Session SH03
Towards an Integrated Solar-Terrestrial Data Environment

Virtual GeoMagnetic Observatory
Concept and Implementation

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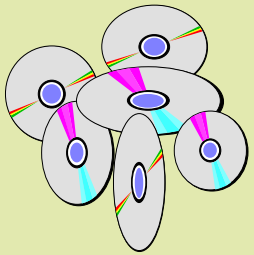
To get scientific data from various, mostly distributed sources, a scientist has to:

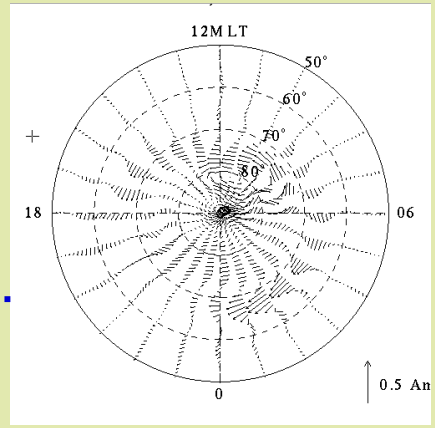
1. Search through a number of data centers, various institutions, observatories, contact colleagues… Hi, Bob, could you send me…?

2. Get data via snail-mail, air-mail, e-mail, World Wide Web… Ooh, when I get these data?

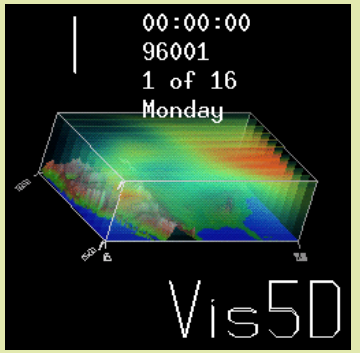
3. Then ingest retrieved data into the local database… Uhf, done!



4. Finally, process the collected data using own algorithms and codes, run models… and…



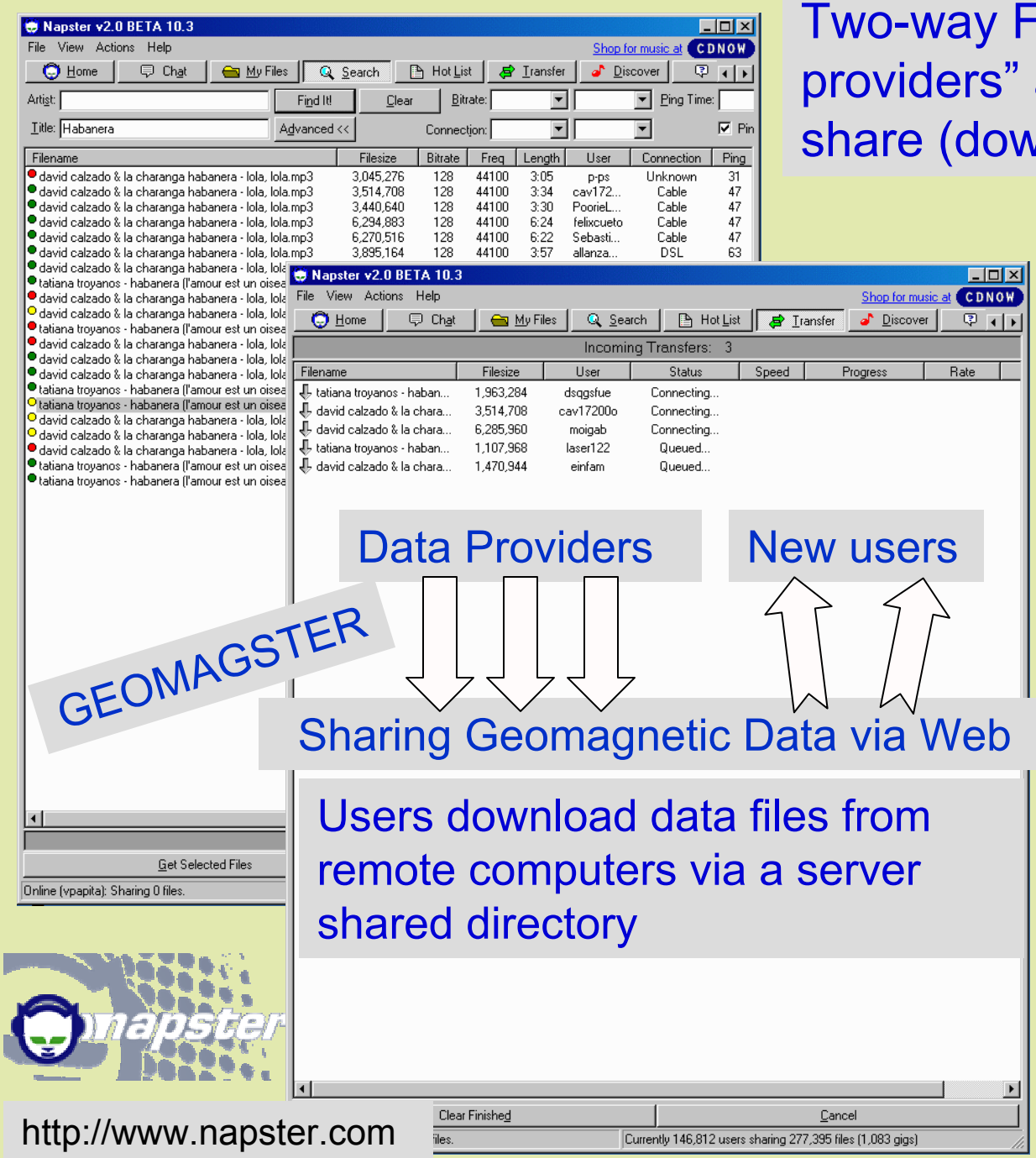
5. Only then get meaningful or meaningless results… Hurrah!



