

GeoConnections

Services Overview

Canadian
Geospatial
Data
Infrastructure



Infrastructure
canadienne
de données
géospatiales



Jean François Doyon
Tom Kralidis
June 2003

Services Overview



- Web Services
- OGC Web Services
- OGC Web Services Within CGDI
- CGDI Development Network

Services Overview



- Web Services
- OGC Web Services
- OGC Web Services Within CGDI
- CGDI Development Network

Introduction



- GeoConnections
 - Federally coordinated program to facilitate the geospatial information highway in Canada
- Canadian Geospatial Data Infrastructure (CGDI)
 - Network of distributed data and services
 - See <http://geodiscover.cgdi.ca/>

Web Services



– What’s a Web Service??

- **Service:** performs functions based on request, provided by an entity through an interface
- **Interface:** a set of operations which characterize a service
- **Web Service:** any software which makes itself available over the Internet and uses a standard XML messaging system
- **Process:** request / response / process
- Use of the **Internet** as the distributed computing platform (DCP)
- Enabling “Plug and Play” Interoperability

**** Web Services Enable Infrastructure ****

Web Services



- Independent of
 - operating systems
 - programming languages
 - Organizations
- How?
 - non-proprietary data / messaging standards
 - eXtensible Markup Language (XML)

Web Services- Benefits



- Lower software integration costs
- Maintaining legacy systems
- Using standards lowers IT costs of collaboration with external partners, vendors, clients

