# Engineering Software Suite Validates System Design

Originating Technology/NASA Contribution

Design errors are costly. When it comes to creating complex systems for aerospace design and testing system readiness, engineering system requirements must be clearly defined, and these systems need to be tested to ensure accuracy, consistency, and safety. Testing a system, however, can require as much as 50 to 70 percent of the total design cycle time. The ability to identify potential problems early in the design cycle saves time and expense, while still ensuring safe and reliable systems. This type of research is of interest not only to the NASA Ames Research Center's Robust Software Engineering group, but to government agencies and industry, any sectors which build critical, expensive systems, such as control software for an aircraft or the U.S. Ballistic Missile Defense System's command and control system.

Partnership

To date, more than $6.5 million of government funding has been dedicated to the development of EDAptive Computing Inc.'s (ECI) EDAstar engineering software tool suite. NASA's Ames Research Center provided a significant share of this funding, through a total of five **Small Business Innovation Research (SBIR)** contracts (three Phase I contracts and two Phase II contracts). This backing from Ames allowed the Centerville, Ohio-based company to generate critical components of the software tool suite, namely Syscape and VectorGen.

Syscape is a platform-portable, customizable system design editor that utilizes a hierarchical block diagram structure, multiple design views, and user-defined plug-ins to capture executable specifications of multidisciplinary systems. These executable specifications can be used to analyze concepts and requirements; balance risk and performance trade-offs among the various subsystems; develop system and subsystem specifications;
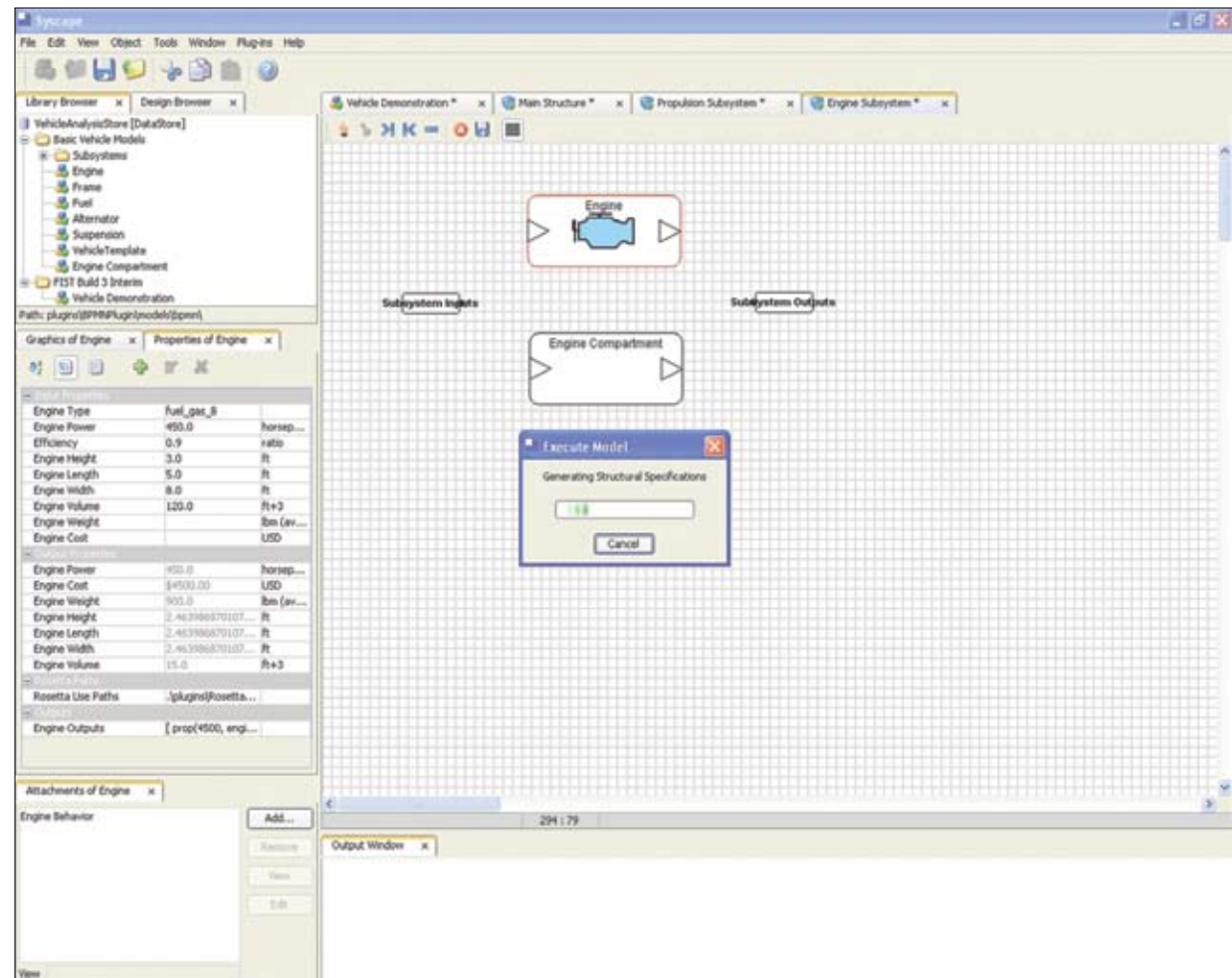
With graphical editing tools, EDAstar-based solutions can be used to rapidly create high-level, high-confidence design concepts.

