Digital Imaging and Communications in Medicine (DICOM)

HTJ2K Transfer Syntax

Supplement 235

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Open Issues

1.	Should there be a transfer syntax for floating point pixel data encoded as HTJ2K lossless?
2.	Is it ok to have a separate transfer syntax which has constrained encoding details to optimize performance for HTJ2K, as specified below in section 10.18 below. This was mostly done for performance reasons, but also to specify the decoder requirements. If other encoding details are required, other transfer syntaxes could be specified.
3.	Should a box header be required or forbidden for HTJ2K bitstreams? (The box header is the metadata which prefixes file instances for HTJ2K - eg the JP2 file header in Part 5 A.4.4)
4.	Are the constrained HTJ2K parameters excessive or insufficient? (See 10.18 below)
5.	Each frame is current restricted to a single fragment, restricting the total size to 2^31-4 bytes. Does this cause any issues?

Commented [1]: ISO 15444 - JPEG 2000 standard ISO 19566-1 - "JPEG Systems Group" - defines box information generally

Closed Issues

1.	Should rendered images be permitted to have more than 8 bits when rendered with HTJ2K? The availability of HDR monitors is becoming much more common, and these would allow for display of HDR content, so it could be allowed to return HDR rendered images. No: Consensus from WG-27 meeting is to proceed with this, but as a supplement on Part 18 rather than having it in this supplement.
2.	Should rendered images permit HTJ2K lossless images? Currently the only lossless format permitted for rendered images is PNG. No: for this supplement, but create a separate workitem/supplement

Scope and Field of Application

This supplement covers the addition of the HTJ2K Transfer Syntax to PS3.5. The addition of HTJ2K is intended to address some of the shortcomings of JPEG 2000 which have prevented wider adoption of JPEG 2000, specifically, the performance of encoding and decoding as well as the encoder and decoder complexity.

Update PS3.5 Section 2

2 Normative References

The following standards contain provisions that, through references in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibilities of applying the most recent editions of the standards indicated below.

…

[ISO/IEC 15444-9] ISO/IEC. 2005. Information technology - JPEG 2000 image coding system: Interactivity tools, APIs and protocols.

[ISO/IEC 15444-15] ISO/IEC. 2019. Information technology - JPEG 2000 image coding system — Part 15: High-Throughput JPEG 2000

…

Update PS3.3 C.7.6.1.1.5.1

C.7.6.1.1.5.1 Lossy Image Compression Method

Lossy Image Compression Method (0028,2114) may be multi-valued if successive lossy compression steps have been applied; the value order shall correspond to the values of Lossy Image Compression Ratio (0028,2112), if present.

Defined Terms for Lossy Image Compression Method (0028,2114):

ISO_10918_1

JPEG Lossy Compression [ISO/IEC 10918-1]

ISO_14495_1

JPEG-LS Near-lossless Compression [ISO/IEC 14495-1]

ISO_15444_1

JPEG 2000 Irreversible Compression [ISO/IEC 15444-1]

ISO_15444_15

JPEG 2000 image coding system — Part 15: High-Throughput JPEG 2000 [ISO/IEC 15444-15]

ISO_13818_2

MPEG2 Compression [ISO/IEC 13818-2]

ISO_14496_10

MPEG-4 AVC/H.264 Compression [ISO/IEC 14496-10]

ISO_23008_2

HEVC/H.265 Lossy Compression [ISO/IEC 23008-2]

Note on PS 3.3 Section C.7.6.3.1.2 no update to this section is required as HTJ2K re-uses JPEG2000 and existing color spaces.

Add PS3.5 Sections 8.2.X

8.2.X HTJ2K Image Compression

DICOM provides a mechanism for supporting the use of the HTJ2K Image Compression through the Encapsulated Format (see PS3.3). Annex A defines a number of Transfer Syntaxes that reference the HTJ2K Standard and provide a lossless (bit preserving) and a lossy compression scheme, and a second lossless compression scheme optimized for display of truncated bit streams.

