# GeoWeb 2006

# GML Processing Augmented with SVG Embedded Ontology and Meta Data

**David Dodds**

**Open-Meta Computing Inc**

First a brief review of the SVG Title and Description elements and then the SVG Metadata element.

SVG Title and Description elements:

From SVG Specification: Each container element or graphics element in an SVG document may supply a 'desc' and may also supply a 'title' description.

The 'desc' element contains a detailed description for the container or graphics element containing it. This description should be usable as replacement content for cases when the user cannot see the rendering of the SVG element for some reason.

The 'title' element contains a short title for the container or graphics element containing it. This short title provides information supplementary to the rendering of the element, but is not sufficient to replace it.

These are typically text, but can be content in other markup languages

```
<title>
  Some title text.
</title>

<desc>
  Some description text
  which can be multi-line.
</desc>
```

My original metadata section for SVG Spec 1.0 (http://www.w3.org/TR/SVG/metadata.html#Example) contains the SVG Description element with namespace usage, providing metadata information about a barchart. The same example contains the SVG Metadata element which contains RDF based metadata about a barchart. Examples of SVG Description and Title elements occurring in later versions of the SVG Specification seem to use the same barchart information.

http://www.w3.org/TR/SVG/struct.html#DescriptionAndTitleElements

```
<?xml version="1.0" standalone="no"?>
<!DOCTYPE svg SYSTEM
"http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">
<svg width="4in" height="3in" version="1.1"
    xmlns="http://www.w3.org/2000/svg">
<g>
 <title>
  Company sales by region
 </title>
 <desc>
  This is a bar chart which shows
  company sales by region.
 </desc>
 <!-- Bar chart defined as vector data -->
</g>
</svg>
```

Follows is my original metadata section for SVG Spec 1.0 http://www.w3.org/TR/SVG/metadata.html#Example

```
 <?xml version="1.0" standalone="yes"?>
 <svg width="4in" height="3in" version="1.1"
    xmlns = 'http://www.w3.org/2000/svg'>
    <desc xmlns:myfoo="http://example.org/myfoo">
      <myfoo:title>This is a financial report</myfoo:title>
      <myfoo:descr>The global description uses markup from the
       <myfoo:emph>myfoo</myfoo:emph> namespace.</myfoo:descr>
```

```
      <myfoo:scene><myfoo:what>widget $growth</myfoo:what>
      <myfoo:contains>$three $graph-bar</myfoo:contains>
       <myfoo:when>1998 $through 2000</myfoo:when> </myfoo:scene>
    </desc>
     <metadata>
      <rdf:RDF
          xmlns:rdf = "http://www.w3.org/1999/02/22-rdf-syntax-ns#"
          xmlns:rdfs = "http://www.w3.org/2000/01/rdf-schema#"
          xmlns:dc = "http://purl.org/dc/elements/1.1/" >
        <rdf:Description about="http://example.org/myfoo"
           dc:title="MyFoo Financial Report"
           dc:description="$three $bar $thousands $dollars $from 1998
$through 2000"
           dc:publisher="Example Organization"
           dc:date="2000-04-11"
           dc:format="image/svg+xml"
           dc:language="en" >
         <dc:creator>
          <rdf:Bag>
           <rdf:li>Irving Bird</rdf:li>
           <rdf:li>Mary Lambert</rdf:li>
          </rdf:Bag>
         </dc:creator>
        </rdf:Description>
      </rdf:RDF>
    </metadata>
  </svg>
```

Markup languages other than SVG can be used to package and structure data which is to be associated with the SVG file using it. Above we saw the namespace, myfoo, used to provide a structure, and by virtue of that, semantics to the description text. This means that a program using an XML parser can use this information not just human eyes. The metadata element uses the Dublin Core metadata system to describe contents in the SVG file.

