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Advisory Group on Outreach

Tutorial ‘International Standards’

Web Map Server (WMS) & Web Feature Server (WFS)
Overview

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Plan

➢ Web Services
   ➢ Vision, Dreams & Challenges
   ➢ How does it work? (Concepts)

➢ Standards in support of GI Web Services
   ➢ Applicable ISO/OGC standards
   ➢ WMS : Web Map Server
   ➢ WFS : Web Feature Server
   ➢ SLD, CPS, WMS as a presentation service for GML/Features, …

➢ Web Services & Spatial Data Infrastructure (SDI)

ёт Examples

➢ More advanced vision, concept & products = Future-Proofness!
Dream & Challenges

- GI community have to face:
  - creation of the right services
  - quicker response to market demand
  - demonstration of differentiated services
  - proposition of adhoc and personalized services
  - delivery of high level Quality of Services online

This is true for publishers, producers, suppliers, vendors, all levels of authorities, ...

End-users now expect to get that!
Interoperability - a Must!

- GOAL: enable e-business & Quality of Services
- SOLUTION: interoperable Web Services to build value & bring innovative services to user/customer/citizen

![Interoperability Diagram]

- Satisfied User
- Innovative Services
- INTEROPERABILITY
- Infrastructure / GIS / data / billing

Dynamic Reach e-business

Satisfaction
Services, QoS & Time to market
A Must have
Distributed Mapping or geo-enabled services to present and analyze information from “Geo-Servers” using different vendors technology and rendering methods.
Baseline for GI Interop...

- Map (+ Coverage & Terrain) Services
  ⇒ Web Map Services (WMS, WCS, WTS)
- GI Object Services, Transactions
  ⇒ Web Feature Services
- Models, Encoding & Transport of GI Information
  ⇒ GML
- Presentation, Dynamic Legend, Symbol
  ⇒ Portrayal, Styling, …
- Registry & Discovery & Chaining of Data & Services
  ⇒ Catalog Services
Standards!

“Not codifying status-quo of technology anymore, but defining requirements for new technology...” (Olaf Ostessen, Chairman of TC211)

- **Metadata**  
  (ISO-ISO19115,19139 / OGC)

- **WMS** : Web Map Service  
  (OGC / ISO-ISO19128)

- **WFS** : Web Feature Service (+ filters)  
  (OGC / ISO...starting)

- **Feature Model**, incl. geometry model  
  (ISO-ISO19109/110,19125 / OGC)

- **GML & Encoding**  
  (OGC / ISO-ISO19136)

- **WCS, WTS** : Coverages, Terrain  
  (OGC)

- **Catalog / WRS** : Catalog & Registry  
  (OGC)

- **Service metadata, model, chaining**  
  (ISO-ISO19119 / OGC-OWS)

 ➔ FRAMEWORK FOR INTEROPERABILITY
 ➔ BOOST THE VALUE CHAIN
 ➔ ENABLE BETTER ACCESS TO GI
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What is a Web Map Server?

The OpenGIS Web Map Server Specification (WMS) is a set of interface specifications that provide uniform access by Web Clients to maps rendered by map servers on the Internet. Thus, WMS is a service interface specification that:

• Enables the dynamic construction of a map as a picture, as a series of graphical elements, or as a packaged set of geographic feature data

• Answers basic queries about the content of the map

• Can inform other programs about the maps it can produce and which of those can be queried further
What is a Web Map Server?
Main WMS Interfaces

**GetMap** - Specifies communication protocols to merge many web map views into one view.

**GetCapabilities** - Explains what a map server can do (so integrators know what to ask for).

**GetFeatureInfo** - Specifies how to ask for more information about web map features.

**DescribeLayer** - Describes the data underlying each layer.
What is a Web Feature Server?

Whereas WMS delivers a picture, **WFS supports the direct exploitation and access of feature data and associated attributes on the Web.**

- The WFS is a service interface that describes data manipulation on geographic features. Data Manipulation operations include the ability to insert, delete, update, get and query features on spatial and non-spatial constraints.
What are Features?

• A feature is an “entity” (restaurant, tree, etc.), an observation or an “event” (accident, fire)

• A feature is one instance of a FeatureType

• A FeatureType is the Schema (structure) that you expose to the world. A FeatureType is defined by a set of attribute definition, the attribute definition have a name and a type. The attributes may be a number, string and also a geometry

• A Feature Collection is a structured collection of features. It is a Feature that groups other Features
What is Geographic Markup Language (GML) ?

