Using XML technology for data and system metadata for the MBARI Ocean Observing System

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The Monterey Bay Aquarium Research Institute (MBARI), a nonprofit, privately funded research institute devoted to the development of technology to support research in ocean sciences has been developing systems for long term environmental monitoring in Monterey Bay since 1987. The institute has initiated a project for expanding its ocean observing system capabilities through an expansion of existing moored data acquisition systems. The goal of this project is to develop highly flexible, configurable, and redeployable ocean observing systems utilizing a wide variety of sensors and platforms, including moorings, ocean-bottom substations, Remotely Operated Vehicles (ROVs), Autonomous Underwater Vehicles (AUVs), autonomous gliders, and ships, to provide semi-continuous observations of important physical, biological, and chemical variables extended in space and time to support long term monitoring and event detection, such as the onset of an El Niño, as well as support for focussed intermediate-term scientific process studies.

A fundamental goal of the MBARI Ocean Observing System (MOOS) effort is to utilize recent advances in 'smart network' technology to design an instrument software infrastructure to provide real-time reconfiguration, remote device control, and automated event detection and response within a network with limited bandwidth links (radio-frequency and acoustic). Smart networks also provide a capability for 'plug and work' instruments, automated device and service discovery, and a distributed, object oriented software architecture. These are some of the features that characterize the 'wet side' of the MOOS system. The software (and hardware) infrastructure being designed to support these features is called MOOS Instrument Software Infrastructure or MOOS-ISI and has been described in the literature.

A companion to the 'wet side of MOOS' is a shore side data system (SSDS). The purpose of SSDS is to be the repository for managing all the scientific data collected, and to provide users with access to this data. A primary requirement is to insure that all the metadata (data about the data) required for properly interpreting the data from the system sensors is collected and managed along with the sensor data. In the context of a highly flexible and reconfigurable observing system such as MOOS, this problem is particularly challenging.

A third aspect of the MOOS system is the operational need to monitor, control, diagnose and recover from system failures in 'real' time. This aspect places further demands on the MOOS-ISI architecture. The architecture must be capable of capturing the current status of system elements (sensors, instrument clusters, platforms and communication links), as well as controlling and modifying them. An audit trail or 'history' of the system state is also required to support diagnostics and recovery and to fully identify the system state as an aspect of data interpretation.

In this presentation we provide an overview of the MOOS ISI system design, and an overview of both the scientific and system capabilities and requirements that must be met by the metadata architecture. We then describe how XML technology has been utilized to develop a metadata architecture by describing the XML schemas that have been prototyped to meet various capabilities and requirements of the system.