Diseño de Servicios Web para Catastro

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Semana Geomática Internacional 2013
IGAC, Bogotá Colombia, 2013-10-01

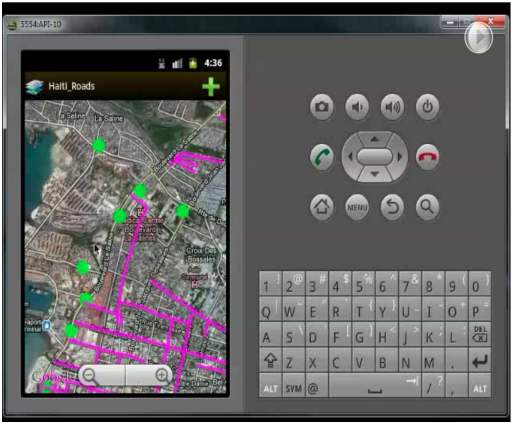
Contenido

- Interoperabilidad
- OGC
- Sistema de informacion Catastral
- GML
- WFS
- WMS
- Cadastral Web Systems - Demos
- Cadastral Web Systems - Design

Publishing Geospatial Data

First Map of the World
Catal Huyuk (South East Turkey) 6200 BC

Publishing Geospatial Data



Viewing and creating data from mobile devices

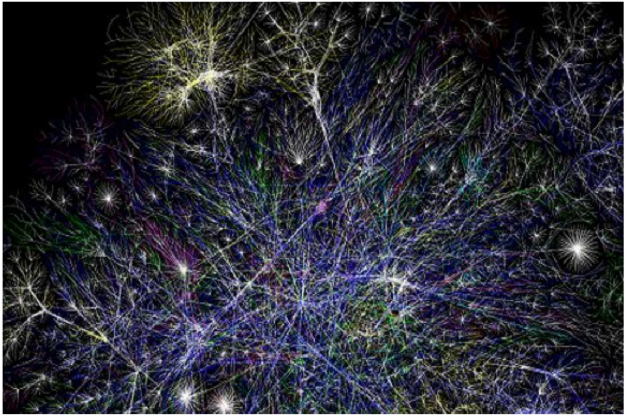
Geo Package

What changed?

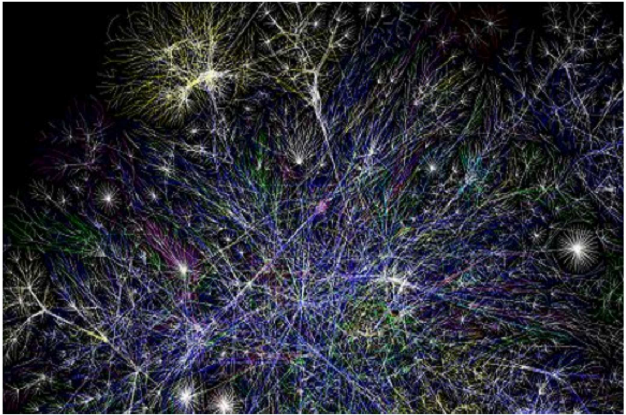
What changed?

Technology

What is this?



Internet



World Wide Web

- Enabled by Internet
- All **Information** from Computers connected around the world.

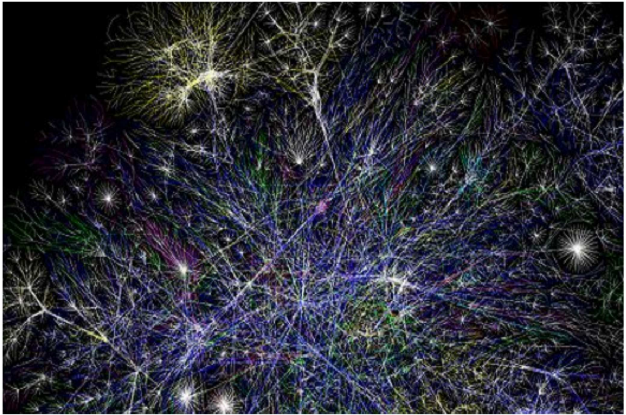
How do we connect to the Web?

- URL
- HTTP GET
- Protocols
- Encodings
- ...

