Chapter 1

Maps on the Web

Emmanuel Stefanakis

http://www2.unb.ca/~estef/
Publishing Maps on the Web

• The World Wide Web …
  – A common means of publishing maps

• Web maps …
  – Million of people use web maps daily
  – Few of them know how they are actually generated
The Web...

- Communication of computers
  - Client-Server Architecture....

```
CLIENT  HTTP/HTML  SERVER
    ▲         ▼
    ↓         ↓
GET       PUT
```
Publishing Maps on the Web

• Two approaches …
  – Static maps
    • Apply the basic web resources
  – Interactive maps
    • Enriched functionality by extending
      – The client side functionality
      – The server side functionality
Static Maps…

HTTP

GET

http://server/unb.htm

CLIENT

PUT

{ unb.htm, map.jpg }

SERVER

html text (unb.htm)

<p>UNIVERSITY OF NEW BRUNSWICK</p>

<img src="map.jpg">

map / image
map.jpg
Static Maps…

<html>
<head>
  <title>UNB Campus</title>
</head>

<body>
  <p>UNIVERSITY OF NEW BRUNSWICK</p>
  <img src="map.jpg">
</body>

</html>
Static Maps…

• Clickable maps …
  – Images may have “sensitive areas” …

associate a hyperlink to these areas…
Static Maps...

• Clickable maps...
Static Maps…

• Clickable maps …

<html>
<head>
  <title>UNB Campus</title>
</head>
<body>
  <p>UNIVERSITY OF NEW BRUNSWICK</p>
  <img src="map.jpg" width="319" height="424" usemap="#UNBMap">
  <p>Click on the image to see more</p>

  <map name="UNBMap">
    <area href="OldArtsBuilding.jpg" shape="polygon" coords="113,315, 101,334, 164,372, 172,346">
    <area href="http://gge.unb.ca" shape="rect" coords="93,39, 135,94">
    <area href="BusStop.jpg" shape="circle" coords="85,233, 10">
  </map>
</body>
</html>
Interactive Maps…

- Enriched functionality by extending…
  - the **client side** functionality
  - the **server side** functionality
Interactive Maps…

- Enriched functionality by extending…
  - the client side functionality
  - the server side functionality
Extend the Client-side…

- Plugins…
  - make the web browser capable to read and process additional formats
Extend the Client-side…

- Plugins

 PDF Reader (plugin)

 CLIENT

 GET
 http://server/unb.htm

 HTTP

 SERVER

 html text (unb.htm)

 `<p>UNIVERSITY OF NEW BRUNSWICK</p>`

 `<img src="map.pdf">`

 PDF Reader toolbox

 map / image map.pdf
Extend the Client-side…

• Plugins…
  – Scalable Vector Graphics (SVG) …
    • is a language for describing two-dimensional graphics and graphical applications
    • it is based on the XML standard
    • it describes…
      – Content + Map Symbols + …
Extend the Client-side...

• Plugins…
  – Scalable Vector Graphics (SVG) …
    • A W3C standard (current version 1.1)…
      – http://www.w3.org/Graphics/SVG/

• SVG Document Type Declaration (DTD)
  <!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN"
"http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">
SCALABLE VECTOR GRAPHICS (SVG)

SVG is a widely-deployed royalty-free graphics format developed and maintained by the W3C SVG Working Group. This is a public group, which works on an open mailing list and which welcomes your feedback.

Upcoming Events


The Graphical Web will showcase SVG, as well as related technologies like Canvas, WebGL, CSS, Javascript, and HTML5 video and audio. The theme of the 2014 edition of the conference will be Visual Storytelling – using new technology to produce compelling visual narratives on the web. The Graphical Web 2014 is being organised by the Data Visualisation Centre of the UK’s Office for National Statistics. The event will be of interest to a broad range of attendees, from graphics professionals right through to data journalists. As well as conference sessions and training workshops, the W3C SVG Work Group will be holding meetings as part of the conference.

What is SVG?

SVG is a markup language for describing two-dimensional graphics applications and images, and a set of related graphics script interfaces. SVG 1.1 is a W3C Recommendation and is the most recent version of the full specification. A second edition of SVG 1.1 which includes clarifications and minor improvements based on developer feedback is currently in Last Call. SVG Tiny 1.2 is a W3C Recommendation, and targets mobile devices.

