DICOM Correction Proposal

<table>
<thead>
<tr>
<th>STATUS</th>
<th>Assigned</th>
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<tr>
<td>Date of Last Update</td>
<td>2016/01/19</td>
</tr>
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<td>Submission Date</td>
<td>2015/11/13</td>
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<td>Correction Number</td>
<td>CP1583</td>
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Log Summary: Define Errors for Restful Rendering

Name of Standard
PS3.18 2015c

Rationale for Correction:
The Parameters in PS3.18, related to Restful Rendering do not specify error related to query parameters.

Correction Wording:

_Update PS3.18, Section 6.1.1.5 as follows:_

5 6.1.1.5 Accept Query Parameter

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:

```plaintext
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>
<thead>
<tr>
<th>Service</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>URI</td>
<td>accept-name = &quot;contentType&quot;</td>
</tr>
<tr>
<td>WS</td>
<td>not applicable</td>
</tr>
<tr>
<td>RS</td>
<td>accept-name = &quot;accept&quot;</td>
</tr>
</tbody>
</table>

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 `*/*`.

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

If a DICOM media type is present, non-DICOM media types shall not be present. If both DICOM and non-DICOM media types are present, the response shall be 409 (Conflict), and should include a payload containing an appropriate error message.

Update PS3.18, Section 6.1.1.6 as follows:

### 6.1.1.6 Accept Header Field

The Accept header field is used to specify media ranges acceptable to the user agent. It has the following syntax:

```
Accept = 1#(media-range [weight])
```

Where,

```
media-range = media-type
  / type "/" "*" parameters
  / "/" parameters
```

The Accept header field shall be present. Its value shall be a comma-separated list of one or more media ranges acceptable in the response. See [RFC7231, Section 5.3.2](https://tools.ietf.org/html/rfc7231#section-5.3.2).

A media range is either a media-type or a wildcard. Wildcards use the asterisk ("**") to group media types into ranges, with `<type>/" indicating all subtypes of that type, and "/" indicating all media types from the target's Resource's Category.

For example, the media range "image/**" matches "image/jpeg", which is the default media type for the Single Frame Image Resource Category, and "text/**" matches "text/html", which is the default media type for the Text Resource Category. The ""/*" media range matches the default media type for the target's Resource Category.

If the origin server receives a request without an Accept header field, but that might have a response payload, it shall return a 406 (Not Acceptable).

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

If a DICOM media type is present, non-DICOM media types shall not be present. If both DICOM and non-DICOM media types are present, the response shall be 409 (Conflict), and should include a payload containing an appropriate error message.

Update PS3.18, Section 6.1.2.1 as follows:

### 6.1.2.1 Acceptable Character Sets

The term Acceptable Character Sets denotes the character sets that are acceptable to the user agent in the response. The Acceptable Character Sets are those specified in:

- the "charset" media type parameter
- the `<charset-set>` query parameter
- the Accept-Charset header field
- the default character set for the media type, if any
When the acceptable character sets contains a list of one or more Defined Terms they should be ordered as specified in PS3.3, Section C.12.1.2, and PS3.5, Section 6.1.2.3. This is especially important for ISO 2022 character sets.

**Update PS3.18, Section 6.1.2.2 as follows:**

**6.1.2.2 Character Set Query Parameter**

The `<character-set>` query parameter is primarily designed for use in hyperlinks (URLs) embedded in documents, where the Accept-Charset header field is not accessible.

The `<character-set>` query parameter has the following syntax:

```
character-set = name "=" 1#(charset [weight])
```

The `<character-set>` query parameter value is a comma-separated list of one or more `<charset>`s. It is similar to the Accept-Charset header field, except that it shall not have wildcards. It shall be supported by the origin server. It is optional for the user agent.

All `<charset>`s present in the `<character-set>` query parameter may have a corresponding character set in the Accept-Charset header field, either explicitly or implicitly through wildcards.

The `<name>` of the `<character-set>` query parameter is defined by the Service. Table 6.1.2-1 contains the names of the `<character-set>` query parameter for some services.

<table>
<thead>
<tr>
<th>Service</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>URI</td>
<td>name = &quot;charset&quot;</td>
</tr>
<tr>
<td>WS</td>
<td>not applicable</td>
</tr>
<tr>
<td>RS Studies</td>
<td>name = &quot;charset&quot;</td>
</tr>
</tbody>
</table>

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

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.

**Update PS3.18, Section 6.1.2.3 as follows:**

**6.1.2.3 Accept-Charset Header Field**

The Accept-Charset header field has the following syntax:

