



#### **Calhoun: The NPS Institutional Archive**

#### **DSpace Repository**

CRUSER (Consortium for Robotics and Unmanned Systems EdiacatilitynamtdRessearche)rs' Publications

2019

# Short-Term Self-Moving Maritime-Land Mesh Networks

# Bordetsky, Alex

Monterey, California: Naval Postgraduate School

https://hdl.handle.net/10945/62091

This publication is a work of the U.S. Government as defined in Title 17, United States Code, Section 101. Copyright protection is not available for this work in the United States.

Downloaded from NPS Archive: Calhoun



Calhoun is the Naval Postgraduate School's public access digital repository for research materials and institutional publications created by the NPS community. Calhoun is named for Professor of Mathematics Guy K. Calhoun, NPS's first appointed -- and published -- scholarly author.

> Dudley Knox Library / Naval Postgraduate School 411 Dyer Road / 1 University Circle Monterey, California USA 93943

http://www.nps.edu/library

# Short-Term Self-Moving Maritime-Land Mesh Networks





### What

- Enable a maritime-land mesh network of short-living nodes and links while integrating UxV in a multi-domain environment.
- Enable integration of miniature directional-antennas with littoral mesh nodes, and the elusive networking capability they bring.
- · Minimize tactical operator interactions with directional antennas
- Design the Knowledge Base foundations for managing short-living nodes and short-living links autonomies.
- Identify the best-suited architectural requirements for the construction, deployment, and operations of autonomous short-lived networks using unmanned assets.
- Identify the architectural requirements for a network backbone infrastructure that could be deployed and operated using a long-distance control link.

## How

Utilize miniature directional antenna units in the maritime-land mesh networking testbed.

Research current unmanned systems technologies that could carry on networking nodes, position them in the right locations, and adjust their positions as needed.

Examine different types of communication links and protocols to determine which will provide the most reliable and secure communications.

Evaluate which sensors are best-suited to be carried onboard unmanned systems to provide situation awareness data to key stakeholders.

Conduct simulated tests within the CENETIX lab followed by field experiments focused on feasibility and constraints analysis for the proposed network integration combined with experimental studies of the self-aligning network control channels and network operation techniques.

## Why

Survivability of communications in austere environments. The Navy must communicate, but needs to exploit the potential of self-organizing networks of elusive unmanned systems to conduct cyber-physical maneuver in the maritime-land combat clutter to survive in the future operating environment.

We address significant key warfighting needs to:

- Introduce robust system of unmanned vehicles that can act in the role of humans in network deployment duties, while allowing human operators to direct, observe, and maintain situational awareness from a safe distance.
- o Gain an asymmetric warfighting advantage through hard-to-detect networks.
- o Increase survivability during C2 communications.
- Reduce detectable footprint of USN/USMC/USSOF tactical communications to counter near-peer communications direction-finding capabilities.
- Enable real-time collaborative mission planning and execution with seamless and continuous situational awareness in contested or denied.





Dr. Alex Bordetsky, PI abordets@nps.edu 831-915-2408

Senior Researcher: Eugene Bourakov Lead Students: LT Beverly Crawford