UnitsML

Representing Scientific Units of Measure and Quantities in XML

http://unitsml.nist.gov

UnitsML will enable markup of scientific units to allow unambiguous storage, exchange, and processing of numeric data. The project has three components:

- UnitsML – an XML schema
- UnitsDB – a database containing detailed information on scientific units of measure
- Tools – to facilitate the incorporation of UnitsML into other markup languages

UnitsML

UnitsML allows encoding of scientific units of measure and quantities into XML and will validate XML documents that use UnitsML. Initial development of this schema was done at NIST, but completion of the development process should include input from the international scientific and engineering community. Towards this end, we are initiating an OASIS Technical Committee to address any needed changes in the schema and publish a final recommendation.

Types of Units:
- SI (International System of Units) base and special derived units (e.g., meter, second, joule, volt)
- SI derived units (e.g., square meter, meter per second, mm · s^{-2})
- Non-SI units (e.g., minute, ångström, and inch)

We anticipate that UnitsML will be used by the developers of other markup languages to address the needs of specific communities (e.g. mathematics, chemistry, materials science, etc.). The UnitsML schema is not intended to be a standalone schema, but rather to be used in combination with other specific schemas through the appropriate use of namespaces.

UnitsDB

A database is under development to contain detailed units and dimensionality information for an extensive number of SI units and common, non-SI units. The database includes information needed to reference units in an XML document, and specifically includes:
- Unique identifiers
- Unit symbols
- Language-specific unit names
- Representations in terms of other units (including conversion factors)

In addition to scientific units, the database will include information about common quantities (e.g., length, mass), including the dimension of quantities with respect to the 7 base quantities.

Tools ◄

To aid in the deployment of UnitsML, appropriate tools are under development in order to encourage the adoption of UnitsML by the scientific community. Example tools include:

- Web Services – for machine-to-machine communication of information in UnitsDB
- Parser – for interpreting and providing appropriate XML for derived units not specifically contained in the database (e.g., mm $\cdot$ μs^{-2})
- Simple Editor – for incorporating UnitsML into other markup languages and for tagging units according to the UnitsML schema

► Example of Use

UnitsML used within another ML (AnIML – the Analytical Information Markup Language) through the proper use of namespaces

```xml
<?xml version="1.0"?>

<AnIML xmlns:animlcore="http://animl.sourceforge.net/CORE"
    xmlns:unitsml="http://unitsml.nist.gov/2005"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://animl.sourceforge.net/CORE
    http://animl.sourceforge.net/schema/animl-core.xsd"
    version="1.0">
...
  <animlcore:Parameter name="SampleAmount">
   <float32>12.2</float32>
    <unitsml:unitsml>
     <unitsml:units>
       <unitsml:unit numericID="NISTu27" symbolicID="g">
        <unitsml:system name="SI" type="SI_multiples_and_sub"/>
        <unitsml:name lang="en-US">gram</unitsml:name>
       </unitsml:unit>
     </unitsml:units>
    </unitsml:unitsml>
  ...
</AnIML>
```

NIST
National Institute of
Standards and Technology
Technology Administration
U.S. Department of Commerce