CSS-SVG Effects Task Force Started

The CSS and SVG Working groups have started a joint task force to discuss and develop mutual features such as gradients, transforms, filters, and animation. The aim is to specify a

Recommendations

- SVG 1.1 2nd Edition
- SVG Tiny 1.2
- SVG Mobile 1.1
Extend the Client-side...

- Plugins...
  - Scalable Vector Graphics (SVG) ...
SVG...
<xml version="1.0" standalone="no"?>
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN" "http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">
<svg width="100%" height="100%" version="1.1" xmlns="http://www.w3.org/2000/svg">
<polygon points="408,238 560,195 578,260 430,306"
style="fill:red; stroke:blue; stroke-width:1"/>
</svg>
</xml>
Extend the Client-side…

- Plugins…
  - Scalable Vector Graphics (SVG) …
    - An SVG document **can be created**…
      - from scratch in a text editor
      - using an SVG editor
      - as an output of another program
        » e.g., ArcGIS, Adobe Illustrator, etc.
    - An SVG file **can be viewed** …
      - in a Web browser if an appropriate plugin is available
Extend the Client-side…

- Plugins… SVG

**SVG Viewer (plugin)**

- **GET**
  - http://server/unb.htm

**CLIENT**

- **HTTP**

**SERVER**

- **PUT**
  - { unb.htm, map.svg }

```
<html>
  <p>UNIVERSITY OF NEW BRUNSWICK</p>
  <object>map.svg</object>
</html>
```

```
<svg>
  <poly>…</poly>
  <rect>…</rect>
</svg>
```
Extend the Client-side...

- Plugins...
  - Google Earth Viewer
Extend the Client-side…

- **Java Applets – JavaScripts (API’s)**
  - The functionality varies …
    - from very simple button interactivity
    - to a sophisticated mapping environment
Extend the Client-side...

- Java Applets – Examples…
Extend the Client-side…

- **Java Applets…**

```
GET
http://server/unb.htm

PUT
{ unb.htm
  map.jpg
  map.class }
```

- **Java Virtual Machine**

```
<html>
  <p>UNIVERSITY OF NEW BRUNSWICK</p>
  <applet src="map.class">
```

- **Java code**
  - `map.java`
  - `map.class`
- **Java-applet code**
Extend the Client-side...

- **JavaScripts...**

  ![Diagram of client-server communication](Image)

  **CLIENT**

  Java Virtual Machine

  GET
  http://server/unb.htm

  **HTTP**

  **SERVER**

  PUT
  { unb.htm, map.jpg }

  html (unb.htm)

  `<p>UNIVERSITY OF NEW BRUNSWICK</p>`
  `<img src="map.jpg"`>  
  `<javascript="zoom_buttons">`  
  `<javascript="pan_buttons">`  
  `<javascript="mouse_XY">`
Interactive Maps…

• Enriched functionality by extending…
  – the **client side** functionality
  – the **server side** functionality
Extend the Server-Side

- Common Gateway Interface (CGI)
  
e.g., http://server?doThis&parameter1&parameter2
Extend the Server-Side

• GeoNames Server

http://www.geonames.org/
Extend the Server-Side

- Common Gateway Interface (CGI)

  e.g., http://server?doThis&parameter1&parameter2

  http://api.geonames.org/gtopo30?lat=45.95&lng=-66.67
  &username=demo
Extend the Server-Side

http://api.geonames.org/gtopo30?lat=45.95&lng=-66.67&username=demo
Extend the Server-Side

http://api.geonames.org/cities?north=46.0&south=45.8&east=-66.5&west=-66.7
Extend the Server-Side

- Common Gateway Interface (CGI)

GET
http://server/unb.htm?satellite_image
&Xmin&Ymin&Xmax&Ymax

CLIENT

HTTP

PUT
{ unb.htm, map.jpg }

SERVER

CGI Application

Database

UNIVERSITY
OF
NEW
BRUNSWICK

<html>
<p>UNIVERSITY OF NEW BRUNSWICK</p>
<img src="map.jpg">
Extend the Server-Side

