



## DRAFT INTERNATIONAL STANDARD ISO/DIS 17432

ISO/TC 215

Secretariat: ANSI

Voting begins on:  
2004-02-17

Voting terminates on:  
2004-07-19

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

# Health informatics — Messages and communication — Web access to DICOM persistent objects

*Informatique de santé — Messages et communication — Accès au web pour les objets persistants DICOM*

ICS 35.240.80

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

Conformément aux dispositions de la Résolution du Conseil 15/1993, ce document est distribué en version anglaise seulement.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

**Copyright notice**

This ISO document is a Draft International Standard and is copyright-protected by ISO. Except as permitted under the applicable laws of the user's country, neither this ISO draft nor any extract from it may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, photocopying, recording or otherwise, without prior written permission being secured.

Requests for permission to reproduce should be addressed to either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Reproduction may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.

## Contents

		Page
	<b>1 Scope .....</b>	<b>1</b>
	<b>2 Conformance .....</b>	<b>1</b>
	<b>3 Normative references .....</b>	<b>1</b>
5	<b>4 Terms and definitions .....</b>	<b>2</b>
	<b>5 Symbols and abbreviated terms .....</b>	<b>2</b>
	<b>6 Data communication Requirements .....</b>	<b>3</b>
	6.1 Interaction .....	3
	6.2 HTTP Request .....	3
10	6.2.1 Parameters of the HTTP Request .....	3
	6.2.2 List of Media types supported in the Response .....	4
	6.2.3 List of character sets supported in the Response .....	4
	6.3 HTTP Response .....	4
	6.3.1 Body of single DICOM MIME sub-type part response .....	4
15	6.3.2 Transfer syntax .....	4
	6.3.3 Body of Non-DICOM MIME type response .....	5
	<b>7 Persistent Object types .....</b>	<b>5</b>
	7.1 Single Frame Image Objects .....	5
	7.1.1 Objects accessed .....	5
20	7.1.2 MIME type constraints .....	5
	7.2 Multi-Frame Image Objects .....	6
	7.2.1 Objects included .....	6
	7.2.2 MIME type constraints .....	6
	7.3 Text Objects .....	6
25	7.3.1 Objects included .....	6
	7.3.2 MIME type constraints .....	6
	7.4 Other Objects .....	7
	7.4.1 Objects included .....	7
	7.4.2 MIME type constraints .....	7
30	<b>8 Parameters .....</b>	<b>7</b>
	8.1 Parameters available for all DICOM Persistent Objects .....	7
	8.1.1 Request type .....	8
	8.1.2 Unique identifier of the study .....	8
	8.1.3 Unique identifier of the series .....	8
35	8.1.4 Unique identifier of the object .....	8
	8.1.5 MIME type of the response .....	8
	8.1.6 Charset of the response .....	9
	8.1.7 Anonymize object .....	9
	8.2 Parameters for DICOM image persistent objects .....	10
40	8.2.1 Annotation on the object .....	10
	8.2.2 Number of pixel rows .....	10
	8.2.3 Number of pixel columns .....	11
	8.2.4 Region of the image .....	11
	8.2.5 Window center of the image .....	12
45	8.2.6 Window width of the image .....	12

	8.2.7	Frame Number .....	12
	8.2.8	Image Quality .....	12
	8.2.9	Unique identifier of the presentation object .....	13
	8.2.10	Unique identifier of the series containing the presentation object .....	13
50	8.2.11	Transfer Syntax UID .....	13
	Annex A (informative) URL/URI Transfer Syntax .....		15
	Syntax of the <query> component .....		16
	Annex B (informative) Examples .....		17
	B.1	Retrieving a simple DICOM image in JPEG .....	17
55	B.2	Retrieving a DICOM SR in html .....	17
	B.3	Retrieving a region of a DICOM image .....	17
	B.4	Retrieving as a DICOM MIME type .....	17
	Annex C : Applications (informative) .....		19
60	Annex D : IANA Mapping (informative) .....		20

## Foreword

65 ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

70 International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

75 Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 1 was prepared by Technical Committee ISO/TC 215, *Healthcare Informatics, Working Group 2, Message and Communications*.

## 80 Introduction

The DICOM standard is well accepted in the medical imaging area, including radiology, cardiology, pathology, radiotherapy as well as specialties using visible light imaging equipment (e.g. endoscopes, microscopes).

85 The requesters of medical imaging studies and care providers require rapid and reliable access to reports and images. Within computerized environments such access is increasingly based on web technologies. Access to relevant DICOM persistent objects is required without the need for duplication of such data objects.

90 Clinicians need to have access either to the original data in native DICOM format that allows extensive manipulation using specialised software which makes use of the detailed DICOM metadata, or rendered into a generic format (e.g. JPEG, PDF) that can be presented with off-the-shelf applications.

