# Department of the Navy SBIR/STTR Transition Program

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Topic # N151-064
Cognitive Radio Architectures for Cyberspace Operations
Syncopated Engineering, Inc.

## WHO

**SYSCOM:** ONR

**Sponsoring Program:** Phase II SBIR

**Transition Target:** Marine manpack system capable of providing a broad variety of military applications including receive-only applications such as real-time adaptive spectral sensing, SIGINT processing, and direction finding, as well as time-sensitive cognitive Electronic Warfare (EW) and adaptive MIMO-OFDM communications.

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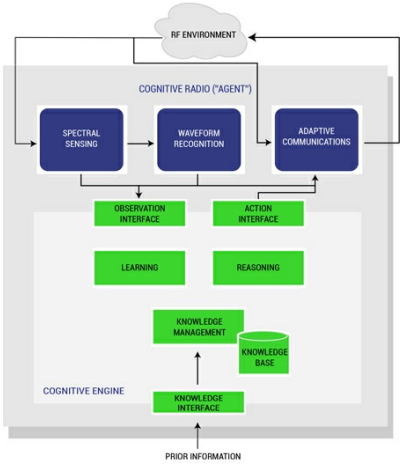
**Other transition opportunities:** Solutions to expressed needs by US SOCOM and the Army Rapid Capabilities Office to ensure dominance of the spectral domain. Anti-jamming, cognitive radar, and autonomous wireless systems that leverage a portfolio of SDR products and form factors with application specific “radio personalities”. For large system integrators, our intelligent radio solutions can be integrated as a component within their system development and delivery programs (e.g. SIGINT, counter-UAS, low-probability of intercept wireless comm.)






## WHAT

**Operational Need and Improvement:** The wireless spectrum is a dynamic and harsh environment, and has become another Cyber battle space for the military. Innovation in wireless communications technologies has resulted in an explosion of wireless devices, multiple commercially deployed standards and a very crowded spectrum, which makes it difficult to adapt to the wireless communication environment without multiple devices. The military has also benefited from these innovations and they too are faced with multiple communication radio standards and a crowded spectrum. To maintain our spectral dominance, we need a cognitive radio that is self-aware of the dynamic spectral domain and provides robust, adaptive tactical wireless communications that seamlessly avoids interference and intentional jamming all in a single portable device.

**Specifications Required:** The cognitive radio solution needs to provide core capabilities in spectral sensing, waveform recognition and adaptive wireless communications, integrated with a cognitive engine that enables autonomous learning and system reconfiguration. A flexible and modular architecture enables deployment across a variety of heterogeneous computing devices in order to support real-time and offline operations, as well as manpack, tactical or strategic platforms.

**Technology Developed:** Syncopated Engineering’s Cognitive Radio, built on our highly successful CIELO family of multi-channel SDR products, includes a cognitive engine capable of autonomous learning and reconfiguration to adapt to dynamic spectral environments. Our CR system includes spectral sensing, waveform recognition, and adaptive radio communications providing complete spectrum situational awareness, cognitive EW and robust, anti-jam wireless communications for cyberspace operations.

**Warfighter Value:** Our Cognitive Radio solution leverages a reconfigurable and scalable SDR architecture, and as such can be tailored to the physical size, weight and power constraints of the given mission and support deployments from highly mobile small manpacks to larger fixed deployments.

## WHEN

**Contract Number:** N68335-17-C-0056 **Ending on:** December 31, 2018

| Milestone | Risk Level | Measure of Success | Ending TRL | Date |
|---|---|---|---|---|
| Spectral Sensing | Low | Probability of Detection | TRL4 | September 2017 |
| 2-channel Receiver / Waveform Recognition / Direction Finding | Med | RF performance / Probability of Classification / AoA Accuracy | TRL5 | December 2017 |
| MIMO-OFDM | Low | BER | TRL4 | April 2018 |
| Cognitive Engine Integration | Med | Adaptation Speed | TRL5 | June 2018 |
| 2x2 MIMO Manpack CR | Med | RF Performance | TRL6 | December 2018 |

## HOW

**Projected Business Model:** Our cognitive radio solutions include both full-featured, purpose-built intelligent radio systems, as well as commercially available SDR platforms and IP that can be integrated across a variety of devices and wireless application scenarios. Our solutions enable wireless software developers to start further down the development path, reducing time-to-market and enabling the ability to focus on their innovative applications.

**Company Objectives:** Syncopated Engineering is a creative solution provider of software applications and embedded systems for wireless communications, signal processing, and data analytics. We have Cognitive Radio / Software Defined Radio (SDR) and hardware acceleration product lines that are complementary to our custom solution development offerings. Our goal is to establish a high performance and reconfigurable suite of intelligent SDR platforms that complement our purpose-built custom product and solution offerings. The combination of performance and flexibility in our solutions provides a unique competitive advantage and drives our repeatable solution-delivery model.

**Potential Commercial Applications:** The Internet-of-Things will capitalize on the explosion of new wireless devices, but the multiple commercially deployed standards makes it difficult to adapt to the wireless communication environment without multiple devices, and even harder to protect wireless networks from bad actors that are both wireless and highly mobile. Commercial applications for our cognitive radio solutions include as an intelligent wireless security sensor for wireless intrusion detection systems, or as a multi-protocol wireless Internet-of-Things communications node.

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