Electromagnetic Spectrum Enterprise Capabilities and Services

DEFENSE INFORMATION SYSTEMS AGENCY
The IT Combat Support Agency

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Our nation's dominance in air, land, sea, space and cyberspace is underpinned by a cross-cutting reliance on the electromagnetic spectrum. EMS enables our warfighters to use critical technologies such as radar, navigation, connected weapons and sensors, and much more. Future technologies will utilize the EMS as the foundation for wireless capabilities and the internet-of-things, which are essential to extending "power to the edge."

Access to the EMS is increasingly challenged by peer and near-peer adversaries. EMS challenges also go beyond the military battlespace. Access to the EMS domestically is a national strategic asset, as commercial mobile broadband technologies are key to bolstering economic growth and prosperity. Access to the EMS, and operations within the EMS, represent new opportunities for the Department of Defense and our national economy.

Why Defense Spectrum Organization?

The Defense Information Systems Agency's Defense Spectrum Organization supports access to, and operations within, the EMS through spectrum planning, information system acquisition and development, and direct support to military operations.

The driving motivation for DSO is to inspire and empower people so that together we can solve tomorrow's challenges today. This passion for problem-solving enables DSO to execute the mission of delivering tools, capabilities and expertise to the DoD.

DSO envisions a world where the warfighter has freedom of action within the EMS when and where needed.

DSO lives by five core tenets to execute the mission:

- Working together to understand the requirements and deliver solutions at the speed of relevance.
- Sharing knowledge and delivering capability that turns the impossible into the possible.
- Making relationships personal and letting people know we care about them.
- Providing fair and balanced technical analysis, always telling the truth and being transparent to build trust.
- And always finding creative solutions to the hard challenges by thinking outside the box.

DoD Spectrum Support to the Warfighter

Department of Defense spectrum management is a crucial element of our national defense. Electromagnetic spectrum support is a critical component in carrying out the Defense Information Systems Agency's priorities around the globe.

- **Align and Integrate Data Delivery for EMS Operations Capabilities.** DSO prepared for the acquisition of the electromagnetic battle management system. The EMBM request for information was released, and the DSO team began analyzing the data to prepare for the request for proposal. EMBM will support a commander's ability to plan, direct, monitor and assess operations in the electromagnetic spectrum.

- **EMSO Modernization.** DSO supported efforts to evolve/implement the DoD to agile EMSO as called for in the DoD Digital Modernization and DoD C3 Modernization strategies.

- **EMS Situational Awareness.** DSO sustained efforts to improve EMS situational awareness and develop electromagnetic battle management capabilities that enable Joint All Domain Command and Control operations.

- **Electromagnetic Spectrum Enterprise Architecture.** DSO led the DoD EMSEA Joint Working Group and developed the EMS Information Environment enterprise architecture segment of EMSEA to inform and guide the transformation of capabilities and activities to improve DoD EMS operations by the year 2030, support DoD modernization strategies and apply to EMS IE segment stakeholders.

- **America's Mid-Band Initiative Team.** DSO supported a DoD and multi-agency working group assessing national security and national economic goals to utilize spectrum in the 3400-3550 MHz range. Focus was on courses of action to support commercial access to at least 100 MHz of contiguous spectrum between 3400 and 3550 MHz.

- **Telecommunications Advanced Research and Dynamic Spectrum Sharing Systems.** DSO established a TARDyS3 program to lead the DoD activities in the 3550-3650 MHz band. This tool suite will provide interference prevention, detection and resolution as well as enable sharing between DoD ranges and Citizens Broadband Radio Service.

- **2025-2110 MHz Spectrum Management Coordination System.** DSO developed an email-based interim capability to enable DoD to share spectrum with commercial users (Broadcast Auxiliary Service community) in the 2025-2110 MHz band. This capability was replaced by the initial operating capability of SMCS in the third quarter of fiscal year 2021.

- **Bilateral Agreements.** DSO engaged in allied partner bilateral agreements with the United Kingdom, Australia and Canada under the auspices of memorandums of understanding between DoD and the allied defense agencies to advance coalition operations.

