

# ALCF COMPUTING RESOURCES



## Theta

Theta, a 11.69-petaflops supercomputer, is a stepping stone to the ALCF's next leadership-class system, Aurora. Theta delivers advanced capabilities for computational science and engineering research, while providing a platform to help ALCF users transition their applications to the new Cray/Intel architecture.

- Cray/Intel® Xeon Phi™ architecture
- 11.69 petaflops
- 64-core 1.3 GHz Intel 7230 processor per node
- 4,392 nodes
- 281,088 cores
- 843 TB of memory
- 70 TB of high-bandwidth memory
- Aries interconnect with Dragonfly configuration
- 24 racks

## Mira

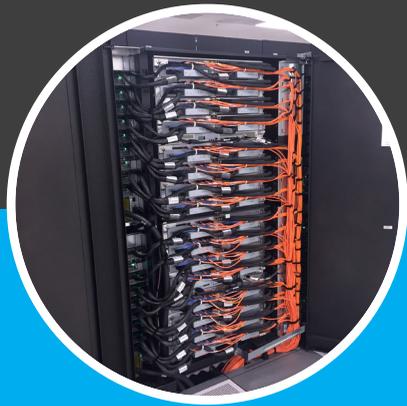
Mira is the ALCF's 10-petaflops IBM Blue Gene/Q supercomputer. In addition to being one of the most powerful supercomputers in the world, Mira is also among the most energy efficient. The system saves considerable energy through innovative chip designs and a unique water-cooling system.

- IBM Blue Gene/Q architecture
- 10 petaflops
- 16-core 1.6 GHz IBM PowerPC A2 processor per node
- 49,152 nodes
- 786,432 cores
- 768 TB of memory
- 5D torus interconnect
- 48 racks

## Cooley

Cooley is the ALCF's data analysis and visualization cluster. The system helps researchers analyze and explore the massive datasets that result from their simulations on Mira. Cooley shares file systems with the supercomputer, enabling direct access to Mira-generated results.

- Intel® Haswell architecture
- 293 teraflops
- 2 6-core 2.4 GHz Intel E5-2620 processors per node
- 1 NVIDIA Tesla K80 GPU per node
- 126 nodes
- 1,512 cores
- 47 TB of memory
- 3 TB of GPU memory
- FDR InfiniBand interconnect
- 6 racks



## Cetus

Cetus is an IBM Blue Gene/Q system used to offload both debugging issues and alternative production workloads from Mira. To facilitate these activities, Cetus shares the same software environment and file systems as Mira.

- IBM Blue Gene/Q architecture
- 838 teraflops
- 16-core 1.6 GHz IBM PowerPC A2 processor per node
- 4,096 nodes
- 65,536 cores
- 64 TB of memory
- 5D torus interconnect
- 4 racks

## Vesta

Vesta, an IBM Blue Gene/Q system, serves at the ALCF's test and development platform, providing a computing resource for researchers preparing to use Mira.

- IBM Blue Gene/Q architecture
- 419 teraflops
- 16-core 1.6 GHz IBM PowerPC A2 processor per node
- 2,048 nodes
- 32,768 cores
- 32 TB of memory
- 5D torus interconnect
- 2 racks

## Data Storage

**MIRA DISK STORAGE:** The Mira system consists of 384 I/O nodes that connect to 22 storage arrays that control 13,000 disk drives with a total useable capacity of 27 PB and a maximum aggregate transfer speed of 330 GB/s over two file systems. Mira uses the General Parallel File System to access the storage.

**THETA DISK STORAGE:** The Theta system consists of 30 I/O nodes that connect to a storage array that controls 2,300 disk drives with a total useable capacity of 9 PB and a maximum aggregate transfer speed of 240 GB/s. Theta uses Lustre to access this storage.

**TAPE STORAGE:** The ALCF has three 10,000-slot libraries using LTO 6 tape technology. The LTO tape drives have built-in hardware compression with compression ratios typically between 1.25:1 and 2:1, depending on the data, giving an effective capacity of 36-60 PB.

## Networking

The ALCF has an internal proprietary network for communicating between nodes. InfiniBand enables communication between the I/O nodes and the storage system. Ethernet is used for external user access, and for maintenance and management of the machines. Systems connect to other research institutions using up to 100 Gb/s of network connectivity.

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### Contact

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