

Providing Scalable Simulations, Environments and Data Structures for Theatre of War Analysis and Training

There are growing imperatives for realistic, valid, and insightful distributed simulations using global-scale, high-resolution battlespace environments. These can be well served by advances in cluster computing and high performance networks, but only if appropriate communications strategies enable scalability and fault-tolerance. The authors set forth their experiences and solutions derived during two decades working on parallel supercomputers and trans-continental meta-computers. Speaking primarily from their recent experiences with U.S. Joint Forces Command's JSAF simulations, they will cover lessons learned, innovations, data management techniques, and future development goals. Starting with projects in the early '90s, the ISI/Caltech team has enabled scalability in the SAF family of entity-level simulations. This scalability typically delivered one to two orders of magnitude increases in simulated entity count, easily fielding 1,000,000 SAF entities in one simulation. They will discuss data management issues, user-interface constraints, fault-tolerance improvements, and code portability questions. Tested approaches and available applications will be identified.

Presentation/paper would be prepared by Dan Davis, Robert Lucas, Garth Baer and Tom Gottschalk. They have a long history in distributed, large-scale, high performance computing (see a group of germane papers at http://www.isi.edu/~ddavis/JESPP/JESPP_Papers.html) with a putatively unparalleled series of successes in very large-scale, entity-level simulations. The authors know of no other group conducting SAF simulations at anywhere near this scale, but they have been approached by several other commands who require such scale. The authors represent the following academic institutions and positions: Dan M. Davis is the Director of the JESPP Project at Information Sciences Institute/University of Southern California; Robert F. Lucas is the Division Director of Scalable Computing at ISI/USC; Garth D. Baer is a Graduate Student studying International Law at the George Washington University; and Thomas D. Gottschalk is a Senior Research Scientist, Member of the Professional Staff and a Lecturer in Physics at the California Institute of Technology (Caltech). The presentation itself would probably be presented by a team made up of Davis and Baer, with the Doctors Lucas and Gottschalk in attendance. With the exception of Mr. Baer, they all have doctoral degrees, and he is in the process of getting his. Their presentations at IITSEC in Orlando, Florida have twice been chosen as Continuing Education Units for Modeling and Simulation Professional certification. The complete thrust of this work has been a stable, extensible and productive simulation environment. It has not been the advancement of arcane and abstruse academic concepts.

Providing Scalable Simulations, Environments and Data Structures for Theater of War Analysis and Training. - - The authors will show examples of the modified JSAF code running remotely at the Maui High Performance Computing Center and demonstrate the scalability that is designed into the architecture. They will discuss the needs that drove the development of an environment of that scale, the

performance of alternative architectures, the resultant flood of information, the approaches taken to manage that data, and continuing issues being addressed.

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