Section contains IOD Attributes that describe CT images.

TABLE 3.4-13
CT IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	See 3.4.9.1.1.1.
Samples per Pixel	(0028,0002)	1	Mandatory (Shall be 1).
Photometric Interpretation	(0028,0004)	1	Mandatory (expect “MONOCHROME2” and reject “MONOCHROME1”) / Generated “MONOCHROME2” or “MONOCHROME1”
Bits Allocated	(0028,0100)	1	Shall be 16.
Bits Stored	(0028,0101)	1	Mandatory (expect 16) / Generated (write 16)
High Bit	(0028,0102)	1	Ignored (expect 15) / Generated (write 15)
Rescale Intercept	(0028, 1052)	1	Used (default to –1024 if not found) / Generated
Rescale Slope	(0028,1053)	1	Used / Generated (write 1)
Rescale Type	(0028,1054)	1C	Used / Copied or Generated in case of GSI VV.
KVP	(0018,0060)	2	Used / Copied
Acquisition Number	(0020,0012)	2	Ignored / Copied if unique across source series, set empty otherwise
Scan Options	(0018,0022)	3	Used / Copied
Data Collection Diameter	(0018,0090)	3	Used / Copied
Reconstruction Diameter	(0018,1100)	3	Ignored
Distance Source to Detector	(0018,1110)	3	Ignored / Copied
Distance Source to Patient	(0018,1111)	3	Ignored / Copied
Gantry/Detector Tilt	(0018,1120)	3	Used / Removed
Table Height	(0018,1130)	3	Ignored / Copied
Rotation Direction	(0018,1140)	3	Ignored / Copied
Exposure Time	(0018,1150)	3	Used / Copied
X-ray Tube Current	(0018,1151)	3	Used / Copied
Exposure	(0018,1152)	3	Ignored / Copied
Exposure in μ As	(0018,1152)	3	Ignored / Copied
Filter Type	(0018,1160)	3	Ignored / Copied
Generator Power	(0018,1170)	3	Ignored / Copied
Focal Spot	(0018,1190)	3	Ignored / Copied
Convolution Kernel	(0018,1210)	3	Used / Copied

3.4.9.1.1 CT Image Attribute Descriptions

3.4.9.1.1.1 Image Type

When generating images, here are the values that may be set.

Value 1 has the following value:

- DERIVED identifies a Derived Image

Value 2 has the following value:

- SECONDARY identifies a Secondary Image

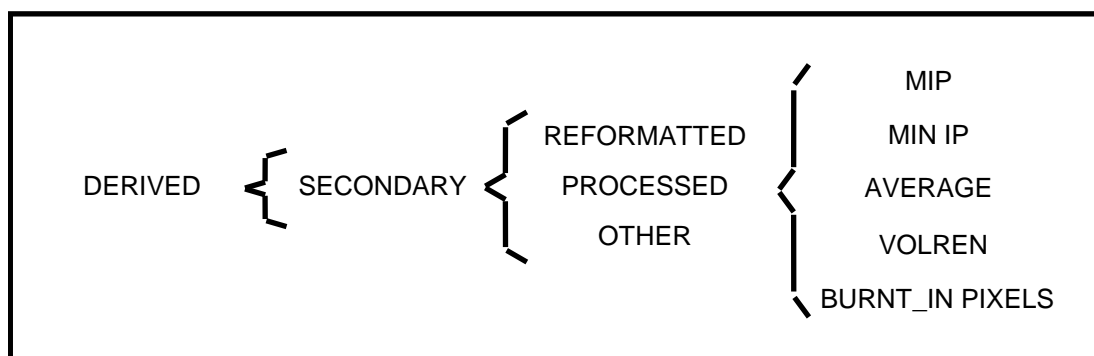
Value 3 has the following value:

- REFORMATTED identifies a Reformatted Image
- PROCESSED identifies a functional image
- OTHER

Value 4, if defined, indicates that the image has a slice thickness superior to the pixel size; the rendering algorithm over the thickness can have the following values:

- MIP identifies a thick Maximum Intensity Projection Image
- MIN IP identifies a thick Minimum Intensity Projection Image
- AVERAGE identifies a thick Average Image
- VOLREN identifies a thick Volume Rendered Image
- BURNT_IN PIXELS identifies burnt pixels images

ILLUSTRATION 3.4-1
CT IMAGE TYPE DECISION TREE



When reading images, all values are accepted except if Value 3 is:

- PJN or PROJECTION IMAGE collapsed images are not suitable for 3D
- LOCALIZER are 2D images so are rejected

3.5 PRIVATE DATA

The following private elements are used.

TABLE 3.5-14
 PRIVATE ADVANTAGE ATTRIBUTES

Attribute Name	Tag	VR	VM	Type	Attribute Description
Private Creator	(0019, 00xx)	LO	1	3	GEMS_ACQU_01: Used / Copied
Table Speed	(0019, xx23)	DS	1	3	Used / Copied
Midsacan Time	(0019, xx24)	DS	1	3	Used / Removed
Gantry Velocity	(0019, xx27)	DS	1	3	Used / Copied
SFOV Type	(0019, xx39)	SS	1	3	Used / Copied
Dependent on #views processed	(0019, xx6A)	SS	1	3	Used/Copied
Private Creator	(0031, 00xx)	LO	1	3	GEMS_3D_XA_01: Used / Copied
Structure of Interest	(0031, xx01)	CS	1	3	Used/Copied
Missing Frame Status	(0031, xx02)	CS	1	3	Used/Copied
Anatomy	(0031, xx03)	CS	1	3	Used/Copied
Volume Substracted Mode	(0031, xx04)	CS	1	3	Used/Copied
Modality	(0031, xx07)	CS	1	3	Used/Copied (value = "XA")
Pos Calibration Date	(0031, xx09)	DA	1	3	Used/Copied
Pos Calibration Status	(0031, xx0B)	CS	1	3	Used/Copied
Spin Phase of Volume	(0031,xx20)	CS	1	3	Used / Copied
Private Creator	(0043, 00xx)	LO	1	3	GEMS_PARM_01: Used / Copied
Pitch Ratio	(0043, xx27)	SH	1	3	Used / Copied
Private Scan Options	(0043, xx2B)	SS	1	3	Used/Copied
motCorr	(0043, xx65)	US	1	3	Used/Copied
IBOCorr	(0043, xx67)	US	1	3	Used/Copied
Private Creator	(0045, 00xx)	LO	1	3	GEMS_HELIOS_01: Used / Copied
Sigma Mode	(0045, xx13)	SS	1	3	Ignored / Copied
Ibone Flag	(0045, xx21)	SS	1	3	Used / Copied
Peris Flag	(0045, xx22)	SS	1	3	Used / Copied
Cardiac Recon Algo	(0045, xx30)	CS	1	3	Used / Removed
Average Heart Rate	(0045, xx31)	CS	1	3	Used / Generated
Temporal Resolution	(0045, xx32)	FL	1	3	Used / Removed
Cardiac Phase Number	(0045, xx33)	CS	1	3	Used / Copied
Noise Reduction Image Filter Description	(0045, xx33)	LO	1	3	Used / Copied
Actual Rpeak Fixed Time Delay	(0045, xx3F)	CS	1	3	Used / Copied
Private Group Creator	(0047, 00xx)	LO	1	3	GEMS_VXTL_USERDATA_01: Used / Generated
Private User Data	(0047, xx11)	LT	1	3	Used / Generated. If contains "Registered series" the saved volume has been moved due to registration.
Private Group Creator	(0049, 00xx)	LO	1	3	GEMS_CT_CARDIAC_001: Used/Copied

EkgGatingType	(0049, xx16)	SH	1	3	Used/Ignored
Temporal Alg	(0049, xx22)	CS	1	3	Used/ Ignored Used by CXP and indicates (if value is set to 1) if the data is a Temporal input dataset
Phase Location	(0049, xx23)	CS	1	3	Used/Ignored Used by CXP. Indicates the logical phase location "LEFT", "TARGET" or "RIGHT"
PreBlended Cycle 1	(0049, xx24)	OW	1	3	Used/Ignored Used by CXP for SnapShot Pulse Data. It contains the Pixel Data from an overlapping region acquired later in time
PreBlended Cycle 2	(0049, xx25)	OW	1	3	Used/Ignored Used by CXP for SnapShot Pulse Data. It contains the Pixel Data from an overlapping region acquired earlier in time
Private creator	(0051,00xx)	LO	1	3	"GEMS_FUNCTOOL_01"
Group name	(0051,xx01)	LO	1	3	Used / Generated: Functional analysis applications classify their functions into groups of functions like Perfusion, Standard, and General... VV use only "NO GROUP"
Function name	(0051,xx02)	LO	1	3	Used / Generated: Name of the function used to get the current functional map
Bias	(0051,xx03)	SL	1	3	Used / Generated: Bias to be applied to data, i.e. Real value = (data + bias) * scale
Scale	(0051,xx04)	FL	1	3	Used / Generated: Scale to be applied to data, i.e. Real value = (data + bias) * scale
Parameter count	(0051,xx05)	SL	1	3	Used / Generated: Length in characters of the parameter string element 0x05
Parameters	(0051,xx06)	LT	1	3	Used / Generated: String containing functional parameter level, name and value stored respectively delimited by "\n" and are stored in the order of their declaration in the functional protocol.
Version	(0051,xx07)	LO	1	3	Used / Generated: String containing the software version (for example, 2.5.30)
Color ramp index	(0051,xx08)	SL	1	3	Used / Generated: Color ramp index (0=rainbow, 1=Hot iron...)
Window width	(0051,xx09)	SL	1	3	Used / Generated: Window width of the view from which the functional map has been saved
Window level	(0051,xx0A)	SL	1	3	Used / Generated: Window level of the view from which the functional map has been saved
BValue	(0051,xx0B)	SL	1	3	Ignored/Removed
Wizard state data size	(0051,xx0C)	SL	1	3	Ignored/Removed: Bytes size of the wizard state data saved in binary format.
Wizard State	(0051,xx0D)	OB	1	3	Ignored/Removed: Binary data containing description of wizard state.

