

DICOM Correction Proposal

STATUS	Final Text
Date of Last Update	2014/09/08
Person Assigned	James Philbin <james.philbin@jhmi.edu>
Submitter Name	James Philbin <james.philbin@jhmi.edu>
Submission Date	2013/08/14

Correction Number	CP-1324
Log Summary: Add a new Value Representation "UR" for URI/URLs and make all necessary changes to update the DICOM Standard to use new RFC 3896 Uniform Resource Identifier (URI): Generic Syntax.	
Name of Standard: PS 3.5 2013	
<p>Rationale for Correction:</p> <p>URI/URLs are becoming an important part of the standard in PS 3.18 and PS 3.19 and adding a Value Representation "UR" for them will help insure that they have the correct syntax. Furthermore, RFC 3986 <i>Uniform Resource Identifier (URI): Generic Syntax</i> has superseded RFC 2396. This CP updates all references to RFC 2396 to RFC 3986.</p> <p>WG-06 notes that the VRs of existing tags almost never change, but that there have been changes in the past when it was deemed that the change was important, and would be unlikely to have significant impact on existing studies. WG-06 believes that this is such a case. The four tags affected by this change are all relatively new. The only current studies that might be affected are those using non-default character repertoires, which will be in error unless they are parsed as URIs.</p> <p>There are four attributes affected by this CP:</p> <ol style="list-style-type: none"> 1. Retrieve URL (0008,1190), 2. Pixel Data Provider URL (0028,7FE0), 3. Retrieve URI (0040,E010), and 4. Contact URI (0074,100A). <p>The "UR" Value Representation has the following characteristics:</p> <ul style="list-style-type: none"> • The Value Multiplicity of the Value Representation "UR" shall be 1. • URI/URLs can be encoded using different character repertoires. (See IETF RFC 3987 Internationalization of URIs and RFC5890 Internationalized Domain Names for Applications (IDNA): Definitions and Document Framework and RFC5891 Internationalized Domain Names in Applications (IDNA): Protocol {}) • The maximum length of the value field of an attribute with a VR of "UR" is defined to be $2^{32}-2$. <p>This CP also updates PS 3.18 Appendix A to conform to RFC 3986. It uses the ABNF defined by RFC 5234 to define the syntax of the query component of DICOM URIs. This grammar allows the query component of DICOM URI/URLs to contain the same set of characters as defined in 3986. This allows more characters than the previous grammar; however, the individual transactions define the legal parameters and these have not changed. The motivation for expanding the potential character set is to allow future transactions more latitude in defining their parameters.</p>	
Correction Wording:	

Update reference URI RFC in PS 3.3 2013 Section 2.3

2.3 INTERNET ENGINEERING TASK FORCE (IETF)

...
[RFC 2396] IETF. *Uniform Resource Identifiers (URI): Generic Syntax*.
<http://tools.ietf.org/html/rfc2396>.

[RFC3986].IETF. *Uniform Resource Identifiers (URI): Generic Syntax* { HYPERLINK
<http://www.ietf.org/html/rfc3986> }.

Update PS 3.3 2013 Table 10-3b REFERENCED INSTANCES AND ACCESS MACRO ATTRIBUTES

>Retrieve URI	(0040,E010)	1	Retrieval access path to the referenced instance(s). Includes fully specified scheme, authority, path, and query in accordance with RFC 2396 3986 . Note: The VR of this attribute has changed from UT to UR.
...			

Update PS 3.3 2013 Table C.4.23-1 INSTANCE AVAILABILITY NOTIFICATION MODULE ATTRIBUTES

>>Retrieve URI	(0040,E010)	Retrieval access path to the referenced SOP instance(s). Includes fully specified scheme, authority, path, and query in accordance with RFC 2396 3986 . Note: The VR of this attribute has changed from UT to UR.
----------------	-------------	---

Update PS 3.3 2013 Table C.7-11a IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
<i>Include 'Image Pixel Macro' Table C.7-11b</i>			
Pixel Data Provider URL	(0028,7FE0)	1C	A URL of a provider service that supplies the pixel data of the Image. Required if the image is to be transferred in one of the following presentation contexts identified by Transfer Syntax UID: 1.2.840.10008.1.2.4.94 (DICOM JPIP Referenced Transfer Syntax) 1.2.840.10008.1.2.4.95 (DICOM JPIP Referenced Deflate Transfer Syntax) Note: The VR of this attribute has changed from UT to UR.
...			