• The Geography Markup Language (GML) is an XML encoding for the transport and storage of geographic information, including both the spatial and non-spatial properties of geographic features.

• GML is a XML extension to define geospatial Features.

• GML defines content: There is no mix between content and presentation.

  <wfs:SANTACLAUS fid="SANTA_CLAU.S.01">
    <wfs:NAME> SantaClaus </wfs:NAME>
    <wfs:DESC> This feature represents Santa Claus </wfs:DESC>
    <wfs:STATUS> Moving </wfs:STATUS>
    <wfs:PLACE> Sydney </wfs:PLACE>
    <wfs:GEOM>
      <gml:Point srsName="EPSG:4326">
        <gml:coordinates> 77.612779, -63.09055 </gml:coordinates>
      </gml:Point>
    </wfs:GEOM>
    <wfs:SPEED> 231309.64 </wfs:SPEED>
    <wfs:GIFTS> 292308 </wfs:GIFTS>
  </wfs:SANTACLAUS>
Main WFS Interfaces

- **GetCapabilities** - Indicates which feature types it can service and what operations are supported on each.

- **DescribeFeatureType** - Describes the structure of any feature type upon request.

- **GetFeature** - Services requests to retrieve feature instances from a datastore. Feature properties to fetch may be specified. The query may be constrained spatially and non-spatially.

- **LockFeature** - Processes a lock request on one or more instances of a feature type for the duration of a transaction. This ensures that serializable transactions are supported.

- **Transaction** - Services transaction requests. A transaction request is composed of operations that modify features in the datastore; **insert**, **update** and **delete** features.
Interoperable Data Models
Design
Map the WFS/GML feature types onto the data source (Databases, SDE, …)
Features
do not mix with representation

- Feature definition are made in XMLSchema, based on GML Schemas.
- GML = XML based encoding standard for geographic information developed by the OpenGIS Consortium.
- GML is intended to model the structure and relationships for real world geography, not a graphical representation of that geography.
- Graphical representation is to be expressed in SVG, VRML, or equivalent.
Examples

Credit: IONIC Software (results of Portrayal Engine)
SLD passed as parameter of a WMS request to trigger the Style of the "on-the-fly" presentation.
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SDI: Architecture

Registry services
- Catalog
- Find Service

Application

Other SDI,
Map Servers, Feature Servers, Coverage Servers, Census info, Weather, etc.

Other Services
- Gazetteer
- Annotation (xima)
- Geo Coding
- ...

Data Services
(existing) geo databases

Map Server
- Feature Server
- Data

Portrayal

Feature Server
- Data

Geo Coding
The architecture envisioned by INSPIRE deploys **interoperable services** that will help to produce and **publish, find and access**, and eventually, **use and understand** geographic information over the Internet across European Union and Association Countries at local, national, and European levels.
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✔️ Examples

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NMA - Norwegian Mapping Agency

e-gov – National SDI
Interoperable Spatial Data Infrastructure & Application for General Secretariat / Cartography Dept at UN HQ
EO – Earth Observation / CEOS (including GML Data exchange)
WFS/GML for e-business
(a PathFinder Project)
Web Application Design
Portal of OGC Web Services by BRGM (French Geological Survey)

Using online Catalog
A WFS/GML LBS project!
600,000+ Subscribers in 10 countries!
Disaster Response Interop Geo-Services (OWS1.2 2002)
e-Gov Application
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Data Clearinghouse

Data: Publish-Find-Load

Publish Metadata

Browse Result

Find Data

ClearingHouse Network

Phone

Download

View - download - etc.

Load

integrate

NO BIND
The Service vision

“Publish-Find-Bind” on the web

• Promoting interoperability by minimizing the requirements for shared understanding

• Enabling just-in-time integration

• Enabling interoperability of legacy applications
Services Registry

Register both data and services metadata

1. Data Services
2. Metadata
3. Registry

Service interface

Registry interface

Request → Response

Data

Service metadata

Data metadata

19115 / 19119

« Catalogs »
The Big Picture

Application Dev Toolkits

Web Services

Catalogs Services

(www.askthespider.com)

1. Data Services
2. Metadata
3. Registry
Thank you

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