- **Operational Support Teams Provide Global Support.** DSO facilitated detachments of the spectrum operational teams globally via onsite and reach-back support. These teams helped resolve electromagnetic spectrum interference issues, train field spectrum operators and conduct electromagnetic analysis. Those receiving assistance included combatant commands, the service components, coalition nations, NATO and other agencies.

- **Spectrum Policy and Governance Support.** DSO performed analyses to evaluate spectrum bands and support balanced spectrum repurposing decisions at domestic and international spectrum and satellite network forums. The organization leads DoD technical preparations for the World Radiocommunication Conference, an international forum where radio regulations are periodically reviewed and revised.

- **EMS Superiority Strategy Support.** DSO participated in the first DoD Chief Information Officer-EMS cross functional team EMS Superiority Strategy implementation plan development core team meeting. Working integrated product teams were formed for each of the five goals. DSO led Goal 4 WIPT - Partnerships: International and National Spectrum Planning and participated in other goal-based WIPTs that involved DSO equities (e.g., software/material solutions, data, architecture, etc.). Support will help the achievement of EMS superiority for the warfighter.

- **Mobile Service Provider Analysis Processes.** DSO optimized and streamlined the analysis processes associated with the DoD mobile service provider effort, which improves quality-of-life smartphone connectivity on DoD military installations through deployment of additional infrastructure. The analysis support ensures this additional infrastructure does not interfere with DoD operations or introduce hazards to personnel, fuels or ordnance.

- **Missile Defense Agency Homeland Defense Radar.** DSO conducted a spectrum survey in support of the MDA for INDO-PACOM's Homeland Defense of Guam mission. The MDA develops ballistic missile defense capabilities to protect the U.S. from ballistic missile attacks.

EMS Enterprise Capabilities and Services

The EMS Enterprise comprises EMS operations, support services, data, analysis, planning tools and other capabilities that enable access to, and operations within, the EMS.

DSO anticipates, understands and solves multidimensional EMS access challenges so that DoD continues to be the most lethal fighting force across all warfighting domains.

To help our customers anticipate, understand and solve challenges, DSO provides the following capabilities and services:

- Inform senior DoD and combatant command leadership decision-making.
- Conduct national and international EMS outreach that advances DoD and national interests.
- Conceive, prototype, develop and deploy the next generation of EMS-related algorithms, models and simulations.
- Design, develop, field, operate and sustain EMS operations information systems.
- Conduct EMS engineering analyses, modeling and simulations in support of DoD global access to, and operations within, the EMS.
- Conduct research, outreach, advocacy and analysis of emerging EMS technologies that advance DoD's ability to gain and maintain superiority within the EMS.
- Serve as the Defense Spectrum data administrator.
- Acquisition and analysis support to mitigate electromagnetic environmental effects.

DSO's core competencies include:

- E3 engineering.
- Strategic spectrum planning.
- Information systems.
- Modeling and simulation.
- Operations to provide complete spectrum-related services.

Global Electromagnetic Spectrum Information System

DSO is transforming EMS operations from a pre-planned and static frequency assignment process into a dynamic, responsive and agile capability through the Global Electromagnetic Spectrum Information System. GEMSIS is the joint program of record. The GEMSIS Program Management Office is delivering capabilities through an evolutionary incremental acquisition approach to continue enhancing the ease of use, efficiency and effectiveness of access to the EMS.

The GEMSIS PMO provides the following spectrum services and capabilities:

