DICOM Correction Proposal

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Correction Number	CP1581
Log Summary: Define Errors for Rendering	
Name of Standard PS3.18 2015c	
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 Request

8.1 Parameters Available for all DICOM Persistent Objects

Parameters specified in this section 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 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 is specifies that this is a URI mode request. The parameter name shall be "requestType", and the value shall be "WADO". It is REQUIRED.

If the value is not "WADO", the response shall be 409 (Conflict), and should 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 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.

If this parameter has a value that is not a Study Instance UID, the response shall be 409 (Conflict), and should include a payload containing an appropriate error message.

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.

If this parameter has a value that is not a Series Instance UID, the response shall be 409 (Conflict), and should include a payload containing an appropriate error message.

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:

- a required "DocumentUniqueId" that contains the Instance UID,
- an optional "RepositoryUniqueId" that contains the UID of the DICOM server, and
- 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.

If this parameter has a value that is not a SOP Instance UID, the origin server shall return a 409 (Conflict) response, and should include a payload containing an appropriate error message.

8.1.5 ~~MIME~~ Acceptable Media Types for ~~of~~ the Response

~~**MIME type(s) desired by the Web Client for**~~ **Media types acceptable to the user agent in** the response from the ~~**Server**~~ **origin server**, as defined in the IETF RFC7230. ~~**This parameter is OPTIONAL for URI based mode, it shall be present for the WS mode "Rendered Requester" and shall not be present in the other WS mode transactions.**~~

~~**The parameter name shall be "contentType" for URI based mode, and, for the WS mode, "ContentTypeList" that contains one or multiple "ContentType".**~~

~~**In URI based mode, 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 RFC7230. In WS mode, it contains one or more "ContentType" elements containing each one MIME type.**~~

~~**In URI based mode, the Web Client user agent shall provide list of content types it supports in the "Accept" header field of the GET method. The value of the contentType parameter of the request shall be one of the values specified in that field.**~~

~~I~~n URI mode the name shall be "contentType" and its value is a comma-separated list of one or more media types. It is OPTIONAL. Any media types contained in the "contentType" parameter shall also be specified in the Accept header field, either explicitly or though the use of a wildcard (type/* or */*).

In WS mode the element name shall be "ContentTypeList" that contains one or more "ContentType" elements, each with a value that is a media type.

Any parameter values that are not valid or not supported shall be ignored.

Note

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

2. ~~When this parameter is absent, the default content type of the response is dictated by the "MIME type constraints" sub-sections of Section 7 (i.e., 7.1.2, 7.2.2, 7.3.2, 7.4.2).~~

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

Character set with which the returned objects are to be encoded, as defined in the IETF 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 based mode, and "CharsetList" containing one or more elements "Charset" for the WS mode.

For the URI mode, 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 RFC7230.

In URI based mode, 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.

If this parameter has a value that is not a valid character set, the origin server shall return a 409 (Conflict) response, and should include a payload containing an appropriate error message.

The Web 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)
- 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)

Note

1. 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.

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

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~~ **the Content-Type** 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.

If this parameter has any other value than "yes", the origin server shall return a 409 (Conflict) response, and should 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

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 Image Persistent Objects

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 7.2.

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 based mode and the WS mode "Rendered Requester" transaction. 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 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:

- "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 define additional values for this parameter.

The origin server shall ignore any values it does not support.

~~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 this parameter specifies viewport dimensions that are either ill-defined or not supported, then the response shall be a 409 (Conflict), and should include a payload containing an appropriate error message.

8.2.2.1 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~~

8.2.2.2 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.

8.2.3 Not Used

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

If this parameter specifies an ill-defined region, the origin server shall return a 409 (Conflict) response, and should 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 one or the other is not present the origin server shall return a 409 (Conflict) response, and should 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 409 (Conflict) response, and should 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, and "WindowCenter" for the WS mode.

It controls ~~**Controls**~~ the luminosity 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~~

8.2.5.2 Window Width of the Image

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

It controls ~~**Controls**~~ the contrast 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.

8.2.6 Unused

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.

If the target resource is not a multi-frame image and the frame number is not 1; or if the frame number is greater that the number of frames in the Instance, then the response shall be a 409 (Conflict).

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 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 409 (Conflict), and should 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 Identifier of the Presentation State Object

The parameters below specify the series and instance UIDs of a Presentation State. They are optional; however, if one is present, they shall both be present.

If the Presentation State parameters are present, then only the Annotation, Image Quality, and Viewport parameters may also be present. If any of the other parameters are present the response shall be 409 (Conflict), and should include a payload containing an appropriate error message.

If the target resource is not a Presentation State then the response will be 409 (Conflict), and should include a payload containing an appropriate error message.

8.2.9.1 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 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 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.

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 Unused

8.2.11 Transfer Syntax UID

The parameter name shall be "transferSyntax" for URI based mode, and "TransferSyntaxUIDList" containing one or more "TransferSyntaxUID" elements for the WS mode.

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 chosen as one of the values of TransferSyntaxUID corresponding to JPIP, in case of which the returned objects will contain the URL of the JPIP session to launch for retrieving the corresponding image.

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