

Conformance Statement Overview

modiCAS||3D

V 3.2

modiCAS||3D supports 2D and 3D surgery planning for hip or knee replacements. It supports planning based on Computed Radiography Images, Digital X-Ray Images (For Presentation, For Processing), Secondary Capture Images and CT images. These images can also be loaded from local or network storage.

The result of the planning procedure is stored locally or on network storage as a PDF file or as an Encapsulated PDF DICOM Object. Additionally, the Encapsulated PDF DICOM Object can be sent as such to a configured DICOM Storage SCP.

SOP Classes		User of Service (SCU)	Provider of Service (SCP)
Verification			
Verification	1.2.840.10008.1.1	No	Yes
Transfer (Image SOP Class)			
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	No	Yes
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	No

Network Services

Name	Value
Application Context Name	1.2.840.100008.3.1.1.1
Implementation Class UID	1.3.6.1.4.1.30071.8
Implementation Version Name	fo-dicom 3.0.0

Implementation Identifying Information

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1 Introduction

1.1 Audience

This DICOM Conformance Statement (DCS) is written for people that need to understand how **modiCAS||3D** will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. However, integrators are expected to fully understand the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

1.2 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between **modiCAS||3D** and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

- The comparison of different Conformance Statements is only the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

1.3 Terms, Definitions and Abbreviations

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.

Term	Definition
Abstract Syntax	The information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Secondary Capture Image Storage, Computed Radiography Image Storage SOP Class.
Application Entity (AE)	A DICOM information exchange implementation, 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.

Term	Definition
Application Entity Title (AET)	The unique name of an Application Entity, used to identify a DICOM application to other DICOM applications on a given network.
Association	A network communication channel set up between two 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), composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Source Image Sequence (0008,2112).
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: SC Image IOD, DX Image IOD, CT Image IOD.
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, Patient Sex et al.
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.
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: Secondary Capture Image Storage Service SOP Class.

Term	Definition
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". Examples: Patient ID (0010,0020)
Transfer Syntax	The encoding used for exchange of DICOM information objects and messages.
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 be able to identify the format of each data element.

[Terms and Definitions](#)

1.4 References

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

2 Networking

2.1 Implementation Model

Verification

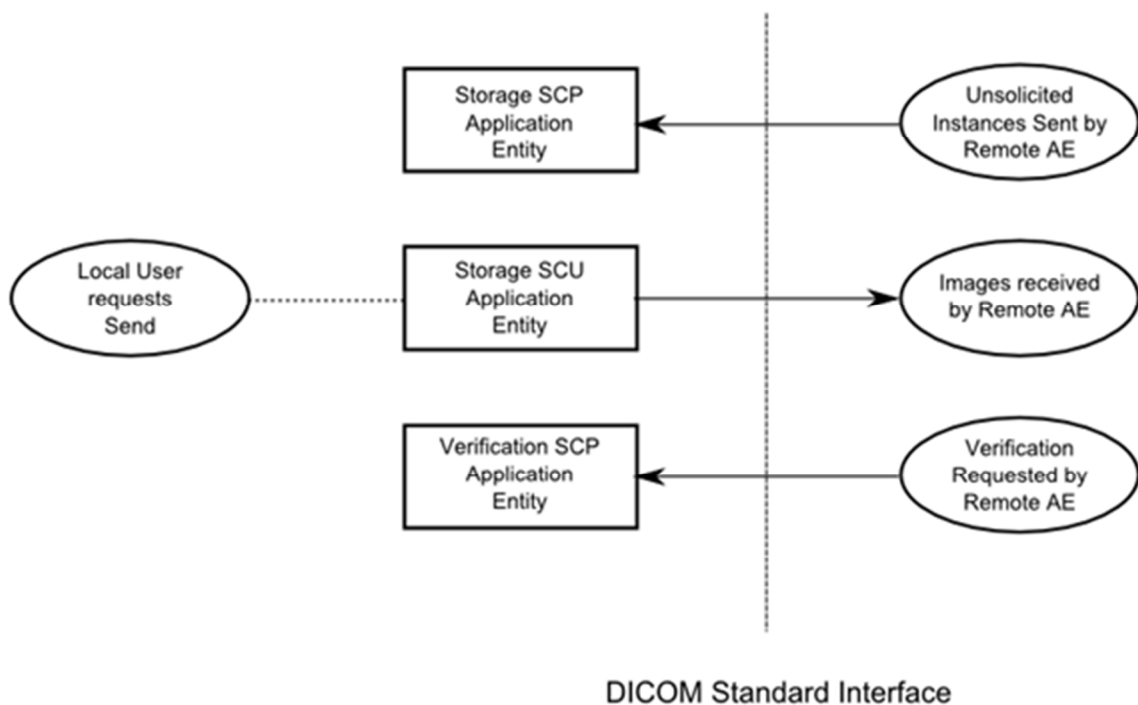
modiCAS||3D responds to Verification requests from remote nodes. The Verification Request is handled by the Storage SCP.

