Digital Imaging and Communications in Medicine (DICOM)

Supplement 198: Retirement of WADO-WS

DICOM Standards Committee

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VERSION: Final Text

Developed in accordance with work item 2016-12-B.

Scope and Field of Application

This supplement retires the WADO-WS Web Service from the Standard. The functionality provided by WADO-WS is now included in and enhanced by DICOM*web*. WADO-URI and WADO-RS remain part of the Standard.

Retirement does not imply that these features cannot be used. However, the DICOM Standards Committee will not maintain the documentation of retired features. The reader is referred to earlier editions of the Standard.

The use of the retired features is discouraged for new implementations, in favor of those alternatives remaining in the standard.

The DICOM Standard will not reuse Data Element tags and UIDs that would conflict with retired services.

Update PS3.1, Section 4 as follows:

~~**WADO-WS - Web Access to DICOM Objects by Web Services (WS*)**~~

Update PS3.2, Section 4 as follows:

~~**WADO-WS**~~

~~**Web Access to DICOM Objects by Web Services (WS*)**~~

Replace PS3.2, Section A.4.2.2.1 with the following:

A.4.2.2 "Application Entity <1>"

An Application Entity that supports ~~**the WADO transport**~~**Web** services shall have the following sections:

Details of this specific Application Entity shall be specified under this section.

A.4.2.2.1 ~~WADO-WS Specifications~~ Retired

See PS3.2-2017b.

Update PS3.2, Section I.1 as follows:

I.1 Conformance Statement Overview

This fictional product EXAMPLE-WADO-SERVICE implements the WADO-URI services, ~~**the WADO-WS services**~~ and the WADO RS services for access to DICOM SOP Instances that are stored on an EXAMPLE-PACS-ARCHIVE. The EXAMPLE-WADO-SERVICE is only available as a plug in option for the EXAMPLE-PACS-ARCHIVE. All of the networking, database, and other services are provided by the EXAMPLE-PACS-ARCHIVE. This conformance claim refers to the conformance claim for the EXAMPLE-PACS-ARCHIVE for all such services.

Table I.1-1 provides an overview of the network services supported by EXAMPLE-WADO-SERVICE.

Table I.1-1. Network Services

Network Service	User of Service (Client)	Provider of Service (Server)
~~**WADO**~~		
WADO - URI - Retrieve Imaging Document	No	Yes
WADO - URI - Retrieve Rendered Imaging Document	No	Yes

Network Service	User of Service (Client)	Provider of Service (Server)
~~**WADO - WS - Retrieve Imaging Document Set**~~	~~**No**~~	~~**Yes**~~
~~**WADO - WS - Retrieve Rendered Imaging Document Set**~~	~~**No**~~	~~**Yes**~~
WADO - RS - Retrieve Study	No	Yes
WADO - RS - Retrieve Series	No	Yes
WADO - RS - Retrieve Instance	No	Yes
WADO - RS - Retrieve Frames	No	Yes
WADO - RS - Retrieve Bulkdata	No	Yes
WADO - RS - Retrieve Metadata	No	Yes

Update PS3.2, Section I.3.1 as follows:

I.3.1 Revision History

Table I.3.1-1. Revision History

Document Version	Date of Issue	Author	Description
1.1	October 30, 2003	WG 6	Version for Final Text
1.2	August 30, 2007	WG 6	Revised Introduction
~~**1.3**~~	~~**August 20, 2011**~~	~~**WG 6**~~	~~**WADO-WS Final Text**~~
1.**43**	February 6, 2013	WG 6	WADO-RS Final Text

Update PS3.2, Section I.4.1.1 as follows:

Update PS3.2, Section I.4.1.1: revise Figure I.4.1-1 to remove WADO-WS.

I.4.1.1 Application Data Flow

Remove the WADO-WS from Figure I.4.1-1.

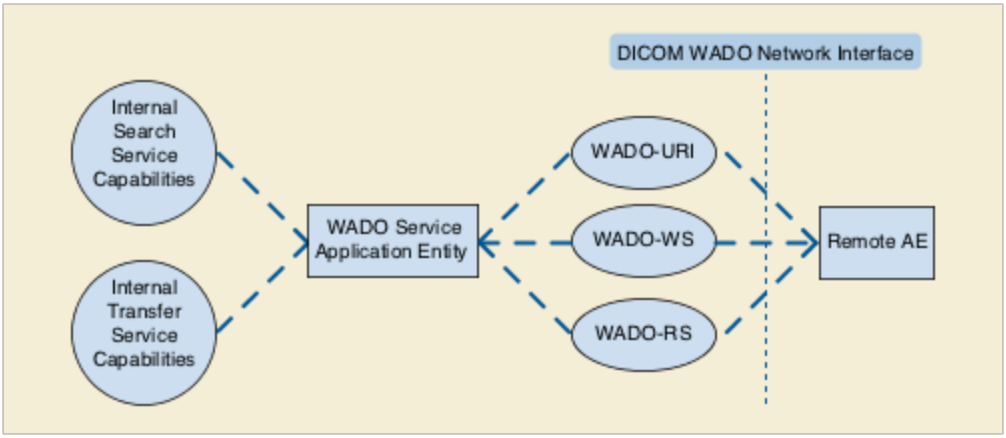

Figure I.4.1-1. Application Data Flow Diagram

The WADO Service Application receives WADO requests from a remote AE. These requests may be either over the URI~~, WS~~ or RS interfaces. It is associated with the local real-world activity "Retrieve Images". It converts these requests into internal lookup functions to find the matching SOP Instances. It then obtains these matching SOP Instances and composes a response back to the requesting remote AE.

Update PS3.2, Section I.4.2 as follows:

I.4.2 AE Specifications

This AE complies with Chapter 6 in PS3.18, specifications for ~~**WS, RS and URI**~~ **Web Services** access.

Modify PS3.2, Section I.4.2.1:

I.4.2.1 WADO-WS Specifications

DICOM has retired the WADO-WS Service. See PS3.2-2017b. This product still supports this service as described here.