# A number of examples of ontologies pertinent to GML geo-processing

(some item extracts from)
http://sweet.jpl.nasa.gov/ontology/material_thing.owl

```
<owl:Class rdf:ID="Equipment">
<rdfs:subClassOf rdf:resource="#Infrastructure"/>
</owl:Class>
<owl:Class rdf:ID="Instrument">
<rdfs:subClassOf rdf:resource="#Equipment"/>
</owl:Class>
<owl:Class rdf:ID="Facility">
<rdfs:subClassOf rdf:resource="#Infrastructure"/>
</owl:Class>
<owl:Class rdf:ID="Structure">
<rdfs:subClassOf rdf:resource="#Facility"/>
</owl:Class>
<owl:Class rdf:ID="Building">
<rdfs:subClassOf rdf:resource="#Structure"/>
</owl:Class>
<owl:Class rdf:ID="Computer">
<rdfs:subClassOf rdf:resource="#Equipment"/>
</owl:Class>
```

Class and subClassOf are the referents which signify levels / directions of hierarchy.

Directed graph structure is indicated by those two terms. Inferencing can use graph theory techniques on structures (such as ontologies) built from RDF-family elements such as subClassOf.

For example, in the above ontology excerpt we see that a Computer and a Building are different kinds of Infrastructure. The Computer is an Equipment kind of Infrastructure and the Building is a Facility kind of Infrastructure.

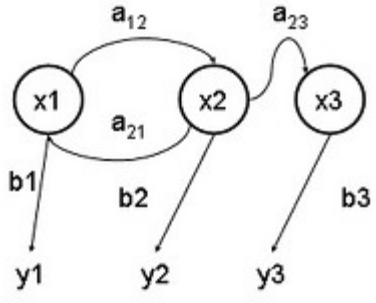
Perhaps one has other ontology members like:

```
<owl:Class rdf:ID="Barn">
<rdfs:subClassOf rdf:resource="#Building"/>
</owl:Class>
<owl:Class rdf:ID="School">
<rdfs:subClassOf rdf:resource="#Building"/>
</owl:Class>
<owl:Class rdf:ID="House">
<rdfs:subClassOf rdf:resource="#Building"/>
</owl:Class>
<owl:Class rdf:ID="GasStation">
<rdfs:subClassOf rdf:resource="#Building"/>
</owl:Class>
```

If our computer system determines that a School District has an Infrastructure then it can infer, by means of the previously mentioned inferencing techniques, that a School District may have Schools, Houses, and even Barns.

Since we might process our inferencing in either the up or down hierarchical direction we could also use detection of the presence of Schools in a geospatial data set to look further in the data set for confirmation of other Infrastructure elements, such as  Houses, GasStations etc.

Hidden Markov Models can be used with ontological structure leaves, such as House, School and GasStation (above) to generate or confirm Probabilistic Ontologies which can "shadow" OWL ontologies the way that topic maps can "shadow" geographic data sets, such as GML instances.




Markov Model

Shadowing is implied inclusion in a data set performed by use of references in the shadowing construction pointing at items in the shadowed data set.

Geospatial maps, for example, may have one or more Topic Maps which contain pointers into them, provide navigation etc for the maps just as though the information was actually present in the map data sets.

By having a topic map implemented via a Hidden Markov Model our geospatial system is able to make inferences bi-directionally, that is either towards the leaves of the graph structure or towards the topmost classes in the ontology. This provides the geospatial data processing computer with the ability to "predict" , through inferencing using the ontology graph structure, the inclusion of both items (like schools, houses) and structures (like organizations of schools, ie school districts) in a geospatial scenario, such as the School District data set.

Semantic Web for Earth and Environmental Terminology (SWEET)
There are 15 different ontologies in SWEET:
http://sweet.jpl.nasa.gov/ontology/ Earth Realm,
Physical Phenomena, Physical Process, Physical Property, Sun Realm, Biosphere, Data, Data Center, Human Activity, Material Thing, Numerics, Sensor, Space, Time, Units.
SWEET provides a computer knowledge in those 15 domains.

space.owl.xml

```
<owl:Class rdf:ID="Downward">
<owl:equivalentClass rdf:resource="#Down"/>
</owl:Class>
<owl:Class rdf:ID="Base">
<owl:equivalentClass rdf:resource="#Bottom"/>
</owl:Class>
<owl:Class rdf:ID="Bottom">
<rdfs:subClassOf>
<owl:Restriction>
<owl:onProperty rdf:resource="#hasDirection"/>
<owl:allValuesFrom rdf:resource="#Down"/>
</owl:Restriction>
```