Update PS 3.3 2013 Table C.12-1 SOP COMMON MODULE ATTRIBUTES

>Retrieve URI	(0040,E010)	3	Retrieval access path to HL7 Structured Document. Includes fully specified scheme, authority, path, and query in accordance with RFC 2396 3986 . Note: The VR of this attribute has changed from UT to UR.
---------------	-------------	---	--

Update PS 3.3 2013 Table C.26-1 PRODUCT CHARACTERISTICS MODULE ATTRIBUTES

>Retrieve URI	(0040,E010)	Retrieval access path to Product Label Document. Includes fully specified scheme, authority, path, and query in accordance with RFC 2396 3986 . Note: The VR of this attribute has changed from UT to UR.
---------------	-------------	---

Update PS 3.3 2013 Table C.30.1-1 Unified Procedure Step Progress Information Module Attributes

>>Contact URI	(0074,100a)	URI to communicate with performer of the procedure in progress. Any URI (telephone number, URL, etc.) is permitted. Note: The VR of this attribute has changed from UT to UR.
---------------	-------------	---

Update PS 3.5 2013 Section 2 Normative references

~~IETF RFC2396~~ ~~Uniform Resource Identifiers (URI): Generic Syntax~~

~~Note: RFC 2396 is available from "<http://www.ietf.org/rfc/rfc2396.txt>".~~

IETF RFC3986 Uniform Resource Identifiers (URI): Generic Syntax { HYPERLINK "<http://www.ietf.org/html/rfc3986>" }

Append at end of PS 3.5 2013 Section 2. Normative references

IETF RFC3987 Internationalized Resource Identifiers (IRIs) { HYPERLINK "<http://www.ietf.org/html/rfc3887>" }.

IETF RFC5890 Internationalized Domain Names for Applications (IDNA): Definitions and Document Framework { HYPERLINK "<http://www.ietf.org/html/rfc5890>" }.

IETF RFC5891 Internationalized Domain Names in Applications (IDNA): Protocol { HYPERLINK "<http://www.ietf.org/html/rfc5891>" }.

Append to PS 3.5 2013 Section 4 Symbols and abbreviations

URI/URL Uniform Resource Identifier / Locator

Insert row below into PS 3.5 2013 Section 6.2, Table 6.2-1 after UN and before US

UR	<u>A string of characters that</u>	<u>The subset of the</u>	<u>2³²-2 bytes maximum</u>
-----------	---	---------------------------------	--

<u>Universal Resource Identifier or Universal Resource Locator (URI/URL)</u>	<u>identifies a URI or a URL as defined in IETF RFC3986 “Uniform Resource Identifier (URI): Generic Syntax”.</u> <u>Leading spaces are not allowed. Trailing spaces shall be ignored. Data Elements with this VR shall not be multi-valued.</u> <u>Note: Both absolute and relative URIs are permitted. If the URI is relative, then it is relative to the base URI of the object within which it is contained.</u>	<u>Default Character Repertoire required for the URI as defined in IETF RFC3986 Section 2, plus the space (20H) character permitted only as trailing padding.</u> <u>Characters outside the permitted character set must be "percent encoded".</u> <u>Note: The Backslash (5CH) character is among those disallowed in URIs.</u>	<u>Note: The length is limited only by the size of the maximum unsigned integer representable in a 32 bit VL field minus one, since FFFFFFFFH is reserved</u>
--	--	--	---

Add new section to PS 3.5 2013 6.2.3

6.2.3 URI/URL (UR) Value Representation

The URI/URL (UR) VR uses a subset of the Default Character Repertoire as defined in IETF RFC3986, and shall not use any code extension or replacement techniques. URI/URL domain name components that in their original form use characters outside the permitted character set shall use the Internationalized Domain Names for Applications encoding in accordance with IETF RFC5890 and RFC5891. Other URI/URL content that uses characters outside the permitted character set shall use the Internationalized Resource Identifiers encoding mechanism of IETF RFC 3987, representing the content string in UTF-8 and *percent encoding* characters as required.