Does it sound exciting? Searching and then converting from various foreign formats into something useful for the local processing and analysis – that can be **time consuming, labor intensive, and very often frustrating if the collected data do not deliver what you have expected!**

VGMO.NET: Virtual GeoMagnetic Observatory

Two-way FTP servers connect “data providers” and “users” allowing them to share (download) geomagnetic data



GEOMAGSTER

Data Providers

New users

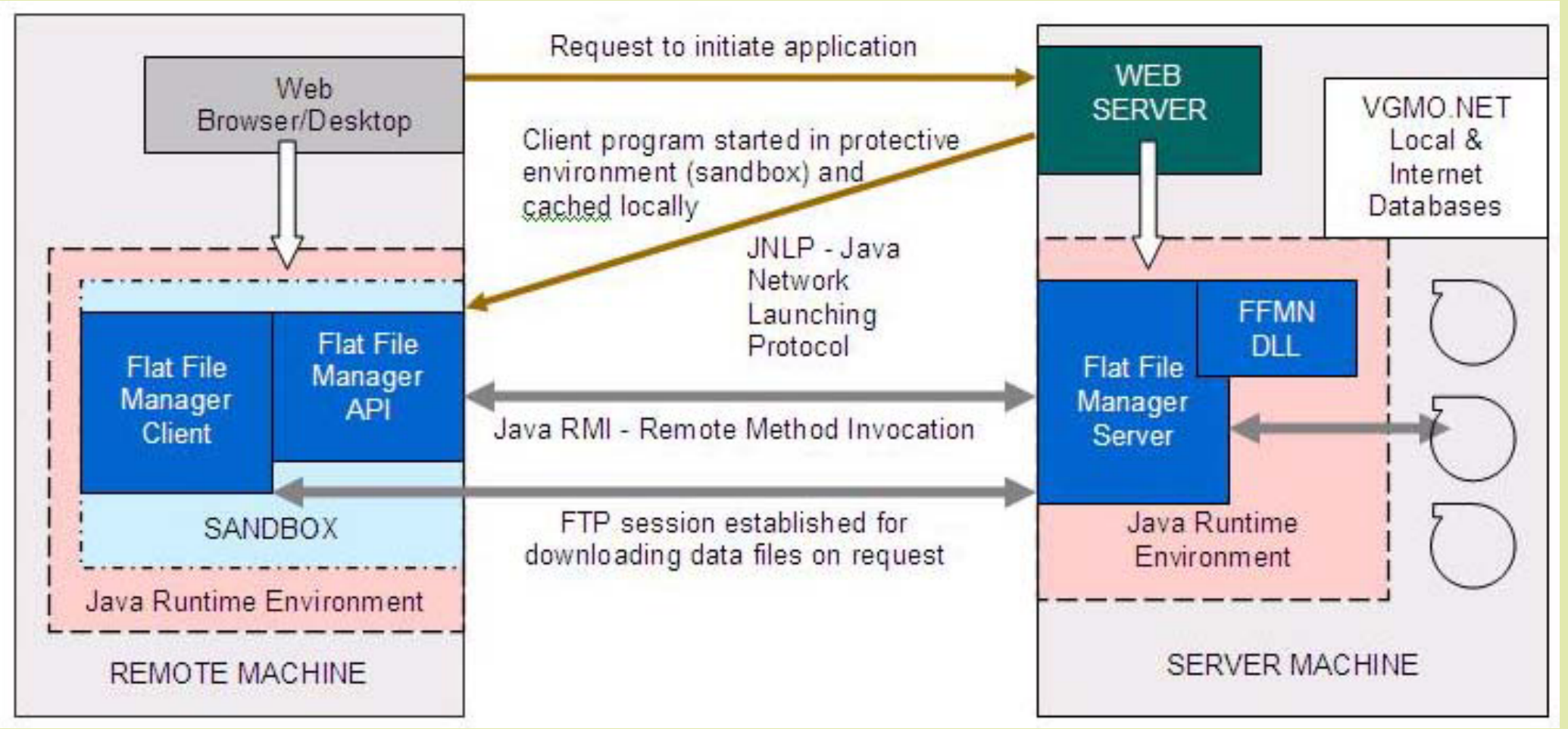
Sharing Geomagnetic Data via Web

Users download data files from remote computers via a server shared directory

http://www.napster.com

Therefore, if geomagnetic data are placed in shared directories at various Web sites (e.g., data centers, observatories, universities, individual PCs, etc.) and they are of the same type (e.g., in the IAGA-2002 ASCII Data Exchange Format) or even in any format which can be read and converted, then we can deploy the Napster-like servers (Geomagsters!) at a number of locations (e.g., World Data Centers) and enjoy the flexible and convenient data service – everybody can share data with others and populate local databases as needed!