Storage

The DICOM implementation of **modiCAS||3D** is able to initiate associations for Storage of Encapsulated PDF Storage DICOM Composite Information Objects to Remote AEs and to receive and respond to associations for Storage from Remote AEs.

2.1.1 Application Data Flow

The following figure represents the functionality of modiCAS||3D. The graphical layout does not necessarily represent the actual design of the software.



[Implementation Model Data Flow](#)

2.1.2 Functional Definitions of AEs

2.1.2.1 Verification SCP

ECHO-SCP (as part of STORAGE SCP) waits in the background for incoming connections, where it will accept associations with Presentation Contexts for SOP Class of the Verification Service Class and responds with 'success' to echo requests.

2.1.2.2 Storage SCU

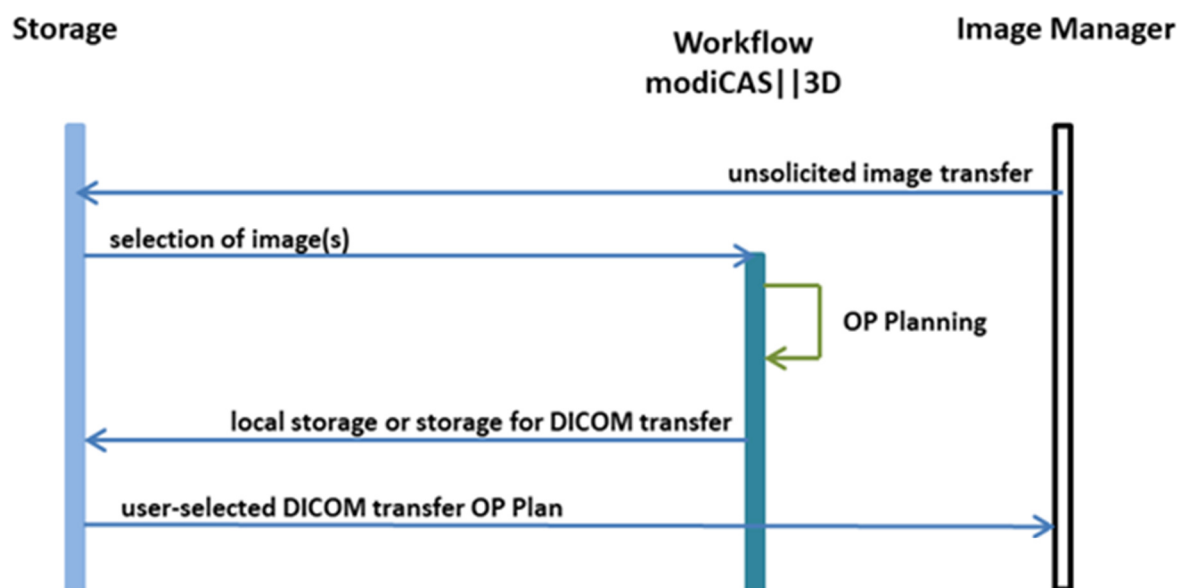
STORAGE-SCU is activated through the user interface when a user selects to send the surgery plan (encapsulated PDF) from the User Interface (currently displayed instance) to a remote AE (pre-configured single target).

2.1.2.3 Storage SCP

STORAGE-SCP waits in the background for incoming connections, where it will accept associations with Presentation Contexts for SOP Classes of the Storage Service Class and stores the received instances to the local database, where they may subsequently be opened and processed through the user interface.