Hidden	(0051,xx0E)	SL	1	3	Used / Generated: Boolean tag setup to true when functional map shall be hidden to user
Private Creator	(0053,00xx)	LO	1	3	GEHC_CT_ADVAPP_001: Used / Copied
Type of Shuttle Acquisition	(0053,xx20)	IS	1	3	Used / Copied
ASIR Information	(0053,xx40)	SH	1	3	Used / Copied
High Resolution Mode	(0053,xx61)	SH	1	3	Used / Copied
Image Position Patient Setting	(0053,xx63)	CS	1	3	Used / Copied
Multi Energy Image Type	(0053,xx73)	LO	1	3	Ignored / Removed
Monochromatic Energy	(0053,xx75)	DS	1	3	Ignored / Removed
MultiEnergyNoiseReduced	(0053, xx7B)	SH	1	3	Ignored / Removed
MultiEnergyNoiseReducedMethod	(0053, xx7C)	LO	1	3	Ignored / Removed
Sub Optimal IQ String	(0053,xx7D)	LO	1	3	Ignored / Removed
Annotation mA	(0053,xx83)	DS	1	3	Ignored / Removed
Multi Energy KV Annot Name	(0053,xx88)	SH	1	3	Ignored / Removed
Multi Energy KV Unit Label	(0053,xx89)	SH	1	3	Ignored / Removed
Material Type #1	(0053,xx8A)	LO	1	3	Ignored / Removed
Material Type #2	(0053,xx8B)	LO	1	3	Ignored / Removed
GSI Scan Mode Preset	(0053,xx8C)	LO	1	3	Ignored / Removed
MonoWindowLow	(0053, xx8D)	IS	2	3	Ignored / Removed
MonoWindowHigh	(0053, xx8E)	IS	2	3	Ignored / Removed
MD1 Attenuation curve	(0053, xx8F)	FL	1-n	3	Ignored / Removed
MD1 intercept	(0053,xx92)	DS	1	3	Ignored / Removed
MD1 slope	(0053,xx93)	DS	1	3	Ignored / Removed
MD1 support data	(0053,xx95)	OW	1	3	Ignored / Removed
MD2 support data	(0053,xx96)	OW	1	3	Ignored / Removed
NM1 data	(0053,xx97)	OW	1	3	Ignored / Removed
MD2 intercept	(0053,xx98)	DS	1	3	Ignored / Removed
MD2 slope	(0053,xx99)	DS	1	3	Ignored / Removed
NM2 data	(0053,xx9A)	OW	1	3	Ignored / Removed
MD2 Attenuation curve	(0053,xx9B)	FL	1-n	3	Ignored/Removed
GSI Data Version	(0053,xx9C)	SH	1	3	Ignored / Removed
MARs Annotation	(0053,xx9D)	LO	1	3	Ignored / Copied
Private Group Creator	(0059, 00xx)	LO	1	3	GEMS_VXTL_REGISTRATION_01: Used / Generated
Deformed Flag	(0059, xx00)	IS	1	3	Used / Generated. Generated if the saved volume is geometrically deformed regarding its original data, hence distance, area, volume or angle measurements are invalid.
Private Group Creator	(0059, 00xx)	LO	1	3	GEMS_VXTL_TEMPORAL_01: Used/Copied. Used in CXP and indicates if the data are Temporal compatible.

Temporal Processed	(0059, xx01)	CS	1	3	Used/Generated. Used by CXP and contains the type of motion correction algorithm applied
Temporal Algo Version	(0059, xx02)	LO	1-n	3	Ignored/Generated. Used by CXP and contains the version of motion correction algorithm applied
Temporal Algo Status	(0059, xx03)	CS	1	3	Used/Generated Used by CXP. Indicates if manual tracking is required prior to processing

4. SC INFORMATION OBJECT IMPLEMENTATION

4.1 INTRODUCTION

This section specifies the use of the DICOM SC Image IOD to represent the information included in SC images produced and read by this implementation. Corresponding attributes are conveyed using the module construct. The contents of this section are:

4.2 - IOD Entity-Relationship Model

4.3 - IOD Module Table

4.4 - IOD Module Definition

SC Images are also used as a vector to store the internal states of the Volume Viewer Applications, called Save State. This type of object can be read or written, but only the private fields are used in that case, as the other fields are only used to have the object stored in the same Patient. Actual data are retrieved from the original images that the Save State points to. The third value of Image Type is then "VXTL STATE". See section 4.5.1 for a description of these private tags.

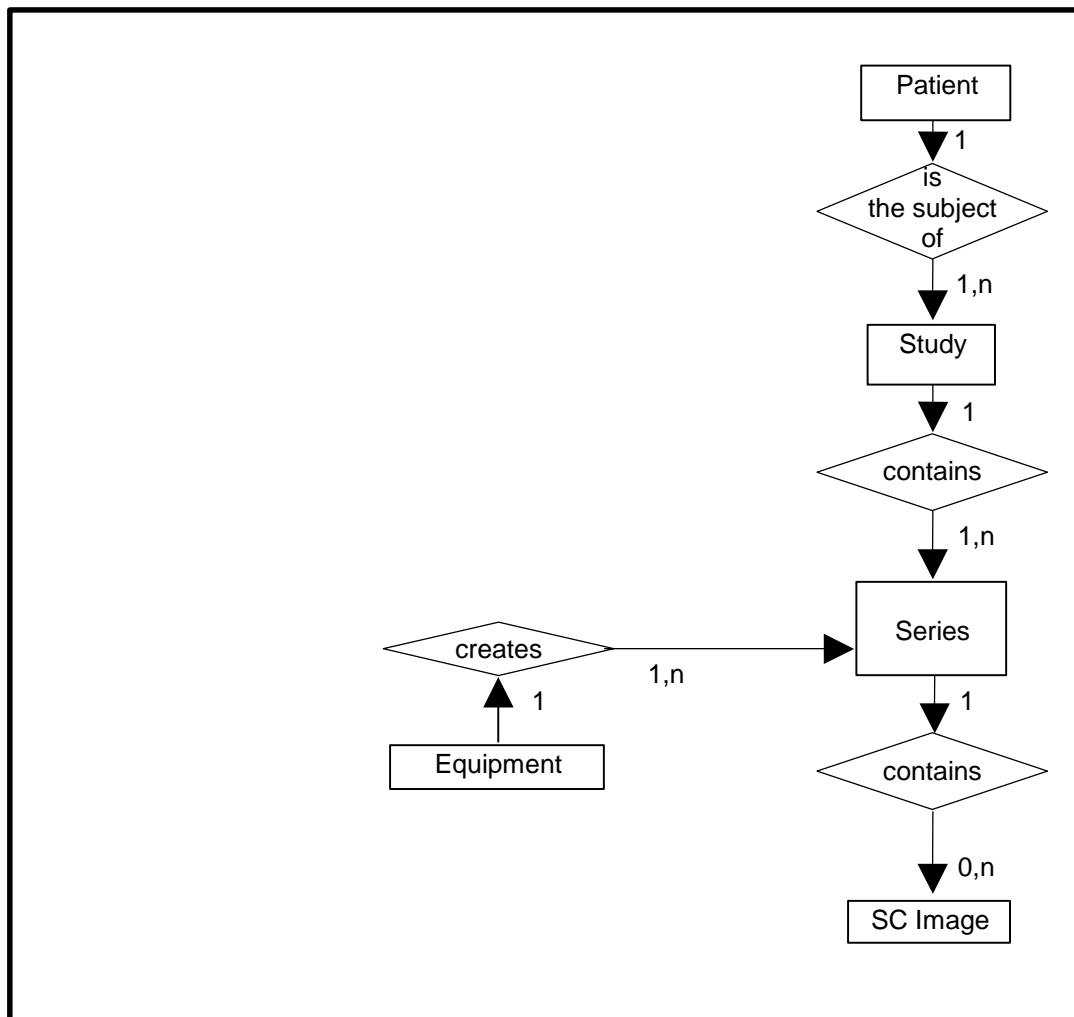
4.2 SC ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the SC Image interoperability schema is shown in Illustration 4.2-1. In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box.
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to n Images per Series, but the Patient to Study relationship has 1 Patient for each Study (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 4.2-1
SC IMAGE ENTITY RELATIONSHIP DIAGRAM



4.2.1 ENTITY DESCRIPTIONS

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

4.2.2 Volume Viewer Mapping of DICOM entities

TABLE 4.2-1
MAPPING OF DICOM ENTITIES TO VOLUME VIEWER ENTITIES

DICOM	Volume Viewer Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image

4.3 IOD MODULE TABLE

Within an entity of the DICOM SC IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 4.3-1 identifies the defined modules within the entities which comprise the DICOM SC IOD. Modules are identified by Module Name.

See DICOM Part 3 for a complete definition of the entities, modules, and attributes.

**TABLE 4.3-1
 SC IMAGE IOD MODULES**

Entity Name	Module Name	Reference
Patient	Patient	4.4.1.1
	Clinical Trial Subject	Not used / Not copied
Study	General Study	4.4.2.1
	Patient Study	4.4.2.2
	Clinical Trial Study	Not used / Not copied
Series	General Series	4.4.3.1
	Clinical Trial Series	Not used / Not copied
Equipment	General Equipment	4.4.4.1
	SC Equipment	4.4.8.1
Image	General Image	4.4.5.1
	Image Pixel	4.4.5.2
	Device	Not used / Not copied
	Specimen	Not used / Not copied
	SC Image	4.4.8.2
	Overlay Plane	Not used / Not copied
	Modality LUT	4.4.6.2
	VOI LUT	4.4.6.1
	SOP Common	4.4.7.1

4.4 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. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

If an element is not listed below, it means that it will be ignored at reading and not copied at writing.

4.4.1 Common Patient Entity Modules

4.4.1.1 Patient Module

This section specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

**TABLE 4.4-1
 PATIENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Used / Copied
Patient ID	(0010,0020)	2	Used / Copied
Issuer of Patient ID	(0010,0021)	3	Ignored / Copied
Patient's Birth Date	(0010,0030)	2	Used / Copied
Patient's Sex	(0010,0040)	2	Used / Copied
Referenced Patient Sequence	(0008,1120)	3	Ignored / Copied
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Patient's Birth Time	(0010,0032)	3	Ignored / Copied
Other Patient IDs	(0010,1000)	3	Ignored / Copied
Other Patient Names	(0010,1001)	3	Ignored / Copied
Other Patient IDs Sequence	(0010,1002)	3	Ignored / Copied
Ethnic Group	(0010,2160)	3	Ignored / Copied
Patient Comments	(0010,4000)	3	Ignored / Copied

4.4.2 Common Study Entity Modules

The following Study IE Modules are common to all Composite Image IODs which reference the Study IE. These Modules contain Attributes of the patient and study that are needed for diagnostic interpretation of the image.

4.4.2.1 General Study Module

This section specifies the Attributes which describe and identify the Study performed upon the Patient.

**TABLE 4.4-2
 GENERAL STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Mandatory / Copied
Study Date	(0008,0020)	2	Used / Copied
Study Time	(0008,0030)	2	Used / Copied
Referring Physician's Name	(0008,0090)	2	Used / Copied
Study ID	(0020,0010)	2	Used / Copied
Accession Number	(0008,0050)	2	Used / Copied
Study Description	(0008,1030)	3	Used / Copied
Physician(s) of Record	(0008,1048)	3	Ignored / Copied
Name of Physician(s) Reading Study	(0008,1060)	3	Ignored / Copied
Referenced Study Sequence	(0008,1110)	3	Ignored / Copied
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Procedure Code Sequence	(0008,1032)	3	Ignored / Copied
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	1C	

4.4.2.2 Patient Study Module

This section defines Attributes that provide information about the Patient at the time the Study was performed.

**TABLE 4.4-3
 PATIENT STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	Ignored / Copied
Patient's Age	(0010,1010)	3	Used / Copied
Patient's Size	(0010,1020)	3	Ignored / Copied
Patient's Weight	(0010,1030)	3	Used / Copied
Occupation	(0010,2180)	3	Ignored / Copied
Additional Patient's History	(0010,21B0)	3	Used / Copied

4.4.3 Common Series Entity Modules

The following Series IE Modules are common to all Composite Image IODs which reference the Series IE.

4.4.3.1 General Series Module

This section specifies the Attributes which identify and describe general information about the Series within a Study.