Uniform Resource Locator (URL)

- http://my.umbc.edu/
- ftp://ftp.funet.fi/pub/standards/RFC/rfc959.txt
- mailto:bermud@me.com

Every node can be a URL



Protocols

Protocols

- TCP/IP
- HTTP (GET, POST)

HTTP GET is a URL

```
http://localhost:8080/geoserver/topp/ows?
service=WFS&
version=1.0.0&
request=GetCapabilities
```

HTTP has Parameters and Values

```
http://localhost:8080/geoserver/topp/ows?

service=WFS&
version=1.0.0&
request=GetCapabilities
```

HTTP POST

```
<?xml version="1.0"?>
   <wfs:GetCapabilities
      service="WFS"
      version="1.0.0"
     ...
```

Encodings

<XML />

Service

Distinct part of the functionality that is provided by an entity through interfaces. (ISO 19119:2005)

Interface

Named set of operations that characterize the behaviour of an entity.

Operations

- Specification of a transformation or query that an object may be called to execute. It has a name and a list of parameters.
- For example GetFeature of WFS
- Is defined by a set of protocols (e.g. HTTP GET)

Service

http://en.wikipedia.org/wiki/File:Roomba_original.jpg

Interfaces


Room Selection Interface
Ro•mba
Robotic FloorVac
S
M
L
Electric Interface
http://en.wikipedia.org/wiki/File:Roomba_original.jpg

In an OGC Web Service

- Service = WFS 2.0
- Interface = Basic or Transaction
- Operations for Basic = DescribeFeature and GetFeature
- Protocol = GetFeature uses HTTP Get

Let's Try - Setup

To view HTTP requests, we can use Firefox:

- Open: Tools / Web Developer / Web Console
- Select Net

Let's Try - Test

- Open any page
- Open a wrong URL
- Inspect the console
- Click on example petition: "Get http:// ...."

What Should I get back if I ask a server for a "Toluca"

- A Map of Toluca
- A video
- A picture
- The history
- List of Hotels
- ???

There is a need to design specialized operations

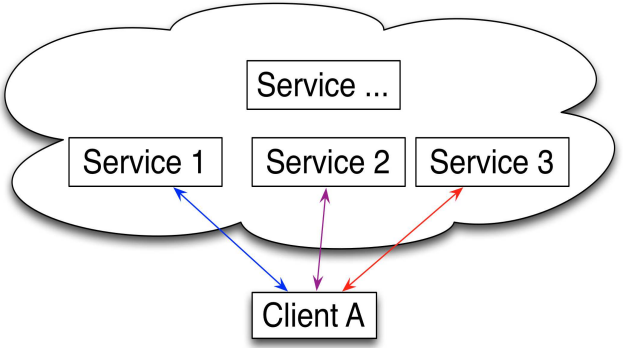
For example, for restaurants services:

- Find me all restaurants 5 km from here
- Find me the restaurant with the best guacamole
- Add my review to restaurant X: " Meat very good, service terrible"
- Reserve the restaurant X for two for today at 8 PM and bring 25 red flowers to the table

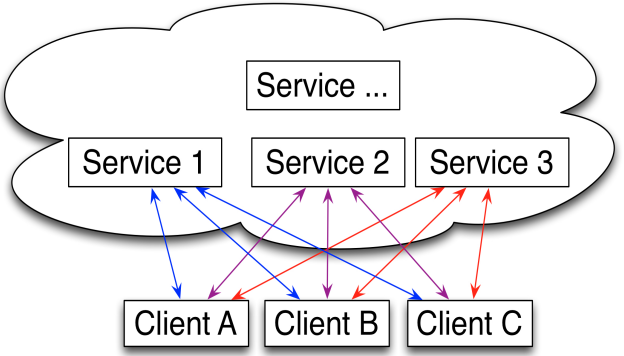
How to get a map?

- getMap
- getImage
- get2dmap
- getlocation
- ...

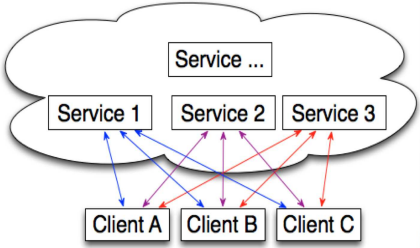
Heterogeneous Services



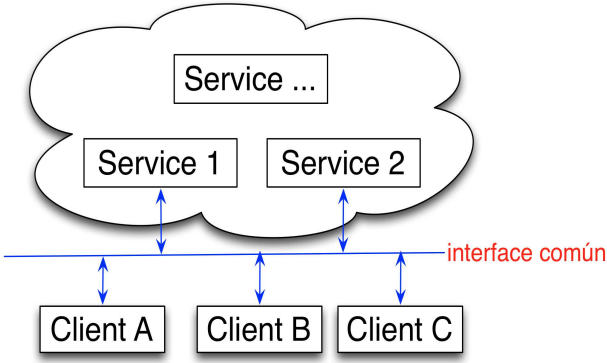
Heterogeneous Services



Lack of agreement looks bad



Agreement of Interfaces- Great!



