

GML

- Standard OGC
- Grammatica XML scritta in XML Schema
- Molto diffuso
- Standard corposo
 - Diversi profile

1

GML

- Citando lo standard:
"This International Standard defines the XML Schema syntax, mechanisms and conventions that:
 - provide an open, vendor-neutral framework for the description of geospatial application schemas for the transport and storage of geographic information in XML;
 - allow profiles that support proper subsets of GML framework descriptive capabilities;

2

GML

- enable the creation and maintenance of linked geographic application schemas and datasets;
- support the storage and transport of application schemas and datasets;
- increase the ability of organizations to share geographic application schemas and the information they describe."

3

GML

- Versioni
 - 2.1.2, 3.1, 3.2.1
 - alcuni cambiamenti
- namespace utilizzati
 - <http://www.w3.org/1999/xlink> xlink
 - <http://www.opengis.net/gml> gml < 3.2.1
 - <http://www.opengis.net/gml/3.2> gml 3.2.1

4

GML

- Definisce propri
 - simple type
 - complex type
- Oggetti GML -> elementi XML
- Proprietà oggetti GML -> elementi XML
- Attributi delle proprietà -> attributi XML

5

Convenzioni

- oggetti sono istanziati come elementi XML con un nome in UpperCamelCase;
- le proprietà sono istanziate come elementi XML i cui nomi sono in lowerCamelCase;
- gli elementi astratti hanno il nome preceduto da "Abstract" (oggetti) o "abstract" (proprietà) ("_" gml < 3.2.1);
- i nomi dei complex types sono in UpperCamelCase e terminano in "Type";
- i tipi astratti cominciano con la parola "Abstract"

6

Oggetti

- Un oggetto GML è un elemento XML di un tipo derivato direttamente o indirettamente da AbstractGMLType

```
<element name="AbstractObject" abstract="true"/>
<element name="AbstractGML" type="gml:AbstractGMLType" abstract="true"
substitutionGroup="gml:AbstractObject"/>
<complexType name="AbstractGMLType" abstract="true">
  <sequence>
    <group ref="gml:StandardObjectProperties"/>
  </sequence>
  <attribute ref="gml:id" use="required"/>
</complexType>
```

7

Proprietà

- caratteristica di un oggetto GML
- un elemento in un documento GML è una proprietà se e solo se è figlio di un oggetto GML
- gli oggetti GML possono avere un numero illimitato di proprietà
- NON deriva da AbstractGMLType
- indicata in due modi:
 - per valore e per riferimento

8

Proprietà: esempi

```
<gml:centerOf>
  <gml:Point gml:id="point96" srsName="urn:x-ogc:def:crs:EPSG::4326">
    <gml:pos>-31.936 15.834</gml:pos>
  </gml:Point>
</gml:centerOf>
```

OPPURE

```
<gml:centerOf xlink:href="http://my.big.org/locations/point53"/>
```

9

Proprietà

```
<group name="StandardObjectProperties">
  <sequence>
    <element ref="gml:metaDataProperty" minOccurs="0"
maxOccurs="unbounded"/>
    <element ref="gml:description" minOccurs="0"/>
    <element ref="gml:descriptionReference" minOccurs="0"/>
    <element ref="gml:identifier" minOccurs="0"/>
    <element ref="gml:name" minOccurs="0" maxOccurs="unbounded"/>
  </sequence>
</group>
<element name="description" type="gml:StringOrRefType"/>
<element name="descriptionReference" type="gml:ReferenceType"/>
<element name="name" type="gml:CodeType"/>
<element name="identifier" type="gml:CodeWithAuthorityType"/>
<attribute name="id" type="ID"/>
```

10

Feature

- Una feature GML è un oggetto significativo nel dominio del discorso considerato.
 - Es. fiume, persona, automobile, ecc...
- presenta diverse tipologie di proprietà:
 - standard
 - geometriche
 - topologiche
 - temporali

11

Feature

```
<complexType name="AbstractFeatureType" abstract="true">
  <complexContent>
    <extension base="gml:AbstractGMLType">
      <sequence>
        <element ref="gml:boundedBy" minOccurs="0"/>
        <element ref="gml:location" minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
<element name="AbstractFeature" type="gml:AbstractFeatureType" abstract="true"
substitutionGroup="gml:AbstractGML"/>
```

12

Feature

- i tipi di feature sono elementi XML
- il tipo deriva da `gml:AbstractFeatureType`
- l'elemento fa parte del `gml:AbstractFeature substitution group` (direttamente o indirettamente)
- il nome dell'elemento denota il valore semantico

```
<element name="<<featureName>>"
type = "<<contentModel >>"
substitutionGroup="gml:AbstractFeature" />
```

13

Feature: esempio

```
<complexType name="RadioTowerType">
<complexContent>
<extension base="gml:AbstractFeatureType">
<sequence>
<element name="location" type="gml:PointPropertyType"/>
<element name="floorSpace" type="gml:SurfacePropertyType"/>
<element name="serviceArea" type="gml:SurfacePropertyType"/>
<!-- ... -->
</sequence>
</extension>
</complexContent>
</complexType>

<element name="RadioTower" type="RadioTowerType"
substitutionGroup="gml:AbstractFeature"/>
```

