

SDI office awards simulation facility contract

Galen Gruman, Assistant Editor

The Defense Dept.'s Strategic Defense Initiative Organization and Air Force Electronic Systems Division have awarded a five-year, \$508-million contract to Martin Marietta Information Systems to develop a central simulation facility to test and develop software and system architectures for "Star Wars" battle management, command, control, and communications. The facility would also be used to evaluate whether implementing new weapons technologies was worth the cost.

The testbed will eventually "consist of high-fidelity versions of all elements and thus will closely emulate [any implemented strategic defense] system," according to a January SDI Organization report on the testbed's capabilities.

While the contract is for five years, the focus is on the first two years, said Lt. Col. Zke Zimmerman, deputy program manager of the SDI Organization's National Testbed Joint Program Office. The results from the first two years will determine development directions for the following years, he said.

Diverse tools. The initial focus will be on creating a software-development environment, Zimmerman said. The testbed program will most likely use off-the-shelf programs for the simulation environment, support tools, and operating system, he said. It would reuse or adapt existing Defense Dept. code for threat-assessment and other military needs whenever possible, Zimmerman said. Original software would be developed for SDI-specific applications, such as modeling proposed weapons and attack scenarios, he said.

The testbed contract requires that all new software be written in Ada unless the mission requirements dictate the use of another language, Zimmerman said. However, most of the code expected to be taken from earlier SDI projects and other military efforts is in Fortran, he said, so the simulation environment must let Ada and Fortran applications exchange data and interact easily.

Martin Marietta will tackle that need for interface standards in the contract's early phases, Zimmerman said, so off-the-shelf, adapted, and custom software "can be tied together to mesh for simulation." Portability will be an important criterion in software selection because "we want to minimize recoding," he said.

The overall development model "will use a methodology off the shelf" from Mitre Corp., the SDI Organization's systems engineering contractor, Zimmerman said. Development models for specific applications will be decided on a project-by-project basis, he said. "It is evolutionary development," Zimmerman said.

No hardware has been chosen for a final configuration, Zimmerman said. Initial efforts will use at least one Cray supercomputer and mainframes from Digital Equipment Corp., ELXSI Corp., and IBM, he said.

While new software must be written in Ada, much of the testbed code will be taken from earlier projects, most of which used Fortran. This requires a simulation environment with standard interfaces.

Once the simulation environment is developed, the testbed project will develop a prototyping center that will include man-in-the-loop simulations on various architectures to add unpredictability to test scenarios and to test how well the architecture handles human factors, Zimmerman said. These simulations will include blue teams and red teams, people taking on US and Soviet roles against each other.

Distributed effort. The testbed project includes development of a distributed network to link development sites

throughout the nation. Existing military networks, such as ARPAnet, have both insufficient security and bandwidth, Zimmerman said. Near-term goals are to work with eight remote development sites and eventually add hundreds of off-site developers to the network, he said.

The eight facilities expected to be online first are the SDI headquarters in Washington, D.C., Army Advanced Research Center in Huntsville, Ala., Naval Research Lab in Washington, D.C., Air Force Space Division in Los Angeles, Air Force Space Technology Center in Albuquerque, N.M., Air Force Electronic Systems Division at Hanscom Air Force Base, Mass., Los Alamos National Lab in Los Alamos, N.M., and Lawrence Livermore National Lab in Livermore, Calif.

Evaluation. The project will use existing Defense Dept. verification and validation practices rather than invent new ones, Zimmerman said. But it will also be advised by a 12-member group of scientists, called the Simulation Engineering Panel. Liaison officers will also consult with groups like the Software Engineering Institute, he said.

The advisory scientists are very involved in project specifics, Zimmerman said, and helped create the testbed requirements and review the contractor proposals. They will also help validate the simulation configurations developed, he said. "They will be the first group to evaluate and [have] input on development," Zimmerman said. "The technology basis [for such large-scale simulation] is not necessarily well-established," said the panel's chairman, James Brown, a computer-science professor at the University of Texas at Austin and chief scientist at Information Research Associates. Brown is known for his work on operating systems, performance evaluation, parallel processing, and supercomputing.

Other panel members are Paul Reynolds of the University of Virginia, an

expert in distributed systems; Victor Peterson of the NASA Ames Research Center simulation facility; Dean Pappas of the military's Moore College, an expert on military simulation; Don Good of Computation Logic, an expert in security assurance; Chris Hendrickson of the Lawrence Livermore National Lab, an expert in large coding problems; Walter Kohler of the University of Massachusetts, an expert in distributed simulation; Raymond Pollock of Schaefer Associates, an expert in physics simulation; Robert Seldon of the Los Alamos National Lab; Charles Vick of Optimization Technologies; and Jack Wolton, a private consultant and former researcher at the Los Alamos National Lab.

"Our job is to see that the very best technology is applied," Brown said. To do that, the panel will do more than react to inquiries from the testbed program office, he said. As the panel's involvement progresses, "we will recognize things that need to be done," Brown said. One key area the panel has already targeted for advice is the immature field of creating large-scale distributed systems that use man-in-the-loop simulations, simulated components, and real components, he said.

While acknowledging that a simula-

tion is never the same as the real thing, Brown said that even a failure would be valuable because it would prevent the development and deployment of an unworkable system. "If you can't make the simulation work, you can't make the real thing work," he said.

Technology transfer. "I view [the national testbed] as an opportunity to build a technology base for the design of large-scale distributed systems," Brown said. "It is like a CAD system for very, very large systems," he said.

Although the testbed is a military project, it might develop the basic technology needed for large-scale distributed systems everywhere.

Although the testbed is a military project, Brown said he believes it can lay the basis for large-scale distributed systems everywhere. While the testbed program was never intended to develop large-scale simulation capabilities for the world at large, it can nonetheless do so because "there is nothing [militarily] sensitive" about the underlying technology, Brown said.

Nonmilitary applications include

modeling the global economy, planning lunar bases, and designing large factories, Brown said. "NASA probably needs this [technology] as much or more than SDI," he said.

The testbed is Brown's only involvement in SDI research, and he said, "I don't want to know anything sensitive. . . . [The testbed] is a good technical job."

Costs. The testbed's total cost through 1992 is expected to be between \$750 million and \$1 billion, according to a Defense Dept. statement. Zimmerman said he thought \$1 billion was sufficient to "establish a baseline of a user facility" in the next five years.

The National Testbed project will be based at Falcon Air Force Station near Colorado Springs, Colo. The contract to Martin Marietta, awarded Jan. 22, includes subcontracts to Carnegie Mellon University, Computer Technology Associates, Ferranti, Geo Dynamics, Hughes Aircraft, IBM, Logicon, Nichols Research Group, and Ralph M. Parson Co., according to a Defense Dept. statement.

The Colorado facility will employ about 1500 people over the next five years, it said. When the five-year contract expires, the joint program office will decide whether the simulation facility is complete and whether to select another contractor to run the facility, Zimmerman said.