BIOWULF
HIGH PERFORMANCE COMPUTING AT THE NIH

NIH National Institutes of Health

At A Glance: Supercomputing at NIH

What Is Biowulf?
Access to robust computing resources is critical to the wide variety of biomedical research conducted at the National Institutes of Health (NIH). As such, NIH provides its Intramural Research Program (IRP) investigators with state-of-the-art high performance computing (HPC) resources. Biowulf, NIH's supercomputer and the largest of the HPC resources, now makes it possible for the IRP community to pursue research questions that were previously beyond its reach. As a testament to its raw computing power and cutting-edge capabilities, Biowulf is ranked among the top 100 most powerful supercomputers in the world by the TOP500 project. Thanks to Biowulf, the NIH IRP community is now one of the world's leaders in the biomedical computing space, providing its investigators with a world-class HPC environment for advancing biomedical science.

What CIT Offers NIH
Fully aware that the computational needs of the research community are ever-growing, NIH embarked on a multiyear initiative to expand Biowulf's computing capabilities. Those improvements have allowed researchers to conduct the kinds of large-scale data analyses required in a wide variety of scientific fields, including genomics, molecular simulation, imaging, and proteomics.

The enhancements to Biowulf have already had a significant impact on how research is performed in the IRP, with over half of IRP labs actively using Biowulf to process and analyze their research data.

Some noteworthy ways in which Biowulf benefits the IRP community include:

- *Power and Flexibility*: Biowulf provides both immense computing power and a wide array of applications to meet the varied needs of IRP investigators.
- *Decreased Processing Time*: Data processing that once took eight hours for large data sets now can take as few as two—allowing investigators to spend more time on the analysis.
- *Increased Speed for Complex Computational Projects*: Biowulf has more than 480 graphical processing units (GPUs), which decreases the time it takes to complete projects that use large amounts of computing resources over long periods of time, such as rendering 3D images.
- *Ease in Data Transfers*: A 100 Gbps connection allows for fast, secure, and reliable data transfers.
- *Central Location of Data*: IRP investigators can share data and collaborate through a central file system.

- *Secure and Ample Storage*: Researchers have access to substantial, highly secure storage—25PB to be exact!

Key Biowulf Highlights

Here are some of the remarkable statistics on high performance computing at NIH as of August 2018:

- Biowulf is currently being used by more than a third of all IRP research groups.
- Since its inception in 1999, more than 2,100 papers based on data that was generated or analyzed using Biowulf have been published.
- Since 2014, the number of active Biowulf accounts have more than doubled, and the number of jobs submitted have increased by nearly 700%.
- During that same period, computing capacity increased by 450%, going from 18,000 to 99,000 cores, including 28 large-memory nodes for memory intensive projects. In addition, data storage capacity increased by 733%, going from 3 to 25 petabytes— enough to store 250,000 hours of television programming—and now includes leading-edge, object-oriented storage technology.

Learn More About High Performance Computing at NIH

Not only does NIH offer this powerful resource to the IRP community, it also provides its researchers with:

- Expert staff to assist with computing needs.
- Walk-in consultations at coffee shops around NIH's campus for investigators to drop in with questions.
- Training sessions and seminars on NIH's HPC capabilities and Biowulf.

For More Information

For more information on HPC and Biowulf and to gain access to its expert staff, please visit hpc.nih.gov or contact staff@hpc.nih.gov.

To set up an account, visit hpc.nih.gov/docs/accounts for step-by-step instructions.