Note: For example, the use of a patient name in a URI/URL string may require use of the RFC3987 technique.

Update PS 3.5 2013 Section 6.4 with the following:

Data Elements with a VR of SQ, OF, OW, OB, ~~or~~ UN **or UR** shall always have a Value Multiplicity of one.

Update PS 3.5 2013 Section 7.1.2 with the following:

- for VRs of **UR and** UT the 16 bits following the two character VR Field are reserved for use by later versions of the DICOM Standard. These reserved bytes shall be set to 0000H and shall not be used or decoded. The Value Length Field is a 32-bit unsigned integer. The Value Field is required to have an Explicit Length_r that is_r the Value Length Field shall contain a value equal to the length (in bytes) of the Value Field.

Note: VRs of **UR and** UT may not have an Undefined Length, i.e. a Value Length of FFFFFFFFH.

Update PS 3.5 2013 Section 7.1.2 with the following:

**Table 7.1-1
DATA ELEMENT WITH EXPLICIT VR OF OB, OW, OF, SQ, UR, UT OR UN**

Tag		VR		Value Length	Value
Group Number (16-bit unsigned integer)	Element Number (16-bit unsigned integer)	VR (2 byte character string) of "OB", "OW", "OF", "SQ", <u>"UR"</u> , "UT" or "UN"	Reserved (2 bytes) set to a value of 0000H	32-bit unsigned integer	Even number of bytes containing the Data Element Value(s) encoded according to the VR and negotiated Transfer Syntax. Delimited with Sequence Delimitation Item if of Undefined Length.
2 bytes	2 bytes	2 bytes	2 bytes	4 bytes	'Value Length' bytes if of Explicit Length

Update PS 3.5 2013 Section 8.4.1:

...

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 IETF RFC ~~2396~~3968. The transport protocol shall be HTTP or HTTPS.

...

Update PS 3.6 2013 Section 6:

Tag	Name	Keyword	VR	VM
(0008,1190)	Retrieve URL	RetrieveURL	<u>UTUR</u>	1
(0028,7FE0)	Pixel Data Provider URL	PixelDataProviderURL	<u>UTUR</u>	1
(0040,E010)	Retrieve URI	RetrieveURI	<u>UTUR</u>	1
(0074,100A)	Contact URI	ContactURI	<u>STUR</u>	1

Update PS 3.18 2013 Section 3 Normative References

IETF RFC ~~2396~~3986 Uniform Resource Identifiers (URI): Generic Syntax

Update PS 3.18 2013 Section 6.2.1 Parameters of the HTTP Request

The parameters of the <query> component of the Request-URI to be sent to the web Server through the HTTP GET method request shall be represented as defined in IETF RFC ~~2396~~3986.

Update PS 3.18 2013 Table 6.6.1-2 **Store Instances Response Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Retrieve URL	(0008,1190)	2	The URL where the Study is available for retrieval via a WADO-RS Retrieve Study service. Note: The VR of this attribute has changed from UT to UR.
Failed SOP Sequence	(0008,1198)	1C	A sequence of Items where each Item references a single

Attribute Name	Tag	Type	Attribute Description
			SOP Instance for which storage could not be provided. Required if one or more SOP Instances failed to store.
>Table 10-11 "SOP Instance Reference Macro Attributes" in PS3.3			
>Retrieve URL	(0008,1190)	2	The URL where the SOP Instance is available for retrieval via a WADO-URI or WADO-RS service. If the study Retrieve URI is specified above, this URL can be constructed if the client knows the series and instance UIDs. Note: The VR of this attribute has changed from UT to UR.
...			