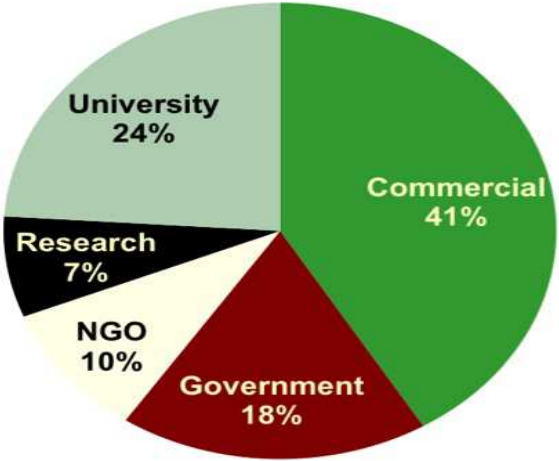
Open Geospatial Consortium

- Funded in 1994
- Voluntary consensus
- Standards organization
- Leads the development of standards for geospatial and location based services.

Open Geospatial Consortium (OGC)

Mission: To serve as a global forum for the collaboration of developers and users of spatial data products and services, and to advance the development of international standards for geospatial interoperability.

Open Geospatial Consortium (OGC)



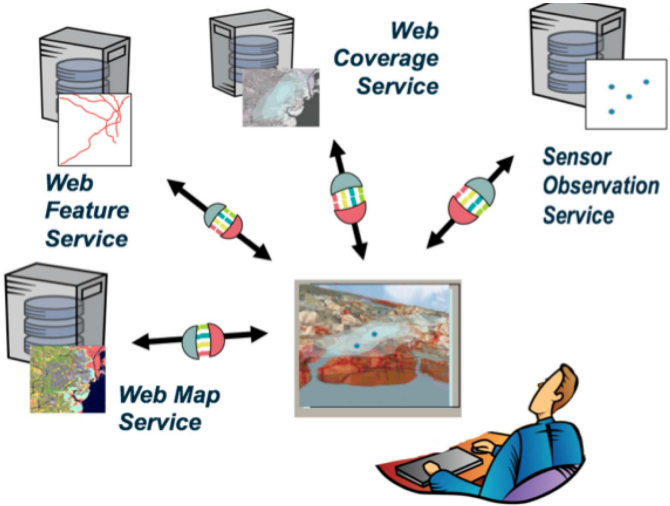
Members in America Latina

- Fundação CPqD (Brazil)
- Instituto Geográfico Agustín Codazzi (Colombia)
- Ministerio de Bienes Nacionales - Secretaria Ejecutiva SNIT (Chile)
- INFOCAM (México)
- Instituto Nacional de Estadística y Geografíca INEGI (México)
- CentroGeo (México)
- Universidad Autónoma del Estado de México (México)

Implementations

Collaboration

Services


Web
Coverage
Service
Web
Feature
Service
Sensor
Observation
Service
Web Map
Service

Diseño de Servicios Web para Catastro

- Catastro
- Servicios Web
- Servicios OGC para Catastro

Catastro

Sistema de información territorial del Estado, que tiene como finalidad obtener un inventario analítico de los inmuebles con base en sus características;

