Technical Publications

Direction 5404097-100
Revision 3

SmartScore^{TM} 4.0
DICOM CONFORMANCE STATEMENT

CONFORMANCE STATEMENT OVERVIEW

SmartScore 4.0 is a software application designed to be used on the Advantage Windows workstation, so networking and media storage features are inherited from this platform. SmartScore 4.0 loads CT DICOM images and allows user to mark lesions on them and generate reports out of the prognosis. These reports and lesion-marked images can be saved in DICOM format (Secondary Capture), which can be displayed by other GEHC applications (such as the Image Viewer) or by other non-GE applications conformant to the DICOM Standard. SmartScore 4.0 is also able to create a reduced set of original CT images as a new series within the same study.

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

Table 0.1 – NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Object read / write		
CT Image Storage	Yes	Yes
Secondary Capture Image Storage	Yes	No

REVISION HISTORY

REVISION	VERSION	AUTHOR	DATE	REASON FOR CHANGE
1	1	Pradipto Kolay	Oct 4, 2007	Initial revision for SmartScore 4.0
1	2	Pradipto Kolay	Oct 8, 2007	Updated document based on HII review comments
2	1	Sai Suhas Kolukula	Jun 10 2009	Added CT IOD (Sec. 4) and for SC IOD: - Series Date and Time tag (0x0008, 0x0021) (0x0008, 0x0031) to Generated (System Date / System Time) - Secondary Capture Device ID – gen from InetAddress.getLocalHost() - Operator Name gen from System.getProprety("user.name") - Patient Position Copied.
2	2	Sai Suhas Kolukula	Sep 22 2009	- Updated (0008,0012) and (0008,0013) to Generated. - Removed references to CT Scanner. - Added CT IOD to the tables in Section 2 & 3 - Changed SC IOD FSR to No and FSC to Yes in the tables in Section 2 & 3. - Removed the CT Information Object Implementation in Section 3 (last 2 lines). - Changed (7FE0,0010) (CT IOD) to Copied - Mentioned that the Patient Module (Sec 4.5.1.1) encompasses Patient Identification, Demographic, Medical modules from the DICOM standard
3	1	Sai Suhas Kolukula	June 20 2010	- Moved to the new template. - Changed Station Name tag to: Generated: InetAddress.getLocalHost()
3	2	Sai Suhas Kolukula	Aug 24 2010	Updated after review comments.
4	1	Mitul Ramwani	August 8, 2014	Added following tags to section:3.4.1 - (0010, 0021): issuer of patient id - (0010, 1002): Other patient ids sequence
4	2	Mitul Ramwani	November 27, 2014	Added sections 2.1 and 2.2 Updated copyright information Updated section 1.6 References Updated section 3.1 Introduction Updated 3.4.3.1 Table 3-6 with corrections for Reference PPS Sequence and Performed Procedure code Sequence Updated table 4-7 for the same Updated description for table 4.5.5.5
4	3	Bhavya Ajani	January 22, 2015	Updated Table 3-6 & Table 4-7 on GENERAL SERIES MODULE ATTRIBUTES to have PPS related tags marked as removed. Updated TABLE 4-9 on GENERAL IMAGE MODULE ATTRIBUTES to remove "maybe we send yes" from Attribute description for "Burned In Annotations" Updated table 3-16 & 3-11 to change Attributes description for Samples per pixel tag to "Ignored (expect "1") / Copied"

5	1	Bhavya Ajani	February 10, 2015	Updating Part Revision from 1 to 2.
6	1	Bhavya Ajani	March 31, 2015	Updated Table 3-3 & Table 4-4 to have consistancy between CT & SCPT for Patient Module Attributes Updated Table 3-4 & 4-5 to have consistency between CT & SCPT for General Study Module Attributes Updated table 4-6 to have consistency between CT & SCPT for Patient Study Module Attributes Updated table 3-15 & 4-14 to add Contributing Equipment Sequence tags for CT & SCPT Updated part number revision Updated Copyright year

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1. INTRODUCTION

1.1 OVERVIEW

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

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

Section 2 (Network Conformance Statement), which specify the GE HEALTHCARE equipment compliance to the DICOM requirements for the implementation of networking features.

Section 3 (CT Information Object Implementation), which specify the GE HEALTHCARE equipment compliance to DICOM requirements for the implementation of a CT Information Object.

Section 4 (SC Information Object Implementation), which specify the GE HEALTHCARE equipment compliance to DICOM requirements for the implementation of SC Information object.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

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

GE Healthcare DICOM Conformance Statements

@

http://www.ge.com/DICOM

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

Product Implementation:

CT Advantage

MR Advantage

SmartScore
Conformance
Statement
Direction:
5404097-100

......
Conformance
Statement
Direction:
......