Note

The context where the usage of lossy compression of medical images is clinically acceptable is beyond the scope of the DICOM Standard. The policies associated with the selection of appropriate compression parameters (e.g., compression ratio) for HTJ2K lossy compression are also beyond the scope of this Standard.

The use of the DICOM Encapsulated Format to support HTJ2K Compressed Pixel Data requires that the Data Elements that are related to the Pixel Data encoding (e.g., Photometric Interpretation, Samples per Pixel, Planar Configuration, Bits Allocated, Bits Stored, High Bit, Pixel Representation, Rows, Columns, etc.) shall contain values that are consistent with the characteristics of the compressed data stream. The Pixel Data characteristics included in the HTJ2K bit stream shall be used to decode the compressed data stream.

The requirements when using a Standard Photometric Interpretation (i.e., a Defined Term from PS.3. C.7.6.3.1.2) are specified in Table 8.2.X-1. No other Standard Photometric Interpretation values shall be used.

Table 8.2.X-1. Valid Values of Pixel Data Related Attributes for HTJ2K Transfer Syntaxes using Standard Photometric Interpretations

Photometric Interpretation	Transfer Syntax	Transfer Syntax UID	Samples per Pixel	Planar Configuration	Pixel Representation	Bits Allocated	Bits Stored	High Bit
MONOCHROME1 MONOCHROME2	HTJ2K (Lossless)	1.2.840.10008.1.2.4.XX0	1	absent	0 or 1	8, 16, 24, 32 or 40	1-38	0-37
	HTJ2K (RPCL)	1.2.840.10008.1.2.4.XX1						
	HTJ2K (Lossy)	1.2.840.10008.1.2.4.XX2						
PALETTE COLOR	HTJ2K (Lossless Only)	1.2.840.10008.1.2.4.XX0	1	absent	0	8 or 16	1-16	0-15
	HTJ2K (RPCL)	1.2.840.10008.1.2.4.XX1						
YBR_RCT	HTJ2K (Lossless)	1.2.840.10008.1.2.4.XX0	3	0	0	8, 16, 24, 32 or 40	1-38	0-37
	HTJ2K (RPCL)	1.2.840.10008.1.2.4.XX1						

	HTJ2K (Lossy)	1.2.840.10008.1.2.4.XX2						
YBR_ICT	HTJ2K (Lossy)	1.2.840.10008.1.2.4.XX2	3	0	0	8, 16, 24, 32 or 40	1-38	0-37
RGB	HTJ2K (Lossless)	1.2.840.10008.1.2.4.XX0	3	0	0	8, 16, 24, 32 or 40	1-38	0-37
	HTJ2K (RPCL)	1.2.840.10008.1.2.4.XX1						
	HTJ2K (Lossy)	1.2.840.10008.1.2.4.XX2						
YBR_FULL	HTJ2K (Lossless)	1.2.840.10008.1.2.4.XX0	3	0	0	8, 16, 24, 32 or 40	1-38	0-37
	HTJ2K (RPCL)	1.2.840.10008.1.2.4.XX1						
	HTJ2K (Lossy)	1.2.840.10008.1.2.4.XX2						

Note

These requirements are specified in terms of consistency with what is encapsulated, rather than in terms of the uncompressed pixel data from which the compressed data stream may have been derived.

When decompressing, should the characteristics explicitly specified in the compressed data stream be inconsistent with those specified in the DICOM Data Elements, those explicitly specified in the compressed data stream should be used to control the decompression. The DICOM Data Elements, if

inconsistent, can be regarded as suggestions as to the form in which an uncompressed Data Set might be encoded, subject to the general and IOD-specific rules for uncompressed Photometric Interpretation and Planar Configuration, which may require that decompressed data be converted to one of the permitted forms.