Integrated Spectrum Desktop

ISD provides a "common desktop" for accessing web-based spectrum management capabilities. The ISD facilitates access to the GEMSIS tools in order to improve visibility and flow of information within the spectrum management business processes. Also, the ISD provides links to common service and joint web pages.
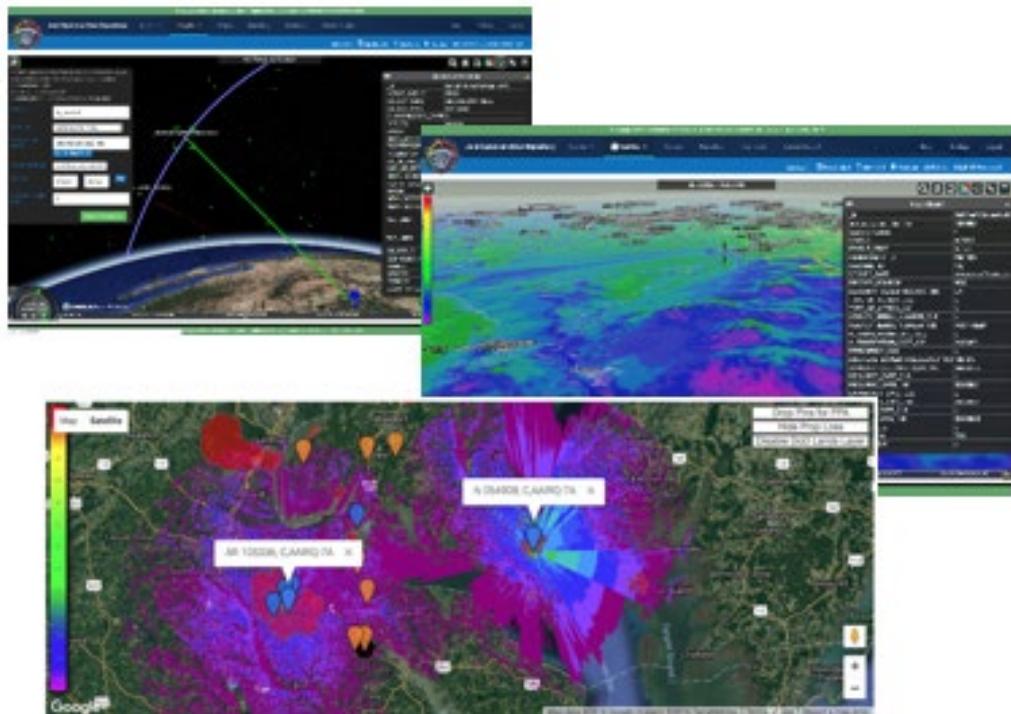
Joint Spectrum Data Repository

The DSO has been chartered to collect, standardize and distribute spectrum-related data. To fulfill this mission, DSO provides direct online data access to the GEMSIS Joint Spectrum Data Repository. The JSDR contains DoD, national and international spectrum-related information up to the Secret level. The JSDR provides user access to spectrum database components through customized queries as well as through a universal query. The JSDR offers business intelligence analytics on selected data sets and engineering analysis tools as well as access to spectrum-related documentation and files.

JSDR capabilities include:

- Access to frequency assignments, spectrum certification, detailed equipment characteristics and interference reports.
- User generation of a layered electromagnetic operating environment.
- Geospatial visualization of data within the JSDR with terrain and temporal overlay.
- Satellite line-of-sight heat map capability.
- Federating queries to multiple intelligence community spectrum-related data sources.
- Content management information system for unstructured spectrum-related information.
- Machine-to-machine application programming interfaces for information exchange.
- Support for DoD exercises.
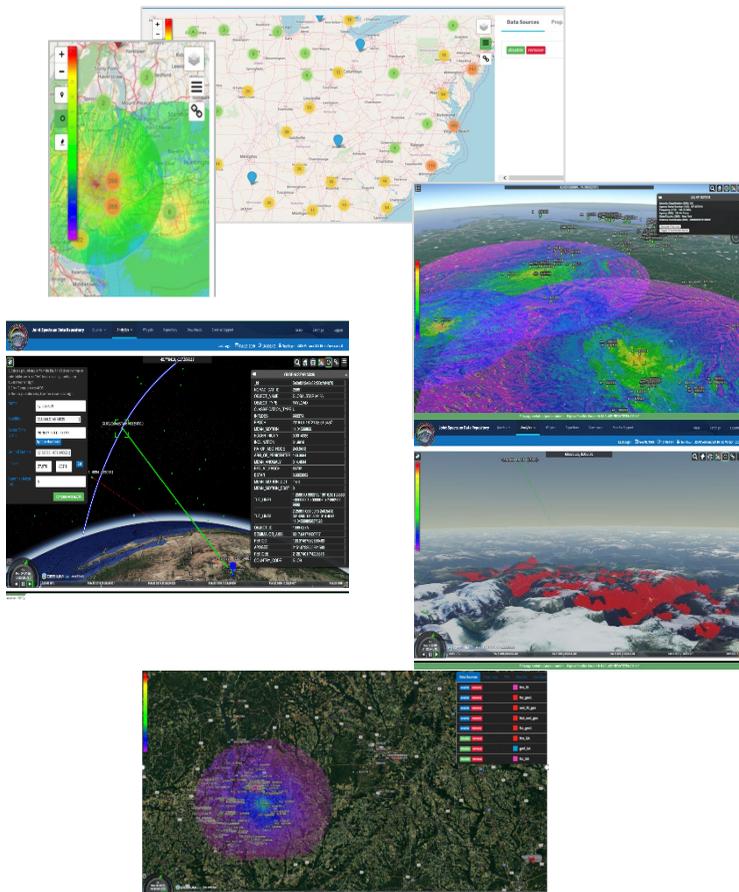
End-to-End Supportability System

