

Current Achievements of UCONN UWSN Lab

<http://uwsn.engr.uconn.edu>

Lab Participants:

UWSN lab involves 15 faculty members from six departments across two colleges at UCONN. More than 15 students (including graduates and undergraduates) are actively participating in various research topics on underwater communications and networking.

Publications:

Overview

- J. Cui, J. Kong, M. Gerla and S. Zhou, “Challenges: Building Scalable Mobile Underwater Wireless Sensor Networks for Aquatic Applications”, *IEEE Network, Special Issue on Wireless Sensor Networking*, Vol. 20, No. 3, pp.12-18, May/June 2006 (Acceptance ratio: 10.3%)
- Jun-Hong Cui, Jiejun Kong, Mario Gerla, and Shengli Zhou, “Challenges: Building Scalable and Distributed Underwater Wireless Sensor Networks (UWSNs) for Aquatic Applications”, *UCONN CSE Technical Report: UbiNet-TR05-02*, January 2005 (updated in September 2005)

Applications

- S. Zhou and P. Willett, “Submarine Location Estimation via a Network of Detection-Only Sensors”, *IEEE Transactions on Signal Processing*, 2007 (to appear).
- J. Kong, J. Cui, D. Wu, and M. Gerla, “Building Underwater Ad-hoc Networks and Sensor Networks for Large Scale Real-time Aquatic Applications”, In Proceedings of *IEEE Military Communications Conference*, Atlantic City, New Jersey, USA, October 17-20, 2005

Physical layer

- B. Li, S. Zhou, M. Stojanovic, and L.Freitag, “Pilot-tone based ZP-OFDM demodulation for an underwater acoustic channel”, In Proceedings of *MTS/IEEE OCEANS conference*, Boston, MA, Sept. 18-21, 2006.

Ranging and Localization

- C. R. Berger, S. Zhou, Z. Tian, and P. Willett, “Precise timing for multiband OFDM in a UWB system”, In Proceedings of *International Conference on Ultra Wideband*, Waltham, MA, Sept. 24-27, 2006.
- Z. Zhou, J. Cui and S. Zhou, “Localization for Large-Scale Underwater Sensor Networks”, *UCONN CSE Technical Report: UbiNet-TR06-04 (BECAT/CSE-TR-06-15)*, December 2006

Medium Access Control

- Peng Xie and Jun-Hong Cui, “Exploring Random Access and Handshaking Techniques in Large-Scale Underwater Wireless Acoustic Sensor Networks”, In Proceedings of *IEEE/MTS OCEANS'06*, Boston, Massachusetts, USA, September 18-21, 2006.
- Peng Xie and Jun-Hong Cui, “An Energy-Efficient MAC Protocol for Underwater Sensor Networks”, *UCONN CSE Technical Report: UbiNet-TR06-06*, December 2006

Multi-Hop Routing

- Peng Xie, Jun-Hong Cui, and Li Lao, “VBF: Vector-Based Forwarding Protocol for Underwater Sensor Networks”, In Proceedings of *IFIP Networking'06*, Coimbra, Portugal, May 15 - 19, 2006
- Peng Xie, Jun-Hong Cui, and Li Lao, “VBF: Vector-Based Forwarding Protocol for Underwater Sensor Networks”, *UCONN CSE Technical Report: UbiNet-TR05-03*, February 2005 (updated in May 2005).

Reliable Data Transfer

- Zheng Guo, Bing Wang and Jun-Hong Cui, “Efficient Error Recovery with Network Coding in Underwater Sensor Networks”, *UCONN CSE Technical Report: UbiNet-TR06-05 (BECAT/CSE-TR-06-16)*, December 2006.
- Zheng Guo, Peng Xie, Jun-Hong Cui, and Bing Wang, “On Applying Network Coding to Underwater Sensor Networks”, Proceedings of *ACM WUWNet'06 in conjunction with ACM MobiCom'06*, Los Angeles, California, USA, September 25, 2006.
- Peng Xie and Jun-Hong Cui, “SDRT: A Reliable Data Transport Protocol for Underwater Sensor Networks”, *UCONN CSE Technical Report: UbiNet-TR06-03*, February 2006.