Modify PS3.2, Section I.4.4.2:

I.4.4.2 WS Interface

DICOM has retired the WADO-WS Service. See PS3.2-2017b. This product still supports this service as described here.

Replace PS3.2, Section I.6 with the following:

I.6 Support of Character Sets

All EXAMPLE-WADO-SERVICEs support Unicode UTF-8 for all ~~**WS**~~ **Web Services** transactions. The EXAMPLE-WADO-SERVICE does not convert character sets when returning SOP Instances using DICOM encoding. The original DICOM encoded character sets are preserved. When a PDF encoding is returned, character set conversion is performed and the PDF is returned with a UTF-8 encoding. JPEG renderings, will also utilize UTF-8 encoding for internal labels.

See conformance claim for EXAMPLE-PACS-ARCHIVE for character sets used within the DICOM instances.

Replace PS3.2, Section I.7 with the following:

I.7 Security

EXAMPLE-WADO-SERVICE supports transport level security measures for **all Web Services** ~~**URI and RS access, and the WS-Security services for WS access**~~.

...

100 ***Update PS3.3, Section 10.3 Table 10-3b as follows:***

Table 10-3b. Referenced Instances and Access Macro Attributes

Attribute Name	Tag	Type	Attribute Description
Type of Instances	(0040,E020)	1	Type of object instances referenced. Defined Terms: **DICOM** **CDA**
Study Instance UID	(0020,000D)	1C	Unique identifier for the Study. Required if Type of Instances (0040,E020) is DICOM
Series Instance UID	(0020,000E)	1C	Unique identifier for the Series that is part of the Study identified in Study Instance UID (0020,000D), if present, and contains the referenced object instance(s). Required if Type of Instances (0040,E020) is DICOM
Referenced SOP Sequence	(0008,1199)	1	References to object instances. One or more Items shall be included in this Sequence
>Referenced SOP Class UID	(0008,1150)	1	Uniquely identifies the referenced SOP Class.
>Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the referenced SOP Instance.
>HL7 Instance Identifier	(0040,E001)	1C	Instance Identifier of the encapsulated HL7 Structured Document, encoded as a UID (OID or UUID), concatenated with a caret ("^") and Extension value (if Extension is present in Instance Identifier). Required if Type of Instances (0040,E020) is CDA.
>Referenced Frame Number	(0008,1160)	1C	Identifies the frame numbers within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Note This Attribute may be multi-valued. Required if the Referenced SOP Instance is a multi-frame image and the reference does not apply to all frames, and Referenced Segment Number (0062,000B) is not present.
>Referenced Segment Number	(0062,000B)	1C	Identifies the Segment Number to which the reference applies. Required if the Referenced SOP Instance is a Segmentation and the reference does not apply to all segments and Referenced Frame Number (0008,1160) is not present.

Attribute Name	Tag	Type	Attribute Description
DICOM Retrieval Sequence	(0040,E021)	1C	Details for retrieving instances via the DICOM Retrieve Service. Required if DICOM Media Retrieval Sequence (0040,E022), WADO Retrieval Sequence (0040,E023), WADO-RS Retrieval Sequence (0040,E025) and XDS Retrieval Sequence (0040,E024) are not present. May be present otherwise. This sequence shall only identify sources known to have instances referenced in Referenced SOP Sequence (0008,1199). One or more Items shall be included in this Sequence.
>Retrieve AE Title	(0008,0054)	1	Title of a DICOM Application Entity where the referenced instance(s) may be retrieved on the network.
DICOM Media Retrieval Sequence	(0040,E022)	1C	Details for retrieving instances from Media. Required if DICOM Retrieval Sequence (0040,E021), WADO Retrieval Sequence (0040,E023), and WADO-RS Retrieval Sequence (0040,E025) and XDS Retrieval Sequence (0040,E024) are not present. May be present otherwise. This sequence shall only identify media known to have instances referenced in Referenced SOP Sequence (0008,1199). One or more Items shall be included in this Sequence.
>Storage Media File-Set ID	(0088,0130)	2	The user or implementation specific human readable identifier that identifies the Storage Media on which the referenced instance(s) reside.
>Storage Media File-Set UID	(0088,0140)	1	Uniquely identifies the Storage Media on which the referenced instance(s) reside.
WADO Retrieval Sequence	(0040,E023)	1C	Details for retrieving instances available via WADO-URI. Note This sequence addresses use of the URI-based Web Access to DICOM Objects. Retrieval via the **IHE XDS-I.b RAD-69 Transaction** ~~**Web Services based WADO-WS**~~ is addressed in the XDS Retrieval Sequence (0040,E024). Required if DICOM Retrieval Sequence (0040,E021), DICOM Media Retrieval Sequence (0040,E022), WADO-RS Retrieval Sequence (0040,E025) and XDS Retrieval Sequence (0040,E024) are not present. May be present otherwise. One or more Items shall be included in this Sequence.
>Retrieve URI	(0040,E010)	1	URI/URL specifying the location of the referenced instance(s). Includes fully specified scheme, authority, path, and query in accordance with [RFC3986]. Note The VR of this attribute has changed from UT to UR.
XDS Retrieval Sequence	(0040,E024)	1C	Details for retrieving instances using ~~**WADO-WS or**~~ **the** IHE XDS.b