95 This Standard specifies the means whereby a request for access to a DICOM persistent object is to be expressed as an HTTP URL/URI (see RFC2396) request which includes a pointer to a specific DICOM persistent object in the form of its Instance UID. The request also specifies the format of the result to be returned in response to the request. Examples include i) (MIME) Content-type (e.g. application/dicom or image/jpeg for images, application/dicom or application/rtf or xml for reports) ii) Content-Encodings iii) reports as HL7/CDA Level 1.

100 The parameters of the query URL as defined within this standard are sufficient for the HTTP server to act as a DICOM SCU (Service Class User) to retrieve the requested object from an appropriate DICOM SCP (Service Class Provider) using baseline DICOM functionality as defined in [DICOM PS 3.4] and [DICOM PS 3.7].

Specifications of requirements for additional DICOM persistent objects and formats for the responses from the server will be produced in the future as required.

# 105 **Health informatics — Messages and communication — Web access to DICOM persistent objects**

## **1 Scope**

This standard specifies a web-based service for accessing and presenting DICOM (Digital Imaging and Communications in Medicine) persistent objects (e.g. images, medical imaging reports). This is intended for distribution of results and images to healthcare professionals. It provides a simple mechanism for accessing a DICOM persistent object 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 as specified by the requester (e.g. JPEG or GIF) or in a native DICOM format. It does not support facilities for web searching of DICOM images. This standard relates only to DICOM persistent objects (not to other DICOM objects or to non-DICOM objects).  
115 Access control beyond the security mechanisms generally available to web applications is outside the scope of this standard.

## **2 Conformance**

Systems claiming conformance to this standard shall function in accordance with all its mandatory clauses.

## 120 **3 Normative references**

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 1. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 1 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

DICOM PS 3.3, *Digital Imaging and Communications in Medicine, Information Object Definition*

DICOM PS 3.4, *Digital Imaging and Communications in Medicine, Service Class Specifications*

130 ~~DICOM PS 3.5, *Digital Imaging and Communications in Medicine, Data Structures and Encoding*~~

DICOM PS 3.6, *Digital Imaging and Communications in Medicine, Data Dictionary*

DICOM PS 3.10, *Digital Imaging and Communications in Medicine, Media Storage and File Format for Media Interchange*

- 135 DICOM PS 3.11, *Digital Imaging and Communications in Medicine, Media Storage Application Profile*
- DICOM PS 3.14, *Digital Imaging and Communications in Medicine, Grayscale Standard Display Function*
- HL7 CDA, *Health Level Seven, Clinical Document Architecture (CDA)*
- IETF RFC2045 and followings, *MIME Multipurpose Internet Mail Extension*
- 140 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.*

## 145 **4 Terms and definitions**

For the purposes of this part of ISO 1, the following terms and definitions apply.

### **4.1**

#### **DICOM Persistent Object**

150 An instance of a data object as defined by [DICOM PS 3.3] that has been allocated an unique identifier in the format specified for SOP Instance UID in [DICOM PS 3.3] and has been chosen as an object to be saved securely for some period of time. Within the DICOM Standard, a DICOM Persistent Object is referred to as a Composite Service Object Pair (SOP) Instance.

### **4.2**

#### **Web Client System**

155 A system using Internet technologies (web, e-mail...) interested in retrieving DICOM Persistent Objects from a Web Enabled DICOM Server, through HTTP/HTTPs protocol.

### **4.3**

#### **Web Enabled DICOM Server**

160 A system managing DICOM Persistent Objects and able to transmit them on request to the Web Client System.

### **4.4**

#### **Web Access to DICOM Persistent Objects**

A service enabling the Web Client System to retrieve DICOM Persistent Objects managed by a Web Enabled DICOM Server, through HTTP/HTTPs protocol.

## 165 **5 Symbols and abbreviated terms**

DICOM Digital Imaging and Communications in Medicine

HL7 Health Level Seven

	HTML	HyperText Markup Language
	HTTP	HyperText Transfer Protocol
170	HTTPS	HyperText Transfer Protocol, secured
	MIME	Multipurpose Internet Mail Extensions
	SOP	Service Object Pair
	UID	Unique (DICOM) Identifier
	URL/URI	Uniform Resource Locator / Identifier
175	XML	eXtensible Markup Language

