

SoliPACS Server SoliPACS Web Server

DICOM Conformance Statement


Volume 2

<WADO>

Revision 1.1
Software Version 11.1 and after

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Prepared for

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1. CONFORMANCE STATEMENT OVERVIEW

This document is DICOM Conformance Statement of SoliPACS Server that allows Web Access to DICOM Persistent Objects (WADO). SoliPACS Server fully conforms to WADO specifications defined in DICOM Part 18. The text of DICOM Part 18 is identical to that published by ISO as ISO DIS 17432.

WADO is a web-based service for accessing and presenting DICOM persistent objects (e.g. images, medical imaging reports). The service is intended for distribution of results and images to healthcare professionals. WADO is a simple mechanism for accessing DICOM persistent objects from HTML pages or XML documents, through HTTP/HTTPs protocol, using DICOM UIDs (Unique Identifiers). Data may be retrieved either in a presentation-ready form (e.g. JPEG or GIF) as specified by the requester or in a native DICOM format.

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3. Introduction

3.1 Revision History

Document Revision	Date	Author	Description
1.0	January 15, 2008	M. Kobayashi	Initial
1.1	February 4, 2008	M. Kobayashi	Typographical corrections

3.2 Audience

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

3.3 Remarks

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication between the SoliPACS Server and other DICOM systems. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [DICOM]. However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- The comparison of different Conformance Statements is the first step towards assessing interconnectivity between SoliPACS Server and other DICOM conformant equipment.
- Test procedures should be defined to validate the desired level of connectivity.
- The DICOM standard will evolve to meet the users' future requirements. SoliPACS Server is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

3.4 Definitions and Abbreviation

DICOM	Digital Imaging and Communications in Medicine
HL7	Health Level Seven
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
HTTPs	HyperText Transfer Protocol, secured
MIME	Multipurpose Internet Mail Extensions
SOP	Service Object Pair
UID	Unique (DICOM) Identifier
URL/URI	Uniform Resource Locator / Identifier
WADO	Web Access to DICOM Persistent Objects
XML	eXtensible Markup Language

3.5 References

HL7 CDA Health Level Seven, Clinical Document Architecture (CDA)
IETF RFC2045 and followings MIME Multipurpose Internet Mail Extension
IETF RFC2396 Uniform Resource Identifiers (URI): Generic Syntax
IETF RFC2616 Hypertext Transfer Protocol -- HTTP/1.1
IETF RFC3240 Application/dicom MIME Sub-type Registration
ISO/IEC 10918 JPEG Standard for digital compression and encoding of continuous-tone still images

4. NETWORKING

4.1 Implementation Model

4.1.1 Application Data Flow

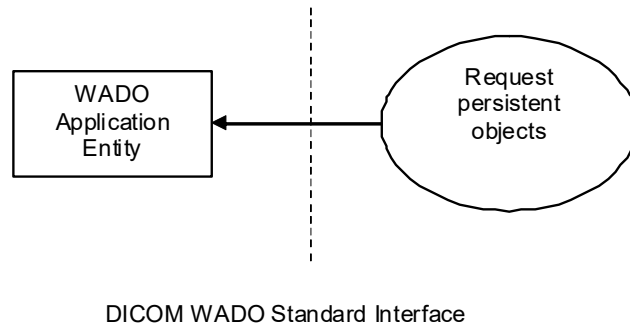


FIGURE 4.1-1
DATA FLOW DIAGRAM

The SoliPACS Server WADO application provides web-based service accessing to DICOM persistent objects.

4.1.2 Functional Definition of AEs

4.1.2.1 Functional Definition of WADO Application Entity

WADO application is a background process running on a Windows 2003 Server. Multiple instances of WADO application may be running at any one time. The application may be started/restarted interactively via a utility.

WADO application will listen for connection requests at the Presentation Address configured. This application is an implementation of a concurrent server; it forks a new process for each connection request it receives. Each forked process exists for the life of HTTP connection and then exits.

The requester establishes HTTP connection and requests DICOM persistent objects using GET method. DICOM persistent objects are provided in a presentation-ready form as specified by the requester or in a native DICOM format.

