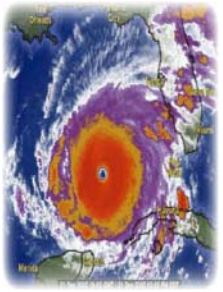

Problem: Disaster Preparedness and Management

No matter how well the DHS and associated organizations prepare, natural disasters will continue to pose a threat to our safety and security. Faced with the inevitability of such events, how shall the DHS efficiently plan for and respond to these occurrences? Information regarding disaster preparedness and management is readily available. The real dilemma is how handle an overwhelming amount of structured and unstructured information in a short amount of time.

Diverse sources of information such as census bureau data, real estate records, emergency plans, news sources, and government meteorological reports and studies all aid in the development and execution of response plans. This information resides in relational databases, file systems, document management systems, and Web servers. Consuming this data at high speeds in an actionable format under pressure is very difficult. The DHS must:

- Quickly develop an accurate Common Operational Picture (COP) for wherever the next disaster occurs
- Be able to instantly assimilate and analyze dynamic streams of information from federal, state and local organizations to make actionable decisions
- Analyze mountains of historical reports on previous major disasters to create preparedness plans

Too Much Information, Too Little Time: The Geographic Solution

The amount of content that must be reviewed in order to track and prepare for the next major disaster is dramatically increasing. Traditional natural disaster data collection and external open sources such as newspapers, Internet sites and blogs all contribute to the available information.

Disaster preparedness and response naturally carries a geographic component. Every flood, earthquake, hurricane, forest fire and tornado happens somewhere, and DHS workers must take advantage of location information in all forms of content to accomplish their mission. Currently, DHS workers analyze most information in a virtual text-only world, rather than in the context of digital maps.

DHS must continue to improve analysis tools to handle the vast amount of information available at all levels of the organization. With recent reorganizations and personnel shortages, both in the leadership and within the ranks of everyday employees, improvements to analysis tools are even more vital.

The use of geographic search technology, combined with a geographic information solution (GIS), fuses text and geographic information into one view. This enables DHS workers to detect patterns in large collections of documents based on their relationship with locations. Now a standard analysis tool in many intelligence organizations, DHS can leverage geographic search technology to improve situational awareness. This is the ultimate fusion of all unstructured data.

How Does a Geographic Search System Work?

Geographic search systems must take advantage of both structured and unstructured content to create a true fusion tool that presents a clear disaster COP. Processing unstructured content requires a high level of natural language understanding of important entities including places, events, and people. Such a tool must be able to disambiguate geographic references in unstructured text – the ability to decipher between places such as Jamestown, Mississippi and Jamestown, Texas.

Simply put, a geographic search system accurately identifies references to geographic locations within documents, determines an appropriate location for those references, and then enables search and visualization of the documents in a Graphical User Interface (GUI). Upon performing a geographic bounded search within the GUI, relevant documents appear as icons on a digital map. The location of each document icon coincides with a geographic location mentioned within the document. The system renders a map appropriately speckled with icons representing documents that include text pertaining to the identified location and subject. By clicking on a document icon or summary, a user gains direct access to the original document in its entirety.

Example Use Case

A Category 2 hurricane with winds of 100 miles per hour rapidly intensifies as it churns Westward across the northern fringes of the Bahaman Islands. Now a category 4 storm with winds gusting in excess of 145 mph, it threatens the lower Florida peninsula with an estimated storm surge of nearly 20 feet. Landfall occurs 6 hours later when it slams in to the Miami, Florida area. Large portions of the Florida coastline are submerged under several feet of seawater which causes massive damage to both homes and businesses. As the hurricane passes over the peninsula and back into the Gulf of Mexico, disaster relief workers arrive. They work against the clock to support millions of people who did not evacuate the area. Information starts streaming in to local and federal agencies from newswires, bulletins, homeland security officials, local government contacts, and first responders. The information consists of a wide variety of formats such as relational database records, word processing files, presentations, XML, and message traffic (such as emails).

