

Why URIs for quantities and units are important

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1 Why is the Web important?

The Web is here to stay. It has become an essential part of scientific and engineering practice.

The Web initially was concerned with person readable documents, which are identified by URIs. The Semantic Web is also concerned with objects and computer processable statements about the relationships between objects. Both the objects and the statements are identified by URIs.

2 What is a URI?

A URI is a identifier for an object which is used on the Web. The guidelines for the use of URIs state that a URI should always identify the same object.

Two types of URI in common use are:

- URN: an identifier for which an access method over the Web is not defined;
- HTTP URI: an identifier for which the HTTP access method is defined, but need not be provided.

The Web has thousands of URNs and billions of HTTP URIs.

3 Why does this affect standards for quantities and units?

Standards for quantities and units today are concerned with a) the definition of the concepts, and b) the representation of the concepts in person readable documents.

With the advent of the Semantic Web, it is also necessary to be concerned with c) the representation of the concepts on the Web.

4 Why should the Web be treated differently to other data representation standards?

Today there are many standards for the representation of scientific and engineering data, each with a particular domain of application. The standards define keywords corresponding to quantities and units, and specify how they are to be used within a particular domain of application. The definition of the keywords is in a person readable document, which makes reference to the standards for quantities and units.

The use of quantities and units on the Web is more similar to the use of quantities and units in person readable documents. The applications are widespread and unknown.

5 What are the implications of assigning a URI to a quantity or unit?

A URI is an identifier which is unique on the Web. A Technical Committee responsible for the definition of a quantity or unit can also specify its URI (or perhaps both a URN and an HTTP HRI).

There is no requirement that a URI can be accessed over the Web. However, an HTTP URI can be accessed, if the organisation controlling the URI wishes.

6 What happens if the responsible Technical Committee does not do this?

Others will. Probably there will be many different national and international standard which will assign URIs to quantities and units for use within particular applications domains.

7 Is there a specification for the form of the URI?

ISO Central Secretariat and the IETF hve agreed the form of a URN which can identify a standard, or an object defined within a standard - see "A Uniform Resource Name (URN) Namespace for the International Organization for Standardization (ISO)" <http://tools.ietf.org/html/draft-goodwin-iso-urn-03>).

A similar HTTP URI could also be used.

NOTE The form of a URN has to be agreed with the IETF. An HTTP URI can be anything which starts with a registered domain - e.g. [http://www.iso.org/.....](http://www.iso.org/) No agreement with the IETF is required.

8 Why are there URNs and HTTP URIs?

The use of URNs is a legacy of a now obsolete view of the Web architecture. With this obsolete view, there are things in the world and documents on the Web. Things in the world cannot be downloaded to your computer, so they are assigned URNs. Documents on the Web can be downloaded, so they are assigned HTTP URIs (called URLs in the obsolete view) which specifies the HTTP protocol for downloading.

The current view of the Web architecture is that all objects (things in the world or documents) can be assigned URIs. Access to an HTTP URI for an object can return:

1. nothing (error 404);
2. a description of the identified object - perhaps a definition or a reference to a definition;
3. if the identified object is a document, the content of that document.

The use of a URN is now nothing more than a statement that "the assigner of this URI does not intend to put any information about the identified object on the Web *ever!*".

9 Why should a standards organisation provide access to an HTTP URI?

If the standards organisation does not, then others will provide an equivalent access.

EXAMPLE If http://...uri_of_unit_u cannot be accessed, then another organisation "units-are-us" (say) will provide a "resolver" URI http://www.units-are-us.com/http://...uri_of_unit_u which can.

Access provided by the standards body can return:

1. a definition of the quantity or unit;

2. a reference to the standard which defines the quantity or unit;
3. other information about the quantity or unit, such as its representation in a person readable document;
4. if appropriate, information that the quantity or unit has been superseded and reference to its successor.

10 How will a URI for a quantity or unit be used?

The URI for a quantity or unit can be used in a computer processable representation of information that refers to objects by URI.

EXAMPLE 1 The statement that x is a length can be represented in MathML as follows:

```
<apply>
  <in/>
  <ci>x</ci>
  <ci definitionURL="http://...uri_of_length"/>
</apply>
```

EXAMPLE 2 The equation $x = 5 \text{ m}$ can be represented in MathML as follows:

```
<apply>
  <eq/>
  <ci>x</ci>
  <apply>
    <times/>
    <cn>5<cn>
    <ci definitionURL="http://...uri_of_the_metre"/>
  </apply>
</apply>
```

NOTE MathML has been used in these example. RDF is another representation which could take advantage of this. In RDF, example 1 would be:

```
<Description about="#x">
  <type resource="http://...uri_of_length"/>
</Description>
```

11 Can standards for quantities and units take advantage of computer processable representations of information?

The assignment of URIs to quantities and units makes this possible, but does not require that this shall be done.

A standard that defines quantities and units could also provide a computer processable representation of some of the information contained in normative text. This would enable some automated checks that the content of the standard was used appropriately.

EXAMPLE 1 The statement that the metre is a length can be represented in MathML as follows:

```
<apply>
  <in/>
  <ci definitionURL="http://...uri_of_the_metre"/>
  <ci definitionURL="http://...uri_of_length"/>
</apply>
```

EXAMPLE 2 The freezing point of silver is defined to be at 961.78 degrees Celsius according to ITS90. The thermodynamic temperature that is the freezing point of silver can be assigned a URI. In MathML we have:

```
<apply>
  <in/>
  <ci definitionURL="http://...uri_of_the_freezing_point_of_silver"/>
  <ci definitionURI="http://...uri_of_thermodynamic_temperature"/>
</apply>
```

```

<apply>
  <eq/>
  <apply>
    <ci definitionURL="http://...uri_of_celsius(t90)"/>
    <ci definitionURL="http://...uri_of_the_freezing_point_of_silver"/>
  </apply>
  <cn>961.78</cn>
</apply>

```

EXAMPLE 3 The statement that the international inch is 0.0254 m is as follows:

```

<apply>
  <eq/>
  <ci definitionURL="http://...uri_of_the_international_inch"/>
  <apply>
    <times/>
    <cn>0.0254</cn>
    <ci definitionURL="http://...uri_of_the_metre"/>
  </apply>
</apply>

```

EXAMPLE 4 The statement that Newton is kilogram.metre.(second-2) is as follows:

```

<apply>
  <eq/>
  <ci definitionURL="http://...uri_of_the_Newton"/>
  <apply>
    <times/>
    <ci definitionURL="http://...uri_of_the_kilogram"/>
    <apply>
      <divide/>
      <ci definitionURL="http://...uri_of_the_metre"/>
    </apply>
    <power/>
    <ci definitionURL="http://...uri_of_the_second"/>
    <cn>2</cn>
  </apply>
</apply>
</apply>
</apply>

```

12 Will other standards use URIs assigned by standards for quantities and units?

Yes. Other standards may wish to make statements about quantities and units which are valid only for a particular scientific or engineering domain.

EXAMPLE A standard concerned with geometry may wish to state that length is a manifold. This is convenient for geometry, but it is not known whether or not this is true in the real world at all scales.

```

<apply>
  <in/>
  <ci definitionURL="http://...uri_of_length"/>
  <ci definitionURL="http://...uri_of_manifold"/>
</apply>

```

13 Can access to a URI for a quantity or unit obtain computer processable information?

If access over the Web is supported at all, then it is most useful for this to be a person readable document. However, access can also obtain computer processable information if required.

There are different ways in which a computer application can request particular types of information from a URI. These are described in "Cool URIs for the Semantic Web" (<http://www.w3.org/TR/cooluris/>).