- CGI – Example (JPL NASA Server)

```plaintext
http://wms.jpl.nasa.gov/wms.cgi
?request=GetMap
&service=WMS
&version=1.1.1
&srs=EPSG:4326
&format=image/jpeg
&styles=
&bbox=-180,-90,180,90
&width=600
&height=300
&layers=global_mosaic
```
Extend the Server-Side

- CGI – Example (JPL NASA Server)

http://wms.jpl.nasa.gov/wms.cgi
?request=GetMap
&service=WMS
&version=1.1.1
&srs=EPSG:4326
&format=image/jpeg
&styles=
&bbox=23,37.5,25,38.5
&width=600
&height=300
&layers=global_mosaic
http://ows.geobase.ca/wms/geobase_en?
service=wms
&request=GetMap
&version=1.1.1
&srs=epsg:4269
&bbox=-66.77,45.87,-66.57,46.01
&width=800&height=600
&style=&format=image/png
&layers=imagery:Landsat7
http://ows.geobase.ca/wms/geobase_en?service=wms
&request=GetMap
&version=1.1.1
&srs=epsg:4269
&bbox=-180,-90,180,90
&width=800&height=600
&style=&format=image/png
&layers=imagery:Landsat7
<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Title</th>
<th>Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>WMS-GeoBase</td>
<td>Data Collection...</td>
<td>The data available are: Administrative Boundaries (Aboriginal Lands, Cana...</td>
</tr>
<tr>
<td>1</td>
<td>elevation:cded2</td>
<td>Canadian Digital Elevation...</td>
<td>The Canadian Digital Elevation Data (CDED) consists of an ordered array o...</td>
</tr>
<tr>
<td>10</td>
<td>elevation:cded5</td>
<td>Canadian Digital Elevation...</td>
<td>The Canadian Digital Elevation Data (CDED) consists of an ordered array o...</td>
</tr>
<tr>
<td>21</td>
<td>landcover:scs2</td>
<td>Land Cover, Circ...</td>
<td>Land Cover information is the result of vectorization of raster thematic da...</td>
</tr>
<tr>
<td>73</td>
<td>imagery:landsat7</td>
<td>Landsat 7 Ortho...</td>
<td>The orthoimage data set is a complete set of cloud-free (less than 10%) or...</td>
</tr>
<tr>
<td>75</td>
<td>reference:bathy</td>
<td>Reference: bathy...</td>
<td>Shows the depths (bathymetry) of the waters in and around Canada.</td>
</tr>
<tr>
<td>77</td>
<td>reference:land</td>
<td>Canadian and F...</td>
<td>Canadian and Foreign landmass at 1:1M scale (Atlas of Canada)</td>
</tr>
<tr>
<td>82</td>
<td>reference:boun</td>
<td>Geopolitical Boundaries...</td>
<td>The Atlas of Canada 1,000,000 National Frameworks Data, Administrative ...</td>
</tr>
<tr>
<td>85</td>
<td>referencesnts</td>
<td>Index of the Nat...</td>
<td>Topographic maps produced by Natural Resources Canada conform to the...</td>
</tr>
<tr>
<td>92</td>
<td>reference:hydro</td>
<td>Hydrography...</td>
<td>This group covers drainage (coastlines, rivers, lakes) for the Canadian land...</td>
</tr>
<tr>
<td>101</td>
<td>reference:roads</td>
<td>Road Network...</td>
<td>This group covers the road network (primary and secondary highways, se...</td>
</tr>
<tr>
<td>105</td>
<td>reference:place</td>
<td>Populated place...</td>
<td>Populated Places data set shows a selection of named populated places s...</td>
</tr>
</tbody>
</table>

