Digital Imaging and Communications in Medicine (DICOM)

Supplement 14

Unknown Value Representation

Status: **Final Text June 3, 1997**

Foreword

2 ACC (the American College of Cardiology), NEMA (the National Electrical Manufacturers Association) and the ACR (the American College of Radiology) formed a joint ad-hoc Committee to further expand the Standard for
4 Digital Imaging and Communications in Medicine initially developed by ACR and NEMA. The corresponding Supplements to the DICOM Standard were developed according to the NEMA Procedures

6 This Supplement to the Standard is developed in liaison with other Standard Organizations including CEN TC251 in Europe and JIRA in Japan, with review also by other organizations member of the ANSI HISPP in the
8 USA which includes IEEE, HL7 and X12.

The DICOM standard is structured as a multi-part document using the guidelines established in the following
10 document:

- ISO/IEC Directives, 1989 Part 3 - Drafting and Presentation of International Standards.

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This document is a Supplement to the DICOM Standard. It is an extension to Part 5 of the published DICOM
14 Standard which consists of the following parts:

Part 1 — Introduction and Overview
16 Part 2 — Conformance

Part 3 — Information Object Definitions
18 Part 4 — Service Class Specifications

Part 5 — Data Structures and Encoding
20 Part 6 — Data Dictionary

Part 7 — Message Exchange
22 Part 8 — Network Communication Support for Message Exchange

Part 9 — Point-to-Point Communication Support for Message Exchange
24 Part 10 — Media Storage and File Format for Data Interchange

Part 11 — Media Storage Application Profiles
26 Part 12 — Media Formats and Physical Media

Part 13 — Print Management - Point-to-point Communication Support
28

These Parts are independent but related documents.

Scope and Field of Application

2   This Supplement specifies an additional Value Representation (VR) of UN, standing for Unknown, designed to allow DICOM applications to better manage unknown private attributes that have been obtained through the
4   default DICOM Transfer Syntax (Implicit VR Little Endian).

Since this document proposes changes to a existing Parts of DICOM the reader should have a working
6   understanding of the Standard.

This proposed Supplement specifies a change in PS 3.5 (Extension to section 6.2, 6.2.1 table 6-2, sections 6.4,
8   7.1.2 and 7.8.2).

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Digital Imaging and Communications in Medicine (DICOM)

Part 5 Addendum

10 *Unknown Value Representation*

Item #1

2 *Change section 6.2 - all modifications to the existing section are shown in BOLD <u>underlined</u> font.*

4 The Value Representation of a Data Element shall describe the data type and format of that Data Element's Value(s). Part 6 of the DICOM Standard lists the VR of each Data Element by Data Element Tag.

6 Values with VRs constructed of character strings, except in the case of the VR UI, shall be padded with SPACE characters (20H, in the Default Character Repertoire) when necessary to achieve even length. Values with a

8 VR of UI shall be padded with a single trailing NULL (00H) character when necessary to achieve even length. Values with a VR of OB shall be padded with a single trailing NULL byte value (00H) when necessary to

10 achieve even length.

All new VRs defined in future versions of DICOM shall be of the same Data Element Structure as

12 **defined in Section 7.1.2 (i.e. following the format for VRs such as OB, OW, SQ and UN).**

> **Note:** **Since all new VRs will be defined as specified in section 7.1.2, an implementation may choose to**
14 > **ignore VRs not recognized by applying the rules stated in Section 7.1.2.**

16 An individual Value, including padding, shall not exceed the Length of Value. For multi-valued fields see Section 6.4.

18 > Note: The length of Value Representations for which the Character Repertoire can be extended or replaced are
> expressly specified in characters rather than bytes in the following table. This is because the mapping from a
20 > character to the number of bytes used for that character's encoding may be dependent on the character set
> used.