DICOM STANDARD

Standard Specification:

DICOM

Part 1

DICOM

Part 16
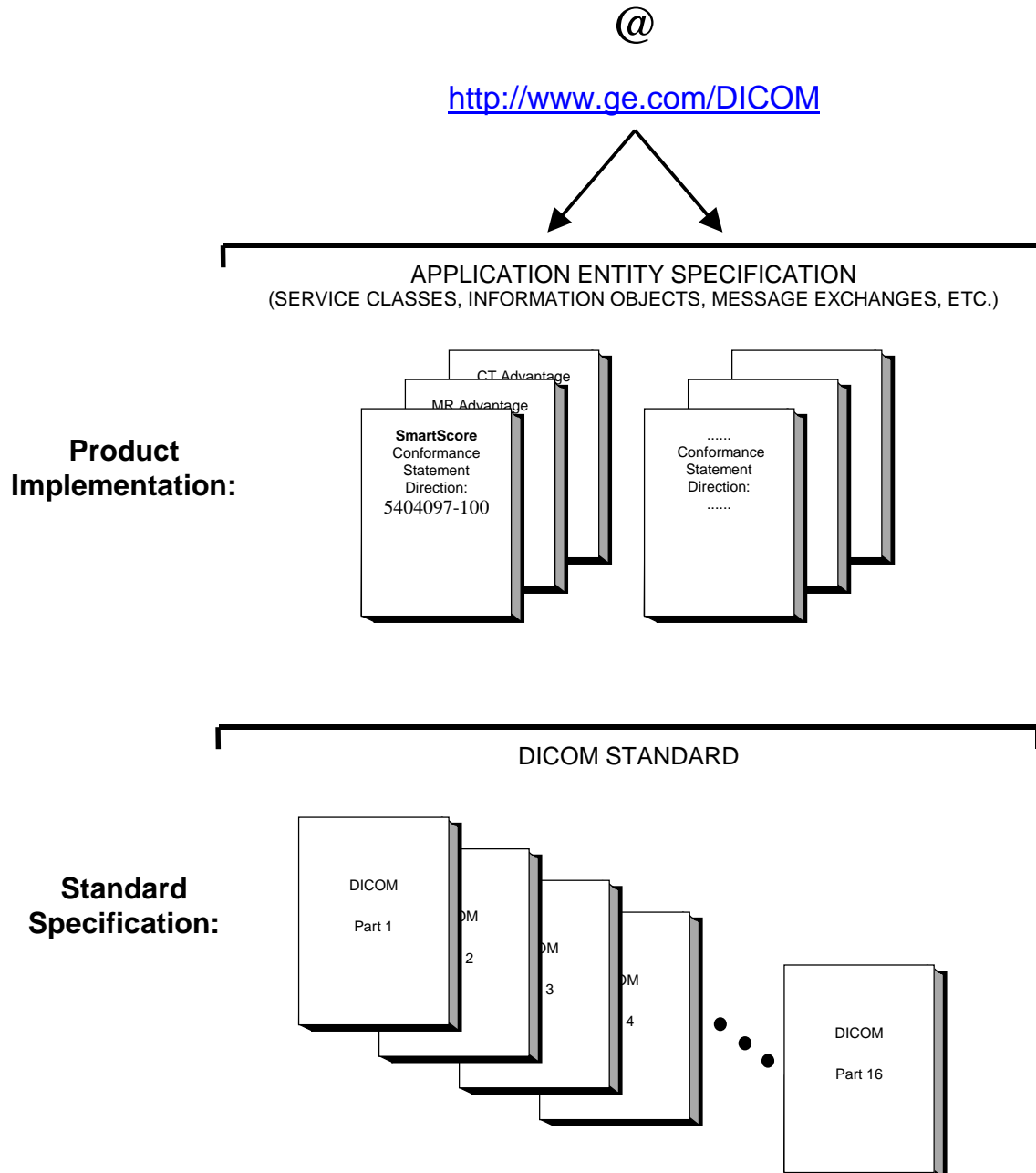
This document specifies the DICOM implementation. It is entitled:

> *SmartScore 4.0*
> *Conformance Statement for DICOM*
> *Direction: 5404097-100*

This Introduction familiarizes the reader with DICOM terminology and general concepts. It should be read prior to reading the individual products' GE HEALTHCARE Conformance Statements.

The GE HEALTHCARE Conformance Statement, contained in this document, also specifies the Lower Layer communications, which it supports (e.g., TCP/IP). However, the Technical Specifications are defined in the *DICOM* Part 8 standard.

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

> DICOM Secretariat
> NEMA
> 1300 N. 17th Street, Suite 1752
> Rosslyn, VA 22209
> USA
> Phone: +1.703.841.3200

1.3 INTENDED AUDIENCE

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the *DICOM* 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 GE HEALTHCARE implementations.   This specification, called a Conformance Statement, includes a DICOM Conformance Statement and is necessary to ensure proper processing and interpretation of GE HEALTHCARE medical data exchanged using DICOM. The GE HEALTHCARE Conformance Statements are available to the public.

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

Included in this DICOM Conformance Statement are the Module Definitions which define all data elements used by this GE HEALTHCARE implementation. If the user encounters unspecified private data elements while parsing a GE HEALTHCARE Data Set, the user is well advised to ignore those data elements (per the DICOM standard). Unspecified private data element information is subject to change without notice. If, however, the device is acting as a "full fidelity storage device", it should retain and re-transmit all of the private data elements which are sent by GE HEALTHCARE devices.

