Topic: N161-068

JPAnalytics LLC

The Modular Clandestine Communications System (MCCS)
JPAnalytics' Modular Clandestine Communications System (MCCS) is an underwater acoustic communications system capable of delivering reliable communications in challenging environments while being virtually undetectable by adversaries. JPAnalytics lives by the motto "Where Data, Theory and Analysis Create Innovative Solutions" to harness its expertise in signal processing, underwater acoustics, communications and embedded systems and develop paradigm-shifting solutions in underwater acoustic communications and detection. The MCCS addresses extensive needs in undersea vehicles, weapons and sensors. Its proprietary processing algorithms and modular signal, software and hardware architectures enable robust operation in challenging environments and efficient system optimization to satisfy user requirements and constraints. The MCCS has been extensively tested with field data and analyzed by independent organizations. JPAnalytics is looking for visionary customers and innovative and resourceful partners.

Technology Category Alignment:

Scalable Teaming of Autonomous Systems
Networks and Communications
Unmanned Ground and Sea Vehicles
Acoustic, Seismic and Magnetic

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SYSCOM: ONR
Contract: N68335-17-C-0550
Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0550

Department of the Navy SBIR/STTR Transition Program

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WHO

SYSCOM: ONR

Sponsoring Program: Forward-Deployed Energy and Communication Outpost (FDECO)

Transition Target: Forward-Deployed Nodes, UUVs, Sensors and Weapons

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https://www.onr.navy.mil/en/About-ONR/History/tales-of-discovery/remus

Other transition opportunities: MCCS provides a reliable and clandestine (Low Probability of Detection or LPD) communications capability for underwater platforms. Communications between manned platforms, between manned and unmanned platforms and between unmanned platforms are all supported. Any scenario where clandestine acoustic communications is needed between undersea platforms is a transition opportunity for MCCS. JPAnalytics desires to work with transition partners with the vision and desire to exploit the capabilities of MCCS to create new capabilities for our nation's warfighters.

Notes: The MCCS will enable reliable and clandestine mission critical communications for the Mk 18 Mod 2 Kingfish shown here and future generations of unmanned undersea vehicles, sensors and weapons.

WHAT

Operational Need and Improvement: The use of distributed and small manned and unmanned undersea platforms is an important component of current and future operations. Communications between the distributed platforms necessary to maintain cross-platform coordination, situational awareness and positive operational control is often required in these operations. Currently, this typically relies on commercial modems that employ fairly high source levels and/or readily recognizable acoustic signals. However, for many missions the probability of success relies on maintaining a stealthy posture. A reliable, robust and clandestine undersea communications capability that is adaptable to diverse environments, platforms and operational constraints and requirements is needed to insure the future viability of these missions.

Specifications Required: To develop an acoustic communications system employing stealthy (covert, LPD) techniques for sending information through ocean acoustic channels at modest to moderate bit rates (100s of bits per second) over ranges of 1 to 10 km.

Technology Developed: The MCCS core technologies are modular signal, algorithm and hardware architectures that enable efficient system optimization and implementation to meet user needs. The modular signal architecture integrates a unique "featureless" signal set with error correction coding that reliably transmits information at very low SNRs and is difficult for an adversary to detect. The modular signal processing algorithm architecture integrates a two-stage adaptive signal detection, synchronization, and demodulation algorithm with an efficient decoding structure and enables efficient implementation on low-power processors. The modular hardware architecture combines COTS embedded processing modules with customized "wet-end" hardware to allow the use of state-of-the-art low-power processing technology in parallel with "wet-end" system optimization for specific applications.

Warfighter Value: JPAnalytics' Modular Clandestine Communications System (MCCS) provides a reliable underwater acoustic communications capability to the warfighter in challenging environments while being virtually undetectable by adversaries. This will increase the probability of success of the missions discussed above under "Operational Need". The modular signal and processing structure enables the MCCS to automatically update itself or be easily updated by an end user to better maintain an LPD posture and to adjust to changing operational constraints and requirements.

WHEN

Contract Number: N68335-17-C-0550

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate MCCS Core Stage 1 algorithm running on COTS embedded processor. Demonstrate low counter detection vulnerability of MCCS signal set.	N/A	Algorithm running and providing accurate results. Signals satisfy user LPD metrics.	4	3rd QTR FY18
Demonstrate entire MCCS received signal processing chain running in real-time on COTS embedded processor.	Low	COTS processing card satisfying SWaP constraints and numerically accuracy of embedded algorithms comparable with that of off-line algorithms.	4	2nd QTR FY19
Demonstrate MCCS implemented on COTS embedded processor reliably demodulating signals under operational conditions.	Low	Message success rate exceeding user defined threshold in operational conditions.	5	3rd QTR FY19
Demonstrate communications to and from a selected operational platform over desired operational ranges.	Med	Message success rate exceeding user defined threshold in operational conditions.	6	4th QTR FY20

HOW

Projected Business Model: JPAnalytics will pursue Phase II Option and Subsequent Phase II funding to transition the prototype system developed with the Phase II Base funding to application-specific, deployment-ready systems. Once this is done, JPAnalytics will consider three primary methods of transition. These are to license MCCS processing algorithms and optimized signal sets and array configurations to prime contractors to integrate into their systems, to provide programmed embedded processing chips to acoustic modem manufacturers, and to produce board sets, arrays and transducers for direct sale to end users or system integrators. Both one-time and subscription-based licenses will be considered.

JPAnalytics plans to retain the sole right to modify MCCS signal sets optimized for end-user applications and approval rights for the transmit transducers and receive hydrophone arrays used with the system. JPAnalytics will also offer to customers hydrophone array and wet-end electronics design services to enable them to maximize overall system performance.

Company Objectives: JPAnalytics lives by the motto "Where Data, Theory and Analysis Create Innovative Solutions" to harness its expertise in signal processing, underwater acoustics, communications and embedded systems and develop paradigm-shifting solutions in underwater acoustic communications and detection. Our work is always guided by the harsh task master of reliable operation in the real-world environments in which our nation's forces must operate. Our objective is to identify challenging candidate applications and needs, develop new core technological capabilities and rapidly and efficiently transition those capabilities into solutions that meet the needs of our customers. JPAnalytics is looking for visionary customers and innovative and resourceful partners with whom it can work to achieve this objective.

Potential Commercial Applications: The MCCS signal structure and detection methodology is useful and applicable in any applications where communications occurs at very low signal-to-noise ratios and in dynamic multipath environments.

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