The HTJ2K bit stream specifies whether or not a reversible or irreversible multi-component (color) transformation [ISO 15444-1 Annex G], if any, has been applied. If no multi-component transformation has been applied, then the components shall correspond to those specified by the DICOM Attribute Photometric Interpretation (0028,0004). If the JPEG 2000 Part 1 reversible multi-component transformation has been applied then the DICOM Attribute Photometric Interpretation (0028,0004) shall be YBR_RCT. If the JPEG 2000 Part 1 irreversible multi-component transformation has been applied then the DICOM Attribute Photometric Interpretation (0028,0004) shall be YBR_ICT.

Note

1. For example, single component may be present, and the Photometric Interpretation (0028,0004) may be MONOCHROME2.
2. The application of a JPEG 2000 Part 1 reversible multi-component transformation is signaled in the HTJ2K bit stream by a value of 1 rather than 0 in the SGcod Multiple component transformation type of the COD marker segment [ISO 15444-1 Table A.17]. No other Value of Photometric Interpretation than YBR_RCT or YBR_ICT is permitted when SGcod Multiple component transformation type is 1.
3. Though it would be unusual, would not take advantage of correlation between the red, green and blue components, and would not achieve effective compression, a Photometric Interpretation of RGB could be specified as long as no multi-component transformation [ISO 15444-1 Annex G] was specified by the HTJ2K bit stream. For some applications the use of RGB is permitted, e.g., Whole Slide Microscopy Images, to allow conversion to DICOM from proprietary formats without loss due to color space transformation. Alternative methods of decorrelation of the color components than those specified in [ISO 15444-1 Annex G] are permitted as defined in PS3.3, such as a Photometric Interpretation of YBR_FULL; this may be useful when converting existing YBR_FULL Pixel Data (e.g., in a different Transfer Syntax) without further loss.

In either case (Photometric Interpretation of RGB or YBR_FULL), the value of SGcod Multiple component transformation type would be 0.

PS3.3 may constrain the Values of Photometric Interpretation for specific IODs.

4. Despite the application of a multi-component color transformation and its reflection in the Photometric Interpretation Attribute, the "color space" remains undefined. There is currently no means of conveying "standard color spaces" either by fixed values (such as sRGB) or by ICC profiles. Note in particular that the JP2 file header is not sent in the HTJ2K bit stream that is encapsulated in DICOM.
5. If HTJ2K Compressed Pixel Data is decompressed and re-encoded in Native (uncompressed) form, then the Data Elements that are related to the Pixel Data encoding are updated accordingly. If color components are converted from YBR_ICT or YBR_RCT to RGB during decompression and Native re-encoding, the Photometric Interpretation will be changed to RGB in the Data Set with the Native encoding.
6. The upper limit of 40 on Bits Allocated (0028,0100) and 38 on Bits Stored (0028,0101) reflects the maximum HTJ2K sample precision of 38 and the DICOM requirement to describe Bits Allocated (0028,0100) as multiples of bytes (octets).

The HTJ2K bit stream is capable of encoding both signed and unsigned pixel values, hence the Value of Pixel Representation (0028,0103) may be either 0 or 1 for monochrome Photometric Interpretations depending on what has been encoded (as specified in the SIZ marker segment in the precision and sign of component parameter).

The Value of Planar Configuration (0028,0006) is irrelevant since the manner of encoding components is specified in the JPEG 2000 standard, hence it shall be set to 0.

Add PS3.5 Section 10.18

10.18 Transfer Syntax for HTJ2K Compression

One Transfer Syntax is specified for HTJ2K Lossless Image Compression, and one for HTJ2K Lossy Image Compression. Any of these may be negotiated separately and there is no default or baseline specified (other than described in Section 10.1).

Note

1. All HTJ2K codecs are required by [ISO/IEC 15444-1] to support both reversible and irreversible wavelet and multi-component transformations. The reason for specifying two separate Transfer Syntaxes in DICOM is to allow an application to request the transfer of images in a lossless manner when possible. The HTJ2K Image Compression Transfer Syntax allows for either lossless or lossy compression to be used at the sender's discretion.
2. No baseline using other compression schemes is required.
3. When the pixel data has been received in the HTJ2K Image Compression Transfer Syntax, since it may have been lossy compressed, the waiver of the requirement in Section 10.1 to support the DICOM Default Little Endian Transfer Syntax still applies.