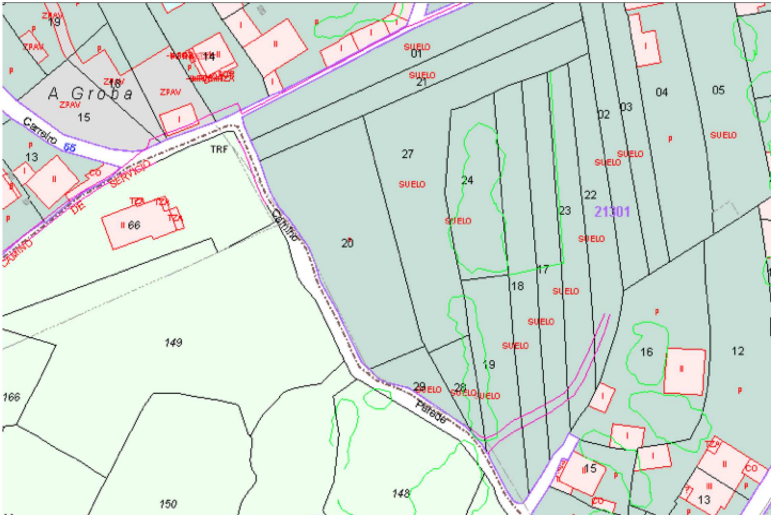
Definición Mexico

LEY DE CATASTRO DEL ESTADO DE MÉXICO 1997 - Art 2

Catastro; al sistema de información territorial del Estado, que tiene como finalidad obtener un inventario analítico de los inmuebles con base en sus características; Actividad catastral; al conjunto de procedimientos y acciones que permiten integrar, conservar y mantener actualizado el inventario analítico de los inmuebles;

Producto... un mapa

Mapa Catastral Moderno



Sistema de Información Catastral

- Procesamiento de información vectorial
- Entendimiento de sistema de coordenadas
- Procesamiento de estilos (colores, lineas)
- Extraer informacion acerca de una parcela (dueño, valor)

Informacion acerca de una Parcela

GOBIERNO DE ESPAÑA | MINISTERIO DE HACIENDA Y ADMINISTRACIONES PÚBLICAS | SECRETARÍA DE ESTADO DE HACIENDA | DIRECCIÓN GENERAL DEL CATASTRO | Sede Electrónica del Catastro

CONSULTA DE DATOS CATASTRALES

INFORMACIÓN PROPORCIONADA POR LA DIRECCIÓN GENERAL DEL CATASTRO DEL MINISTERIO DE HACIENDA Y ADMINISTRACIONES PÚBLICAS

¿Cómo se pueden obtener datos protegidos (titularidad y valor catastral) de los inmuebles y certificados telemáticos de los mismos?

Datos del Bien Inmueble	
Referencia catastral	40102A010053910000BT Obtener etiqueta Copiar referencia al portapapeles
Localización	Polígono 10 Parcela 5391 CACERAS BAJAS. FUENTERREBOLLO (SEGOVIA)
Clase	Rústico
Coeficiente de participación	100,000000 %
Uso	Agrario
Datos de la Finca en la que se integra el Bien Inmueble	
Localización	Polígono 10 Parcela 5391 CACERAS BAJAS. FUENTERREBOLLO (SEGOVIA)
Superficie suelo	7.250 m^2
Cultivos	

Subparcelas	Clase de Cultivo	Intensidad Productiva	Superficie (Ha)
0	MR Pinar resinable	01	0,7250

Modelo Conceptual - UML

- Captura formalmente los tipos de datos a usar
- Se utuliza para generar XML schemas, APIs y bases de datos
- Ejemplo: http://inspire.ec.europa.eu/index.cfm/pageid/2

Specificación INSPIRE

Legislation

Commission Regulation (EU) No 1089/2010 as regards interoperability of spatial data sets and services 08.12.2010

Technical Guidelines Annex I

INSPIRE Data Specification on Administrative Units - Guidelines v3.0.1 03.05.2010

INSPIRE Data Specification on Cadastral Parcels - Guidelines v 3.0.1 03.05.2010

METADATA FOR DOCUMENT

SUBJECT	PUBLISHER	SOURCE	LANGUAGE	CATEGORY	PUBLICATION DATE
Data Specifications	INSPIRE Thematic Working Group Cadastral Parcels	INSPIRE Thematic Working Group Cadastral Parcels	en	Data Specifications	03/05/2010

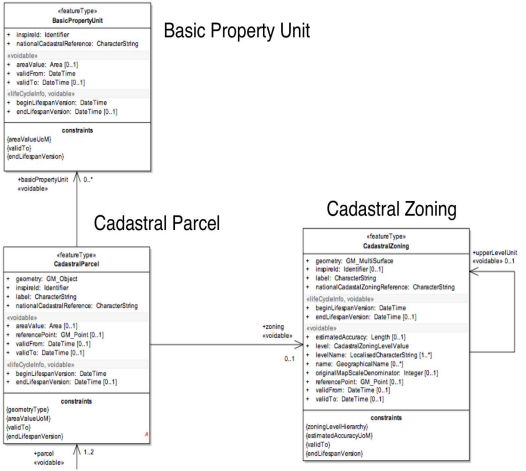
Version: 3.0.1 **Is this the latest version?** YES

