GE Healthcare

Technical Publications

Direction DOC2064043
Revision 2

Centricity™ Multi-Disciplinary Team Meeting (MDT)

DICOM CONFORMANCE STATEMENT

REVISION HISTORY

REV	DATE	REASON FOR CHANGE	AUTHOR
1	18 Nov 2017	Initial creation of MDT DCS document	Batári Ferencné
2	12 March 2019	MDT DCS updated for convergence to C360: Added reference to EA 4.0 DICOM Conformance Statement Added GEHC and EA definitions in the Abbreviations table Added Centricity Enterprise Archive in complement to GE Health Cloud storage Removed platform naming “GE Healt Cloud” from document name and header.	Batári Ferencné

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CONFORMANCE STATEMENT OVERVIEW

Centricity™ Multi-Disciplinary Team Meeting (MDT) is a web-based solution built on top of Centricity Case Exchange and is used to prepare and support the meeting(s) of a group of professionals from one or more clinical disciplines who together make decisions regarding recommended treatment of individual patients. The decision (outcome report containing the MDT group's conclusion, opinion, or recommended treatment) in PDF format may be encapsulated in a DICOM in order to send the report to hospitals PACS for archiving purpose.

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

Table 0.1 – APPLICATION

SOP Classes	Input	Output
Transfer		
Encapsulated PDF Storage	No	Yes

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1. INTRODUCTION

1.1 OVERVIEW

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

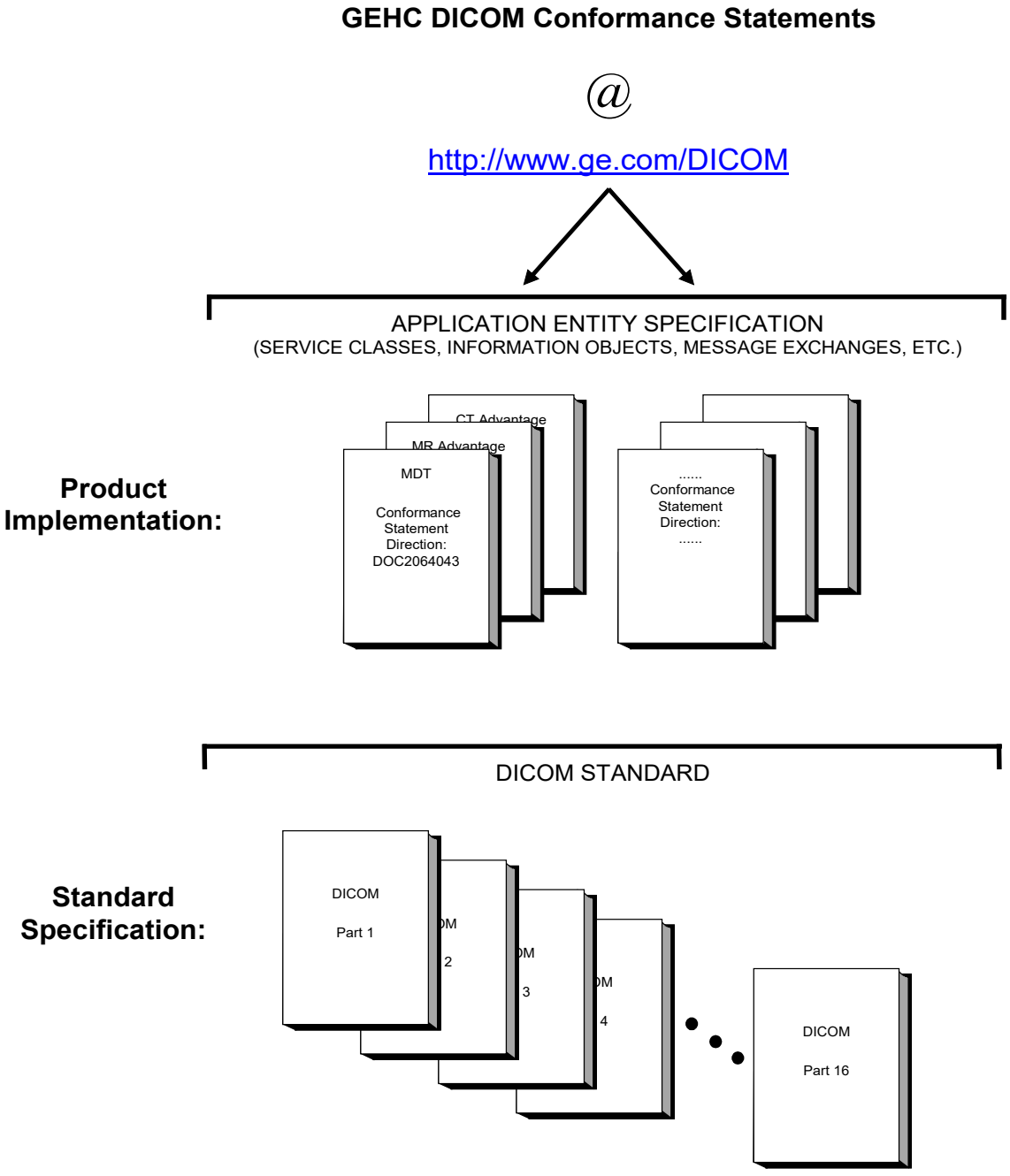
Section 1 (INTRODUCTION), which describes the overall structure, intent, and references for this Conformance Statement