## 6 Data communication Requirements

### 6.1 Interaction

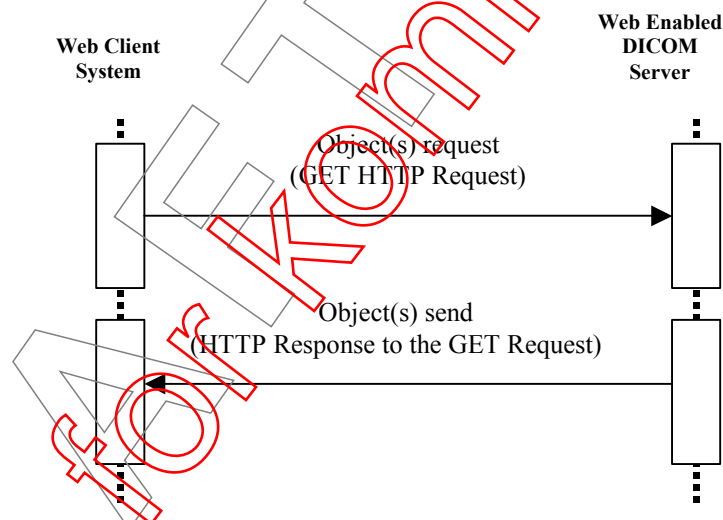


Figure 1 — Interaction Diagram

180 The interaction shall be as shown in Figure 1.

### 6.2 HTTP Request

The HTTP Request used shall use the GET method as defined in [IETF RFC2616].

#### 6.2.1 Parameters of the HTTP Request

185 The parameters of the <query> component of the Request-URI to be sent to the web server through the HTTP GET method request shall be represented as defined in [IETF RFC2396].

NOTE Other components of the Request-URI depend on the configuration, e.g. location and script language of the Web Enabled DICOM Server.

NOTE The means by which the Web Client System obtains the value of the necessary parameters for web accessing of DICOM objects is out of the scope of the standard.

## 190 6.2.2 List of Media types supported in the Response

The "Accept" field of the GET method request shall specify the Media type(s) acceptable to the Web Client System. The(se) Media type(s) shall be a superset of the list of MIME types specified in clause 7 of this standard devoted to the DICOM persistent object types.

195 NOTE Typically the Accept field will be sent by a Web Client as "\*/\*". An optional parameter specifies the MIME type(s) preferred by the Web Client, as a subset of those specified in the "Accept" field.

## 6.2.3 List of character sets supported in the Response

200 The "Accept-charset" field of the GET method request shall specify the character set of the object to be retrieved. If the "Accept-charset" field of the GET method is not present, or the Web Enabled DICOM Server does not support the specified character set, the character set of the response will be at the discretion of the Web Enabled DICOM Server.

NOTE Typically the user of a Web Client does not have control over the "Accept-charset" field. An optional parameter specifies the character set to be used in the returned object.

## 6.3 HTTP Response

The response shall be an HTTP Response Message as specified in [IETF RFC2616].

205 NOTE The content of the message-body varies according to the Media type as defined below.

### 6.3.1 Body of single DICOM MIME sub-type part response

#### 6.3.1.1 MIME Type

The MIME type shall be 'application/dicom', as specified in [IETF RFC3240].

#### 6.3.1.2 Content

210 The body content shall be a "Part 10 File" which includes a meta-header as defined in [DICOM PS 3.10].

### 6.3.2 Transfer syntax

215 The returned DICOM object shall be encoded using one of the transfer syntaxes specified in the transfer syntax query parameter as defined in clause 8.2.11 below. By default, the transfer syntax shall be "Explicit VR Little Endian".

NOTE This implies that retrieved images are sent un-compressed by default.

### 6.3.3 Body of Non-DICOM MIME type response

#### 6.3.3.1 MIME Type

220 The MIME type shall be one on the MIME types defined in the contentType parameter, preferably the most desired by the Web Client, and shall be in any case compatible with the 'Accept' field of the GET method.

Note The HTTP behavior is that an error (406 – Not Acceptable) is returned if the required content type cannot be served.

#### 6.3.3.2 Content

225 The content shall be a single MIME part containing the object to be retrieved.

Note: Multiple objects in a response are not supported by this standard. The parameters select only a single object to retrieve. Most current Web Clients are able to retrieve single objects, within a "non multipart" MIME body, and are not able to support multipart/related or multipart/mixed responses.

## 230 7 Persistent Object types

The provisions for some specific object types shall be as defined in this section.

NOTE In all cases the categorisation depends on the SOP Class of the objects, enabling a client, or application building an HTML page for the client, to determine in advance of the request what the requirements will be.

### 235 7.1 Single Frame Image Objects

#### 7.1.1 Objects accessed

240 In this category are all object instances of SOP classes defined in [DICOM PS3.3] that consist of a single image frame, instances of multi-frame SOP Classes which contain only one frame, or object instances that consist of single frame accessed from instances of multi-frame SOP Classes using the "frameNumber" parameter.