</rdfs:subClassOf>
<rdfs:subClassOf
rdf:resource="http://sweet.jpl.nasa.gov/ontology/numerics.owl#Maximum"/>
</owl:Class>

expressed in OWL a class-name y is expressed to be a synonym of class-name x by using the equivalentClass term, such as Y is a synonym of X, =
<owl:Class rdf:ID="Yyy">
<owl:equivalentClass rdf:resource="#Xxxx"/>

"base is the maximum downward direction and is a synonym for bottom", the base of a statue is therefore the maximum downward direction in/of the statue if foot is located at the bottom of x then foot is located at the maximum downward direction in/of x. For example: axis-labelling is located below the base of the graphs.

<owl:Class rdf:ID="ExtensiveQuantity">
<rdfs:subClassOf rdf:resource="#PhysicalQuantity"/>
</owl:Class>
-
<owl:Class rdf:ID="IntensiveQuantity">
<rdfs:subClassOf rdf:resource="#PhysicalQuantity"/>
</owl:Class>
-
<owl:Class rdf:ID="SpatialExtentRelatedQuantity">
<rdfs:subClassOf rdf:resource="#ExtensiveQuantity"/>
</owl:Class>
-
<owl:Class rdf:ID="SpatialExtent">
<rdfs:subClassOf rdf:resource="#SpatialExtentRelatedQuantity"/>
</owl:Class>

Simple inferencing determines from the above ontology segment that a SpatialExtent is a PhysicalQuantity, common sense to you and me but news to a computer where no one is home. By means of these ontologies the geospatial processing computer can “see” that real geo-things have a spatial

extent and that that is represented via numeric value, and so it can use this knowledge to determine completeness and reasonableness of geo-spatial data sets. Look at it as a semantic version of DTDs / Schemas.
Following is an extract from my procedural knowledge based geospatial system. It uses co-ordinate and geometric information from SVG “pictures” and from GML files.
Ontologies are declarative and my system (example below) is based on performing logical tests, or procedures, upon data from geospatial data sets and from SVG data sets. The ontology item:

<rdf:Property ID="IsNear">
<rdfs:comment>has a degree of nearness (by value).
g1(x)</rdfs:comment>
<rdfs:range.rdf:resource="#www.open-meta.com/2001/
IsNear" />
<rdfs:domain rdf:resource="#SvgEntity" />
</rdf:Property>

the procedure used to perform the test, in this case distance of separation of two points is “near” by some measure:

IsNear = g1 = 1 - (1/2 + 1/PI*arctan((sqrt((x2-x1)^2+(y2-
y1)^2))-k(1)/k(2)))

Rather than being (effectively) binary like most ontology terms, the procedurally based ontology is active and may have qualitative values for its terms.

# Examples of SVG files containing embedded ontological and metadata content

```
<?xml-stylesheet type="text/xsl" href="anim02.xsl"?>
<svg width="16cm" height="14cm" viewBox="0 0 255 201">
<metadata xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:rdfs="http://www.w3.org/TR/. ..-schema#"
xmlns:dxsvg="http://www.open-meta.com/dxschema/">
<rdf:Description about="#arrowstreamer">
<dxsvg:Ingress resource="#funnel"/>
</rdf:Description>
<rdf:Description about="#arrowstreamer">
<dxsvg:Inside resource="#funnel" />
</rdf:Description>
<rdf:Description about="#funnel">
<dxsvg:Containz resource="#arrowstreamer"/>
</rdf:Description>
<rdf:Description about="#arrowstreamer">
<opencyc:above-Generally resource="#funnel" />
</rdf:Description>
</metadata>
<desc>Copyright 2006 David Dodds Example anim02 – demonstrate deBono diagram SVG animation with Lakoff spatial metaphor</desc>
<rect x="1" y="1" width="253" height="199"
fill="black" stroke="blue" stroke-width="7" />
<text id="uplabel" x="230" y="20" style="font-family: Verdana; font-size:12.333; fill:blue">UP</text>
<text id="downlabel" x="200" y="180" style="font-family: Verdana; font-size:12.333; fill:blue">DOWN</text>
<g id="leftfunnelside">
<path d="M 99 180 L 99 57"
style="fill:none; stroke:green; stroke-width:10"/> </g>
<g id="rightfunnelside">
<path d="M 153 57 L 153 180 " style="fill:none; stroke:green; stroke-width:10"/> </g>
<rect id="arrowstreamer" x="110" width="3" height="20" >
<animate attributeName="y" attributeType="XML"
begin="0s" dur="5s" fill="freeze" from="50" to="170" />
<animate attributeName="height" attributeType="XML"
begin="0s" dur="5s" fill="freeze" from="20" to="143" />
<animateColor attributeName="fill" attributeType="CSS"
from="rgb(0,0,255)" to="rgb(110,0,0)"
begin="0s" dur="5s" fill="freeze" /> </rect>
</svg>
```