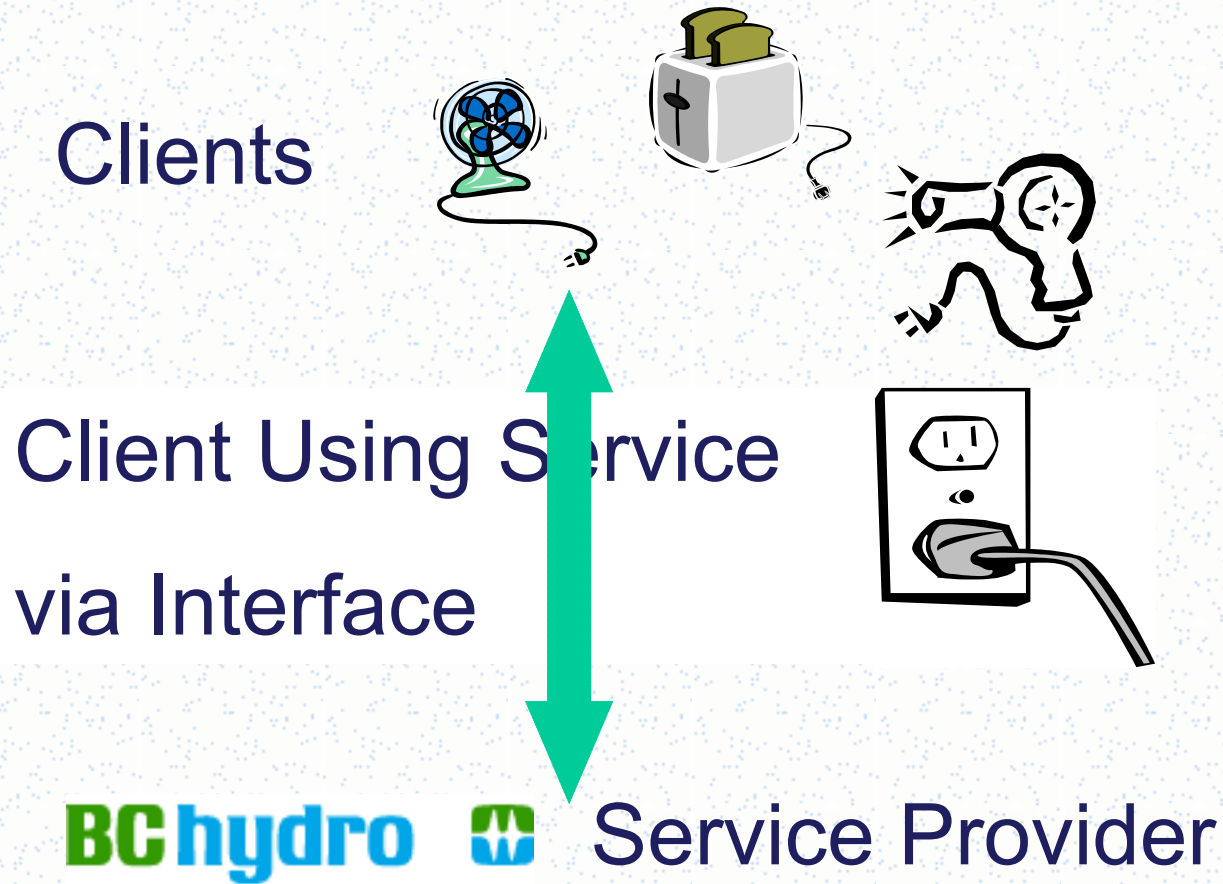
Web Services



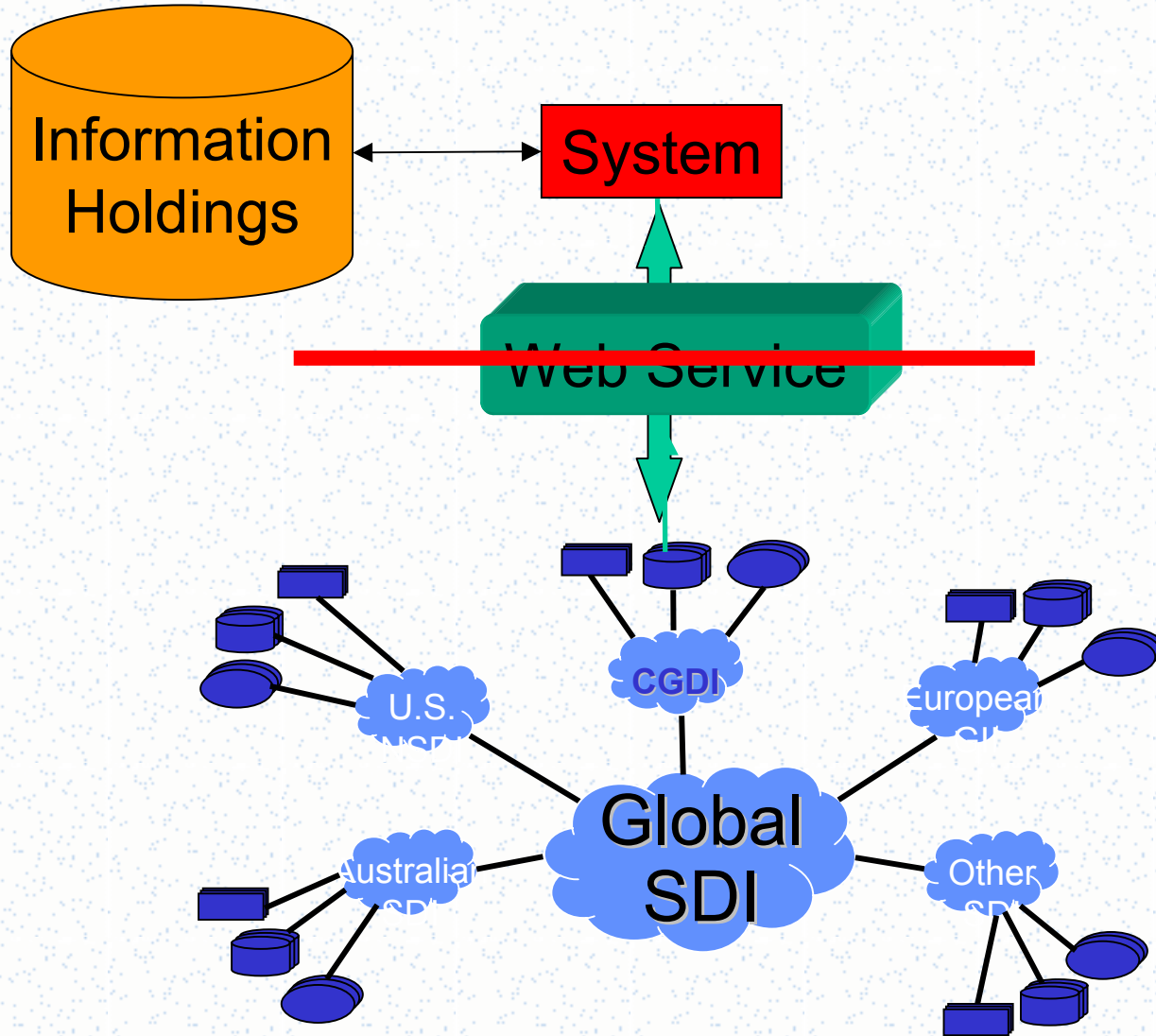
– Web Service Protocol Stack

- Transport
 - **HTTP**, SMTP, FTP
- XML Messaging
 - Common XML (**XML-RPC**, **SOAP**)
- Service Description
 - Web Services Description Language (**WSDL**)
 - » **Describes public interface**