The End-to-End Supportability System is a web application that supports the entire Equipment Spectrum Supportability business process as well as provides a major tool for gathering equipment information critical to JEMSO. It offers the tools for the services, combatant commands and industry to create, validate, process, approve and store spectrum certification-related records and files. It consists of four major components:

1. An editor module for creating records.

2. An explorer module for searching and storing records in the database.

3. A business process manager providing transparency and tracking workflow.

4. A host nation module for requesting and documenting responses to access spectrum from host nations.
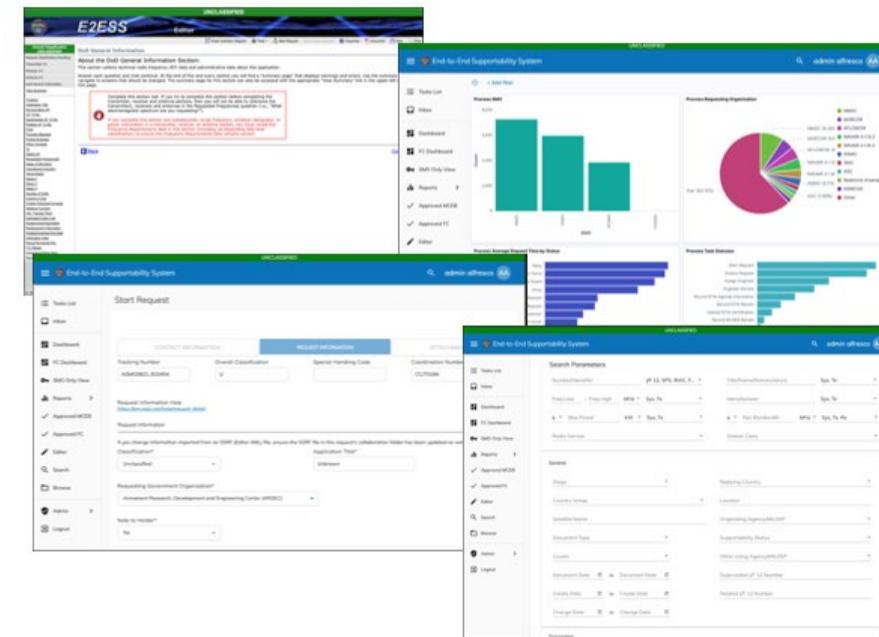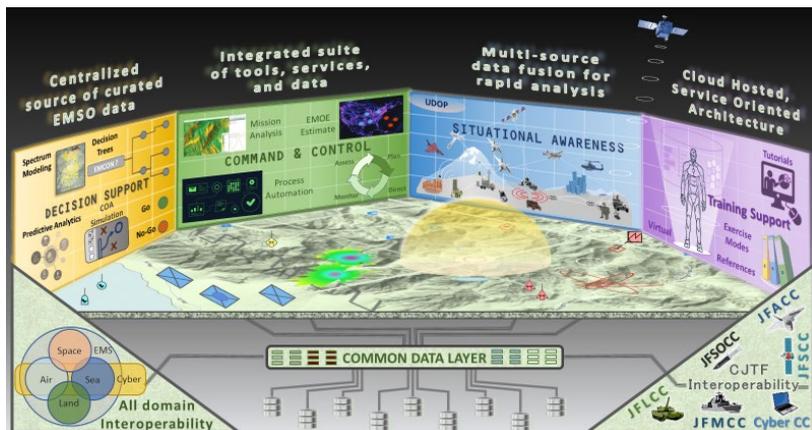
SPECTRUM XXI