<?xml version="1.0" standalone="yes" ?>
<svg xmlns = 'http://www.w3.org/2000/svg'>
<metadata xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
        xmlns:rdfs="http://www.w3.org/TR/. ..-schema#"
        xmlns:dxsvg="http://www.open-meta.com/dxschema/" >
 <rdf:Description about="#text1">
   <dxsvg:Below resource="#xbaseline"/>
 </rdf:Description>
 <rdf:Description about="#text1">
   <dxsvg:IsNear resource="#xbaseline" />
 </rdf:Description>
 <rdf:Description about="#text2">
   <dxsvg:Below resource="#text1"/>
 </rdf:Description>
 <rdf:Description about="#text2">
   <dxsvg:IsNear resource="#text1" />
 </rdf:Description>
 <rdf:Description about="#endlineleft">
   <dxsvg:AtRight resource="#line1"/>
 </rdf:Description>
 <rdf:Description about="#endlineleft">
   <dxsvg:IsNear resource="#line1" />
 </rdf:Description>
 <rdf:Description about="#endlineright">
   <dxsvg:AtLeft resource="#bar13"/>
 </rdf:Description>
 <rdf:Description about="#endlineright">
   <dxsvg:IsNear resource="#bar13" />
 </rdf:Description>
 <rdf:Description about="#line1">
   <dxsvg:AtRight resource="#line2" />
 </rdf:Description>
 <rdf:Description about="#line2">
   <dxsvg:AtRight resource="#line3" />
 </rdf:Description>
 <rdf:Description about="#line3">
   <dxsvg:AtRight resource="#line4" />
 </rdf:Description>
 <rdf:Description about="#line4">
   <dxsvg:AtRight resource="#line5" />
 </rdf:Description>
 <rdf:Description about="#line5">
   <dxsvg:AtRight resource="#line6" />
 </rdf:Description>
 <rdf:Description about="#line6">
   <dxsvg:AtRight resource="#line7" />
 </rdf:Description>
 <rdf:Description about="#line7">
   <dxsvg:AtRight resource="#line8" />
 </rdf:Description>
 <rdf:Description about="#line8">
   <dxsvg:AtRight resource="#line9" />
 </rdf:Description>
 <rdf:Description about="#line9">
   <dxsvg:AtRight resource="#line10" />
 </rdf:Description>
 <rdf:Description about="#line10">
   <dxsvg:AtRight resource="#line11" />

```
  </rdf:Description>
  <rdf:Description about="#line11">
    <dxsvg:AtRight resource="#line12" />
  </rdf:Description>
</metadata>
<rect x="37" y="190" width="280" height="1" style="stroke:black; stroke-width:1" />
<text id="text3" x="317" y="194"
  style="font-family:Verdana; font-size:12.333; fill:indigo">
18
</text>
<rect x="333" y="96" width="1" height="104" style="stroke:black; stroke-width:1" />
<rect x="37" y="96" width="1" height="104" style="stroke:black; stroke-width:1" />
<rect id="line1" x="40" y="160" width="20" height="40" style="stroke:green; fill:green; stroke-width:0" />
<rect id="line2" x="60" y="140" width="20" height="60" style="stroke:yellow; fill:yellow; stroke-width:0" />
<rect id="line3" x="80" y="111" width="20" height="89" style="stroke:red; fill:red; stroke-width:0" />
<rect id="line4" x="100" y="130" width="20" height="70" style="stroke:yellow; fill:yellow; stroke-width:0" />
<rect id="line5" x="120" y="173" width="20" height="27" style="stroke:green; fill:green; stroke-width:0" />
<rect id="line6" x="140" y="191" width="20" height="09" style="stroke:green; fill:green; stroke-width:0" />
<rect id="line7" x="160" y="140" width="20" height="60" style="stroke:yellow; fill:yellow; stroke-width:0" />
<rect id="line8" x="180" y="167" width="20" height="33" style="stroke:green; fill:green; stroke-width:0" />
<rect id="line9" x="200" y="175" width="20" height="25" style="stroke:green; fill:green; stroke-width:0" />
<rect id="line10" x="220" y="129" width="20" height="71" style="stroke:yellow; fill:yellow; stroke-width:0" />
<rect id="line11" x="240" y="150" width="20" height="50" style="stroke:green; fill:green; stroke-width:0" />
<rect id="line12" x="260" y="139" width="20" height="61" style="stroke:yellow; fill:yellow; stroke-width:0" />
<rect id="line13" x="280" y="125" width="20" height="75" style="stroke:yellow; fill:yellow; stroke-width:0" />
<text id="text1" x="37" y="210"
  style="font-family:Verdana; font-size:12.333; fill:black">
87  88  89  90  91  92  93  94  95  96  97  98  99
</text>
<text id="text2" x="37" y="230"
  style="font-family:Verdana; font-size:12.333; fill:brown">
Mean High Ratings August 1999
</text>
</svg>
```