1.5 IMPORTANT REMARKS

The use of these DICOM Conformance Statements, in conjunction with the *DICOM* Standards, is intended to facilitate communication with GE imaging equipment. However, **by itself, it is not sufficient to ensure that inter-operation will be successful**. The **user (or user's agent)** needs to proceed with caution and address at least four issues:

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (*DICOM*), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non–GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.

- **Validation** - Testing the complete range of possible interactions between any GE device and non–GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non–GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non–GE device and the stability of the image data for the intended applications.

Such a validation is required before any clinical use (diagnosis and/or treatment) is performed. It applies when images acquired on GE imaging equipment are processed/displayed on a non-GE device, as well as when images acquired on non-GE equipment is processed/displayed on a GE console or workstation.

- **Future Evolution** - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the *DICOM* Standard. *DICOM* will incorporate new features and technologies and GE may follow the evolution of the Standard. The GE HEALTHCARE protocol is based on *DICOM* as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices, which have implemented *DICOM*. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these DICOM Conformance Statements**. The **user** should ensure that any non–GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failures 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/

AWS 3.1 DCS: AWS 3.1 DICOM Conformance Statement, direction number 5479929-1EN.

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 definitons 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

CT   Computed Tomography

DHCP   Dynamic Host Configuration Protocol

DICOM   Digital Imaging and Communications in Medicine

HIS   Hospital Information System

HL7   Health Level 7 Standard

IHE   Integrating the Healthcare Enterprise

IOD Information Object Definition

ISO International Organization for Standards

JPEG Joint Photographic Experts Group

LUT Look-up Table

PACS Picture Archiving and Communication System

PDU Protocol Data Unit

RIS Radiology Information System

SC Secondary Capture

SCP Service Class Provider

SCU Service Class User

SOP Service-Object Pair

TCP/IP Transmission Control Protocol/Internet Protocol

U Unique (Key Attribute)

UL Upper Layer

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 *SmartScore 4.0* 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 use 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 the application 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 consistent, the tag will be absent from the data set if "Ignored" at load or possibly regenerated if "Used" at load

2. NETWORK CONFORMANCE STATEMENT

SmartScore 4.0 is a software application designed for use on the Advantage Windows workstation. This means that networking is inherited from this platform. The application uses CT DICOM images to quantify the calcification in the anatomy. The slices displayed by the application may be saved in DICOM format as Secondary Capture. These images can be loaded and displayed by other GE HEALTHCARE applications (such as Volume Viewer or the Image Viewer), or by other non-GE applications conformant to the DICOM Standard.

For a complete description of the networking conformance, refer to the AWS3.1 conformance statement (see section 1.6 REFERENCES). SmartScore provides option to create 3 different types of DICOM series to the user:

1. A reduced set of the original CT images as a new CT series

2. The report captured as an SCPT series

3. The screen save of annotated images as SCPT series.

These DICOM series are added to the local database / browser but there is no option to network them to another DICOM SCU / SCP from *within* SmartScore itself. There is also no option to create DICOM media from *within* SmartScore application.

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

•   The DICOM CT IODs that are required for use and generated in *SmartScore* (Section 3),

•   The DICOM SC IODs written by the application (section 4),

SOP Class Name	SOP Class UID	Input	Output	Remarks
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes	Reduced series are exported as CT Images.
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes	Patient report and screen save are exported as SCPT Dicom Images.

2.1 IMPLEMENTATION IDENTIFYING INFORMATION

Application Name	Implementation Class UID
SmartScore	1.2.840.113619.6.263

2.2 SUPPORT OF EXTENDED CHARACTER SETS

SmartScore supports the extended character set defined by the following table:

Character Set Description	Defined Term without code extension	Defined Term with code extension	ISO Registration Number
Latin Alphabet No. 1	ISO_IR 100	Not Supported	ISO_IR 100

3. CT INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

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

3.2 SMARTSCORE MAPPING OF DICOM ENTITIES

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

TABLE 3-1
MAPPING OF DICOM ENTITIES TO SMARTSCORE ENTITIES

DICOM	Smartscore Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image
Frame	Not Applicable

3.3 IOD MODULE TABLE

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

TABLE 3-2
CT IMAGE IOD MODULES

Entity Name	Module Name	Reference
Patient	Patient	3.4.1.1
Study	General Study	3.4.2.1
	Patient Study	3.4.2.2
Series	General Series	3.4.3.1
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	3.5.6.4
	CT Image	3.4.6.8
	Overlay Plane	3.4.6.5
	VOI LUT	3.4.6.6
	SOP Common	3.4.6.7

3.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM 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 v3.0 Standard Part 3 (Information Object Definitions). Also note that Attributes that are not present in tables are not supported.

