ENVIRONMENTAL DATA CUBE SUPPORT SYSTEM

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The Environmental Data Cube Support System (EDCSS) was conceived to reduce the barriers to using realistic environment representation in DoD Modeling and Simulation (M&S). In the past, simulations often utilized rudimentary statically declared environmental data and effects, which represented unrealistically benign conditions. While many of these simulations continue to be employed today, there is an increasing desire to couple simulations together in federations and improve their realism through physics-based performance models. To do so requires the use of consistent and realistic environmental data and effects. The EDCSS provides a response to this demand, offering access to authoritative source data for all four environmental domains (Atmosphere, Ocean, Terrain, and Space) in a flexible manner that allows for disparate simulation applications to consume a single environment representation via their own custom formats and/or protocols.

The EDCSS is not itself an environmental database or model; rather it leverages source data and modeling capabilities from authoritative DoD and NOAA sources. The primary emphasis for EDCSS is to utilize relevant historical scenarios as the basis of its environment representation, however EDCSS technology can be employed to process live forecast data and products as well. EDCSS offers the ability to query, browse, and access source databases for reuse but also provides a project-centric user work flow that promotes the declaration of specific product and environment scenario requirements to which EDCSS can recommend the most appropriate resource to be used. An OV-1 is provided as Figure 1 below. In this way, consumers remain focused on their own requirements and not the ever changing landscape of source data and modeling capabilities.

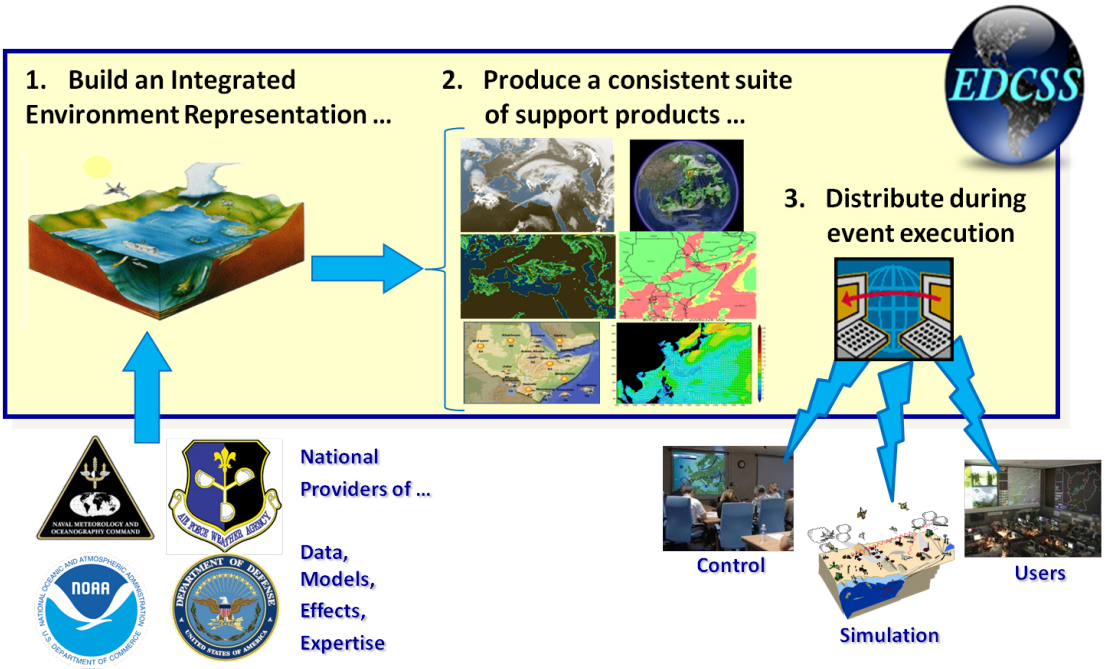

Figure 1:EDCSS Operational View (OV-1)

The EDCSS produces custom configured products in the form of Data, Effects/Impacts, Text, and Graphics. Data products include both standards-based formats and customer application-specific formats. Effects products capture the influence of the environment on specific military systems (e.g. sensors, vehicle performance, inter-visibility) and are provided in a novel multi-dimensional lookup table format referred to as a Hypercube. EDCSS also provides rule-based System Impact products that capture the nominal response of military systems to the underlying environment scenario. EDCSS Text products enable stimulation of operational Command and Control (C2) applications. EDCSS Graphic products provide customized views of the environment scenario and can range from simple graphics to simulated satellite imagery and radar products.

In addition to coordinating production of a consistent suite of end-user environment representation products, EDCSS also offers technology for the distribution and integration of those products. The EDCSS Distributor is a lightweight web application that can be readily deployed on simulation networks to provide a single access and control point for all environment representation products a community requires. The Distributor offers both a web interface for human interaction and web services for automated download from consuming applications. To facilitate efficient ingest of data and effects products into simulation applications, and to minimize duplication of effort across the community, the EDCSS provides a Runtime Integration Module (RIM) that exposes straightforward Java and C/C++ language API's for direct access to data and effects.

The EDCSS has been under development by Atmospheric and Environmental Research (AER) since 2007, with program management by the Modeling and Simulation Executive Agents (MSEAs) for Atmosphere and Space Natural Environment (ASNE), Ocean, and Terrain. Funding for EDCSS development has been provided by the Modeling and Simulation Steering Committee as well as the US Air Force and US Navy. Today the EDCSS is a mature technology (TRL 7) routinely employed for Combatant Commander (COCOM) Joint Training and Mission Rehearsal Exercises (MRXs), Air Force Combat Air Forces Distributed Mission Operations (CAF/DMO), Navy Fleet Synthetic Training (FST), and the OSD Planning and Analysis communities. In 2013, EDCSS technology was transitioned to operational use at the Air Force Weather Agency (AFWA) as well as the Naval Warfare Development Command (NWDC).

EDCSS software is delivered to the government open-source and requires no commercial or proprietary software or hardware. EDCSS does not own, and therefore does not re-distribute, the environment data and modeling resources it employs. The EDCSS is a service oriented architecture (SOA), exposing all of its core functionality as well-defined services that can be integrated into other DoD Enterprise Architectures. Full information and documentation, as well as access to the system, is provided at https://www.edcss.net.

For more information please contact:
Karl.Pfeiffer@aer.com