**Image encoding**
- **PNG**
- **PNG24**
- **JPEG**
- **GIF**
- **TIFF**

**Options**

**Layer name**

- **Add**
- **Close**
- **Help**
<table>
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<td>WMS-GeoBase</td>
<td>Data Collections from GeoBase</td>
<td>The data available are: Administrative Boundaries (Abor...</td>
</tr>
<tr>
<td>1</td>
<td>elevation:ccd250k</td>
<td>Canadian Digital Elevation Data, 1:250,000</td>
<td>The Canadian Digital Elevation Data (CDED) consists of...</td>
</tr>
<tr>
<td>10</td>
<td>elevation:ccd50k</td>
<td>Canadian Digital Elevation Data, 1:50,000</td>
<td>The Canadian Digital Elevation Data (CDED) consists of...</td>
</tr>
<tr>
<td>21</td>
<td>landcover:ccsc2000</td>
<td>Land Cover, Circa 2000</td>
<td>Land Cover information is the result of vectorization of...</td>
</tr>
<tr>
<td>73</td>
<td>imagery:landsat7</td>
<td>Landsat 7 Orthorectified Imagery over Canada (1999-2003)</td>
<td>The orthoimage data set is a complete set of cloud-free...</td>
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<td>reference:bathymetry</td>
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<td>Canadian and Foreign Landmass</td>
<td>Canadian and Foreign landmass at 1:1M scale (Atlas of...</td>
</tr>
<tr>
<td>82</td>
<td>reference:boundaries</td>
<td>Geopolitical Boundaries</td>
<td>The Atlas of Canada, 1,000,000 National Frameworks Da...</td>
</tr>
<tr>
<td>85</td>
<td>reference:cts</td>
<td>Index of the National Topographic System of Canada</td>
<td>Topographic maps produced by Natural Resources Can...</td>
</tr>
<tr>
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<td>reference:hydro</td>
<td>Hydrography</td>
<td>This group covers drainage (coastlines, rivers, lakes) for...</td>
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<td>105</td>
<td>reference:placenames</td>
<td>Populated places in Canada</td>
<td>Populated Places data set shows a selection of named p...</td>
</tr>
<tr>
<td>110</td>
<td>boundaries:geopolitical</td>
<td>Canadian Geopolitical Boundaries</td>
<td>Canadian Geopolitical Boundaries contains the intern...</td>
</tr>
<tr>
<td>114</td>
<td>boundaries:aboriginal</td>
<td>Aboriginal Lands</td>
<td>Aboriginal Lands including Indian Reserves, Land Clai...</td>
</tr>
<tr>
<td>119</td>
<td>boundaries:municipal</td>
<td>Municipal Boundaries</td>
<td>Municipal Boundaries data product consists of a series ...</td>
</tr>
<tr>
<td>124</td>
<td>nrr:roadnetwork</td>
<td>NRN Network</td>
<td>The National Road Network (NRN) product contains qu...</td>
</tr>
<tr>
<td>129</td>
<td>nrr:streetnames</td>
<td>NRN Street Names</td>
<td>Street Names of National Road Network</td>
</tr>
<tr>
<td>134</td>
<td>nrr:addressrange</td>
<td>NRN Address Range</td>
<td>Address Ranges of National Road Network</td>
</tr>
<tr>
<td>140</td>
<td>nhn:hydrography</td>
<td>NHN Hydrography</td>
<td>The National Hydro Network (NHN) focuses on providi...</td>
</tr>
<tr>
<td>159</td>
<td>nhn:network</td>
<td>NHN Network</td>
<td>A network flowing through naturally occurring or constr...</td>
</tr>
<tr>
<td>168</td>
<td>nhn:drainageareas</td>
<td>Boundaries of Drainage Areas</td>
<td>Canadian territory subdivision used to manage and dist...</td>
</tr>
<tr>
<td>176</td>
<td>nhnt:toponyms</td>
<td>NHN Toponyms</td>
<td>A feature delineating the extent, in whole or in part, of...</td>
</tr>
</tbody>
</table>