#### 7.1.2 MIME type constraints

The server shall be able to send a response in each of the following MIME types:

application/dicom

image/jpeg

245 If the contentType parameter is not present in the request, the response shall contain an image/jpeg MIME type, if compatible with the 'Accept' field of the GET method.

When an image/jpeg MIME type is returned, the image shall be encoded using the JPEG baseline lossy 8 bit Huffman encoded non-hierarchical non-sequential process [ISO/IEC 10918].

250 NOTE The choice of image/jpeg as the default for continuous tone images is a consequence of the universal support by Web Clients.

The server should also support the following MIME types:

- image/gif
- image/png
- image/jp2

255 The server may also support other MIME types.

## 7.2 Multi-Frame Image Objects

### 7.2.1 Objects included

In this category are all SOP classes defined in [DICOM PS3.3] that are multi-frame image objects.

### 7.2.2 MIME type constraints

260 The server shall be able to send a response in the following MIME type:

- application/dicom

If the contentType parameter is not present in the request, the response shall contain a application/dicom MIME type.

The server should also support the following MIME type.

- 265
- video/mpeg
  - image/gif

The server may also support other MIME types.

## 7.3 Text Objects

### 7.3.1 Objects included

270 In this category are all SOP classes defined in [DICOM PS3.3] which include the SR Document Content Module.

NOTE This includes all SOP Classes that are SR documents, such as narrative text, structured reports, CAD, measurement reports and key object selection documents.

### 7.3.2 MIME type constraints

275 The server shall be able to send a response in each of the following MIME types:

- application/dicom

- text/plain
- text/html

280 If the contentType parameter is not present in the request, or contains only MIME types that the server does not support, the response shall contain a text/html MIME type.

It is recommended that the server also support the following MIME types:

- text/xml
  - application/pdf
  - text/rtf
- 285 — a "CDA" MIME type, in conformance to [HL7 CDA], e.g. application/x-hl7-cda-level-one+xml.

The server may also support other MIME types.

## 7.4 Other Objects

### 7.4.1 Objects included

290 The category shall include all objects of all SOP classes defined in [DICOM PS3.3] which are not included in the categories described in the sections above, and which are considered in [DICOM PS3.3] as classes of persistent objects.

### 7.4.2 MIME type constraints

- The server shall be able to send a response in the application/dicom MIME types.

295 The server may also support other MIME types.

If the contentType parameter is not present in the request, the response shall contain an application/dicom MIME type.

## 8 Parameters

### 8.1 Parameters available for all DICOM Persistent Objects

300 Parameters specified in this clause are applicable to all supported DICOM SOP Classes.

NOTE — To identify a DICOM Object, only one UID is required, because any UID is globally unique. However, the standard requires that the UID of the higher levels in the DICOM Information Model are specified (i.e., series and study), in order to support the use of DICOM devices that support only the baseline hierarchical (rather than extended relational) Query/Retrieve model, which requires the Study Instance UID and Series Instance UID to be defined when retrieving an SOP Instance, as defined in [DICOM PS 3.4].

305

### 8.1.1 Request type

Type of request performed. This parameter is REQUIRED.

The parameter name shall be "requestType".

The value shall be "WADO".

310 NOTE This parameter allows other types of requests to be introduced in the future, using a similar syntax.

### 8.1.2 Unique identifier of the study

Study Instance UID as defined in [DICOM PS 3.3]. This parameter is REQUIRED.

The parameter name shall be "studyUID".

315 The value shall be encoded as a Unique Identifier (UID) string, as specified in [DICOM PS 3.5], except that it shall not be padded to an even length with a NULL character.

### 8.1.3 Unique identifier of the series

Series Instance UID as defined in the [DICOM PS 3.3]. This parameter is REQUIRED.

The parameter name shall be "seriesUID".

320 The value shall be encoded as a Unique Identifier (UID) string, as specified in [DICOM PS 3.5], except that it shall not be padded to an even length with a NULL character.

### 8.1.4 Unique identifier of the object

SOP Instance UID as defined in the [DICOM PS 3.3]. This parameter is REQUIRED.

The parameter name shall be "objectUID".

325 The value shall be encoded as a unique identifier (UID) string, as specified in [DICOM PS 3.5], except that it shall not be padded to an even length with a NULL character.

### 8.1.5 MIME type of the response

MIME type(s) desired by the Web Client for the response from the Server, as defined in the [IETF RFC2616]. This parameter is OPTIONAL.

The parameter name shall be "contentType".

330 The value shall be a list of MIME types, separated by a "," character, and potentially associated with relative degree of preference, as specified in [IETF RFC2616].

The Web Client shall provide list of content types it supports in the "Accept" field of the GET method. The value of the contentType parameter of the request shall be one of the values specified in that field.

