C.2.2.2 Attribute Matching

... The Specific Character Set (0008,0005) Attribute may be present in the Identifier but is never matched. Rather, it specifies how other Attributes are encoded in the Request and Response Identifiers.

It may influence how matching of other Attributes is performed. If Specific Character Set (0008,0005) is absent, then the default character repertoire shall be used. Specific Character Set (0008,0005) shall not have a zero length value.

Specific Character Set (0008,0005) may have multiple values if escape sequences are used to switch between character repertoires within values.

If the SCP does not support the value(s) of Specific Character Set (0008,0005) in the Request Identifier, then the manner in which matching is performed is undefined and shall be specified in the conformance statement.

Notes: 1. If an SCU sends a Request Identifier with a single byte character set not supported by the SCP, then it is likely, but not required, that the SCP will treat unrecognized characters as wildcards and match only on characters in the default repertoire, and return a response in the default repertoire.

2. Some Specific Character Set values are used with multi-component group person names (e.g., single-byte, ideographic and phonetic and phonetic component groups separated by an “=” (3DH) character), which may also affect the behavior of literal string matching.

The Timezone Offset From UTC (0008,0201) attribute may be present in the Identifier but is not matched if Timezone query adjustment is negotiated. If Timezone query adjustment is negotiated, it specifies how date and time Attribute values are interpreted in the Request and Response Identifiers if those values lack a specific time zone offset specification.

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:
a) not a date or time or datetime, contains no wild card characters
b) a date or time or datetime, contains a single date or time or datetime with no "-" then single value matching shall be performed. Except for Attributes with a PN Value Representation, only entities with values which match exactly the value specified in the request shall match. …

If extended negotiation of fuzzy semantic matching rather than literal matching of PN Value Representation is successful, not only may matching be insensitive to case, position, accent, and character encoding, but in addition other techniques such as phonetic matching may be applied.

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 time attributes (and associated date attributes, if present) from the local timezone to UTC. It shall also adjust values of datetime attributes 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 conformance statement.

Notes:
1. This definition implies that dates or times or datetimes 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"
   - the TM "223000" matches the deprecated ACR/NEMA 2.0 form "22:30:00"
   - the DA "19980128" matches the deprecated ACR/NEMA 2.0 form "1998.01.28"

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 DT Value Representation may not contain a negative offset from Universal Coordinated Time (UTC) if single value matching is intended. Use of the "-" character in date, time or datetime 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".

…

C.2.2.2.5 Range Matching
In the absence of extended negotiation, if the Attribute is a date, then:

a) A string of the form "<date1> - <date2>" where <date1> is less or equal to <date2>, shall match all occurrences of dates which fall between <date1> and <date2> inclusive
b) A string of the form "- <date1>" shall match all occurrences of dates prior to and including <date1>
c) A string of the form "<date1> -" shall match all occurrences of <date1> and subsequent dates

In the absence of extended negotiation if the Attribute is a time, then:

a) A string of the form "<time1> - <time2>", where <time1> is less or equal to <time2>, shall match all occurrences of times which fall between <time1> and <time2> inclusive
b) A string of the form "- <time1>" shall match all occurrences of times prior to and including <time1>
c) A string of the form "<time1> -" shall match all occurrences of <time1> and subsequent times

If the Attribute is a datetime, then:
a) A string of the form "<datetime1> - <datetime2>", where <datetime1> is less or equal to <datetime2>, shall match all moments in time which fall between <datetime1> and <datetime2> inclusive.

b) A string of the form "- <datetime1>" shall match all moments in time prior to and including <datetime1>

c) A string of the form "<datetime1> -" shall match all moments in time subsequent to and including <datetime1>

d) The offset from Universal Coordinated Time, if present in the Value of the Attribute, shall be taken into account for the purposes of the match.

If extended negotiation of combined datetime matching is successful, then a pair of Attributes that are a date and a time, both of which specify the same form of range matching, shall have the concatenated string values of each range matching component matched as if they were a single datetime Attribute.

Note: For example, a Study Date of "20060705-20060707" and a Study Time of "1000-1800" will match the time period of July 5, 10am until July 7, 6pm, rather than the three time periods of 10am until 6pm on each of July 5, July 6 and July 7, as would be the case without extended negotiation.