VGMO.NET Web-Based Flat File Manager
A Software Framework for Remote Access to VGMO



A secure, scalable, platform independent, and user-friendly software framework for Remote Access to VGMO.NET Flat File Manager

The Flat File Manager Client is written to the Java 2 SE platform that requires a Java Web Start (JNLP - Java Network Launching Protocol)

VGMO.NET Highlights

Remote (Client) Machine Requirements

- Java Runtime Environment (JRE), version 1.2.2 or later
- Java Web Start (available for Windows 98/ME/NT/2000/XP, Linux, and Solaris OE)
- The library and "Java thin client" for the FFMN Client

Server Requirements

- Any standard Web server that must be configured to support JNLP
- Flat File Manager DLLs and Flat File Manager Server software

Platform Independence

- FFMN Server can be deployed on a wide-variety of platforms (Linux, Solaris OE, Windows 98/ME/NT/2000/XP) and launched remotely from any platform

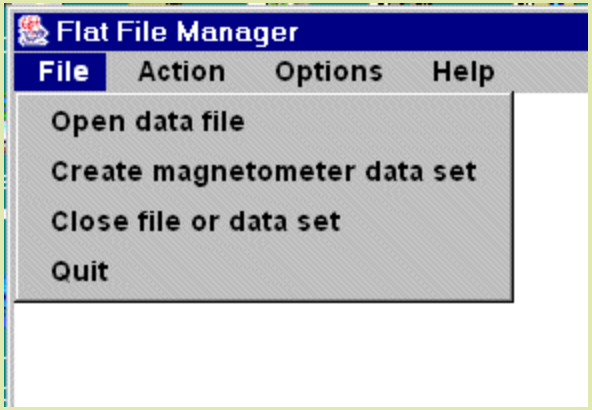
Client Side Security and Notification of Application's Origin