3.4.1 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 (encompassing Patient Identification, Demographic, Medical modules) 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 3-3
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	Used / 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	Ignored / Copied
>Referenced SOP Instance UID	(0008,1155)	1C	Ignored / Copied
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	Used / Copied
Smoking Status	(0010,21A0)	3	Used / Copied
Patient Comments	(0010,4000)	3	Used / Copied

3.4.2 Study Entity Modules

The following Study IE Modules are common to all Composite Image IODs which reference the Study IE. These Module 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
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	Ignored / Copied
Study ID	(0020,0010)	2	Used / Copied
Accession Number	(0008,0050)	2	Ignored / Copied
Study Description	(0008,1030)	3	Ignored / 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	Ignored / Copied
>Referenced SOP Instance UID	(0008,1155)	1C	Ignored / Copied
Procedure Code Sequence	(0008,1032)	3	Ignored / Copied
>Code Value	(0008,0100)	1C	Ignored / Copied
>Code Scheme Designator	(0008,0102)	1C	Ignored / Copied
>Code Meaning	(0008,0104)	1C	Ignored / Copied

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 3-5
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	Used / 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 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 3-6
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 / Copied
Series Date	(0008,0021)	3	Ignored / Generated
Series Time	(0008,0031)	3	Ignored / Generated
Performing Physicians' Name	(0008,1050)	3	Ignored / Copied
Protocol Name	(0018,1030)	3	Ignored / Copied
Series Description	(0008,103E)	3	Used / Generated
Operators' Name	(0008,1070)	3	Ignored / Copied
Referenced Performed Procedure Step Sequence	(0008,1111)	3	Removed
>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 / Copied
Largest Pixel Value in Series	(0028,0109)	3	Ignored / Copied
Request Attributes Sequence	(0040,0275)	3	Ignored / Copied
>Requested Procedure ID	(0040,1001)	1C	
>Scheduled Procedure Step ID	(0040,0009)	1C	
>Scheduled Procedure Step Description	(0040,0007)	3	
>Scheduled Protocol Code Sequence	(0040,0008)	3	
>>Code Value	(0008,0100)	1C	
>>Code Scheme Designator	(0008,0102)	1C	

>>Code Meaning	(0008,0104)	1C	
Performed Procedure Step ID	(0040,0253)	3	Removed
Performed Procedure Step Start Date	(0040,0244)	3	Removed
Performed Procedure Step Start Time	(0040,0245)	3	Removed
Performed Procedure Step Description	(0040,0254)	3	Removed
Performed Protocol Code Sequence	(0040,0260)	3	Removed
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	1C	

3.4.4 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, the same patient name.

TABLE 3-7
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 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 that produced a Series of Images.

TABLE 3-8
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	Generated: InetAddress.getLocalHost()
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 / Copied
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 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 3-9
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient Orientation	(0020,0020)	2C	Used / Copied
Content Date	(0008,0023)	2C	Used / Generated
Content Time	(0008,0033)	2C	Used / Generated
Image Type	(0008,0008)	3	Ignored / Copied
Acquisition Number	(0020,0012)	3	Used / 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 / Copied

Source Image Sequence	(0008,2112)	3	Ignored / Copied
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Images in Acquisition	(0020,1002)	3	Ignored / Copied
Image Comments	(0020,4000)	3	Used / Copied
Quality Control Image	(0028,0300)	3	Ignored / Copied
Burned In Annotations	(0028,0301)	3	Ignored / Copied
Lossy Image Compression	(0028,2110)	3	Ignored / Copied
Lossy Image Compression Ratio	(0028,2112)	3	Ignored / Copied

3.4.6.1.1 Lossy Image Compression

Application does not support reading compressed images.

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 3-10
IMAGE PLANE MODULE ATTRIBUTES

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

3.4.6.3 Image Pixel Module

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

TABLE 3-11
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Ignored (expect "1") / Copied
Photometric Interpretation	(0028,0004)	1	Ignored (expect "MONOCHROME2") / Copied
Rows	(0028,0010)	1	Mandatory (expect 512) / Copied
Columns	(0028,0011)	1	Mandatory (expect 512) / Copied
Bits Allocated	(0028,0100)	1	Ignored (expect "16") / Copied
Bits Stored	(0028,0101)	1	Ignored (expect "16") / Copied
High Bit	(0028,0102)	1	Ignored (expect "15") / Copied
Pixel Representation	(0028,0103)	1	Ignored (expect "1") / Copied
Pixel Data	(7FE0,0010)	1	Used / Copied.
Planar Configuration	(0028,0006)	1C	Ignored / Copied
Pixel Aspect Ratio	(0028,0034)	1C	Ignored / Copied
Smallest Image Pixel Value	(0028,0106)	3	Ignored / Copied
Largest Image Pixel Value	(0028,0107)	3	Ignored / Copied

Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	Ignored / Copied
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Ignored / Copied
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Ignored / Copied
Red Palette Color Lookup Table Data	(0028,1201)	1C	Ignored / Copied
Green Palette Color Lookup Table Data	(0028,1202)	1C	Ignored / Copied
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Ignored / Copied

3.4.6.4 Contrast/Bolus Module

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

TABLE 3-12
CONTRAST/BOLUS MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Contrast / Bolus Agent	(0018,0010)	2	Ignored / 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	Ignored / 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

3.4.6.5 Overlay plane module

This section contains Attributes that describe characteristics of an Overlay Plane.

