**Change Request**

**#:** 206  
**Assigned OGC Document #:** 12-023  
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**Document Name/Version:** Filter Encoding 2.0 Encoding Standard / 2.0  
**OGC Project Document:** 09-026r1

If this is a revision of a previous submission and you have a Change Request Number, then check here: ☐  
Enter the CR number here: 203  
Enter the Revision Number that you are revising here: 0

**Title:** Add support for unit of measure conversions  
**Source:** WFS-FES.SWG

**Work item code:**  
**Category:** B (Addition of feature)

**Reason for change:** The current WFS standard has no support for unit of measure conversions.

Driving usecases:

* Get me everything that matches my filter where the literal has units of my choosing  
* Get some features and portray their properties in a unit of measure of my choosing.

**Summary of change:**  
Add a new filter encoding conformance class 'Unit of measure conversions' which adds the ability to:

* Make filter queries that are 'UoM' enabled  
* Make ad hoc queries that can specify 'desired' units of measure for individual properties

WFS will add a new list of 'UoM enabled properties' to FeatureType's in the GetCapabilities response  
The units of measure are from UCUM

**Consequences if not approved:**  
Without being aware of how the WFS stores its underlying data, a client must make first make 'exploratory' queries in order to make a best guess at the underlying unit of measure. This must be done before a client can actually make a filter query to get the data they are...
really interested in.

It's analogous to the server not being able to translate between spatial reference systems, which is strange when spatial transformations are essentially the same class of problem as unit of measure conversions.

Clauses affected:

///// Filter Encoding Specification 2.0

Page 2 - Table 1 - FE conformance classes
[add]
Unit of measure conversions | Implements support for UCUM defined units of measure by converting between units with a common base | A.16, A.17

Page 3 - 3 Normative References

The Unified Code for Units of Measure - Version 1.8.2 - http://unitsofmeasure.org/

Page 10 6.3.1 General Considerations
[Replace second paragraph]
An ad hoc query expression is a query expression that contains the names of one or more resource types to query, an optional projection clause enumerating the properties of the resource to present in the response, an option selection clause that constraints the properties of those resources types in order to define a result set, an optional sorting clause specifying the order in which the result set is presented, and an optional unit of measure portrayal clause that specifies the units of measure to be used when encoding specific properties.

Page 10 6.3.2 XML encoding
[add]

...
For XML-encoded requests, standards that reference this International Standard shall use the fes:UomPortrayal element (see Section 9), which is substitutable for fes:AbstractUomPortrayalClause, to encode the unit of measure portrayal clause of an ad hoc query expression.

For KVP-encoded requests, the keywords UOMPROPERTY and UOM_PORTRAYAL shall be used to encode a unit of measure portrayal clause (see Table 2).

Page 18 - 7.5.2 Encoding
[Replace second paragraph]
The fes:Literal element is used to encode any explicitly stated value. If the literal value is a geometric value, the value shall be encoded following the rules of GML (defined in ISO 19136). If the value has a defined unit of measure and the service conforms to the unit of measure conversions conformance class (see Table 1 and/or A.16) then a gml:MeasureType with an appropriate uom attribute may instead be encoded.

Page 33 - Figure 10
[add]
+ ImplementsUomConversions : Boolean

Page 36 - Table 5 — Names of conformance class constraints
[add]
Unit of measure conversions | ImplementsUomConversions

Page 36 - 7.14.2 EXAMPLE
[add]
FALSE

Page 43 -
[add]
9 Unit of Measure Portrayals
9.1 General Considerations

The fes:UomPortrayal element (see Figure 19) is an optional part of a service-specific query and is included in the normative set of Filter schema files (i.e. " uom.xsd").

The fes:UomPortrayal element is used to specify properties whose values shall be encoded using a single unit of measure in place of the native measure. This International Standard requires that the service be responsible for converting values between from one UCUM defined unit of measure to another.

The fes:UomPortrayal element is only intended for usage with services which are conformant to the unit of measure conversion conformance class. See Table 1 for more information.