(updated version)

```
<?xml version="1.0" standalone="yes"?>
 <svg width="4in" height="3in" version="1.1"
    xmlns = 'http://www.w3.org/2000/svg'>
    <desc xmlns:myfoo="http://example.org/myfoo">
      <myfoo:title>This is a financial report</myfoo:title>
      <myfoo:descr>The global description uses markup from the
        <myfoo:emph>myfoo</myfoo:emph> namespace.</myfoo:descr>
      <myfoo:scene><myfoo:what>widget growth</myfoo:what>
      <myfoo:contains>three graph-bar</myfoo:contains>
        <myfoo:when>1998 through 2000</myfoo:when>
        <myfoo:data>100 250 319</myfoo:data></myfoo:scene>
   </desc>
    <metadata>
      <rdf:RDF
          xmlns:rdf = "http://www.w3.org/1999/02/22-rdf-syntax-ns#"
          xmlns:rdfs = "http://www.w3.org/2000/01/rdf-schema#"
          xmlns:dc = "http://purl.org/dc/elements/1.1/" >
        <rdf:Description about="http://example.org/myfoo"
            dc:title="MyFoo Financial Report"
            dc:description="three bar thousands dollars from 1998 through 2000 dataurl http://example.org/myfoodata"
            dc:publisher="Example Organization"
            dc:date="2000-04-11"
```

```
            dc:format="image/svg+xml"
            dc:language="en" >
          <dc:creator>
            <rdf:Bag>
              <rdf:li>Irving Bird</rdf:li>
              <rdf:li>Mary Lambert</rdf:li>
            </rdf:Bag>
          </dc:creator>
        </rdf:Description>
      </rdf:RDF>
    </metadata>
<rect id="bar1" x="50" y="155" width="20" height="40" style="stroke:green; fill:red; stroke-width:0" />
<rect id="bar2" x="95" y="135" width="20" height="60" style="stroke:yellow; fill:yellow; stroke-width:0" />
<rect id="bar3" x="140" y="106" width="20" height="89" style="stroke:red; fill:green; stroke-width:0" />
<text id="text1" x="37" y="210"
  style="font-family:Verdana; font-size:12.333; fill:black">
1998 1999 2000
</text>
<text id="text2" x="37" y="230"
  style="font-family:Verdana; font-size:12.333; fill:green">
$100 $250 $319 (thousands dollars)
</text>
<text id="text3" x="37" y="265"
  style="font-family:Verdana; font-size:12.333; fill:brown">
MyFoo Financial Report  widget growth
</text>
<text id="text4" x="37" y="285"
  style="font-family:Verdana; font-size:12.333; fill:brown">
Example Organization  2000-04-11
</text>
<text id="text5" x="180" y="175"
  style="font-family:Verdana; font-size:12.333; fill:blue">
thousands dollars
</text>
 </svg>
```

