

FIEA

Advanced data sharing & systems interaction

In a push to improve the interoperability of the complex systems that support joint-service and multinational operations--the ability for these systems to interact and share data--the Department of Defense created the Department of Defense Architecture Framework (DoDAF). The framework uses an architecture data model and repository system to establish a common approach and backbone for DoD architecture description development, presentation, and integration.

The effectiveness of the framework, however, has been hampered by the lack of semantic definitions, a methodology, and software tools to support valid, interoperable views, products, and reusable artifacts among the DoD's operations processes. KBSI is designing, developing, and deploying a language, suite of tools, and methodology that enable true interoperability among the DoDAF's complex joint-service and multinational operations support systems and technologies.

Innovative systems interaction

KBSI's Framework for the Interoperability of Executable Architectures (FIEA) project is bridging the gaps among DoDAF capable tools for defining the artifacts and products of a DoDAF architecture and defining the mathematical model that supports their execution for down-stream analysis, validation, and verification. FIEA provides the language and tools to support model execution, ensuring that operations models are sufficiently detailed to allow verification, validation by the domain expert, and logical transformation into another architectural segment. FIEA also enables the management of executable models, ensuring that models yield measures of performance and effectiveness, including fault-tolerance, availability, and security, for the various attributes of mission-critical operations and systems.

The FIEA technology was developed by researchers from the Air Force Research Laboratory (AFRL), Electronic Systems Center (ESC), and KBSI, funded by an Air Force SBIR program. FIEA generates abstract executable models from basic enterprise architectures such as the DoD Architecture Framework (DoDAF) and the Federal Enterprise Architecture Framework (FEAF). These abstract models can be structurally derived from enterprise architectures to which executable content can be added. Once the model is encoded using an abstract executable model language, the Executable Architecture Representation Language (EARL), numerous downstream executions--e.g., simulation-based and quantitative analysis and service-oriented architecture



(SOA) deployment--can be generated automatically. This approach enables vendor-independent model reuse without the need to change the core enterprise architecture.

FIEA differs from other approaches that require modification of the core enterprise architecture meta-model: EARL supports the representation of executable content outside of the core enterprise architecture. The approach exploits the full potential of the core enterprise architecture: i.e., to emulate or simulate the system that is being modeled or to auto-generate code that automates an enterprise process. An example of the latter is the generation of Service Oriented Architecture (SOA)-based Web Services -- Business Process Execution Language (WS-BPEL) or Web Services Choreography Description Language (WS-CDL).

FIEA's ability to develop executable architectures from enterprise architecture models is effective for a number of reasons: models can be inspected at various levels to ensure correctness; models can be reused to generate different types of executions; and the traceability of results along multiple levels of abstraction provides for better documentation of results and better visibility into simulation results against requirements comparisons.

The FIEA-based executable architecture language support, translators, and execution support tools have been integrated into KBSI's ModelMosaic® modeling suite. Ongoing and planned FIEA technology transition activities include installation at the AFRL/Ryt nucleus lab, use in layered sensing architecture modeling verification and validation, and missile defense planning interoperability demonstrations with the Missile Defense Agency.

