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8	Correction Number CP-1544	
9	Log Summary: Value Representation corrections related to OL, UC and UR	
10	Name of Standard	
11	PS3.5, PS3.18, PS3.19 2016b	
12	Sup 181 introduced the OL VR but did not make corresponding changes to parts other than PS3.5. Also, it should not have added	
13	OL to text describing the packing of bits for Pixel Data and Overlay Data, since it is not used for that role, and did not completely	
14	expunge all uses of the word "String" after Other Byte, Word, etc.	
15	CP 1031 introduced the UC VR but did not add it to the list of bulk data attributes for WADO-RS; it should be added.	
16	CP 1324 introduced the UR VR but did not add it to the list of bulk data attributes for WADO-RS; it should not be added since it is	
17	not the expectation that URLs will be that large.	
18	Since the term "octet-stream" is used elsewhere, harmonize the usage in PS3.5 by using it in place of "string of bytes" and "sequence	
19	of bytes", and use the term "stream" rather than "string" or "sequence" for values that are not bytes and where appropriate for bytes.	
20	Correction Wording:	

Amend DICOM PS3.5 as follows:

## 6.2 Value Representation (VR)

Table 6.2-1. DICOM Value Representations

VR Name	Definition	Character Repertoire	Length of Value
...	...	...	...
OB Other Byte	<del>A string of bytes</del> <b>An octet-stream</b> where the encoding of the contents is specified by the negotiated Transfer Syntax. OB is a VR that is insensitive to Little/Big Endian byte ordering (see Section 7.3). The <del>string of bytes</del> <b>octet-stream</b> shall be padded with a single trailing NULL byte value (00H) when necessary to achieve even length.	not applicable	see Transfer Syntax definition
OD Other Double	A <del>stringstream</del> <b>stringstream</b> of 64-bit IEEE 754:1985 floating point words. OD is a VR that requires byte swapping within each 64-bit word when changing between Little Endian and Big Endian byte ordering (see Section 7.3).	not applicable	2 <sup>32</sup> -8 bytes maximum
OF Other Float	A <del>stringstream</del> <b>stringstream</b> of 32-bit IEEE 754:1985 floating point words. OF is a VR that requires byte swapping within each 32-bit word when changing between Little Endian and Big Endian byte ordering (see Section 7.3).	not applicable	2 <sup>32</sup> -4 bytes maximum
OL Other Long	A <del>stringstream</del> <b>stringstream</b> of 32-bit words where the encoding of the contents is specified by the negotiated Transfer Syntax. OL is a VR that requires byte swapping within each word when changing between Little Endian and Big Endian byte ordering (see Section 7.3).	not applicable	see Transfer Syntax definition
OW Other Word	A <del>stringstream</del> <b>stringstream</b> of 16-bit words where the encoding of the contents is specified by the negotiated Transfer Syntax. OW is a VR that requires byte swapping within each word when changing between Little Endian and Big Endian byte ordering (see Section 7.3).	not applicable	see Transfer Syntax definition
...	...	...	...
UN Unknown	<del>A string of bytes</del> <b>An octet-stream</b> where the encoding of the contents is unknown (see Section 6.2.2).	not applicable	Any length valid for any of the other DICOM Value Representations
...	....	...	...

## 7.3 Big Endian Versus Little Endian Byte Ordering

### Note

The packing of bits within values of OB, ~~OL~~ or OW Value representation for Pixel Data and Overlay Data is described in Section 8.

## 8.1 Pixel and Overlay Data, and Related Data Elements

Pixel Data (7FE0,0010) and Overlay Data (60xx,3000) have a VR of OW or OB, depending on the negotiated Transfer Syntax (see Annex A). The only difference between OW and OB being that OB, ~~a string of bytes~~ an octet-stream, shall be unaffected by Byte Ordering (see Section 7.3).

## A.4 Transfer Syntaxes For Encapsulation of Encoded Pixel Data

1. ...

2. ...

3. The encoding of the Data Elements of the Data Set shall be as follows according to their Value Representations:

- ...

- For the Value Representations OB, OL and OW, the encoding shall meet the following specification depending on the Data Element Tag:

- Data Element (7FE0,0010) Pixel Data may be encapsulated or native.

If encapsulated, it has the Value Representation OB and is ~~a sequence of bytes~~ an octet-stream resulting from one of the encoding processes. It contains the encoded pixel data stream fragmented into one or more Item(s). ...

