



# IMAGE

Integration Modeling with Adaptively Generated Entities



### Summary

- Legacy software reuse (Extended Air Defense Testbed)
- Government owned, no proprietary software
- Highly configurable modular entities with flexible decision making rulesets
- High fidelity communications modeling with high-fidelity ruleset based response
- Rulesets and configurable communications allow modeling of military and civilian C3
- Provides a "Look Forward" capability for the warfighter

**IMAGE performs sophisticated modeling of the interaction of complex system-to-system C3 architectures, including military, civilian, and coalition C3 systems.**

IMAGE is a wholly government owned comprehensive Modeling & Simulation environment. IMAGE focuses on detailed modeling of system component integration and system-to-system interoperability. It provides unique tools for simulating whether C3, Surveillance and Response system components are effectively integrated to perform standard and emergency missions. IMAGE's capability to model diverse and complex interacting components and interacting systems is driven by its flexible ruleset capability and its high fidelity communications modeling capability. This unique design enables IMAGE to model any C3 architecture including Air and Missile Defense – National and European deployment, Coalition contingency operations, Homeland Defense border operations, and Homeland Defense disaster response operations.

IMAGE is an event-stepped, repeatable, constructive simulation that operates in real-time, non-real-time, interactive, batch, or federated mode as required for each particular analysis. IMAGE is derived from the Missile Defense Agency's (MDA) Extended Air Defense Testbed (EADTB). EADTB is a high-detail, flexible, and validated simulation of national and theater air and missile defense that was developed for MDA under contract to the Space and Missile Defense Command (SMDC). EADTB was chosen as the parent model of IMAGE because of its fidelity and flexibility in modeling C3. This fidelity and flexibility is essential for providing an M&S capability that realistically simulates the interaction of components within a system (for example, the interaction of sensors with the communications and command systems) and simulates the interaction in an architecture of diverse systems; for example, military interacting with civilian, single service interacting with joint services, or single nation force interacting with multi-national coalition forces. IMAGE's capability to model diverse and complex interacting components and interacting systems is driven by its flexible ruleset capability and its high fidelity communications modeling capability. This unique design enables IMAGE to model any C3 architecture including Air and Missile Defense – National and European deployment, Coalition contingency operations, Homeland Defense border operations, and Homeland Defense disaster response operations.

IMAGE is unique among M&S because of its ability to model perception data (as opposed to modified truth data) and its ability to model not only the communications between components and between systems, but also the response of the Command and Control (C2) to the communications messages.

Real world C2 relies on information that is often inaccurate, incomplete, or delayed. Furthermore, the available data upon which decisions are based may vary among different C2 sites, giving rise to conflicting decisions. In addition, these C2 sites must rely on communication networks for the transmission and reception of information that they need in order to respond effectively. Limited bandwidth and

high loads for these communications networks can introduce significant delays for the flow of information among decision-making entities. This accumulation of information errors, discrepancies and staleness significantly contributes to what has been described as the fog of war.

To make meaningful simulation assessments of C2 processes, whether military (the warfighter) or civilian, the fog of war must be modeled accurately because it is a key attribute of the decision-making environment. This means that the data being used to support decisions at each site must be explicitly modeled, as well as the characteristics of the networks used for distribution of decisions that are made and data that are sent. Once these data and their distribution are modeled, the decision logic that operates on these data must also be accurately represented.

IMAGE has unique features that make it particularly suitable for C3 analyses including modular entities, high fidelity communications modeling, and flexible decision making rulesets defined through a special, interpreted, ruleset language. IMAGE modeling algorithms are general-purpose and configured by input data. The performance of simulated entities is data-driven, and the experiment logic used by each simulated entity is driven by flexibly definable rulesets.



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