

Contact: Pam Elliott Cain

IOWA STATE UNIVERSITY – EQUIPMENT PURCHASE

Action Requested: Consider ratification of an IBM BlueGene/L (a unique proprietary parallel supercomputer) at the cost of \$1.25 million.

Executive Summary:

Iowa State University reported that the purchase of this supercomputer equipment was critical to the University's research in plant genomics and systems biology. Iowa State University requested the Executive Director to approve the emergency purchase of this equipment, which was completed as of December 8, 2005.

Board Policy allows the Executive Director to approve emergency purchases which exceed \$1,000,000 to be followed by Board ratification. Emergency purchases are defined as purchases that are critical to sustaining patient care or human life, maintaining critical research equipment, or similar instances.

ISU was included as a member of a special group of potential purchasers called first movers that would receive a price incentive to commit to purchase early. To preserve the price of \$1.25 million, ISU had to place the order with IBM by December 16, 2005, with delivery scheduled by December 30, 2005. After that date, the price will go up to \$1.9 million, an increase of \$650,000.

Faculty members involved have been working with the National Science Foundation and other federal agencies to secure the funding. ISU would not have had funding to handle the significant increase in cost caused by a delay in purchasing.

Description of Equipment

This purchase will create a supercomputing facility consisting of a 1024-node BlueGene/L supercomputer (2048 processors, 512GB main memory, 5.7 teraflops peak), front end and service nodes, and 11 terabytes of disk storage. This equipment was chosen after evaluation of the needs of an NSF funded Major Research Instrumentation project for research in plant genomics and systems biology, the needs of Iowa State University researchers in the NSF/USDA/DOE maize genome sequencing project, and the need for providing a leading-edge high performance computing platform to Iowa State University researchers.

Justification of Need for the Equipment

Iowa State University researchers need leading edge high performance computing resources to be at the forefront of science and technology research.

1. The National Science Foundation awarded a Major Research Instrumentation grant to Iowa State University researchers to procure a parallel supercomputer for research projects in plant genomics and systems biology.
2. Iowa State University researchers are part of a consortium selected to sequence the maize genome in a major national effort led by the NSF, USDA and DOE agencies. The researchers need a high-performance parallel computer to assemble the maize genome. In addition, IBM is providing access to their 20,384 processor BlueGene/L system at T.J. Watson Research Center. Having a smaller system at Iowa State University will tremendously help this research.
3. Members of the Laurence H. Baker Center for Bioinformatics and Biological Statistics at ISU need high performance parallel computers for sustaining their leadership role in bioinformatics research.

4. High performance computing is identified as a critical need by the Plant Sciences Institute advisory board and plant sciences researchers, especially those in plant genomics. Plant Sciences faculty members are dependent on high performance computers for their research.
5. State of the art high performance computing resources are required to be at the forefront of research in engineering and the sciences.

IBM BlueGene/L is a unique proprietary parallel supercomputer. A 64 rack configuration is currently the top rated supercomputer in the world. The planned purchase of the one rack (1024 nodes) system will put Iowa State University at position number 73 in the world in terms of peak supercomputing performance.

Any Known Alternatives to the Equipment

There are three types of high-performance supercomputers – vector supercomputers, massively parallel supercomputers and commodity clusters. Vector supercomputers are designed to have only modest parallel processing abilities and most applications in computational genomics and life sciences do not lend themselves to vector processing.

To meet ISU's computational and research needs, ISU needs access to both commodity cluster computers and massively parallel supercomputers. Due to the method that commodity clusters use to communicate between processors/nodes, machines in this class cannot be considered equivalent to machines in the massively parallel BlueGene/L class when solving large-scale genomic problems. ISU needs a computer in each class; a BlueGene/L massively parallel supercomputer and a 64 node, dual core commodity cluster.

Estimated Cost and Source of Funding

The BlueGene/L acquisition (which includes a full rack of 1024 nodes, front end, service node, storage, software and installation) will cost \$1.25 million.

- ♦ NSF Major Research Instrumentation Grant (\$600,000)
- ♦ Plant Sciences Institute (\$150,000)
- ♦ Office of the Vice Provost for Research (\$150,000).
- ♦ Office of Information Technology Services (\$150,000)
- ♦ President's Office (\$200,000)