

**Title of Project:** Converting non-parallel discrete-event simulators in massively parallel ones

**Project Number:** 82

**University Project Leaders/Departments:** Prof. Krys Pawlikowski  
CSSE

### **Brief outline of project**

---

Our Simulation Research Group [1], with members from the Department of Computer Science and Software Engineering and the Department of Management, has been involved in ongoing research activities aimed at developing techniques and methodologies for automated discrete-event computer simulation, suitable for quickly and reliably carrying out performance evaluation studies of complex dynamic systems, such as for example the Internet. Such scientific computing typically can require processing of enormous amounts of data collected during simulations, so its success depends on employment of the distributed computing power of networked computers. Our research group has proposed a powerful scenario for conducting efficient and fast quantitative simulation studies, known as Multiple Replications in Parallel (MRIP). In this scenario, multiple instances of an ordinary serial simulation program are run on different processors but co-operate together in producing reliable final results. Such distributed processing can be automatically initiated and then fully controlled by AKAROA2<sup>1</sup>, our unique controller of distributed MRIP simulations. The first version of Akaroa2 can work on arbitrary number of computers of a local area network. For example, we are able to run simulation experiments on all, about 250, workstations of our departmental computer laboratory. One of our current research goals is at allowing AKAROA2 to control even larger computing systems. Recently, as the outcome of research activities within PlanetLab NZ project [2], we have successfully deployed Akaroa2 on computers of PlanetLab, a global experimental network that links over 1000 computers in over 500 research centres around the world.

While Akaroa2 offers full support in running simulation experiments, it is not equipped with a software library that could be used for writing simulation programs. Users can either write such programs by themselves, or use specialized simulation packages. For example, for studying performance of the Internet and other multimedia telecommunication networks, we write our simulation programs with a help of such packages as OPNET, OMNET++ or NS2. The aim of this project would be to develop an interface between Akaroa2 and one or more of the existing simulation modelling packages. The final results of this research project are expected to be reported in a paper submitted for an international conference and/or a journal.

### **Specific student requirements:**

---

Please indicate below any specific academic requirements you have for the summer scholarship student (e.g., specific level; specific courses, or equivalents, completed)

A student should have good programming skills (preferably in C or C++). Some knowledge of networking would be helpful.

### **Special condition:**

n/a

---