SPECTRUM XXI is a client/server, Windows-based software system that provides frequency managers with a single information system to address spectrum management automation requirements. SXXI supports operational planning and management of the radio frequency spectrum with an emphasis on assigning compatible frequencies and performing spectrum engineering tasks. SXXI is the joint standard system for spectrum management throughout DoD. It has also been adopted by the National Telecommunications and Information Administration for processing frequency records for federal agencies. SXXI is operational in over 18 foreign nations through Foreign Military Sales and was used by U.S. Central Command and all NATO coalition forces spectrum management elements in the Afghan area of operations.
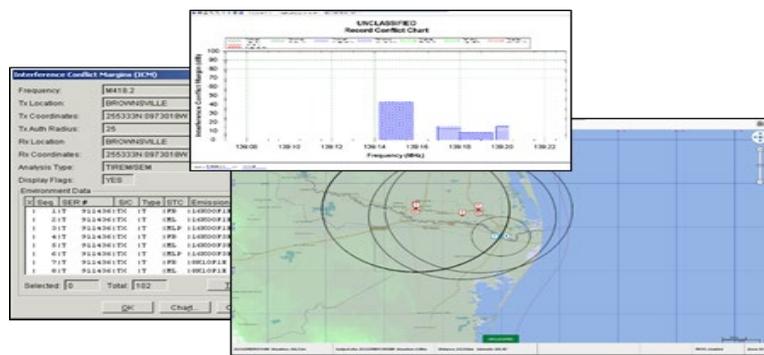
Electromagnetic Battle Management

Electromagnetic Battle Management includes actions to monitor, assess, plan and direct operations in the EMS that support the commander's objectives. It is the coordinated direction of all joint functions in the EMS to enable the orderly conduct of friendly EMSO.

EMBM Minimum Viable Capability Release 1 is focused on improving situational awareness for combatant commands. MVCR2 will focus on deliberate planning, decision support, C2 and training.

Joint Spectrum Interference Resolution Online

DoD established the Joint Spectrum Interference Resolution program to address persistent and recurring electromagnetic interference problems in joint operations, including those between civil and DoD systems and those involving space systems.

The Joint Spectrum Interference Resolution Online portal is a web-based, centralized application containing data and correspondence for reported interference, meaconing, intrusion and jamming incidents. The portal is the repository for the results of analyses, collected data and supporting documentation for EMI resolution of both trend and future interference resolution analysis.
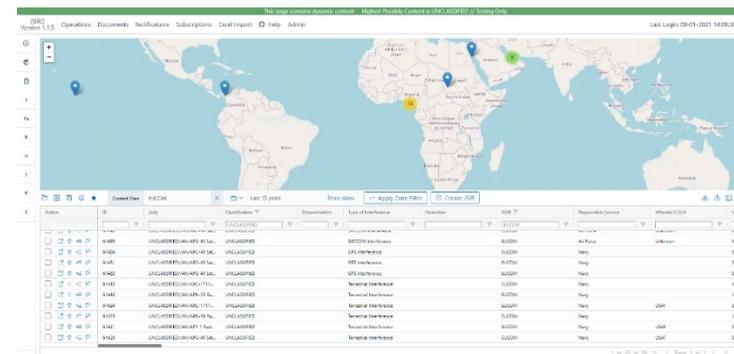
E3 Spectrum and Applied Engineering

DSO is the engineering center of excellence maintaining the subject matter expertise, experience and analytical tools required to address electromagnetic spectrum operations in the complex electromagnetic operational environment.

DSO provides direct and reimbursable support to the DoD components to address the impact of the electromagnetic environment upon the operational capability of military forces, equipment, systems and platforms.