This module is not currently supported by the SmartScore product and will be ignored.

TABLE 3-13
OVERLAY PLANE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Overlay Rows	(60xx,0010)	1	Module Unsupported
Overlay Columns	(60xx,0011)	1	Module Unsupported
Overlay Type	(60xx,0040)	1	Module Unsupported
Origin	(60xx,0050)	1	Module Unsupported
Overlay Bits Allocated	(60xx,0100)	1	Module Unsupported
Bit Position	(60xx,0102)	1	Module Unsupported
Overlay Data	(60xx,3000)	1C	Module Unsupported
Overlay Description	(60xx,0022)	3	Module Unsupported
Overlay Subtype	(60xx,0045)	3	Module Unsupported
Overlay Label	(60xx,1500)	3	Module Unsupported
ROI Area	(60xx,1301)	3	Module Unsupported
ROI Mean	(60xx,1302)	3	Module Unsupported
ROI Standard Deviation	(60xx,1303)	3	Module Unsupported
Overlay Descriptor - Gray	(60xx,1100)	3	Module Unsupported
Overlay Descriptor - Red	(60xx,1101)	3	Module Unsupported
Overlay Descriptor - Green	(60xx,1102)	3	Module Unsupported
Overlay Descriptor - Blue	(60xx,1103)	3	Module Unsupported
Overlays - Gray	(60xx,1200)	3	Module Unsupported
Overlays - Red	(60xx,1201)	3	Module Unsupported
Overlays - Green	(60xx,1202)	3	Module Unsupported
Overlays - Blue	(60xx,1203)	3	Module Unsupported

3.4.6.6 VOI LUT module

This section specifies the Attributes that describe the VOI LUT.

TABLE 3-14
VOI LUT MODULE ATTRIBUTES

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

3.4.6.7 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 3-15
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Ignored / Copied
SOP Instance UID	(0008,0018)	1	Ignored / Generated
Specific Character Set	(0008,0005)	1C	Used / Copied Only the "ISO_IR 100" character set is supported.
Instance Creation Date	(0008,0012)	3	Ignored / Generated (System Date)
Instance Creation Time	(0008,0013)	3	Ignored / Generated (System Time)
Instance Creator UID	(0008,0014)	3	Ignored / Copied
Time zone Offset From UTC	(0008,0201)	3	Ignored / Copied
Instance Number	(0020,0013)	3	Used / Generated
SOP Instance Status	(0100,0410)	3	Ignored / Copied
SOP Authorization Date and Time	(0100,0420)	3	Ignored / Copied
SOP Authorization Comment	(0100,0414)	3	Ignored / Copied
Authorization Equipment Certification Number	(0100,0416)	3	Ignored / Copied
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, DCM, Acquisition Equipment) (109102, DCM, 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

3.4.6.8 CT Image Module

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

TABLE 3-16
CT IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	Ignored / Copied
Samples per Pixel	(0028,0002)	1	Ignored (expect "1") / Copied
Photometric Interpretation	(0028,0004)	1	Ignored (expect "MONOCHROME2") / Copied
Bits Allocated	(0028,0100)	1	Ignored (expect "16") / Copied
Bits Stored	(0028,0101)	1	Ignored (expect "16") / Copied
High Bit	(0028,0102)	1	Ignored (expect "15") / Copied
Rescale Intercept	(0028, 1052)	1	Used / Copied
Rescale Slope	(0028,1053)	1	Ignored / Copied
KVP	(0018,0060)	2	Used / Copied
Acquisition Number	(0020,0012)	2	Used / Copied
Scan Options	(0018,0022)	3	Used / Copied
Data Collection Diameter	(0018,0090)	3	Ignored / Copied
Reconstruction Diameter	(0018,1100)	3	Ignored / Copied
Distance Source to Detector	(0018,1110)	3	Ignored / Copied
Distance Source to Patient	(0018,1111)	3	Ignored / Copied
Gantry/Detector Tilt	(0018,1120)	3	Ignored / Copied
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 μAs	(0018,1153)	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

3.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

This section describes the private tag attributes that are present in CT images from a GE scanner (Manufacturer DICOM tag (0008, 0070) starts with GE MEDICAL SYSTEMS).

PRIVATE ADVANTAGE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Private Creator	(0019, 00xx)	3	GE HEALTHCARE_ACQU_01: Ignored / Copied
Table Speed	(0019, xx23)	3	Ignored / Copied
Midscan Time	(0019, xx24)	3	Ignored / Copied
Gantry Velocity	(0019, xx27)	3	Used / Copied
SFOV Type	(0019, xx39)	3	Ignored / Copied
Dependent on #views processed	(0019, xx6A)	3	Ignored / Copied
Private Creator	(0043, 00xx)	3	GE HEALTHCARE_PARM_01: Ignored / Copied
Delta Start Time [msec]	(0043, xx1E)	3	Used / Copied
Pitch Ratio	(0043, xx27)	3	Used / Copied
Private Scan Options	(0043, xx2B)	3	Ignored / Copied
motCorr	(0043, xx65)	3	Ignored / Copied
IBOCorr	(0043, xx67)	3	Ignored / Copied
Private Creator	(0045, 00xx)	3	GE HEALTHCARE_HELIOS_01: Ignored / Copied
Sigma Mode	(0045, xx13)	3	Ignored / Copied
Ibone Flag	(0045, xx21)	3	Ignored / Copied
Peris Flag	(0045, xx22)	3	Ignored / Copied
Cardiac Recon Algo	(0045, xx30)	3	Used / Copied
Average Heart Rate	(0045, xx31)	3	Ignored / Copied
Temporal Resolution	(0045, xx32)	3	Ignored / Copied
Cardiac Phase Number	(0045, xx33)	3	Used / Copied
Private Creator	(004b, 00xx)	3	GEMS_HINO_CT_01: Ignored / Copied
R Time	(004B, xx02)	3	Used / Copied
HBC number	(004B, xx03)	3	Used / Copied

