NEW WEB-GIS ARCHITECTURE

OPeNDAP

As the fast growth of Web-GIS produces more and more applications requiring data stored at remote databases, data access security and data transfer speed over the internet are at issue. The authors compare traditional client/server approaches with the open-source OPeNDAP data server.<P>

Traditional client/server Web-GIS applications are usually based on accessing databases stored in one server machine or within a network of servers. Data transport goes as follows:
-client requests data using web interface, web service or other interface
-data requests sent to HTTP server, which sends pre-defined SQL statement to database
-database retrieves data and sends resulting dataset back to HTTP server
-HTTP Server forwards results to client.
In this approach the login on a remote database is usually established by an authorised account and may cause data security problems. Furthermore, developers need to study the database structure, dataset storage format and data access protocol, and to pre-define SQL statements. Data transfer is also time-consuming.

OPeNDAP
OPeNDAP (Open-source Project for a Network Data Access Protocol) is a tool developed to make local data accessible to remote locations regardless of local storage. It is based on the open-source Distributed Oceanographic Data System (DODS) of the OPeNDAP group. From the OPeNDAP data server, hosted by a data owner, clients can retrieve data by sending a URL over the internet. The owner controls the distribution of his data and the way users access it from remote sites. The Database Administrator manages the OPeNDAP data server and the database on the server side. The approach includes three physically independent parts: (1) Client, (2) Apache HTTP Server and (3) Database Server and does not require pre-defined SQL statements. Instead the HTTP Server sends the client request to the OPeNDAP Server, which builds SQL statements dynamically. This increases the data retrieval flexibility of the Web GIS application because SQL queries are made at client request time, leading to enlarged data access content and easily realised data sharing. The OPeNDAP Server is the only one granted enough privileges to access the database, which increases data security, and since the data is transported in binary format, data transfer time is shortened.

Implementation
Each OPeNDAPs server can host several local databases and the data from one database can also be hosted on different OPeNDAP. The servers work mainly as a data-transport tool, by retrieving data from databases and establishing the Data Access Protocol to encapsulate a user's data request. OPeNDAP is implemented in the "OceanOgraphic Data Mapping Interface" Web-GIS application. This OPeNDAP Server hosts three survey datasets: emolt, drift and hydro, and drift. From the interface users can click onto links to study the datasets, set up request parameters and send them to the OPeNDAP Server so as to retrieve spatial GIS data. The application is hosted at Northeast Fishery Science Center and can be accessed at http://gisweb.wh.whoi.edu/cgi-bin/ioos/ioos.pl. Figure 5 shows dynamically created GIS maps using eMOLT survey data hosted by OPeNDAP Server. Tests show that total data retrieval time is shorter than when using pre-defined SQL statements in the traditional way.

Concluding Remarks

The temporary Oceanographic OPeNDAP Server provides oceanographic data for public researchers at http://gisweb.wh.whoi.edu:8080/dods/whoi. The user interface provided is DODS Directory (http://gisweb.wh.whoi.edu:8080/dods/whoi/).

Further Reading
-Honglei Dai, Lansen Chen, 2006, EcoSystem Survey Data Mapping Interface: Web-Based GIS application for Ocean Species Sample Analysis. 2006, GIM International, Vol. 20, No. 2, pp 61-63.

-Plewe, B., 1997, GIS Online: Information Retrieval, Mapping, and the Internet. Santa Fe, NM: OnWord Press, 311.

-Honglei Dai, Wenbao LIU, Lansen Chen, 2004, An Ap-proach On Rendering GIS Vector Maps onto Internet. In: TSU GIS 2004- The 1st Annual GIS Symposium at TSU. May 19-20, 2004. Troy, Alabama USA.

Websites

http://opendap.org

http://mapserver.gis.umn.edu/

https://www.gim-international.com/content/article/opendap

http://opendap.org

http://mapserver.gis.umn.edu/

https://www.gim-international.com/content/article/opendap