DESCRIPTION

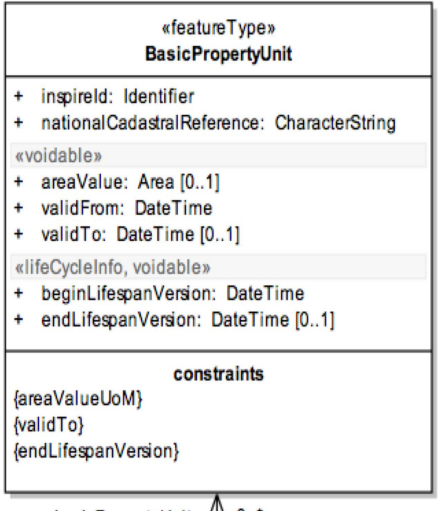
This document describes the INSPIRE Data Specifications for the spatial data theme Cadastral Parcels

URL	DOCUMENT TYPE

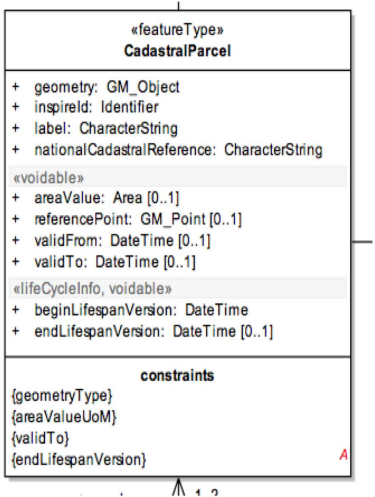
Modelo UML Catastral



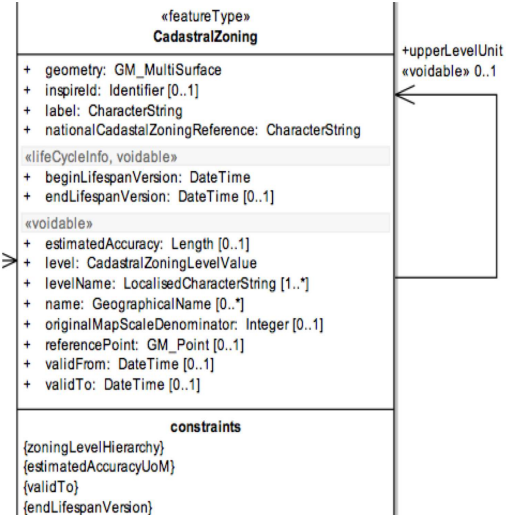
Modelo UML Catastral



Modelo UML Catastral



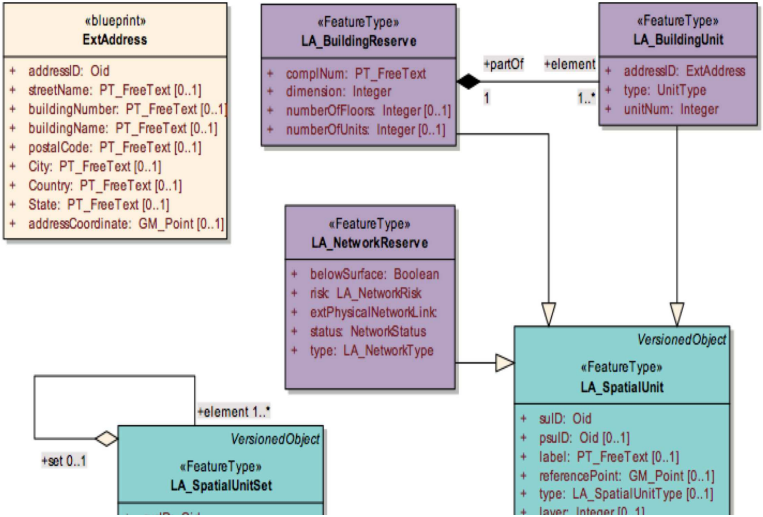
Modelo UML Catastral



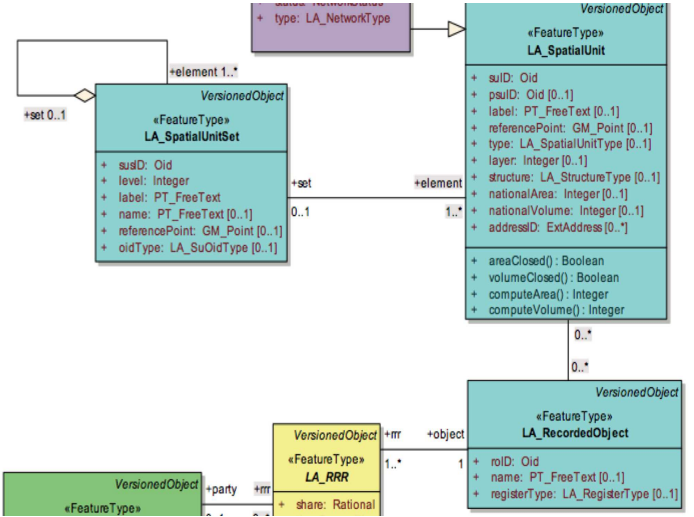
ISO Standard

- ISO/WD 19152.3
- Geographic information — Land Administration Domain Model (LADM)
- Documento en ISO
- Document público

