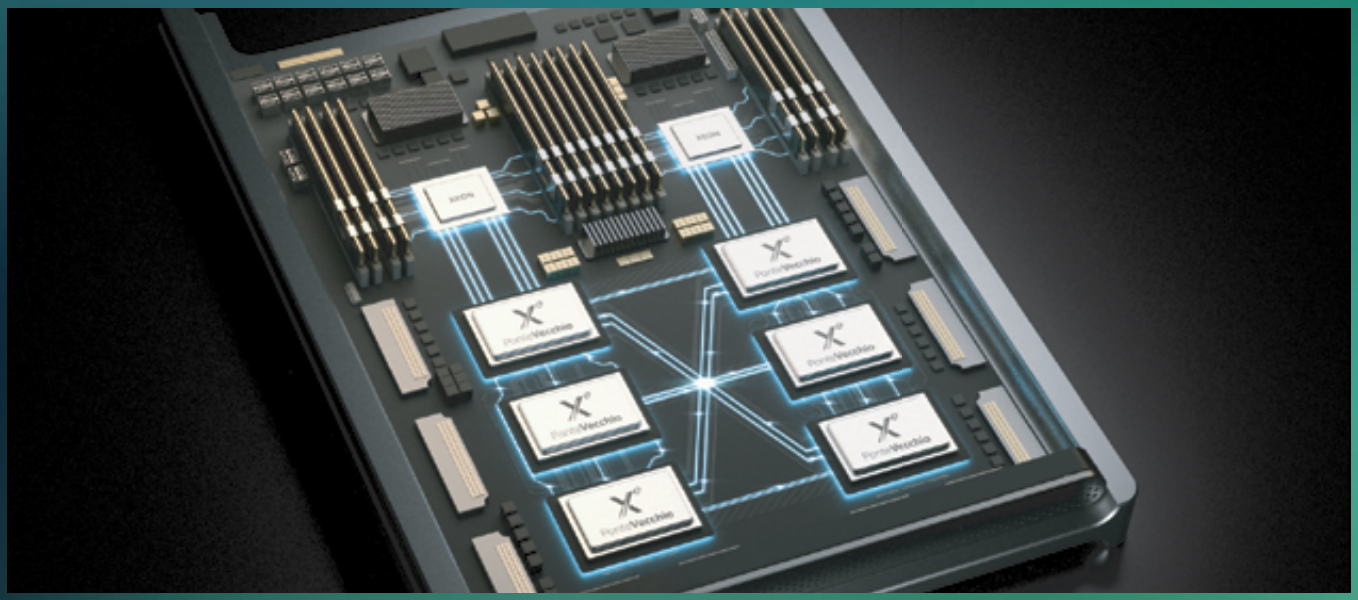
Argonne NATIONAL LABORATORY

Aurora

The Argonne Leadership Computing Facility's exascale system will be used to dramatically advance scientific discovery and innovation.



Aurora's compute nodes will be equipped with two Intel Xeon Scalable processors and six general-purpose GPUs based on Intel's X^e architecture.
Image: Intel Corporation

The ALCF's upcoming Aurora exascale supercomputer will integrate world-class compute capabilities with powerful memory, storage, fabric, and acceleration to advance the frontiers of science. Scientists will use the Intel-Hewlett Packard Enterprise (HPE) supercomputer to pursue some of the farthest-reaching science and engineering breakthroughs ever achieved with supercomputing.

Aurora will be based on Intel's Xeon Scalable processors and high-performance Intel X^e GPU compute accelerators. The system will rely on HPE Cray EX supercomputer exascale-class architecture and HPE Slingshot technology, which can provide concurrent support for advanced simulation and modeling, AI, and analytics workflows. Aurora will leverage historical advances in software investments along with increased application portability via Intel's oneAPI. The supercomputer will also introduce a new I/O system called Distributed Asynchronous Object Storage (DAOS) to meet the needs of new exascale workloads.

Preparing for Aurora

To prepare for the arrival of Aurora, ALCF staff members have been working to ensure hardware, software, and a diverse set of scientific computing applications are ready for the research community as soon as the system is deployed for science. The team's work covers everything from exascale code development and hardware technology evaluations to user training and close partnerships with vendors, fellow national laboratories, and DOE's Exascale Computing Project (ECP). These activities and collaborations are laying the groundwork for Aurora to drive a new era of scientific discoveries and technological innovations at the ALCF and beyond.

U.S. DEPARTMENT OF ENERGY

Argonne National Laboratory is a U.S. Department of Energy laboratory managed by UChicago Argonne, LLC.

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Aurora Early Science Program

The Aurora Early Science Program is designed to prepare key applications for the scale and architecture of the ALCF's upcoming exascale supercomputer, and field-test compilers and other software to pave the way for other production applications to run on the system.

The program supports 15 projects in a wide range of scientific areas and computational methods. The diverse set of projects reflects the ALCF's efforts to create an environment that supports emerging data science and machine learning approaches alongside traditional modeling and simulation-based research.

Exascale Training

The ALCF and the ECP offer several training opportunities, including workshops, webinars, and hackathons, to help researchers prepare for Aurora and other DOE exascale systems. Stay tuned to the ALCF and ECP websites for upcoming opportunities.

Aurora's ability to handle simulation, data analysis, and artificial intelligence workloads will give researchers an unprecedented set of tools to advance scientific discovery.

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SYSTEM SPECS

Peak Performance

> 2 Exaflops DP 2EF

Compute Node

2 Intel Xeon scalable "Sapphire Rapids" processors; 6 Intel Xᵉ arch- based GPUs; Unified Memory Architecture; 8 fabric; RAMBO

GPU Architecture

Intel Xᵉ arch-based "Ponte Vecchio" GPU; Tile-based chiplets, HBM stack, Foveros 3D integration, 7nm

Platform

HPE Cray EX supercomputer

System Size

> 10,000 Nodes

Aggregate System Memory

>10 PB

CPU-GPU Interconnect

CPU-GPU: PCIe
GPU-GPU: Xᵉ Link

System Interconnect

HPE Slingshot 11; Dragonfly topology with adaptive routing

Network Switch

25.6 Tb/s per switch, from 64–200 Gbs ports (25 GB/s per direction)

High-Performance Storage

≥ 230 PB, ≥ 25 TB/s (DAOS)

Programming Models

Intel oneAPI, MPI, OpenMP, C/C++, Fortran, SYCL/DPC++

Software Stack

HPE Cray EX software stack +Intel Enhancements + Dataand Learning