14

Feature collection

- collezione di istanze di feature
- presenta una proprietà il cui tipo deriva da `gml:AbstractFeatureMemberType`
- può presentare una proprietà derivata da `gml:AggregationAttributeGroup` per fornire informazioni circa la semantica della collezione

15

Feature collection

```
<element name="Road" type="ex:RoadType" substitutionGroup="gml:AbstractFeature"/>

<complexType name="RoadType">
<complexContent>
<extension base="gml:AbstractFeatureType">
<sequence>
<element name="segment" type="ex:RoadMemberType" minOccurs="0"
maxOccurs="unbounded"/>
</sequence>
<attributeGroup ref="gml:AggregationAttributeGroup"/>
</extension>
</complexContent>
</complexType>
```

16

Feature collection

```
<complexType name="RoadMemberType">
<complexContent>
<extension base="gml:AbstractFeatureMemberType">
<sequence minOccurs="0">
<element ref="ex:RoadSegments"/>
</sequence>
<attributeGroup ref="gml:AssociationAttributeGroup"/>
</extension>
</complexContent>
</complexType>
<Road gml:id="r1" aggregationType="sequence">
<segment>
<RoadSegment gml:id="s1"/>
</segment>
<segment xlink:href="#s8"/>
<segment>
<RoadSegment gml:id="s4"/>
</segment>
</Road>
```

17

Geometrie

- ogni tipo di geometria deriva da `AbstractGeometryType`
- ogni elemento geometrico è direttamente o indirettamente nel `substitution group` di `AbstractGeometry`

```
<complexType name="AbstractGeometryType" abstract="true">
<complexContent>
<extension base="gml:AbstractGMLType">
<attributeGroup ref="gml:SRSReferenceGroup"/>
</extension>
</complexContent>
</complexType>
<element name="AbstractGeometry" type="gml:AbstractGeometryType"
abstract="true" substitutionGroup="gml:AbstractGML" />
```

18

Geometrie: coordinate

```
<complexType name="CoordinatesType">
  <simpleContent>
    <extension base="string">
      <attribute name="decimal" type="string" default=""/>
      <attribute name="cs" type="string" default=""/>
      <attribute name="ts" type="string" default="&#x20;"/>
    </extension>
  </simpleContent>
</complexType>
```

ES.

```
<gml:coordinates decimal="." cs="." ts=" " > 1.413,4.524 1.429,5.516
1.432,7.235 </gml:coordinates>
```

19

Geometrie: coordinate (3.x.x)

```
<complexType name="DirectPositionType">
  <simpleContent>
    <extension base="gml:doubleList">
      <attributeGroup ref="gml:SRSReferenceGroup"/>
    </extension>
  </simpleContent>
</complexType>
```

```
<element name="pos" type="gml:DirectPositionType"/>
```

ES.

```
<gml:pos>671962.08125 5138438.105288462</gml:pos>
```

20

Geometrie: coordinate (3.x.x)

```
<complexType name="DirectPositionListType">
  <simpleContent>
    <extension base="gml:doubleList">
      <attributeGroup ref="gml:SRSReferenceGroup"/>
      <attribute name="count" type="positiveInteger" />
    </extension>
  </simpleContent>
</complexType>
```

```
<element name="posList" type="gml:DirectPositionListType" />
```

ES.

```
<gml:posList>
671962.08125 5138438.105288462 671962.08125 5138438.105288462
5138438.105288462 671962.08125 5138438.105288462 671962.08125
</gml:posList>
```

21

Primitive geometrie: point

```
<complexType name="PointType">
  <complexContent>
    <extension base="gml:AbstractGeometricPrimitiveType">
      <sequence>
        <choice>
          <element ref="gml:pos" />
          <element ref="gml:coordinates" />
        </choice>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

```
<element name="Point" type="gml:PointType"
substitutionGroup="gml:AbstractGeometricPrimitive" />
```

22

Primitive geometrie: linestring

```
<complexType name="LineStringType">
  <complexContent>
    <extension base="gml:AbstractCurveType">
      <sequence>
        <choice>
          <choice minOccurs="2" maxOccurs="unbounded">
            <element ref="gml:pos"/>
            <element ref="gml:pointProperty"/>
            <element ref="gml:pointRep"/>
          </choice>
          <element ref="gml:posList"/>
          <element ref="gml:coordinates"/>
        </choice>
      </sequence>
    </extension>
  </complexContent>
</complexType>
<element name="LineString" type="gml:LineStringType"
substitutionGroup="gml:AbstractCurve" />
```

23

Primitive geometrie: linestring

```
<complexType name="AbstractCurveType" abstract="true">
  <complexContent>
    <extension base="gml:AbstractGeometricPrimitiveType"/>
  </complexContent>
</complexType>
<element name="AbstractCurve" type="gml:AbstractCurveType" abstract="true"
substitutionGroup="gml:AbstractGeometricPrimitive" />
```

24

Riferimenti

- <http://www.opengeospatial.org/standards/gml>