(from CYC ontology)

```
<rdf:Property rdf:ID="above-Directly">
<rdfs:label xml:lang="en">above - directly</rdfs:label>
<rdfs:comment>(#$above-Directly ABOVE BELOW) means either that (1) the volumetric center of ABOVE is directly above some point of BELOW, if ABOVE is smaller than BELOW; or that (2) some point of ABOVE is directly above the volumetric center of BELOW, if ABOVE is larger than, or equal in size to, BELOW.</rdfs:comment>
<guid>bd58fbde-9c29-11b1-9dad-c379636f7270</guid>
<rdfs:subPropertyOf rdf:resource="#above-Generally"/>
<rdfs:domain rdf:resource="#SpatialThing-Localized"/>
<rdfs:range rdf:resource="#SpatialThing-Localized"/>
</rdf:Property>
```

(from author's procedural ontology)

```
<rdf:Property ID="Above">
<rdfs:comment>centroid of OBJY1 is anywhere above the centroid of OBJY2. Above means a y-axis value for OBJY1 which is less than the y-axis for OBJY2. (2D)          </rdfs:comment>
<rdfs:range rdf:resource="#SvgEntity" />
<rdfs:domain rdf:resource="#SvgEntity" />
</rdf:Property>
```

```
public real Above( int y1, int y2 )
    {
      if (y1 < y2 )       //2D Above
      {
        /* Far( ) = 1 – IsNear( ) */
        return 1 - ( IsNear(y2-y1) );
      }
      else
      {
        return 0;
      }
}
```

# The school district GML data set is used in conjunction with some ontologies to demonstrate (SVG) graphics which know what they mean, adding the availability of semantic queries to those of regular geo-spatial information processing.

## Listing F.2.2.2 schools.xml xsi:schemaLocation="http://www.opengis.net/examples schools.xsd"

school district(s), from GML dataset.
Each has a stringname and has a named geographical region as a location indicator or a collection of points (coordinates) in some spatial reference system. Since they are spatially disjoint they have locations in "direction" (like north, south, northwest, etc) relative to / from each other. Regions have an area magnitude aka size. They have "content" (generally) such as grass , dirt, water, trees, buildings, animals / people, roads, in various degrees at various sub-regions or #$Place's. Therefore school district 5 may be 'north' of school district 7 and part of a school district's #$boundary may be #$Water (of type #$Ocean, for example.) Maybe these two districts are contained in a super-region called 'Pacific NorthWest'. Pacific is a reference to the ocean which partly borders this super-region. NorthWest is a direction (away) from a central point or origin (aka '1030' on the clock face)

Examples of CYC ontology knowledge fragments:

#$SpatiallyDisjointRegionType region types whose instances are non-overlapping region types
..each of the regions in the collection is spatially disjoint with the other regions in the collection. Other instances of #$SpatiallyDisjointRegionType include #$CanadianProvince, #$IndependentCountry, #$City, and #$Colony. A non-example is #$EcologicalRegion, since ecological regions can overlap.
guid: bd58e513-9c29-11b1-9dad-c379636f7270
direct instance of: #$SecondOrderCollection #$AtemporalNecessarilyEssentialCollectionType
direct specialization of: #$RegionType

#$bordersOn borders on

(#$bordersOn REGION1 REGION2) means that the #$GeographicalRegions REGION1 and REGION2 are physically adjacent to each other and do not overlap, i.e. there is a border between them. Examples: (#$bordersOn #$CentralUSATimeZone #$MountainUSATimeZone), (#$bordersOn (#$TerritoryFn #$Nepal) (#$TerritoryFn #$Tibet).
guid: bd58e17a-9c29-11b1-9dad-c379636f7270
direct instance of: #$SymmetricBinaryPredicate #$IrreflexiveBinaryPredicate #$InterExistingObjectPredicate #$SpatialPredicate
direct specialization of: #$onSamePlanetSurfaceAs #$adjacentTo #$touchesDirectly-Apartanomic

