RFD: 3-D GeoBrowser Characteristics

This section of the RFD contains two sets of characteristics for describing a 3-D Geobrowser: (A) User Interface Functionality Criteria, and (B) Deployment Characteristics. Responders to the RFD should describe their Geobrowser using the two sets (A and B) of categories in this section. No known Geobrowser currently meets all of the functional criteria.

The operation of a 3-D Geobrowser recalls and extends the ease of using a standard physical globe. Abilities to navigate around the Earth with virtual hands and to zoom into a particular location through virtual manipulation or through a textual search can provide the user with a greater ability to explore the state of the planet. 3-D Geobrowsers are able to integrate and leverage distributed geospatial servers, Spatial Data Infrastructures, and the plethora of traditional World Wide Web resources in ways that are consistent with a geocentric, whole-Earth-based perspective.

User interface functionality necessary to meet the 3-D Geobrowser Mandate are listed in **Table 1**. Responders to this RFD should describe the capability of their implementation (whether an operational or prototype system) using these criteria. The first column in **Table 1** provides a level of criticality of providing the functionality: E = Essential; S = Secondary

Figure 1 provides an architecture for Geobrowsers with Internet access to remote data sources. 3-D Geobrowsers will be deployed on typical consumer hardware platforms, e.g., personal computers (perhaps gaming platforms in the future), that employ the latest graphic rendering technologies and depend upon Internet access to link remote geospatial data and access distributed image servers. Use of a hardware graphic accelerator maybe necessary at the present time to render the imagery, e.g., Invidia GeForce. Some data servers may provide imagery prepared for use with a specific Geobrowser. A Geobrowser may also access other geospatial data based solely on compatibility with the access interface, e.g., OpenGIS Web Services. These geospatial data servers are discovered by queries to a remote catalog, e.g., NSDI Clearinghouse. For large volume imagery access, a broadband Internet connection is assumed, e.g., at least 100s kbit/s. In order to meet the "Real-Time Response" criteria in Table 1, an optional caching scheme may be utilized for some near-term solutions.

Based on the architecture of Figure 1, Geobrowser implementations can be described by the criteria in **Table 2**. RFD responders should describe their Geobrowser implementation using these deployment characteristics.