In addition, the 1.2.840.10008.1.2.4.XX1 Transfer Syntax is specified to allow for decoding of truncated or streaming data at lower resolutions or lossy levels. The 1.2.840.10008.1.2.4.XX1 transfer syntax shall be encoded with the following HTJ2K parameters:

Progression order: RPCL (Resolution Position Component Layer, that sequences the blocks so that progressive increase in resolution can be read first).

Number of decompositions: enough such that the width or height of the base resolution is <= 64

Inclusion of TLM (Tile Length Marker, e.g., resolution markers, not related to number of tiles)

Block Size: 64x64

Number of tiles: 1

Signed encoding shall be used if the raw imaging data is signed, or if the unsigned data safely fits in the signed range (that is, if high bit + 1 < bits stored). This optimizes decode performance by avoiding an offset operation internally.

Note:

An example of the unsigned data in signed encoding would be if the source data uses 12 bits of unsigned data, then it can safely be encoded in 16 bits signed, but if it is 16 bits of unsigned data, then it doesn't work to encode in 16 bits signed, and the HTJ2K algorithm implements that by subtracting 32767 before encoding. That subtract/add makes the algorithm slower, but isn't easily avoided for unsigned data when the size is too large.

Update PS3.5 Section 8.4.1

8.4.1 JPIP Referenced Pixel Data

DICOM provides a mechanism for supporting the use of JPEG 2000 Interactive Protocol through the inclusion of a URL reference to a pixel data provider service. Annex A defines two Transfer Syntaxes that utilize URL references to a JPIP pixel data provider service.

The use of ~~the~~ these Transfer Syntaxes requires that the Pixel Data Provider URL specify a URL that will represent the JPIP request including the specific target information. Additional parameters required by the application may be appended to the URL when accessing the pixel data provider.

Note

For example, a JPIP request for a 200 by 200 pixel rendition of the entire image can be constructed from the Pixel Data Provider URL as follows:

Pixel Data Provider URL (0028,7FE0) = http://server.xxx/jpipserver.cgi?target=imgxyz.jp2

URL Generated by the application = http://server.xxx/jpipserver.cgi?target=imgxyz.jp2&fsiz=200,200

The JPIP client shall only request a JPEG 2000 **or HTJ2K** bit stream**.**

The JPIP server shall return a Content-type of image/jp2, image/jpp-stream or image/jpt-stream **or image/jph or image/jphc**, all of which shall be supported by the JPIP client.

Commented [2]: Check IANA registration for jphc with/without box contents and decide how to box or require unboxed retrieves.

The Number of Frames (0028,0008) Attribute, if present in the Data Set, identifies the number of frames available for this image. Each frame is accessible as a separate JPIP code stream. Code streams referenced in the URL Target shall be sequentially numbered starting with stream 1.

Note

For example, a JPIP request for a 200 by 200 pixel rendition of frame 17 of a multi-frame image can be constructed from Pixel Data Provider URL as follows:

Pixel Data Provider URL (0028,7FE0) = http://server.xxx/multiframeimage.jp2

URL Generated by the application = http://server.xxx/multiframeimage.jp2?fsiz=200,200&stream=17

A valid stream query parameter value is always less than or equal to the value in the Number of Frames (0028,0008).

The syntax of the Pixel Data Provider URL (0028,7FE0) is defined in [ISO/IEC 15444-9] Annex C (Client Request). That standard respects the URI recommendations [RFC3986]. The transport protocol shall be HTTP or HTTPS.

Note

According to [ISO/IEC 15444-9], "Each JPIP request is directed to a specific representation of a specific original named resource or a specific portion of that resource. That resource may be a physically stored file or object, or may be something that is created virtually by the server upon request."