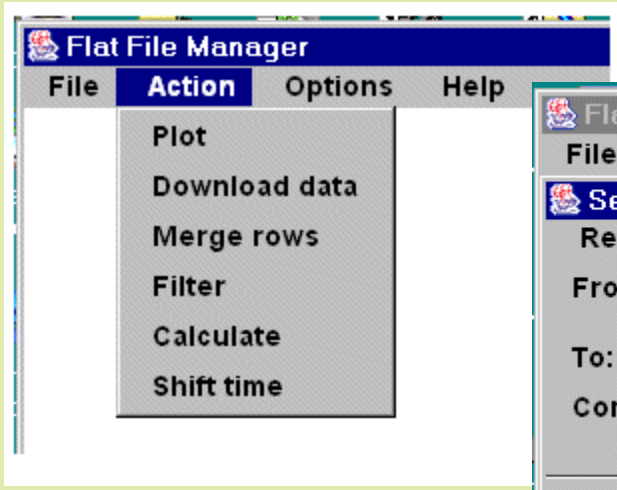
- The FFMN service provider signs the downloadable code to ensure that no other party can impersonate the application on the Web; thus, the VGMO framework provides flexibility without compromising security.
- The user is shown a dialog displaying the application's origin (based on the signer's certificate) before the application is launched; thereby, the user can make an informed decision whether to grant additional privileges to the downloaded code
- If the user trusts the FFMN service provider, he/she can go choose to grant additional system privileges, such as a write access to a local disk