Sensor Node Design

- Zhijie Shi and Yunsi Fei, “Exploring Architectural Challenges in Scalable Underwater Wireless Sensor Networks”, In Proceedings of *Annual Boston Area Computer Architecture Workshop (BARC)*, February 2006.

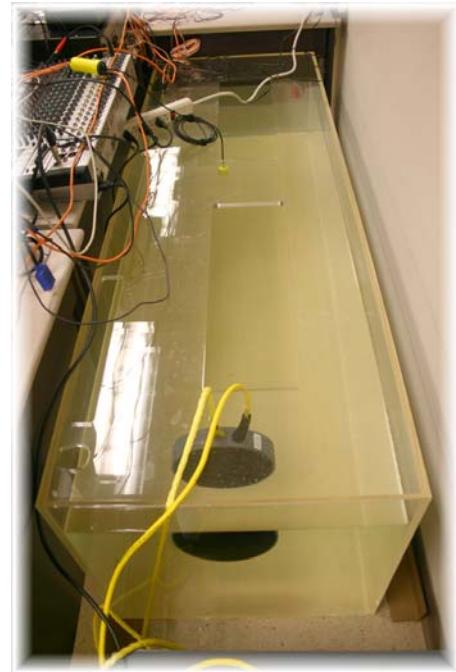
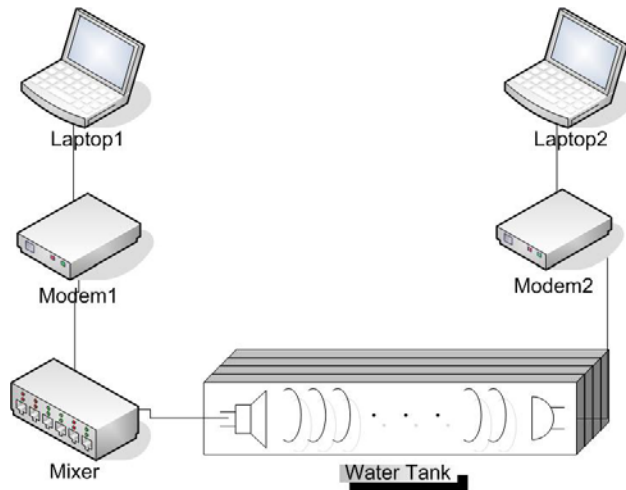
Funding:

1. Seed-Funds from UCONN CSE, ECE, EEP, BECAT, and SOE for UCONN UWSN Lab, Total: \$42,750 03/2006 --- 06/2007 (**PIs: Jun-Hong Cui, Yunsi Fei, Zhijie Shi, and Shengli Zhou, etc.**)
2. “Advancing Underwater Acoustic Communication: A Shift from Single-Carrier to Multi-Carrier Paradigms”, UCONN UCRF Large Grant, Total: \$28,000, 05/01/2006 --- 04/30/2008 (**PI: Shengli Zhou**)
3. “Tackling Fundamental Networking Problems in Underwater Acoustic Sensor Networks”, NSF CAREER, Total \$400,000, 01/01/2007 --- 12/31/2011 (**PI: Jun-Hong Cui**)

Other Highlights:

1. Dr. Jun-Hong Cui co-founded an ACM workshop on underwater networks (WUWNet'06, <http://wuwnet.engr.uconn.edu>) in conjunction with ACM MobiCom'06. WUWNet'06 is the first forum on underwater networks in the broad networking community. The workshop was a great success, and it attracted more than 70 participants. Among the eight ACM MobiCom workshops, WUWNet finally TIED with VANET (a well-established workshop), ranking the FIRST in terms of attendance. A steering committee for WUWNet has been formed, and Dr. Cui serves as the steering committee chair.

2. **Testbed Development:** A lab testbed has been developed. It is located in BECAT A-12 at UCONN. A logical diagram and the physical setting are shown below.



3. **Senior Design Project:** Dr. Shengli Zhou has successfully guided a senior design project titled “Multi-carrier Underwater Acoustic Modem”. The experiment setting and a sample of signal pulse received at the receiver side are illustrated as follows.

