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Canada

Geolinking Service (GLS)

What is a Geolinking Service (GLS)?

A **Geolinking Service (GLS)** operates on geolinked data, or attribute data that are not directly attached and bundled with geographic coordinates.

GLS provides a mechanism to incorporate the data into a database as an Internet-enabled "relate" (link/join/merge) function on two tables that share a common key field.

What can you do with GLS?

- **Web mapping.** One of the most widely applicable uses of geolinking is to support web mapping – in particular, the *dynamic* creation of Web Map Service (WMS) layers.

  Dynamic data from an XML stream produced with a **Geolinked Data Access Service (GDAS)** can be seamlessly merged with the associated geospatial framework via the geolinkage field, and delivered through a WMS.
- **Desktop GIS.** A GLS can add an attribute field or amend the contents of an existing field in a dataset in the spatial data warehouse so it can be used in a GIS.
- **Modelling.** A model can be enabled with a GLS on the front end to accept data, and a GDAS on the output end to provide results, allowing the user to easily run different input scenarios through the model.
- **Data replication.** A GLS can use GDAS streams to regularly update the contents of a data warehouse and its associated metadata tables, based on the latest information available from the primary data warehouse.

GLS make it easy for users to create WMS layers "on-the-fly"!

Customized applications that were previously costly and time-consuming to create can now be made dynamically, using Open GIS standards and WMS-compliant web mapping clients.

- **Simple, seamless.** GDAS and GLS can be wrapped in a simple interface and used as a "black box" – easy and quick.
- **No extras required.** The user does not need specialized software, GIS/database/WMS expertise, data, or even the framework data to be able to create WMS layers.
- **Efficient use of distributed computing.** GDAS and GLS services keep data and geographical datasets where they belong – at the source.

Examples of applications that could use dynamically generated WMS layers

- West Nile virus risk by county
- Real estate sales by census tract or neighbourhood
- Traffic volumes by road sections
- Rainfall comparison for the current week over the previous 5 years by ecoregion

Using a Geolinking WMS to create layers "on-the-fly"

To create a WMS layer from another organization's geolinked data . . .

Before GLS technology:

Static WMS, multi-step preparation, always available

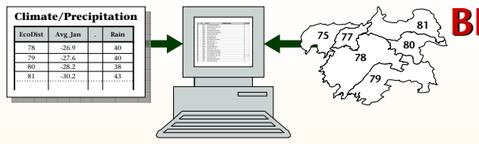
Identify available data. Find data through standard channels (e.g. Web, contacting colleagues, organizations).

FIND

Request data. If not already packaged and available, the source organization must extract and prepare the data in a format that your corporate system can utilize.

Transfer to your own system. Download, FTP, CD, etc.

Merge the data. In your corporate GIS or database, add or join the desired data via the geolinkage field to the spatial data attribute table.



BIND

Configure your web map server to display the layer. Your server must comply with the OGC Web Map Server Interface Implementation Specifications, and provide the following information to users of your layer:

- **Metadata** giving provider contact details, data information, etc. (***GetCapabilities*** request)
- **A map image** location (URL) and other parameters such as size, projection, geographic area, and image format (***GetMap*** request)
- [Optionally] **Further attribute information about the features** shown on the map (***GetFeatureInfo*** request)

PUBLISH

Using new GLS technology:

Dynamic WMS, seamless procedure, on request

Identify the data. Find the data and associated framework you need directly through the service registry (attributes available via GDAS, and associated framework data linked through GLS).

SERVICE REGISTRY

Then simply initiate the processing.

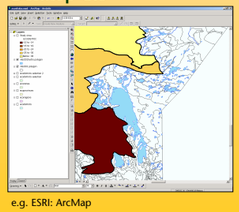
Geolinking WMS

Merge new attribute data with the framework, and create the final WMS layer **seamlessly, in a single step** using **Geolinked Data Access Service** and **Geolinking Service**

Store or discard after processing. Layers are fast and easy to generate – if data volatility is of concern, just discard the layer after processing.

