

DIRECTOR: PROFESSOR PETER MORA



THE UNIVERSITY OF QUEENSLAND

Brisbane Qld 4072 Australia
Telephone (07) 3365 7418
International +61 7 3365 7418
Facsimile (07) 3365 7347
Email admin@esscc.uq.edu.au
Internet <http://www.esscc.uq.edu.au>

March 3rd, 2005

Professor Geoffrey Fox
Community Grids Lab
501 N. Morton St.
Bloomington, IN 47404
USA

Re: Support for iSERVO proposal

Dear Professor Fox,

I am delighted to provide my strongest possible support for your proposal, “*Earthquakes, Tsunamis, and the International Solid Earth Research Virtual Observatory (iSERVO)*”, which is being submitted to the US National Science Foundation’s *Partnerships for International Research and Education* program (<http://www.nsf.gov/pubs/2005/nsf05533/nsf05533.pdf>). This effort – based on large scale international collaboration that incorporates computational simulation and analysis, land and space-based observations, and utilizing web technologies – is of utmost importance. It represents a forefront research program addressing issues of global societal impact, especially in regards to the earthquake and tsunami hazards, and is of particular interest to us.

In Australia and internationally, there has been increasing recognition that supercomputer simulation of solid earth processes offers a predictive capability for complex phenomena such as earthquakes that could lead to breakthroughs in forecasting of catastrophic events and their effects such as the recent destructive tsunami. As such, solid earth simulation represents a key global priority which will provide the required underpinning for more effective disaster mitigation and policy development. When the overall simulation effort comes to fruition, it will be possible to take steps that dramatically reduce human losses and suffering associated with earthquake disasters.

Furthermore, experience such as that which we obtained in the successful and longstanding ACES international cooperation has proven that research is far more effective if countries cooperate for a common good. This allows us to lever from one another's advances and undertake research collaboration including joint development of simulation models and infrastructure, and to implement more effective data sharing arrangements. International

collaboration minimises wasteful duplication of effort and dramatically improves our ability to advance towards the common goal. The solid earth simulation problem is too large, too complex and involves too many aspects for any one group or country to solve, and we each have unique contributions to make. For this reason, it has become increasingly clear that by effective international cooperation, we will ultimately solve this critical global problem, a fact that has become widely recognised by the international community.

Our commitment to the iSERVO effort will include

- **Establishment of an Australian iSERVO node**

We aim to establish of an Australian iSERVO node. This would build on Australia's \$AUS 15M commitment to construct the Australian Solid Earth Systems Simulator Major National Research Facility (ACcESS MNRf), and the research programs of my centre, Earth Systems Science Computational Centre which span computational geodynamics, computational earthquake science, and computational technologies.

- **Collaborative work on the iSERVO framework**

We would work with you towards development of the iSERVO cyber-infrastructure framework compatible with our national infrastructure, and particularly the ACcESS MNRf. For example, as part of the ACcESS MNRf initiative, we are developing a new scripting language for geo-science simulations called *Escript*. This language enables researchers to define simulations at a high level such as partial differential equations or particle simulation model parameters, and for these to be mapped onto a parallel computer. This has the effect of providing broader access to the geoscience research community to large scale computations and the extraordinary opportunity this offers to probe fundamental research questions. The scripting system, *Escript*, makes use of a parallel finite element library (Finley) and the LSMearth particle simulation model that were developed in Australia among others.

We would actively, as a user as well as provider, contribute to iSERVO data and computational Grid. In particular we would support the implementation and, where needed, the development of data exchange protocols (such as GML) and we would make an effort to make our software infrastructure compatible with these standards.

Our commitment to iSERVO would also include working with you to build a common iSERVO framework incorporating the software and simulation tools being developed under the ACcESS MNRf such as mentioned above.

- **Participate in collaborative geoscience research**

We would participate in collaborative computational solid earth systems science research with the US iSERVO group. We are particularly interested in collaborating on simulation based research aimed at improved understanding of the physics of earthquake generation and interacting fault systems, the tsunami generation process to improve accuracy of tsunami simulations with the goal of providing critical input into next generation real time tsunami warning systems, and plate-mantle scale geodynamics aimed at better understanding the way the tectonic plates interact with the dynamics of the planet, including the effect of how melting and formation/destruction of the crust influence the global scale.

- **Participation in teaching curricula**

We would participate in developing new teaching curricula together with the iSERVO group, particularly on computational solid earth systems science, and we would be interested in using such new curricula. Presently we are developing new 2nd and 3rd year undergraduate subjects on computational geodynamics and computational seismology and we would be delighted if these provided useful input into the iSERVO curricula effort.

- **Participate in visiting scholars program**

Experience has shown that while creation of the cyber infrastructure is critical for ongoing collaborations, so too is personal contact and interactions. As such, we would participate very actively in a visiting scholars program through exchange of students and scientists between our universities.

- **Participate in workshops and meetings**

- **Contribute software and computer cycles**

The \$AUS 15M ACcESS Major National Research Facility initiative involves construction of new simulation models, parallel software including a high level scripting system, and parallel supercomputer hardware to enable geoscience simulations from the micro to global scale. We would be happy to contribute – for collaborative research within the iSERVO group – access to this software and parallel hardware. We would also be able to facilitate access to Australian databases for research purposes.

I am wishing you success in your iSERVO proposal and hope that the NSF will see the vast benefits of funding your proposal.

For your information, the Australian government has allocated an additional \$AUS 540M for its national research facilities program starting in 2006. We aim to develop a proposal for major funding support of order \$20M to establish the Australian iSERVO node through the national facilities funding mechanism combined with State government support from their \$100M research infrastructure fund.

I am looking forward to working with you on the iSERVO project.

Sincerely,



Professor Peter Mora
Director, Earth Systems Science Computational Centre (ESSCC)
Executive Director, APEC Cooperation for Earthquake Simulation (ACES)
Deputy CEO and Chair, Science Committee, Australian Computational Earth Systems Simulator
Major National Research Facility (ACcESS MNRF)