Attribute Name	Tag	Type	Attribute Description
			RAD-69 Transaction. Note Retrieval via WADO-URI is addressed by the WADO Retrieval Sequence (0040,E023). Retrieval via WADO-RS is addressed by the WADO-RS Retrieval Sequence (0040,E025). Required if DICOM Retrieval Sequence (0040,E021), DICOM Media Retrieval Sequence (0040,E022), WADO-RS Retrieval Sequence (0040,E025) and WADO Retrieval Sequence (0040,E023) are not present. May be present otherwise. This sequence shall only identify repositories known to have instances referenced in Referenced SOP Sequence (0008,1199). One or more Items shall be included in this Sequence.
>Repository Unique ID	(0040,E030)	1	Uniquely identifies a Repository from which the referenced instances can be retrieved.
>Home Community ID	(0040,E031)	3	Uniquely identifies a Community to which requests for the referenced instances can be directed.
WADO-RS Retrieval Sequence	(0040,E025)	1C	Details for retrieving instances via WADO-RS. Note Retrieval via WADO-URI is addressed in the WADO Retrieval Sequence (0040,E023). Retrieval via ~~**WADO-WS**~~ **the IHE-XDS-I.b RAD-69 Transaction** is addressed in the XDS Retrieval Sequence (0040,E024). Required if DICOM Retrieval Sequence (0040,E021), DICOM Media Retrieval Sequence (0040,E022), WADO Retrieval Sequence (0040,E023) and XDS Retrieval Sequence (0040,E024) are not present. May be present otherwise. One or more Items shall be included in this Sequence.
>Retrieve URL	(0008,1190)	1	URL specifying the location of the referenced instance(s).

...

105 ***Update PS3.17, Section HHH with the following:***

HHH. ~~Evolution of~~ Transition from WADO to ~~Web and~~ RESTful Services (Informative)

Update PS3.17, Section HHH.1.1 with the following:

110 ## HHH.1.1 Request Parameters

~~**The new service based on WS should continue to support all the request parameters defined by WADO, for maintaining backward compatibility with the present URI based WADO, including the options to return either native DICOM objects or a rendered object (JPEG, PDF etc.).**~~

The WADO-RS and STOW-RS requests have no parameters because data is requested through well defined URLs and content negotiation through HTTP headers.

~~**The WADO-WS request parameters are summarized as below:**~~

Table HHH.1-1. Summary of DICOM/Rendered URI Based WADO Parameters

Parameter	Allowed for	Requirement in Request
requestType	DICOM & Rendered	Required
studyUID	DICOM & Rendered	Required
seriesUID	DICOM & Rendered	Required
objectUID	DICOM & Rendered	Required
contentType	DICOM & Rendered	Optional
Charset	DICOM & Rendered	Optional
Anonymize	DICOM	Optional
Annotation	Rendered	Optional
Rows, columns	Rendered	Optional
Region	Rendered	Optional
windowCenter, windowWidth	Rendered	Optional
imageQuality	DICOM & Rendered	Optional
presentationUID	Rendered	Optional
presentationSeriesUID	Rendered	Optional
transferSyntax	DICOM	Optional
frameNumber	DICOM & Rendered	Optional

~~**For the WS "DICOM Requester" transaction, the parameters will be the following:**~~

~~Table HHH.1-2. Summary of "DICOM Requester" WADO-WS Parameters~~

~~Parameter~~	~~Requirement in Request~~	~~Multiplicity~~
~~**StudyRequest**~~	~~**Required**~~	~~**One**~~
~~**>SeriesRequest**~~	~~**Required**~~	~~**One or more**~~
~~**>>DocumentRequest**~~	~~**Required**~~	~~**One or more**~~
~~**>>>RepositoryUniqueId**~~	~~**Optional**~~	~~**One**~~

Parameter	Requirement in Request	Multiplicity
>>>DocumentUniqueId	Required	One
>>>HomeCommunityId	Optional	One
>>>FrameNumber	Optional	One
>>>Anonymize	Optional	One
>>>TransferSyntaxUIDList	Optional	One
>>>>TransferSyntaxUID	Required	One or more

Table HHH.1-3. Summary of "Rendered Requester" WADO-WS Parameters

Parameter	Requirement in Request	Multiplicity
StudyRequest	Required	One
>SeriesRequest	Required	One or more
>>DocumentRequest	Required	One or more
>>>RepositoryUniqueId	Optional	One
>>>DocumentUniqueId	Required	One
>>>HomeCommunityId	Optional	One
>>>Annotation	Optional	One
>>>Rows / Columns	Optional	One
>>>Region	Optional	One
>>>WindowCenter/ WindowWidth	Optional	One
>>>ImageQuality	Optional	One
>>>PresentationUID	Optional	One
>>>PresentationSeriesUID	Optional	One
>>>FrameNumber	Optional	One
>>>Anonymize	Optional	One
>>>ContentTypeList	Required	One
>>>>ContentType	Required	One or more
>>>CharsetList	Optional	One

~~Parameter~~	~~Requirement in Request~~	~~Multiplicity~~
~~>>>>Charset~~	~~Required~~	~~One or more~~

~~Table HHH.1-4. Summary of "Metadata Requester" WADO-WS Parameters~~

~~Parameter~~	~~Requirement in Request~~	~~Multiplicity~~
~~StudyRequest~~	~~Required~~	~~One~~
~~>SeriesRequest~~	~~Required~~	~~One or more~~
~~>>DocumentRequest~~	~~Required~~	~~One or more~~
~~>>>RepositoryUniqueId~~	~~Optional~~	~~One~~
~~>>>DocumentUniqueId~~	~~Required~~	~~One~~
~~>>>HomeCommunityId~~	~~Optional~~	~~One~~
~~>>>Anonymize~~	~~Optional~~	~~One~~
~~>>>XPath~~	~~Required~~	~~One~~

Replace PS3.17, Section A.HHH.1.2.2

HHH.1.2.2 ~~WADO-WS~~ Retired

See PS3.17-2017b.

Update PS3.17, Section HHH.2 as follows:

HHH.2 Web ~~and Rest~~ Services Implementation

The implementation architecture has to maximize interoperability, preserve or improve performance and minimize storage overhead.

The Web ~~**and REST**~~ Services technologies have been selected to:

1. be firewall friendly and supporting security,
2. be supported by and interoperable between multiple development environments, and
3. have sufficient performance for both large and small text and for binary data.

~~**The XML implementation of the messages uses theCamelCase parameter names style used in SOAP 1.2 (element names starting with an upper case character, e.g., ElementOne, attribute names starting with a lower case character e.g., attributeOne)**~~.

