Gulf of Maine Framework Data Project

The U. S. and Canada just completed a one-year demonstration project to create a distributed framework data resource that spans international borders and connects more than a dozen regional, State, Federal, Provincial and other types of organizations. Most of the achievements were planned, but several unanticipated benefits came out of this activity as well. First, we're finding that the regional partnerships continue to grow despite an end in the project funding. Second, and perhaps more significant, the ocean-science community is engaging on the national scale that extends well beyond the Gulf of Maine. Indeed, a culture change seems to be underway that will have important implications for our nation's response to recommendations from the U.S. Commission on Ocean Policy. This all started with a joint FGDC and GeoConnections grant that catalyzed activities in the Gulf of Maine region, building upon the years of effort at the Open Geospatial Consortium (OGC) and related developments in the NSDI and the Canadian Geospatial Data Infrastructure. Two organizations led the charge: GoMOOS, the Gulf of Maine Ocean Observing System (www.gomoos.org), in the U. S., and DM Solutions Group (www.dmsolutions.ca) in Canada.

Living Proofs of Concept

GoMOOS hosts all three of the following sites (see www.gomoos.org for more info):

- *GoMMaP* – The Gulf of Maine Mapping Portal (GoMMaP) is a single point of access to a wide range of informative maps of the Gulf of Maine. The site relies upon the OGC Web Mapping Service (WMS) to integrate data from 16 different organizations, and the list is growing. This truly dynamic and distributed data-map resource is one of the two primary deliverables that came out of the FGDC/GeoConnections project (see www.gommap.org).
- *Gulfwatch* – For more than a decade, scientists from Canada and the U.S. have been monitoring environmental contaminants found in mussels around the Gulf of Maine. Until this year, the data resided only in spreadsheets. The FGDC/GeoConnections project turned these data into a practical dynamic web-mapping application that with mapping and graphing tools – the maps integrate the contaminant information with other relevant environmental conditions supplied by GoMMaP partners. (see www.gomoos.org).
- *OpenIOOS* – GoMOOS and DM Solutions leveraged the achievements above to help the Southeastern Universities Research Association (SURA), the Office of Naval Research and the NOAA Coastal Services Center to spread the success to the rest of the U.S. coastal science community. The resulting Integrated Ocean Observing System (IOOS) is a fully distributed, real-time, OGC-compliant data-aggregation tool. This site goes one step farther by using the OGC Web Feature Service (WFS) to merge data with satellite imagery. (see www.openioos.org).

Technical Achievements & Issues

- *Achieving Interoperability* – The OGC standards enabled integration of data maps between entities that have very different skill sets and capabilities. Some partners had elaborate "GIS shops" whereas others knew very little about GIS.

- **Cost effective implementations** – GIS shops with ArcIMS servers it easy to add an OGC connector to their existing capabilities in order to become OGC compliant – this helped overcome some initial reluctance for partners to participate with their data. For others, we found that Open Source software solutions enabled participation by entities in the ocean community who had never used GIS to display their data. These partners had neither the time nor money to become GIS savvy, yet they are able to participate in our project.
- *Metadata Publication* – There are still issues of getting folks to publish their metadata to national clearinghouses. In some sense, the technical issues were easier to overcome than the issues of getting partners to fill out and publish adequate metadata. Somehow, we need to simplify this process.

Institutional and Cultural Achievements
- *Gulf of Maine Data Partnership* – Impediments to data sharing are both technical and institutional in origin. To overcome institutional impediments and assure sustainability of GoMMaP, GoMOOS will be hosting the Gulf of Maine Ocean Data Partnership. A Memorandum of Agreement has been signed by more than 20 partnering institutions around the Gulf of Maine who would like to contribute to the data sharing activity (see www.gomoos.org)
- *Ocean Science discovers GIS* – Long thought to be the domain of terrestrial applications, the ocean science community has begun to embrace these dynamic Internet mapping capabilities as a valuable tool for ocean research and applications.
- *OGC Publisher and other Open Source tools* – For many partners, we heard that participation had to be easy. The OpenIOOS activity, in particular, prompted GoMOOS and DM Solutions to undertake development of tools that simplify the process. These tools include an Open Source software product that facilitates publication of common oceanographic data types to the OGC specifications.

Looking Ahead

- *Influencing the OGC* – To meet the needs of the coastal science community and an integrated ocean observing system, the OGC specifications will have to evolve. For example, the dynamic and multi-dimensional aspects of the ocean (and atmosphere) require generalization of the layer concept will require more flexible implementation of the time dimension and the vertical dimension.
- *Marine Metadata Initiative* – The coastal ocean science community needs its own content standards. NSF, NOAA and ONR have begun working together to achieve community consensus and guidance on data standards -- the language that interoperability that can be leveraged by the metadata clearinghouses such as the NSDI. (see http://marinemetadata.org)
- *FGDC Extensions* – Content standards need to evolve to include the new sensors and data types that will populate the ocean observing systems. As with the OGC, these FGDC standards need involvement of the ocean science community. Involvement will grow as the community recognizes the power in the success stories that have emerged from FGDC and GeoConnections activities.