



White Paper



Simplified access to North American magnetic data using the Internet

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INTRODUCTION

The success of any exploration or scientific project depends on the ability to find and use all types of geoscientific data efficiently. For many geoscientists, the "Data Experience" of sharing and distributing large volume data continues to be an inefficient and time-consuming process. Geophysical specialists can typically spend 20 to 40% of their time delivering data to decision makers to support active projects.

A new generation of Internet and intranet data-sharing protocols can improve this data experience by making it easier to access and share geo-related data, both privately within an organization, and globally across the Internet. These new protocols streamline the process of responding to data requests by providing 'self-serve' data to end users in unique working environments, without the need to worry about data projection, windowing, security, file formats and server loading.

Providing efficient access to data

In order for a data-sharing protocol to solve the problem of distributing large volume data, it must be able to solve the end user's data problem and be easy for the data provider to implement.

Organizations who can benefit from a successful data-sharing solution include those that need the ability to:

- Share geospatial data among many people connected to the same network
- Make geospatial data discoverable on the web, either on the Internet, or through an intranet portal
- Deliver geospatial data to web clients in any format and projected coordinate system.
- Transfer large volumes of data over an Internet or intranet
- Move data securely and efficiently
- Provide spatially aware data in any projected coordinate system or file format while storing the data in its "native format"

The data consumer or user of the data wants to:

- Discover data (see what data are available) efficiently
- Explore the data (find out more about the data) before downloading the data
- Exploit the data (download and start using the data) in the context of their area of interest

administrators don't have to make sure data are all in the same projection on the server; as long as the data have a projection, DAP will display them correctly.

Internet and intranet Access

DAP provides the ability to distribute data from a server behind a firewall or proxy server to a client application using an Internet, intranet, peer-to-peer network connection.

This network flexibility enables someone using a DPA or GIS software application on notebook computer to connect to a data store and download data, then disconnect and continue to work remotely.

Single storage strategy

Geosoft's Data Access Technology or DAT enables a DAP server to store complete datasets in their native format. Projections, windowing, file conversion and scaling are all performed 'on-the-fly' by the DAP technology when a user requests to download data. This minimizes storage and administration costs by eliminating the need to store several copies of the same data in different formats or to reformat the data manually.

Client/Interface Independence

Geosoft's DAP technology is client independent allowing an organization to chose the end user interface for public download of spatial data. Currently Geosoft has built DAP into its existing Oasis montaj interface and software applications. Geosoft is currently developing interfaces to Map Info, Arc View and other common user interfaces.

The scalable nature of DAP means that a single DAP installation can support direct data browsing and retrieval from both DAP-enabled software applications like Oasis montaj and common GIS systems, and from thin-client web browsers that want to extract data in a specific format for their own application.

Metadata catalogue mapping

Geosoft DAP administration tools provide the ability to load metadata information from an internal metadata RDBMS catalogue into an XML Meta browser for Oasis montaj. This browser enables users to query information before downloading the data files to their desktops.

Balanced client/server processing loads

DAP technology supports balanced process loading on both the server and client's CPU by using the end users CPU to perform processing tasks. This minimizes the load on the server and improves its performance.

Support for all data types

Geosoft DAP technology supports not only grid and image spatial databases but also random point, airborne profile, maps, GIS and documents/reports. This enables a single transport technology to serve all data types without the need to support and invest in multiple technologies to satisfy diverse end user data requirements.

Access to Geosoft's Hyper-indexing technology

Geosoft has developed a hyper-indexing technology that optimizes spatial data searches, making them significantly faster than using standard SQL queries. This makes it possible to quickly locate and extract subsets of regional or countrywide survey/archive data. Hyper technology currently applies to gridded data and is extendible to point, profile and map data.