115989 of 115989 bytes of capabilities downloaded.
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<tr>
<td>1</td>
<td>elevation.cded250k</td>
<td>Canadian Digital Elevation Data, 1:250,000</td>
<td>The Canadian Digital Elevation Data (CDED) consists of...</td>
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<tr>
<td>10</td>
<td>elevation.cded50k</td>
<td>Canadian Digital Elevation Data, 1:500,000</td>
<td>The Canadian Digital Elevation Data (CDED) consists of...</td>
</tr>
<tr>
<td>21</td>
<td>landcover:css2000</td>
<td>Land Cover, Circa 2000</td>
<td>Land Cover information is the result of vectorization of...</td>
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<td>73</td>
<td>imagery:landsat7</td>
<td>Landsat 7 Orthorectified Imagery over Canada (1999-2003)</td>
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<td></td>
<td>reference:bathmetry</td>
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<td>Shows the depths (bathmetry) of the waters in and ar...</td>
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<td>Canadian and Foreign landmass at 11M scale (Atlas of...</td>
</tr>
<tr>
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<td>reference:boundaries</td>
<td>Geopolitical Boundaries</td>
<td>The Atlas of Canada 1,000,000 National Frameworks Data...</td>
</tr>
<tr>
<td>85</td>
<td>reference:hydro</td>
<td>Hydrography</td>
<td>Topographic maps produced by Natural Resources Can...</td>
</tr>
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<td>reference:roads</td>
<td>Road Network</td>
<td>This group covers drainage (coastlines, rivers, lakes...</td>
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<td>The National Road Network (NRN) product contains qu...</td>
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**Image encoding**
- PNG
- PNG24
- JPEG
- GIF
- TIFF

**Coordinate Reference System (66 available)**

Layer name: imagery:landsat7

WGS 84

1 Layer(s) selected
Add Layer(s) from a Server

GeoBase

<table>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>WMS-GeoBase</td>
<td>Data Collection</td>
<td>The data available are: Administrative Boundaries (Aboriginal Lands, Canadian Geopolitical Boundaries and Canadian Digital Elevation Data (CDED)) consists of an ordered array of ground elevations at regularly spaced points.</td>
</tr>
<tr>
<td>1</td>
<td>elevation:cded2</td>
<td>Canadian Digital Elevation Data (CDED)</td>
<td>The Canadian Digital Elevation Data (CDED) consists of an ordered array of ground elevations at regularly spaced points.</td>
</tr>
<tr>
<td>10</td>
<td>elevation:cded5</td>
<td>Canadian Digital Elevation Data (CDED)</td>
<td>The Canadian Digital Elevation Data (CDED) consists of an ordered array of ground elevations at regularly spaced points.</td>
</tr>
<tr>
<td>21</td>
<td>landcover:ccs2</td>
<td>Land Cover</td>
<td>Land Cover information is the result of vectorization of raster thematic data originating from classified Land Cover data.</td>
</tr>
<tr>
<td>73</td>
<td>imagery:landsat7</td>
<td>Landsat 7 Orthoimage</td>
<td>The orthoimage data set is a complete set of cloud-free (less than 10%) orthoimages covering the Canadian landmass.</td>
</tr>
<tr>
<td>75</td>
<td>reference:bathy</td>
<td>Reference: Bathymetry</td>
<td>Shows the depths (bathymetry) of the waters in and around Canada.</td>
</tr>
<tr>
<td>77</td>
<td>reference:land</td>
<td>Canadian and Foreign Lands at 1:1M scale (Canada)</td>
<td>Canadian and Foreign lands at 1:1M scale (Atlas of Canada)</td>
</tr>
<tr>
<td>82</td>
<td>reference:boundary</td>
<td>Geopolitical Boundary</td>
<td>The Atlas of Canada 1,000,000 National Frameworks Data, Administrative Boundaries consists of area and boundary data.</td>
</tr>
<tr>
<td>85</td>
<td>reference:nt</td>
<td>Index of the National Topographic System</td>
<td>Topographic maps produced by Natural Resources Canada conform to the National Topographic System.</td>
</tr>
<tr>
<td>87</td>
<td>reference:hydro</td>
<td>Hydrography</td>
<td>This group covers drainage (coastlines, rivers, lakes) for the Canadian landmass.</td>
</tr>
<tr>
<td>92</td>
<td>reference:roads</td>
<td>Road Network</td>
<td>This group covers the road network (primary and secondary highways, selected ferry routes) for the Canadian landmass.</td>
</tr>
<tr>
<td>105</td>
<td>reference:place</td>
<td>Place</td>
<td>Populated Places data set shows a selection of named populated places suitable for use at various scales.</td>
</tr>
<tr>
<td>110</td>
<td>boundaries:geo</td>
<td>Canadian Geopolitical</td>
<td>Canadian Geopolitical Boundaries contains the international, inter-provincial and territorial boundaries, as well as the boundaries of the provinces and territories.</td>
</tr>
<tr>
<td>114</td>
<td>boundaries:aboriginal</td>
<td>Aboriginal Lands</td>
<td>Aboriginal Lands including Aboriginal Reserves, Land Claim settlement and other Indian Lands.</td>
</tr>
<tr>
<td>119</td>
<td>boundaries:mu</td>
<td>Municipal Boundaries</td>
<td>Municipal Boundaries data product consists of a series of municipal features, each defined as a bounded area.</td>
</tr>
</tbody>
</table>

