Magnifying research: Scientists team together to upgrade supercomputer

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A group of Kansas State University scientists is boosting research across campus by making the largest supercomputer in the state even larger. The project also will benefit researchers at other schools in Kansas.

The scientists, led by Daniel Andresen, associate professor of computing and information sciences, have recently received a three-year $700,000 grant from the National Science Foundation's Major Research Instrumentation Program to upgrade the university's research computing cluster, called Beocat. The scientists also received $300,000 in matching funds from the university.

Beocat is a cluster of servers that provides computational support for large research projects and is located in the university's computing and information sciences department in the College of Engineering. The cluster's design type is called Beowulf, so the designers called the university's form Beocat in honor of the Kansas State University Wildcats .

Beocat supports research in four colleges and 12 to 15 departments across campus, and the upgrade will at least double its research capacities. While the average desktop or laptop has between two and four cores in its central processing unit, Beocat has 1,200 cores. It also has 10 machines that each have 64 gigabytes of memory -- much more than the average two to four gigabytes that come with a desktop or laptop. The upgrade will give Beocat individual machines with 512 gigabytes to a terabyte of memory and more than 2,000 total cores.

"That's like 1,500 laptops stacked up or 1,000 desktops stacked up and working together," Andresen said.

The extra memory will be especially helpful for some of the larger research projects across campus. For example, it takes about 50 gigabytes of space to analyze a single genome. A group of biologists on campus wants to analyze 5,000 genomes -- a huge computing task that requires a lot of memory. But an upgraded Beocat will be able to handle such a large research load in a timely manner.

Beocat has about 400 users working on research in areas such as life sciences, genetics, chemistry and agriculture. Some of the supercomputer's projects have involved: looking at the flowering time of plants; understanding how water policies and practice changes affect the Ogallala Aquifer in western Kansas; and collaborating with the University of Kansas and the University of Oklahoma to study the effects of carbon flux and species migration.

Additionally, the supercomputer's work fits in with the university's 2025 vision, Andresen said. Having better on-campus resources, such as an upgraded supercomputer, will help faculty members produce more accurate and cost-effective research.

"This type of capacity will drive lab experiments as well as provide simulations," Andresen said. "Research now involves theory, lab work and simulation, which is computer driven. This upgrade will help with simulation because you can model things first that might be very expensive before you actually apply them."

Not only does the supercomputer help scientists and researchers at Kansas State University, but researchers at colleges throughout the state of Kansas -- including Emporia State University, Benedictine College and Bethany College -- are also able to use the supercomputer.

"This [supercomputer](#) allows faculty to have better access to getting research done with their research dollars," Andresen said. "It will also enable us to reach out and really have an impact on the community colleges and four-year institutions throughout the state. This will also help the Kansas work force because we are going to be graduating more people who actually know how to use these cutting edge technologies."

The group will start installing the upgraded equipment in the spring semester. The upgrade will involve faculty as well as students, particularly Adam Tygart, sophomore in computer science, Manhattan, who manages Beocat.

Other co-principal investigators on the project include: Doina Caragea, assistant professor of computing and information sciences; Brett Esry, university distinguished professor of physics; Walter Dodds, university distinguished professor of biology; and David Steward, professor of civil engineering. Senior personnel on the project include Jianhan Chen, assistant professor of biochemistry, and Christine Aikens, assistant professor of chemistry.

Provided by Kansas State University