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Paper Title : Managing Sensor Network Configuration and Metadata In Ocean Observatories Using Sensor Pucks

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ABSTRACT

Cabled observatories such as MARS or NEPTUNE will consist of many deployed instruments which communicate with human operators and shore-side data repositories. In addition, these deployed devices may actually communicate with other, facilitating capabilities such as autonomous event response. These potentially complex interactions between multiple entities - human and machine - require that knowledge of the system configuration be available to participants. Users of instrument data require information - "metadata" - about the sensor that generated the data. Software which coordinates and controls instruments requires access to the software interfaces of those devices.

"Manual configuration" has been used on small-scale systems, but in a network consisting of hundreds or thousands of instruments, the configuration challenge becomes critical. We propose to address the problem through automation of the configuration process, which will be achieved at several levels. Automated configuration will simplify the system operator's task of building and maintaining the observatory network.

We describe a small, low-powered information storage device which we call a "sensor puck". When plugged into a suitable computer (lab workstation, deployed observing node), information can be written to or read from the puck. While an instrument is being prepared for initial integration into the observatory, a technician "loads" a puck with information necessary to configure the instrument within the observatory, and then physically attaches the puck to its instrument. Thereafter the attached puck always travels with its instrument, no matter where it is being installed in the observing network.

The information loaded into the puck encompasses whatever is necessary to enable automatic configuration and system integration of the instrument when it is plugged into the observatory network, and any other information required by observatory policies. This information may include structured descriptions of the instrument's sensor and data characteristics (metadata). The information can also include actual software code that is retrieved from the puck and executed by an observatory node when the device is plugged in; this code could implement distributed instrument control and data retrieval interfaces, allowing network-wide access to the instrument functionality. We believe the puck concept to be a powerful one; a given instrument puck is configured just once, enabling automatic configuration of its instrument no matter where it is installed on the network thereafter.

We also describe mechanisms by which an instrument and its puck can be "discovered" by the observatory network when the devices are plugged in. Several approaches are explored, with varying degrees of automation. We evaluate these approaches with special consideration to electrical and safety aspects of the undersea environment. Information and results from our prototyping efforts will also be presented.