## D.1 Detailed Example of Pixel Data Encoding

The Pixel Data Element, as specified by the DICOM Default Transfer Syntax in Section 10.1, has a Value Representation of OW (Other Word-String). ...

## G.3 The RLE Algorithm

### G.3.1 The RLE Encoder

A ~~sequence~~ stream of identical bytes (Replicate Run) is encoded as a two-byte code:

< -count + 1 > <byte value>, where

count = the number of bytes in the run, and

$2 \leq \text{count} \leq 128$

and a non-repetitive ~~sequence of bytes~~ octet-stream (Literal Run) is encoded as:

< count - 1 > <Literal ~~sequence of bytes~~ octet-stream>, where

count = number of bytes in the ~~sequence~~ stream, and

$1 \leq \text{count} \leq 128$ .

1 ...  
2 Amend DICOM PS3.18 as follows:

### 3 **6.5.6 WADO-RS - RetrieveMetadata**

4 ...  
5 The study, series, or instance metadata includes all attributes; however, a RESTful Service is permitted to replace the Value Field of  
6 an attribute with a BulkDataURL for attributes with Value Representations (VR) of FL, FD, IS, LT, OB, OD, OF, OL, OW, SL, SS, ST,  
7 UC, UL, UN, US, and UT. The client can use the BulkDataURL with the RetrieveBulkData action to retrieve the original Value Field  
8 of that attribute.

#### 9 **Note**

- 10 1. The server is not required to replace any attribute with a BulkDataURL; this is intended to allow the server to provide  
11 clients with metadata of a reasonably small size by leaving out large data Value Fields.
- 12 2. OB, OD, OF, OL, OW and UN Attributes **not replaced with a BulkDataURL with binary Value Fields** are encoded as  
13 XML Base64 binary values.
- 14 3. Some DICOM instances, such as SR documents, may be entirely described in the metadata.

### 15 ... 16 **F.2.2 DICOM JSON Model Object Structure**

17 ...  
18 Each attribute object contains the following named child objects:

- 19 • vr: A string encoding the DICOM Value Representation. The mapping between DICOM Value Representations and JSON Value  
20 Representations is described in Section F.2.3.
- 21 • At most one of:
  - 22 • Value: An array containing one of:
    - 23 • The Value Field elements of a DICOM attribute with a VR other than PN, SQ, OB, OD, OF, OL, OW, or UN (described in  
24 Section F.2.4)
    - 25 The encoding of empty Value Field elements is described in Section F.2.5
    - 26 • The Value Field elements of a DICOM attribute with a VR of PN. The non-empty name components of each element are encoded  
27 as a JSON strings with the following names:
      - 28 • Alphabetic
      - 29 • Ideographic
      - 30 • Phonetic
    - 31 • JSON DICOM Model objects corresponding to the sequence items of an attribute with a VR of SQ
    - 32 Empty sequence items are represented by empty objects
  - 33 • BulkDataURI: A string encoding the WADO-RS URL of a bulk data item describing the Value Field of an enclosing Attribute with  
34 a VR of FL, FD, IS, LT, OB, OD, OF, OL, OW, SL, SS, ST, UC, UL, UN, US, or UT (described in Section F.2.6)
  - 35 • InlineBinary: A base64 string encoding the Value Field of an enclosing Attribute with a VR of OB, OD, OF, OL, OW, or UN (described  
36 in Section F.2.7)

