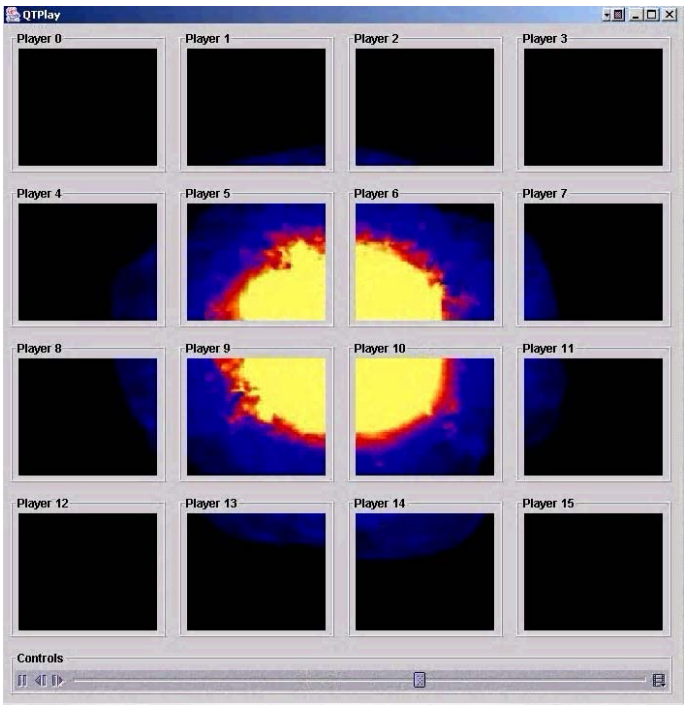
OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY
FACT SHEET

Agent- Based Common Operational Picture

Hundreds of Software Agents analyzing supernova simulation results

Scientists who use simulation models to better understand physical phenomena commonly deal with massive datasets. The output of such a simulation can often be terabytes in size, can be widely distributed, and may require months of supercomputing time to produce. Bringing these simulation models and algorithms to maturity requires significant iteration where the scientist must modify an algorithm, and then validate the resulting output. Typically, once a candidate dataset is produced, a scientist either examines the data in raw form or invests considerable time and effort to analyze the data using highly specialized hardware and software tools. Clearly, viewing the data in raw form is very time consuming and prone to errors. On the other hand, high-end systems and tools are typically expensive and difficult to maintain, and are therefore unsuitable for use during the development process of simulation models. Neither of these solutions is desirable, prompting the need for a simple and flexible analysis system for scientists to use during the development of simulation algorithms.



We have shown that a large system of distributed software agents spread across a massive and distributed dataset is a simple and flexible way to help a scientist to validate simulation output and thereby improve the simulation algorithm. We have conducted an experiment where 100 time steps of data from a supernova simulation are segmented into 800 individual pieces, managed by 800 agents, running on conventional systems. We have developed a system where a single software agent is responsible for each individual segment of data. Upon request, these 800 agents work together to produce a visual representation of the dataset which the scientist can use to validate the simulation model output. Our results illustrate that a large system of software agents is a simple and flexible solution to the problem of data validation during the development of scientific simulation models. In work with numerous scientists at various laboratories and universities, we have been successfully using this approach to render data from a supernova simulation.

This concepts works for science, but is also directly applicable to military common operational pictures.

POC: Thomas E. Potok, Ph.D.
Oak Ridge National Laboratory
P.O. Box 2008, Oak Ridge, TN 37831-6415
Phone/Email: 865-574-0834/potokte@ornl.gov