

Contact: Andrea Anania

IOWA STATE UNIVERSITY EQUIPMENT PURCHASE

Action Requested: Consider approval for Iowa State University to purchase a High Performance Computing Cluster for approximately \$1,373,022 (final amount subject to configuration changes.)

Executive Summary: Equipment purchases at the Regent institutions costing more than \$1 million are required by Board policy to be approved by the Board of Regents.

Description of the Equipment

The High Performance Computing Cluster consists of over 160 sixteen-core servers (nodes) using the latest Intel processors. These nodes will allow ISU researchers to solve a problem which will require the use of 2560 CPUs at the same time, 10 Terabytes of main memory, 480 Terabytes of local scratch disk and 1024 Terabytes of shared disk space.

The cluster will have one large memory server for bioinformatics programs which currently must stay within a single server. This single server will have 32 cores of the latest Intel processor, 1 Terabyte of main memory, 4 Terabytes of local scratch space, and will have access to the 1024 Terabytes of shared disk space.

For very CPU-intensive programs the cluster contains 32 servers, each with two accelerator cards, either the newest Nvidia K20 GPU or the Intel MIC/Phi coprocessor. Each of these accelerator cards has a peak speed of just over 1024 GigaFlops, giving these 32 servers an aggregate peak CPU speed of over 64 Teraflops.

Justification of the Need for the Equipment

Iowa State University (ISU) received a major research equipment grant from the National Science Foundation. The purpose of this grant is to acquire a large high performance computation (HPC) platform.

The University reports that:

- ▶ The HPC platform will:
 - ◆ Support the NSF-funded research of 17 investigators from 8 departments, which will be made available to other ISU users;
 - ◆ Provide state-of-the-art training opportunities for students. Proposed research involves a mix of algorithm development for parallel architectures and computational modeling, while pursuing compelling applications in biological, material, energy and climate sciences;
 - ◆ Accelerate knowledge discovery;
 - ◆ Provide external visibility;
 - ◆ Help solve problems of national need and societal benefit in four broad research areas plus other application areas, including reverse engineering of crystal structures and network flow approaches to optimize power generated from distributed wind turbines; and
 - ◆ Support efforts in Biosciences and ISU's bioinformatics graduate program, multi-scale methods for grand challenge problems, computational fluid dynamics modeling, and coupled dynamics of land use change and regional climate extremes.

- ▶ All advances in computational algorithms made possible by the HPC cluster will be made available to the broader research community in the form of open-source codes. Simulations made possible by these algorithms will have broad national and societal impact ranging from climate change scenarios to wind power generation to plant biotechnology and improved animal breeding.
- ▶ The proposed HPC cluster will greatly enrich ISU's research infrastructure. Use of the HPC cluster will be incorporated into advanced courses and time will be allocated to train undergraduates, graduate students, and postdoctoral fellows in computational modeling and algorithm development.

Any Known Alternatives to the Equipment Proposed

A formal Request for Proposal process incorporating detailed functional specifications was completed, and bid invitations were sent to 14 HPC providers. Out of the ten responses received, Atipa Technologies was chosen because it met the RFP's technical requirements, scored the highest based on ISU's evaluation criteria, and was the lowest cost response.

Estimated Cost and Source of Funding

The cost of the High Performance Computing Cluster as bid is \$1,373,022, but the final cost is subject to configuration changes by ISU. This price includes the necessary hardware, software, installation, training, two-year warranty, and support. The source of funding is a National Science Foundation grant.

Board Policy: Chapter 7.06B(12) of the Regents Policy Manual requires that:

- ◆ Equipment costing more than \$1,000,000 must be submitted to the Board for approval; and
- ◆ Requests submitted to the Board Office for approval must include the following information:
 - ◆ Description of the equipment;
 - ◆ Justification of the need for the equipment;
 - ◆ Any known alternatives to the equipment proposed; and
 - ◆ Estimated cost and source of funding.