- Service Discovery
 - Universal Description, Discovery, and Integration (**UDDI**)
 - » **Centralized registry**
 - » **Provides publish / find mechanisms**

Services, Interfaces, Clients

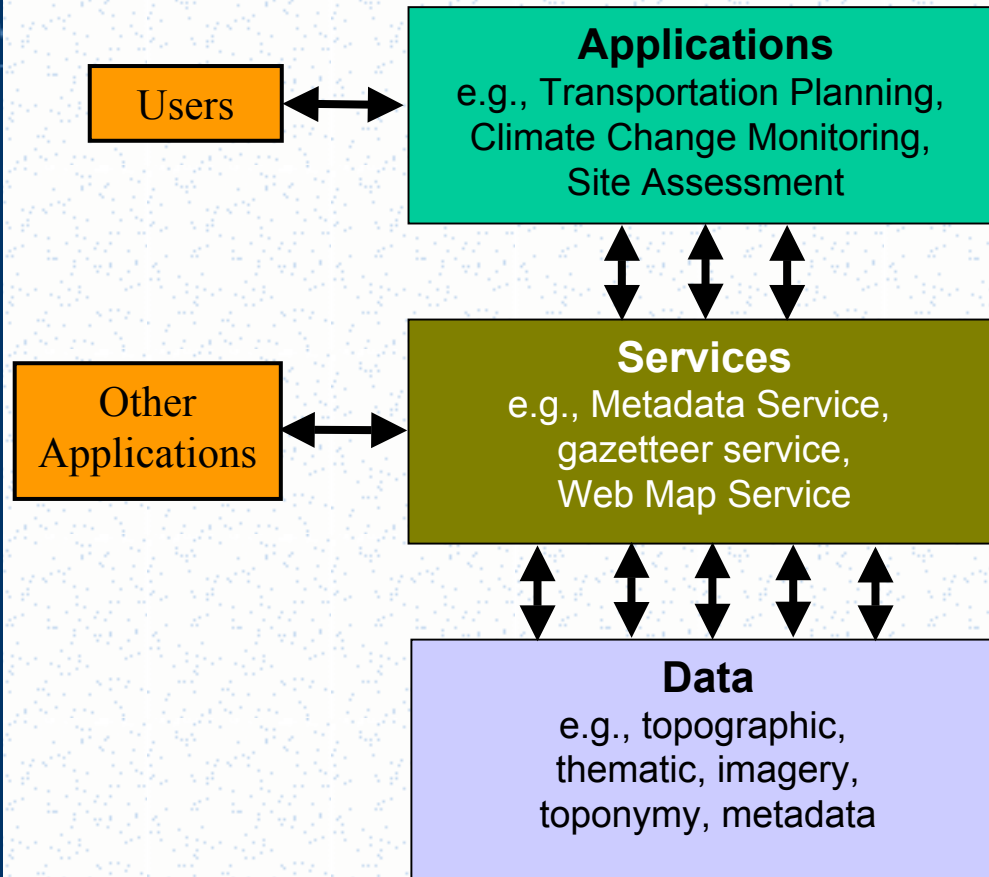


Web Services





Service Architecture Approach



For Example...

