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Storage and Distribution of Digital Data From the Gulf of Mexico Seafloor Observatory

P.E. Murray, U. of Texas at Austin, and C. Zala and M. Dunham-Wilkie, Barrodale Computing Services Ltd.

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Abstract

After the initial deployment of instruments at the Seafloor Observatory in Mississippi Canyon Block 118, the Gulf of Mexico Hydrates Research Consortium plans to install a fiber-optic cable for continuous transmission of data onshore for several of the instruments installed there. Using the planned configuration of instruments, data rates could exceed 180 gigabytes of data per day. The data streams must be relayed to a buffering station onshore and then retransmitted to a second facility for processing, archiving, and reformatting for public access. Both locations require sufficient bandwidth to handle the data, redundancy for backups, and computational power adequate for the prescribed tasks at each location. A software system is also necessary to handle these automated tasks, allow researchers to access subsets of the data from archive, and perform routine analyses for quality control and ongoing research.

A necessary component is the software for the data management and archive system (DMAS). This is being designed under contract by Barrodale Computing Services, and will employ an object relational database management system (ORDBMS) to store and catalog the data, allow users to select subsets of data for analysis, and perform routine processing and analysis of the data of primary interest to the research community.

Two research units of The University of Texas at Austin (Bureau of Economic Geology and Texas Advanced Computing Center (TACC)) have volunteered to provide the facility for storage and public redistribution of the data. The computer resources at TACC are sufficient for both long- and short-term storage with redundancy, as well as high-speed connectivity through the Internet to allow users to interact

with the data and instrumentation. At this time, an institution to act as the data buffering facility has not been identified.

Here we present a summary of the planned DMAS software development and the data management strategy developed for the data collected from the Seafloor Observatory.

Introduction

The Gulf of Mexico Hydrates Research Consortium and the Center for Marine Resources and Environmental Technology are currently developing a multi-sensor Seafloor Observatory to be installed on the continental slope of the northern Gulf of Mexico (OCS Block Mississippi Canyon 118). The aim of this station is to monitor and investigate the hydrocarbon system within the hydrate stability zone of the northern Gulf of Mexico, and to remotely observe changes in the physical and chemical parameters of gas hydrates. The station will be equipped with a variety of sensors that will measure the physical, chemical, microbial and thermal conditions in its local environment and detect temporal changes of those conditions. Major components of the Seafloor Observatory are geochemical instruments, temperature sensors, accelerometers, and an array of hydrophones to collect acoustic data (details can be found in [1]).

After deployment and testing of the instruments in the observatory, the data collection plan is to be divided into two phases. In the initial phase, data will be acquired using data loggers with limited storage capacity. These will be located at the observatory, periodically retrieved and redeployed to download the data. In the second phase, additional instruments will be deployed and the system is to be linked with a fiber-optic cable to an onshore location, enabling continuous monitoring and acquisition of data over extended periods. Table 1 shows the anticipated daily data volumes from each instrument for each phase. In both cases, a comprehensive plan must be in place to allow researchers to access the data.

All these data will need to be archived in an appropriately structured DMAS. We describe a general architecture for the DMAS development in terms of actors, data repositories and services. Given the advantages of an object-relational database management system (ORDBMS) as outlined in the next section, it is planned that the DMAS will be implemented using an ORDBMS.