Compression and Streaming Technology

DAP's Task technology compresses and (optionally) encrypts a 'task' over the network to provide both optimum use of available bandwidth and security. A Task may be constructed as a single block of data, or if the data is large, the data can be streamed. Streaming is useful when transferring very large volumes of data. It enables a client or a server to collect, transfer and use data without the need to create temporary storage.

DAP Administration Tools

Geosoft has developed administration tools that simplify and automate the process of loading metadata information into a DAP registry and the loading data onto a DAP server. These tools also make it easier for administrators to manage multiple data servers, data files and their associated Meta data files.

DAP (and Task) technology is bi-directional. This means that DAP can be used to load and administer a DAP site from a remote client on the same network. For example, a DAP site might be set up to

collect data from an ongoing data collection project so the data can be readily available to other people who are monitoring the project as it progresses. Data collectors can use DAP to stream new data to the DAP site on a daily basis, at which point the data is both "backed-up" and made available to others.

Multiple Server and Catalogue Access

DAP technology uses the HTTP protocol to communicate between the client and the server, enabling organizations to point users to multiple data servers and data catalogues. This makes it possible to have data servers in numerous locations and allows end users to see a single list of available data types and sources. The DAP Data Server catalogue can point to both internal and external DAP catalogue servers.

DAP for a WEB client

Organizations that need to make data easy-to-find and available to a wide variety of users over the web can use the DAP WMS Server, DAP Web Server and the DAP Extraction Server to build custom web pages for users to access data. Geosoft can also provide custom web development services. Geosoft has also extended access to its Data Catalogue and Data Server through an Open GIS Consortia Web Browser. No java applet or plug-in is required to download the data.

Summary Conclusion

This paper demonstrates how data access protocols are able move data from various data stores through a local intranet or global Internet into a spatially aware workstation environment, Geographical Information System (GIS), or thin web client for interpretation.

The examples in the following poster show how the Data Access Protocol technology (DAP) is able to catalog, store and serve North American 2 km magnetic grid data to a variety of web browser and software client-based environments. It provides a practical example of how a single technology can support multiple data servers and workstations, enabling users to share magnetic or other high volume data more efficiently.



Figure 1: The DAP user's experience

Accessing data using a web browser

1. Open your web browser and connect to a DAP web site



<http://www.geodap.com/map>

This screen shows the **DAP data explorer**, a web interface for exploring and downloading data from a DAP server. Data providers can use this interface or build a custom one.

3. Explore the available data layers.



This lower left panel lists the **data sources** that are available on the server. Each data source contains **layers** of unique data (such as point or line data, grids, and images).

4. Query the metadata to refine your search or learn more about the data.



Click the **i** button next to a data layer to view the **metadata** (information about the data). The metadata shown here is a simple text file with a description of the data layer. The DAP server supports other types metadata such as PDFs, spreadsheets or images.

5. Display and select the data layers you want to download.



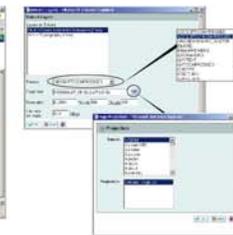
The selected data layers are listed in the top left panel and displayed in the main window on the right. This example shows a global topography grid and a magnetic grid covering North America.

6. Select the geographical extent of the data.



Use the zoom tools in the display panel to select the geographical area of data you want to download. This feature ensures that you only download the data you need.

7. Choose the projection and file format.



Use the zoom tools in the display panel to select the geographical area of data you want to download. This feature ensures that you only download the data you need.

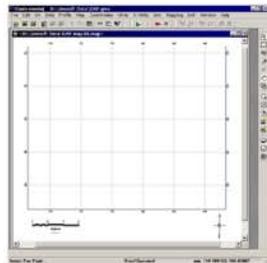
8. Extract and download the data.



Click the extraction button and the extraction server retrieves the data, formats and projects it, then compresses it into a zip file for your to download.