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Item #2

24 *Add UN VR to section 6.2.1*

26 **6.2.1 Unknown (UN) Value Representation**

The Unknown (UN) VR shall only be used for Private Attribute Data Elements and Standard Data Elements

28 previously encoded as some DICOM VR other than UN using the DICOM Default Transfer Syntax (Implicit VR Little Endian), and whose Value Representation is currently unknown. As long as the VR is unknown the Value

30 Field is insensitive to Little/Big Endian byte ordering and shall not be 'byte-swapped' (see section 7.3). See section 7.8 for a description of Private Data Attribute Elements and section 10 and Annex A for a discussion of

32 Transfer Syntaxes.

The UN VR shall not be used for Private Creator Data Elements (i.e. the VR is equal to LO, see section 7.8.1).

34 > Notes: 1. All other (non-default) DICOM Transfer Syntaxes employ explicit VR in their encoding, and therefore any
> Private and/or Standard Data Element Value Field Attribute value encoded and decoded using any Transfer
36 > Syntax other than the default, and not having been translated to the DICOM Default Transfer Syntax default in
> the interim, will have a known VR.
38 > 2. If at some point an application knows the actual VR for an Attribute of VR UN (e.g. has its own applicable
> data dictionary), it can assume that the Value Field of the Attribute is encoded in Little Endian byte ordering,
40 > irrespective of the current Transfer Syntax.

3. This VR of UN is needed when an explicit VR must be given to a Data Element whose Value Representation is unknown (e.g. store and forward). UN is a means to explicitly indicate that the Value Representation of a Data Element is unknown.

4. The length field of the Value Representation of UN may contain the value of "unknown length". See section 7.5.1 to determine how to parse Data Elements with an unknown length.

5. An example of a Standard Data Element using a UN VR is a Type 3 or Type U Standard Attribute added to an SOP Class definition. An existing application which does not support that new Attribute (and encounters it) could convert the VR to UN.

Item #3

Add UN VR into Table 6.2-1

Table 6.2-1: DICOM value representations

VR Name	Definition	Character Repertoire	Length of Value
UN Unknown	A string of bytes where the encoding of the contents is unknown. (See Section 6.2.1)	not applicable	Any length valid for any of the other DICOM Value Representations

2   *Item #4*

Change section 6.4 to include UN VR - all modifications to the existing section are shown in BOLD <u>underlined</u>
4   *font.*

6   Data Elements with a VR of SQ, OW, OB, **<u>or UN</u>** shall always have a Value Multiplicity of one.

8   *Item #5*

Change section 7.1.2 to include UN VR - all modifications to the existing section are shown in BOLD <u>underlined</u>
10   *font.*

12   When using the Explicit VR structures, the Data Element shall be constructed of four consecutive fields: Data
Element Tag, VR, Value Length, and Value. Depending on the VR of the Data Element, the Data Element will
14   be structured in one of two ways:

        - for VRs of OB, OW, SQ, **<u>and UN</u>** the 16 bits following the two character VR Field are reserved for use
16   by later versions of the DICOM Standard. These reserved bytes shall be set to 0000H and shall not
            be used or decoded (Figure 7.1.2-1). The Value Length Field is a 32-bit unsigned integer. If the
18   Value Field has an Explicit Length, then the Value Length Field shall contain a value equal to the
            length (in bytes) of the Value Field. Otherwise, the Value Field has an Undefined Length and a
20   Sequence Delimitation Item marks the end of the Value Field.

22   - for all other VRs the Value Length Field is the 16-bit unsigned integer following the two character VR
            Field (Figure 7.1.2-2). The value of the Value Length Field shall equal the length of the Value Field.

Item #6

2 *Add UN to Figures 7.1.2-1 and7.1.2-2 - all modifications to the existing section are shown in BOLD Underline font.*

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Figure 7.1.2-1: Data Element with <u>Explicit VR of OB, OW, SQ, or UN</u>

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", "SQ**", 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

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Figure 7.1.2-2: Data Element <u>with Explicit VR other than OB, OW, SQ, or UN</u>

Tag		VR	Value Length	Value
Group Number (16-bit unsigned integer)	Element Number (16-bit unsigned integer)	VR (2 byte character string)	Length (16-bit unsigned integer)	Even number of bytes containing the Data Element Value(s) encoded according to the VR and negotiated Transfer Syntax.
2 bytes	2 bytes	2 bytes	2 bytes	'Value Length' bytes

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