335 NOTE Typically the Accept field will be sent by a Web Client as "\*/\*", which is compatible with any MIME types.

### 8.1.6 Charset of the response

Character set with which the returned object is to be encoded, as defined in the [IETF RFC2616]. This parameter is OPTIONAL.

340 The parameter name shall be "charset".

The value shall be a list of character sets, separated by a "," character, and potentially associated with relative degree of preference, as specified in [IETF RFC2616].

345 The Web Client may provide a list of character sets it supports in the "Accept-charset" field of the GET method. If this field is present, the value of the charset parameter of the request shall be one of the values specified in it.

The Server may or may not support character set conversion. If character set conversion is supported:

- text based DICOM objects retrieved other than as application/dicom MIME type (e.g., text/plain) may be returned in the requested character set (converted if necessary)
- 350 — DICOM objects retrieved as application/dicom MIME type have all contained strings returned in the requested character set (converted if necessary) and the Specific Character Set (0008,0005) updated (if necessary)

355 NOTE The IANA Character Set registrations specify names and multiple aliases for most character sets. The standard value for use in WADO is the one marked by IANA as "preferred for MIME." If IANA has not marked one of the aliases as "preferred for MIME", the name used in DICOM shall be the value used for WADO.

NOTE: The table in Annex D provides an informative mapping of some IANA values to DICOM Specific Character Set Defined Terms:

360

### 8.1.7 Anonymize object

Removal of all patient identification information from within the DICOM object, if not already done, as defined in [DICOM PS 3.15]. This parameter is OPTIONAL. It shall only be present if contentType is application/dicom.

365 This parameter is Optional

The parameter name shall be "anonymize".

The value shall be "yes".

The server may return an error if it either cannot or refuses to anonymize that object.

370 The server shall return a new SOP Instance UID if the content of the object has not already been anonymized.

NOTE 1 This standard does not introduce any security-related requirements. It is likely that the information contained within DICOM objects identifies the patient. The protocol used (that is HTTP) can be replaced by HTTPS, which is its secure extension, to protect the information in transit. The underlying DICOM implementation decides whether or not to grant access to a particular DICOM object based on whatever security policy or mechanism it has in place. A server is unlikely to fulfil a request from an unknown user (e.g., accessed via the HTTP protocol) unless it is certain that the data requested has no patient identifying information within it and has been approved for public viewing.

NOTE 2 The Anonymize object enables, for example, teaching files systems or clinical trial applications to offer an access to original images stored in a PACS, without disclosing the patients identity, and requiring storage of a (de-identified) copy of the original image. Anonymization is the responsibility of the server. In order to preserve patient confidentiality, the server likely will refuse to deliver an anonymized SOP instance to an unknown or unauthorized person unless the server is certain that the SOP instance holds no patient identifying information. This would include "blanking out" any annotation area(s) containing nominative information burned into the pixels or in the overlays.

## 8.2 Parameters for DICOM image persistent objects

These parameters shall only be included when a request is made for a Single Frame Image Object or Multi-Frame Image Object as defined in clause 7.2.

### 8.2.1 Annotation on the object

Annotation of an object retrieved and displayed as an image. This parameter is OPTIONAL. It shall not be present if contentType is application/dicom, or is a non-image MIME type (e.g., text/\*). When it is not present for an image object, no annotation may be burnt in.

When used in conjunction with a presentation state object, it shall be applied after the presentation on the image. When used in conjunction with the region parameter, it shall be applied after the selection of the region.

The parameter name shall be "annotation". Its value is a non-empty list of one or more of the following items, separated by a "," character:

- "patient", for displaying patient information on the image (e.g. patient name, birth date,...)
- "technique", for displaying technique information of the image (e.g. image number, study date, image position,...)

NOTE The exact nature and presentation of the annotation is determined by the Server. The annotation is burned into the returned image pixels.

### 8.2.2 Number of pixel rows

The parameter name shall be "rows".

The value shall be expressed as an integer, representing the image size to be returned. It is OPTIONAL. It shall not be present if contentType is application/dicom.

If both "rows" and "columns" are specified, then each shall be interpreted as a maximum, and a size will be chosen for the image within these constraints, maintaining the correct aspect ratio. If only the number of columns is present, the number of rows shall be chosen in order to maintain the correct aspect ratio. If both are absent, the image (or selected region) is sent in its original size (or

the size of the presentation state applied on the image), resulting as one pixel of screen image for each value in the image data matrix.

The value shall be encoded as an integer string (IS), as specified in [DICOM-PS 3.5].

### 8.2.3 Number of pixel columns

415 The parameter name shall be “columns”.

The value shall be expressed as an integer, representing the image size to be returned. It is OPTIONAL. It shall not be present if contentType is application/dicom.