~~**The WADO-WS response will be provided as list of instances in MTOM/XOP ("DICOM" or "Rendered" Requesters), XML encoded additional information resulting from the XPath filters applied on every objects selected ("Information Requester")**~~

The WADO-RS response will be provided as a list of XML and/or binary instances in a multipart/related response. The type of response depends on the media types listed in the Accept header.

The STOW-RS response is a standard HTTP status line and possibly an XML response message body. The meaning of the success, warning, or failure statuses are defined in PS3.18.

Update the PS3.17, Section 3 title as follows:

HHH.3 Uses For ~~WADO-WS, WADO-RS and STOW-RS~~ Web Services

. . .

Modify PS3.17, Section 5 as follows:

HHH.5 ~~IHE ITI Compatibility~~ Retired

See PS3.17-2017b.

~~**There is a strong desire that the ITI Transaction RAD-69 be a proper implementation of the DICOM WS-* transaction. Note that RAD-69 is not the entire suite of XD* transactions. It is the "Retrieve Imaging Document Set" transaction.**~~

~~**The RAD-69 transaction is quite simple, can be difficult to find all the parts of the ITI documentation. In summary, the RAD-69 transaction is a WS request to the IHE "RequestDocumentSet" action and related endpoints. The request is a list of "DocumentRequest", each "DocumentRequest" has three elements: required OID, required RepositoryID, and optional CommunityID. The response is a list of "DocumentResponse". Each "DocumentResponse" has four elements: required OID, required RepositoryID, required Document, and optional CommunityID.**~~

~~**The mapping to DICOM for OID would be SOP Instance UID, and Document the DICOM contents. RepositoryID is analogous to the AE Title. It is not a perfect mapping. IHE considers the configuration where one system acts as a front end for multiple other systems, each identified by a RepositoryID. The CommunityID is an extension of this to "communities" that exchange data through gateways. The gateways will use the RepositoryID to identify internal repository systems.**~~

~~**RAD-69 requires no understanding of document contents. They are binary blobs that are identified by an OID.**~~

Replace PS3.17, Section HHH.6 as follows:

HHH.6 ~~Proxy Agent For Non-WS DICOM Archive~~ Retired

See PS3.17-2017b.

Update PS3.18, Section 3 as follows:

… 3.4 Other References

~~**[ebRS] OASIS. April 2002. 2.0. *ebXML Registry Services Specification*. http://www.oasis-open.org/committees/regrep/documents/2.0/specs/ebrs.pdf .**~~

Delete the following from PS3.18, Section 5:

~~**MTOM - Message Transmission Optimization Mechanism**~~

~~**SOAP Simple Object Access Protocol (SOAP12 for SOAP version 1.2)**~~

~~**WADO-WS Web Access to DICOM Objects by Web Services (WS*)**~~

~~**WS Web Services**~~

~~**WSDL Web Services Description Language**~~

~~**XOP XML-binary Optimized Packaging**~~

Update PS3.18, Section 6 as follows:

6 Data Communication Requirements

DICOM Web Services use the HTTP and HTTPS protocols as its transport medium. Web Services supports versions 1.0, 1.1 and 2 of the protocol. If an origin server supports version 2, it shall also support version 1.1. If an origin server supports version 1.1, it shall also support version 1.0.

It is recommended that user agents that want to use HTTP/2 first initiate an HTTP/1.1 connection to the origin server and then upgrade to HTTP/2. If the upgrade fails then the user agent can still use the HTTP/1.1 connection. [RFC7540] Section 3 explains how to initiate HTTP/2 connections.

6.1 Interaction

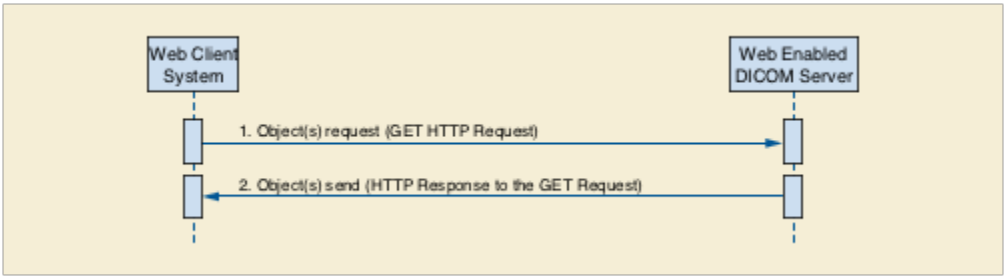

Figure 6-1. Interaction Diagram

The interaction shall be as shown in Figure 6-1.

Multiple communications modes are possible:

- URI based using HTTP Get: WADO-URI request

~~**• Web Services (WS) using HTTP Post: WADO-WS, either:**~~

~~**1. DICOM Requester (Retrieve Imaging Document Set)**~~

~~**2. Rendered Requester (Retrieve Rendered Imaging Document Set)**~~

~~**3. Metadata Requester (Retrieve Imaging Document Set Metadata)**~~

1. RESTful Services (RS) using HTTP Get: WADO-RS, either:

   - DICOM Requester (Retrieve Study, Series, or Instance DICOM Objects)
   - Frame Pixel Data Requester (Retrieve Instance Frame Pixel Data)
   - Bulk Data Requester (Retrieve Study, Series, Instance Bulk Data)
   - Metadata Requester (Retrieve Study, Series, Instance Metadata)

2. RESTful Services (RS) using HTTP Get: QIDO-RS:

    1. Query Requester (Search for Study, Series or Instance DICOM Objects)

3. RESTful Services (RS) using HTTP POST: STOW-RS, either:

    1. DICOM Creator (Store Instances)
    2. Metadata and Bulk Data Creator (Store Instances)

4. RESTful Services (RS) using HTTP Options: RS Capabilities:

    1. Provided information about the capabilities of a DICOM RESTful web service provider)

Update PS3.18, Section 6.1.1.3 as follows:

6.1.1.3 Rendered Media Types

DICOM instances may be converted by a rendering process into non-DICOM media types in order to display them using commonly available non-DICOM software, such as browsers.