4.2 AE Specifications

4.2.1 WADO AE Specification

This application provides Standard Conformance to the web service specified by DICOM 3.0 Part 18: Web Access to DICOM Persistent Objects (WADO).

4.2.1.1 Description and Sequencing Activities

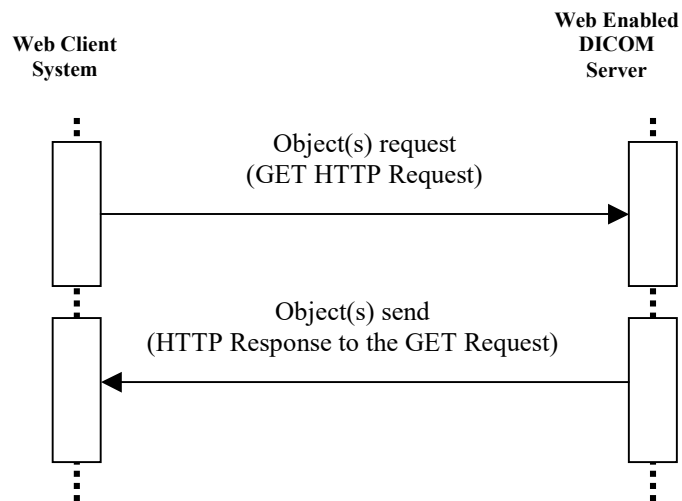


Figure 4.2-1

SEQUENCING DIAGRAM FOR ACTIVITY: REQUEST PERSISTENT OBJECTS

The figure above is a possible sequence of messages between a requester (Web Client System) and the WADO Application Entity (Web Enabled DICOM Server).

1. The requester (Web Client System) initiates HTTP Request, using the GET method as defined in IETF RFC2616.
2. The WADO Application (Web Enabled DICOM Server) returns HTTP Response Message as defined in IETF RFC2616. For a DICOM object, the MIME type is 'application/dicom' as defined in IETF RFC3240 and the body content is a "Part 10 File", which includes a meta-header as defined in DICOM 3.0 Part 10. The returned DICOM object is encoded in "Explicit VR Little Endian" by default. For non-DICOM object, the MIME type is one of the MIME types defined in the contentType parameter. If the required content type cannot be served, an error (406 – Not Acceptable) is returned to the requester.

4.2.1.2 Persistent Object Types

The WADO Application supports the following persistent object types.

4.2.1.2.1 Single Frame Image Objects

The table below lists the supported MIME types for all objects of SOP Classes that consist of a single image frame or objects that consist of single frame accessed from multi-frame instances using the “frameNumber” parameter.

Table 4.2-1

MIME TYPE CONSTRAINTS FOR SINGLE FRAME IMAGE OBJECTS

MIME Type	Description
image/jpeg (default)	JPEG file
application/dicom	DICOM Part 10 file
image/gif	GIF file (RLE compressed)
image/png	PNG file
image/jp2	JPEG2000 file

JPEG file is returned, if contentType parameter is not present.

4.2.1.2.2 Multi-frame Image Objects

The table below lists the supported MIME types for multi-frame image objects.

Table 4.2-2

MIME TYPE CONSTRAINTS FOR MULTI-FRAME IMAGE OBJECTS

MIME Type	Description
application/dicom (default)	DICOM Part 10 file
image/gif	GIF file

DICOM Part 10 file is returned, if contentType parameter is not present.

4.2.1.2.3 Text Objects

The table below lists the supported MIME types for all objects of SOP Classes that include the SR Document Module.

Table 4.2-3

MIME TYPE CONSTRAINTS FOR SR DOCUMENT OBJECTS

MIME Type	Description
text/html (default)	HTML file
application/dicom	DICOM Part 10 file
text/plain	Plain text file encoded in ASCII, Shift-JIS or Big5
text/xml	XML file encoded in UTF-16

HTML file is returned, if contentType parameter is not present.

4.2.1.2.4 Encapsulated PDF objects

The table below lists the supported MIME types for all objects of Encapsulated PDF SOP Class and EBM private PDF Report SOP Class.