Under extreme pressure to relay accurate and timely information to field workers, an operations research analyst opens a Web browser and logs on to the information portal, powered by MetaCarta Geographic Text Search. This portal points to a collection of several million documents which includes toxicity reports, first responder deployment reports, evacuation plans, newswires, emails, and other proprietary communications. The analyst enters the term “drinking water”, into a search field and the place “Miami, FL” in a Location Finder field. Upon executing a search, MetaCarta’s geographic search system presents the analyst with a map of Miami, overlaid with icons representing documents referencing drinking water contingency plans. The icons are numbered to indicate their relevance. The use of “Miami, FL” as a geographic filter reduced the amount of relevant content from tens of thousands of documents to less then twenty-five that matched the geographic and keyword search constraints – all in less than a second. The analyst then selects one of the documents to view and read in its entirety by simply clicking on a hyperlink in the results section.

Discovery

An EPA drinking water specialist on loan to the disaster team adds the term “E. coli” to the search and re-executes the query. The specialist discovers hotspots for contamination and notices that drinking water contamination models are available in several documents available along with remediation plans.

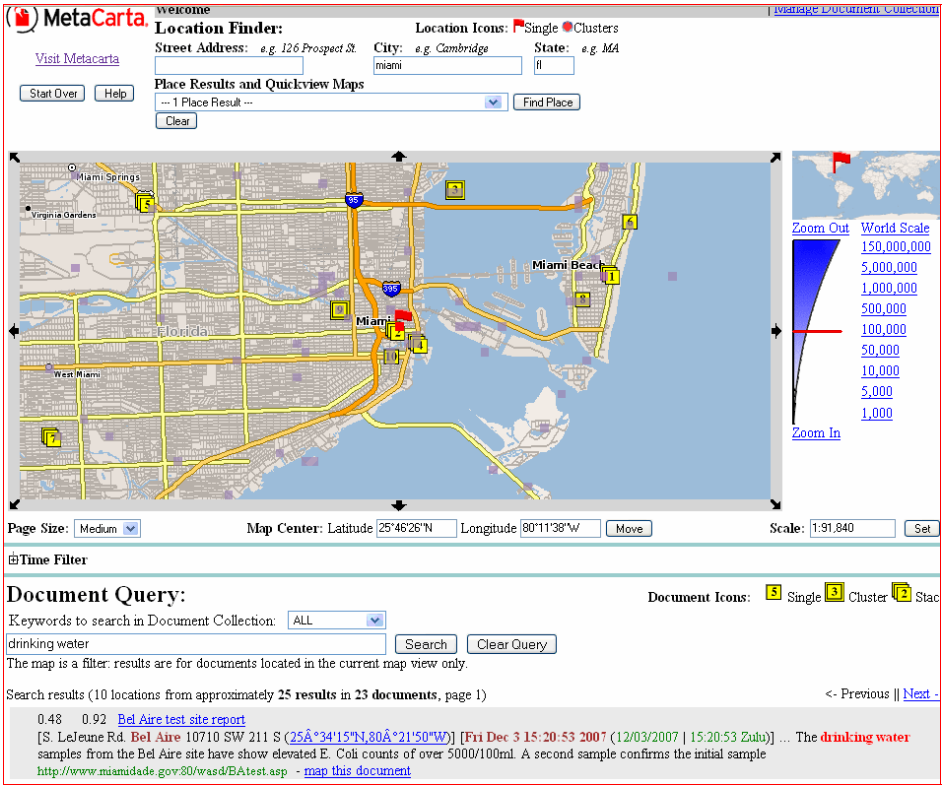

Figure 1: Using a geographic search system to identify risks to drinking water

Example Use Case: Action and Results

A safe drinking water plan is enacted. Television and radio spots immediately begin to play warning the trapped residents to not use their house water while safe bottled water is distributed by National Guard troops. The disaster relief workers in the area are also warned, and they wear protective gear to prevent infection. Thousands of people are protected from a serious health risk that would have overwhelmed a severely taxed medical infrastructure. Aid workers continue critical recovery work.

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