A trip planning web site that calculates the best route between two cities

uses
Gazetteer service,
Road network server,
Web mapping service

based on
Geographical Names,
Road network features
Base maps

eXtensible Markup Language (XML)



- Markup language describing structured information
 - Meta Language
 - Self Describing Semantics
- Information Exchange / Messaging
- Human Readable
- Portable, non-proprietary
- Interoperable

eXtensible Markup Language (XML)



- Allows for application-neutral communication
- Separates content from look and feel
 - Enables scalable development for wide variety of applications
- Many XML processing / development tools

Web Services



- Mainstream Web Services Environments for Geospatial
 - Microsoft MapPoint.net
 - programmable XML Web Service for location intelligence into your applications, business processes, and Web sites
 - <http://www.microsoft.com/mappoint/net/>
 - ESRI Geography Network
 - <http://www.geographynetwork.com/webservices/index.html>
 - OpenGIS Consortium (OGC)
 - <http://www.opengis.org/>

Services Overview



- Web Services
- OGC Web Services
- OGC Web Services Within CGDI
- CGDI Development Network

OpenGIS Consortium (OGC)



- Collaborative environment
 - industry, government, academia
- Public, open specifications for geospatial interoperability
- “Geo-Enable” the Web

OGC Specifications (relative)



- **Visualization ***
 - OpenGIS Web Map Service (WMS)
- **Data Access ***
 - OpenGIS Web Feature Service (WFS)
- **Data Encoding ***
 - OpenGIS Geography Markup Language (GML)
- **Viewer Client Bookmarks ***
 - OpenGIS Web Map Context Documents
- **Data Presentation ****
 - OpenGIS Styled Layer Descriptor (SLD)
- **Data Query ****
 - OpenGIS Filter Encoding

- **All formally endorsed by CGDI**

* Supported by MapServer
** To be supported by MapServer

Web Map Service (WMS)



- Provides images of map data defined by a geographic / spatial component
- Provides point based query functionality
- Interoperable means of map compositing

Web Map Service (WMS)



- Interoperable, 'just-in-time' approach to map delivery
- Map compositing from multi-servers

Web Mapping: Phase I



GeoGratis - Netscape

File Edit View Go Communicator Help

Back Forward Reload Home Search Netscape Print Security Shop Stop

Bookmarks Location: geogratis.cgdli.gc.ca

047026_0100_000730
Start Date: 2000-07-30
Path: 47
Row: 026
UTM Zone: 10 - Netscape

Natural Resources Canada

047026_0100_000730
Start Date: 2000-07-30
Path: 47
Row: 026
UTM Zone: 10
N 49.824336523 S 47.903002297 W -124.3838044 E -121.2994672

GeoGratis Landsat 7 Ortho

[Landsat](#)

[RADARSAT](#)

[Atlas Vectors](#)

[CGIS \(Canadian Geographic Information Systems\)](#)

[GeoBase Data \(CGDI Framework layers\)](#)

[Earth Observation Data](#)

[Vector/Tabular Data](#)

[Download Now after se Discovery Portal](#)

[Download DIRECTORY](#)

Abstract

The orthoimage data set is cr... creation. The imagery has be... not available, the most accur... better in the South and 50 me... accuracy is evaluated for ea... from sources as mentioned a... centroids. In some cases the... used. The control points are c... Sectors are located in the su...