Regardless of other extended negotiation, an application may use the value of Timezone Offset From UTC (0008,0201) to adjust values of time and datetime attributes from the local timezone to UTC for matching. See C.2.2.2.1.

Note: If extended negotiation of combined datetime matching is successful, the timezone offset may effect a change in date if the local time and UTC are on different sides of midnight.

Range matching is not defined for types of Attributes other than dates and times.

...  

C.4.1.1.3.1 Request Identifier Structure
An Identifier in a C-FIND request shall contain:

— Key Attributes values to be matched against the values of storage SOP Instances managed by the SCP.
— Query/Retrieve Level, element (0008,0052) which defines the level of the query.
— Conditionally, the Attribute Specific Character Set (0008,0005). This Attribute shall be included if expanded or replacement character sets may be used in any of the Attributes in the Request Identifier. It shall not be included otherwise.
— Conditionally, the Attribute Timezone Offset From UTC (0008,0201). This Attribute shall be included if Key Attributes of time are to be interpreted explicitly in the designated local time zone. It shall not be present otherwise, i.e., it shall not be sent with a zero-length value.

The Key Attributes and values allowable for the level of the query shall be defined in the SOP Class definition for the Query/Retrieve Information Model.

C.4.1.1.3.2 Response Identifier Structure
The C-FIND response shall not contain Attributes that were not in the request or specified in this section.

An Identifier in a C-FIND response shall contain:

— Key Attributes with values corresponding to Key Attributes contained in the Identifier of the request.

Notes: 1. All Required Keys in the Request Identifier, as well as all Optional Keys in the Request Identifier that are supported by the SCP, will therefore be present in the Response Identifier.
2. Required Keys and supported Optional Keys in the Response Identifier will have zero length if the SCP has no value to send; i.e., there is no requirement that the SCP have a value for these, or create a dummy value.

3. The requirement that unsupported Optional Keys present in the Request Identifier not be included in the Response Identifier is specified in C.2.2.1.3.

— Query/Retrieve Level, element (0008,0052) which defines the level of the query. The Query/Retrieve level shall be equal to the level specified in the request.

— Conditionally, the Attribute Specific Character Set (0008,0005). This Attribute shall be included if expanded or replacement character sets may be used in any of the Attributes in the Response Identifier. It shall not be included otherwise. The C-FIND SCP is not required to return responses in the Specific Character Set requested by the SCU if that character set is not supported by the SCP. The SCP may return responses with a different Specific Character Set.

— Conditionally, the Attribute Timezone Offset From UTC (0008,0201). This Attribute shall be included if any Attributes of time in the Response Identifier are to be interpreted explicitly in the designated local time zone. It shall not be present otherwise, i.e., it shall not be sent with a zero-length value.

…

Modify Section C.5

Table C.5-1—SOP CLASS EXTENDED NEGOTIATION SUB-ITEM (service-class-application-information field)—A-ASSOCIATE-RQ

<table>
<thead>
<tr>
<th>Item Bytes</th>
<th>Field Name</th>
<th>Description of Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Relational-queries</td>
<td>This byte field defines relational-query support by the Association-requester. It shall be encoded as an unsigned binary integer and shall use one of the following values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 – relational queries not supported</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 – relational queries supported</td>
</tr>
<tr>
<td>2</td>
<td>Date-time matching</td>
<td>This byte field defines whether or not combined date and time attribute range matching is requested by the Association-requester. It shall be encoded as an unsigned binary integer and shall use one of the following values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 – combined matching not requested</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 – combined matching requested</td>
</tr>
<tr>
<td>3</td>
<td>Fuzzy semantic matching of person names</td>
<td>This byte field defines whether or not fuzzy semantic person name attribute matching is requested by the Association-requester. It shall be encoded as an unsigned binary integer and shall use one of the following values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 – fuzzy semantic matching not requested</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 – fuzzy semantic matching requested</td>
</tr>
<tr>
<td>4</td>
<td>Timezone query adjustment</td>
<td>This byte field defines whether or not the Attribute Timezone Offset From UTC (0008,0201) shall be used to adjust the query meaning for time and datetime fields in queries.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 – Timezone query adjustment not requested</td>
</tr>
</tbody>
</table>
C.5.1.1.2  SOP Class Extended Negotiation Sub-Item Structure (A-ASSOCIATE-AC)

The SOP Class Extended Negotiation Sub-Item is made of a sequence of mandatory fields as defined by PS 3.7. Table C.5-2 defines the Service-class-application-information field for DICOM Query/Retrieve SOP Classes and Specialized DICOM Query/Retrieve SOP Classes which include the C-FIND operation. This field may be either one or three bytes in length (i.e., item bytes 2 and 3 are optional).