Table 4.2-4

MIME TYPE CONSTRAINTS FOR ENCAPSULATED PDF OBJECTS

MIME Type	Description
application/pdf (default)	PDF file
application/dicom	DICOM Part 10 file

PDF file is returned, if contentType parameter is not present.

4.2.1.2.5 Other objects

The table below lists the supported MIME type for all other objects.

Table 4.2-5

MIME TYPE CONSTRAINTS FOR OTHER OBJECTS

MIME Type	Description
application/dicom	DICOM Part 10 file

DICOM Part 10 file is returned, if contentType parameter is not present.

4.2.1.3 Parameters

4.2.1.3.1 Parameters Available for all DICOM Persistent Objects

The table below lists parameter names applicable to all supported DICOM SOP Classes.

Table 4.2-6

PARAMETERS AVAILABLE FOR ALL DICOM PERSISTENT OBJECTS

Parameter Name	Description	Type
requestType	The value shall be "WADO"	REQUIRED
studyUID	Study Instance UID	OPTIONAL (Note 1)
seriesUID	Series Instance UID	OPTIONAL (Note 1)
objectUID	SOP Instance UID	REQUIRED
User	User name registered to the Web Server. This parameter is a private extension to the standard DICOM WADO.	REQUIRED if retrieval of the object is subject to user privilege.

Note 1)

DICOM PS 3.18 mandates Web client system to provide the UIDs of the higher levels in the DICOM Information Model. However, the WADO Application of SoliPACS Server does not require higher level UIDs, as it supports extended relational Query.

4.2.1.3.1 Parameters Available for DICOM Image Persistent Objects

The table below lists parameter names applicable to single frame image objects and multi-frame image objects.

Table 4.2-7

PARAMETERS AVAILABLE FOR DICOM IMAGE PRESENTATION OBJECTS

Parameter Name	Description	Type
rows	Integer value of image height to be returned. Not allowed if contentType=application/dicom.	OPTIONAL
columns	Integer value of image width to be returned	OPTIONAL
region	Four positive decimal strings separated by the ',' representing the region of the source image to be returned.	OPTIONAL
windowCenter	Decimal string specifying the luminosity of the image to be returned.	REQUIRED, if windowWidth is present
windowWidth	Decimal string specifying the contrast of the image to be returned.	REQUIRED, if windowCenter is present
frameNumber	Integer value specifying the single frame with that number within a multiframe image object to be returned.	OPTIONAL
imageQuality	Integer value within the range 1 to 100 specifying the required quality of the image to be returned. 100 represents the best quality. Not allowed if contentType=application/dicom.	OPTIONAL
presentationUID	SOP Instance UID of the presentation state storage object to be applied to the image.	OPTIONAL
presentationSeriesUID	Series Instance UID of the series containing the presentation state storage object to be applied on the image.	REQUIRED and shall only be present if presentationUID is present.

4.3 Physical Network Interfaces

4.3.1 Supported Communication Stacks

4.3.1.1 TCP/IP Stack

WADO application of the SoliPACS Server is implemented using the TCP/IP stack supplied with the Windows 2003 Operating System.

4.3.2 Physical Media

The SoliPACS Server supports a single network interface. One of the following physical network interfaces will be available depending on installed hardware options:

Table 4.3-1

SUPPORTED PHYSICAL NETWORK INTERFACES

Ethernet 1000baseT
Ethernet 100baseTX

4.3.3 Additional Protocols

SoliPACS Server does not support additional protocols.

4.4 Configuration

4.4.1 TCP/IP Port

Table 4.4-1

TCP/IP PORT CONFIGURATION TABLE

Application Entity	TCP/IP Protocol	Default Port ID
WADO	HTTP on TCP Port	80
	HTTPs on SSL Port (Optional)	443

4.4.2 TCP/IP Parameters

Table 4.4-2

CONFIGURATION PARAMETERS TABLE

Parameter	Configurable	Default Value
General Parameters		
Time-out waiting for response to TCP/IP connect() request.	Yes	120 Seconds

5. Security

The SoliPACS Server optionally supports HTTPs protocol.

6. WADO URL

HTTP://xxx.xxx.xxx.xxx/DicomWeb/DicomWeb.dll/WADO