

# Montana State University Builds a Centralized Computing Resource for Researchers and Students

## CASE STUDY

MSU is recognized nationally for its research prominence among leading public research universities. Its prolificity has led to many significant and even world-changing discoveries. MSU holds more than 250 active technology licenses. In addition, 91 patents and 36 plant variety certificates have been issued for MSU discoveries with many more pending.

Research expenditures at MSU typically exceed \$100 million annually. Particularly notable research departments include immunology; chemistry and biochemistry; transportation; physics; and land resources and environmental sciences. Much of the research funding is derived from the National Science Foundation, National Institutes of Health, the Departments of Energy, Defense and Agriculture, and private sources.

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“The UI has been great. Our users submit and monitor their own jobs with ease, and we can focus on monitoring and managing the cluster with increased facility and insight.”

— Pol Llovet, Associate  
Director of Cyberinfrastructure

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### The Challenge

MSU's Information Technology Center's Research Cyberinfrastructure (RCI) group was charged with building a shared community computing resource. Their goal was to build a flexible infrastructure that would let them offer compute and storage services at an affordable price. It had to be scalable in small increments, easy to administer, and able to use off-premise resources to extend the infrastructure when necessary. It also had to be easy enough for students to use, and reliable enough for researchers to count on for their grant projects.

### The Solution

The team at MSU spent a considerable amount of time researching a solution. Their approach to providing infrastructure is an interesting one. Rather than build a giant cluster and house it in a data center on campus, MSU chose to build a modest cluster of generalized nodes on premise, and take advantage of technologies such as virtualization and cloud computing

to provide a flexible, affordable solution that meets the unique needs of their diverse researchers. Since these nodes would have to be reconfigured quickly and reliably to meet the needs of various projects, MSU required management software that could handle the task. They chose a BIOS-IT cluster solution powered by Supermicro, Mellanox, Intel® Enterprise Edition for Lustre, and Bright Cluster Manager. The cluster provided the university with a central HPC capability for a diverse range of workloads with high performance fabric for parallel workloads and a 500TB parallel file system to handle large IO demand and complex data analysis.

BIOS-IT selected Bright's management software as it makes it easy to configure the overall cluster initially, and re-configure nodes as needed. The cluster was pre-installed in the BIOS-IT HPC facility and soak tested for a number of days, using tools provided by Bright. This reduced the installation time on

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site and meant the system was ready for use from the researchers and end users almost from day one.

### **Reuse, Reduce, Recycle**

MSU discovered that using Bright provided unexpected additional savings. Before the compute resources became a community asset, individual labs would purchase servers and build their own clusters. Bright Cluster Manager's hardware-agnostic architecture enabled the university to reuse these existing servers, making them a functional part of the centralized cluster. MSU has reduced the cost of computing by recycling what it has already purchased.

**Future Proofing with Bright OpenStack**  
A unique challenge posed by a university environment was finding an existing location suitable for housing a large data center. Buildings designed

for classrooms and libraries are not well suited to the task. MSU had to work within the constraints of the buildings on campus, while designing a centralized compute resource that would meet their needs now and into the future. Their blueprint calls for a modest-scale on-premise cluster, virtualized clusters, and the ability to expand use of off-premise resources when necessary.

OpenStack was the solution of choice. It enables MSU to spin up virtualized HPC clusters on existing servers, and easily expand to managed cloud servers. The university selected Bright OpenStack < link: [brightopenstack.com](http://brightopenstack.com) > for a number of reasons: Bright OpenStack is a certified, OpenStack Powered Platform, ensuring interoperability; it was designed to make spinning up Bright HPC clusters within an OpenStack cloud easy; and it enables MSU to manage

their local HPC clusters, their remote HPC clusters, and the OpenStack cloud itself from the same powerful user interface.

### The Result

For MSU, Bright provided a seamless solution. It offered the university all-inclusive software for deploying, provisioning, monitoring, health checking, and much more. It was easy for sysadmins to use, and it was easy for end users to access.

The installation went according to plan. It was completed in January 2015, and has been running user jobs and producing results ever since. There are roughly 20 labs using Bright, including mechanical engineering, physics, neuroscience, ecology, computational chemistry, and others. More users are being added every month.

Users are particularly impressed with Bright's web interface. RCI attributes its popularity to Bright's ease of use and uncomplicated interface. Users submit their jobs using the terminal, then refresh the web interface to see status updates.

The new system is meeting the goals and expectations of MSU's team. Labs are able to access the compute resources they need without the cost and overhead of setting up their own clusters. And the centralized nature of the cyberinfrastructure has granted more faculty and students access to compute resources than ever previously envisioned.

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“Bright Cluster Manager accelerated our deployment time by providing all the tools to deploy, configure, validate performance and run soak tests across the whole cluster. Our installation was completed in a matter of days and the cluster was ready for users within 1 week of us being on site.”

— Sam Ashdown, BIOS-IT ([sales@bios-it.com](mailto:sales@bios-it.com))

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