If both “rows” and “columns” are specified, then each shall be interpreted as a maximum, and a size will be chosen for the image within these constraints, maintaining the correct aspect ratio. If only the number of columns is present, the number of rows shall be chosen in order to maintain the correct aspect ratio. If both are absent, the image (or selected region) is sent in its original size (or the size of the presentation state applied on the image), resulting as one pixel of screen for one pixel of the image.

The value shall be encoded as an integer string (IS), as specified in [DICOM PS 3.5].

### 425 8.2.4 Region of the image

This parameter allows selection of a rectangular region of an image matrix to be retrieved. The purpose of this parameter is to allow a user to view a selected area of the image matrix, for example at higher magnification.

The parameter is OPTIONAL.

430 The parameter name shall be “region”.

It shall not be present if contentType is application/dicom.

The value shall be expressed as a list of four positive decimal strings, separated by the ',' character, representing the region of the source image to be returned. These decimal values shall be values in a normalized coordinate system relative to the size of the original image matrix measured in rows and columns, with values ranging from 0.0 to 1.0, and representing in the following order:

435 — the x position of the top left hand corner of the region to be retrieved , 0.0 corresponding to the first column of the image matrix.

440 — the y position of the top left hand corner of the region to be retrieved , 0.0 corresponding to the top row of the image matrix.

— the x position of the bottom right hand extent of the region, 1.0 corresponding to the last column of the image matrix, 0.0 being forbidden.

— the y position of the bottom right hand extent of the region, 1.0 corresponding to the last row of the image matrix, 0.0 being forbidden.

445 Note The server may or may not support this parameter.

If this parameter is supported, an image matrix corresponding to the specified region shall be returned with size corresponding to the specified normalised coordinate values otherwise the complete image matrix shall be returned. If the presentationUID parameter is present, the region shall be selected after the corresponding presentation state has been applied on the image.

#### 450 8.2.5 Window center of the image

The parameter name shall be "windowCenter".

Controls the luminosity of the image as defined in [DICOM PS 3.3]. This parameter is REQUIRED if "windowWidth" is present. This parameter shall not be present if there is a presentationUID parameter. It shall not be present if contentType is application/dicom.

455 The value shall be encoded as a decimal string (DS), as specified in [DICOM PS 3.5].

#### 8.2.6 Window width of the image

The parameter name shall be "windowWidth".

460 Controls the contrast of the image as defined in [DICOM PS 3.3]. It is REQUIRED if "windowCenter" is present. This parameter shall not be present if there is a presentationUID parameter. It shall not be present if contentType is application/dicom.

The value shall be encoded as a decimal string (DS), as specified in [DICOM PS 3.5].

#### 8.2.7 Frame Number

The parameter name shall be "frameNumber".

465 Specifies that the single frame with that number within a multi-frame image object, as defined in [DICOM PS 3.3] that shall be returned. It is OPTIONAL and shall be ignored in the case of all objects other than multi-frame objects. It shall not be present if contentType is application/dicom.

The value shall be encoded as an integer string (IS), as specified in [DICOM PS 3.5].

#### 8.2.8 Image Quality

470 The parameter name shall be "imageQuality". It is OPTIONAL. It shall not be present if contentType is application/dicom, except if the transferSyntax parameter is present and corresponds to a lossy compression.

If the requested MIME type is for a lossy compressed image (e.g. image/jpeg), this parameter indicates the required quality of the image to be returned within the range 1 to 100, 100 being the best quality.

475 **NOTE** Decompression and recompression may degrade the image quality if the original image was already irreversibly compressed. In case the image has been already lossy compressed using the same format as required (e.g. jpeg), it may be sent as it is without decompressing and recompressing it.

The value shall be encoded as an integer string (IS), as specified in [DICOM PS 3.5].

480 **NOTE** The specific interpretation of the meaning of this parameter is left to the interpretation of the implementers of the standard.

### 8.2.9 Unique identifier of the presentation object

The parameter name shall be "presentationUID".

SOP Instance UID of the presentation state storage object to be applied to the image. This parameter is OPTIONAL. It shall not be present if contentType is application/dicom.

485 The value shall be encoded as a unique identifier (UID) string, as specified in [DICOM PS 3.5], except that it shall not be padded to an even length with a NULL character.

If this parameter is combined with region and/or annotation parameter(s), the presentation state shall be applied to the image prior to selecting a region and burning in annotations.

490 If the Presentation Size Mode in the presentation state is SCALE TO FIT or TRUE SIZE, then the displayed area specified in the presentation shall be scaled to fit the size specified by the rows and columns parameters if present, otherwise the displayed area selected in the presentation state will be returned without scaling.