Accessing data using a DAP application client

1. Open a georeferenced map in a DAP software application.



DPA and GIS software applications such as Oasis montaj (shown here), MapInfo, acQuire, and ArcView provide a DAP client for accessing data. This client is a menu or plug-in that enables you to connect to a DAP server and download data directly into your map.

2. Connect and explore the available datalayers.



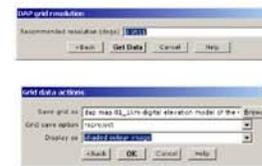
Oasis montaj provides a menu that enables you to connect directly a DAP server. You can search for your data using keywords or by specifying a particular type of data (grids, point).

3. Query the metadata to refine your search and learn more about the data.



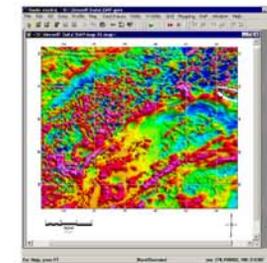
You can choose from a list of data layers and view the metadata associated with each layer in the metadata browser. The metadata provides information that describes the data and can include related documents or other files. This information can help you decide whether to download a dataset or not.

4. Select the data you want to download.



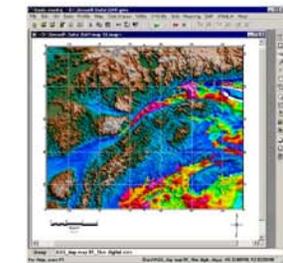
Select the data layer you want to download. You can specify the resolution, colour shading, projection and file name.

5. Oasis montaj downloads the actual data into your map



Oasis montaj downloads the actual data (not just a view of it) based on the area your map covers and displays it in your map. By selecting only the data that fits your map, DAP ensures that you only get the data you require. This reduces download times and eliminates the need to manually crop or window the data.

6. Start using your data.



You can now edit, process or analyse the data in Oasis montaj or convert and export it to use in other applications. Repeat the process to download and display additional data layers on your map.

Figure 2: How the DAP components work

This diagram provides a description of each DAP component and shows how the components integrate to enable a user to access data from a DAP server using a DAP-enabled workstation application client or web browser.

DAP Data Server

The DAP Data Server provides **data to a DAP enabled data client for a specified area of interest at a desired resolution**. Data is delivered in a neutral format for use by the DAP client in their own context. As with the DAP Catalog Server, the DAP Data Server is optimized to work with extremely large data stores, which can be in a variety of formats, or linked directly to any open data archive. The DAP Catalog Server and DAP Data Server are both required for all DAP configurations.

DAP Catalog Server

The DAP Catalog Server provides **catalog services to support the exploration of available data sets for an area of interest**. This includes providing metadata information about data. The DAP Catalog Server is optimized to perform spatial and contextual searches extremely quickly.

The DAP server components

5 separate DAP Server services are used to deliver all types of spatial data to web and workstation application clients:

- DAP Data Server
- DAP Catalog Server
- DAP Extraction Server
- DAP Web Server
- DAP WMS Server

DAP Application Client

Software programs such as Oasis montaj, acQure, and MapInfo include a DAP client that enables users to connect directly to a DAP server and access data. The software enables the user what data and metadata are available and then download the data to their software program. The DAP server delivers the data for the area the user is interested in with the correct projection and appropriate file format for the software program.