DSO provides comprehensive E3 and spectrum engineering support services utilizing worldwide frequency allocation and assignment databases, military and commercial equipment characteristics databases, and world-class analytical tools and models to identify, assess, correct and mitigate potential EM interference to ground, sea-based, airborne and space-based military equipment, systems and platforms.

In addition, DSO provides support to the DoD components for:

1. Radio-frequency engineering analyses.
2. Test and measurement services.
3. Electromagnetic compatibility site surveys.
4. Spectrum planning.
5. RF coverage predictions.
6. Communication planning.
7. Mobile service provider E3 analyses for military base installations.
8. Joint ordnance E3 assessments and hazards of EM radiation to ordnance.
9. E3 and spectrum supportability training and education support.
10. Military and commercial E3 standards development.
11. DoD Acquisition/Joint Capabilities Integration and Development System and EMS survivability support.

Strategic Spectrum Planning and Sharing

EMS Enterprise Architecture

The Electromagnetic Spectrum Enterprise Architecture provides an enterprise view of the electromagnetic spectrum maneuver space via the DoD architecture framework-formatted products and fit-for-purposes views.

EMSEA is a long-term architecture effort that formulates information to describe the current environment. With EMS operational stakeholders, EMSEA informs and guides the transformation of capabilities and activities to improve DoD EMS operations and support DoD modernization strategies.

DSO Strategic Planning Division — in coordination with the DoD stakeholders — develops, maintains, updates and reviews the EMSEA and its associated transition plans. DSO also analyzes non-EMS architectures, assesses architectural impacts of DoD policies and strategies, and coordinates and integrates with other architecture efforts, such as the JADC2 Reference Architecture.

Citizen Broadband Radio Service

As part of the Citizen Broadband Radio Service that incorporates spectrum access systems and environmental sensing capabilities, DSO is developing a spectrum scheduling system and an interference protection, prevention, detection and resolution capability for DoD. This development will expeditiously communicate spectrum use and resolve interference in the 3550-3650 MHz band through autonomous negotiation with spectrum access systems. It will quickly identify potential sources of electromagnetic interference and effectively manage user interactions through an intuitive user interface that is responsive to each user's individual requirements.

DSO is using an agile development approach, combined with the DoD-authorized Platform One platform as a service development, security and operations environment to rapidly develop and deploy this capability. In addition, DSO is partnering with the National Advanced Spectrum and Communications Test Network and the National Institute of Standards and Technology to collect data about the CBRS spectrum sharing system. This collaboration will assist decision-makers in evaluating the effectiveness of the CBRS sharing ecosystem to co-exist with DoD radar systems at scale and speed.
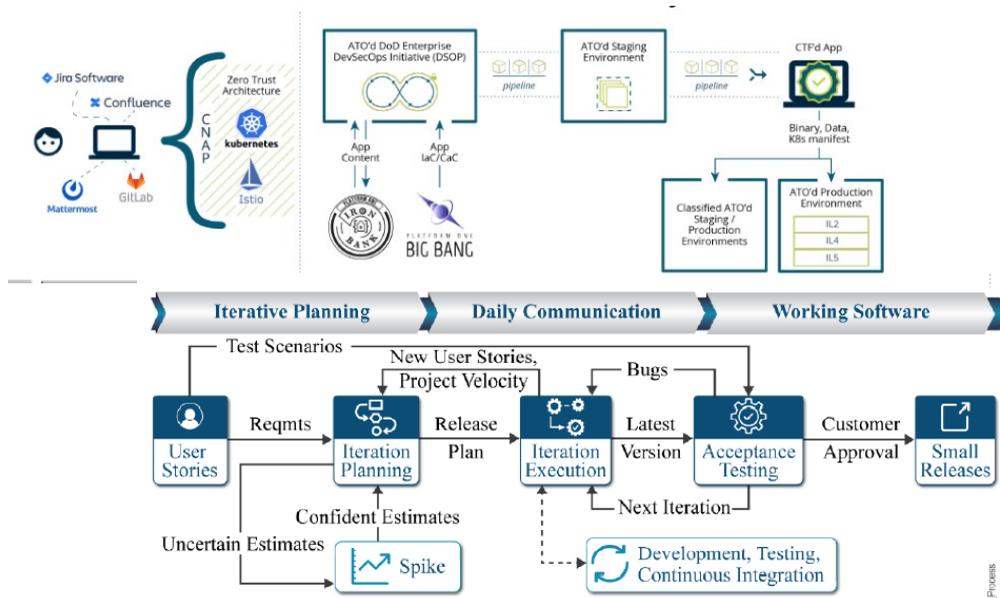
2025-2110 MHz Spectrum Management Coordination System