"The Target request field specifies the original named resource to which the request is directed. It is specified using a PATH, which could be a simple string or a URI. If the Target field is not specified and the request is carried over HTTP, then the JPIP request shall be directed to the resource specified through the path component of the JPIP request URL.

Transport over UDP or other protocols is not supported.

Add PS3.5 Section A.4.13

A.4.13 HTJ2K Image Compression

The International Standards Organization ISO/IEC has developed an International Standard, [**ISO/IEC 15444-15**] (JPEG 2000 Part 15 HTJ2K), for digital compression and coding of continuous-tone and single-bit still images (see Annex F for further details).

A DICOM Transfer Syntax for HTJ2K Image Compression shall be identified by a UID value, appropriate to its HTJ2K coding process.

Three Transfer Syntaxes are specified for HTJ2K:

1. A Transfer Syntax with a UID of "1.2.840.10008.1.2.4.XX0", which specifies the use of the lossless mode of HTJ2K.

2. A Transfer Syntax with a UID of "1.2.840.10008.1.2.4.XX1", which specifies the use of the lossless mode of HTJ2K, with compression parameters to allow for truncated stream decoding.

3. A Transfer Syntax with a UID of “1.2.840.10008.1.2.4.XX2”, which specifies the use of lossy HTJ2K encoding.

Each frame shall be encoded separately as a single fragment.

Add PS3.5 Section F.X

F.X Encapsulated HTJ2K Encoded Images

The International Standards Organization (ISO/IEC) has prepared an International Standard, [ISO/IEC 15444_15] (JPEG 2000 Part 15 HTJ2K), for the digital compression and coding of continuous-tone still images. This standard is known as the JPEG 2000 Part 15 HTJ2K Standard, or just the HTJ2K standard.

An HTJ2K stream allows for bit depths up to 38 bits per channel and up to 255 components. Components do not need to all be the same type or bit depth. The color space of the image is specified in the HTJ2K encoding.

Inclusion of a HTJ2K coded image in a DICOM message is facilitated by the use of specific Transfer Syntaxes that are defined in Annex A.

Update PS3.6 Table A-1

Table A-1. UID Values

UID Value	UID Name	UID Keyword	UID Type	Part
…				
1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only)	JPEG 2000Lossless	Transfer Syntax	PS3.5
1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression	JPEG2000	Transfer Syntax	PS3.5
…				
1.2.840.10008.1.XX0	**HTJ2K Lossless**	**HTJ2K**	**Transfer Syntax**	**PS3.5**
1.2.840.10008.1.XX1	**HTJ2K Lossless RPCL**	**HTJ2KRPCL**	**Transfer Syntax**	**PS3.5**
1.2.840.10008.1.XX2	**HTJ2K Lossy**	**HTJ2KLossy**	**Transfer Syntax**	**PS3.5**

Update PS 3.18 Table 8.7.3-5

Table 8.7.3-5. Media Types and Transfer Syntax UIDs for Compressed Data in Bulkdata

Resource Category	Media Type	Transfer Syntax UID	Transfer Syntax Name	Optionality
Single Frame Image	image/jpeg	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	D
		1.2.840.10008.1.2.4.50	JPEG Baseline (Process 1) :Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	O
		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)	O

		1.2.840.10008.1.2.4.57	JPEG Lossless, Non-Hierarchical (Process 14)	O
	image/dicom-rle	1.2.840.10008.1.2.5	RLE Lossless	D
	image/jls	1.2.840.10008.1.2.4.80	JPEG-LS Lossless Image Compression	D
		1.2.840.10008.1.2.4.81	JPEG-LS Lossy (Near-Lossless) Image Compression	O
	image/jp2	1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only)	D
		1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression	O
	image/jpx	1.2.840.10008.1.2.4.92	JPEG 2000 Part 2 Multi-component Image Compression (Lossless Only)	D
		1.2.840.10008.1.2.4.93	JPEG 2000 Part 2 Multi-component Image Compression	O
	image/jph	**1.2.840.10008.1.2.4.XX0**	**HTJ2K Lossless**	**D**