Table C.5-2—SOP CLASS EXTENDED NEGOTIATION SUB-ITEM (service-class-application-information field)—A-ASSOCIATE-AC

<table>
<thead>
<tr>
<th>Item Bytes</th>
<th>Field Name</th>
<th>Description of Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Relational-queries</td>
<td>This byte field defines relational-query support for the Association-acceptor. It shall be encoded as an unsigned binary integer and shall use one of the following values: 0 – relational-queries not supported 1 – relational-queries supported</td>
</tr>
<tr>
<td>2</td>
<td>Date-time matching</td>
<td>This byte field defines whether or not combined date and time attribute range matching will be performed by the Association-acceptor. It shall be encoded as an unsigned binary integer and shall use one of the following values: 0 – combined matching not performed 1 – combined matching performed</td>
</tr>
<tr>
<td>3</td>
<td>Fuzzy semantic matching of person names</td>
<td>This byte field defines whether or not fuzzy semantic person name attribute matching will be performed by the Association-acceptor. It shall be encoded as an unsigned binary integer and shall use one of the following values: 0 – fuzzy semantic matching not performed 1 – fuzzy semantic matching performed</td>
</tr>
<tr>
<td>4</td>
<td>Timezone query adjustment</td>
<td>This byte field defines whether or not the Attribute Timezone Offset From UTC (0008,0201) shall be used to adjust the query meaning for time and datetime fields in queries. 0 – Timezone adjustment of queries not performed 1 – Timezone adjustment of queries performed</td>
</tr>
</tbody>
</table>

C.6.1.2.1.1  C-FIND SCU Conformance

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

...
C.6.1.2.2.1  C-FIND SCP Conformance

... An implementation which that conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCU 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.

...

C.6.2.2.1.1  C-FIND SCU Conformance

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

...

C.6.2.2.2.1  C-FIND SCP Conformance

... An implementation which that conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCU 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.

...

K.2.2.2  Attribute Matching

... See Section C.2.2.2 and subsections for specific rules governing of Matching Key Attribute encoding for and performing of different types of matching.

The Specific Character Set (0008,0005) Attribute and/or the Timezone Offset From UTC (0008,0201) Attribute may be present in the Identifier but is are never matched, i.e., it is they are not considered a Matching Key Attributes. See Section C.2.2.2 for details.

Single value matching of Attributes with Person Name Value Representation may be affected by extended negotiation of fuzzy semantic matching of person names.

...

K.4.1.1.3.1  Request Identifier Structure

An Identifier in a C-FIND request shall contain

- Key Attributes values to be matched against the values of Attributes specified in that SOP Class.
- Conditionally, the Attribute Specific Character Set (0008,0005). This Attribute shall be included if expanded or replacement character sets may be used in any of the Attributes in the Request Identifier. It shall not be included otherwise.

Note: This means that Specific Character Set (0008,0005) is included if the SCU supports expanded or replacement character sets in the context of this service. It will not be included if expanded or replacement character sets are not supported by the SCU.
Conditionally, the Attribute Timezone Offset From UTC (0008,0201). This Attribute shall be included if Key Attributes of time are to be interpreted explicitly in the designated local time zone. It shall not be present otherwise, i.e., it shall not be sent with a zero-length value.

The Key Attributes and values allowable for the query shall be defined in the SOP Class definition for the corresponding Worklist Information Model.

K.4.1.1.3.2 Response Identifier Structure

The C-FIND response shall not contain Attributes that were not in the request or specified in this section.

An Identifier in a C-FIND response shall contain:

— Key Attributes with values corresponding to Key Attributes contained in the Identifier of the request (Key Attributes as defined in K.2.2.1.)