For example:

- A DICOM SOP Instance containing an image could be rendered into the image/jpeg or image/png Rendered Media Types.
- A DICOM SOP Instance containing a multi-frame image in a lossless transfer syntax could be rendered into a video/mpeg or video/mp4 Rendered Media Type.
- A DICOM SOP Instance containing a Structured Report could be rendered into a text/html, text/plain, or application/pdf Rendered Media Type.

Note

Rendered Media Types are usually consumer format media types. Some of the same non-DICOM media types are also used as Bulk Data Media Types, that is, for encoding bulk data extracted from Encapsulated Pixel Data (used with compressed Transfer Syntaxes), without applying a rendering process; see Section 6.1.1.8.

Table 6.1.1-2 specifies the meaning of media type requirement terms used in Table 6.1.1-3 and the tables in Section 6.1.1.8.

Table 6.1.1-2. Definition of Media Type Requirement Terms

Requirement	Definition
default	The origin server shall return this media type when none of the Acceptable Media Types (see Section 6.1.1.4) are supported. The origin server shall support this media type.
required	The origin server shall support this media type.
optional	The origin server may support this media type.

Origin servers that support ~~**URI, WS or RS**~~ **Web S~~s~~**ervices shall support rendering instances of different Resource Categories into Rendered Media Types as specified in Table 6.1.1-3.

Table 6.1.1-3. Rendered Media Types by Resource Category

Category	Media Type	URI	~~WS~~	RS
Single Frame Image	image/jpeg	default	~~**default**~~	default
	image/gif	optional	~~**optional**~~	required
	image/png	optional	~~**optional**~~	required
	image/jp2	optional	~~**optional**~~	optional
Multi-frame Image	image/gif	optional	~~**optional**~~	optional
Video	video/mpeg	optional	~~**optional**~~	optional
	video/mp4	optional	~~**optional**~~	optional
	video/H265	optional	~~**optional**~~	optional
Text	text/html	default	~~**default**~~	default
	text/plain	required	~~**required**~~	required
	text/xml	optional	~~**optional**~~	required
	text/rtf	optional	~~**optional**~~	optional
	application/pdf	optional	~~**optional**~~	optional

When an image/jpeg media type is returned, the image shall be encoded using the JPEG baseline lossy 8 bit Huffman encoded non-hierarchical non-sequential process defined in ISO/IEC 10918-1.

Note

250 A DICOM encapsulated CDA resource may be returned as a text/xml media type.

The origin server may support additional rendered media types.

A transfer syntax media type parameter is not permitted for Rendered Media Types.

Update PS3.18, Section 6.1.1.5 as follows:

6.1.1.5 Accept Query Parameter

255 The <accept> query parameter is primarily designed for use in hyperlinks (URLs) embedded in documents, where the Accept header field is not accessible. It is similar to the Accept header field, except that it shall not have wildcards (<type>/* or */*).

The <accept> query parameter has the following syntax:

260
```
accept = accept-name "=" 1#(media-type [weight])
accept-name = "%s" quoted-string
```

Note

The "%s" that prefixes the <accept-name> specifies that it is a case sensitive token. See [RFC7405].

Its value is a comma-separated list of one or more <media-type>s, possibly including parameters. It shall be supported by the origin server. It is optional for the user agent.

The <accept-name> of the <accept> query parameter is defined by the Service. It is case-sensitive. Table 6.1.1-4 contains the <accept-name> of the <accept> query parameter for some services.

Table 6.1.1-4. <accept> Query Parameter Name by Service

Service	**Name**
URI	accept-name = "contentType"
~~**WS**~~	~~**not applicable**~~
RS	accept-name = "accept"

The <accept> query parameter should not be used when the user agent can specify the values in the Accept header field.

All media types present in an <accept> query parameter shall be compatible with a media range in the Accept header field, either explicitly or implicitly through wildcards.

Note

For example, the presence of image/jpeg in the <accept> query parameter will require the Accept header field to include one of the following values: image/jpeg, image/*, or */*.

Update PS3.18, Section 6.1.1.8 as follows:

6.1.1.8 DICOM Media Types and Media Types For Bulk Data

This section defines the media types used to represent DICOM Instances and bulk data. It describes:

- The media type and transfer syntax parameter for DICOM PS3.10 Files
- The media types that can be used for the bulk data of single and multi-frame images and video extracted from Instances.
- The syntax of DICOM Media Types including their transfer syntax and character set parameters.
- The query parameter for transfer syntax.
- The meaning of Acceptable Transfer Syntaxes and Selected Transfer Syntax.
- The media types supported by each service.

The media types defined in this section are distinct from those into which DICOM Instances may be rendered (which are defined in Section 6.1.1.3); some of the same media types are used for both rendered content and bulk data.

Depending on the service, the media types may be single part or multipart, and may have required or optional transfer syntax and/or character set parameters.

Table 6.1.1.8-1a, Table 6.1.1.8-1b, Table 6.1.1.8-1c and Table 6.1.1.8-1d specify the media types used to encode different representations of DICOM Instances for the ~~**URI, WS, and RS services**~~ **Web Services**. These media types apply to all Resource Categories and have default encodings for images and video data elements contained in the Instances.

The definitions of media type requirements are provided in Table 6.1.1-2.