## F.2.3 DICOM JSON Value Representation

Table F.2.3-1. DICOM VR to JSON Data Type Mapping

VR Name	Type	JSON Data Type
AE	Application Entity	<i>String</i>
AS	Age String	<i>String</i>
AT	Attribute Tag	<i>String</i>
CS	Code String	<i>String</i>
DA	Date	<i>String</i>
DS	Decimal	<i>Number</i>
DT	Date Time	<i>String</i>
FL	Floating Point Single	<i>Number</i>
FD	Floating Point Double	<i>Number</i>
IS	Integer String	<i>Number</i>
LO	Long String	<i>String</i>
LT	Long Text	<i>String</i>
OB	Other Byte- <del>String</del>	<i>Base64 encoded <b><u>stringoctet stream</u></b></i>
OD	Other Double- <del>String</del>	<i>Base64 encoded <b><u>stringoctet stream</u></b></i>
OF	Other Float- <del>String</del>	<i>Base64 encoded <b><u>stringoctet stream</u></b></i>
<b>OL</b>	<b>Other Long</b>	<i>Base64 encoded <b><u>stringoctet stream</u></b></i>
OW	Other Word- <del>String</del>	<i>Base64 encoded <b><u>stringoctet stream</u></b></i>
PN	Person Name	<i>Object containing Person Name component groups as strings (see Section F.2.2)</i>
SH	Short String	<i>String</i>
SL	Signed Long	<i>Number</i>
SQ	Sequence	<i>Array containing DICOM JSON Objects</i>
SS	Signed Short	<i>Number</i>
ST	Short Text	<i>String</i>
TM	Time	<i>String</i>
UC	Unlimited Characters	<i>String</i>
UI	UID	<i>String</i>
UL	Unsigned Long	<i>Number</i>
UN	Unknown	<i>Base64 encoded <b><u>stringoctet stream</u></b></i>
UR	URI	<i>String</i>
US	Unsigned Short	<i>Number</i>
UT	Unlimited Text	<i>String</i>

## F.2.7 InlineBinary

**Note**

Implementers should in particular pay attention to the PS3.5 rules regarding the value representations of OD, OF, **OL** and OW.

Amend DICOM PS3.19 as follows:

**A.1.5 Description**

...

**Table A.1.5-2. DICOM Data Set Macro**

Name	Optionality	Cardinality	Description
...	...	...	...
>BulkData	C	1	<p>A reference to a blob of data that the recipient may retrieve through use of the GetData() method, a WADO-RS call or a STOW-RS call.</p> <p>Required if the DICOM Data Element represented is not zero length and an XML Infoset Value, Item, InlineBinary or PersonName element is not present.</p> <p>The provider of the data may use a BulkData reference at its discretion to avoid encoding a large DICOM Value Field as text by value in the Infoset. For example, pixel data or look up tables.</p> <p>There is a single BulkData Infoset element representing the entire Value Field, and not one per Value in the case where the Value Multiplicity is greater than one. E.g., a LUT with 4096 16 bit entries that may be encoded in DICOM with a Value Representation of OW, with a VL of 8192 and a VM of 1, or a US VR with a VL of 8192 and a VM of 4096 would both be represented as a single BulkData element.</p> <p>All rules (e.g., byte ordering and swapping) in PS3.5 apply.</p> <p><b>Note</b></p> <p>Implementers should in particular pay attention the PS3.5 rules regarding the value representations of <b>OD, OF, OL and OW</b> <del>and OF</del>.</p> <p>If the BulkData has a string or text Value Representation, the value(s) of the DICOM Specific Character Set Data Element, if present, might be necessary to determine its encoding.</p>
...	...	...	...

Name	Optionality	Cardinality	Description
>InlineBinary	C	1	<p>The Value Field of the enclosing Attribute encoded as base64.</p> <p>Required if the DICOM Data Element represented is:</p> <ul style="list-style-type: none"> <li>• not zero length</li> <li>• the VR if the enclosing Attribute is either OB, OD, OF, <b>OL</b>, OW, or UN</li> <li>• an XML Infoset Value or BulkData XML element is not present</li> </ul> <p>Shall not be present otherwise.</p> <p>There is a single InlineBinary Infoset element representing the entire Value Field, and not one per Value in the case where the Value Multiplicity is greater than one. E.g., a LUT with 4096 16 bit entries that may be encoded in DICOM with a Value Representation of OW, with a VL of 8192 and a VM of 1, or a US VR with a VL of 8192 and a VM of 4096 would both be represented as a single InlineBinary element.</p> <p>All rules (e.g., byte ordering and swapping) in PS3.5 apply.</p> <p><b>Note</b></p> <p>Implementers should in particular pay attention to the PS3.5 rules regarding the value representations of OD, OF, <b>OL</b> and OW.</p>

## A.1.6 Schema

The Normative version of the XML Schema for the Native DICOM Model follows:

...

VR = attribute vr { "AE" | "AS" | "AT" | "CS" | "DA" | "DS" | "DT" | "FL" | "FD" | "IS" | "LO" | "LT" | "OB" | "OD" | "OF" | **"OL"** | "OW" | "PN" | "SH" | "SL" | "SQ" | "SS" | "ST" | "TM" | "UC" | "UI" | "UL" | "UN" | "UR" | "US" | "UT" }