Section 2 (NETWORK CONFORMANCE SATEMENT), which specifies the GEHC equipment compliance to the DICOM requirements for the implementation of Networking features.

Section 3 (ENCAPSULATED PDF INFORMATION OBJECT IMPLEMENTATION) which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a Encapsulated PDF Information Object.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

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



This document specifies the DICOM implementation. It is entitled:

Centricity™ Multi-Disciplinary Team Meeting (hereinafter "MDT") MDT 1
Conformance Statement for DICOM
Direction ***DOC2064043***

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

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

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

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

1.3 INTENDED AUDIENCE

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

1.4 SCOPE AND FIELD OF APPLICATION

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

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

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

1.5 IMPORTANT REMARKS

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

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non–GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.

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

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

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

- **Interaction** - It is the sole responsibility of the **non–GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1.6 REFERENCES

NEMA PS3	Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/
GE Health Cloud DCS	GE Health Cloud DICOM Conformance Statement, direction number DOC1961546.
Centricity EA DCS	Centricity Enterprise Archive DICOM Conformance Statement, direction number DOC0708777

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
DICOM	Digital Imaging and Communications in Medicine
EA	Enterprise Archive
GEHC	GE Healthcare
IOD	Information Object Definition
ISO	International Organization for Standards

IO	Intra-oral X-ray
JPEG	Joint Photographic Experts Group
O	Optional (Key Attribute)
PACS	Picture Archiving and Communication System
R	Required (Key Attribute)
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
US	Ultrasound
VL	Visible Light
VR	Value Representation

2. NETWORK CONFORMANCE STATEMENT

2.1 INTRODUCTION

This section of the Conformance Statement specifies the MDT Conformance Statement compliance to DICOM requirements for **Networking** features. All DICOM interconnectivity and storage features are provided by the GE Health Cloud or Centricity Enterprise Archive.

MDT generates PDF encapsulated DICOM object, upload them to the DICOM Image store in GE Health Cloud or Centricity Enterprise Archive.

Using the features and function in the GE Health Cloud or Centricity Enterprise Archive, the user may download the objects back to their originating DICOM system and from there transfer them to other DICOM stations or PACS, where they may be displayed in any application capable of displaying such DICOM objects.

For a complete description of the media storage conformance, refer to the GE Health Cloud DICOM Conformance Statement or Centricity Enterprise Archive DICOM Conformance Statement as the platforms upon which MDT runs (see References).

SOP Classes Used as Output:

Modality	SOP Class	Remarks
DOC	1.2.840.10008.5.1.4.1.1.104.1	Encapsulated PDF Output

Implementation Identifying Information

Application Name	Implementation Class UID
MDT	1.2.840.113619.6.451

3. ENCAPSULATED PDF INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

This section specifies the use of the DICOM ENCAPSULATED PDF INFORMATION OBJECT IMPLEMENTATION to represent results DICOM encapsulated PDF by this implementation. Corresponding attributes are conveyed using the module construct.