TABLE 4.4-4
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Used / Copied Defined Terms: CT = Computed Tomography
Series Instance UID	(0020,000E)	1	Mandatory / Generated
Series Number	(0020,0011)	2	Used / Generated
Laterality	(0020,0060)	2C	Ignored / Generated: "" (empty as the software cannot know semantically the laterality)
Series Date	(0008,0021)	3	Used / Generated: current date
Series Time	(0008,0031)	3	Used / Generated: current time
Performing Physicians' Name	(0008,1050)	3	Used / Copied
Protocol Name	(0018,1030)	3	Used / Removed
Series Description	(0008,103E)	3	Used / Generated (see section 4.5)
Operators' Name	(0008,1070)	3	Used / Generated The generated value is the current user's full name or the value of GECOS environment variable or if both were empty then it is the operator name from the original image.
Referenced Performed Procedure Step Sequence	(0008,1111)	3	Ignored / Removed
Body Part Examined	(0018,0015)	3	Ignored / Copied
Patient Position	(0018,5100)	2C	Used / Copied for CT 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
Smallest Pixel Value in Series	(0028,0108)	3	Ignored / Removed
Largest Pixel Value in Series	(0028,0109)	3	Ignored / Removed
Request Attributes Sequence	(0040,0275)	3	Ignored / Copied (Entire sequence copied)
>Requested Procedure ID	(0040,1001)	1C	
>Accession Number	(0008,0050)	3	

>Issuer of Accession Number Sequence	(0008,0051)	3	
>Study Instance UID	(0020,000D)	3	
>Referenced Study Sequence	(0008,1110)	3	
>Requested Procedure Description	(0032,1060)	3	
>Requested Procedure Code Sequence	(0032,1064)	3	
>Reason for the Requested Procedure	(0040,1002)	3	
>Reason for Requested Procedure Code Sequence	(0040,100A)	3	
>Scheduled Procedure Step ID	(0040,0009)	1C	
>Scheduled Procedure Step Description	(0040,0007)	3	
>Scheduled Protocol Code Sequence	(0040,0008)	3	
Performed Procedure Step ID	(0040,0253)	3	Ignored / Removed
Performed Procedure Step Start Date	(0040,0244)	3	Ignored / Removed
Performed Procedure Step Start Time	(0040,0245)	3	Ignored / Removed
Performed Procedure Step Description	(0040,0254)	3	Ignored / Removed
Performed Protocol Code Sequence	(0040,0260)	3	Ignored / Removed

4.4.4 Common Equipment Entity Modules

The following Equipment IE Module is common to all Composite Image IODs which reference the Equipment IE.

4.4.4.1 General Equipment Module

This section specifies the Attributes which identify and describe the piece of equipment which produced a Series of Images.

**TABLE 4.4-5
 GENERAL EQUIPMENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Used / Copied
Institution Name	(0008,0080)	3	Used / Copied
Institution Address	(0008,0081)	3	Ignored / Copied
Station Name	(0008,1010)	3	Used / Copied
Institutional Department Name	(0008,1040)	3	Ignored / Copied
Manufacturer's Model Name	(0008,1090)	3	Used / Copied
Device Serial Number	(0018,1000)	3	Ignored / Copied
Software Versions	(0018,1020)	3	Ignored / Copied
Spatial Resolution	(0018,1050)	3	Ignored / Removed
Date of Last Calibration	(0018,1200)	3	Ignored / Copied
Time of Last Calibration	(0018,1201)	3	Ignored / Copied
Pixel Padding Value	(0028,0120)	3	Ignored / Copied

4.4.5 Common Image Entity Modules

The following Image IE Modules are common to all Composite Image IODs which reference the Image IE.

4.4.5.1 General Image Module

This section specifies the Attributes which identify and describe an image within a particular series.

**TABLE 4.4-6
 GENERAL IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient Orientation	(0020,0020)	2C	Ignored / Generated. See 4.4.5.1.1.1
Content Date	(0008,0023)	2C	Used / Generated, empty "". See 4.4.5.1.1.2
Content Time	(0008,0033)	2C	Used / Generated, empty "". See 4.4.5.1.1.2
Image Type	(0008,0008)	3	Used / Generated. See 4.4.5.1.1.3
Acquisition Number	(0020,0012)	3	Ignored / Copied
Acquisition Date	(0008,0022)	3	Used / Copied
Acquisition Time	(0008,0032)	3	Used / Copied
Referenced Image Sequence	(0008,1140)	3	Ignored / Copied
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Derivation Description	(0008,2111)	3	Ignored / Removed. See 4.4.5.1.1.4
Source Image Sequence	(0008,2112)	3	Used / Removed. See 4.4.5.1.1.4 and 4.5
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Images in Acquisition	(0020,1002)	3	Ignored / Removed
Image Comments	(0020,4000)	3	Ignored / Removed
Quality Control Image	(0028,0300)	3	Ignored / Removed
Burned In Annotations	(0028,0301)	3	Ignored / Removed
Lossy Image Compression Ratio	(0028,2112)	3	Used / Copied. See 4.4.5.1.1.5
Lossy Image Compression	(0028,2110)	3	Ignored / Copied

4.4.5.1.1 General Image Attribute Descriptions

4.4.5.1.1.1 Patient Orientation

Since Secondary Captures do not include the patient orientation, this field must be present. This field will be filled for 2D reformatted and 3D views, and will be empty (zero length) for other views.

The precision depth could be up to 3 characters, for example "LAF\FAR ", but can be less if the view is oriented along a baseline, like "L\FA" or "L\F ".

4.4.5.1.1.2 Content Date and Time

When Volume Viewer is saving a secondary capture:

- the condition to set these tags should be used if the image are temporally related, but is not clearly met for reformatted images ; anyway, since most AE will expect this tag to be present, we have decided to set this tag
- Volume Viewer might set this content date to the time the reformatted image is created, but then might move away from the purpose of this date which is linked to the acquisition
- Volume Viewer might set it to the original content date, but it does not make sense for reformatted images which are derived from several images

Taken in consideration the reasons above, Volume Viewer will set an empty tag to avoid possible misinterpretation of some applications using this tag as creation date and time of the secondary captured image or the original scan time.

4.4.5.1.1.3 Image Type

When generating images, here are the values that may be sent.

Value 1 has the following value:

- DERIVED identifies a Derived Image

Value 2 has the following value:

- SECONDARY identifies a Secondary Image

Value 3 has the following value:

- SCREEN SAVE identifies a screen capture or a generated image.
- VXTL STATE identifies a Voxtool state SC: private data of the screen save holds information to restore the state of the application

Value 4, if defined, indicates the rendering algorithm of the view, and can have the following values:

- MIP identifies a Maximum Intensity Projection Image
- MIN IP identifies a Minimum Intensity Projection Image
- AVERAGE identifies an Average Image
- VOLREN identifies a Volume Rendered Image
- SURFACE identifies a surface shaded Image
- RAYSUM identifies a RaySum Image
- INTEGRAL identifies an Integral Image

When reading images, only those with Value 3 equal to VXTL STATE and images with Secondary Capture Device Manufacturer's Model Name (0018,1018) tag containing the string "Volume Viewer" or "FILMER" are accepted.

4.4.5.1.1.4 Derivation Description and Source Image Sequence

The Derivation Description tag is not used.

The Source Image Sequence is used only when the secondary capture comes from the Direct3D / Volume Auto View software. In this case, the Series Description contains "Direct3D State" and the actual Direct3D state is stored in the private group 0x0047 "GEMS_3DSTATE_001" (see the private dictionary at section 4.5). This state contains all the parameters useful to reconstruct a Volume Rendered view similar to the one shown in this secondary capture. The Source Image Sequence addresses the list of the original images used.

4.4.5.1.1.5 Lossy Image Compression

Volume Viewer does not use compression when saving images, nor it decompresses images. So this field is just copied.

4.4.5.2 Image Pixel Module

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

TABLE 4.4-7
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Mandatory / Generated <ul style="list-style-type: none"> • “1” for greyscale images • “3” for color images
Photometric Interpretation	(0028,0004)	1	Mandatory / Generated <ul style="list-style-type: none"> • “MONOCHROME2” or “MONOCHROME1” for greyscale images • “RGB” for color images
Rows	(0028,0010)	1	Mandatory / Generated
Columns	(0028,0011)	1	Mandatory / Generated
Bits Allocated	(0028,0100)	1	Ignored / Generated <ul style="list-style-type: none"> • “16” for greyscale images • “8” for color images
Bits Stored	(0028,0101)	1	Mandatory / Generated <ul style="list-style-type: none"> • “16” for greyscale images • “8” for color images
High Bit	(0028,0102)	1	Ignored / Generated <ul style="list-style-type: none"> • “15” for greyscale images • “7” for color images
Pixel Representation	(0028,0103)	1	Ignored / Generated <ul style="list-style-type: none"> • “1” for greyscale images • “0” for color images
Pixel Data	(7FE0,0010)	1	
Planar Configuration	(0028,0006)	1C	Ignored / Generated <ul style="list-style-type: none"> • Removed for greyscale images • “0” for color images
Pixel Aspect Ratio	(0028,0034)	1C	Ignored / Removed
Smallest Image Pixel Value	(0028,0106)	3	Ignored / Removed
Largest Image Pixel Value	(0028,0107)	3	Ignored / Removed
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	Ignored / Removed

Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Ignored / Removed
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Ignored / Removed
Red Palette Color Lookup Table Data	(0028,1201)	1C	Ignored / Removed
Green Palette Color Lookup Table Data	(0028,1202)	1C	Ignored / Removed
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Ignored / Removed

4.4.6 Common Lookup Table Modules

4.4.6.1 VOI LUT module

This section specifies the Attributes that describe the VOI LUT.

This module is not saved for color (“RGB”) images.

**TABLE 4.4-8
 VOI LUT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
VOI LUT Sequence	(0028,3010)	3	Ignored / Removed
>LUT Descriptor	(0028,3002)	1C	
>LUT Explanation	(0028,3003)	3	
>LUT Data	(0028,3006)	1C	
Window Center	(0028,1050)	3	Used / Generated (value generated from the current value used in the saved view)
Window Width	(0028,1051)	1C	Used / Generated (value generated from the current value used in the saved view)
Window Center & Width Explanation	(0028,1055)	3	Ignored / Removed

4.4.6.2 Modality LUT module

This section specifies the Attributes that describe the Modality LUT.

This module is not saved for color (“RGB”) images. It is only saved for CT

**TABLE 4.4-9
 MODALITY LUT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Modality LUT Sequence	(0028,3000)	3	Ignored / Removed
>LUT Descriptor	(0028,3002)	1C	
>LUT Explanation	(0028,3003)	3	
>Modality LUT Type	(0028,3004)	1C	
>LUT Data	(0028,3006)	1C	
Rescale Intercept	(0028,1052)	1C	Used / Generated
Rescale Slope	(0028,1053)	1C	Ignored / Generated “1”
Rescale Type	(0028,1054)	1C	Used / Generated <ul style="list-style-type: none"> • For example “mg/cm³, Z” for MD • “HU” for other CT • “US” for other modalities

4.4.7 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

4.4.7.1 SOP Common Module

This section defines the Attributes which are required for proper functioning and identification of the associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD.

TABLE 4.4-10
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Used / Generated: "1.2.840.10008.5.1.4.1.1.7"
SOP Instance UID	(0008,0018)	1	Used / Generated To generate a unique ID, the process concatenates the Implementation Root UID, serial number, the process ID number, the timestamp and a counter incremented each time.
Specific Character Set	(0008,0005)	1C	Used / Copied Support ISO_IR 100, ISO_IR 192, GB18030 character set Note: Character set can not be changed in the generated derived images.
Instance Creation Date	(0008,0012)	3	Used for VXTL STATE type image only / Generated: current date
Instance Creation Time	(0008,0013)	3	Used for VXTL STATE type image only / Generated: current time
Instance Creator UID	(0008,0014)	3	Ignored / Removed
Time zone Offset From UTC	(0008,0201)	3	Ignored / Removed
Instance Number	(0020,0013)	3	Used / Generated
SOP Instance Status	(0100,0410)	3	Ignored / Removed
SOP Authorization Date and Time	(0100,0420)	3	Ignored / Removed
SOP Authorization Comment	(0100,0414)	3	Ignored / Removed
Authorization Equipment Certification Number	(0100,0416)	3	Ignored / Removed
Contributing Equipment Sequence	(0018,A001)	3	Ignored / Generated
>Purpose of Reference Code Sequence	(0040,A170)	1	Ignored / Generated Following triplets are used when generating: (109101, DCS, Acquisition Equipment) (109102, DCS, Processing Equipment)
>>Code Value	(0008,0100)	1C	Ignored / Generated
>>Code Scheme Designator	(0008,0102)	1C	Ignored / Generated
>>Code Meaning	(0008,0104)	1C	Ignored / Generated

>Manufacturer	(0008,0070)	1	Ignored / Generated
>Institution Name	(0008,0080)	3	Ignored / Generated
>Institution Address	(0008,0081)	3	Ignored / Generated
>Station Name	(0008,1010)	3	Ignored / Generated
>Manufacturer's Model Name	(0008,1090)	3	Ignored / Generated
>Device Serial Number	(0018,1000)	3	Ignored / Generated
>Software Versions	(0018,1020)	3	Ignored / Generated

4.4.8 SC Modules

This Section describes SC Equipment, and Image Modules. These Modules contain Attributes that are specific to SC Image IOD.

