Recent Smart Sensing Developments:
Undersea Warfare Surveillance Prospects

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**NDIA Joint Undersea Warfare Technology Conference,
March, 2009, San Diego, CA**

ABSTRACT

This presentation will describe how recent development in smart sensing technology will improve quality, delivery speed, and affordability of remote surveillance systems — for undersea warfare surveillance as well as for commercial monitoring. Data-based results will be reviewed for UUV-based mine detection, UAV-based periscope detection, sonar-based submarine detection, and radar-based whale detection, as well as for commercial meter and accelerometer monitoring. Smart sensor systems include three components: persistent sensing devices, efficient sensor telemetry, and smart sensing processors (SSPs) that reduce sensor data to valuable information in real time. Two developments will be described, the first being emergence of general purpose SSP that can reside either upstream or downstream of remote sensor telemetry, or both. The SSP can be configured to transform data from any sensor, because it is fast and compact; it can automatically adapt to changing conditions; it can incorporate any variety of feature extraction functions; and it runs with a simple, open source API (application programming interface). The second development is the emergence of a fast and effective, data-based procedure for configuring SSPs. The procedure involves (a) identifying smart sensor value metrics for SSP tuning, including traditional hit and false alarm rates as well as telemetry reduction, energy use, and sensor persistence metrics; (b) designing and performing experiments, during which useful data will be gathered for SSP tuning; and (c) using a structured SSP procedure and available toolkit to tune and configure SSPs quickly. Since SSPs operate efficiently to meet general purpose needs, the same SSP platform can be replicated and delivered affordably, either as a software or hardware module. The SSP tuning procedure takes about a week. Through both developments, effective sensor systems can be delivered quickly and affordably for undersea surveillance, as well as for commercial monitoring.