NOTE The intent of the TRUE SIZE mode in the presentation state cannot be satisfied, since the physical size of the pixels displayed by the web browser is unlikely to be known. If the Presentation Size Mode in the presentation state is MAGNIFY, then the displayed area specified in the presentation shall be magnified (scaled) as specified in the presentation state. It will then be cropped to fit the size specified by the rows and columns parameters, if present.

495

NOTE Any Displayed Area relative annotations specified in the presentation state are rendered relative to the Specified Displayed Area within the presentation state, not the size of the returned image.

500 Though the output of the presentation state is defined in DICOM to be in P-Values (greyscale values intended for display on a device calibrated to the DICOM Grayscale Standard Display Function [DICOM PS 3.14]), the greyscale or colour space for the image returned by the request is not defined by this standard.

### 8.2.10 Unique identifier of the series containing the presentation object

505 The parameter name shall be "presentationSeriesUID".

Series Instance UID of the series containing the presentation state storage object to be applied on the image. This parameter is REQUIRED and shall only be present if "presentationUID" is present.

The value shall be encoded as a unique identifier (UID) string, as specified in [DICOM PS 3.5], except that it shall not be padded to an even length with a NULL character.

510 NOTE As specified in DICOM, the Presentation State will be in the same study as the image it applies to.

### 8.2.11 Transfer Syntax UID

The parameter name shall be "transferSyntax".

The Transfer Syntax to be used within the DICOM image object, as specified in [DICOM PS 3.6]. This parameter is OPTIONAL. It shall not be present if contentType is other than application/dicom.

515 By default the DICOM object(s) returned shall be encoded in Explicit VR Little Endian. Neither Implicit VR, nor Big Endian shall be used. The response shall be the Transfer Syntax requested if

possible. If it is not possible for the response to be sent using the requested transfer syntax then the Explicit VR Little Endian Uncompressed Transfer Syntax shall be used.

520 The value shall be encoded as an unique identifier (UID) string, as specified in [DICOM PS 3.5], except that it shall not be padded to an even length with a NULL character.

DRAFT for committee work 2004

## Annex A (informative)

### URL/URI Transfer Syntax

525 Access to the content of a data object is enabled by specifying a "link" pointing to a specific DICOM Persistent Object by means of its URL/URI and specifying its DICOM object Instance UID and the transfer syntax to be employed.

Extension to searching DICOM objects from a Server is out of the scope of the present standard. Differences between "Web Accessing" and "Searching" are mainly:

- 530
- 1) "Web Accessing" means retrieving an object as a "binary" answer: "I have it, I give it to you" or "I haven't". In fact, the negative answer will be a "Void" object or an error.
  - 2) "Searching" means querying for objects has a "fuzzy answer": "I have a list of potential candidates to your question - see above the (possible void) list of their reference -".

535 The general syntax of the standard respects the URI recommendation [IETF RFC2396]. It can be expressed as:

```
<scheme>://<authority><path>?<query>
```

It is structured following BNF syntax. The first definition of this syntax is:

- 3) URI-reference = [ absoluteURI | relativeURI ] [ "#" fragment ]
- 4) absoluteURI = scheme ":" ( hier\_part | opaque\_part )

540

- 5) relativeURI = ( net\_path | abs\_path | rel\_path ) [ "?" query ]
- 6) hier\_part = ( net\_path | abs\_path ) [ "?" query ]

545 The present standard aims only to define the term query, and not the other components of the URL/URI which are defining the path way from the Web Client System to the Web Enabled DICOM System, independent of the DICOM Persistent Object itself. However it is anticipated that, if present, scheme value is HTTP, in order to be compatible with web browsers.

This definition of the term query shall respect fully the BNF syntax exposed in the [IETF RFC2396]. Within a query component, the characters ";", "/", "?", ":", "@", "&", "=", "+", ",", and "\$" are reserved. It is only a restriction of it for the unique purpose of retrieving DICOM Persistent Objects through Web Access to DICOM Persistent Objects.

550 **NOTE** — management of the HTTP returns different codes (e.g. "404 Not found") as specified in [IETF RFC2616].

555 Control names and values are escaped. Space characters are replaced by "+", and then reserved characters are escaped as described in [IETF RFC2396]. Non-alphanumeric characters are replaced by "%HH", a percent sign and two hexadecimal digits representing the ASCII code of the character. Line breaks are represented as "CR LF" pairs (i.e., "%0D%0A").

The control names/values are listed in the order they appear in the document. The name is separated from the value by "=" and name/value pairs are separated from each other by "&".

