

Experiment Design and Discussion @ the 21st Desert UW Group Meeting

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Objectives

- A) To **prove the correctness and usability** of a technology/protocol/algorithm
- B) To **evaluate the performance** of a technology/protocol/algorithm in a specific real-world scenario
- C) To **collect statistics** on the performance of a technology/protocol/ algorithm

Parameters

Controllable

- System Design (center frequency, Bandwidth, Modulation & Coding scheme, Transmission Power, Deployment, number of devices, Protocol Stack, Quality of Service to be guaranteed)

Out of control

- Environmental conditions (ssp, wind speed/direction, weather, currents)
- Biological activity in the area (marine mammals? shrimps?)

Approach A: prove correctness and usability of a tec/protocol/algo

Pros:

- Proof that tec/protocol/algo properly works in a real-world scenario
- Identification of possible fault and functioning limits, leading to improvement of the tec/protocol/algo

Cons

- Measurements over short intervals of time
- Poor data quality
- Limited understanding of the cause-effect relationship between environmental conditions and obtained results, thus limiting generalization

Approach A: what is needed?

- A set of protocols to be tested and the framework to carry out the experiments (Desert+devices)
- Capability to adjust parameters and software on the fly (in order to improve the technology in the field and measure the improvement)
- Software for post-processing the data on real time and provide quick feedback on the system/protocol performance of interest

Approach B: evaluate performance

Pros:

- performance evaluation of the protocol/tec/algo at different env conditions
- Evaluation of the robustness of the tec/protocol/algo
- Better data quality than A

Cons:

- Scenario-specific results
- Requires more observability on the environmental parameters
- Requires more automatization than A

Approach B: what is needed?

- Devices and protocols/algorithms to be tested and the framework for the experiments (DESERT)
- Collection of environmental data
- Experiments have to be scheduled properly in order to collect consistent data for different parameters
- Automatization both in the networking experiments, data collection, and management

Approach C: collect statistics

Pros

- Good data quality (reusable for future studies)
- Suitable data for understanding the relationship between environment and performance of the tec/algo/protocol, thus making it possible to generalize results

Cons

- Requires rigorous scheduling of the experiments (and longer experiments)
- Requires some a priori knowledge of the environmental conditions
- Requires rigorous data management, storage and processing

Approach C: what is needed?

- Autonomous devices (pre-programmed according to a given scheduling), protocols and Desert framework
- Collection of environmental data
- Study on the best scheduling strategy for the experiments in order to successfully obtain the objectives
- Software for efficiently managing and storing the data
- Tests of the autonomous framework to be used at sea

Possible objectives for the group

- To prove and evaluate (possibly improving during the field work) the robustness and effectiveness of DESERT as a framework for experimenting networking protocols in underwater acoustic networks
- Evaluate and confirm previous studies on the performance of a few networking protocols with respect to different varying parameters (this requires a mature understanding of the relationship between the protocol and the parameters affecting its performance (such as delay or PER or both)) and how these parameters can be changed during the experiments (if they are controllable or not)