2.1.3 Sequencing of Activities

modiCAS| |3D Workflow



[Sequencing of Activities](#)

2.2 Application Entity Specification

2.2.1 Verification SCP AE Specification

2.2.1.1 SOP Classes

For SOP Classes supported, please refer to Table [Network Services](#) (Provider of Service) in the DCS Overview.

2.2.1.2 Association Policies

ECHO-SCP accepts but never initiates associations.

2.2.1.2.1 Number of Associations

ECHO-SCP accepts one association at a time to response to a request for verification.

2.2.1.2.2 Asynchronous Nature

ECHO-SCP software does not support asynchronous communication (multiple outstanding transactions over a single association).

2.2.1.2.3 Implementation Identifying Information

For Implementation Identifying Information please refer to Table [Implementation Identifying Information](#) in the DCS Overview.

2.2.1.3 Associations Initiation Policy

Does not apply.

2.2.2 Storage SCP AE Specification

2.2.2.1 SOP Classes

For SOP Classes supported, please refer to Table [Network Services](#) (Provider of Service) in the DCS Overview.

2.2.2.2 Association Policies

modiCAS||3D will accept instances of SOP Classes according to Table [Network Services](#) (Provider of Service) in the DCS Overview. There is no limit on the number of presentation contexts accepted except for the DICOM limit. In the event that the **modiCAS||3D** DICOM application runs out of resources, it will reject the association request.

modiCAS||3D will support the following Transfer Syntaxes as SCP

Presentation Context Table – “Store SCP”				
Abstract Syntax Description	Transfer Syntax	Transfer Syntax	Role	Ext.
	Name List	UID List		Neg.
SOP Classes Table 1 (column SCP)	JPEG Lossless (Process 14)	1.2.840.10008.1.2.4.70	SCP	None
	JPEG 2000 Lossless Only	1.2.840.10008.1.2.4.90		
	Explicit VR Little Endian	1.2.840.10008.1.2.1		
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2		

[Presentation Contexts Store SCP](#)

The default PDU size used will be 16 kB (max 128 kB).

2.2.2.2.1 Number of Associations

modiCAS||3D Storage-SCP accepts one association at a time.

2.2.2.2.2 Assynchronous Nature

modiCAS||3D Storage-SCP software does not support asynchronous communication (multiple outstanding transactions over a single association).

2.2.2.2.3 Implementation Identifying Information

For Implementation Identifying Information please refer to Table [Implementation Identifying Information](#) in the DCS Overview.

2.2.2.3 Association Initiation Policy

Does not apply.

2.2.2.4 Association Acceptance Policy

The **modiCAS||3D** DICOM application accepts incoming DIMSE C-STORE Storage requests.

The local SCP-AET can be configured (Chapter [Configuration](#)).

2.2.3 Storage SCU AE Specification

2.2.3.1 SOP Classes

For SOP Classes supported, please refer to Table [Network Services](#) (User of Service) in the DCS Overview.

2.2.3.2 Association Policies

modiCAS||3D will attempt to send the processed object from the User Interface (currently displayed instance) to a remote AE (pre-configured single target). This service is activated through the user interface.

In case the remote Service Provider is not able to accept an association, an appropriate message will be displayed to the user.

The default PDU size used will be 16 KB.

2.2.3.2.1 Number of Associations

modiCAS||3D Storage-SCU initiates a single association at a time.

2.2.3.2.2 Asynchronous Nature

modiCAS||3D Storage-SCU software does not support asynchronous communication (multiple outstanding transactions over a single association).

2.2.3.2.3 Implementation Identifying Information

For Implementation Identifying Information please refer Table [Implementation Identifying Information](#) in the DCS Overview.

2.2.3.3 Association Initiation Policy

In case a user requests DICOM Send, **modiCAS||3D** will attempt to initiate a new association for Encapsulated PDF Storage SOP CLASS to send a single object (currently displayed instance) to the configured destination.

2.2.3.3.1 Activity – “Send to ...”

The C-STORE request is triggered by a user interaction. If the process successfully establishes an association to a remote Application Entity, it will transfer a single object (currently displayed instance) via the open association.

If the C-STORE Response from the remote Application contains a status other than “Success” or “Warning”, the association is aborted.

With success status for the transfer, the association will be closed.

