Topic: N151-064

Azure Summit Technology, Inc.

Cognitive Radio Architectures for Cyberspace Operations

The rapid proliferation of wireless communications protocols is accelerating the obsolescence of radio equipment. The RF environment is becoming more complex and increasingly crowded to meet the growing demand for wireless services. Azure Summit is defining and developing new innovative algorithms to monitor, sense, and detect signals in a dense RF environment; allowing friendly forces to reconfigure their Software Defined Radios (SDR) to adapt to the new operating conditions on the fly. These algorithms in tandem with Azure Summit's tactical SDR, will enable electronic warfare and electronic attack capabilities for dismounts and SWAP-constrained, unmanned platforms. This capability will minimize obsolescence and logistics costs while maximizing interoperability and adaptive functionality.

Technology Category Alignment:

RF Components for sensing, transmission and communication
Cognitive/Adaptive Capabilities
Modular/Open/Reconfigurable Architectures
Unmanned Ground and Sea Vehicles
Radio Frequency (RF) (non-EW)

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SYSCOM: ONR
Contract: N68335-16-C-0283

Department of the Navy SBIR/STTR Transition Program

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WHO

SYSCOM: ONR

Sponsoring Program: JCREW, FNT 13-03

Transition Target: Group 1-2 UAS for the Navy

TPOC:
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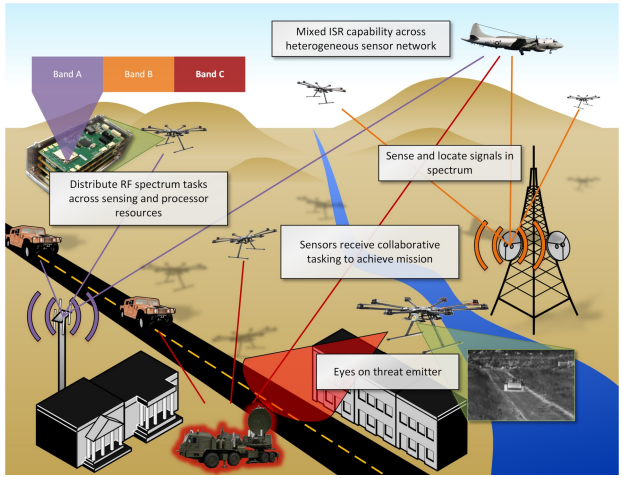
Other transition opportunities:

Notes:
SDR: Software Defined Radio
RF: Radio Frequency
UAS: Unmanned Air Systems
SWaP: Size, Weight and Power
SIGINT: Signals Intelligence
EW: Electronic Warfare



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WHAT

Operational Need and Improvement:
USMC seeks to develop a Cognitive Radio Architecture that can be applied to future software-defined radio (SDR) systems to provide real time spectrum awareness. In addition to signal classification, the architecture must be able to perform electronic attack in order to defeat RF threats such as improvised explosive devices (IEDs) and red force communications. The goal is to integrate this capability into a low SWaP SDR on Group 1-2 Unmanned Air Systems (UAS), providing ground forces with increased situational awareness and electronic protection.

Specifications Required: Size, Weight, and Power (SWaP) compatible with Group 1-2 UAS.

Technology Developed:
We have developed a cognitive software defined radio that can characterize complex radio frequency (RF) environments, identify threats, and apply electronic attack (EA) tactics to gather intelligence as well as deny or degrade adversaries' use of the RF spectrum.

Warfighter Value:
- Accurate knowledge of the RF space can supply battlefield command with a better operational picture. This includes better joint frequency management for blue force communications, location of hostile emitters, tactical SIGINT collection, and a baseline of the civilian RF infrastructure.
- Furthermore, large SIGINT platforms have a prominent RF signature and high unit cost, making them likely prey for lower cost missile intercept. A distributed RF sensor network, overcomes many of these obstacles. A heterogeneous mix of low-cost, UAV/payloads reduce the cost of attrition, but increase the cost of kinetic engagement to the enemy. A large quantity of platforms can form a collaborative sensor network, which self optimizes across time, frequency, and space to share the sensing load and obtain better knowledge of the RF spectrum.

WHEN

Contract Number: N68335-16-C-0283 **Ending on:** December 31, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop Architecture for Wide Band Detection	Med	Simulate detection algorithm on dense spectrum scenario and develop hardware signal processing architecture	4	July 2017
Design and Develop Cognitive Classifier	Med	Demonstrate classification of narrowband signals using cognitive framework and one-versus-rest classifiers	4	July 2017
Cognitive classification demonstration	Med	Demonstrate automated classification of small subset of basic signal types on low SWaP payload	5	July 2017
Platform sensor integration	High	Demonstrate RF classification and/or geolocation on distributed network of UAS	6	July 2018

HOW

Projected Business Model:
Azure Summit designs and builds a wide range of SDR products with the help of contract manufacturers (CM). We intend to demonstrate the technology on our low SWaP payload using a network of small group UAS and provide the sensor as a subsystem component for integration by larger primes.

Company Objectives:
Azure Summit is looking to expand its portfolio of EW applications for its SDR product families.

Potential Commercial Applications:
The cognitive radio technology will classify and act on RF signals of interest, providing situational awareness (SA) and force protection (FP) for the ground forces.

We also believe that the cognitive radio sensor when paired with UAS can also be used for wide area spectrum monitoring for spectrally efficient communications. In particular for developing countries, where the RF environment is highly unregulated and there's a strong demand for wireless communications, it is important to map the RF spectrum to maximize its use.

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