Table 6.1.1.8-1a. Media Types for DICOM PS3.10 Files

Media Type	Descriptions	URI	~~WS~~	RS
application/dicom	Encodes Composite SOP Instances in the DICOM File Format defined in PS3.10 Section 7 “DICOM File Format”.	See Table 6.1.1.8-2	~~See Table 6.1.1.8-2~~	See Table 6.1.1.8-2

Table 6.1.1.8-1b. Media Types for DICOM Metadata

Media Type	Descriptions	URI	~~WS~~	RS
application/dicom+xml	Encodes Composite SOP Instances as XML Infosets defined in the Native Dicom Model defined in PS3.19.	not applicable	~~required~~	required
application/dicom+json	Encodes Composite SOP Instances in the JSON format defined in Annex F.	not applicable	~~not applicable~~	required

Table 6.1.1.8-1c. Media Types for DICOM Uncompressed Bulk Data

Media Type	Descriptions	URI	~~WS~~	RS
application/octet-stream	Encodes a Bulkdata object as a stream of uncompressed bytes, in little endian byte order. Note This is the same encoding defined in PS3.19 for the returned value of the getData() call for uncompressed Bulk Data.	not applicable	~~not applicable~~	See Table 6.1.1.8-3a

Table 6.1.1.8-1d. Media Types for DICOM Compressed Bulk Data

Media Type	Descriptions	URI	~~WS~~	RS
image/* video/*	Encodes Bulkdata values, which in the case of compressed Pixel Data for WADO-RS services, will have each frame encoded as a separate part of a multipart response and identified by an appropriate Content-Type header. Note This is not the same encoding defined in PS3.19 for the returned value of the getData() call for compressed Pixel Data, which will contain the entire payload of the Pixel Data element encoded in Encapsulated Format as defined in PS3.5 (i.e., as a Sequence of Fragments).	not applicable	~~not applicable~~	See Table 6.1.1.8-3b

Table 6.1.1.8-2 specifies, by Resource Category (see Table 6.1.1-1) , the application/dicom media type for PS3.10 Files, along with the default and allowed Transfer Syntax UID combinations for each resource category for the ~~URI, WS and RS services.~~**Web Services**. The default media type for the Resource Category shall be returned when the origin server supports none of the Acceptable Media Types.

If no transfer-syntax parameter is specified for the media type for PS3.10 Files (application/dicom) then the Explicit VR Little Endian Transfer Syntax "1.2.840.10008.1.2.1" shall be used.

Note

This is different from the Default Transfer Syntax defined in Section 10.1 “DICOM Default Transfer Syntax” in PS3.5, which is Implicit VR Little Endian.

Table 6.1.1.8-2. Transfer Syntax UIDs for 'application/dicom' Media Type Instances in the Image or Video Resource Categories

Category	Transfer SyntaxUID	Transfer Syntax Name	URI	~~WS~~	RS
Single Frame Image	1.2.840.10008.1.2.1	Explicit VR Little Endian	default	~~default~~	default
	1.2.840.10008.1.2.4.70	JPEG Lossless, Non-Hierarchical, First-Order Prediction(Process 14 [Selection Value 1]) :Default Transfer Syntax for Lossless JPEG Image Compression	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.50	JPEG Baseline (Process 1) :Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.51	JPEG Extended (Process 2 & 4) :Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression (Process 4 only)	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.57	JPEG Lossless, Non-Hierarchical (Process 14)	optional	~~optional~~	optional
	1.2.840.10008.1.2.5	RLE Lossless	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.80	JPEG-LS Lossless Image Compression	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.81	JPEG-LS Lossy (Near-Lossless) Image Compression	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only)	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.92	JPEG 2000 Part 2 Multi-component Image Compression (Lossless Only)	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.93	JPEG 2000 Part 2 Multi-component Image Compression	optional	~~optional~~	optional
Multi-frame Image	1.2.840.10008.1.2.1	Explicit VR Little Endian	default	~~default~~	default
	1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only)	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression	optional	~~optional~~	optional

Category	Transfer SyntaxUID	Transfer Syntax Name	URI	~~WS~~	RS
	1.2.840.10008.1.2.4.92	JPEG 2000 Part 2 Multi-component Image Compression (Lossless Only)	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.93	JPEG 2000 Part 2 Multi-component Image Compression	optional	~~optional~~	optional
Video	1.2.840.10008.1.2.1	Explicit VR Little Endian	default	~~default~~	default
	1.2.840.10008.1.2.4.100	MPEG2 Main Profile @ Main Level	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.101	MPEG2 Main Profile @ High Level	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.102	MPEG-4 AVC/H.264 High Profile / Level 4.1	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.103	MPEG-4 AVC/H.264 BD-compatible High Profile / Level 4.1	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.104	MPEG-4 AVC/H.264 High Profile / Level 4.2 For 2D Video	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.105	MPEG-4 AVC/H.264 High Profile / Level 4.2 For 3D Video	optional	~~optional~~	optional
	1.2.840.10008.1.2.4.106	MPEG-4 AVC/H.264 Stereo High Profile / Level 4.2	optional	~~optional~~	optional

Table 6.1.1.8-3a and Table 6.1.1.8-3b specify, by Resource Category (see Table 6.1.1-1) , the various media types for bulk data, along with the default and allowed media types and Transfer Syntax UID combinations for each resource category for the ~~**WS and**~~ RS service~~**s**~~.

Note

No entries are specified for ~~**the**~~ **WADO-**URI ~~**or WS**~~ service~~**s**~~, ~~**since they**~~ **because it** do**es** not support separate retrieval of bulk data.

These media types can be used to retrieve image or video bulk data encoded in a specific Transfer Syntax.

Update PS3.18, Section 6.1.1.8.1.2 as follows:

6.1.1.8.1.2 Transfer Syntax Parameter

All DICOM Media Types may have a single transfer syntax parameter, but its usage may be constrained by the service for which they are used.

~~**Support for the transfer syntax parameter is optional for WS Services.**~~

RS origin servers shall support the transfer syntax parameter.

...

Update PS3.18, Section 6.1.1.8.5 as follows:

6.1.1.8.5 Support For DICOM Media Types by Service

The URI~~**, WS,**~~ and RS APIs support the following DICOM Media Types:

```
uri-media-type = dicom
ws-media-type = dicom-xml [dcm-parameters]
rs-media-types = (dcm-multipart / dicom-json) [dcm-parameters]
```

Support for the transfer syntax and charset media type parameters is required for RS services.