```
Accept-Charset = 1#(charset [weight]) / ("*") [weight])
```

The user agent may provide a list of Acceptable Character Sets in the Accept-Charset header field of the request. Its value is a comma-separated list of one or more `<charset>`s and/or the wildcard value ("*"). It shall be supported by the origin server. It is optional for the user agent.

The values of the Accept-Charset header field values are prioritized by their `<weight>` parameter.

If no wildcard ("*") is present, then any character sets not explicitly mentioned in the header field are considered "not acceptable" to the client.

A request without an Accept-Charset header field implies that the user agent will accept any charset in response.

If the media type defines a "charset" parameter, it should be included with the media type in the Accept header field, rather than in the Accept-Charset header field.

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

Update Section 6.5.8.1.2.1 as follows:

6.5.8.1.2.1 Image Annotation

The annotation parameter specifies that the rendered images shall be annotated with patient and/or procedure information. Its value is a comma-separated list of one or more keywords. It has the following syntax:

```
%%"annotation=" 1#( %%"patient" / %%"technique" )
```

Where

- "patient" Indicates that the rendered images shall be annotated with patient information (e.g., patient name, birth date, etc.).
- "technique" Indicates that the rendered images shall be annotated with information about the procedure that was performed (e.g., image number, study date, image position, etc.).

When this parameter is not present, no annotations shall be applied.

The origin server shall apply the annotations after all other parameters have been applied.

The origin server may support additional keywords, which should be included in the Conformance Statement and the Retrieve Capabilities response.

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

Note

1. The exact nature and presentation of the annotation is determined by the origin server. The annotation is burned into the rendered image pixels.
2. A user agent wanting more control over annotations may retrieve an image, omitting the "annotation" parameter; and separately retrieve the metadata; and create customized annotations on the image.

Update Section 6.5.8.1.2.2 as follows:

6.5.8.1.2.2 Image Quality

The "quality" parameter specifies the requested quality of the rendered images. It has the following syntax:

```
%%"quality=" integer
```

Where

- integer is an unsigned integer between 1 and 100 inclusive, with 100 being the best quality.

If the value of this parameter is less than 1 or greater than 100, the response shall be a 409 (Conflict), and should include a payload containing an appropriate error message.

The "quality" parameter is only supported for media types that allow lossy compression.

Note:

1. Decompression and re-compression may degrade the image quality if the original image was already irreversibly compressed. If the image has been already lossy compressed using the same format as required (e.g., jpeg), it may be sent as is without decompressing and re-compressing it.
2. The specific interpretation of the meaning of this parameter is determined by the origin server.

Update Section 6.5.8.1.2.3 as follows:
6.5.8.1.2.3  Scaling a Region of a Source Image(s) to a Viewport

The "viewport" parameter specifies a rectangular region of the source image(s) to be cropped, and a rectangular region corresponding to the size of the user agent’s viewport to which the cropped image should be scaled.

If the target resource is a Presentation State Instance, the syntax for this parameter is:

%s"viewport=" vw "," vh

Otherwise it is:


Where

vw and vh  Are positive integers specifying the width and height, in pixels, of the rendered image.

sx and sy  Are decimal numbers whose absolute values specify, in pixels, the top-left corner of the region of the source image(s) to be rendered. If either <sx> or <sy> is not specified it defaults to 0.

sw and sh  Are decimal numbers whose absolute values specify, in pixels, the width and height of the region of the source image(s) to be rendered. If <sw> is not specified, the origin server shall render to the right edge of the source image. If <sh> is not specified, the origin server shall render to the bottom edge of the source image. If <sw> is a negative value, the image is flipped horizontally. If <sh> is a negative value, the image is flipped vertically.

The source image region parameters (sx, sy, sw, and sh) shall not be present when rendering a Presentation State Instance. If they are present the origin server shall return a 409 (Conflict).

The origin server shall first crop, if specified, then scale the source images, maintaining their original aspect ratio, until either the rendered image width is the same as the viewport width or the image height is the same as the viewport height, whichever avoids truncation. In other words, viewport scaling makes the image(s) as large as possible, within the viewport, without overflowing the viewport area and without distorting the image.

If any of the optional parameter values are not present, the default value shall be used. Individual values may be elided, but the commas between the values shall be present. For example:

viewport=512,512,,,512,512

The missing <sx> and <sy> parameter values shall default to 0.

If trailing values are elided, then the trailing commas shall be omitted. For example:

viewport=1024,1024

The missing <sx>, <sy>, <sw>, <sh> will have their default values, which means the image(s) will not be cropped, and the full image will be rendered.

If the viewport parameter is not present, the rendered image(s) shall not be scaled, i.e., the rendered image(s) shall contain the same sized pixel matrix as the source DICOM image.

If this parameter specifies an ill-defined source region or viewport, the origin server shall return a 409 (Conflict) response, and should include a payload containing an appropriate error message.

Note

The default values for <sx> and <sy> differ from the defaults in the Specified Displayed Area in Presentation States, which uses integer values with the top left corner being (1,1). See PS3.3 Section C.10.4.
Update Section 6.5.8.1.2.4 as follows:

190 6.5.8.1.2.4 Windowing

The "window" parameter controls the windowing of the images as defined in PS3 Section C.8.11.3.1.5. It has the following syntax:

```%s"window=" center "," width "," function```

Where:
- `center` is a decimal number containing the window-center value
- `width` is a decimal number containing the window-width value
- `function` is one of the following keywords: "linear", "linear-exact", or "sigmoid".

Note:
1. These correspond to the differently capitalized and punctuated values of VOI LUT Function (0028,1056). See PS3 Section C.11.2.1.2.
2. All three parameter values are required.

If any of the parameter values are invalid, the origin server shall return a 409 (Conflict) response, and should include a payload containing an appropriate error message.

If the target resource is a Presentation State, this parameter shall not be used. If this parameter is present when the target resource is a Presentation state, the origin server shall return a 409 (Conflict).

Update Section 6.5.8.2.1 as follows:

195 6.5.8.2.1 Presentation State Instance

If the target resource is a Presentation State Instance, that instance may contain references to one or more series, each of which may contain one or more instances, each of which may contain one or more frames. The response shall return rendered versions of all supported Instances and frames referenced by the Presentation State Instance.

For example, if the Presentation State instance references a multi-frame image, then the response will contain all frames specified by the target resource, or if the Presentation State instance references a series, then the response will contain all instances contained in that series.

If the target resource is a Presentation State Instance, 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 Presentation State Instance contains a Blending Sequence, then the rendered images in the response shall correspond to the frames of the input that have a Blending Sequence Item with a Blending Position (0070,0405) value of UNDERLYING. See PS3, Section C.11.14.1.1.

The origin server shall render all of the images referenced by the Presentation State in an Acceptable Media Type using the rendering pipeline specified in PS3.4.

If there is more than one image in the response, they shall be ordered according to the:
1. Dimension Index Values (0020,9157) attribute, if present
2. Image Position (Patient) (0020,0032) attribute, if present
3. Image Position Volume (0020,9301), if present
4. Order of the instance references in the presentation state

If the above does not fully specify the ordering of the frames, then the origin server shall resolve any remaining ambiguity in the ordering.

If the Presentation Size Mode is TRUE SIZE it shall be treated as SCALE TO FIT.
If the Presentation Size Mode is SCALE TO FIT, the origin server shall scale the Specified Displayed Area in the Presentation State, maintaining its original aspect ratio, until either the rendered image width is the same as the viewport width or the rendered image height is the same as the viewport height, whichever comes first. In other words, viewport scaling makes the displayed area selection as large as possible, within the viewport, without overflowing the viewport area and without distorting the image. If the viewport parameter is not present, the returned images shall have the dimensions of the Specified Displayed Area.

If the Presentation Size Mode is MAGNIFY, then the referenced images shall be scaled to the Specified Displayed Area in the Presentation State, and then they shall be cropped to the size specified by the "viewport" parameter. If the request does not contain a "viewport" parameter, then the referenced images shall not be cropped.

Any Specified Displayed Area relative annotations in the Presentation State shall be rendered relative to the Specified Displayed Area within the Presentation State, not the size of the viewport.

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 rendered images is not defined by this standard.