and apply formal, mathematically rigorous techniques to ensure safety, accuracy, and consistency. Once created, executable specifications can be used in conjunction with VectorGen to automatically generate tests to ensure system implementations meet specifications. According to the company, the VectorGen tests considerably reduce the time and effort required to validate implementation of components, thereby ensuring their safe and reliable operation.

The multiagency SBIR support has further allowed the company to expand operations from 5 core employees in 2000 to 15 employees in 2007. Additionally, in 2004,

EDAptive Computing received a $45,000 commercialization assistance award from the NASA Glenn Garrett Morgan Commercialization Initiative to support marketing, planning, and awareness efforts in the defense and aerospace industries.

Product Outcome

EDAstar is ECI's unique solution to completely capture and validate system design requirements. With graphical editing tools, EDAstar-based solutions can be used to rapidly create high-level, high-confidence design concepts with automatically generated tests in a fraction of the time needed by current methods. Further, EDAstar can be used for simulating requirements, assessing risks, and checking their consistency and correctness before expensive mistakes are made in system design and development.

In addition, EDAstar-generated tests, monitoring, and assertions can be used to verify and validate a design or implementation against its specification. EDAstar complements and bridges gaps in existing commercial-off-the-shelf (COTS) tool-based design flows, fitting in the design flow between tools to capture requirements and tools to create detailed specifications and design. Furthermore, EDAstar tools and models can be used as the framework and semantic glue, respectively, for integrating multidisciplinary models, tools, and methods for modeling and simulating a multidisciplinary system of systems.

EDAshield, an additional product offering from ECI, can be used to diagnose, predict, and correct errors after a system has been deployed using EDAstar-created models. EDAshield is a collection of methods and reusable software and hardware assets for system security and can be used to assure trustworthiness, as well as generate anti-tamper logic to protect hardware and software against reverse engineering.