4.4.8.1 SC Equipment Module

This Module describes equipment used to convert images into a DICOM format.

**TABLE 4.4-11
 SC IMAGE EQUIPMENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Conversion Type	(0008,0064)	1	Ignored / Generated: WSD = Workstation
Modality	(0008,0060)	3	Used / Generated See 4.4.3.1 for Enumerated Values.
Secondary Capture Device ID	(0018,1010)	3	Ignored / Generated from gethostname()
Secondary Capture Device Manufacturer	(0018,1016)	3	Ignored / Generated "GE MEDICAL SYSTEMS"
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	3	Used / Generated: the name of the application. One of: Reformat, Volume Viewer, AutoBone,
Secondary Capture Device Software Version	(0018,1019)	3	Ignored / Generated: Voxtool version "vx _{tl} _x_y_z"
Video Image Format Acquired	(0018,1022)	3	Ignored / Removed
Digital Image Format Acquired	(0018,1023)	3	Ignored / Removed

4.4.8.2 SC Image Module

The table in this Section contains IOD Attributes that describe SC images.

**TABLE 4.4-12
 SC IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Date of Secondary Capture	(0018,1012)	3	Ignored / Generated: current date
Time of Secondary Capture	(0018,1014)	3	Ignored / Generated: current time

4.5 PRIVATE DATA DICTIONARY

In the case of a secondary capture coming from the Direct3D software, the following private group is read. Note that this group is read only if the Series Description contains "Direct3D State". In this case, the SC object belongs to a Standard Extended SOP Class based on the SC SOP class. Note that Volume Viewer does not create those extended objects, but just reads them.

For a complete description of the tags, see the conformance statement of Direct3D.

TABLE 4.5-13
3D STATE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Private Group Creator	(0047,00xx)	3	"GEMS_3DSTATE_001"
General Description	(0047,xxD6)	3	Used
TDRT	(0047,xxD7)	3	Used
NVRP	(0047,xxD8)	3	Used
CVRPN	(0047,xxD9)	3	Used
Volume Rendering Presets Sequence	(0047,xxDA)	3	Used
> Preset Name	(0047,xxDB)	3	Used
> Opacity Curve X	(0047,xxDC)	3	Used
> Opacity Curve Y	(0047,xxDD)	3	Used
> NOCP	(0047,xxDE)	3	Used
> Color Curve X	(0047,xxDF)	3	Used
> Color Curve Y	(0047,xxE0)	3	Used
> NCCP	(0047,xxE1)	3	Used
> GSA	(0047,xxE2)	3	Used
> VRSF	(0047,xxE3)	3	Used
> AF	(0047,xxE4)	3	Ignored
> DF	(0047,xxE5)	3	Ignored
> SCF	(0047,xxE6)	3	Ignored
> SPF	(0047,xxE7)	3	Ignored
Orthogonal Clipping Planes	(0047,xxE8)	3	Used
CP	(0047,xxE9)	3	Used
CFP	(0047,xxEA)	3	Used
CVU	(0047,xxEB)	3	Used
RFOV	(0047,xxEC)	3	Used
PPRP	(0047,xxED)	3	Ignored
3DWW	(0047,xxEE)	3	Used
3DWL	(0047,xxEF)	3	Used
BBV	(0047,xxF0)	3	Ignored
ERF	(0047,xxF1)	3	Used
TDRMS	(0047,xxF2)	3	Ignored
TDSSS	(0047,xxF3)	3	Ignored

This is the Voxtool Save State object. These private elements will be found when the third value of Image Type (0008,0008) is “VXTL STATE”. This object is purely private to Voxtool to save and reload its state. In this case, the SC object belongs to a Standard Extended SOP Class based on the SC SOP class. The attribute description, in particular the mention if this tag is mandatory, is related to the purpose of this Extended SOP Class.

TABLE 4.5-14
VOXTOOL SAVE STATE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Private Group Creator	(0057,00xx)	3	“GEMS_ADWSoft_3D2”
Views Layout	(0057,xx04)	3	Used / Generated
Private Group Creator	(0057,00xx)	3	“GEMS_VXTLSTATE_001”
SState Version	(0057,xx14)	3	Mandatory/ Generated. Required if 3rd value of Image Type is “VXTL STATE”.
Volumes Info	(0057,xx05)	3	Mandatory/ Generated. Required if 3rd value of Image Type is “VXTL STATE”.
> Series UID	(0020,000e)	3	Mandatory/ Generated
> Image UIDs	(0057,xx06)	3	Mandatory/ Generated
>> Referenced SOP Class UID	(0008,1150)	3	Mandatory/ Generated
>> Referenced SOP Instance UID	(0008,1155)	3	Mandatory/ Generated
> SUV Scan Time	(0057,xx07)	3	Used / Generated
> SUV Administred Time	(0057,xx08)	3	Used / Generated
> SUV Measured Time	(0057,xx09)	3	Used / Generated
> SUV PostInjected Time	(0057,xx10)	3	Used / Generated
> SUV Tracer Activity	(0057,xx11)	3	Used / Generated
> SUV PostInjected Activity	(0057,xx12)	3	Used / Generated
> SUV Half Life	(0057,xx13)	3	Used / Generated
> SegList Seq	(0057,xx15)	3	Mandatory/ Generated
>> SegList Count	(0057,xx16)	3	Used / Generated
>> SegList List	(0057,xx17)	3	Mandatory/ Generated
>> SegList Name	(0057,xx18)	3	Mandatory/ Generated
>> SegList Label	(0057,xx20)	3	Mandatory/ Generated
>> SegList Slots	(0057,xx38)	3	Used / Generated
>> SegList Pretty Name	(0057,xx58)	3	Mandatory/ Generated
>> SegList Segmented Object	(0057, xx59)	3	Mandatory/ Generated
>> SegList Derived From	(0057, xx60)	3	Mandatory/ Generated
>> Seglist Threshold	(0057,xx80)	3	Mandatory/ Generated
>> Seglist Dens Max	(0057,xx81)	3	Mandatory/ Generated
> Volume Filename	(0057,xx19)	3	Mandatory/ Generated
> Bookmark Seq	(0057,xx21)	3	Used / Generated
>> Bookmark	(0057,xx22)	3	Used / Generated
> VT Points	(0057,xx40)	3	Used / Generated
> VT Meas	(0057,xx42)	3	Used / Generated
> VT Tree	(0057,xx44)	3	Used / Generated

> VT TreeContext	(0057,xx84)	3	Used / Generated
> Thrombuses	(0057,xx89)	3	Used / Generated
> Volume Zcomb Filter	(0057,xx52)	3	Used / Generated
> Registration R	(0057,xx87)	3	Used / Generated
> Registration C	(0057,xx88)	3	Used / Generated
> PhaseRegistration NbPhase	(0057, xx78)	3	Used / Generated
> PhaseRegistration Phase	(0057, xx79)	3	Used / Generated
> Generated Volume Info	(0057,xxC0)	3	Used/Generated.
Views Info	(0057,xx26)	3	Mandatory/ Generated. Required if 3 rd value of Image Type is "VXTL STATE".
> Bookmark Seq	(0057,xx21)	3	Used / Generated
>> Bookmark	(0057,xx22)	3	Used / Generated
> Cursor Position	(0057,xx23)	3	Used / Generated
> View Slot	(0057,xx27)	3	Mandatory/ Generated
> View Resized Previous Slot	(0057,xx86)	3	Used / Generated
> Wireframe	(0057,xx29)	3	Mandatory/ Generated
> Annotation	(0057,xx31)	3	Mandatory/ Generated
> Camera Position	(0057,xx55)	3	Used / Generated
> HideVol Seq	(0057, xx69)	3	Mandatory/ Generated
>> HideVol Name	(0057, xx70)	3	Mandatory/ Generated
>> HideVol Hide	(0057, xx71)	3	Mandatory/ Generated
> Curved Geom Type	(0057, xx72)	3	Mandatory/ Generated
> Curved Forced Geom	(0057, xx73)	3	Mandatory/ Generated
> Curved Unseg Display	(0057, xx74)	3	Mandatory/ Generated
> Curved Angle	(0057, xx75)	3	Mandatory/ Generated
> Curved Thickness	(0057, xx76)	3	Mandatory/ Generated
> Curved Primary View Slot	(0057,xx85)	3	Used / Generated
> MixVol Name	(0057,xx91)	3	Used / Generated
> Registration Volume ID	(0057,xx0A)	3	Mandatory / Generated. Must exists for SState_Version >= 14
Slider State	(0057,xx32)	3	Used / Generated
Proto Name	(0057,xx33)	3	Mandatory/ Generated. Required if 3 rd value of Image Type is "VXTL STATE".
Proto Title	(0057,xx34)	3	Mandatory/ Generated. Required if 3 rd value of Image Type is "VXTL STATE".
Proto Film Name	(0057,xx35)	3	Mandatory/ Generated. Required if 3 rd value of Image Type is "VXTL STATE".
Proto Scenario	(0057, xx77)	3	Mandatory/ Generated. Required if 3 rd value of Image Type is "VXTL STATE".
Proto Step	(0057,xx36)	3	Mandatory/ Generated. Required if 3 rd value of Image Type is "VXTL STATE".
Cardiac Shortaxis Orientation	(0057, xx61)	3	Used / Generated
Cardiac Longaxis Orientation	(0057, xx62)	3	Used / Generated

Cardiac Verticallongaxis Orientation	(0057, xx63)	3	Used / Generated
Cardiac Valve Position	(0057, xx64)	3	Used / Generated
Cardiac Apex Position	(0057,xx82)	3	Used / Generated
Cardiac ES Position	(0057, xx65)	3	Used / Generated
Cardiac ED Position	(0057, xx66)	3	Used / Generated
Cardiac ES Phase	(0057, xx67)	3	Used / Generated
Cardiac ED Phase	(0057, xx68)	3	Used / Generated
Image File Name	(0057,xx90)	3	Used / Generated
VT Preset	(0057,xx47)	3	Used / Generated
Fusion Factor	(0057,xx92)	3	Used / Generated
VT State	(0057,xx49)	3	Used / Generated
Preferences	(0057,xx51)	3	Used / Generated
SegList Perfusion Mean	(0057,xx93)	3	Used / Generated
SegList Perfusion Std	(0057,xx94)	3	Used / Generated
Cardiac Patient EDAP	(0057,xx95)	3	Used / Generated
Cardiac Patient CVP	(0057,xx96)	3	Used / Generated
Cardiac Patient PCWP	(0057,xx97)	3	Used / Generated
Cardiac Patient Height	(0057,xx98)	3	Used / Generated
Cardiac Patient Width	(0057,xx99)	3	Used / Generated
Cardiac Patient HeartRate	(0057,xx9A)	3	Used / Generated
Cardiac Patient ESAP	(0057,xx9B)	3	Used / Generated
Cardiac Patient EDBP	(0057,xx9C)	3	Used / Generated
Cardiac Patient ESBP	(0057,xx9D)	3	Used / Generated
Cardiac Valve Position For MA	(0057,xx9E)	3	Used / Generated
Cardiac Apex Position For MA	(0057,xx9F)	3	Used / Generated
SState Type	(0057,xxA0)	3	Used / Generated
VT Auto Points	(0057,xxA2)	3	Used / Generated
Proto Java Step	(0057,xxA3)	3	Used / Generated
Nb Volumes Stored	(0057,xxA4)	3	Used / Generated
Lumen Angle	(0057,xxA5)	3	Used / Generated
Cardiac Calcifs Thresh	(0057,xxA6)	3	Used / Generated
Is Saline Flush	(0057,xxA7)	3	Used / Generated
Proto Scenario Type	(0057,xxA8)	3	Used / Generated
Proto Scenario Anatomy	(0057,xxA9)	3	Used / Generated
SegList Is In Default 3DVols	(0057,xxAA)	3	Used / Generated
HTML Page	(0057,xx54)	3	Used / Generated
Private Group Creator	(0047,00xx)	3	“GEMS_3DSTATE_001”
General Description	(0047,xxD6)	3	Used
Registration Reference	(0057,xx0D)	3	Mandatory / Generated. Must exists for SState Version >= 14 Refer to an existing Registration Volume ID or 0

