

USCG MISLE Web-Based GIS Application

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Abstract:

The Coast Guard has a need to use GIS technologies to serve as a dynamic visualization tool to display the location of search and rescue cases, oil spills, aids to navigation information, demographics data, readiness data, etc. to better aid CG decision makers and improve information services to the public. The Marine Information for Safety and Law Enforcement (MISLE) GIS application is an attempt at satisfying this need. MISLE GIS is a full featured web deployed application. It features a Clustered SDE Database on the back, ArcIMS and Web Service middle tier, and a thin rich client on the front end. This client is an ActiveX Control that runs inside Internet Explorer and emulates a desk top GIS application. This application displays base maps and charts, Coast Guard specific information on Facilities and waterways, as well as dynamic data relating to CG Cases and Activities.

Hardware:

Development System

Intel Pentium III 1.2 Dual processors with 3931676 KB RAM

Testing System

Redundant Intel Xeon 2.8 Dual processors with 1048084 KB RAM

Production System

Redundant Intel Xeon 1.6 Quad processors with 7863632 KB RAM

Functionally:

The purpose of the MISLE GIS application is to serve as a reference map for various areas of interest for the US Coast Guard. Primarily the application is accessed on land after the incidents have been entered through the non-spatial MISLE application via PDA or desktop reporting.

The spatial side of the application runs deeper than what can be seen on the surface. On the backend lies a SQL Server database with ArcSDE 8.2 handling the spatial translation. ArcSDE primarily handles all of the spatial searching and retrieval of data requested by the ArcIMS client which is running a separate web server.

ArcIMS by itself is a favorable client for serving spatial data to the web. However, it does have limitations. The MISLE users require a simple interface combined with advanced search and drawing capabilities. A number of processes to complete many of the capabilities had to be developed specifically for this application. For example adding a layer dynamically to the web based client and choosing which field to use as a label.

Design:

The design of MISLE GIS is co-dependent on many variables. ArcIMS as discussed above requires significant custom development to meet the needs of MISLE users. Therefore various controls must be developed to utilize existing ArcSDE schemas and the creation of new schemas must be interwoven without breaking integrity.

The most intriguing design is that of the Available layers table. This table is essentially a catalog table which references all layers, both ArcSDE and flat files. The available layers table links to the sde.sde_layers table found in the SDE database. This is referenced by the client to give the user an organized list of layers to add to their map service.

This layer catalog functionality gives the user control over color of the displayed features and how the layers are labeled. For ease of recreation these customizations can be saved to their server stored profiles.

The client takes a considerable amount of credit for being the most time consuming for development. However concurrently as the data is being displayed data sources also must be found, loaded, and maintained. The thin client does not have direct access to the database. In fact by use of the display name the actual table names of the ArcSDE layers are masked. But there is intent to open the database to read only access by various GIS savvy users in the USCG.

Therefore vector and raster layers stored in ArcSDE are cataloged logically by either Coast Guard wide or one of nine coast guard administration districts. This model would serve the logical purpose allowing each district or unit to store its data in separately.

There are many more customizations that have been implemented. Please review "Creating Custom GIS Web Applications using ArcIMS, ArcSDE, and ActiveX" Lakey, Mike UC 2004; and also "Workaround for ActiveX connector Shortcomings" Kowalski, Brian UC 2004 for more information on customization in the MISLE GIS client.

Future:

The Coast Guards Enterprise GIS database started with a specific project to support. However, projects evolve and new needs are identified. The GIS component of the MISLE application was the foundation for a new project in Port Security GIS support. This new initiative was brought about by a number of factors including the super bowl.

The new requirements include raster data support and complete focused datasets for various ports. The Port GIS requires a substantial increase in disk storage requirements to meet the new goals.

The future of the Enterprise GIS will be an independent modular database allowing multiple projects such as MISLE and Port Security GIS which are thin ArcIMS clients to seamlessly access the database. As Coast Guard confidence with GIS grows it is foreseeable that many districts will begin accessing the database directly through ArcGIS.

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