

DICOM Correction Proposal

STATUS	Letter Ballot
Date of Last Update	2024/01/14
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Submission Date	2023-03-30

Correction Number	CP-2305
Log Summary: Clarify Matching of Key Attributes with a VR of IS or DS	
Name of Standard	PS3.4
<p>Rationale for Correction:</p> <p>The current standard text is silent on the Single Value Matching of Key Attributes with a VR of IS (Integer String) or DS (Decimal String). For example, whether the IS values "+7" and "007" match the value "7" is undefined.</p> <p>It is, therefore, proposed to add a new subsection for these two VRs that clarifies that matching of such values is implementation dependent. It is also proposed to require that details on the matching performed shall be specified in the Conformance Statement (similar to what is required for other VRs).</p> <p>For background information, see also this discussion in the newgroups "comp.protocols.dicom": https://groups.google.com/g/comp.protocols.dicom/c/JNsg7upVJ08</p> <p><i>Editorial changes:</i> The term "Conformance Statement" should be written with capital initials throughout the standard text.</p>	
Correction Wording:	

Change PS3.4 Section C.2.2.2.1

C.2.2.2.1 Single Value Matching

If the value specified for a Key Attribute in a request is non-zero length and if it is not of VR SQ and:

- of VR of AE, CS, LO, LT, PN, SH, ST, UC, UR or UT and contains a single value with no wild card characters, and if Extended Negotiation of Empty Value Matching is successful and it does not have the value of exactly two QUOTATION MARK characters, or
- of VR of DA, TM or DT and contains a single value with no "-" and no QUOTATION MARK characters, or
- of any other VR

then Single Value Matching shall be performed. Except for Attributes with a PN VR, only entities with values that match exactly the value specified in the request shall match. This matching is case-sensitive, i.e., sensitive to the exact encoding of the key Attribute Value in character sets where a letter may have multiple encodings (e.g., based on its case, its position in a word, or whether it is accented).

The following subsections define specifics for certain VRs.

C.2.2.2.1.1 Attributes of VR of PN

For Attributes with a PN VR (e.g., Patient Name (0010,0010)), an application may perform literal matching that is either case-sensitive, or that is insensitive to some or all aspects of case, position, accent, or other character encoding variants.

Note

For multi-component names, the component group delimiter "=" (3DH) may be present in the Key Attribute Value, but may give unexpected results if the SCP does not support matching on separate components but interprets the entire value literally as a single string. E.g., "Wang^XiaoDong=王^小東" may or may not match "Wang^XiaoDong" or "王^小東"; Wild Card Matching without the component group delimiter, such as "*"Wang^XiaoDong*" or "*"王^小東*" may be necessary.

If Extended Negotiation of fuzzy semantic matching rather than literal matching of PN VR is successful, not only may matching be insensitive to case, position, accent, and character encoding (including combining characters), but in addition other techniques such as phonetic matching may be applied.

Note

1. Matching of PN Attributes may be accent-insensitive, as specified in the **eC**onformance **sS**tatement. Accent-insensitive matching would successfully match, for instance, a query character "SMALL LETTER a" (06/01 in the default ISO-IR 6) with

"SMALL LETTER a WITH GRAVE ACCENT" (14/00 in ISO-IR 100),

"SMALL LETTER a WITH TILDE" (14/03 in ISO-IR 100),

"SMALL LETTER a WITH BREVE" (14/03 in ISO-IR 101), and

"CAPITAL LETTER a WITH ACUTE ACCENT" (12/01 in ISO-IR 100) (if matching is also case-insensitive),

but would not match 14/00 in ISO-IR 101, which is "SMALL LETTER r WITH ACUTE ACCENT". Matching to particular bit-combinations is specific to each supported character set (note the difference in meaning of 14/00), and should be described in the **eC**onformance **sS**tatement.

2. An SCU application may elect to perform additional filtering of the responses by applying the matching rules itself. In the event that both the SCU and SCP are applying the matching rules, this process will be successful as long as literal matching is performed by both, and any additional SCU filtering is insensitive to case, position, accent, or other character encoding variants.

However if fuzzy semantic matching of PN Attributes has been negotiated, matching by the SCP may result in responses that are not obviously related to the request, hence care should be taken if any additional filtering of responses is performed by the SCU. For example, if phonetic matching is performed, a query for "Swain" might well return "Swayne", or if name component order insensitive matching is performed, a query for "Smith^Mary" might well return "Mary^Smith" or "Mary Smith" or "Smith, Mary". Fuzzy semantic matching may also take into account separate single-byte, ideographic and phonetic name component groups.