Registration Moving	(0057,xx0E)	3	Mandatory / Generated. Must exists for SState Version >= 14 Refer to an existing Registration Volume ID or 0
Registration Volume Information Sequence	(0057,xx0B)	3	Mandatory / Generated. Must exists for SState Version >= 14.
> Registration Volume ID	(0057,xx0A)	3	Mandatory / Generated. Must exists for SState Version >= 14
> Registration Volume Group	(0057,xx1A)	3	Mandatory / Generated. Must exists for SState Version >= 14
> Registration Volume ROI State	(0057,xx1B)	3	Mandatory / Generated. Must exists for SState Version >= 14
> Registration Volume ROI	(0057,xx1C)	3	Mandatory / Generated. Must exists for SState Version >= 14 Must contain six numbers. First three are the minimal coordinates of the ROI, last three are the maximal coordinates of the ROI. Coordinates are in Voxtool orthogonal coordinate system.
Registration Landmark Information Sequence	(0057,xx0C)	3	Mandatory / Generated. Must exists for SState Version >= 14
> Registration Landmark ID	(0057,xx2A)	3	Mandatory / Generated. Must exists for SState Version >= 14
> Registration Landmark Volume Type	(0057,xx3D)	3	Mandatory / Generated. Must exists for SState Version >= 14
> Registration Landmark Volume Info Sequence	(0057,xx2B)	3	Mandatory / Generated. Must exists for SState Version >= 14
>> Registration Volume ID	(0057,xx0A)	3	Mandatory / Generated. Must exists for SState Version >= 14
>> Registration Landmark Volume State	(0057,xx3B)	3	Mandatory / Generated. Must exists for SState Version >= 14
>> Registration Landmark Volume Position	(0057,xx3C)	3	Mandatory / Generated. Must exists for SState Version >= 14 Must contain three number representing coordinates of a 3D point. Coordinates are in Voxtool orthogonal coordinate system.
SState Onco	(0057,xxBA)	3	Added when Save State is generated from an onco-compatible protocol (isOncoCompatible="yes") and when the OncoQuant license is available.
SState Onco Info Seq	(0057,xxBB)	3	Can exist if SState Onco is present.
> SState Onco Info	(0057,xxBC)	3	Contained by sequence SState Onco Info Seq. At least one element in sequence if SState Onco Info Seq is present.
SState Summary Table Info Seq	(0057,xxBD)	3	Can exist if SState Onco is present.

> SState Summary Table Info	(0057,xxBE)	3	Contained by sequence SState Summary Table Info Seq. At least one element in sequence if SState Summary Table Info Seq is present.
Plaques	(0057,xxAB)	3	Used / Generated
Cardiac Top	(0057,xxAD)	3	Used /Generated
TVCAR Emphysema Preset Name	(0057,xxAE)	3	Used / Generated
TVCAR Emphysema LUT	(0057,xxAF)	3	Used / Generated
TVCAR Data Filter	(0057,xxB0)	3	Used / Generated
Glucose Level	(0057,xxB1)	3	Used / Generated
DLO Instance UID	(0057,xxB2)	3	Used / Generated
TwoD Series Info	(0057,xxB3)	3	Used / Generated
Nb TwoD Series stored	(0057,xxB4)	3	Used / Generated
Primary Volume Name	(0057,xxB5)	3	Used / Generated
Cardiac Lumen Min Value	(0057,xxB6)	3	Used / Generated
Functional Protocol Infos	(0057,xxB7)	3	Used / Generated
>Functional Protocol Infos param Size	(0057,xxB8)	3	Used / Generated
>>Functional Protocol Infos param	(0057,xxB9)	3	Used / Generated
VVI Trajectory Spheres	(0057,xxBF)	3	Used / Generated
Cardiac Z Values	(0057,xxC1)	3	Used / Generated
Loaded Plugin List	(0057,xxC6)	3	Used / Generated

4.5.1 3D State Attribute Descriptions

4.5.1.1 General Description

A simple text field which gives a general, free form description of the current study.

4.5.1.2 TDRT - 3D Rendering Type

Enumerated parameter which records type of rendering to be applied.

TDRT: {1, 2, 3, 4, 5} 1=Volume Rendering, 2=MIP, 3=MinIP, 4=RaySum, 5=Integral.

Note: The typical setting will be Volume Rendering for the first release of VAV, although MIP could also be selected.

4.5.1.3 NVRP - Number of Volume Rendering Presets

The number of volume rendering presets, NVRP, defined in the VAV 3D state object. It will be desirable to save as many as 5 presets which are applicable to the current study.

NVRP: [0 .. 5]. 0: Volume Rendering is not applicable.

Note: NVRP will routinely be 5 for a VAV study.

4.5.1.4 CVRPN - Current Volume Rendering Preset Number

Set number preset number, CVRPN, which specifies which of the defined presets is currently applied.

CVRPN: [1 - NVRP]

4.5.1.5 Volume Rendering Presets Sequence

Set of volume rendering presets

4.5.1.6 Preset Name

Simple textual name associated with this preset. Appropriate for labeling a preset button on the user interface of the 3D application for example.

4.5.1.7 Opacity Curve X

The X values of the opacity curve coordinates. This field must contain NOCP values (see 4.5.1.9).

Hounsfield units (a CT#), [-1024 .. 3071]

4.5.1.8 Opacity Curve Y

The Y values of the opacity curve coordinates. This field must contain NOCP values (see 4.5.1.9).

A measure of opacity / mm, [0.0 .. 1.0]

4.5.1.9 NOCP - Number of Opacity Curve Points

The number of points which make up the opacity curve.
NOCP: [2 .. 64].

4.5.1.10 Color Curve X

The X values of the color curves. This field must contain NCCP values (see 4.5.1.12).

Hounsfield units (a CT#), [-1024 .. 3071]

Linear interpolation is always applied between points along a color curve. (i.e., if a step function is desirable, it will be built into to VAV curve itself)

For all Hounsfield values less than the smallest X contained in the above set of points, a color of (0, 0, 0) should be assigned. For all Hounsfield values greater than the largest X contained in the above set of points, a color of (0, 0, 0) should be assigned.

4.5.1.11 Color Curve Y

The Y values of the color curves. This field must contain 3*NCCP values (see 4.5.1.12).

A color value represented as an RGB floating point triplet, ([0.0..1.0], [0.0..1.0], [0.0..1.0])

4.5.1.12 NCCP - Number of Color Curve Points

NCCP: [2 - 64]

4.5.1.13 GSA - Gray Scale Applied

Simple boolean flag, GSA, which specifies if gray scale rendering is currently being applied (versus 3 channel color) for this preset.

GSA: [0, 1]

Note: If the gray scale flag is set, each point of the VAV color curve will be an RGB triplet corresponding to a gray scale value (i.e., R=G=B). If shading is also on (see parameter below), a non-zero gray scale flag should map to Voxtool's monochrome option being applied.

4.5.1.14 VRSF - Volume Rendering Shading Flag

Simple boolean flag, VRSF, which specifies whether shading (gray scale or color) is applied for this preset.

VRSF: [0, 1]

Note: Voxtool does not currently support an optimized path for gray scale shading. But this case should be addressed in that each point of the VAV color curve will be an RGB triplet to a gray scale value (i.e., R=G=B).

4.5.1.15 AF - Ambient Factor

The ambient factor term in the general lighting equation, applicable if shading is On.

AF: a percentage, [0.0 ... 1.0]

Constraint: $AF + DF + SCF \leq 1.0$

4.5.1.16 DF - Diffuse Factor

The diffuse factor term in the general lighting equation, applicable if shading is On.

DF: a percentage, [0.0 ... 1.0]

Constraint: $AF + DF + SCF \leq 1.0$

4.5.1.17 SCF - Specular Contribution Factor

The specular contribution factor term in the general lighting equation, applicable if shading is On.

SCF: a percentage, [0.0 ... 1.0]

Constraint: $AF + DF + SCF \leq 1.0$

Note: For the initial release of VAV, the SCF term will always be zero. Likewise, Voxtool does not currently support specular lighting.

4.5.1.18 SPF - Specular Power Factor

The specular power factor term in the general lighting equation, applicable if shading is On.

SPF: a floating point value ≥ 0.0

4.5.1.19 Orthogonal Clipping Planes

Specifies up to six clipping planes which define our sub volume of interest. The general equation for a plane in the RAS system will be utilized.

$$A_1 r + B_1 a + C_1 s + D_1 = 0$$

$$A_2 r + B_2 a + C_2 s + D_2 = 0$$

$$A_3 r + B_3 a + C_3 s + D_3 = 0$$

$$A_4 r + B_4 a + C_4 s + D_4 = 0$$

$$A_5 r + B_5 a + C_5 s + D_5 = 0$$

$$A_6 r + B_6 a + C_6 s + D_6 = 0$$

A total of 24 floating point coefficients define the 6 arbitrary planes. The sign convention regarding the plane normals is as follows: the normal for a given clipping plane should point away from the portion of the volume that we wish to cut away.

These 24 points will be stored as a list of floats (A1, B1, C1, D1, A2, B2, ..., C6, D6).

If fewer than 6 clipping planes are required, each coefficient for an unused clipping plane should be set to zero.

Note: For the first release of VAV, only simple orthogonal clipping planes will be utilized. Thus the general plane equations above reduces to the following (where only the non-zero terms are shown):

$$A_1 r + D_1 = 0$$

$$A_2 r + D_2 = 0$$

$$B_3 a + D_3 = 0$$

$$B_4 a + D_4 = 0$$

$$C_5 s + D_5 = 0$$

$$C_6 s + D_6 = 0$$

4.5.1.20 CP - Camera Position

RAS Location of camera

CP: patient relative 3D point, (R, A, S) in mm.

4.5.1.21 CFP - Camera Focal Point

RAS Location of camera focal point, CFP, essentially the center of the 3D scene.

CFP: patient relative 3D point, (R, A, S) in mm.

Note: The camera position and focal point uniquely define the camera viewing vector.

4.5.1.22 CVU - Camera "View Up" Vector

Unit length RAS vector, CVU, which, when combined with the computed camera viewing vector, uniquely defines the orientation of the the 3D projection image.

CVU: patient relative unit length vector, (R_{grad} , A_{grad} , S_{grad}).

4.5.1.23 RFOV - Rendering Field Of View

Field of View, RFOV, of the 3D projection image.