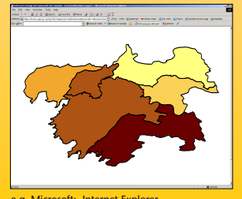
Out to a WMS client

Desktop GIS



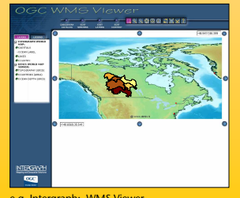
e.g. ESRI: ArcMap

Web browser



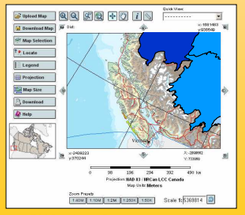
e.g. Microsoft: Internet Explorer

WMS viewer



e.g. Intergraph: WMS Viewer

Configurable web mapping interface



e.g. DM Solutions: Chameleon

And inside the box . . . an implementation of GLS using UMN MapServer and PHP

Geolinked Attribute Data (remote)

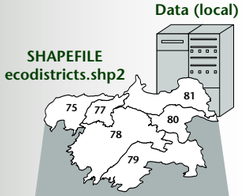
GDAS XML

```
. . .
<Attribute>
  <Description>Mean Monthly Temperature January 1961-1990
  </Description>
  . . .
</Attribute>
<ROWSET>
  <ROW>
    <I>79</I>
    <V>-35.5</V>
  </ROW>
  <ROW>
    <I>80</I>
    <V>-34</V>
  </ROW>
  . . .
</ROWSET>
. . .
```

PHP script: **Create temporary dbf from XML**

Framework Data (local)

SHAPEFILE ecodistricts.shp2



my1081966109.dbf

my1081966109.I	my1081966109.V
79	-35.5
80	-34
81	-33.6
...	...

ecodistricts.dbf

OID	Area	Ecodist	Ecoreg
53	4.8557	79	270
54	2.06192	80	270
55	3.67031	81	271
...	...	...	...

PHP script: **Create mapfile dynamically, including an OGR join**

MapServer

Styled Layer Descriptor (SLD)

An SLD can be used to control colours, line styles and weights, fonts, and other WMS styling information.

ecodistSLD.xml

```
<StyledLayerDescriptor version="1.0.0">
  <NamedLayer>
  <NAME>ecodistricts</NAME>
  <UserStyle>
    <FeatureTypeStyle>
    <Rule>
      <Filter>
        <PropertyIsLessThanOrEqualTo>
          <PropertyName>
            my1081966109.V
          </PropertyName>
          <Literal>-27.697346</Literal>
        </PropertyIsLessThanOrEqualTo>
      </Filter>
      <PolygonSymbolizer>
        <Fill>
          <CssParameter name="fill">
            #ff0000
          </CssParameter>
        </Fill>
      </PolygonSymbolizer>
    </Rule>
. . Etc.
```

OR …Apply a Styled Layer Descriptor (SLD)

MapServer mapfile (WMS configuration file)

```
MAP
  NAME GDAS Map
  STATUS ON
  SIZE 400 300
  UNITS DD
  SHAPEPATH "data"
  TRANSPARENT TRUE
  IMAGECOLOR 255 255 255
  EXTENT -140.999420714 41.6735377449  -52.3645760593 83.6331543686
  PROJECTION
    "init=epsg:4269"
  END
  WEB
      IMAGEPATH "/usr/local/ms4w/apps/gdas/htdocs/mapimage/"
      IMAGEURL "/gdas/mapimage/"
      METADATA
      "wms_title" "GDAS MAP"
      "wms_onlineresource" "http://wms1.agr.gc.ca/cgi-bin/mapserv?map=/usr/www/httpd/htdocs/gdas/temp/wms1081966109.map"
      "wms_srs" "EPSG:42304 EPSG:42101 EPSG:4269"
      "wms_abstract" "This WMS layer contains attribute data of a GDAS framework"
      "accessconstraints" "none"
    . . . Contact information . . .
    END
  END
  LAYER
    CLASSITEM "my1081966109.V"
    CONNECTION "/usr/local/ms4w/apps/gdas/htdocs/data/ecodistricts.shp"
    CONNECTIONTYPE OGR
      DATA "SELECT my1081966109.V FROM ecodistricts LEFT JOIN
'/usr/local/ms4w/apps/gdas/htdocs/temp/my1081966109.dbf'.my1081966109
ON ecodistricts.I = my1081966109.I"
      NAME "ecodistricts"
      PROJECTION
      "init=epsg:4269"
      END
      . . . Etc.
    CLASS
      NAME "<= -27"
      EXPRESSION ([my1081966109.V] <= -27.69
      STYLE
        COLOR 255 255 0
        MAXSIZE 100
        MINSIZE 1
        OUTLINECOLOR 0 0 255
        SIZE 1
        SYMBOL 0
      END
    END
  . . . More classes . . .
  END
END
```

Join temporary dbf on-the-fly to shapefile dbf

Use default styling in the mapfile …

Contacts

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For specific technical details, contact Xiaoyuan Geng gengx@agr.gc.ca

References

GLS Specifications and OGC Web Map Server Interface Implementation Specifications: See *Service Specifications* under *Technical Architecture* at http://www.geoconnections.org/architecture/index_e.cfm

OGC-compliant web map servers: http://www.opengis.org/resources/?page=products