2.2.3.3.2 Proposed Presentation Contexts

Presentation Context Table – “Send to ...”				
Abstract Syntax Description	Transfer Syntax Name List	Transfer Syntax UID List	Role	Ext. Neg.
Encapsulated PDF Storage SOP CLASS	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2		

[Presentation Contexts Send to...](#)

2.2.3.2.3 SOP-specific Conformance – “Send to ...”

The DICOM objects sent by **modiCAS||3D** DICOM application conform to the DICOM IOD Definition (Encapsulated PDF Storage IOD). The object will be sent with a new Series Instance UID, i.e. it will be placed within the same Study of the patient under planning.

Please refer to the Object definition table in chapter [IOD Content](#) for a list of all DICOM IOD attributes of type 1, 2 and 3, which are encoded by the **modiCAS||3D** application.

2.2.3.4 Association Acceptance Policy

Does not apply.

2.3 Networking Interfaces

2.3.1 Physical Network Interface

The application is indifferent to the physical medium over which TCP/IP executes.

2.3.2 Additional Protocols

When host names rather than IP addresses are used in the configuration properties to specify presentation addresses for remote AEs, the application is dependent on the name resolution mechanism of the underlying operating system.

2.3.3 Supported Operating Systems

modiCAS||3D requires Windows 7 and higher - 64 bit only.

2.4 Configuration

Parameters can be configured in Settings/PACS.

Parameter Name	Remark	Default
Local Application Entity		
Local AET	AET for modiCAS 3D SCP Service	MODICAS
Port	port number modiCAS 3D listens to incoming requests	104
Storage Path	Local storage path where incoming object are stored	%temp\PACS-cache
Remote Application Entity		
Remote AET	AET for modiCAS 3D SCU Service to send DICOM encapsulated PDF	PACS
Port	port number modiCAS 3D tries to send to	104
Address	Host name or IP Address	"empty"
Description	"Name" of the remote application	Remote PACS

[DICOM Configuration](#)

The DICOM Standard restricts an AET to max 16 characters 7-bit ASCII, no Control Characters must be used. For connectivity reasons with other DICOM implementations only capital letters should be used. The use of leading and/or trailing spaces should be avoided because of the same reasons.

Alternatively to port 104, the dicom-registered port 11112 can be used. Other ports can be used after verification that they are not occupied by other processes.

Timeout Values [sec] and PDU Size			
Parameter	SCU	SCP	Comment
Association Request	30	30	Accepting or Rejecting an Association Request
DICOM Message	∞	∞	Accepting a DICOM Message
PDU Size [bytes]	16384	16384	For SCP: a maximum of 131072 bytes is accepted

[Timeouts](#)

3 Media Interchange

modiCAS||3D supports reading Images (see table [Network Services](#)) from local, media or network storage.

Transfer Syntax	UID
JPEG Lossless, Process 14 (selection value 1)	1.2.840.10008.1.2.4.70
JPEG Lossy Baseline (Process 1 - 8 bit)	1.2.840.10008.1.2.4.50
JPEG Lossy Extended (12 bit)	1.2.840.10008.1.2.4.51
Explicit VR Little Endian	1.2.840.10008.1.2.1
Explicit VR Big Endian	1.2.840.10008.1.2.2 (retired)
Implicit VR Little Endian	1.2.840.10008.1.2

[Supported Transfer Syntaxes for reading CT images](#)

4 Support of Character Sets

modiCAS||3D supports all character sets of incoming images. Encapsulated PDF Operation Plan objects will carry the same value within (0008,0005) as in the original image.

5 Security

modiCAS||3D does not support any specific security measures.

modiCAS||3D supports security utilizing the firewall of the underlying operating system.

6 Additional Information

6.1 IOD Content (Data In)

modiCAS||3D reads images according to table [Network Services](#) (Provider of Service). The application assumes correct DICOM Syntax. Errors in dataset might be accepted but acceptance cannot and will not be guaranteed. The following attributes must be present and will be checked for consistency.

