Association for Underwater Communications Ranges (AUWAC)

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Field Trials: Their Critical Role in the Development of Robust and Reliable UWCOMMS

- We have much to learn about channel properties: The physical channel is complex and highly variable in space and time.
- We have more to learn about noise: Noise sources are also highly variable in space and time.
- New technologies provide new opportunities to exploit poorly-characterized channel properties, encouraging ongoing field trials.
- Network performance envelope is best measured *before* mission-critical operations.

Field Trial Modalities

	Ship-Based Expeditions	Underwater Ranges
Pros	• Many locations • Variable geometry • Latest technology	• Long term deployment • Cost effective: $O(10^3)$ per day • Potentially well-instrumented • Broad participation • Broad-band internet connection
Cons	• Expensive: $O(10^4\text{-}10^5)$ per day • Anecdotal • Limited participation	• Few locations • Fixed geometry • Technology ages

Underwater Ranges

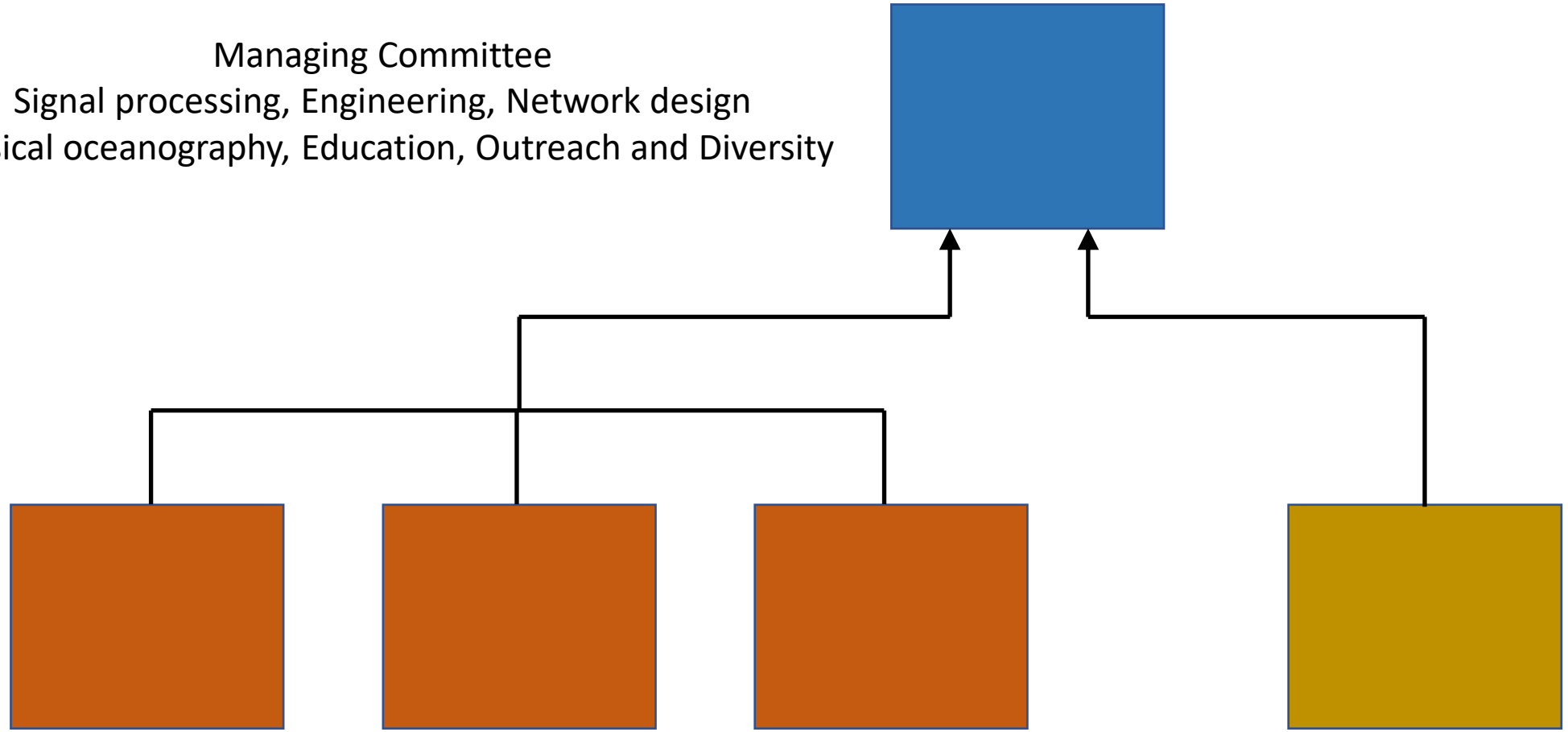
- Existing underwater (acoustic) ranges
  - Pu'uloa acoustic test range (DOD)
  - UNET (ARL, NUS)
    - https://arl.nus.edu.sg/twiki6/bin/view/ARL/UNET
  - Littoral Ocean Observatory Network (CMRE, NATO)
    - https://www.nato.int/cps/ie/natohq/news_143247.htm

- New underwater ranges for acoustical and optical transmissions
  - SIO Pier, SIO (complex bathymetry, established infrastructure, coastal operations support)
  - ASIT, Woods Hole (simple bathymetry, seasonal storm cycles, established infrastructure, coastal operations support).

- State-of-the-art instrumentation package
  - A suite of instruments to leverage deployments of opportunity
  - Arctic and Antarctic field deployments, deep water studies.

AUWAC Range Management

Managing Committee
Signal processing, Engineering, Network design
Physical oceanography, Education, Outreach and Diversity



Association member ranges

Optical and acoustic networking instrumentation package for ad-hoc deployment.

Leveraging AUWAC

- Systematic and unified approach to range access
  - Low participation cost with established SOP
  - Internet-based access to equipment
  - Shared and public data archive
- Regular schedule of channel probes and network tests for long-term studies
- Cost-effective test and evaluation resources for commercial operators
- Journal special issue and conference special session advocates
- Focal point for STEM diversity outreach and public education

AUWAC Challenges

- Funding support for 5 – 10 years required at a non-trivial level:
  - Management committee
  - Establishing new ranges
  - AUWAC activities: workshops, experiments, instrumentation
- MMPA compliance for periodic, long-term acoustic transmissions.
  - https://www.navymarinespeciesmonitoring.us/files/5213/5586/8546/2008_December-HRC-annual-monitoring-plan.pdf
- Finding incentives for management committee members and participating ranges.