#$SpatialPredicate spatial relations

A specialization of #$CotemporalPredicate. Each instance of #$SpatialPredicate is a spatial relation that can (only) hold between one or more #$SpatialThings, and is used to state something about its/their spatial location(s), position(s), or orientation(s). Note that when a #$SpatialPredicate has a #$Group as one of its arguments, a certain spatial relationship is ususally being asserted to hold of all or most of the members of that group; but there are exceptions (e.g. #$in-Among) for which this is not the case.
guid: bd58bc17-9c29-11b1-9dad-c379636f7270
direct instance of: #$PredicateCategory #$AtemporalNecessarilyEssentialCollectionType
direct specialization of: #$CotemporalPredicate
direct generalization of: #$ConnectionPredicate

<?xml version="1.0" standalone="yes" ?>
<svg xmlns = 'http://www.w3.org/2000/svg'  id="metadata-GML-2006" width="450" height="450" >
<title id="test-title">metadata-GML-2006</title>
<desc id="test-desc">Verify that the SVG viewer handles
the presence of (GML) metadata and associated elements.</desc>
<metadata xmlns="http://www.opengis.net/examples" xmlns:gml="http://www.opengis.net/gml"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.opengis.net/examples schools.xsd"
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:owl="http://www.w3.org/2002/07/owl#"
xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#" >
<State>
<gml:description>
Educational institutions with student populations exceeding 500.
</gml:description>
<gml:name>School districts in the North Region.</gml:name>
<gml:boundedBy>
<gml:Box srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
<gml:coordinates>0,0</gml:coordinates>
<gml:coordinates>50,50</gml:coordinates>
</gml:Box>
</gml:boundedBy>
<gml:featureMember>
<SchoolDistrict>
<gml:name>District 28</gml:name>
<gml:boundedBy>
<gml:Box srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
<gml:coordinates>0,0</gml:coordinates>
<gml:coordinates>50,40</gml:coordinates>
</gml:Box>
</gml:boundedBy>
<schoolMember>
<School>
<gml:name>Alpha</gml:name>
<address>100 Cypress Ave.</address>
<gml:location>
<gml:Point srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
<gml:coordinates>20.0,5.0</gml:coordinates>
</gml:Point>
</gml:location>
</School>
</schoolMember>
<schoolMember>
<School>
<gml:name>Beta</gml:name>
<address>1673 Balsam St.</address>
<gml:location>
<gml:Point srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
<gml:coordinates>40.0,5.0</gml:coordinates>
</gml:Point>
</gml:location>
</School>
</schoolMember>
<gml:extentOf>
<gml:Polygon srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
<gml:outerBoundaryIs>
<gml:LinearRing>
<gml:coordinates>0,0</gml:coordinates>

<gml:coordinates>50,0</gml:coordinates>
<gml:coordinates>50,40</gml:coordinates>
<gml:coordinates>0,0</gml:coordinates>
</gml:LinearRing>
</gml:outerBoundaryIs>
</gml:Polygon>
</gml:extentOf>
</SchoolDistrict>
</gml:featureMember>
<gml:featureMember>
<SchoolDistrict>
<gml:name>District 32</gml:name>
<gml:boundedBy>
<gml:Box srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
<gml:coordinates>0,0</gml:coordinates>
<gml:coordinates>30,50</gml:coordinates>
</gml:Box>
</gml:boundedBy>
<schoolMember>
<School>
<gml:name>Gamma</gml:name>
<address>651 Sequoia Ave.</address>
<gml:location>
<gml:Point srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
<gml:coordinates>5.0,20.0</gml:coordinates>
</gml:Point>
</gml:location>
</School>
</schoolMember>
<schoolMember>
<College>
<gml:name>Delta</gml:name>
<address>260 University Blvd.</address>
<gml:pointProperty>
<gml:Point srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
<gml:coordinates>5.0,40.0</gml:coordinates>
</gml:Point>
</gml:pointProperty>
</College>
</schoolMember>
<schoolMember xlink:type="simple" xlink:title="Epsilon High School" xlink:href="http:www.state.gov/schools/cgibin/
wfs?schoolID=hs736" gml:remoteSchema="schools.xsd#xpointer(//complexType[@name='SchoolType'])"/>
<gml:extentOf>
<gml:Polygon srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
<gml:outerBoundaryIs>
<gml:LinearRing>
<gml:coordinates>0,0</gml:coordinates>
<gml:coordinates>40,50</gml:coordinates>
<gml:coordinates>50,50</gml:coordinates>
<gml:coordinates>0,0</gml:coordinates>
</gml:LinearRing>
</gml:outerBoundaryIs>
</gml:Polygon>
</gml:extentOf>
</SchoolDistrict>
</gml:featureMember>
<studentPopulation>392620</studentPopulation>
</State>