RFOV: floating point value in mm.

4.5.1.24 PPRP - Camera Position

Flag, PPRR, which specifies where perspective or parallel ray rendering is done.

PPRR: (0, 1), 0 = Parallel, 1 = Perspective.

Note: The perspective mode, the camera viewing angle, or frustum, can be calculated from the above camera parameters. The RFOV in this case is measured in the plane which includes the CFP and is normal to the viewing vector.

4.5.1.25 3DWW

Window Width parameter describing how to display the 3D projection image.

3DWW: [0.0 ... 4096.0]

4.5.1.26 3DWL

Window Level parameter describing how to display the 3D projection image.

3DWL: [-1024.0 ... 3071.0]

4.5.1.27 BBV - Bounding Box Visible

Simple boolean flag, BBV, which specifies whether the volume bound box should be visible in the resultant 3D image.

BBV: [0. 1]

4.5.1.28 ERF - Enhanced Resolution Flag

Simple boolean flag, ERF, which specifies if volume rendering should be performed in "enhanced resolution" mode

ERF: [0. 1]

4.5.1.29 TDRMS - 3D Render Matrix Size

The size of the image matrix used during the 3D rendering process (not to be confused with the window size which displays the final 3D result).

TDRMS: {128, 256, 512, 768, 1024}

Note: TDRMS will typically be 512 for a VAV study.

4.5.1.30 TDSSS - 3D Sample Step Size

The distance between samples, TDSSS (along a ray or between parallel textures) in mm used during 3D processing.

TDSSS: > 0.0 mm

4.5.1.31 Views Layout

This text string holds an XML describing the organization of views on the screen.

4.5.1.32 Volumes Info

This sequence describes the exams to be reloaded.

4.5.1.33 Image UIDs

This sequence contains the UIDs of the images that need to be reloaded into the software.

4.5.1.34 SState Version

Version number of the format of this Save Sate object.

4.5.1.35 SegList Seq

This sequence describes the volumes of data (series) that need to be reloaded by the save state.

4.5.1.36 SegList Count

Number of values in the SegList List.

4.5.1.37 SegList List

A list of 16 bits values describing which voxels should be reloaded from the image.

4.5.1.38 SegList Name

Voxtool internal name of the volume. Must be unique.

4.5.1.39 SegList Pretty Name

Display name of the volume.

4.5.1.40 SegList Segmented Object

Describes the type of segmentation which has been applied to the volume

4.5.1.41 SegList Derived From

Name of the master volume which has been used for the segmentation of the volume

4.5.1.42 Volume Filename

Public name of the volume.

4.5.1.43 SegList Label

Save State internal name of the volume. Linked volumes will have the same label.

4.5.1.44 Bookmark Seq

This sequence describes the list of bookmarks deposited on the exams.

4.5.1.45 Bookmark

This text string is an XML describing the deposited bookmark.

4.5.1.46 Cursor Position

This value contains the 3D vector describing the position of 3D cursor.

4.5.1.47 Color Value Field

Colors of the 3D Surface / Navigator views

4.5.1.48 Color Value Field Count

Number of colors in Color Value Field.

4.5.1.49 Views Info

This sequence describes information for saved views (position, orientation, annotations and wireframes).

4.5.1.50 View Slot

Position of the view on the screen.

4.5.1.51 Wireframe

This XML string describes the wireframes (traces) of the view.

4.5.1.52 Annotation

This XML string describes the user annotation on the view.

4.5.1.53 Slider State

The type of slider review controller to be restored.

4.5.1.54 Proto Name, Proto Title, Proto FilmName, Proto Scenario

Defines the names of the protocols used to originally build the volumes.

4.5.1.55 Proto Step

The stage number of the wizard protocol.

4.5.1.56 Cardiac Shortaxis Orientation

Cardiac short axis orientation

4.5.1.57 Cardiac Longaxis Orientation

Cardiac long axis orientation

4.5.1.58 Cardiac Verticallongaxis Orientation

Cardiac vertical long axis orientation

4.5.1.59 Cardiac Valve Position

Cardiac valve location

4.5.1.60 Cardiac ES Position

Cardiac end of systole location

4.5.1.61 Cardiac ED Position

Cardiac end of diastole location

4.5.1.62 Cardiac ES Phase

Cardiac end of systole volume phase

4.5.1.63 Cardiac ED Phase

Cardiac end of diastole volume phase

4.5.1.64 SegList Slots

List of the slots which will be assigned the given volume data.

4.5.1.65 VT Points

This XML contains the tracking points of a protocol.

4.5.1.66 VT Meas

Not used yet.

4.5.1.67 VT Tree

This XML contains information for tracking processes.

4.5.1.68 VT Preset

This XML contains information for tracking protocols.

4.5.1.69 VT State

This XML describes the status of the tracking algorithm.

4.5.1.70 Preferences

This XML contains Voxel tool preferences. Currently, it stores only the presence of reference images.

4.5.1.71 SegList Perfusion Mean

Computed mean for the Perfusion tool

4.5.1.72 SegList Perfusion Std

Computed standard deviation for the Perfusion tool

4.5.1.73 Cardiac Patient EDAP

End diastolic arterial pressure (entered by the user)

4.5.1.74 Cardiac Patient CVP

Central venous pressure (entered by the user)

4.5.1.75 Cardiac Patient PCWP

Pulmonary capillary wedge pressure (entered by the user)

4.5.1.76 Cardiac Patient Height

Patient's height (entered by the user or read from DICOM)

4.5.1.77 Cardiac Patient Width

Patient's width (entered by the user or read from DICOM)

4.5.1.78 Cardiac Patient HeartRate

Patient's heart rate (entered by the user or read from DICOM)

4.5.1.79 Cardiac Patient ESAP

End systolic arterial pressure (entered by the user)

4.5.1.80 Cardiac Patient EDBP

End diastolic blood pressure (entered by the user)

4.5.1.81 Cardiac Patient ESBP

End systolic blood pressure (entered by the user)

4.5.1.82 Cardiac Valve Position For MA

Valve position for Myocardium Analysis

4.5.1.83 Cardiac Apex Position For MA

Apex position for Myocardium Analysis

4.5.1.84 SState Type

The type of the SaveState (generated by the user, generated automatically or generated during preprocessing)

4.5.1.85 VT Auto Points

This XML contains the tracking points generated by the auto-tracking

4.5.1.86 Proto Java Step

Current step for the Java wizards

4.5.1.87 Nb Volumes Stored

Number of volumes stored in the SaveState

4.5.1.88 Lumen Angle

Angle value for the lumen views

4.5.1.89 Cardiac Calcifs Thresh

Threshold value for cardiac calcifications

4.5.1.90 Is Saline Flush

If cardiac exam is saline flush

4.5.1.91 Proto Scenario Type

Type of the current scenario

4.5.1.92 Proto Scenario Anatomy

Anatomy for the current scenario

4.5.1.93 SegList Is In Default 3DVols

Flag to indicate if a volume is contained in the Default3DVols list

4.5.1.94 Volume ZComb Filter

This integer holds the type of filter to be applied during CardIQ loading.

4.5.1.95 PhaseRegistration NbPhase

Number of phase indexes used for Phase Registration Protocol

4.5.1.96 PhaseRegistration Phase

Phase indexes used for Phase Registration Protocol

4.5.1.97 HTML Page

This XML contains the path of the HTML page to open when loading.

4.5.1.98 Camera Position

This value contains the 3D vector describing the position of point of view.

4.5.1.99 HideVol Seq

Sequence of data related to HideVol Name and HideVol Hide to indicate if a volume is displayed or not in case of multi-volumes rendering

4.5.1.100 HideVol Name

Name of the volumes to display or not in case of multi-volumes rendering

4.5.1.101 HideVol Hide

State of the volumes to display or not in case of multi-volumes rendering

4.5.1.102 Curved Geom Type

Geometry type of curved view

4.5.1.103 Curved Angle

Angle of curved view

4.5.1.104 Curved Thickness

Thickness of curved view

4.5.1.105 Curved Forced Geom, Curved Unseg Display

Other data for curved view

4.5.1.106 Seglist Threshold, Seglist Dens Max

Minimum and maximum values of a thresholded volume

4.5.1.107 Cardiac Apex Position

Location of apex point in the volume of the heart for Ejection Fraction protocol.

4.5.1.108 VT TreeContext Size, VT TreeContext

This XML contains information for tracking processes in case of Dynamic AVA.

4.5.1.109 Curved PrimaryView Slot

View that is used to created the curved.

4.5.1.110 View Resized Previous Slot

Slot index of the view prior to enlargement to full screen

4.5.1.111 Registration R, Registration C

Registration matrix and center in case of multi volume

4.5.1.112 Thrombuses

Xml line containing information resulting from thrombus extraction.

4.5.1.113 MixVol Name

In case of fused view name of the second volume displayed in the view.

4.5.1.114 SState Onco

It identifies a Save State object created by an onco-compatible protocol with an active OncoQuant license. Such "onco" Save States have the ability to be loaded along with other series in order to do the follow-up of a patient.

4.5.1.115 SState Onco Info Seq

Sequence of SState Onco Info blocks in an onco Save State.

4.5.1.116 SState Onco Info

Oncology follow-up information: Baseline, Nadir, Morphological Criteria, persistent safety messages.

4.5.1.117 SState Summary Table Info Seq

Sequence of SState Summary Table Info blocks in an onco Save State.

4.5.1.118 SState Summary Table Info

Measurements information: linked measurements of the same finding, findings characterization.

4.5.1.119 Plaques

Xml line containing cardiac Plaque detection information

4.5.1.120 Cardiac Top

Cardiac anatomy: top point of the cardiac window

4.5.1.121 Cardiac Lumen Min Value

Cardiac coronaries lumen min density

4.5.1.122 Generated Volume Info

Xml containing information to generate volumes contained in the save state such as type, algorithm and parameters for the algorithm.

This tag is currently used by GSI Volume Viewer and GSI MSI in order to described the GSI generated volumes .

4.5.1.123 Cardiac Z Values

Min and Max of slices covering the heart.

4.5.1.124 TVCAR Emphysema Preset Name

Preset name for emphysema in case of Thoracic VCAR.

4.5.1.125 TVCAR Emphysema LUT

Data to restore the preset of LUT for Emphysema in case of Thoracic VCAR.

4.5.1.126 TVCAR Data Filter

Value to restore the preset of Data Filter for Emphysema in case of Thoracic VCAR.

4.5.1.127 TwoD Series Info

This sequence describes the twoD Series to be reloaded.

4.5.1.128 Nb TwoD Series stored

Number of twoD Series stored in the SaveState

4.5.1.129 Primary Volume Name

Name of the primary master volume for Volume Viewer Innova.

4.5.1.130 Functional Protocol Infos

Sequence of Functional Protocol Infos param Size blocks in case of ReadyView and GenIQ Save State.

4.5.1.131 Functional Protocol Infos param Size

Sequence of Functional Protocol Infos param blocks in case of ReadyView and GenIQ Save State.

4.5.1.132 Functional Protocol Infos param

Functional information to restore ReadyView and GenIQ Save state.

4.5.1.133 VVI Trajectory Spheres

Informations to restore the Trajectory Spheres.

4.5.1.134 Loaded Plugin List

List of plugin loaded when the save state has been generated.