4. SECONDARY CAPTURE 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 by this implementation. Corresponding attributes are conveyed using the module construct.

4.2 SC IOD DESCRIPTION

The Secondary Image (SC) Image Information Object Definition (IOD) specifies images that are converted from a non-DICOM format to a modality independent DICOM format.

Examples of types of equipment that create Secondary Capture Images include:

a. Video interfaces that convert an analog video signal into a digital image.

b. Digital interfaces that are commonly used to transfer non-DICOM digital images from an imaging device to a laser printer.

c. Film digitizers that convert an analog film image to digital data

4.3 SC ENTITY RELATIONSHIP MODEL

The Entity-Relationship diagram for the SC Image interoperability schema is shown in Illustration 5-1. 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
- Lines connecting the corresponding entity boxes to the relationship boxes depict the fact that a relationship exists between two entities.

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 Study for each Patient (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 5-1
SC IMAGE ENTITY RELATIONSHIP DIAGRAM

```
                    ┌──────────────┐
                    │   Patient    │
                    └──────┬───────┘
                           ▼ 1
                    ◇─────────────◇
                    │     is       │
                    │ the subject  │
                    │     of       │
                    ◇─────────────◇
                           ▼ 1,n
                    ┌──────────────┐
                    │    Study     │
                    └──────┬───────┘
                           ▼ 1
                    ◇─────────────◇
                    │   contains   │
                    ◇─────────────◇
                           ▼ 1,n
  ◇────────────◇            ┌──────────────┐
  │  creates   │───────────▶│    Series    │
  ◇────────────◇   1,n      └──────┬───────┘
        ▲ 1                        ▼ 1
  ┌────────────┐            ◇─────────────◇
  │ Equipment  │            │   contains   │
  └────────────┘            ◇─────────────◇
                                   ▼ 0,n
                            ┌──────────────┐
                            │   SC Image   │
                            └──────────────┘
```
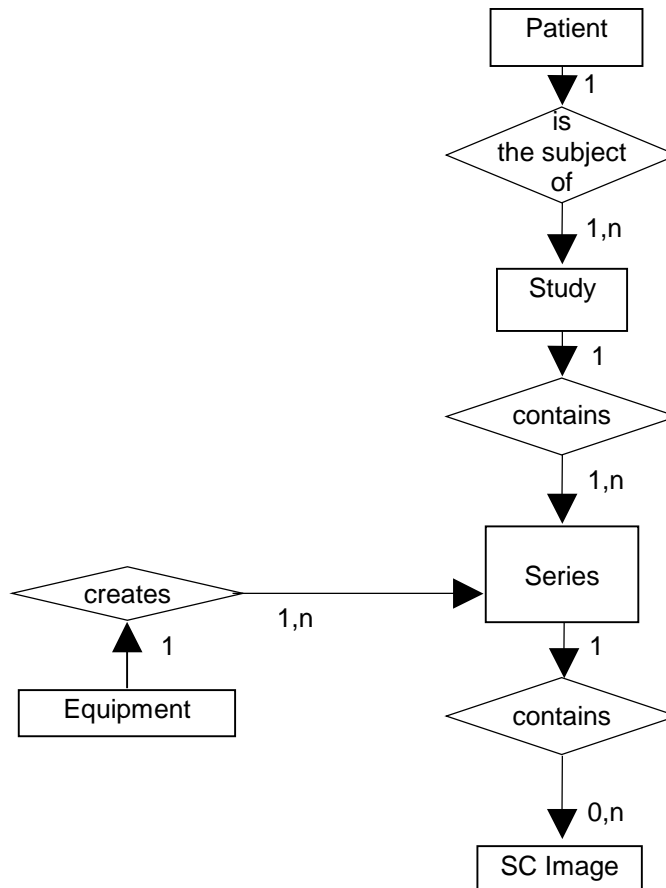
4.3.1 Entity Descriptions

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

4.3.2 SmartScore Mapping of DICOM entities

TABLE 4-2
MAPPING OF DICOM ENTITIES TO SMARTSCORE ENTITIES

DICOM	SmartScore Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image

4.4 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 identifies the defined modules within the entities, which comprise the DICOM SC IOD. Module Name identifies modules.

