

Implementation: What is it?

Take state of the art/science, and translate it to devices and capabilities for specific mission or need (Jose Chavez).

I.E. - Extract from current technology base and make product for user.

Themes

- Integration based on technology capabilities.
- Acomms implementations become tools.
- Better comms will improve and inform missions.
- Technology to prototype
- Training/research/education

Challenges for Implementation

- There is no single solution because problem space is large.
- Implementation framework? Platforms for: Software. Hardware. Testing. Etc.
- Flexibility of implementation (# of hydrophones, etc.)
- Barriers include difficulties in platform integration (Navy), but same could be true for integration into complex UUV systems that work with oil fixtures, etc.
- How to test?

Common user questions to the implementer :

1. How well is it going to work?
2. How do I talk to it?
3. Why isn't it working?

Need to keep these in mind when framing research questions.

Underwater Platforms for Implementation

Themes: fixed vs. mobile, small vs. large, etc.

- Underwater vehicles, multiple sizes and classes (Xsmall to XL, gliders, powered).
- Surface vehicles (unmanned) and gateway buoys.
- Sensors (fixed and drifting or profiling).
- Observatories and fixed infrastructure (cell like networks).

What are the related research opportunities?

- At the extremes of size, weight, power, cost, performance, etc.?

Work/Research Areas

- Develop an architecture or framework that different technologies can be plugged into.
- Standards for different pieces (SW and HW).
- APIs for different modems to ease plugging into new layered systems.

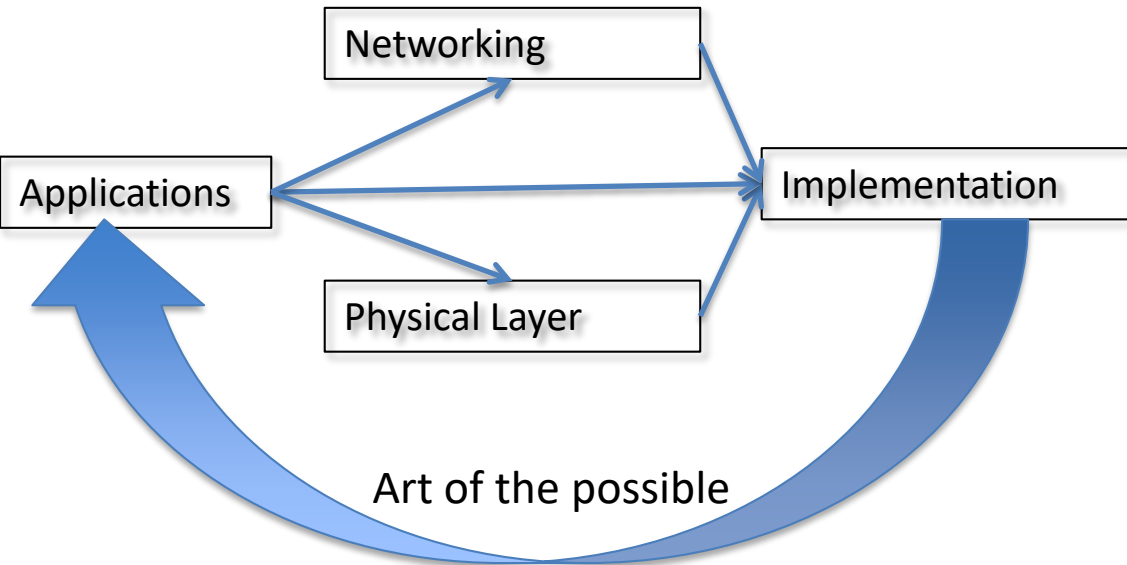
Other:

- Ad-hoc networks (MANET) that self-organize.
- Failed nodes, how to identify and organize around.
- Convergence of sensing (e.g. sonars) and communications systems.

Other notes:

- Will need to support many types of acoustic modems AND different communications modes (optical, wired, etc).
- There's no one modem for the problem.
- Need inherent support for multi-medium links to increase robustness. Need multiple paths for some applications.
- Design for testing up front within specific system components.
- Guaranteed availability (assured comms), etc.

Relationship between Focus Groups



Research Themes (for NSF/ONR)

Simulation, modeling and testing:

- Performance prediction (many types, inform network design, modem design, etc.)
- Standardized testing frameworks that include ocean model, mobility model, autonomy (e.g. H. Schmidt).

Research Components (not necessarily research per-se):

Hardware in the loop testbeds, in-water test beds, reference or benchmark implementations (general), standards, HW/SW development kits, mapping algorithms into processor structures (FPGA, GPU, DSP, etc).

What is Implementation?

0 Requirements and Standards

- User needs, performance metrics.
- Standards to include frameworks, architectures and interfaces.

I – HW (SWaP) and SW

- The modem:
 - Transducer
 - Front-end – Digital
 - Processing (DSP, etc.)
 - Interface to users (to IP network, APP, etc.)
- Software framework or architecture

II Testing and Assessment

- Validation and verification
- System integration
- Performance estimation
- **Performance assessment** (all aspects, against req. too).
- Maintenance, upgrade cycle

III Training, documentation

- Classes, manuals, (TTP), etc.

Grand Challenge Idea

Implement an Underwater Acoustic Network On-the-Fly

- Solve a problem or accomplish a specific mission in underwater acoustic communications and networking.
- Subject to specific constraints in available hardware.
- Unknown environment.
- Heterogeneous platforms and communications links (RF and optical too?).
- Goal: Build network in real-time (a week?), over multiple scales, with different platforms and gateways.
- Deliver data to user, provide command and control.
- Metrics: bit rate, amount of data (information delivered), latency, reliability, etc., etc.