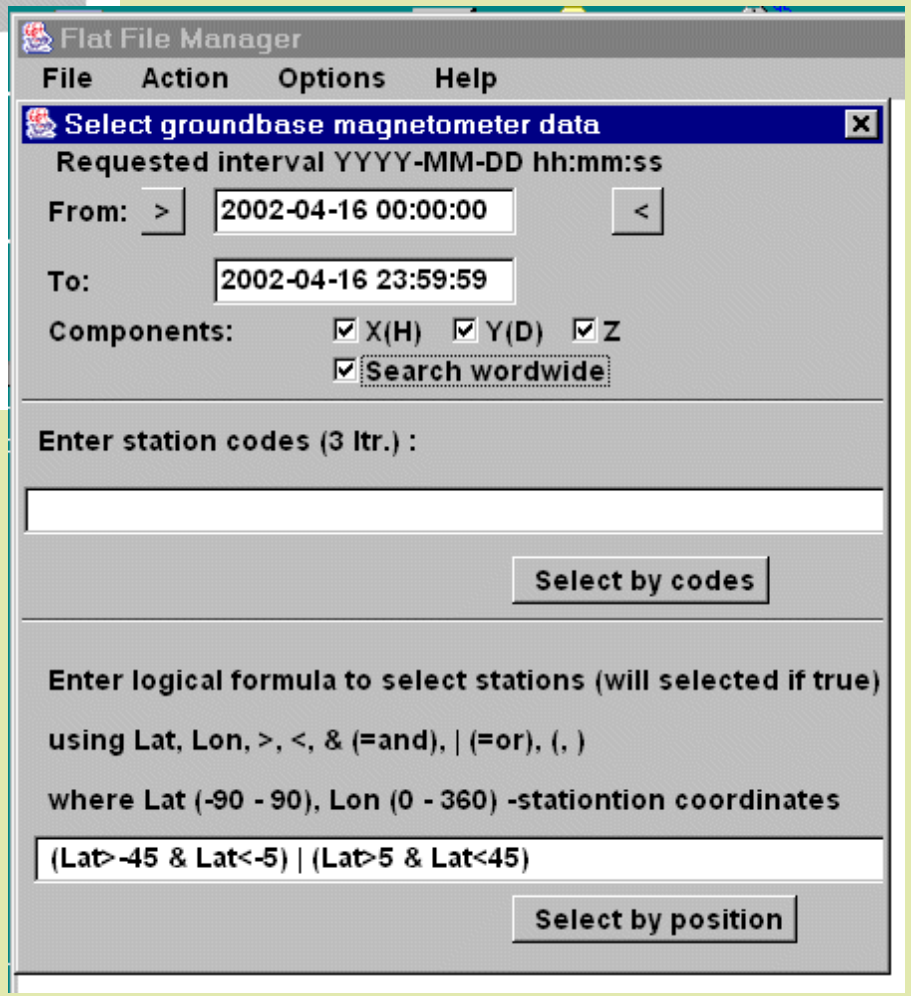
Launching VGMO.NET

1. The very first initiation of FFMN is through a local Web browser. As initiated, the remote machine is checked for necessary software (e.g., JRE). If that software is not found, the user can choose an option of “One Click” installation or download various components manually and launch FFMN later. However, the “One Click” option requires least manual intervention and prepares the platform to launch FFMN remotely.
2. As the FFMN client software is downloaded from the Web server, it is launched locally via JNLP (Java Network Launch Protocol). Note that the downloaded application runs at the remote machine in a protective environment (“sandbox”).
3. The “Java thin client” opens a control connection (out-of band signaling) with the FFMN Server and instructs the server to run Flat File Manager locally but the output is posted at the remote machine. Later this control connection initiates FTP sessions on demand and allows users to download requested files.
4. Subsequent initiations of FFMN from the remote machine can be independent of a Web browser; the application can be launched through desktop shortcuts, making launching the Web-deployed application similar to launching a native application. The user is prompted for creating a desktop shortcut in Step (1).