Canadian Geospatial Data Infrastructure

(3 results)

Sample

[View](#)

[View](#)

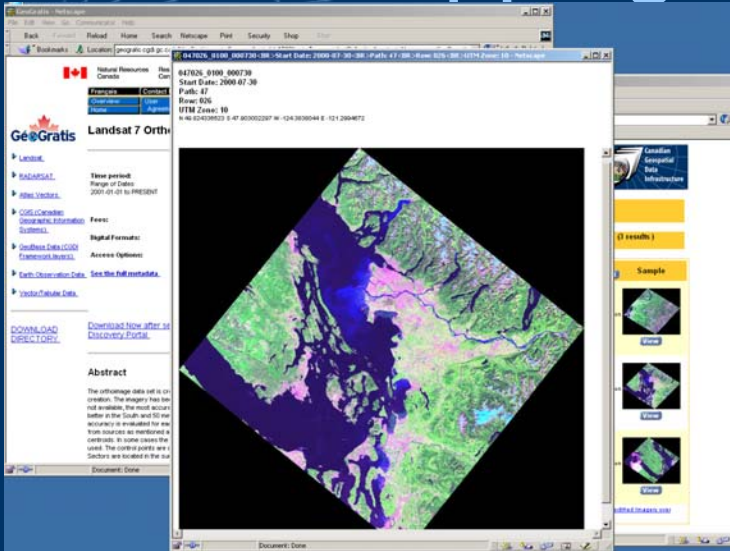
[View](#)

[Rectified Imagery over](#)

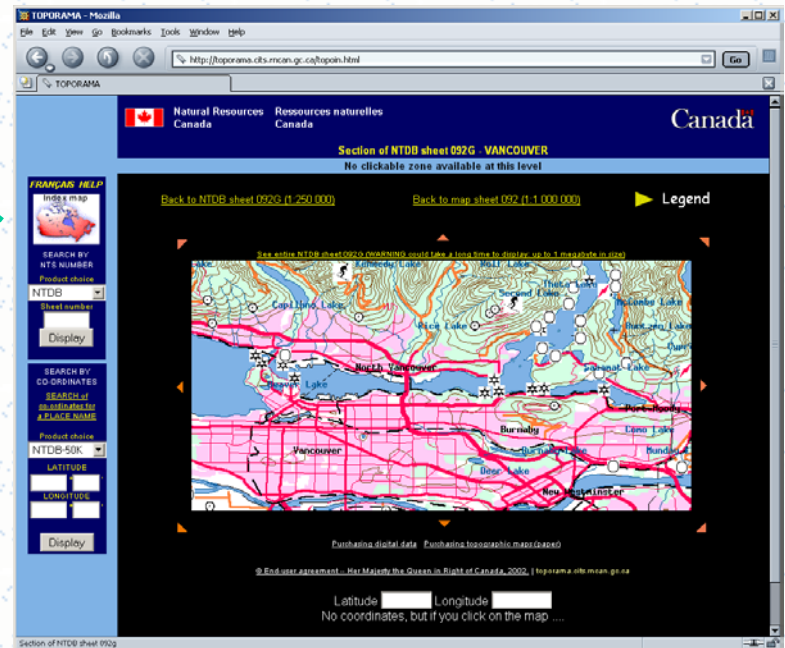
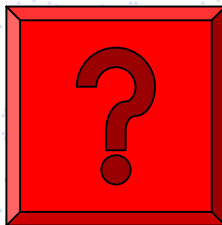
Section of NTDB sheet 092g