### Syntax of the <query> component

560 The BNF syntax restriction of parameters for the Web Access to DICOM Persistent Objects service is the following:

- 7) query = criterion ["&" criterion]
- 8) parameter = name "=" value
- 9) name = nchars
- 10) value = nchars
- 565 11) nchars = \*nchar
- 12) nchar = unreserved | escaped

where unreserved and escaped are defined in [RFC 2396].

## Annex B (informative)

570

### Examples

#### B.1 Retrieving a simple DICOM image in JPEG

575 `http://www.hospital-stmarco/radiology/wado.php?requestType="WADO"  
&studyUID="1.2.250.1.59.40211.235931250200.235931250152"  
&seriesUID="1.2.250.1.59.40211.235931250200.235931250152.235931250200"  
&objectUID="1.2.250.1.59.40211.235931250200.235931250152.235931250200.1"`

#### B.2 Retrieving a DICOM SR in html

580 `http://server234/script678.asp?requestType="WADO"  
&studyUID="1.2.250.1.59.40211.235931250200.235931250152"  
&seriesUID="1.2.250.1.59.40211.235931250200.235931250152.235931250200"  
&objectUID="1.2.250.1.59.40211.235931250200.235931250152.235931250200.1"  
&charset="UTF-8"`

#### B.3 Retrieving a region of a DICOM image

585 Retrieving a region of a DICOM image, converted if possible in JPEG2000, with annotations burned into the image containing the patient name and technical information, and mapped into a defined image size:

590 `https://aspradio/imageaccess.js?requestType="WADO"  
&studyUID="1.2.250.1.59.40211.235931250200.235931250152"  
&seriesUID="1.2.250.1.59.40211.235931250200.235931250152.235931250200"  
&objectUID="1.2.250.1.59.40211.235931250200.235931250152.235931250200.1"  
&contentType="image/jp2;level=1,image/jpeg;q=0.5"  
&annotation="patient,technique"  
&columns="400"  
&rows="300"  
595 &region="0.3,0.4,0.5,0.8"  
&windowCenter="1000"  
&windowWidth="2500"`

#### B.4 Retrieving as a DICOM MIME type

600 Retrieving a DICOM image object using the baseline 8-bit lossy jpeg transfer syntax, and de-identified:

`http://www.medical-webservice.st/RetrieveDocument?requestType="WADO"  
&studyUID="1.2.250.1.59.40211.235931250200.235931250152"`

605 &seriesUID="1.2.250.1.59.40211.235931250200.235931250152.235931250200"  
&objectUID="1.2.250.1.59.40211.235931250200.235931250152.235931250200.1"  
&contentType="application/dicom"  
&anonymize="yes"  
&transferSyntax="1.2.840.10008.1.2.4.50"

DRAFT  
KUN for komiteearbeid 2004

## Annex C: Applications (informative)

610 There are multiple applications, in which DICOM and "web-based" environments are interacting. "Web-based" means information and communication systems that are using Internet related technologies (Web, e-mail...). The basic feature supported by this standard is a mechanism for the "Web-based" system to retrieve a DICOM persistent object from the "DICOM-based" system.

Typical applications are:

- 615
- i) Referencing an image or a report from an electronic patient record (EPR)
  - ii) Including references to images in an e-mail
  - iii) Providing access by outside referring doctors to a hospital web server that contains references to reports, images and waveforms
  - iv) Providing access to anonymized DICOM reports, images and waveforms via a web server, for teaching purposes and for clinical trials
- 620

To retrieve DICOM persistent objects using "WADO", the "web-based" system must "know" the UIDs (Study, Series, SOP Instance) of the objects it needs to retrieve. These may be obtained through different methods (reception of a standardized message containing a document containing the reference to the DICOM objects, query of other systems...) that are beyond the scope of this standard.

625

## Annex D: IANA Mapping (informative)

The following table provides an informative mapping of some IANA values to DICOM Specific Character Set Defined Terms:

IANA	DICOM	Character Set
ISO-8859-1	ISO_IR 100	Latin alphabet #1
ISO-8859-2	ISO_IR 101	Latin alphabet #2
ISO-8859-3	ISO_IR 109	Latin alphabet #3
ISO-8859-4	ISO_IR 110	Latin alphabet #4
ISO-8859-5	ISO_IR 144	Cyrillic
ISO-8859-6	ISO_IR 127	Arabic
ISO-8859-7	ISO_IR 126	Greek
ISO-8859-8	ISO_IR 138	Hebrew
ISO-8859-9	ISO_IR 148	Latin alphabet #5
TIS-620	ISO_IR 166	Thai
ISO-2022-JP	ISO 2022 IR 87	Japanese
ISO-2022-KR	ISO 2022 IR 149	Korean
GB18030	GB18030	Chinese
UTF-8	ISO_IR 192	Unicode

630