<rdf:RDF
<owl:Ontology rdf:about="">
<owl:Class rdf:ID="schoolMember">
<rdfs:subClassOf rdf:resource="#SchoolDistrict"/>
<owl:Class rdf:ID="School">
<rdfs:subClassOf rdf:resource="#schoolMember"/>
<owl:Class rdf:ID="College">
<rdfs:subClassOf rdf:resource="#schoolMember"/>
<rdf:Property rdf:ID="above-Directly">
<rdfs:label xml:lang="en">above - directly</rdfs:label>
<rdfs:comment>(#$above-Directly ABOVE BELOW) means either that (1) the volumetric center of ABOVE is directly above some point of BELOW, if ABOVE is smaller than BELOW; or that (2) some point of ABOVE is directly above the volumetric center of BELOW, if ABOVE is larger than, or equal in size to, BELOW.</rdfs:comment>
<guid>bd58fbde-9c29-11b1-9dad-c379636f7270</guid>
<rdfs:subPropertyOf rdf:resource="#above-Generally"/>
<rdfs:domain rdf:resource="#SpatialThing-Localized"/>
<rdfs:range rdf:resource="#SpatialThing-Localized"/>
</rdf:Property>
</rdf:RDF>
</metadata>
<rect id="box1" x="0" y="0" width="50" height="50" style="stroke:green; fill:none; stroke-width:1" />
<title>  School districts in the North Region.  </title>
 <desc>  Educational institutions with student populations exceeding 500.  </desc>
<rect id="box2" x="0" y="0" width="50" height="40" style="stroke:blue; fill:none; stroke-width:1" />
<title>District 28</title>
<rect id="box3" x="0" y="0" width="30" height="50" style="stroke:brown; fill:none; stroke-width:1" />
and a bunch more SVG statements which draw the boxes, points and other geometric figures described in the GML metadata above and place the associated text near by.
  </svg>

findings by the system:
object1 named School districts in the North Region., isa area rectangle 2500 untyped units.
object2 named District 28, isa area rectangle 2000 untyped units.
object2 is instance1 childOf  SchoolDistrict instance1.
object3 named Alpha, isa location point 20.0,5.0 untyped units, note address 100 Cypress Ave.
object4 is School instance2 hasChild named Beta, isa location point 40.0,5.0 untyped units, note address 1673 Balsam St.
object5 named  District 32, isa area rectangle 1500 untyped units.
object5 is instance1 childOf  SchoolDistrict instance2.
SchoolDistrict instance2 hasChild schoolMember School instance1 hasChild named Gamma, isa location point 5.0,20.0 untyped units.
SchoolMember instance2 hasChild instance1 College named Delta, isa location point 5.0,40.0 untyped units.

Contained in the area  named School districts in the North Region is  the area named District 28 which is the largest of the two contained areas there.
 (upper left coordinate “corner” = zero, zero; = “North” and “West”)
100 Cypress Ave is [qualitative amount] “left of” (west of?) 1673 Balsam St.
Delta College is [qualitative amount] “below” (south of?) both Beta School and Gamma School.

GOOGLE “David Dodds xml svg” to locate and read my other papers in this area.