Document: Done

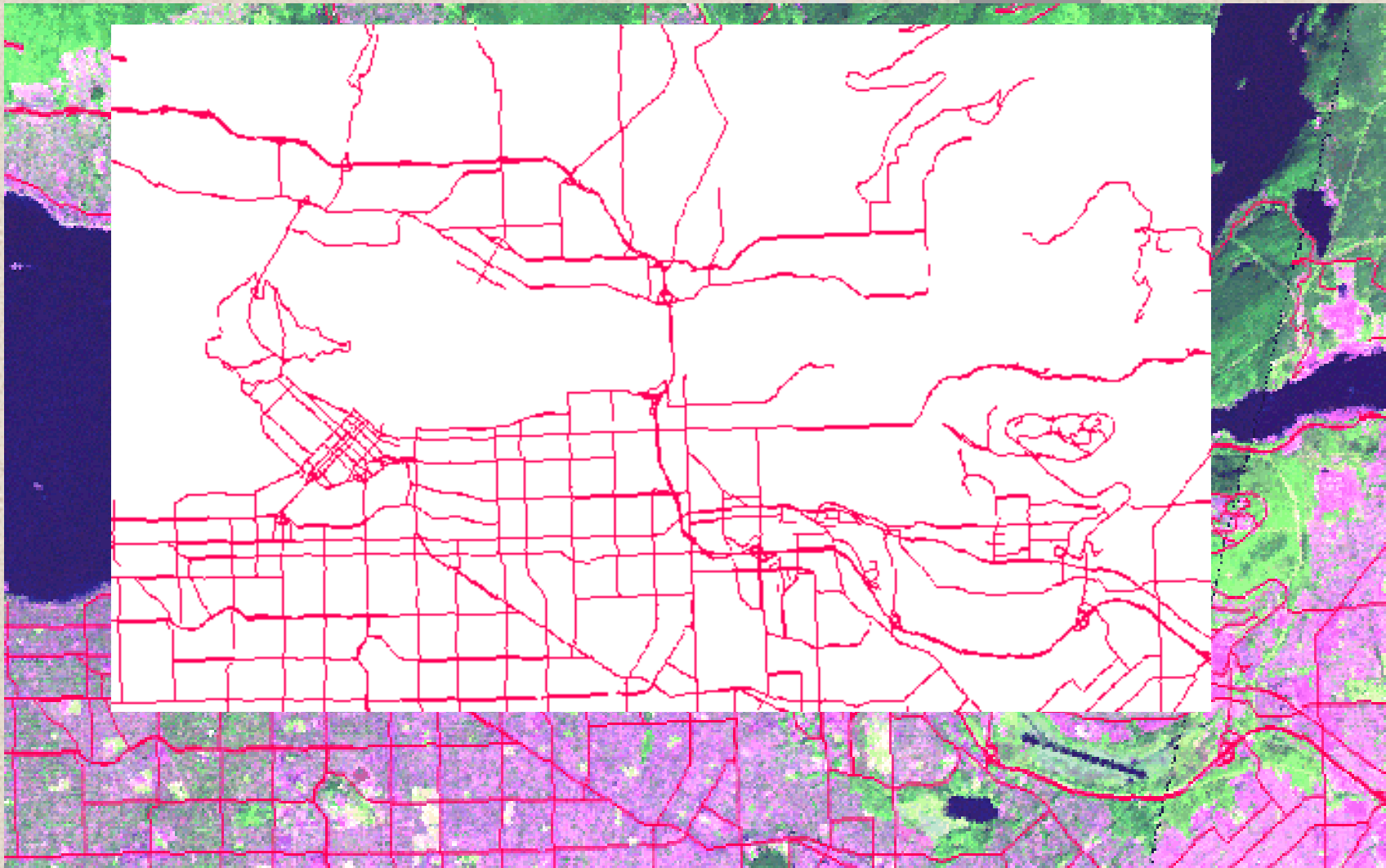
Web Mapping: Phase I



- ~~• Interoperability~~
- ~~• Common Standards~~
- ~~• Services~~



Web Mapping with WMS



Web Feature Service (WFS)



- Feature level access to spatial data
 - Finer grained access and query
- Spatial and non-spatial query capability
 - Attribute and / or geometry
- Returns GML
 - Can further transform with XSLT to SVG, style with SLD, etc.
- Transactional capability
 - INSERT, UPDATE, DELETE, LOCK, ...
- Security considerations

Geography Markup Language (GML)



- XML encoding of geospatial information
 - XML dialect
- Basic application framework for handling geospatial information
- Enables complex features & feature associations between data
- Human-readable
- Can be processed by many XML tools in various development environments

Geography Markup Language (GML)