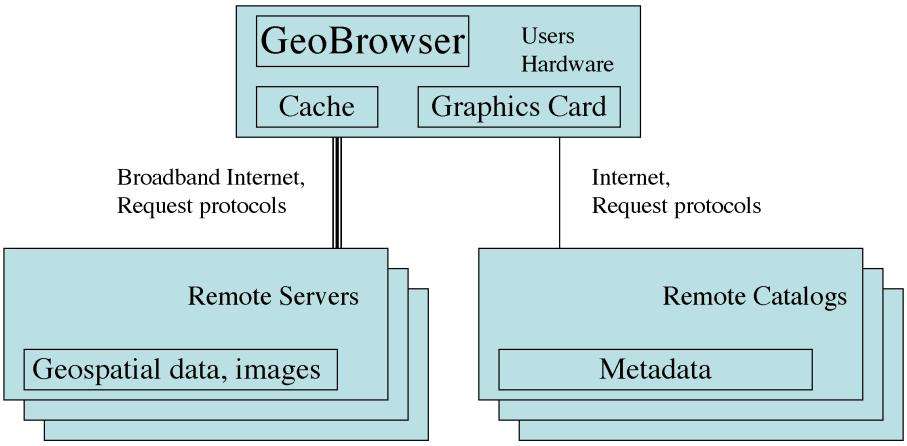

Figure 1 – 3-D GeoBrowser Client/Server deployed configuration

Table 1 – User Interface Functionality Criteria

E	3-D Global Metaphor	Users view is organized around a global view of the Earth. 3-D rendering accommodates user controls to manipulate global view of Earth. After zooming near the surface, display of terrain is provided at user-variable view angle.
E	Realistic base layers	Globe is displayed with various imagery and terrain as base layers. One version of the imagery provides a true-color rendering of the Earth's surface.
E	Real-time display	Display responses to user request typically occur with no human-apparent delay, e.g., ~30 frames per second.
E	Additional data layers	Data layers in addition to the base imagery and terrain layers can be added based upon user interests or pre-set for a given application as published. Interface provides flexibility for transparency and defining display priorities.
E	Discovery	Discovery of additional data layers is provided. Dataset discovery is facilitated by review of metadata.
E	Publishing	Users can define layers, views, fly-throughs that define geographic region and layers that can be recall at later time for other users for specific message for a given application. A key goal is to decision support. This is "content authoring".
S	Urban 3D	Rendering an urban scene with elevation data for buildings, but not full 3-D detail of buildings. May include photograph of building side as a texture of a geometric object.
S	True 3D	Rendering of 3-D objects and processes (e.g., plume) over a terrain rendering.
S	Time Series	For time-series data, user is provided controls to vary the time, e.g., a "swipe" tool. Additional controls for time series may include a dynamic blending approach (i.e. for a 20 year time series) and a calendar or clock
S	Credits Display	Dynamic display of intellectual property credits of data that is visible. Credits are displayed only when data is displayed.
S	Gazetteer	Ability to initiate a search for data layers using a gazetteer.
S	View Description Language (VDL).	VDL enables personalization, publication and collaboration. VDL provides a method to capture, persist and share a view that a user has configured in a browser session. Sharing the view may be within the given Geobrowser or shareable with other users of differing Geobrowsers. Sharing of VDL in a current session between two or more users results in collaboration, e.g., shared views. Provision for sharing the VDL on a regular, e.g., every 1/30th of a second , may be required for collaboration.
S	Multi-level HCI	The human computer interface (HCI) is usable by a variety of users, e.g., citizens, decision makers, scientists. The variety of users will anticipate varying levels of detail and configurability. Some users desire additional detail on datasets integration and configurability perhaps at the expense of simplicity of use.
S	Conflation	Capability to "align" disparate data sets, e.g., location inaccuracies. Geobrowser may provide conflation in user or publisher mode.
S	Access to Models	Ability to request what-if results from computational models, e.g., simulations of geophysical environments.

Table 2 – Deployment Characteristics

Client application integration	Configuration of Geobrowser software integration or interaction with other client resident software applications. Approaches include: • Stand-alone Geobrowser application • Geobrowser plug-in • Use of 3rd party browser plug-in • Use of java, javascript
3-D rendering software	Use of 3-D and graphics rendering software technologies on users computer system, e.g. OpenGL[1]
3-D accelerator hardware	Recommended graphic accelerator card(s) to be present in users computer system.
Client Hardware	Recommended specifications for users computer system, e.g., operating systems, main CPU processing speed, memory requirements, etc.
Caching - media	This version of "caching" relies on the distribution of media, e.g., CDs, containing base image and terrain layers. This may be a base image that is shipped with a Geobrowser to "seed" the application
Caching - Internet	This version of caching is used for any network accessible data and image datasets. Examples include cache of latest used imagery; pre-fetching of anticipated imagery requests, etc.
Internet Image protocols	Protocols, formats and tessellations applied to the remote image server. Indicate if there is intent to make the image access protocol available for consensus standardization.
Tessellation	Method for partitioning imagery space that enables dynamic, global-to-local, multi-resolution access to imagery. Resolution ranging from 10km per pixel to sub-meter per pixel.
Internet image compression	Methods applied to manage data compression when imagery is delivered over the Internet from a remote data server.
Preprocessed Imagery Server	Remote server accessible by multiple Geobrowsers of a given type. Storage and access to multiple datatypes. Access protocols. Methods for users to create content available on image server. Rate of distribution from an imagery server is a key characteristic.
Geospatial data servers	Access of OpenGIS Web Servers for geospatial data, e.g., maps, features, coverages. These servers are not specifically prepared for a given Geobrowser.
Data Type	Capability to handle different types of data formats.
Catalog access	Protocol used to access geo-catalog

[1] http://www.opengl.org/