

# Demonstration of Underwater Acoustic Sensor Networks System

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As a part of our research in Underwater Acoustic Sensor Networks (UWASNs), we propose to demonstrate the acoustic underwater sensor network system which was designed, developed and experimented by our project team. The system hardware, which shown in Figure 1, consists of three underwater sensor nodes, one sink node and one gateway connecting each node via acoustic signal.

In addition, in order to measure the error rate of acoustic signal in underwater, we connected all devices to the monitoring system in wired LAN environment. The monitoring system is a web-based application which shows the packet transmission of sensor nodes and analyzes the error rate of acoustics signal transmission.



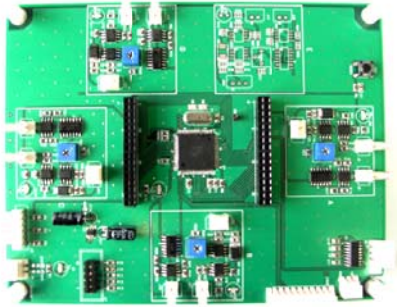
Figure 1 – Deployed underwater sensor nodes in a water tank.

The sensor nodes, which were shown in Figure 2, have the functions of collecting the environment information, sending to sink node gathering and filtering data packets from sensor nodes and transferring to the gateway.

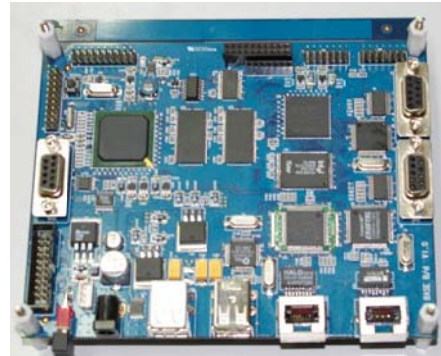
The organization of sensor node is shown by following Figure 2.

- (a) **Acoustic modem:** MCU - ATmega128 **Battery** - Power is supplied from sensor board
- (b) **Sensor board:** MCU - ARM9(PXA270) **Battery** - 12V, 7.0AH battery
- (c) **Acoustic sensor and Housing box:** The sensor which is packed in a waterproof box has several ultrasonic transducer.
- (d) **Combined sensor node:** This sensor node is joined with (a) Acoustic modem and (b) Sensor board via SPI connection. This sensor can transmit the acoustic signal with 1 kps data rate at the 30kHz main frequency in

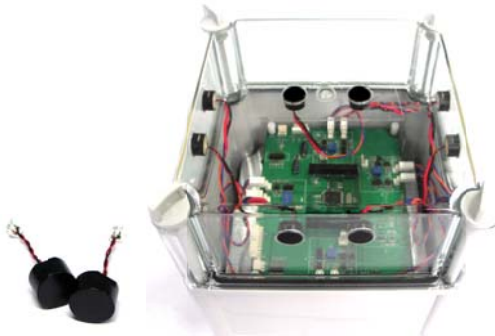
underwater. In this demonstration, we used the TDMA protocol for our underwater sensor nodes which is suitable for a small number of sensor nodes.



(a) Acoustic modem



(b) Sensor board



(c) Acoustic sensor and Housing box



(d) Combined sensor node

Figure 2 – Underwater sensor node.

Space requirement	One Table
Equipment requirement	Wired/Wireless Network Connection