Data Instance

Instance
Document

As static data or
through
Service Instance

Information
Community
Definition

Application
Schema

Geometry
Definitions

GML
Schemas

Geography Markup Language (GML)



```
<?xml version="1.0" encoding="utf-8" standalone="no" ?>
- <featureCollection xmlns:xlink="http://www.w3.org/TR/xlink"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation="http://cgdi-
  dev.geoconnections.org/prototypes/schemas/cgdigaz/cgdigaz_1_0.xsd"
  xmlns:gml="http://www.opengis.net/gml">
- <queryInfo>
  <nameEntered>SURREY</nameEntered>
  <wildcards>TRUE</wildcards>
  <bbox>NULL</bbox>
  <key>FALSE</key>
  <numberOfResults>2</numberOfResults>
</queryInfo>
- <featureMember>
- <GazetteerEntry>
  - <Geometry>
    - <gml:Box srsName="EPSG:4326">
      <gml:coordinates decimal="." cs="," ts=">-122.95888218349,49.0021898395391,-
      122.677735414246,49.2223973169006</gml:coordinates>
    </gml:Box>
  </Geometry>
  <feature_na>Surrey</feature_na>
  <entity>CITY/VIL1</entity>
  <location1>BC</location1>
  <map_chart>92 G/2</map_chart>
  <unique_key>JAZBU</unique_key>
  <lon>-122.75</lon>
  <lat>49.1167</lat>
  <nameSource>CGNDB Names Source Concise Gazetteer</nameSource>
  <featureLayer>G_CCSD962</featureLayer>
  <GMLFeatureID>123456789</GMLFeatureID>
```

Geography Markup Language (GML)



- New features (GML3)
 - Topology
 - Temporal
 - Enhanced Geometry
 - Coverages
 - Units of Measure

OpenGIS Web Map Context Documents - Need



- Growth of various WMS instances
- Growth of applications supporting WMS
- Need for saving state of a web mapping application for reuse, to enable user-friendly web mapping applications
- Any client should be able to generate a given view of data through WMS

OpenGIS Web Map Context Documents - Overview



- 'bookmarkable' XML encoding of state of a web mapping application
- Analogous to 'project' files in most popular GIS software packages
- Enables sharing of application scenarios, demonstrative presentations, etc.
- DM Solutions, GeoConnections part of OGC specification working group

Web Mapping – Same data; multiple applications (OpenGIS Web Map Context)



The image displays four overlapping web browser windows, each showing a different web mapping application. The windows are:

- owsview - Microsoft Internet Explorer:** Shows a map of Canada with a scale of 1:45,306,700. The interface includes a left sidebar with a layer list (e.g., 'Capitale of Canada', 'Canada Boundaries') and a top navigation bar with 'Add Layer' and 'Apply time query to maps' buttons.
- Centre for Topographic Information - Microsoft Internet Explorer:** Displays a topographic map of Canada. The header includes the Canadian flag and 'Canada' logo. A navigation menu has links for 'Français', 'Contact Us', 'Help', 'Education', 'Search', 'Business', and 'Canada Site'. Below the map are 'Update Map' and 'Zoom Factor' controls.
- EPI Online - Microsoft Internet Explorer:** Features a search interface with a 'PLACE NAME:' field and buttons for '1. LOCATE' and '2. SELECT'. The map shows a topographic view of Canada with various cities labeled.
- Quicklook Swath Browser - Microsoft Internet Explorer:** Shows a satellite imagery map of Canada. The header includes the Canadian flag and 'Canada' logo. A navigation menu has links for 'Français', 'Contact Us', 'Help', 'Publications', 'Search', and 'Canada Site'. Below the map are 'Recent Acquisitions' and 'Other Collections' sections.