4.5.2 3D State Private Dictionary

**TABLE 4.5-15
 PRIVATE CREATOR IDENTIFICATION (GEMS_3DSTATE_001)**

Attribute Name	Tag	VR	VM
General Description	(0047,xxD6)	ST	1
TDRT	(0047,xxD7)	CS	1
NVRP	(0047,xxD8)	US	1
CVRPN	(0047,xxD9)	US	1
Volume Rendering Presets Sequence	(0047,xxDA)	SQ	1
Preset Name	(0047,xxDB)	LO	1
Opacity Curve X	(0047,xxDC)	SS	1-n
Opacity Curve Y	(0047,xxDD)	FL	1-n
NOCP	(0047,xxDE)	US	1
Color Curve X	(0047,xxDF)	SS	1-n
Color Curve Y	(0047,xxE0)	FL	3-3*n
NCCP	(0047,xxE1)	US	1
GSA	(0047,xxE2)	CS	1

VRSF	(0047,xxE3)	CS	1
AF	(0047,xxE4)	FL	1
DF	(0047,xxE5)	FL	1
SCF	(0047,xxE6)	FL	1
SPF	(0047,xxE7)	FL	1
Orthogonal Clipping Planes	(0047,xxE8)	FL	24
CP	(0047,xxE9)	FL	3
CFP	(0047,xxEA)	DS	3
CVU	(0047,xxEB)	DS	3
RFOV	(0047,xxEC)	FL	1
PPRP	(0047,xxED)	CS	1
3DWW	(0047,xxEE)	DS	1
3DWL	(0047,xxEF)	DS	1
BBV	(0047,xxF0)	CS	1
ERF	(0047,xxF1)	CS	1
TDRMS	(0047,xxF2)	US	1
TDSSS	(0047,xxF3)	FL	1

TABLE 4.5-16
PRIVATE CREATOR IDENTIFICATION (GEMS_ADWSOFT_3D2)

Attribute Name	Tag	VR	VM
Views Layout	(0057,xx04)	UT	1

TABLE 4.5-17
PRIVATE CREATOR IDENTIFICATION (GEMS_VXTLSTATE_001)

Attribute Name	Tag	VR	VM
Volumes Info	(0057,xx05)	SQ	1
Image UIDs	(0057,xx06)	SQ	1
SUV ScanTime	(0057,xx07)	DT	1
SUV AdministredTime	(0057,xx08)	DT	1
SUV MeasuredTime	(0057,xx09)	DT	1
SUV PostInjectedTime	(0057,xx10)	DT	1
SUV TracerActivity	(0057,xx11)	FL	1
SUV PostInjectedActivity	(0057,xx12)	FL	1
SUV HalfLife	(0057,xx13)	FL	1
SState Version	(0057,xx14)	LO	1
SegList Seq	(0057,xx15)	SQ	1
SegList Count	(0057,xx16)	IS	1
SegList List	(0057,xx17)	OW	1
SegList Name	(0057,xx18)	LO	1
Volume Filename	(0057,xx19)	LO	1

SegList Label	(0057,xx20)	LO	1
Bookmark Seq	(0057,xx21)	SQ	1
Bookmark	(0057,xx22)	LT	1
Cursor Position	(0057,xx23)	FL	3
Color Value Field	(0057,xx24)	UL	3-3*n
Color Value Field Count	(0057,xx25)	IS	1
Views Info	(0057,xx26)	SQ	1
View Slot	(0057,xx27)	LT	1
Wireframe Size	(0057,xx28)	IS	1
Wireframe	(0057,xx29)	UT	1
Annotation Size	(0057,xx30)	IS	1
Annotation	(0057,xx31)	LT	1
Slider State	(0057,xx32)	IS	1
Proto Name	(0057,xx33)	LO	1
Proto Title	(0057,xx34)	LO	1
Proto FilmName	(0057,xx35)	LO	1
Proto Step	(0057,xx36)	LO	1
SegList Slots	(0057,xx38)	LT	1
VT Points Size	(0057,xx39)	IS	1
VT Points	(0057,xx40)	UT	1
VT Meas Size	(0057,xx41)	IS	1
VT Meas	(0057,xx42)	UT	1
VT Tree Size	(0057,xx43)	IS	1
VT Tree	(0057,xx44)	UT	1
VT Preset Size	(0057,xx46)	IS	1
VT Preset	(0057,xx47)	LT	1
VT State Size	(0057,xx48)	IS	1
VT State	(0057,xx49)	LT	1
Preferences Size	(0057,xx50)	IS	1
Preferences	(0057,xx51)	LT	1
Volume ZComb Filter	(0057,xx52)	IS	1
HTML Page Size	(0057,xx53)	IS	1
HTML Page	(0057,xx54)	LT	1
Camera Position	(0057,xx55)	FL	3
Slider Size	(0057,xx56)	IS	1
Slider	(0057,xx57)	LT	1
SegList Pretty Name	(0057,xx58)	LO	1
SegList Segmented Object	(0057,xx59)	IS	1
SegList Derived From	(0057,xx60)	LO	1
Cardiac Shortaxis Orientation	(0057,xx61)	FL	9
Cardiac Longaxis Orientation	(0057,xx62)	FL	9

Cardiac Verticallongaxis Orientation	(0057,xx63)	FL	9
Cardiac Valve Position	(0057,xx64)	FL	3
Cardiac ES Position	(0057,xx65)	FL	3
Cardiac ED Position	(0057,xx66)	FL	3
Cardiac ES Phase	(0057,xx67)	FL	1
Cardiac ED Phase	(0057,xx68)	FL	1
HideVol Seq	(0057,xx69)	SQ	1
HideVol Name	(0057,xx70)	LO	1
HideVol Hide	(0057,xx71)	IS	1
Curved Geom Type	(0057,xx72)	IS	1
Curved Forced Geom	(0057,xx73)	IS	1
Curved Unseg Display	(0057,xx74)	IS	1
Curved Angle	(0057,xx75)	FL	1
Curved Thickness	(0057,xx76)	FL	1
Proto Scenario	(0057,xx77)	LO	1
PhaseRegistration NbPhase	(0057,xx78)	IS	1
PhaseRegistration Phase	(0057,xx79)	IS	1-n
Seglist Threshold	(0057,xx80)	IS	1
Seglist Dens Max	(0057,xx81)	IS	1
Cardiac Apex Position	(0057,xx82)	FL	3
VT TreeContext Size	(0057,xx83)	UT	1
VT TreeContext	(0057,xx84)	UT	1
Curved PrimaryView Slot	(0057,xx85)	LT	1
View Resized Previous Slot	(0057,xx86)	LT	1
Registration R	(0057,xx87)	FL	9
Registration C	(0057,xx88)	FL	3
Thrombuses	(0057,xx89)	LT	1
Image File Name	(0057,xx90)	LT	1
MixVol Name	(0057,xx91)	LO	1
Fusion Factor	(0057,xx92)	FL	1
SegList Perfusion Mean	(0057,xx93)	FL	1
SegList Perfusion Std	(0057,xx94)	FL	1
Cardiac Patient EDAP	(0057,xx95)	FL	1
Cardiac Patient CVP	(0057,xx96)	FL	1
Cardiac Patient PCWP	(0057,xx97)	FL	1
Cardiac Patient Height	(0057,xx98)	FL	1
Cardiac Patient Width	(0057,xx99)	FL	1
Cardiac Patient HeartRate	(0057,xx9A)	FL	1
Cardiac Patient ESAP	(0057,xx9B)	FL	1
Cardiac Patient EDBP	(0057,xx9C)	FL	1
Cardiac Patient ESBP	(0057,xx9D)	FL	1

Cardiac Valve Position For MA	(0057,xx9E)	FL	3
Cardiac Apex Position For MA	(0057,xx9F)	FL	3
SState Type	(0057,xxA0)	IS	1
VT Auto Points	(0057,xxA2)	UT	1
Proto Java Step	(0057,xxA3)	IS	1
Nb Volumes Stored	(0057,xxA4)	IS	1
Lumen Angle	(0057,xxA5)	FD	1
Cardiac Calcifs Thresh	(0057,xxA6)	IS	1
Is Saline Flush	(0057,xxA7)	IS	1
Proto Scenario Type	(0057,xxA8)	IS	1
Proto Scenario Anatomy	(0057,xxA9)	IS	1
SegList Is In Default 3DVols	(0057,xxAA)	IS	1
SState Onco	(0057,xxBA)	IS	1
SState Onco Info Seq	(0057,xxBB)	SQ	1
SState Onco Info	(0057,xxBC)	LT	1
SState Summary Table Info Seq	(0057,xxBD)	SQ	1
SState Summary Table Info	(0057,xxBE)	LT	1
Plaques	(0057,xxAB)	LT	1
Cardiac Top	(0057,xxAD)	FL	3
TVCAR Emphysema Preset Name	(0057,xxAE)	LT	1
TVCAR Emphysema LUT	(0057,xxAF)	LT	1
TVCAR Data Filter	(0057,xxB0)	IS	1
Glucose Level	(0057,xxB1)	FL	1
DLO Instance UID	(0057,xxB2)	UI	1
TwoD Series Info	(0057,xxB3)	SQ	1
Nb TwoD Series stored	(0057,xxB4)	IS	1
Primary Volume Name	(0057,xxB5)	LO	1
Cardiac Lumen Min Value	(0057,xxB6)	IS	1
Functional Protocol Infos	(0057,xxB7)	SQ	1
Functional Protocol Infos param Size	(0057,xxB8)	SQ	1
Functional Protocol Infos param	(0057,xxB9)	LT	1
VVI Trajectory Spheres	(0057,xxBF)	LT	1
Generated Volume Info	(0057,xxC0)	UT	1
Cardiac Z Values	(0057,xxC1)	IS	2
Refarea isactive	(0057,xxC2)	US	1
Refarea pos	(0057,xxC3)	FL	3
Refarea size	(0057,xxC4)	UL	3
Loaded Plugin List	(0057,xxC6)	UT	1

5. KEY OBJECT SELECTION INFORMATION OBJECT IMPLEMENTATION

5.1 INTRODUCTION

This section specifies the use of the DICOM Key Object Selection IOD to represent the information included in KOS produced by this implementation. Corresponding attributes are conveyed using the module construct. The contents of this section are:

5.2 - KEY OBJECT SELECTION Entity-Relationship Model

5.3 - KEY OBJECT SELECTION-IOD MODULE TABLE

5.4 - KEY OBJECT SELECTION - INFORMATION MODULE DEFINITIONS

5.5 - KEY OBJECT SELECTION – TEMPLATE IDENTIFICATION

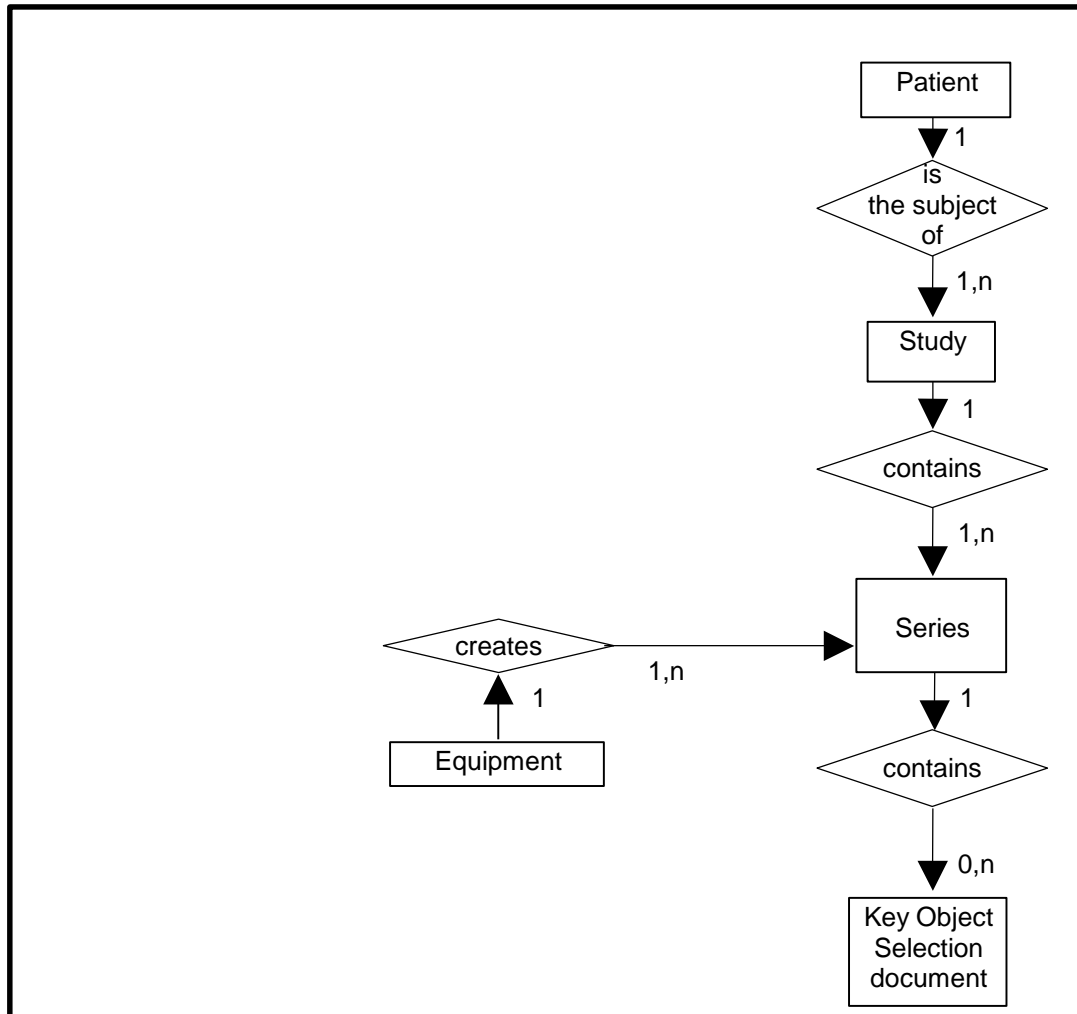
5.2 KEY OBJECT SELECTION ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Key Object Selection interoperability schema is shown in **Illustration 5.2.1**. In this figure, the following diagrammatic convention is established to represent the information organization:

- Each entity is represented by a rectangular box
- Each relationship is represented by a diamond shaped box.
- The fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to n Images per Series, but the Study to Patient relationship has 1 Patient for each Study (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 5.2-1
 KEY OBJECT SELECTION IMAGE ENTITY RELATIONSHIP DIAGRAM



5.2.1 ENTITY DESCRIPTIONS

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

5.2.2 Volume Viewer Mapping of DICOM entities

TABLE 5.2-1
MAPPING OF DICOM ENTITIES TO VOLUME VIEWER ENTITIES

DICOM	Volume Viewer Entity
Patient	Patient
Study	Exam
Series	Series
Equipment	Equipment
Key Object Selection document	Key Object Selection document

5.3 KEY OBJECT SELECTION-IOD MODULE TABLE

Within an entity of the DICOM KEY OBJECT SELECTION IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 5.3.1 identifies the defined modules within the entities which comprise the DICOM KEY OBJECT SELECTION IOD. Modules are identified by Module Name.

See DICOM Part 3 for a complete definition of the entities, modules, and attributes.

TABLE 5.3-1
KEY OBJECT SELECTION DOCUMENT IOD MODULES

Entity Name	Module Name	Reference
Patient	Patient	5.4.1.1
	Clinical Trial Subject	N/A
Study	General Study	5.4.2.1
	Patient Study	5.4.2.2
	Clinical Trial Study	N/A
Series	Key Object Document Series	5.4.3.1
	Clinical Trial Series	N/A
Equipment	General Equipment	5.4.4.1
Document	Key Object Document	5.4.5.1
	SR document Content	5.4.5.2
	SOP Common	5.4.6.1

5.4 KEY OBJECT SELECTION - 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 KEY OBJECT SELECTION Information Object.

If an element is not listed below, it means that it will not be copied at writing.

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

In the following chapter, all new study, series and image instance UID are generated from Volume Viewer base UID: 1.2.840.113619.2.362.

5.4.1 Common Patient Entity Modules

5.4.1.1 Patient Module

This section specifies the attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

**TABLE 5.4-1
 PATIENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Copied
Patient ID	(0010,0020)	2	Copied
Issuer of Patient ID	(0010,0021)	3	Removed
Patient's Birth Date	(0010,0030)	2	Copied
Patient's Sex	(0010,0040)	2	Copied
Other Patient IDs	(0010,1000)	3	Removed
Other Patient Names	(0010,1001)	3	Removed
Other Patient IDs Sequence	(0010,1002)	3	Removed

5.4.2 Common Study Entity Modules

The following Study IE Modules are common to all Composite IODs that reference the Study IE.

5.4.2.1 General Study Module

This section specifies the Attributes, which describe and identify the Study performed upon the Patient.

**TABLE 5.4-2
 GENERAL STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Notes
Study Instance UID	(0020,000D)	1	Copied
Study Date	(0008,0020)	2	Copied
Study Time	(0008,0030)	2	Copied
Accession Number	(0008,0050)	2	Copied
Referring Physician's Name	(0008,0090)	2	Copied
Study Description	(0008,1030)	3	Copied
Study ID	(0020,0010)	2	Copied

5.4.2.2 Patient Study Module

This section defines Attributes that provide information about the Patient at the time the Study was performed.

**TABLE 5.4-3
 PATIENT STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient's Age	(0010,1010)	3	Copied
Patient's Size	(0010,1020)	3	Copied
Patient's Weight	(0010,1030)	3	Copied

5.4.3 Key Object Document Series Entity Modules

The following Key Object Document Series IE Modules are common to all Composite IODs that reference the Key Object Document Series IE.

5.4.3.1 Key Object Document Series Module

This section specifies the attributes that identify and describe general information about the Key Object Document Series within a Study.

**TABLE 5.4-4
 KEY OBJECT SELECTION DOCUMENT SERIES MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	KO
Series Instance UID	(0020,000E)	1	Generated
Series Number	(0020,0011)	1	Generated
Series Description	(0008,103E)	3	“Of Interest”
Series Date	(0008,0021)	3	Not present
Series Time	(0008,0031)	3	Not present
Referenced Performed Procedure Step Sequence	(0008,1111)	2	Empty

5.4.4 Common Equipment Entity Modules

The following Equipment IE Module is common to all Composite IODs that reference the Equipment IE.

5.4.4.1 General Equipment Module

This section specifies the attributes that identify and describe the piece of equipment that produced a Series of Images.

**TABLE 5.4-5
 GENERAL EQUIPMENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	“GE MEDICAL SYSTEMS”
Institution Name	(0008,0080)	3	Hospital name provided on the platform
Station Name	(0008,1010)	3	Host name provided on the platform
Manufacturer's Model Name	(0008,1090)	3	Generated: the name of the application. One of: Reformat, Volume Viewer, AutoBone
Software Versions	(0018,1020)	3	Software version build identifier

5.4.5 Key Object document Entity Modules

The following Key Object document Modules are common to all Composite IODs that reference the Image IE.

5.4.5.1 Key Object document

This section specifies the attributes that identify and describe the Key Object document.

**TABLE 5.4-6
 KEY OBJECT DOCUMENT GENERAL MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020, 0013)	1	Generated
Content Date	(0008, 0023)	1	Generated at the date when the Key Object is created
Content Time	(0008, 0033)	1	Generated at the time when the Key Object is created
Referenced Request Sequence	(0040,A370)	1C	N/A
Current Requested Procedure Evidence Sequence	(0040,A375)	1C	List of images referenced within the Key Object Selection
> Study Instance UID	(0020,000D)	1	Refer to (0040,A375)
> Referenced Series Sequence	(0008,1115)	1	Refer to (0040,A375)
>> Series Instance UID	(0020,000E)	1	Refer to (0040,A375)
>> Referenced SOP Sequence	(0008,1199)	1	Refer to (0040,A375)
>>> Referenced SOP Class UID	(0008,1150)	1	Refer to (0040,A375)
>>> Referenced SOP Instance UID	(0008,1155)	1	Refer to (0040,A375)

5.4.5.2 SR Document Content Module

This section specifies the attributes that identify and describe the SR Document content

TABLE 5.4-7
SR DOCUMENT CONTENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Value Type	(0040, A040)	1	CONTAINER
Concept Name code Sequence	(0040, A043)	1C	(113000, DCM, "Of interest")
> Code Value	(0008, 0100)	1C	See (0040, A043) Sequence
> Coding Scheme Designator	(0008, 0102)	1C	See (0040, A043) Sequence
> Code Meaning	(0008, 0104)	1C	See (0040, A043) Sequence
Continuity Of Content	(0040, A050)	1C	SEPARATE
Content Template Sequence	(0040, A504)	1C	Template that describes the content of the content item
> Mapping Resource	(0008, 0105)	1	DCMR
> Template Identifier	(0040, DB00)	1	2010
Observation Date Time	(0040, A032)	1C	Generated at the date and time when the Key Object is created
Content Sequence	(0040, A730)	1C	Content of the DICOM KEY OBJECT SELECTION – See 5.5

5.4.6 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

5.4.6.1 SOP Common Module

This section defines the Attributes that are required for proper functioning and identification of the associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD.

TABLE 5.4-8
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	1.2.840.10008.5.1.4.1.1.88.59
SOP Instance UID	(0008,0018)	1	Generated from GE Based UID, <station configuration> and timestamp.
Specific Character Set	(0008,0005)	1C	Copied Support ISO_IR 100, ISO_IR 192, GB18030 character set Note: Character set cannot be changed in the generated derived images.
Instance Number	(0020, 0013)	3	Generated

5.5 KEY OBJECT SELECTION – TEMPLATE IDENTIFICATION

This section describes the Key Object Selection Template – TID 2010

This template describes how the SR Document Content Module of the Key Object Selection Information Object Definition is constrained. This template is the standard TID 2010.

5.5.1 TID 2010 Key Object Selection

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	DCID(7010) Key Object Selection Document Title	1	M		(113000, DCM, "Of interest")
2	>	HAS CONCEPT MOD	CODE	EV (113011, DCM, "Document Title Modifier")	1-n	U		Not used
3	>	HAS CONCEPT MOD	CODE	EV (113011, DCM, "Document Title Modifier")	1	UC	IF Row 1 Concept Name = (113001, DCM, "Rejected for Quality Reasons") or (113010, DCM, "Quality Issue")	Not applicable
4	>	HAS CONCEPT MOD	CODE	EV (113011, DCM, "Document Title Modifier")	1	MC	IF Row 1 Concept Name = (113013, DCM, "Best In Set")	Not applicable
5	>	HAS CONCEPT MOD	INCLUDE	DTID(1204) Language of Content Item and Descendants	1	U		Not used
6	>	HAS OBS CONTEXT	INCLUDE	DTID(1002) Observer Context	1-n	U		Present
7	>	CONTAINS	TEXT	EV(113012, DCM, "Key Object Description")	1	U		"Of Interest"
8	>	CONTAINS	IMAGE	Purpose of Reference shall not be present	1-n	MC		Present

5.5.2 TID 1002 Observer Context

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1		HAS OBS CONTEXT	INCLUDE	DTID (1003) Person observer identifying attributes	1	MC		

5.5.3 TID 1003 Person Observer Identifying Attributes

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			PNAME	EV (121008,DCM, "Person Observer Name")	1	M		Name of the current user
2			TEXT	EV (121009,DCM, " Person Observer's Organization Name")	1	U		Hospital Name provided on the platform