Initial commercialization for the EDAstar product included application by a large prime contractor in a
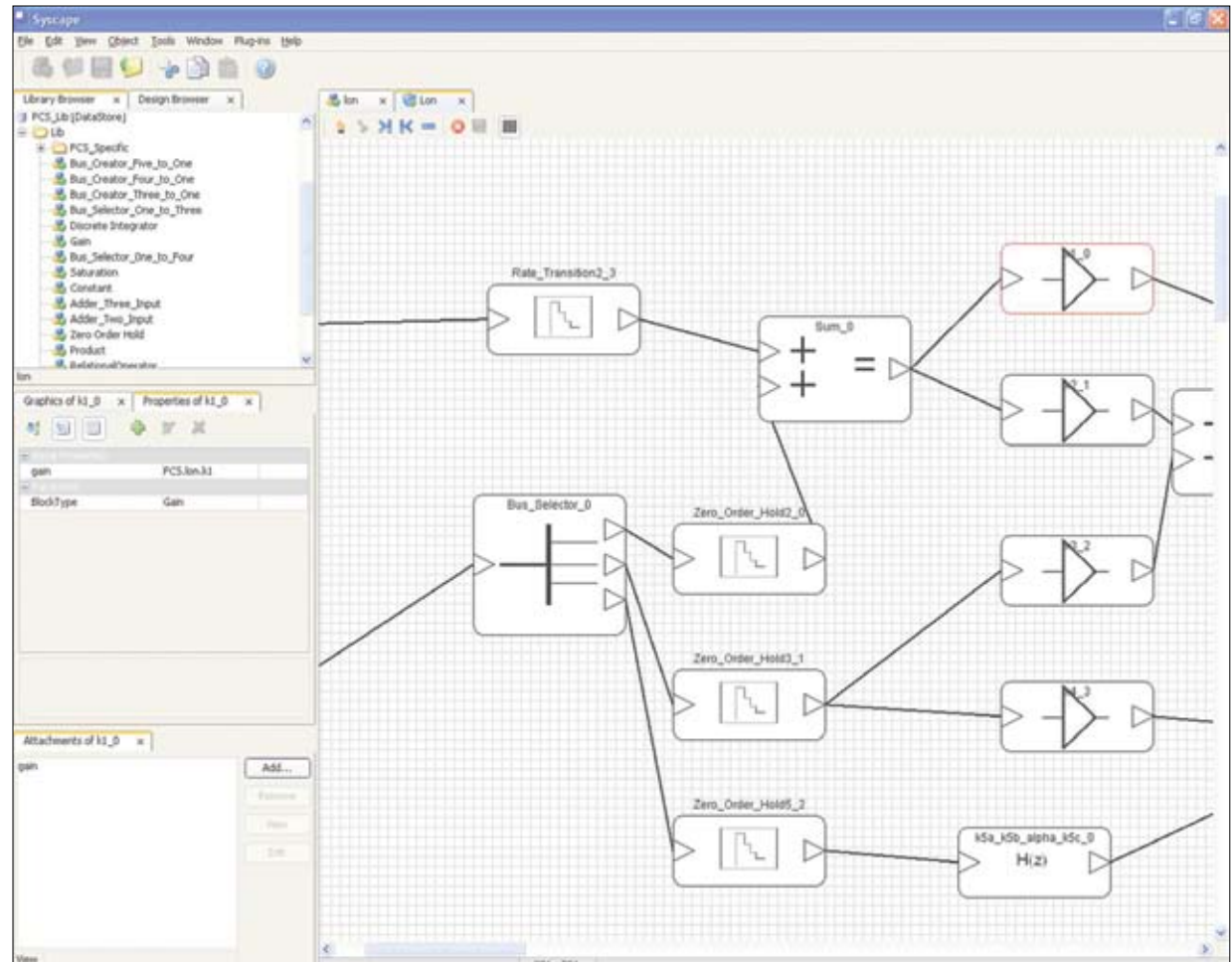
EDAstar can be used for simulating requirements, assessing risks, and checking their consistency and correctness before expensive mistakes are made in the system design and development.

military setting, plus the award of a 5-year U.S. Naval Air Systems Command delivery order contract with a ceiling of over $45 million, entitled "Competent/COTS Upgrade Recertification Environment." Customers include various branches within the U.S. Department of Defense, industry giants like the Lockheed Martin Corporation, Science Applications International Corporation, and Ball Aerospace and Technologies Corporation, as well as NASA's Langley and Glenn Research Centers. ❖

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