Geophysical Research Abstracts
Vol. 13, EGU2011-943-1, 2011
EGU General Assembly 2011

Adding a spatial and temporal dimension to Multidisciplinary Seafloor Observatories

Dale Green and Francois Leroy
Teledyne Benthos, North Falmouth, United States (dale.green@teledyne.com)

The permanent, fixed installations under development for Multidisciplinary Seafloor Observatories deployment are intended for long-term observations of wide area marine phenomena. The spatial observation afforded by these fixed systems will of necessity be sparse due to cost and infrastructure constraints, and local variations in the environment may be missed. Furthermore, the physical reach of the attached sensors will be limited by the availability and cost of cables between the sensor and the central distribution hub.

Currently available technology related to underwater acoustic communications (acomms) can support the fixed installation by filling the holes left by the sparse sampling and by extending the reach of cabled observation to sensors beyond the physical length of the cable. Modem-supported sensors are readily deployed and recovered by surface ship without the necessity of careful placement relative to the hub. While data rates between a remote sensor and the hub-based modem likely will be constrained to less than 1 kbps, the range between modems can be expected to be on the order of 10 km.

Independent, acomms-supported sensors can be serviced by UUV or glider acting as a data truck. In a distributed setting, the vehicle can be routed among sensors without the necessity of surfacing to regain geo-position. Data from the several sensors can then be delivered to the hub-based modem from close range and at much higher data rates.

Furthermore, the deployment of self-contained, buoyant and releasable wireless sensor nodes can afford the scientist a temporal dimension by allowing for short, dedicated studies, precisely timed with seasonal phenomena or other temporal events such as significant weather disturbance or man-induced alteration of the environment.

A major impediment to the use of distributed sensors with low bandwidth communications is simply the legacy of existing sensor design and legacy concepts concerning the use of those sensors. For example, ADCPs and sidescan sonars are legacy sensors that presume the existence of wired connectivity with the end user. Such designs reflect the assumption that only the delivery of raw data will suffice for the forthcoming analysis. This legacy thinking conditions researchers ALWAYS to expect the same level of raw data flow and:

1. Drives acomms researchers to concentrate on increasing data rate.
2. Precludes development of in situ extraction of information.
3. May reduce emphasis on energy conservation.

While it may be desirable to redesign each and every sensor, we think it is more practical to redesign the modem to be more agnostic to the format of data in a sensor, and to offer its substantial signal processing infrastructure as an avenue for in situ data processing and compression. One example, which overcomes the proprietary nature of the data storage and access for an ADCP, is where we simply extract all information available on a standard serial port, time stamp the data, and store it in easily identifiable and accessible files. There is never a need to interrupt the sensor or to be aware of special command sets (e.g, a “break” command) or proprietary means of accessing stored data. Any of these files can be retrieved acoustically simply by identifying the time of interest. Furthermore, a substantial amount of data processing, signal processing, and compression can be done to these data without impacting the sensor processor.

Distributed, remote sensors tightly integrated with acomms modems can serve as large area adjuncts to the Multidisciplinary Seafloor Observatory fixed infrastructure, without any compromise to that system. All that is required is for one acomms modem to be tied directly into the subsea hub, which thereby permits web-based access to all of the data acquired by all nodes in that adjunct network.