Styled Layer Descriptors (SLD)



- Symbolization to map data
- Styling
- Addresses lack of symbolization within current and past OGC services
- Cartographic design of GeoData
- Augments OpenGIS specifications
 - Can custom style WMS content
 - Can custom style WFS content

Styled Layer Descriptors (SLD)



http://www.geobase.ca/styles/sldGeobase.xml - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Refresh

Address http://www.geobase.ca/styles/sldGeobase.xml

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!-- edited with XML Spy v4.4 U (http://www.xmlspy.com) by Michel Gilbert (Natural Resources Canada) -->
<Title>Unclassified</Title>
<ElseFilter />
<MaxScaleDenominator>1.00e1</MaxScaleDenominator>
```

http://www.geobase.ca/styles/sldGeobase.xml# Internet

Filter Encoding



- XML Definition of data query language for online services
 - GML used for geometry querying semantics
 - Used as filter grammar for OpenGIS WFS
 - Stand alone specification
 - Can be applied to any service as a query interface

Services Overview



- Web Services
- OGC Web Services
- OGC Web Services Within CGDI
- CGDI Development Network


CGDI Services Growth



- Many services available within CGDI
 - WMS
 - WFS
 - WCS
 - GML
 - Catalog
 - Gazetteer
 - Tools

CGDI WMS Content Providers



- 28 WMS instances within CGDI within last 20 months
- From multiple agencies / application domains, varying content, vendor implementations
 - Topographic Data (CTIS NTDB 50K, 250K scales, CDED)
 - Atlas of Canada (1M, 7.5M scales)
 - Geology (Geological Survey of Canada)
 - Forestry (National Forest Information System [NFIS])
 - Agriculture (Agriculture and Agri-Food Canada)
 - EO Data (Landsat 7 Ortho Imagery, Radarsat-1 [CCRS])
 - (TRIM Orthos [BC Provincial Government])
 - Marine
- Multilingual Service metadata requirement
 - Currently in collaboration within CGDI, to be forward for  recommendation into forthcoming OGC services

ArcExplorer 4.0.1 - Untitled

File Edit View Layer Tools Interoperability Help

- Lat/Lon Graticule
- Tundra
- Trees
- Marshes/Swamps
- Grasslands
- Croplands
- Utilities Coverage Text
- Utility Point Features
- Power Transmission/L
- Pipelines
- Data Quality Line Feat
- Transportation Covera
- Transportation Structu
- Transportation Structu
- Trails and Tracks
- Railroad Yard Points
- Roads
- Railroads
- Miscellaneous Transp
- Data Quality Line Feat
- Airport Facilities Points
- Population Coverage T
- Miscellaneous Popula

Examples

Internet Explorer

2_en.html&CONTEXT=http://cgdi-dev.geoconnections.org/prototypes/owsview/contexts/geobase_regional_en-demo.xml

ressources naturelles
Canada

Contact Us	Help	Search	Canada Site
Products	Education	Business	News

Graphic Information

Zoom: 2

x:4444893 y:3923457

x:-3546709 y:-869773 X:-1644708 Y:552218

Scale: 1:42958531

0 830 1660 2490 3320 4150 km

Projection: **NAD 83 / IIRCan LCC Canada**
Map Units: **Meters**

Quick View: Zoom Presets:

[SITE MAP](#) [LEXICON](#) [FAQ](#) [COMMENTS](#)

Last update: 2002-10-17 [Important Notices](#)

LAT/LONG: 42.05,-82.74

Legend

Projection

Map Size

Download

Help

Search Results: You Currently Have No Results

Services Overview



- Web Services
- OGC Web Services
- OGC Web Services Within CGDI
- **CGDI Development Network**

CGDI Development Network



- Collaborating geo-technology discussion / testing environment
- Initial focus to implement distributed set of Open GIS Consortium web services developed to support user communities of practice

CGDI Development Network



- Website:
 - <http://cgdi-dev.geoconnections.org/>
- Mailing List:
 - <http://cgdi-dev.geoconnections.org/maillinglist/>
 - Open to all
 - Collaborative environment
 - Test your components / tools
 - Free to join

Services Overview



Thanks!

<http://www.geoconnections.org/>

<http://cgdi-dev.geoconnections.org/>

<http://www.opengis.org/>

<http://www.ogcnetwork.org/>

Jean-François Doyon (jdoyon@nrcan.gc.a)

Tom Kralidis (tom.kralidis@ccrs.nrcan.gc.ca)

* OpenGIS is a registered trademark and OpenLS and OGCNetwork are trademarks of the Open GIS Consortium, Inc. in the U.S. and other countries

Canada