Tag	Attribute	Content	Remark
0008,0008	Image Type	Value 1: ORIGINAL or DERIVED Value 2: PRIMARY or SECONDARY Value 3: AXIAL (CT)	CT: Processing of images with value 3 other than AXIAL cannot be guaranteed
0008,0016	SOP Class UID	see table Network Services	Other images will be refused
0008,0060	Modality	see table Network Services	Other images will be refused
0010,0010	Patient's Name	"displayed in UI"	Used to validate the quadruple
0010,0020	Patient ID	"displayed in UI"	Used to validate the quadruple
0010,0030	Birth Date	"displayed in UI"	Used to validate the quadruple
0010,0040	Sex	"displayed in UI"	Used to validate the quadruple
0018,1110	Distance Source to Detector		non-CT: used for calibration
0018,1111	Distance Source to Patient		non-CT: used for calibration
0018,1164	Imager Pixel Spacing		non-CT: used for calibration
0018,5100	Patient Position	HFS HFP ...	CT
0020,0032	Image Position Patient	X Y Z values	CT: Position planes in 3D space
0020,0037	Image Orientation Patient	Direction cosines	CT
0020,0052	Frame of Reference UID	-	CT: Coordinate system consistency checked
0028,0002	Samples per pixel	1	-
0028,0004	Photometric Interpretation	MONOCHROME1 and MONOCHROME2	-
0028,0010	Rows	Number of rows in matrix	-

Tag	Attribute	Content	Remark
0028,0011	Columns	Number of columns in matrix	-
0028,0030	Pixel Spacing	-	-
0028,0100	Bits Allocated	16	-
0028,0101	Bits Stored	12-16	-
0028,0102	High Bit	Bits stored -1	-
0028,0103	Pixel Representation	0000H or 0001H	Unsigned integer or 2's complement
0028,1050	Window Center	-	-
0028,1051	Window Width	-	-
0028,1052	Rescale Intercept	-	-
0028,1053	Rescale Slope	-	-

[IOD Content](#)

6.2 IOD Content (Data Out: encapsulated PDF)

This section describes the attributes for the encapsulated PDF IOD (1.2.840.10008.5.1.4.1.1.104.1) which is created by this implementation when the user activates the "PACS" function.

Attribute Name	Tag	Comment
Specific Character Set	0008,0005	from Original data set
Instance Creation Date	0008,0012	Date PDF created
Instance Creation Time	0008,0013	Time PDF created
SOP Class UID	0008,0016	1.2.840.10008.5.1.4.1.1.104.1
SOP Instance UID	0008,0018	new Value
Study Date	0008,0020	from Original
Series Date	0008,0021	new Value
Content Date	0008,0023	Date PDF created
Acquisition DateTime	0008,002A	Date and Time PDF created
Study Time	0008,0030	from Original
Series Time	0008,0031	Time PDF created
Content Time	0008,0033	Time PDF created
Accession Number	0008,0050	from Original
Modality	0008,0060	DOC
Conversion Type	0008,0064	WSD
Manufacturer	0008,0070	modiCAS GmbH
Institution Name	0008,0080	"Config Section/Application Settings"
Institution Address	0008,0081	"Config Section/Application Settings"
Referring Physician's Name	0008,0090	from Original
Study Description	0008,1030	from Original
Series Description	0008,103E	e.g. modiCAS 3D Hip Planning
Institutional Department Name	0008,1040	"Config Section/Application Settings"

Attribute Name	Tag	Comment
Performing Physician's Name	0008,1050	from "User"
Manufacturer's Model Name	0008,1090	modiCAS 3D
Patient's Name	0010,0010	from Original
Patient ID	0010,0020	from Original
Patient's Birth Date	0010,0030	from Original
Patient's Sex	0010,0040	from Original
Study Instance UID	0020,000D	from Original
Series Instance UID	0020,000E	new Value
Study ID	0020,0010	from Original
Series Number	0020,0011	incremental starting with 1
Instance Number	0020,0013	incremental starting with 1
Laterality	0020,0062	R L U B
Burned In Annotation	0028,0301	YES
Concept Name Code Sequence	0040,A043	Zero Item in Sequence
Verification Flag	0040,A493	UNVERIFIED
Document Title	0042,0010	modiCAS 3D Surgery Planning Report
Encapsulated Document	0042,0011	PDF-Document
MIME Type of enc. Document	0042,0012	application/pdf
Source Instance Sequence	0042,0013	Reference Instances of original images

[Encoded PDF content](#)