VGMO.NET at Work

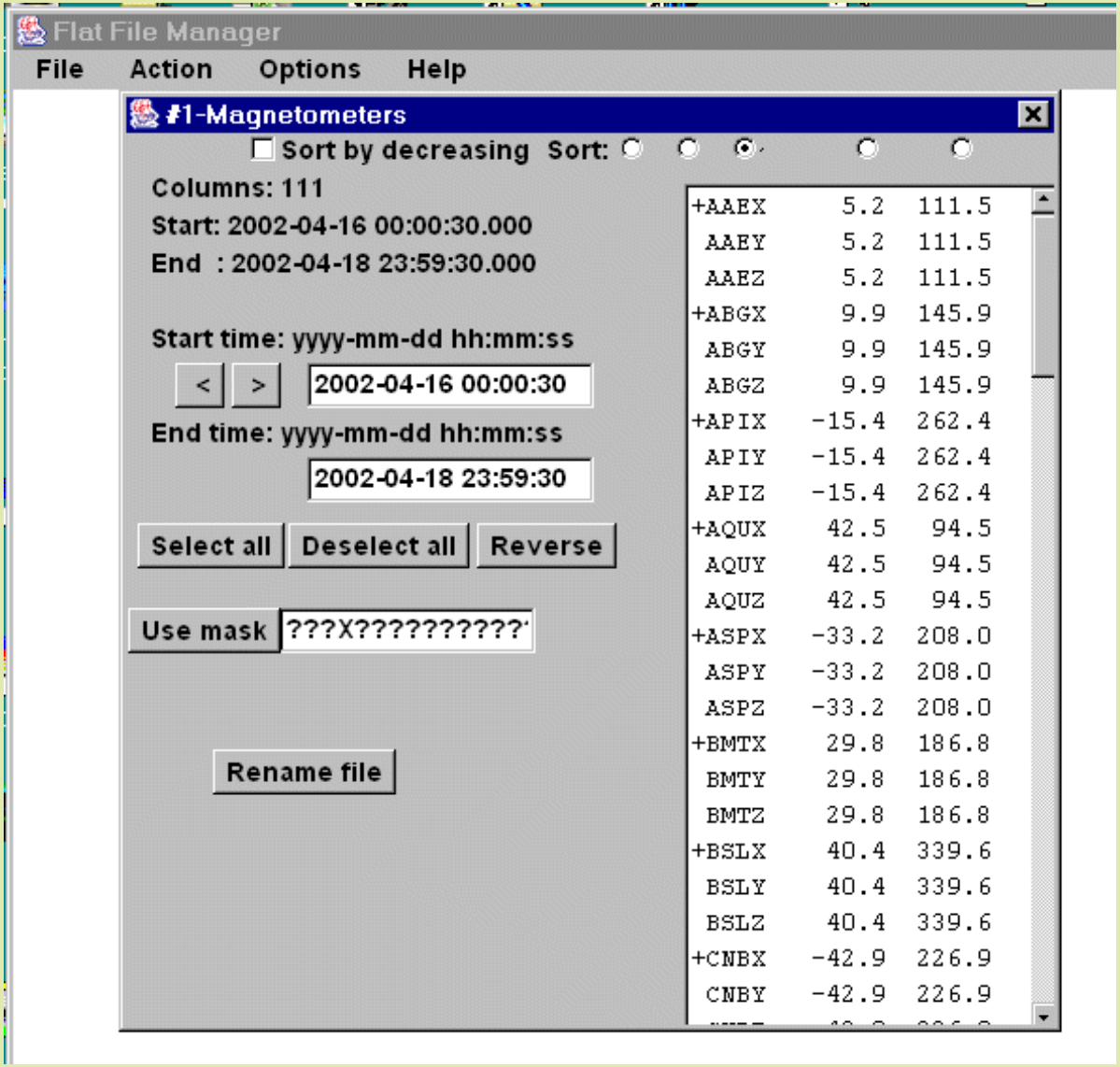






- FFMN Main Menu allows the user to select up to three data sets (File), then do certain operations with selected data sets (Action) by setting Options
- The File item allows the user to open the server database files or to create a temporary data set for the selected geomagnetic stations (selected either by names or geographic location)
- If the selected data are found in the server's database, then the FFMN Server retrieves requested data for the plotting (and possible uploading) to the remote, FFMN client machine
- In addition, if the "Search worldwide" box is checked, the FFMN Server will look for the selected data on a number of remote FTP sites (listed in the FFMN Lookup File); these data are then downloaded, converted to flat files, and added to the FFMN server database
- When new FTP sites with geomagnetic data are found, they can be easily linked through additions to the FFMN Lookup File

