Welcome To Our Website

Underwater Sensor Network Lab

http://uwns. engr. uconn. edu
Research Personnel (I)

• **Sensor Network and Systems Research**
  – John A. Chandy, *Electrical & Computer Engineering*
  – **Jun-Hong Cui, Computer Science & Engineering (Director)**
  – Yunsi Fei, *Electrical & Computer Engineering*
  – Yu Lei, *Chemical, Materials & Biomolecular Engineering*
  – Jerry Zhijie Shi, *Computer Science & Engineering*
  – Lei Wang, *Electrical & Computer Engineering*
  – Bing Wang, *Computer Science & Engineering*
  – Peter Willett, *Electrical & Computer Engineering*
  – **Shengli Zhou, Electrical & Computer Engineering (Co-director)**

• **Algorithmic and Performance Support**
  – Reda Ammar, *Computer Science & Engineering*
  – Lanbo Liu, *Civil & Environmental Engineering*
  – Krishna Pattipati, *Electrical & Computer Engineering*
  – Sanguthevar Rajasekaran, *Computer Science & Engineering*
Research Personnel (II)

• **Context and Applications Consultation**
  - Peter Auster, *Marine Sciences/NURC*
  - Ivar Babb, *National Undersea Research Center (NURC)*
  - Amvrossios Bagtzoglou, *Civil & Environmental Engineering*
  - James O'Donnell, *Marine Sciences*
  - Eric Schultz, *Ecology & Evolutionary Biology*
  - Jiong Tang, * Mechanical Engineering*
  - Thomas Torgersen, *Marine Sciences*

• **External Collaborators**
  - James Preisig & Lee Freitag, *WHOI*; Milica Stojanovic, *MIT/WHOI*
  - Giuseppe Caire, *USC*; John Heidemann & Wei Ye, *USC/ISI*
  - Mario Gerla, *UCLA*; Jim Kurose & Brian Levine, *UMASS*
  - Joseph Rice, *NPS*; Paul C. Hanson, *UW-Madison*
  - International collaborations with research teams from *China, France, Italy, Korea and Singapore*
Current Achievements: Publications (1)

• **Overview**

• **Applications**
  – Jiejun Kong, Jun-Hong Cui, Dapeng Wu, and Mario 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, 2005

• **Physical Layer**
Current Achievements: Publications (2)

- **Ranging and Localization**

- **Medium Access Control**

- **Routing & Forwarding**
Current Achievements: Publications (3)

- **Reliable Data Transfer**

- **Sensor Node Design**

- **Network Deployment**

- **Prototypes & Testbeds**
Current Achievements: Funding

• **Seed-Funds** from UConn CSE, ECE, EEP, BECAT, & SOE for **UConn UWSN Lab**
  – Total: $42,750, 03/2006 --- 06/2007, PIs: Jun-Hong Cui, Yunsi Fei, Zhijie Shi, and Shengli Zhou, etc.

• “**Advancing Underwater Acoustic Communication: A Shift from Single-Carrier to Multi-Carrier Paradigms**” **UConn Large Grant**
  – Total $28,000, 05/2006 --- 04/2008 PI: Shengli Zhou

• “**Tackling Fundamental Networking Problems in Underwater Acoustic Sensor Networks**”, **NSF CAREER**
  – Total: $400,000, 01/2007 --- 12/2011 PI: **Jun-Hong Cui**

• "**The Next Milestone: A Multicarrier Acoustic MODEM with Channel and Network-Adaptivity for Underwater Autonomous Distributed Systems**“, **ONR YIP**

• “**Collaborative Research: Developing a Novel Infrastructure for Underwater Acoustic Sensor Networks**”, **NSF/CRI**
  – Collaborating with UMass: Brian Levine & Jim Kurose; and WHOI: Lee Freitag

• “**Collaborative Research: SEA-Swarm: A Rapidly Deployable Underwater Sensor Network**”, **NSF/NOSS**

• “**A Multicarrier Underwater Acoustic Modem with Precise-Ranging Capability**”, **NSF/IHCS**
Current Achievements: Other Highlights

• 1st ACM International Workshop on UnderWater Networks (WUWNet’06), in conjunction with MobiCom’06
  – URL: http://wuwnet.engr.uconn.edu
  – First forum on underwater networks in the broad networking community
  – Jun-Hong Cui: General Co-Chair, Shengli Zhou: Treasurer and Registration Chair
  – Ranked first (tied with VANET) in terms of attendance among 8 ACM MobiCom’06 workshops

• 2nd ACM International Workshop on UnderWater Networks (WUWNet’07), in conjunction with MobiCom’07
  – URL: http://wuwnet07.engr.uconn.edu
  – Jun-Hong Cui: Steering Committee Chair, Shengli Zhou: Finance Chair
  – Best attended among the five non-free workshops at MobiCom’07

• Tools and Prototypes:
  – Acoustic Modem: Aqua-Modem
  – Simulation Toolkit: Auqa-Sim
  – Lab Testbed: Aqua-Lab
Simulation Toolkit @ UConn

- **Aqua-Sim**: Aquatic network simulator

- **Current Status**
  - Implemented acoustic physical link
  - Implemented R-MAC and VBF
  - Implemented MAC broadcast

- **Future Work**
  - Develop a complete package for all layers
  - Validate acoustic model with measurements

- **Final Goal**
  - Release simulation package to the research community
Aqua-Modem @ UConn

Approach: Multi-carrier modulation with OFDM achieves high transmission rate w/o linear or non-linear equalization

Prototyping:
- Optimize algorithms using TI DSP board (TMS320C6713 at 225 MHZ)
- Explore other designs (FPGA & customized design)
Aqua-Lab @ UConn

• **Hardware setup**
  a. Micro-Modem; b. Sound mixer; c. Water tank; d. Hydrophone; e. Underwater speaker

• **Software packages**
  - Low-level lib
  - High-level lib
  - Emulator
  - More …
Thank You!

UWSN Lab @ UCONN
http://uwsn.engr.uconn.edu/