		1.2.840.10008.1.2.4.XX1	**HTJ2K Lossless with RPCL encoding**	**O**
		1.2.840.10008.1.2.4.XX2	**HTJ2K Lossy**	**O**
Multi-frame Image	image/jp2	1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only)	D
		1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression	O
	image/jpx	1.2.840.10008.1.2.4.92	JPEG 2000 Part 2 Multi-component Image Compression (Lossless Only)	D
		1.2.840.10008.1.2.4.93	JPEG 2000 Part 2 Multi-component Image Compression	O
	image/jph	**1.2.840.10008.1.2.4.XX0**	**HTJ2K Lossless**	**D**
		1.2.840.10008.1.2.4.XX1	**HTJ2K Lossless with RPCL encoding**	**O**

		1.2.840.10008.1.2.4.XX2	**HTJ2K Lossy**	**O**

Update PS 3.18 Section 8.7.3.5

8.7.3.5 Media Type Syntax

The syntax of Media Type usage in DICOM is:

dicom-media-type = (dcm-singlepart / dcm-multipart) [dcm-parameters]

Where

dcm-singlepart = dcm-mt-name

dcm-multipart ;see Section 8.7.3.5.1

dcm-parameters = transfer-syntax-mtp ;see Section 8.7.3.5.2

/ charset-mtp;see Section 8.7.3.5.3

dcm-mt-name = dicom / dicom-metadata / bulkdata / pixeldata ;DICOM Media Type name

dicom = "application/dicom"

dicom-metadata = dicom-xml / dicom-json

dicom-xml = "application/dicom+xml"

dicom-json = "application/dicom+json"

bulkdata = octet-stream / pixeldata

octet-stream = "application/octet-stream"

pixeldata = image-pixel / video-pixel

rendered = image-pixel / video-pixel

image-pixel = "image/jpeg" / "image/dicom-rle" / "image/jls" / "image/jp2" / "image/jpx" **/ "image/jph"**

Commented [3]: And image/jphc depending on box open question

Update PS 3.18 Table 8.7.3-2

Table 8.7.3-2. Transfer Syntax UIDs for application/dicom Media Types

Category	Transfer Syntax UID	Transfer Syntax Name	Optionality
Single Frame Image	1.2.840.10008.1.2.1	Explicit VR Little Endian	D
	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	O
	1.2.840.10008.1.2.4.50	JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	O
	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)	O
	1.2.840.10008.1.2.4.57	JPEG Lossless, Non-Hierarchical (Process 14)	O
	1.2.840.10008.1.2.5	RLE Lossless	O
	1.2.840.10008.1.2.4.80	JPEG-LS Lossless Image Compression	O
	1.2.840.10008.1.2.4.81	JPEG-LS Lossy (Near-Lossless) Image Compression	O
	1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only)	O
	1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression	O
	1.2.840.10008.1.2.4.92	JPEG 2000 Part 2 Multi-component Image Compression (Lossless Only)	O
	1.2.840.10008.1.2.4.93	JPEG 2000 Part 2 Multi-component Image Compression	O
	1.2.840.10008.1.2.4.XX0	**HTJ2K Lossless**	**O**

	1.2.840.10008.1.2.4.XX1	**HTJ2K Lossless RPCL**	**O**
	1.2.840.10008.1.2.4.XX2	**HTJ2K Lossy**	**O**
Multi-frame Image	1.2.840.10008.1.2.1	Explicit VR Little Endian	D
	1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only)	O
	1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression	O
	1.2.840.10008.1.2.4.92	JPEG 2000 Part 2 Multi-component Image Compression (Lossless Only)	O
	1.2.840.10008.1.2.4.93	JPEG 2000 Part 2 Multi-component Image Compression	O
	1.2.840.10008.1.2.4.XX0	**HTJ2K Lossless**	**O**
	1.2.840.10008.1.2.4.XX1	**HTJ2K Lossless RPCL**	**O**
	1.2.840.10008.1.2.4.XX2	**HTJ2K Lossy**	**O**
Video	1.2.840.10008.1.2.1	Explicit VR Little Endian	D
	1.2.840.10008.1.2.4.100	MPEG2 Main Profile @ Main Level	O
	1.2.840.10008.1.2.4.101	MPEG2 Main Profile @ High Level	O
	1.2.840.10008.1.2.4.102	MPEG-4 AVC/H.264 High Profile / Level 4.1	O
	1.2.840.10008.1.2.4.103	MPEG-4 AVC/H.264 BD-compatible High Profile / Level 4.1	O