C.2.2.2.1.2 Attributes of VR of AE, CS, LO, LT, PN, SH, ST, UC, UR and UT

The AE, LO, LT, PN, SH, ST, UC, UR and UT VRs allow the presence of wild card characters "*" and "?". Wild **eC**ard **mM**atching is also defined for CS values. Single **vV**alue **mM**atching against such characters is not supported. See Section C.2.2.2.4.

C.2.2.2.1.3 Attributes of VR of DA, DT or TM

If the Timezone Offset From UTC (0008,0201) Attribute is present in the Identifier and Timezone query adjustment was negotiated, it shall be used to adjust values of Attributes of VR of TM (and associated Attributes of VR of DA, if present) from the local timezone to UTC. It shall also adjust values of Attributes of VR of DT that do not specify a timezone offset. The encoding and semantics of the Timezone Offset From UTC (0008,0201) Attribute shall be as defined in the SOP Common Module in PS3.3.

The manner in which matching is performed is implementation dependent and shall be specified in the **eC**onformance **sS**tatement.

Note

1. This definition implies that values of VR of TM, DA and DT are matched by their meaning, not as literal strings. For example:
 - the DT "19980128103000.0000" matches "19980128103000"
 - the DT "19980128103000" with no timezone offset matches "19980128073000" with timezone offset "-0300"

- the TM "2230" matches "223000"
2. If an application is concerned about how Single Value Matching of dates and times is performed by another application, it may consider using Range Matching instead, which is always performed by meaning, with both values in the range the same.
 3. Exclusion of the "-" character for Single Value Matching implies that a Key Attribute with a VR of DT may not contain a negative offset from Universal Coordinated Time (UTC) if Single Value Matching is intended. Use of the "-" character in values of VR of TM, DA and DT indicates Range Matching.
 4. If an application is in a local time zone that has a negative offset then it cannot perform Single Value Matching using a local time notation. Instead, it can convert the Key Attribute Value to UTC and use an explicit suffix of "+0000".

Add the following Section to PS3.4 (new Subsection C.2.2.2.1.4)

C.2.2.2.1.4 Attributes of VR of DS or IS

The DS and IS VRs allow the same number to be encoded differently when using character strings. Therefore, the manner in which matching is performed is implementation dependent and shall be specified in the Conformance Statement.

Note

For example, the IS values "+7" and "007" may match the value "7", but this is not guaranteed. An implementation should, therefore, not expect this to always happen.

Change PS3.4 Section C.6.1.2.2.1

C.6.1.2.2.1 C-FIND SCP Conformance

An implementation that conforms to one of the SOP Classes of the Patient Root SOP Class Group shall support queries against the Query/Retrieve Information Model described in Section C.6.1.1 using the C-FIND SCP Behavior described in Section C.4.1.3.

An implementation that conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP shall state in its Conformance Statement whether it supports Optional Keys. If it supports Optional Keys, then it shall list the Optional Keys that it supports.

An implementation that conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP shall state in its Conformance Statement whether it supports Relational-queries. If it supports Relational-queries, then it shall also support Extended Negotiation of relational-queries as an SCP.

An implementation that conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP shall state in its Conformance Statement whether or not it supports Extended Negotiation of combined date-time matching, fuzzy semantic matching of person names, Empty Value Matching, and/or Multiple Value Matching. If fuzzy semantic matching of person names is supported, then the mechanism for fuzzy semantic matching shall be specified.

An implementation that conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP shall state in its Conformance Statement whether it supports case-insensitive matching for PN VR Attributes and list **the** Attributes for which this applies.

An implementation that conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP shall state in its Conformance Statement how it makes use of Specific Character Set (0008,0005) and Timezone Offset From UTC (0008,0201) when interpreting queries, performing matching and encoding responses.

An implementation that conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP shall state in its Conformance Statement the manner in which Single Value Matching is performed for DS and IS VR Attributes (if supported) and list the Attributes for which this applies.

Change PS3.4 Section C.6.2.2

C.6.2.2 Conformance Requirements

An implementation may conform to one of the SOP Classes of the Study **HierarchyRoot** SOP Class Group as an SCU, SCP or both. The Conformance Statement shall be in the format defined in PS3.2.

Change PS3.4 Section C.6.2.2.1

C.6.2.2.1 C-FIND SCP Conformance

An implementation that conforms to one of the SOP Classes of the Study Root SOP Class Group shall support queries against the Query/Retrieve Information Model described in Section C.6.2.1 using the C-FIND SCP behavior described in Section C.4.1.3.

An implementation that conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP shall state in its Conformance Statement whether it supports Optional Keys. If it supports Optional Keys, then it shall list the Optional Keys that it supports.