3.2 MDT MAPPING OF DICOM ENTITIES

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

TABLE 3-1
MAPPING OF DICOM ENTITIES TO MDT ENTITIES

DICOM IE	MDT Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image
Encapsulated PDF	Encapsulated PDF
Frame	Not Applicable

3.3 IOD MODULE TABLE

Within an entity of the Encapsulated PDF 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 3-2
ENCAPSULATED PDF IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	N/A
Study	General Study	Used	3.4.2.1
	Patient Study	Not Used	N/A
	Clinical Trial Study	Not Used	N/A
Series	Encapsulated Document Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	N/A
Equipment	General Equipment	Used	3.4.4.1
	SC Equipment	Used	3.4.4.2
Encapsulated Document	Encapsulated Document	Used	3.4.5.1
	SOP Common	Used	3.4.5.2

3.4 INFORMATION MODULE DEFINITIONS

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

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

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 document and are common for all studies performed on the patient.

TABLE 3-3
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	Attribute Description

Patient's Name	(0010,0010)	2	PN	Copied
Patient ID	(0010,0020)	2	LO	Copied
Issuer of Patient ID	(0010,0021)	3	LO	Removed
Patient's Birth Date	(0010,0030)	2	DA	Copied
Patient's Sex	(0010,0040)	2	CS	Copied
Referenced Patient Sequence	(0008,1120)	3	SQ	Removed
Patient's Birth Time	(0010,0032)	3	TM	Removed
Other Patient Ids	(0010,1000)	3	LO	Removed
Other Patient IDs Sequence	(0010,1002)	3	SQ	Removed
Other Patient Names	(0010,1001)	3	PN	Removed
Ethnic Group	(0010,2160)	3	SH	Removed
Patient Comments	(0010,4000)	3	LT	Removed
All other Optional and Conditional Patient Module Attributes				Removed

3.4.2 Common Study Entity Modules

3.4.2.1 General Study Module

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

TABLE 3-4
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	Attribute Description
Study Instance UID	(0020,000D)	1	UI	Generated
Study Date	(0008,0020)	2	DA	Generated
Study Time	(0008,0030)	2	TM	Generated
Referring Physician's Name	(0008,0090)	2	PN	Copied
Referring Physician's Identification Sequence	(0008,0096)	3	SQ	Removed
Study ID	(0020,0010)	2	SH	Copied
Accession Number	(0008,0050)	2	SH	Copied
Issuer of Accession Number Sequence	(0008,0051)	3	SQ	Removed
Study Description	(0008,1030)	3	LO	Generated Value = MDT Outcome Report

Physician(s) of Record	(0008,1048)	3	PN	Removed
Physician(s) of Record Identification Sequence	(0008,1049)	3	SQ	Removed
Name of Physician(s) Reading Study	(0008,1060)	3	PN	Removed
Physician(s) Reading Study Identification Sequence	(0008,1062)	3	SQ	Removed
Requesting Service Code Sequence	(0032,1034)	3	SQ	Removed
Referenced Study Sequence	(0008,1110)	3	SQ	Removed
Procedure Code Sequence	(0008,1032)	3	SQ	Removed
Reason For Performed Procedure Code Sequence	(0040,1012)	3	SQ	Removed

3.4.3 Common Series Entity Modules

3.4.3.1 Encapsulated Document Series Module

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

TABLE 3-5
ENCAPSULATED DOCUMENT SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	Attribute Description
Modality	(0008,0060)	1	CS	Generated Defined Terms: DOC = Document
Series Instance UID	(0020,000E)	1	UI	Generated
Series Number	(0020,0011)	2	IS	Generated Value = 1000
Referenced Performed Procedure Step Sequence	(0008,1111)	3	SQ	Removed
Series Description	(0008,103E)	3	LO	Generated See Section 3.4.3.1.1.1
Series Description Code Sequence	(0008,103F)	3	SQ	Removed
Request Attributes Sequence	(0040,0275)	3	SQ	Removed
Performed Procedure Step ID	(0040,0253)	3	SH	Removed
Performed Procedure Step Start Date	(0040,0244)	3	DA	Removed
Performed Procedure Step Start Time	(0040,0245)	3	TM	Removed
Performed Procedure Step Description	(0040,0254)	3	LO	Removed
Performed Protocol Code Sequence	(0040,0260)	3	SQ	Removed
Comment on the Performed Procedure Step	(0040,0280)	3	ST	Removed