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

TABLE 4-3
SC IMAGE IOD MODULES

Entity Name	Module Name	Reference
Patient	Patient	4.5.1.1
Study	General Study	4.5.2.1
	Patient Study	4.5.2.2
Series	General Series	4.5.3.1
Equipment	General Equipment	4.5.4.1
	SC Equipment	4.5.5.7.1
Image	General Image	4.5.5.1
	Image Pixel	4.5.5.2
	SC Image	4.5.5.7.2
	Overlay Plane	4.5.5.3.1
	Modality LUT	4.5.5.5
	VOI LUT	4.5.5.4
	SOP Common	4.5.5.6.1

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

4.5.1 Patient Entity Modules

4.5.1.1 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
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	Copied
Patient's Birth Date	(0010,0030)	2	Copied
Patient's Sex	(0010,0040)	2	Copied
Referenced Patient Sequence	(0008,1120)	3	Copied
>Referenced SOP Class UID	(0008,1150)	1C	Copied
>Referenced SOP Instance UID	(0008,1155)	1C	Copied
Patient's Birth Time	(0010,0032)	3	Copied
Other Patient IDs	(0010,1000)	3	Copied
Other Patient Names	(0010,1001)	3	Copied
Other Patient IDs sequence	(0010, 1002)	3	Copied
Ethnic Group	(0010,2160)	3	Copied
Smoking Status	(0010,21A0)	3	Copied
Patient Comments	(0010,4000)	3	Copied

4.5.2 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.

4.5.2.1   General Study Module

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

TABLE 4-5
GENERAL STUDY MODULE ATTRIBUTES

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

4.5.2.2   Patient Study Module

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

TABLE 4-6
PATIENT STUDY MODULE ATTRIBUTES

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

4.5.3   Series Entity Modules

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

4.5.3.1   General Series Module

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

TABLE 4-7
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Copied (CT)
Series Instance UID	(0020,000E)	1	Generated
Series Number	(0020,0011)	2	Generated
Laterality	(0020,0060)	2C	Generated: ""
Series Date	(0008,0021)	3	Generated (System Date)
Series Time	(0008,0031)	3	Generated (System Time)
Performing Physicians' Name	(0008,1050)	3	Copied
Protocol Name	(0018,1030)	3	Removed
Series Description	(0008,103E)	3	Generated
Operators' Name	(0008,1070)	3	Generated (System.getProperty("user.name"))
Referenced Performed Procedure Step Sequence	(0008,1111)	3	Removed
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Body Part Examined	(0018,0015)	3	Removed
Patient Position	(0018,5100)	2C	Copied
Smallest Pixel Value in Series	(0028,0108)	3	Removed
Largest Pixel Value in Series	(0028,0109)	3	Removed
Request Attributes Sequence	(0040,0275)	3	Removed
>Requested Procedure ID	(0040,1001)	1C	
>Scheduled Procedure Step ID	(0040,0009)	1C	
>Scheduled Procedure Step Description	(0040,0007)	3	
>Scheduled Protocol Code Sequence	(0040,0008)	3	
>>Code Value	(0008,0100)	1C	
>>Code Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	1C	
Performed Procedure Step ID	(0040,0253)	3	Removed
Performed Procedure Step Start Date	(0040,0244)	3	Removed
Performed Procedure Step Start Time	(0040,0245)	3	Removed
Performed Procedure Step Description	(0040,0254)	3	Removed
Performed Protocol Code Sequence	(0040,0260)	3	Removed
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	1C	

4.5.4 Equipment Entity Modules

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

4.5.4.1 General Equipment Module

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

TABLE 4-8
GENERAL EQUIPMENT MODULE ATTRIBUTES

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

4.5.5 Image Entity Modules

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

4.5.5.1 General Image Module

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

TABLE 4-9
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient Orientation	(0020,0020)	2C	Copied
Content Date	(0008,0023)	2C	Generated (System Date)
Content Time	(0008,0033)	2C	Generated (System Time)
Image Type	(0008,0008)	3	Generated. See 4.5.5.1.1.1
Acquisition Number	(0020,0012)	3	Copied
Acquisition Date	(0008,0022)	3	Copied
Acquisition Time	(0008,0032)	3	Copied
Referenced Image Sequence	(0008,1140)	3	Removed
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Derivation Description	(0008,2111)	3	Removed
Source Image Sequence	(0008,2112)	3	Removed

>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Images in Acquisition	(0020,1002)	3	Removed
Image Comments	(0020,4000)	3	Removed
Quality Control Image	(0028,0300)	3	Removed
Burned In Annotations	(0028,0301)	3	Generated (No is stored)
Lossy Image Compression Ratio	(0028,2112)	3	Removed
Lossy Image Compression	(0028,2110)	3	Removed

4.5.5.1.1   General Image Attribute Descriptions

4.5.5.1.1.1   Image Type

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:

− CAPTURE   identifies a Screen Capture

4.5.5.2   Image Pixel Module

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

TABLE 4-10
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Generated • "1" for black and white images • "3" for color images
Photometric Interpretation	(0028,0004)	1	Generated • "MONOCHROME2" or "MONOCHROME1" for black and white images • "RGB" for color images
Rows	(0028,0010)	1	Generated (512 for Physician Report, 1024 for Patient Report)
Columns	(0028,0011)	1	Generated (512 for Physician Report, 1024 for Patient Report)
Bits Allocated	(0028,0100)	1	Generated • "16" for black and white images • "8" for color images
Bits Stored	(0028,0101)	1	Generated • "16" for black and white images • "8" for color images

High Bit	(0028,0102)	1	Generated • "15" for black and white images • "7" for color images
Pixel Representation	(0028,0103)	1	Generated • "1" for black and white images • "0" for color images
Pixel Data	(7FE0,0010)	1	Generated
Planar Configuration	(0028,0006)	1C	Generated • Removed for black and white images • "0" for color images
Pixel Aspect Ratio	(0028,0034)	1C	Removed
Smallest Image Pixel Value	(0028,0106)	3	Removed
Largest Image Pixel Value	(0028,0107)	3	Removed
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	Removed
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Removed
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Removed
Red Palette Color Lookup Table Data	(0028,1201)	1C	Removed
Green Palette Color Lookup Table Data	(0028,1202)	1C	Removed
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Removed

4.5.5.3 Overlay Modules

4.5.5.3.1 Overlay plane module

This section contains Attributes that describe characteristics of an Overlay Plane.

This module is not currently supported by AW/Voxtool platform (on which SmartScore is built) as well as SmartScore and hence will be ignored.

TABLE 4-11
OVERLAY PLANE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Overlay Rows	(60xx, 0010)	1	Unsupported module
Overlay Columns	(60xx, 0011)	1	Unsupported module
Overlay Type	(60xx, 0040)	1	Unsupported module
Origin	(60xx, 0050)	1	Unsupported module
Overlay Bits Allocated	(60xx, 0100)	1	Unsupported module
Bit Position	(60xx,0102)	1	Unsupported module
Overlay Data	(60xx, 3000)	1C	Unsupported module
Overlay Description	(60xx, 0022)	3	Unsupported module
Overlay Subtype	(60xx, 0045)	3	Unsupported module
Overlay Label	(60xx, 1500)	3	Unsupported module
ROI Area	(60xx, 1301)	3	Unsupported module
ROI Mean	(60xx, 1302)	3	Unsupported module
ROI Standard Deviation	(60xx, 1303)	3	Unsupported module
Overlay Descriptor - Gray	(60xx, 1100)	3	Unsupported module
Overlay Descriptor - Red	(60xx, 1101)	3	Unsupported module
Overlay Descriptor - Green	(60xx, 1102)	3	Unsupported module
Overlay Descriptor - Blue	(60xx, 1103)	3	Unsupported module
Overlays - Gray	(60xx, 1200)	3	Unsupported module
Overlays - Red	(60xx, 1201)	3	Unsupported module
Overlays - Green	(60xx, 1202)	3	Unsupported module
Overlays - Blue	(60xx, 1203)	3	Unsupported module

4.5.5.4 VOI LUT module

This section specifies the Attributes that describe the VOI LUT.

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

TABLE 4-12
VOI LUT MODULE ATTRIBUTES

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

4.5.5.5 Modality LUT module

This section specifies the Attributes that describe the Modality LUT.

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

TABLE 4-13
MODALITY LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality LUT Sequence	(0028,3000)	3	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	Removed
Rescale Slope	(0028,1053)	1C	Removed
Rescale Type	(0028,1054)	1C	Removed

4.5.5.6 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

4.5.5.6.1 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 4-14
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Generated
SOP Instance UID	(0008,0018)	1	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	Copied Only the "ISO_IR 100" character set is supported.
Instance Creation Date	(0008,0012)	3	Generated: current date
Instance Creation Time	(0008,0013)	3	Generated: current time
Instance Creator UID	(0008,0014)	3	Removed
Time zone Offset From UTC	(0008,0201)	3	Removed
Instance Number	(0020,0013)	3	Generated
SOP Instance Status	(0100,0410)	3	Removed
SOP Authorization Date and Time	(0100,0420)	3	Removed
SOP Authorization Comment	(0100,0414)	3	Removed
Authorization Equipment Certification Number	(0100,0416)	3	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, DCM, Acquisition Equipment) (109102, DCM, 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

4.5.5.7 SC Modules

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

4.5.5.7.1 SC Equipment Module

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

TABLE 4-15
SC IMAGE EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Conversion Type	(0008,0064)	1	Generated: WSD = Workstation
Modality	(0008,0060)	3	Copied
Secondary Capture Device ID	(0018,1010)	3	Generated: InetAddress.getLocalHost()
Secondary Capture Device Manufacturer	(0018,1016)	3	Generated "GE Medical Systems"
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	3	Generated: "GEHC-SmartScore"
Secondary Capture Device Software Version	(0018,1019)	3	Generated: "SmartScore ver 4"
Video Image Format Acquired	(0018,1022)	3	Removed
Digital Image Format Acquired	(0018,1023)	3	Removed

4.5.5.7.2 SC Image Module

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

TABLE 4-16
SC IMAGE MODULE ATTRIBUTES

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