~~**Support for the transfer syntax and charset media type parameters is optional for the WS Services.**~~

Support for the "transfer-syntax" and "charset" parameters is forbidden for URI Services (i.e. they may not present in the request or the response).

Update Section 6.1.2 as follows:

6.1.2 Character Sets

Table 6.1.2-1. Character Set Query Parameter Name by Service

Service	**Name**
URI	name = "charset"
~~**WS**~~	~~**not applicable**~~
RS Studies	name = "charset"

Replace PS3.18, Section 6.4 with the following:

6.4 ~~WADO-WS Request/Response~~ Retired

See PS3.2-2017b.

Update PS3.18, Section 8 as follows:

8 Parameters of the Request

8.1 Parameters Available for all DICOM Objects

. . .

8.1.2 Unique Identifier of the Study

Study Instance UID as defined in PS3.3. This parameter is REQUIRED.

The parameter name shall be "studyUID" for URI ~~**based**~~ mode~~**, and "StudyRequest" that contains a required "studyInstanceUID" attribute for the WS mode**~~.

The value shall be encoded as a Unique Identifier (UID) string, as specified in PS3.5, 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 PS3.3. This parameter is REQUIRED.

The parameter name shall be "seriesUID" for URI ~~based~~ mode~~, and, for the WS mode, one or multiple "SeriesRequest" that is included into the above described "StudyRequest" and that contains a required "seriesInstanceUID" attribute~~.

The value shall be encoded as a Unique Identifier (UID) string, as specified in PS3.5, 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 PS3.3. This parameter is REQUIRED.

The parameter name shall be "objectUID" for URI ~~based~~ mode~~, and for the WS mode one or multiple "DocumentRequest" that is included into the above described "SeriesRequest" and that include each one:~~

~~1. a required "DocumentUniqueId" that contains the Instance UID,~~

~~2. an optional "RepositoryUniqueId" that contains the UID of the DICOM server, and~~

3. ~~an optional "HomeCommunityId" that contains the UID of the "clinical affinity domain"~~.

The value shall be encoded as a unique identifier (UID) string, as specified in PS3.5, except that it shall not be padded to an even length with a NULL character.

8.1.5 Acceptable Media Type of the Response

This parameter contains one or more Acceptable Media Types as defined in Section 6.1.1.4. This parameter is OPTIONAL for URI mode. ~~It shall be present for the WS mode "Rendered Requester" action, and shall not be present in the other WS mode transactions.~~

In URI mode the parameter name shall be "contentType", and its value shall contain one or more media types.

~~In WS mode the parameter name shall be "ContentTypeList", which shall contain one or more "ContentType" elements, each containing a media type.~~

See Section 6.1.1 for details.

8.1.6 Charset of the Response

Character set with which the returned objects are to be encoded, as defined in the [RFC7230]. This parameter is OPTIONAL for URI ~~based~~ mode~~, and for the WS mode "Rendered Requester" and shall not be present in the other WS mode transactions~~.

The parameter name shall be "charset" for URI mode~~, and "CharsetList" containing one or more "Charset" elements for WS mode~~.

See Section 6.1.2 for details.

8.1.7 Anonymize Object

Removal of all patient identification information from within the DICOM Objects, if not already done, as defined in PS3.15. This parameter is OPTIONAL. In the URI ~~based~~ mode, it shall only be present if contentType is application/dicom.

This parameter is Optional

The parameter name shall be "anonymize" for URI ~~based~~ mode~~, and "Anonymize" for the WS mode~~.

The value shall be "yes".

The Server may return an error if it either cannot or refuses to anonymize these objects.

~~In WS mode, the metadata describing the objects or information extracted from them in the response shall be anonymized if requested.~~

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 fulfill 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.

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.

8.1.9 ~~Retrieve Partial Information From Objects~~ Retired

See PS3.2-2017b.

~~Retrieval of additional information from the DICOM Objects, using a filtering mechanism based on the XML mapping of DICOM IODs, as described in the Native DICOM Model defined in PS3.19. This parameter is defined only for the WS mode "Information Requester" transaction.~~

~~The parameter name shall be "XPath".~~

8.2 Parameters for DICOM Images

These parameters shall only be included when a request is made for a Single Frame Image Objects or Multi-frame Image or video Objects as defined in Section 6.1.1.2.

8.2.1 Annotation On The Object

Annotation of objects retrieved and displayed as an image. This parameter is OPTIONAL for the URI **~~based~~** mode **~~and the WS mode "Rendered Requester" transaction~~**. It shall not be present if contentType is application/dicom, or is a non-image media type (e.g., text/*). When it is not present for image objects, no additional annotation may be burnt in.

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

The parameter name shall be "annotation" for URI **~~based~~** mode**~~, and "Annotation" for the WS mode~~**. Its value is a non-empty list of one or more of the following items, separated by a "," character:

1. "patient", for displaying patient information on the image (e.g., patient name, birth date,…)

2. "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" for URI **~~based~~** mode**~~, and "Rows" for the WS mode~~**.

The value shall be expressed as an integer, representing the image height to be returned. It is OPTIONAL for the URI ~~based~~ mode ~~and the WS-mode "Rendered Requester" transaction. It shall not be present for other WS-mode transactions~~. 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 images within these constraints, maintaining the correct aspect ratio. If the number of rows is absent and 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 images (or selected region) are sent in their original size (or the size of the presentation state applied on the images), resulting as one pixel of screen image for each value in the images data matrix.

The value shall be encoded as an integer string (IS), as specified in PS3.5.

8.2.3 Number of Pixel Columns

The parameter name shall be "columns" for URI ~~based~~ mode~~, and "Columns" for the WS-mode~~.

The value shall be expressed as an integer, representing the image width to be returned. It is OPTIONAL for the URI ~~based~~ mode ~~and the WS-mode "Rendered Requester" transaction~~. 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 images within these constraints, maintaining the correct aspect ratio. If the number of columns is absent and the number of rows is present, the number of columns shall be chosen in order to maintain the correct aspect ratio. If both are absent, the images (or selected region) is sent in its original size (or the size of the presentation state applied on the images), resulting as one pixel of screen for one pixel of the images.