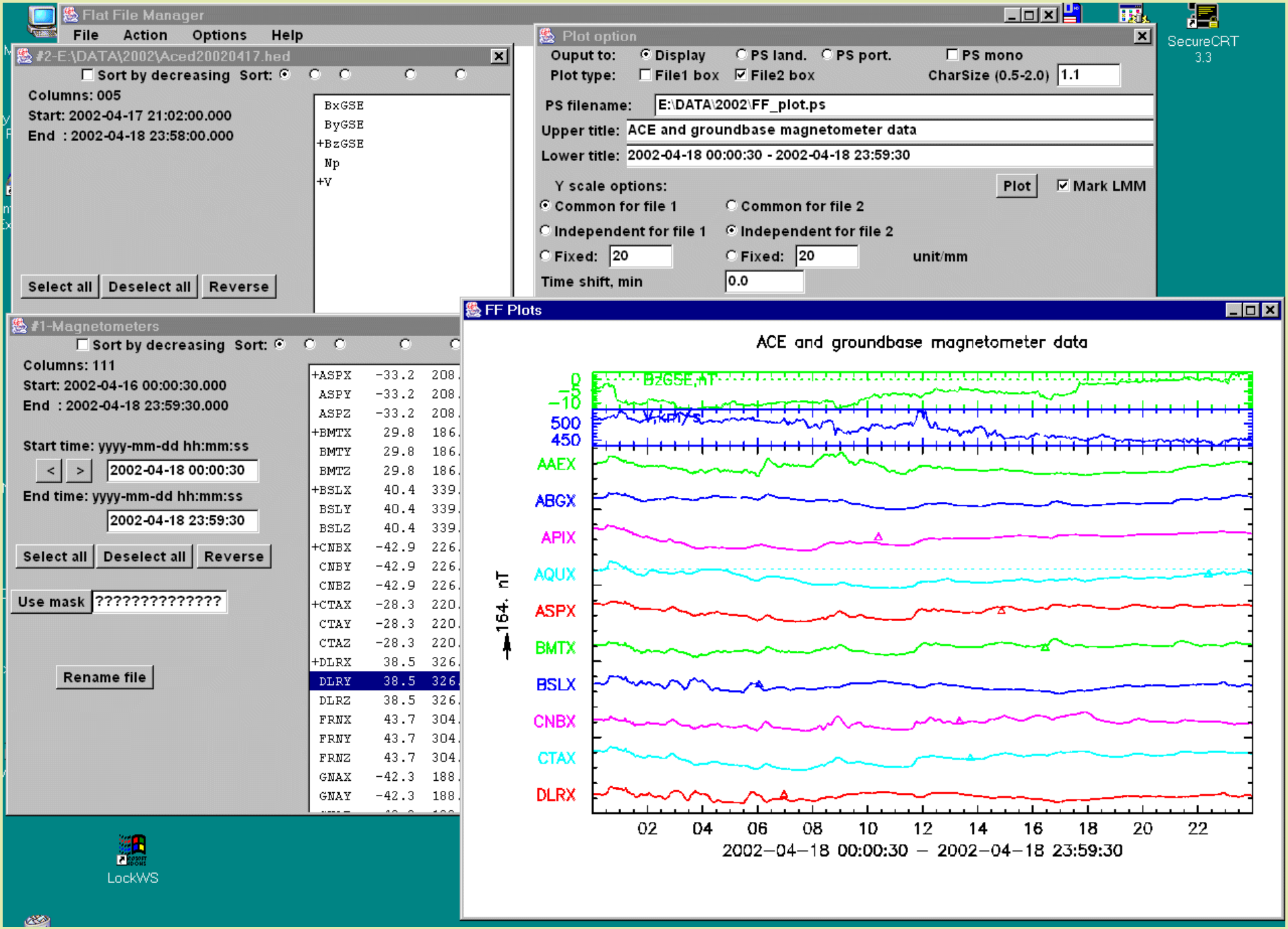
VGMO.NET Actions



FFMN Client shows all data available from the Server (that is, included in the temporary data set for the selected time interval) and then the user can Select all or mark (+) the data subset for Action

- Plot –a stack of magnetograms plotted in accordance with the changeable Options menu
- Download – save the selected dataset to a file (in various formats, including IAGA-2002) and then download this file to the remote machine via FTP. If there were a few opened files on the server, then all selected data will be combined into a single file
- Merge rows – merge two similar data sets with interlaced time intervals
- Filter – apply the low, high, or band-pass filter to the selected data
- Calculate – enter a formula to compute new physical quantity from the given columns in the opened data files (e.g., compute the total geomagnetic field intensity from three orthogonal components)
- Shift time – to change timing in one of the data sets for the plotting purposes (e.g., showing delays between data)

VGMO.NET Example



SUMMARY

- Existing World Data Centers (WDC) continue to serve excellently the worldwide scientific community in providing free access to a huge number of global geophysical databases. Various institutions at different geographic locations house these Centers, mainly organized by a scientific discipline. However, these Centers require the mandatory or voluntary submission of the data.
- Recently many digital geomagnetic datasets have been placed on the Web, often in near-real time. However, some of these sets have not even been submitted to any data center. This has created an urgent need for more sophisticated search engines capable of identifying geomagnetic data on the Web and then retrieving a certain amount of data for scientific analyses.
- In this study, we formulated a concept and developed a prototype of the Virtual GeoMagnetic Observatory (VGMO) that currently uses a pre-set list of the FTP-based geomagnetic data holders (including WDCs) to retrieve requested data.
- Saving retrieved data locally over multiple requests, a VGMO user begins to build his/her own data sub-center, which does not need searching the Web if a newly requested data interval will be within a span of the earlier retrieved data.
- At the same time, these self-sustained sub-centers become available to other VGMO users. This network of “GEOMAGstered” users establishes VGMO.NET where the Web data-crawling becomes transparent to users. More studies are needed to help identifying the newly “Webbed” digital geomagnetic data.