Modelo UML Catastral - ISO

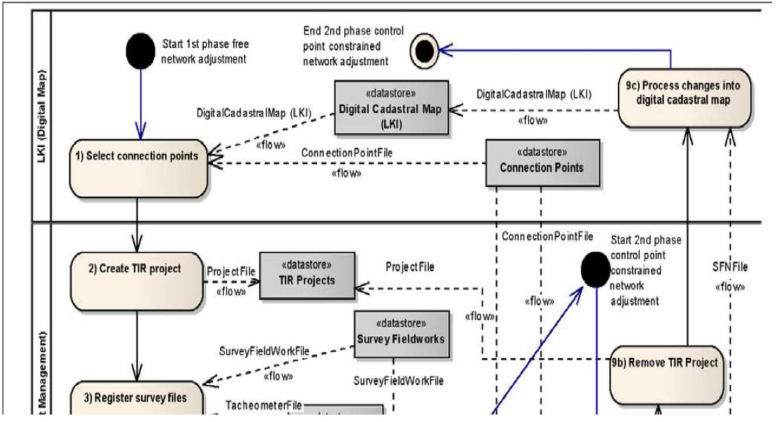


Modelo UML Catastral - ISO

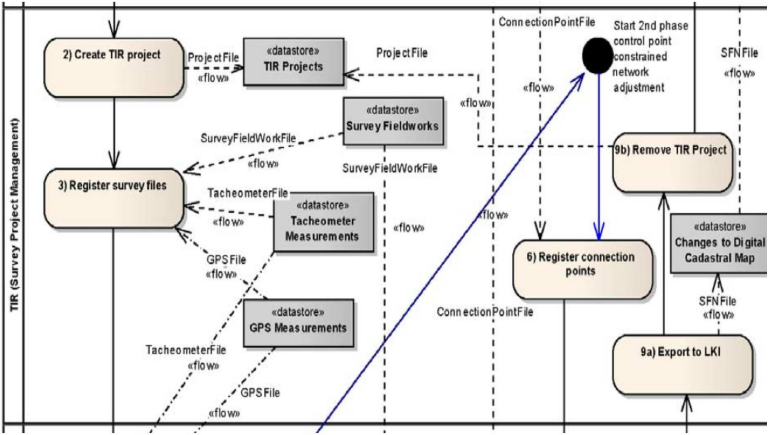


Proceso para inspecciones

The Land Administration Domain Model 'Survey Package' and Model Driven Architecture



Proceso para inspecciones



Geographic Modeling Language

Feature

location

Feature has Properties

Geospatial Feature

height = 3.2 m

Generalization

Class = Feature Type = Tree

Properties of Tree:

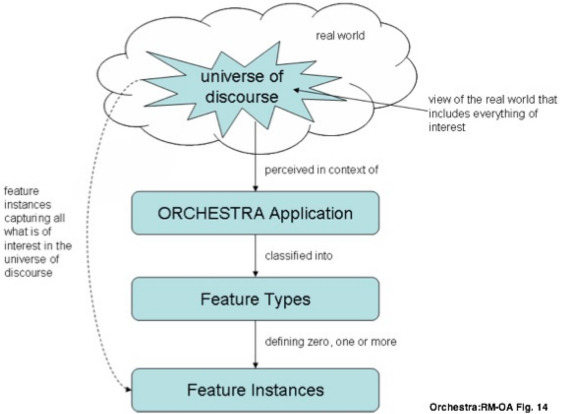
- Height
- Location

All my Trees will have a height and location.