A part of the Advanced Wireless Services-3 auction, DoD will share spectrum operations in the 2025-2110 MHz band with the Electronic News Gathering service (composed of the Broadcast Auxiliary Service, the Cable Television Relay Service and the Local Television Transmission Service).

The Spectrum Management Coordination System provides an integrated system-of-systems that automates an end-to-end workflow for coordinating spectrum access between DoD system operations (e.g., tactical radio relay) and incumbent ENG operations. SMCS is a web-accessible system and is scalable to accommodate technology insertion into supported DoD systems (e.g., the application of dynamic spectrum access to enhance electromagnetic spectrum sharing).

Support to Modernize EMS Operations

DISA DSO is supporting DoD's efforts to modernize the EMS. These efforts will be enabled by cloud-based and artificial intelligence technologies to deliver capabilities and services that facilitate dynamic EMS access and maneuver. EMS modernization will deliver greater lethality, effectiveness and survivability of spectrum-dependent systems across all domains.

This implementation of agile EMS operations enhances the resiliency and effectiveness of the increasing number of DoD SDS operating in congested, contested and constrained electromagnetic environments. Agile EMS operations will leverage modernized, networked C3 systems and support EMS superiority, which in turn enables JADC2 operations.

Electromagnetic Spectrum Operations
Goal: Implement Agile Electromagnetic Spectrum Operations
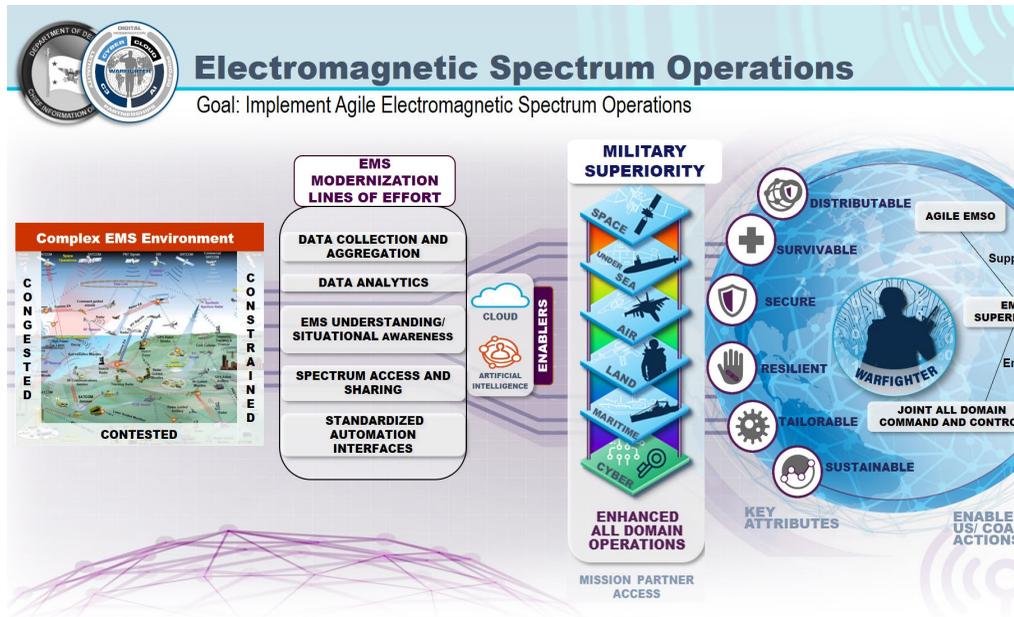
Defense Spectrum Organization Contact Information

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Resources

DISA Services Catalog
https://storefront.disa.mil/kinetic/disa/service-catalog#/category/spectrum