Image encoding

- PNG
- PNG24
- JPEG
- GIF
- TIFF

Coordinate Reference System (66 available)

Layer name: nm:roadnetwork
WGS 84

Add Close Help
<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Title</th>
<th>Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>WMS-GeoBase</td>
<td>Data Collections from GeoBase</td>
<td>The data available are: Administrative Boundaries (Aboriginal Lands, Canadian Geopolitical Boundaries, Municipal Boundaries)</td>
</tr>
<tr>
<td>1</td>
<td>elevation:ced2...</td>
<td>Canadian Digital Elevation Data, Land Cover, Circa 2000</td>
<td>The Canadian Digital Elevation Data (CDED) consists of an ordered array of ground elevation data.</td>
</tr>
<tr>
<td>10</td>
<td>elevation:ced2...</td>
<td>Canadian Digital Elevation Data, Land Cover, Circa 2000</td>
<td>The Canadian Digital Elevation Data (CDED) consists of an ordered array of ground elevation data.</td>
</tr>
<tr>
<td>21</td>
<td>landcover:cs2...</td>
<td>Land Cover, Circa 2000</td>
<td>Land Cover information is the result of vectorization of raster thematic data originating from remote sensing imagery (e.g., Landsat 7).</td>
</tr>
<tr>
<td>73</td>
<td>imagery:landsat7</td>
<td>Landsat 7 Orthorectified Imagery</td>
<td>The orthoimage data set is a complete set of cloud-free (less than 10%) orthoimages covering Canada.</td>
</tr>
<tr>
<td>75</td>
<td>reference:bathymetry</td>
<td>Reference: bathymetry</td>
<td>Shows the depths (bathymetry) of the waters in and around Canada.</td>
</tr>
<tr>
<td>77</td>
<td>reference:canadian_foreign_land</td>
<td>Canadian and Foreign Landmass</td>
<td>The Atlas of Canada 1,000,000 National Frameworks Data, Administrative Boundaries.</td>
</tr>
<tr>
<td>82</td>
<td>reference:geopolitical_boundaries</td>
<td>Geopolitical Boundaries</td>
<td>Topographic maps produced by Natural Resources Canada conform to the National Topographic Series.</td>
</tr>
<tr>
<td>85</td>
<td>reference:hydrography</td>
<td>Hydrography</td>
<td>This group covers drainage (coastlines, rivers, lakes) for the Canadian landmass.</td>
</tr>
<tr>
<td>92</td>
<td>reference:road_network</td>
<td>Road Network</td>
<td>This group covers the road network (primary and secondary highways, selected ferry routes).</td>
</tr>
<tr>
<td>101</td>
<td>reference:places</td>
<td>Populated places in Canada</td>
<td>Populated Places data set shows a selection of named populated places suitable for use as national toponyms.</td>
</tr>
<tr>
<td>110</td>
<td>boundaries:geo...</td>
<td>Canadian Geopolitical Boundaries</td>
<td>Canadian Geopolitical Boundaries contains the international, inter-provincial and territorial boundaries of Canada.</td>
</tr>
<tr>
<td>114</td>
<td>boundaries:aboriginal</td>
<td>Aboriginal Lands</td>
<td>Aboriginal Lands including Indian Reserves, Land Claim settlement and other Indian Lands.</td>
</tr>
<tr>
<td>113</td>
<td>boundaries:municipal</td>
<td>Municipal Boundaries</td>
<td>Municipal Boundaries data product consists of a series of municipal features, each defining a specific administrative area.</td>
</tr>
</tbody>
</table>

Image encoding:
- PNG
- JPEG
- GIF
- TIFF

Coordinate Reference System (66 available):
- WGS 84
Google Earth - Web Mapping Service Parameters

WMS Server: http://demo.cubewerx.com/demo/cubeserv/cubeserv.cgi

Move layers you want to see from left to right side. Order layers such that transparent layers follow opaque layers in the "Selected Layers" list.