The value shall be encoded as an integer string (IS), as specified in PS3.5.

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 for the URI ~~based~~ mode. ~~and the WS-mode "Rendered Requester" transaction. It shall not be present for other WS-mode transactions~~.

The parameter name shall be "region" for URI ~~based~~ mode~~, and "Region" for the WS-mode~~.

It shall only be present if the Acceptable Media Types are Rendered Media Types. See Section 6.1.1.3.

It shall not be present if the Unique Identifier of the Presentation Object parameter is present.

The value shall be expressed as a list of four positive decimal strings, separated by the ',' character, representing the region of the source images 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:

1. 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. ~~In the WS-mode, this value is encoded into an XML element "XMin".~~

2. 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. ~~In the WS-mode, this value is encoded into an XML element "YMin".~~

3. 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. ~~In the WS-mode, this value is encoded into an XML element "XMax".~~

4. 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. ~~In the WS-mode, this value is encoded into an XML element "YMax".~~

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 normalized 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 images.

8.2.5 Window Center of the Image

The parameter name shall be "windowCenter" for URI ~~based~~ mode~~, and "WindowCenter" for the WS mode~~.

Controls the window center of the images as defined in PS3.3. This parameter is OPTIONAL for the URI ~~based~~ mode ~~and the WS mode "Rendered Requester" transaction~~. ~~It shall not be present for other WS mode transactions.~~ This parameter is REQUIRED if "windowWidth" ~~or "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.

The value shall be encoded as a decimal string (DS), as specified in PS3.5.

8.2.6 Window Width of the Image

The parameter name shall be "windowWidth" for URI ~~based~~ mode~~, and "WindowWidth" for the WS mode~~.

Controls the window width of the images as defined in PS3.3. This parameter is OPTIONAL for the URI ~~based~~ mode ~~and the WS mode "Rendered Requester" transaction. It shall not be present for other WS mode transactions.~~ It is REQUIRED if "windowCenter" ~~or "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 PS3.5.

8.2.7 Frame Number

The parameter name shall be "frameNumber" for URI ~~based~~ mode~~, and "FrameNumber" for the WS mode~~.

Specifies that the single frame with that number within a multi-frame image object, as defined in PS3.3 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 PS3.5.

8.2.8 Image Quality

The parameter name shall be "imageQuality" for URI ~~based~~ mode~~, and "ImageQuality" for the WS mode~~. It is OPTIONAL for the URI ~~based~~ mode ~~and the WS mode "DICOM requester" and "Rendered Requester" transactions~~. 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 media 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.

Note

Decompression and re-compression 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 re-compressing it.

The value shall be encoded as an integer string (IS), as specified in PS3.5.

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" for URI ~~based~~ mode~~, and "PresentationUID" for the WS mode~~.

SOP Instance UID of the presentation state storage object to be applied to the images. This parameter is OPTIONAL for the URI ~~based~~ mode~~ and the WS-mode "Rendered Requester" transaction~~. It shall only be present if the Acceptable Media Types are Rendered Media Types. See Section 6.1.1.3.

The value shall be encoded as a unique identifier (UID) string, as specified in PS3.5, except that it shall not be padded to an even length with a NULL character.

If this parameter is present, then the Region of the Image parameter shall not be present. See Section 8.2.4.

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

1. 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.

2. 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.

Though the output of the presentation state is defined in DICOM to be in P-Values (grayscale values intended for display on a device calibrated to the DICOM Grayscale Standard Display Function PS3.14), the grayscale or color space for the images returned by the request is not defined by this standard.

8.2.10 Unique Identifier of the Series Containing the Presentation Object

The parameter name shall be "presentationSeriesUID" for URI ~~based~~ mode~~, and "PresentationSeriesUID" for the WS-mode~~.

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

If this parameter is present, then the Region of the Image parameter shall not be present. See Section 8.2.4.

The value shall be encoded as a unique identifier (UID) string, as specified in PS3.5, except that it shall not be padded to an even length with a NULL character.

Note

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

8.2.11 Transfer Syntax UID

For the URI service the parameter name shall be "transferSyntax" containing one value.

~~**For the WS service the parameter name shall be "TransferSyntaxUIDList" containing one or more "TransferSyntaxUID" elements.**~~

RS Services shall not support this parameter.

The Transfer Syntax to be used within the DICOM image objects, as specified in PS3.6. This parameter is OPTIONAL for the URI ~~based~~ mode~~ and the WS-mode "DICOM Requester" transaction~~. It shall not be present if contentType is other than application/dicom.

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.

Note

The transfer syntax can be one of the JPIP Transfer Syntaxes, in which case the returned objects will contain the URL of the JPIP provider for retrieving the pixel data.

The value(s) shall be encoded as a unique identifier (UID) string, as specified in PS3.5, except that it shall not be padded to an even length with a NULL character.

Replace PS3.18, Annex E

E ~~WADO WS Schemas and Examples~~ Retired

Retired. See PS3.2-2017b.

Update PS3.18, Annex F

F.1 Introduction to JavaScript Object Notation (JSON)

JSON is a text-based open standard, derived from JavaScript, for representing data structures and associated arrays. It is language-independent, and primarily used for serializing and transmitting lightweight structured data over a network connection. It is described in detail by the Internet Engineering Task Force (IETF) in [RFC4627], available at http://www.ietf.org/rfc/rfc4627.txt.

The DICOM JSON Model complements the XML-based Native DICOM Model, by providing a lightweight representation of data returned by DICOM web services. While this representation can be used to encode any type of DICOM Data Set it is expected to be used by client applications, especially mobile clients, such as described in the QIDO-RS use cases (see Annex HHH "Transition from WADO to ~~**Web and Rest**~~ **RESTful** Services (Informative)" in PS3.17).