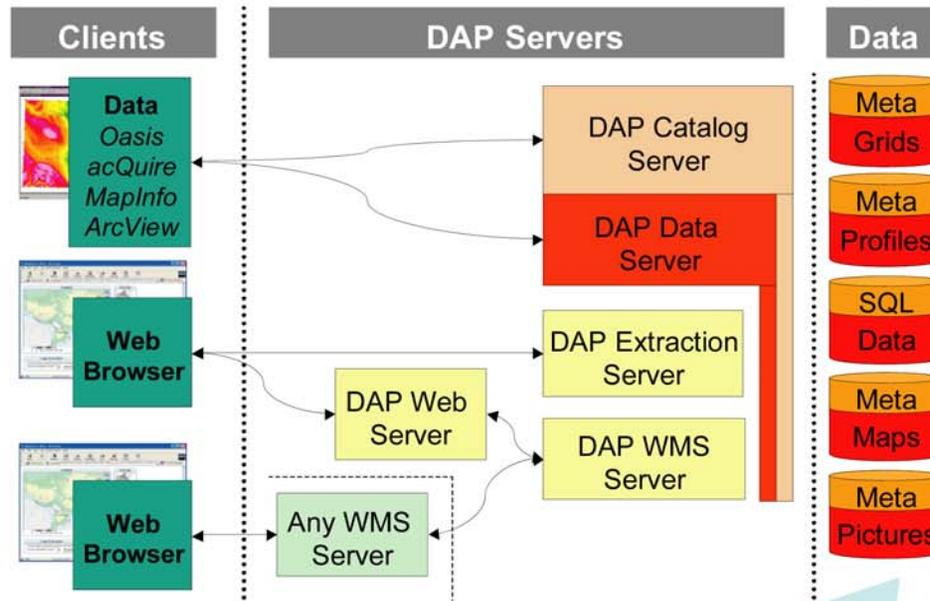
DAP Web Client

The DAP Data Explorer is a web interface that enables users to access data from DAP web server using their browser. The user connects to a DAP web site and uses the web interface to browse the available data and metadata. They can then select an area of data, specify a projection and file format, and download the data in a compressed zip file.

Data providers can use the DAP Data Explorer as their web site interface or develop their own custom interface.

Any WMS Server

If a web site is using an existing WMS server for a front-end, it can be easily connected to a DAP WMS server. By connecting to a DAP server, the existing WMS server can access and select data by location co-ordinates rather than by predetermined tile. The DAP server also provides the ability to store many types of data in their native file formats and to deliver the data in any projection or file format that is required.



DATs, Data and Metadata

The DAP Server can store data and metadata in a variety of formats. Both the data and metadata can be stored locally or linked from other servers. DAP stores the data in a native format and uses DATs to convert the data to the format a client requires.

What are DATs?

DATs (Dynamic Access Technology) are translators that enable the DAP server to read and write to different file formats enabling the user to display and download grids and images in a variety of common third-party formats.

What is Metadata?

Metadata is refers any data or information associated with data. For example, a GIS polygon file showing land ownership would have an associated metadata file that contains the lot number and owner of each piece of land. The DAP server can hold a variety of metadata for a given dataset such as reports, presentations, notes, and archive information in any file format. Common file types include PDFs, Microsoft .doc, .ppt and .xls files, plain text files, html files, and images.

DAP Web Server

The DAP Web Server is a web server that uses the DAP WMS Server interface to **create a web page that enables anyone to explore and download data using their web browser**. The DAP web server page can be placed in any web application frame, allowing it to be easily incorporated into an existing web site. The DAP Web Server will be of interest to organizations that wish to provide a web interface to clients to both browse and extract data of interest.

DAP WMS Server

The DAP WMS Server provides an Open GIS Consortium (OGC) compliant Web Map Server (WMS) interface to support the **delivery or data images to web applications**. This uses DAP Catalog Server and DAP Data Server technologies to retrieve data.

The DAP WMS Server will reproject the data to meet the web client requirements and render the data to an image and deliver this for display by a web application. A DAP Web Server will be of interest to organizations that have existing WMS compatible web pages and wish to provide web browsing to data hosted by their DAP servers.

Note that the WMS interface does not provide for the extraction of data, only the rendering and display of images of data.

DAP Extraction Server

The purpose of the DAP Extraction Server is to **extract requested data from a DAP server, reproject and reformat the data to a specified file format, and deliver the files in a compressed ZIP file** to a web browser client.

Note that DAP data clients (such as Oasis montaj) automatically reproject and store data in their own native format, so they do not require an extraction server.