

DICOM Correction Proposal

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Correction Number	CP1581
Log Summary:	Define Errors for Rendering
Name of Standard	PS3.18 2017b
Rationale for Correction:	The Parameters in PS3.18, Section 8 do not specify error status codes
Correction Wording:	

Update PS3.18, Section 8.2.18 as follows:

8 Parameters of the WADO-URI Request

8.1 Parameters Available for all DICOM Persistent Objects

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

Some of the Query Parameters specified in this section have values that are UIDs. Table 8.1-1 lists error status codes related to UIDs.

Table 8.1-1 UID Related Errors

Status Code	Reason
400 (Bad Request)	The UID is not a correctly formatted, or it references a resource that is not a SOP Instance (i.e., references an instance of a different entity, e.g., a Study).
404 (Not Found)	No resource corresponding to the UID exists.
410 (Gone)	The resource corresponding to the UID, once existed, but no longer exists.

Note: An origin server that does not check the format of the UID, or does not maintain a history of removed resources, may return a 404 (Not Found).

An error response may include a payload containing an appropriate error message.

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 PS3.4.

8.1.1 Request Type

~~Type of request performed. This parameter is REQUIRED for URI based mode.~~

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

~~The value shall be "WADO".~~

Note

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

This parameter specifies that this is a URI service request. The parameter name shall be "requestType", and the value shall be "WADO". It is REQUIRED.

If the value is other than "WADO", and the origin server does not support the value, the response shall be 400 (Bad Request), and may include a payload containing an appropriate error message.

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 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.

Error status codes related to UIDs are specified in Table 8.1-1.

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 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.

Error status codes related to UIDs are specified in Table 8.1-1.

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 mode.

- a required "DocumentUniqueId" that contains the Instance UID,

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.

Error status codes related to UIDs are specified in Table 8.1-1.

8.1.5 Acceptable Media Types for 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.

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

See Section 6.1.1 for details.

8.1.6 ~~Charset of the Response~~ Acceptable Character Sets

Character set with which the returned objects are to be encoded, as defined in the [RFC7230]. This parameter is OPTIONAL for URI mode.

The parameter name shall be "charset" for URI 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~~ For the URI 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 .

The value shall be "yes".

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

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

If this parameter has any other value than "yes", the origin server shall return a 400 (Bad Request) response, and may include a payload containing an appropriate error message.

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~~ **patient's** 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~~ from Objects (Retired)

Retired. See PS3.2-2017b.

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 ~~V~~Video Objects as defined in Section 6.1.1.2.

If any of these parameters are included in a request for non-Image objects (e.g., for SR objects), then the response shall be a 400 (Bad Request), and may include a payload containing an appropriate error message.

8.2.1 Annotation ~~On The~~ on the Object

Annotation of objects retrieved and displayed as an image. This parameter is OPTIONAL for the URI mode. 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 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 mode. 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.

The origin server may support additional values for this parameter.

The origin server shall ignore any values it does not support. If unsupported values are present, the origin server shall include a following Warning header field:

Warning: 299 {+service}: The following annotation values are not supported: <values>

and may include a payload containing an appropriate warning message.

8.2.2 Number of Pixel Rows

8.2.2 Viewport Dimensions

The viewport parameters specify the dimensions of the user agent's viewport. The Viewport Rows and Columns parameters specify the height and width, in pixels, of the returned image.

If these parameters specify viewport dimensions that are either ill-defined or not supported, then the response shall be a 400 (Bad Request), and may include a payload containing an appropriate error message.

8.2.2.1 Pixel Rows

The parameter name shall be "rows" for URI ~~based~~ mode.

The value shall be expressed as an integer, representing the image height to be returned. It is OPTIONAL for the URI ~~based~~ mode. 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

8.2.2.2 Pixel Columns

The parameter name shall be "columns" for URI ~~based~~ mode.

The value shall be expressed as an integer, representing the image width to be returned. It is OPTIONAL for the URI ~~based~~ mode. 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.

8.2.3 Reserved

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.

The parameter name shall be "region" for URI ~~based~~ 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:

- 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.
- 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.

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.

If this parameter specifies an ill-defined region, the origin server shall return a 400 (Bad Request) response, and may include a payload containing an appropriate error message.

8.2.5 Window Center of the Image

8.2.5 Windowing

The windowing parameters are optional; however, if either is present, both shall be present. If only one is present the origin server shall return a 400 (Bad Request) response, and may include a payload containing an appropriate error message.

The Windowing and Presentation State parameters shall not be present in the same request. If both are present the origin server shall return a 400 (Bad Request) response, and may include a payload containing an appropriate error message.

The windowing parameters shall not be present if contentType is application/dicom; if either is present the origin server shall return a 400 (Bad Request) response, and may include a payload containing an appropriate error message.

8.2.5.1 Window Center of the Image

The parameter name shall be "windowCenter" for URI **based** mode.

It controls Controls the window center of the images as defined in PS3.3. This parameter is OPTIONAL for the URI **based** mode. ~~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.~~

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

8.2.6 Window Width of the Image

8.2.5.2 Window Width of the Image

The parameter name shall be "windowWidth" for URI **based** mode.

It controls Controls the window width of the images as defined in PS3.3. This parameter is OPTIONAL for the URI **based** mode. ~~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 PS3.5.

8.2.6 Reserved

8.2.7 Frame Number

The parameter name shall be "frameNumber" for URI ~~based~~ 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.

If the target resource is:

- a single frame image and the frame number is present and not 1, or
- a multi-frame image and the frame number is not between 1 and the number of frames in the image (inclusive), or
- not an image,

then the response shall be a 400 (Bad Request), and may include a payload containing an appropriate error message.

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. It is OPTIONAL for the URI ~~based~~ mode. 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.

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

If the value of this parameter is less than 1 or greater than 100, then the response shall be a 400 (Bad Request), and may include a payload containing an appropriate error message.

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

8.2.9 Unique Identifiers of the Presentation State Object

The parameters in this Section specify the Series and SOP Instance UIDs of a Presentation State. They are OPTIONAL; however, if either is present, both shall be present. If only one is present the origin server shall return a 400 (Bad Request) response, and may include a payload containing an appropriate error message.

If the Presentation State parameters are present, then only the Annotation, Image Quality, Viewport and Region parameters may also be present. If any of the other image rendering parameters described in Section 8.2 are present the response shall be 400 (Bad Request), and may include a payload containing an appropriate error message.

If the target resource is not a Presentation State then the response will be 400 (Bad Request), and may include a payload containing an appropriate error message.

The Presentation State parameters shall not be present if contentType is application/dicom; if either is present the origin server shall return a 400 (Bad Request) response, and may include a payload containing an appropriate error message.

8.2.9.1 Unique Identifier of the Presentation State SOP Instance

The parameter name shall be "presentationUID" for URI ~~based~~ mode.

~~The value is the~~ SOP Instance UID of the ~~P~~resentation ~~S~~tate storage object to be applied to the images. ~~This parameter is OPTIONAL for the URI based mode. It shall not be present if contentType is application/dicom.~~

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

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.

8.2.9.2 Unique Identifier of the Series Containing The the Presentation State ObjectSOP Instance

The parameter name shall be "presentationSeriesUID" for URI ~~based~~ mode.

~~The value is the~~ Series Instance UID of the ~~S~~eries containing the ~~P~~resentation ~~S~~tate storage object to be applied on the images. ~~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 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.

8.2.10 Reserved

8.2.11 Transfer Syntax UID

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

~~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. 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