Feature Instance

My favorite tree in Cartagena is the one in front of the hotel Colombia.
Height = 5 mt
Location: Latitude, Longitude
10.407793,-75.551262

Features Modeling



Orchestra:RM-OA Fig. 14

Geographic Markup Language (GML)

```
<Bridge>
  <span>100</span>
  <height>200</height>
  <gml:centerLineOf>
    <gml:LineString>
       <gml:pos>100 200</gml:pos>
       <gml:pos>200 200</gml:pos>
    </gml:LineString>
  </gml:centerLineOf>
</Bridge>
```

Feature Instance of Type Bridge

```
<Bridge>
  <span>100</span>
  <height>200</height>
  <gml:centerLineOf>
    <gml:LineString>
       <gml:pos>100 200</gml:pos>
       <gml:pos>200 200</gml:pos>
    </gml:LineString>
  </gml:centerLineOf>
</Bridge>
```

Feature Types are defined in GML

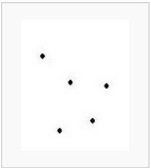
```
<xs:complexType name="BridgeType">
     <xs:complexContent>
          <xs:extension base="gml:AbstractFeatureType">
              <xs:sequence>
              <xs:element name="span"  type="xs:integer"/>
              <xs:element name="height" type="xs:integer"/>
                 <xs:element ref="gml:centerLineOf"/>
               </xs:sequence>
            </xs:extension>
     </xs:complexContent>
 </xs:complexType>
```

GML Provides

- Defines an abstract feature model
- Provides XML Schemas
- Provides primitives:
    - Geometry
    - Feature Types
    - Coordinate Reference Systems

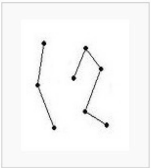
GML Geometries

Point

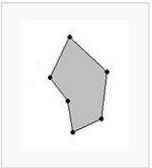


MultiPoint

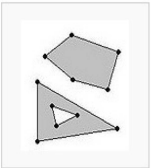
LineString



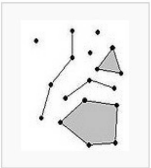
MultiLineString



Polygon



MultiPolygon



GeometryCollection

How can radio station be modeled?

- Point - when looking at a country map
- Polygon - location of the building
- Multipolygon - Area of Transmition

Communities develop their own Application Schemas

- AIXM – Aviation
- CAAML – Canadian avalanches
- CityGML – 3D city models
- CSML – Climate Science Modelling
- DAFIF – Defense aviation
- GeoSciML - Geoscience
- ...

Web Feature Service (WFS)

Web Feature Service (WFS)

- Service (Protocol)
- Do the following with Geographic Features:
    - publish
    - access
    - manipulate

WFS Operations

- *getCapabilities* - summary of the service
- *DescribeFeatureType* - structure of the feature types
- *GetFeature* - get the feature instance
- *Transaction* - create, update and delete geographic features
- *Lock Feature* - Protects feature record when updating it.

WFS Demo

GeoServer Demo

- GeoServer is the reference implementation for WFS 1.1.0.
- Open and free software
- Java-based

GeoServer Demo

- http://localhost:8080/geoserver/web/
- click on Demos
- Explore Operations

Example GetCapabilities Request

Request example:

```
http://localhost:8080/geoserver/topp/ows?
service=WFS&
version=1.0.0&
request=GetCapabilities
```

Link to GetCapabilities

Example DescribeFeature Request

Request example:

```
http://localhost:8080/geoserver/topp/ows?
 service=WFS&
 version=1.1.0&
 request=DescribeFeatureType&
 typeName=topp:tasmania_water_bodies
```

Link to DescribeFeature

Example GetFeature Request

Request example:

```
http://localhost:8080/geoserver/topp/ows?
service=WFS&version=1.1.0&request=getFeature&
TypeName=topp:tasmania_water_bodies
```

Link to getFeature request

Query based on values of properties

Lakes with area > 1067000000 cm.

```
http://localhost:8080/geoserver/topp/ows?
  service=WFS&version=1.1.0&request=getFeature&
  TypeName=topp:tasmania_water_bodies&
  FILTER=
     <Filter xmlns="http://www.opengis.net/ogc">
       <PropertyIsGreaterThan>
         <PropertyName>AREA</PropertyName>
         <Literal>1067000000</Literal>
       </PropertyIsGreaterThan>
     </Filter>
```

Link to GetFeature with filter

Client - Server Demo

- Open uDIG
- **Connect with geoserver:**

  http://localhost:8080/geoserver/topp/ows

References

OGC Standards

http://www.opengeospatial.org/standards

GML Application Profiles

http://www.ogcnetwork.net/gmlprofiles

GeoServer

http://docs.geoserver.org/stable/en/user/data/vector/index.html

uDIG

http://udig.refractions.net

Exercise WFS

Question 1

If you are interested in getting all the names of the counties that are nearby Montgomery County (in Maryland), what SpatialOperator should you use?