3.4.3.1.1 General Series Attribute Descriptions

3.4.3.1.1.1 Series Description

The Series Description will be:

"MDT Outcome Report"

3.4.4 Common Equipment Entity Modules

3.4.4.1 General Equipment Module

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

TABLE 3-6
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	Attribute Description
Manufacturer	(0008,0070)	2	LO	Generated (Value = GE Medical Systems)
Institution Name	(0008,0080)	3	LO	Removed
Institution Address	(0008,0081)	3	ST	Removed
Station Name	(0008,1010)	3	SH	Removed
Institutional Department Name	(0008,1040)	3	LO	Removed
Manufacturer's Model Name	(0008,1090)	3	LO	Generated (Value = GEHC MDT)
Device Serial Number	(0018,1000)	3	LO	Removed
Software Versions	(0018,1020)	3	LO	Generated Actual Application Version
All other Optional or Conditional General Equipment Module Attributes				Removed

3.4.4.2 SC Equipment Module

This section specifies the Attributes that identify and describe the piece of equipment that produced the encapsulated PDF document.

TABLE 3-7
SC EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	Attribute Description
Conversion Type	(0008,0064)	2	CS	Generated (Value = WSD) WSD = Workstation
Modality	(0008,0060)	3	CS	Generated (Value=DOC) DOC = Document
All other Optional SC Equipment Module Attributes				Removed

3.4.5 Encapsulated Document Entity Modules

3.4.5.1 Encapsulated Document

This section specifies the Attributes that identify and describe encapsulated PDF document within a particular series.

TABLE 3-8
GENERAL ENCAPSULATED DOCUMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	Attribute Description
Instance Number	(0020,0013)	1	IS	Generated
Content Date	(0008,0023)	2	DA	Generated (Value = Current Date)
Content Time	(0008,0033)	2	TM	Generated (Value = Current Time)
Acquisition Date Time	(0008,002A)	2	DT	Copied
Image Laterality	(0020,0062)	3	CS	Removed
Burned In Annotations	(0028,0301)	1	CS	Generated (Value = Yes)
Recognizable Visual Features	(0028,0302)	3		Removed
Source Instance Sequence	(0042,0013)	1C	SQ	Removed Condition not met
Document Title	(0042,0010)	2	ST	Generated (Value = "Generic MDT Outcome Report"
Concept Name Code Sequence	(0040,A043)	2	SQ	Empty sequence
Document Class Code Sequence	(0040,E008)	3	SQ	Removed
Verification Flag	(0040,A493)	3	CS	Removed
HL7 Instance Identifier	(0040,E001)	1C	ST	Removed
MIME Type of Encapsulated Document	(0042,0012)	1	LO	Generated (Value = "application/pdf")
List of MIME Types	(0042,0014)	1C	LO	Removed Condition not met
Encapsulated Document	(0042,0011)	1		Generated

3.4.5.2 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 3-9
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	Attribute Description
SOP Class UID	(0008,0016)	1	UI	Generated Value = '1.2.840.10008.5.1.4.1.1.104.1'
SOP Instance UID	(0008,0018)	1	UI	Generated
Specific Character Set	(0008,0005)	1C	CS	Generated (Value= ISO_IR 192)
Instance Creation Date	(0008,0012)	3	DA	Generated (Value = Current Date)
Instance Creation Time	(0008,0013)	3	TM	Generated (Value = Current Time)
Instance Creator UID	(0008,0014)	3	UI	Removed
Time zone Offset From UTC	(0008,0201)	3	SH	Copied
Instance Number	(0020,0013)	3	IS	Generated
SOP Instance Status	(0100,0410)	3	CS	Removed
SOP Authorization Date and Time	(0100,0420)	3	DT	Removed
SOP Authorization Comment	(0100,0424)	3	LT	Removed
Authorization Equipment Certification Number	(0100,0426)	3	LO	Removed
Contributing Equipment Sequence	(0018, A001)	3	SQ	Removed

3.5 SUPPORT OF EXTENDED CHARACTER SET

The product will put all UTF-8 coded characters to Encapsulated PDF document without any modifications.

TABLE 3-10
EXTENDED CHARACTER SET SUPPORT

Encoding	DICOM Term in Specific Character Set (0008,0005)
Unicode in UTF-8	ISO_IR 192