— Conditionally, the Attribute Specific Character Set (0008,0005). This Attribute shall be included if expanded or replacement character sets may be used in any of the Attributes in the Response Identifier. It shall not be included otherwise. The C-FIND SCP is not required to return responses in the Specific Character Set requested by the SCU if that character set is not supported by the SCP. The SCP may return responses with a different Specific Character Set.

Note: This means that Specific Character Set (0008,0005) is included if the SCP supports expanded or replacement character sets in the context of this service. It will not be included if expanded or replacement character sets are not supported by the SCP.

— Conditionally, the Attribute Timezone Offset From UTC (0008,0201). This Attribute shall be included if any Attributes of time in the Response Identifier are to be interpreted explicitly in the designated local time zone. It shall not be present otherwise, i.e., it shall not be sent with a zero-length value.

— Conditionally, the Attribute HL7 Structured Document Reference Sequence (0040,A390) and its subsidiary Sequence Items. This Attribute shall be included if HL7 Structured Documents are referenced within the Identifier, e.g., in the Pertinent Documents Sequence (0038,0100).

Table K.5.1-1—SOP CLASS EXTENDED NEGOTIATION SUB-ITEM (service-class-application-information field)---A-ASSOCIATE-RQ

<table>
<thead>
<tr>
<th>Item Bytes</th>
<th>Field Name</th>
<th>Description of Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>reserved</td>
<td>This byte field shall always be 1</td>
</tr>
<tr>
<td>2</td>
<td>reserved</td>
<td>This byte field shall always be 1</td>
</tr>
<tr>
<td>3</td>
<td>Fuzzy semantic matching of person names</td>
<td>This byte field defines whether or not fuzzy semantic person name attribute is requested by the Association-requester. It shall be encoded as an unsigned binary integer and shall use one of the following values</td>
</tr>
<tr>
<td>4</td>
<td>Timezone query adjustment</td>
<td>This byte field defines whether or not the Attribute Timezone Offset From UTC (0008,0201) shall be used to adjust the query meaning for time and datetime fields in queries.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 - Timezone query adjustment not requested</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 – Timezone query adjustment requested</td>
</tr>
</tbody>
</table>
K.5.1.2 SOP Class Extended Negotiation Sub-Item Structure (A-ASSOCIATE-AC)

The SOP Class Extended Negotiation Sub-Item is made of a sequence of mandatory fields as defined by PS 3.7. This field shall be three bytes in length.

Table K.5.1-2—SOP CLASS EXTENDED NEGOTIATION SUB-ITEM (service-class-application-information field)—A-ASSOCIATE-AC

<table>
<thead>
<tr>
<th>Item Bytes</th>
<th>Field Name</th>
<th>Description of Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>reserved</td>
<td>This byte field shall always be 1</td>
</tr>
<tr>
<td>2</td>
<td>reserved</td>
<td>This byte field shall always be 1</td>
</tr>
</tbody>
</table>
| 3          | Fuzzy semantic matching of person names          | This byte field defines whether or not fuzzy semantic person name attribute matching will be performed by the Association-acceptor. It shall be encoded as an unsigned binary integer and shall use one of the following values  
0 – fuzzy semantic matching not performed  
1 – fuzzy semantic matching performed |
| 4          | Timezone query adjustment                       | This byte field defines whether or not the Attribute Timezone Offset From UTC (0008,0201) shall be used to adjust the query meaning for time and datetime fields in queries.  
0 – Timezone adjustment of queries not performed  
1 – Timezone adjustment of queries performed |

K.6.1.2.2 Modality Worklist Attributes

Table K.6-1 defines the Attributes of the Modality Worklist Information Model:

Table K.6-1
ATTRIBUTES FOR THE MODALITY WORKLIST INFORMATION MODEL

<table>
<thead>
<tr>
<th>Description / Module</th>
<th>Tag</th>
<th>Matching Key Type</th>
<th>Return Key Type</th>
<th>Remark/Matching Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheduled Procedure Step</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scheduled Procedure Step Sequence</td>
<td>(0040,0100)</td>
<td>R</td>
<td>1</td>
<td>The Attributes of the Scheduled Procedure Step shall only be retrieved with Sequence Matching. The Scheduled Procedure Step Sequence shall contain only a single Item.</td>
</tr>
<tr>
<td>&gt;Scheduled Station AE Title</td>
<td>(0040,0001)</td>
<td>R</td>
<td>1</td>
<td>The Scheduled station AE title shall be retrieved with Single Value Matching only.</td>
</tr>
<tr>
<td>&gt;Scheduled Procedure Step Start Date</td>
<td>(0040,0002)</td>
<td>R</td>
<td>1</td>
<td>Scheduled Step Start Date shall be retrieved with Single Value</td>
</tr>
</tbody>
</table>
Scheduled Step Start Time 

(0040,0003)    R    1

Scheduled Step Start Time shall be retrieved with Single Value Matching or Range Matching. Scheduled Step Start Date and Scheduled Step Start Time are subject to Range Matching. If both keys are specified for Range Matching, e.g. the date range July 5 to July 7 and the time range 10am to 6pm specifies the time period starting on July 5, 10am until July 7, 6pm.

Note: If the Information System does not provide scheduling for individual Procedure Steps, it may use the closest scheduling information it possesses (e.g. Procedures are subject to scheduling instead of Procedure Steps).

The attributes in Table K.6-1a are not part of the Worklist Information Model; their inclusion in the C-FIND request and response identifier are governed by rules in sections K.4.1.1.3.1 and K.4.1.1.3.2, respectively.

### Table K.6-1a

**ATTRIBUTES FOR THE MODALITY WORKLIST C-FIND IDENTIFIER**

<table>
<thead>
<tr>
<th>Description</th>
<th>Tag</th>
<th>Request Identifier</th>
<th>Response Identifier</th>
<th>Remark Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Character Set</td>
<td>(0008,0005)</td>
<td>1C</td>
<td>1C</td>
<td>This attribute is required if expanded or replacement character sets are used. See C.2.2.2 and K.4.1.1.3</td>
</tr>
<tr>
<td><strong>Timezone Offset From UTC</strong></td>
<td>(0008,0201)</td>
<td>1C</td>
<td>1C</td>
<td><strong>This attribute is required if times are to be interpreted explicitly in the designated local timezone. See C.2.2.2 and K.4.1.1.3</strong></td>
</tr>
<tr>
<td>HL7 Structured Document Reference Sequence</td>
<td>(0040,A390)</td>
<td>-</td>
<td>1C</td>
<td>One or more Items may be included in this sequence. Required if HL7 Structured Documents are referenced within the Identifier. See K.4.1.1.3</td>
</tr>
</tbody>
</table>
K.6.1.3.1 SCU Conformance

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

K.6.1.3.2 SCP Conformance

An implementation which 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.

K.6.2.2.2 General Purpose Worklist Attributes

The attributes in Table K.6-2a are not part of the Worklist Information Model; their inclusion in the C-FIND request and response identifier are governed by rules in sections K.4.1.1.3.1 and K.4.1.1.3.2, respectively.

<table>
<thead>
<tr>
<th>Description</th>
<th>Tag</th>
<th>Request Identifier</th>
<th>Response Identifier</th>
<th>Remark Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Character Set</td>
<td>(0008,0005)</td>
<td>1C</td>
<td>1C</td>
<td>This attribute is required if expanded or replacement character sets are used. See C.2.2.2 and K.4.1.1.3</td>
</tr>
<tr>
<td>Timezone Offset From UTC</td>
<td>(0008,0201)</td>
<td>1C</td>
<td>1C</td>
<td>This attribute is required if times are to be interpreted explicitly in the designated local timezone. See C.2.2.2 and K.4.1.1.3</td>
</tr>
<tr>
<td>HL7 Structured Document Reference Sequence</td>
<td>(0040,A390)</td>
<td>-</td>
<td>1C</td>
<td>One or more Items may be included in this sequence. Required if HL7 Structured Documents are referenced within the Identifier. See K.4.1.1.3</td>
</tr>
</tbody>
</table>
K.6.2.3.1 SCU Conformance

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

K.6.2.3.2 SCP Conformance

An implementation which that conforms to the General Purpose 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.