Figure 19 - UomPortrayal

```
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>UomPortrayal</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>+ uomPortrayalRequest [1..*] : UomPortrayalRequest</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>UomPortrayalRequest</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>+ valueReference : ValueReference</td>
</tr>
<tr>
<td>+ portrayalUom : UomSymbol</td>
</tr>
</tbody>
</table>
```

9.2 Encoding

The XML encoding for uom portrayals is defined by the following XML Schema fragment:
The fes:UomPortrayal element shall have a minimum of one and an unbounded number of fes:UomPortrayalRequest child elements.

The fes:UomPortrayalRequest element shall have a single property and UCUM defined unit of measure.

9.3 Exceptions

In the event that the fes:ValueReference element contains a reference to a value of an unknown resource type, the service shall raise an InvalidParameterValue (as given in OGC 06-121r3, Table 25)

In the event that the portrayalUom element contains a unit of measure which the service does not understand or is unable to convert the referenced value into then the service shall raise an InvalidParameterValue (as given in OGC 06-121r3, Table 25) exception.

Page 47 -

A.16 Test cases for unit of measure (UoM) conversions

a) Test purpose: Verify the correct method of performing UoM filters.

b) Test method: Verify that the UoM conformance class is satisfied. Submit two filter requests, each with a literal containing a gml:MeasureType where both are expressing the same value but with different UoM's. The results of both requests should be equivalent and be encoded with the same unit of measure.

c) Reference: 7.5.2

d) Test type: basic test.

[add]

A.17 Test cases for unit of measure (UoM) portrayals

a) Test purpose: Verify the correct method of performing UoM portrayals.

b) Test method: Verify that the UoM conformance class is satisfied. Submit two requests, each with a different UoM portrayal for the same value. The responses for both requests should be equivalent but differing in the unit of measure encoded for the specified value.

c) Reference: Section 9

d) Test type: basic test.

Page 74 - C.8 Filter capabilities examples

[add]

... FALSE ...

Page 76 - C.8 Filter capabilities examples

[add]

... FALSE ...

\\\\\\\\\\\\\\\///Web Feature Service 2.0\\\\\\\\\\\\\\\

Page 32 - Figure 8

[Update AdhocQueryExpression to changes in FES made in this change request]

Page 33 - Table 8

[add rows to indicate additions to Table 2 in FES made in this change]
This international standard only supports units of measure if the following conditions are met:

a) The service has indicated that it supports the Unit of measure conformance class as defined by the filter encoding specifications
b) The properties of a feature type being queried or portrayed with a UoM component have been listed in the GetCapabilities response as being 'unit of measure enabled'. See Figure 13.

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### Figure 13

<table>
<thead>
<tr>
<th>FeatureType</th>
<th>UomEnabledProperty[0..*] : UomEnabledProperty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UomEnabledProperty</td>
</tr>
<tr>
<td></td>
<td>+ uomEnabledProperty</td>
</tr>
<tr>
<td></td>
<td>+ valueReference : ValueReference</td>
</tr>
<tr>
<td></td>
<td>+ quantityType : UomSymbol</td>
</tr>
<tr>
<td></td>
<td>+ nativeUom : UomSymbol</td>
</tr>
</tbody>
</table>

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### FeatureTypeList section (example XSD)

```
...
```

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### Figure 17

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<table>
<thead>
<tr>
<th>Additional Documents affected:</th>
</tr>
</thead>
<tbody>
<tr>
<td>09-026r1 - OpenGIS Filter Encoding 2.0 Encoding Standard 09-025r1 - Web Feature Service 2.0</td>
</tr>
</tbody>
</table>

### Supporting Documentation:

A thorough overview of the existing problem and (unworkable) workarounds is documented at: [https://twiki.auscope.org/wiki/Grid/AuscopePortalUOMFilters](https://twiki.auscope.org/wiki/Grid/AuscopePortalUOMFilters)

### Comments:

Assigned

### Status:

Assigned