Update PS 3.18 2013 Section 6.6.1.3.2.2 Response Message Body Example

<DicomAttribute tag="00081190" vr="~~UT~~UR" keyword="RetrieveURL">

Update PS 3.18 2013 Section 6.6.1.3.2.2 Response Message Body Example

<DicomAttribute tag="00081190" vr="~~UT~~UR" keyword="RetrieveURL">

Update PS 3.18 2013 Section 6.6.1.3.2.2 Response Message Body Example

<DicomAttribute tag="00081190" vr="~~UT~~UR" keyword="RetrieveURL">

Replace PS 3.18 2013 Appendix A

A URI Query Component Syntax (Normative)

This Standard uses the URI syntax as defined in IETF RFC 3986 *Uniform Resource Identifier (URI): Generic Syntax* and extends it by specifying the syntax of the *query component* of DICOM URIs. The grammar for the query component is defined using IETF RFC 5234 *Augmented BNF for Syntax Specifications: ABNF*.

DICOM URIs may use the query component of the URI to specify request parameters. The following grammar defines the general syntax of parameters contained in the query component of the URI. Specific HTTP transactions defined elsewhere in this standard may further refine the legal <name> and/or <value> rules.

```

query-component = parameter [ *("&" parameter) ]
parameter      = name "=" value
name           = *qchar
value          = *qchar
qchar          = unreserved / pct-encoded / qspecial
qspecial       = "/" / "?" / ":" / "@" / "!" / "$" / "'"
               / "(" / ")" / "*" / "+" / "," / ";"

```

; The following rules are defined in IETF RFC3986 (Normative). They are reproduced here for convenience.

```

unreserved     = ALPHA / DIGIT / "-" / "." / "_" / "~"
pct-encoded    = "%" HEXDIG HEXDIG

```

Notes:

1. This grammar allows the query component to contain any of the legal characters as defined by RFC 3986.
2. No whitespace is permitted in URIs. Whitespace around line breaks and the line breaks themselves should be stripped before parsing the URI. (See RFC 3986 Appendix C)
3. RFC 3986 does not permit an empty query component, i.e. if the “?” appears in the URI then there must be some legal query parameters in the URI.
4. The <qchar> rule defined above is the <pchar> rule of RFC 3986, which defines the legal character for the query component, minus the characters “=” and “&”.

Update PS 3.18 2013 Table F.2.3-1. DICOM VR to JSON Data Type Mapping

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 String	<i>Base64 encoded string</i>
OD	Other Double String	<i>Base64 encoded string</i>
OF	Other Float String	<i>Base64 encoded string</i>
OW	Other Word String	<i>Base64 encoded string</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>
UI	UID	<i>String</i>
UL	Unsigned Long	<i>Number</i>
UN	Unknown	<i>Base64 encoded string</i>
<u>UR</u>	<u>URI</u>	<u>String</u>
US	Unsigned Short	<i>Number</i>
UT	Unlimited Text	<i>String</i>

Update PS 3.18 2013 Section F.4 DICOM JSON MODEL EXAMPLE as follows:

```

    "00081190": {
      "vr": "UTUR",
      "Value": [
        "http://wado.nema.org/studies/1.2.392.200036.9116.2.2.2.1762893313.1029997326
        .945873"
      ]
    },

```

Update PS 3.18 2013 Section F.4 DICOM JSON MODEL EXAMPLE as follows:

```

    "00081190": {
      "vr": "UTUR",
      "Value": [
        "http://wado.nema.org/studies/1.2.392.200036.9116.2.2.2.2162893313.1029997326
        .945876"
      ]
    },

```

Update PS 3.19 2013 2 Normative References

...

~~[RFC 2396] IETF. *Uniform Resource Identifiers (URI): Generic Syntax*.
<http://tools.ietf.org/html/rfc2396>.~~

[RFC3986]. IETF. *Uniform Resource Identifiers (URI): Generic Syntax*
<http://www.ietf.org/html/rfc3986>

Update PS 3.19 2013 A.1.6 Schema as shown below.

```

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

```