Opaque Layers

WMS Capability fetch failed.

Selected Layers

Transparent Layers

Google Earth - Enter WMS Server URL

URL

http://ows.geobase.ca/wms/geobase_en?service=wms&request=GetCapabilities&version=1.1.1

OK Cancel
Move layers you want to see from left to right side. Order layers such that transparent layers follow opaque layers in the "Selected Layers" list.

**Transparent Layers**

- Data Collections from GeoBase
- Canadian Digital Elevation Data, 1:250,000
- CDED 1:250,000 level 5 overview
- CDED 1:250,000 level 4 overview
- CDED 1:250,000 level 3 overview
- CDED 1:250,000 level 2 overview
- CDED 1:250,000 level 1 overview
- CDED 1:250,000 zoom 2 mosaic
- CDED 1:250,000 zoom 1 mosaic
- CDED 1:250,000 zoom 0 mosaic
- Canadian Digital Elevation Data, 1:50,000
- CDED 1:50,000 level 7 overview
- CDED 1:50,000 level 6 overview
- CDED 1:50,000 level 5 overview
- CDED 1:50,000 level 4 overview
- CDED 1:50,000 level 3 overview
- CDED 1:50,000 level 2 overview
- CDED 1:50,000 level 1 overview
- CDED 1:50,000 zoom 2 mosaic
- CDED 1:50,000 zoom 1 mosaic
- CDED 1:50,000 zoom 0 mosaic
- Land Cover, Circa 2000
- CSC2000 level 0 overview
- CSC2000 level 0 overview
- CSC2000 level 1 overview

**Selected Layers**

- Add ->
- <- Remove
- Move Up
- Move Down

---

**Google Earth - Web Mapping Service Parameters**

- WMS Server: http://wms.geobase.ca/wms/geobase_en?service=wms&request=GetCapabilities&version=1.1.1

Add... | Edit... | Remove

OK | Cancel | Apply
Interactive Maps…

• Enriched functionality by extending…
  – the **client side** functionality
  – the **server side** functionality
Extend both the Client and Server

- Example architecture…

![Diagram showing interactions between Client, HTTP/HTML, and Server with plugin/JVM and CGI components]
Extend both the Client and Server

- Google Earth (plugin)
- Google Maps
- Database
- HTML text
- image

HTTP

GET

PUT

Google Earth CGI

CLIENT

SERVER
Extend both the Client and Server
Extend both the Client and Server

http://geonb.snb.ca/geonb/
Extend both the Client and Server

- **Java Virtual Machine**
- **CLIENT**
- **HTTP**
- **SERVER**
- **GET**
- **PUT**
- **UMN MapServer**
- **Geo-Database**
- **HTML text + JavaScripts**
- **image**
Extend both the Client and Server

- MapServer (CGI) and Openlayers (JS)
Involve a third party → Mashups

• Map-Mashups…
Involve a third party → Mashups

- Alternative architectures
  - Web-based mashups
    - Combination of the content and formatting on the client side (web browser)
  - Server-based mashups
    - Combination of the content and formatting on the server
Server-based Mashups

CLIENT

HTTP

SERVER

GET

PUT

Java Virtual Machine

Third Party (Google Server)

UMN MapServer

Geo-Database

HTML text + JavaScripts

image
Web-based Mashups

CLIENT

HTTP

SERVER

GET

PUT

Java Virtual Machine

Third Party (Google Server)

UMN MapServer

Geo-Database

HTML text + JavaScripts

image
Map Mashups…

Base Map: Google Satellite
Layers: Municipalities, Road Network, Buildings
Map Mashups…

Base Map: Google Map
Layers: Municipalities, Road Network
Map Mashups…
Map Mashups…
Map Mashups…
References