	1.2.840.10008.1.2.4.104	MPEG-4 AVC/H.264 High Profile / Level 4.2 For 2D Video	O
	1.2.840.10008.1.2.4.105	MPEG-4 AVC/H.264 High Profile / Level 4.2 For 3D Video	O
	1.2.840.10008.1.2.4.106	MPEG-4 AVC/H.264 Stereo High Profile / Level 4.2	O
	1.2.840.10008.1.2.4.100.1	Fragmentable MPEG2 Main Profile @ Main Level	O
	1.2.840.10008.1.2.4.101.1	Fragmentable MPEG2 Main Profile @ High Level	O
	1.2.840.10008.1.2.4.102.1	Fragmentable MPEG-4 AVC/H.264 High Profile / Level 4.1	O
	1.2.840.10008.1.2.4.103.1	Fragmentable MPEG-4 AVC/H.264 BD-compatible High Profile / Level 4.1	O
	1.2.840.10008.1.2.4.104.1	Fragmentable MPEG-4 AVC/H.264 High Profile / Level 4.2 For 2D Video	O
	1.2.840.10008.1.2.4.105.1	Fragmentable MPEG-4 AVC/H.264 High Profile / Level 4.2 For 3D Video	O
	1.2.840.10008.1.2.4.106.1	Fragmentable MPEG-4 AVC/H.264 Stereo High Profile / Level 4.2	O
	1.2.840.10008.1.2.4.107	HEVC/H.265 Main Profile / Level 5.1	O
	1.2.840.10008.1.2.4.108	HEVC/H.265 Main 10 Profile / Level 5.1	O
Text	1.2.840.10008.1.2.1	Explicit VR Little Endian	D
Other	1.2.840.10008.1.2.1	Explicit VR Little Endian	D

Note

The Transfer Syntaxes used in a DICOM-RTV Metadata Flow are not included, since they are not used to produce a representation of an Instance encoded in the DICOM File Format.

Update PS 3.18 Section 8.7.4

8.7.4 Rendered Media Types

8.7.4 Rendered Media Types

DICOM Instances may be converted by a rendering process into non-DICOM Media Types. This can be useful to display or process them using non-DICOM software, such as browsers.

For example, an Instance containing:

an image could be rendered into the image/jpeg**, image/jph,** or image/png Rendered Media Types.

a multi-frame image in a lossless Transfer Syntax could be rendered into a video/mpeg or video/mp4 Rendered Media Type.

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 Bulkdata Media Types, that is, for encoding Bulkdata extracted from Encapsulated Pixel Data (used with compressed Transfer Syntaxes), without applying a rendering process. See Section 8.7.3.3.

Rendered images shall contain no more than 8 bits per channel.

Origin servers shall support rendering Instances of different Resource Categories into Rendered Media Types as specified in Table 8.7.4-1.

Table 8.7.4-1. Rendered Media Types by Resource Category

Category	Media Type	URI	RESTful
Single Frame Image	image/jpeg	D	D
	image/gif	O	R
	image/png	O	R

Category	Media Type	URI	RESTful
	image/jp2	O	O
	image/jph	**O**	**O**
Multi-frame Image	image/gif	O	O
Video	video/mpeg	O	O
	video/mp4	O	O
	video/H265	O	O
Text	text/html	D	D
	text/plain	R	R
	text/xml	O	R
	text/rtf	O	O
	application/pdf	O	O