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Dynamic Spectrum Management Using Operational Spectrum Comprehension, Analytics, and Response (OSCAR)

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Abstract:
As the electromagnetic spectrum becomes more and more critical to both Army and adversary operations, it is necessary to better understand and visualize the electromagnetic environment as well as dynamically control friendly emitters under various conditions. This need is further amplified by the increasing demand for spectrum resources at home and abroad especially with respect to commercial spectrum auctions such as AWS-3, AMBIT, EMBRS, and future shared bands. Naturally, this introduces the need for intelligent and dynamic spectrum management systems that can easily monitor and quickly adapt to changes in the electromagnetic environment. To address this need, Peraton Labs is developing the Operational Spectrum Comprehension, Analytics, and Response (OSCAR) system. OSCAR provides a simple automated dynamic spectrum planning and monitoring capability used to plan spectrum usage, deconflict spectrum requests, and push configurations to radios, while also dynamically reacting to and avoiding interference in real time with a mature RF sensor network.

The OSCAR system was developed as a solution to current and future needs for efficient spectrum management and utilization, including support for dynamic behavior in congested or contested environments. OSCAR is a flexible web-based application designed to support test and training range activities as well as provide new capabilities for in theater operations. In the planning phase, OSCAR provides an integrated portal for Spectrum Managers to streamline and simplify their daily activities, such as making and approving frequency authorization requests, visualizing the electromagnetic operating environment (EMOE), and refining mission plans. OSCAR works within the current spectrum management workflow, incorporating inputs from external planning and management tools (e.g. SXXI, SPEED, UNO Planner) and standard record forms as its core source of authoritative information.

For in-mission operations, OSCAR provides spectrum monitoring capabilities and the capacity for radio command and control. OSCAR's spectrum monitoring system includes a distributed network of passive RF sensors that provide near-real-time measurement of the spectrum and integrated signal detection and classification. With the sensor network, interference sources or unauthorized transmitters can be geolocated, providing users with actionable information to resolve the source of detected issues. OSCAR is also able to combine spectrum data with TSPI or PLI data from radios as well as SXXI records to provide the user with a map-based visualization of the EMOE, which enables the user to make informed decisions regarding spectrum management including issuing new or updated frequency assignments to adjust the electromagnetic signature or address interference. Furthermore, OSCAR can even perform automated frequency deconfliction with RF propagation modeling and recommend courses of action. Loadsets can then be pushed directly to over-the-air managed radios within OSCAR's unified interface.

With these features, OSCAR can dramatically improve spectrum management – from planning through mission execution – in congested and contested environments. Workflow automation is needed to increase the pace of frequency assignments while spectrum monitoring and radio control enable the ability to dynamically adapt to a changing electromagnetic environment. OSCAR has been designed to provide these capabilities to be a next-generation tool in support of current and future needs in dynamic spectrum management.