The spatial operators are defined in the [OGC-04-095]_ Chapter 8 and in a newer version in the Section 7.2 of [OGC-09-026r1]_.

Question 2

What are the properties of *gubs:GovernmentalUnitCEType*?

Question 3

What is the first feature retrieved by the server?

Question 4

Pick any feature type from any WFS server and do a query filtering on the value of a property. For example:

- USGS server: How many states have a population over 15 Million?
- WFS UNEP
- WFS NSIDC

Question 5

Publish a shapefile following the instructions in the GeoServer Manual.

Question 6

Use a Java property file, as explained in the GeoServer documentation To create a land data base from a municipality. Create 5 fields.

WEB Map Service (WMS)

This tutorial provides a practical introduction to OGC Web Map Service (WMS) Interface standard.

Goals

- Understand what WMS can be used for
- Understand WMS requests and best practices

Web Map Service (WMS)

The latest version of WMS is 1.3.0 [#ogc-06-042].

A WMS Server:

- Provides information about what maps a service can produce
- Produces a Map
- Answers queries about content of a Map

WMS Usage

- Produce a Map
- Answer queries about content of the map

WMS Operations

- GetCapabilities
- GetMap
- GetFeatureInfo

WMS GetCapabilities Request

Request example:

```
http://ri.opengeospatial.org:8680/degree-wms-130/services?
service=WMS&
version=1.3.0&
request=GetCapabilities
```

Link to getCapabilities

WMS GetCapabilities Response

- How to invoke GetMap
- Types of exceptions
- List of layers

WMS GetMap Request

Request example:

```
http://ri.opengeospatial.org:8680/degree-wms-130/services?
service=WMS&
version=1.3.0&
request=GetMap&
format=image/png&
width=300&
height=300&
crs=EPSG:4326&
layers=cite:BasicPolygons,cite:Forests&
STYLES=default,default
BBOX=-2,-1,2,6&
```

Link to GetMap

WMS GetFeatureInfo Request

Request example:

```
http://ri.opengeospatial.org:8680/degree-wms-130/services?
service=WMS&
version=1.3.0&
request=getfeatureinfo&
format=text/html&
crs=EPSG:4326&
layers=cite:BasicPolygons&
query_layers=cite:BasicPolygons&
BBOX=-2,-1,2,6&
width=300&
height=300&
i=1&
j=1
```

Link to GetFeatureInfo

Exercise WMS

Question 1

Get a toxic release map for Florida from the National Atlas

Question 2

Modify an existing style in the local Geoserver installation.

1. Get a style document: In GeoServer copy the style the tiger roads layer.
2. Modify the style based on the attributes of the data. At least add a label and change a color.
3. Do a get Map request and a screenshot showing the map with the new style.

Question 3

Goal: Create a new SLD that displays a map with countries fill with colors depending on the continent they are located.

- Locate a shape file that has countries (for example at DIVA)
- Use Geoserver or Deegree

Demo Cadaster WFS

- INSPIRE Cadaster
- IGAC
- Australia

INSPIRE Cadaster Workspace

1. Open Deegree
2. Go to workspaces
3. Import deegree-workspace-inspire.
4. Start the workspace - you will see : Active workspace: deegree-workspace-inspire
5. Get feature request numberOfFeatures="15000"

IGAC WMS Cadastral Map

service leyend

Northern Territory Land Information System - Australia

NTLIS WMS server for service ilismap

Methodology to Design Cadaster Web Systems

- **Capture Users Needs**
    - Developers from broader regions
    - Developers creating cool maps from the data
    - Developers generating reports to decision makers

Methodology to Design Cadaster Web Systems

- **Conceptualize**
    - Develop a UML model
    - Design the GML Application Schema
- Design the database

Methodology to Design Cadaster Web Systems

- **Convert**
    - Convert data (e.g. shapefiles to GML). Use tools like HALE
    - Map schemas

Methodology to Design Cadaster Web Systems

- Select a tool to publish the OGC Web Services

Methodology to Design Cadaster Web Systems

- **Select a tool to publish the OGC Web Services**
    - Proprietary (ArcGIS Server,
    - Open Source (GeoServer, Deegree, MapServer)
- Look in the OGC database

The End

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