An implementation that conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP shall state in its Conformance Statement whether it supports Relational Search. If it supports Relational Search, then it shall also support Extended Negotiation of relational-queries as an SCP.

An implementation that conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP shall state in its Conformance Statement whether or not it supports Extended Negotiation of combined date-time matching, fuzzy semantic matching of person names, Empty Value Matching, and/or Multiple Value Matching. If fuzzy semantic matching of person names is supported, then the mechanism for fuzzy semantic matching shall be specified.

An implementation that conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP shall state in its Conformance Statement whether it supports case-insensitive matching for PN VR Attributes and list the Attributes for which this applies.

An implementation that conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP shall state in its Conformance Statement how it makes use of Specific Character Set (0008,0005) and Timezone Offset From UTC (0008,0201) when interpreting queries, performing matching and encoding responses.

An implementation that conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP shall state in its Conformance Statement the manner in which Single Value Matching is performed for DS and IS VR Attributes (if supported) and list the Attributes for which this applies.

Change PS3.4 Section C.6.4.6.2

C.6.4.6.2 C-FIND SCP Conformance

An implementation that conforms to the Repository Query SOP Class as an SCP shall support queries against the Study Root Query/Retrieve Information Model described in Section C.6.2.1 and Section C.6.4.1 using the C-FIND SCP behavior described in Section C.4.1.3 and Section C.6.4.5.

An implementation that conforms to the Repository Query SOP Class as an SCP shall state in its Conformance Statement:

- Which Optional Keys it supports for existence (i.e., to be returned in responses) and which for matching.
- Which Attributes it supports in Items of those Key Attributes that are Sequences.
- Whether it supports Relational Search. If it supports Relational Search, then it shall also support Extended Negotiation of Relational-queries as an SCP.
- Whether or not it supports Extended Negotiation of combined date-time matching, fuzzy semantic matching of person names, empty value matching, and/or multiple value matching. If fuzzy semantic matching of person names is supported, then the mechanism for fuzzy semantic matching shall be specified.
- Whether it supports case-insensitive matching for PN VR Attributes, and list the Attributes for which this applies.
- How it uses Specific Character Set (0008,0005) and Timezone Offset From UTC (0008,0201) when interpreting queries, performing matching and encoding responses.
- Any limitations it places on the number of C-FIND responses.
- The conditions after which a Record Key (0008,041B) value is not valid to allow resumption of a C-FIND operation.

- Any non-DICOM mechanisms used to access SOP Instances that may be specified by a File Access URI (0008,0409), including protocols (such as NFS, SMB, or HTTP), and use of folders and/or container files (ZIP, TAR, GZIP, TARGZIP, BLOB) for the SOP Instances. If such mechanisms are used, the use of Metadata Sequence (0008,041D) or Updated Metadata Sequence (0008,041E) shall be described.
- Whether it provides responses that include entities from multiple repositories (federation), and how it handles differences in support for Attribute matching across those repositories in constructing responses.

<i>Change PS3.4 Section K.6.1.3.2</i>

K.6.1.3.2 SCP Conformance

An implementation that conforms to the Modality Worklist SOP Class **as an SCP** shall support queries against the Worklist Information Model described in Section K.6.1.2 of this Annex using the C-FIND SCP Behavior described in Section K.4.1.3 of this Part.

An implementation that conforms to the Modality Worklist SOP Class as an SCP shall state in its Conformance Statement whether it supports matching on Optional Matching Key Attributes. If it supports Type 3 Return Key Attributes, then it shall list the Optional Return Key Attributes that it supports. It shall identify any Templates it supports for the Protocol Context Sequence (0040,0440).

An implementation that conforms to the Modality Worklist SOP Class as an SCP shall state in its Conformance Statement whether it supports case-insensitive matching for PN VR Attributes and list the Attributes for which this applies.

An implementation that conforms to the Modality Worklist SOP Class as an SCP shall state in its Conformance Statement whether or not it supports Extended Negotiation of fuzzy semantic matching of person names. If fuzzy semantic matching of person names is supported, then the mechanism for fuzzy semantic matching shall be specified.

An implementation that conforms to the Modality Worklist SOP Class as an SCP shall state in its Conformance Statement how it makes use of Specific Character Set (0008,0005) and Timezone Offset From UTC (0008,0201) when interpreting queries, performing matching and encoding responses.

An implementation that conforms to the Modality Worklist SOP Class as an SCP shall state in its Conformance Statement the manner in which Single Value Matching is performed for DS and IS VR Attributes (if supported) and list the Attributes for which this applies.