ADAPTIVE SUPERCOMPUTING ARCHITECTURE
The Cray® XC™ supercomputer series is a massively parallel processing architecture designed to handle a broad range of compute problems. Start small and upgrade or stand up one of the fastest systems on the planet. Wherever you are on the spectrum, you can push the boundaries on your most challenging simulation, analytics, scientific computing, and AI workloads.

It starts with Cray’s system-centric approach to design. Rather than assembling cluster-like components and commodity networks that can degrade at high core counts, the XC series integrates extreme performance interconnect capabilities with best-in-class processing technologies and tightly couples it with an HPC-optimized software environment.

The result is a single, scalable, integrated system that can tackle any application requirement — from small footprint, low-density configurations to systems running at speeds up to 500 petaflops.
DESIGNED FOR DISCOVERY

WORK ETHIC GUARANTEED

CUSTOMIZABLE CONFIGURATIONS DELIVER EXTREME SCALABILITY AND SUSTAINED PERFORMANCE FOR WORKLOADS OF ALL KINDS
Flexibility Because Questions Change

The questions you ask change with each answer. And different applications put different demands on a computer system.

No single processor engine can address every type of application or question. That's why we designed the XC series for flexibility.

XC supercomputers merge the strengths of scalar processing, co-processing, and accelerator technology into one adaptive HPC system. Find the balance of NVIDIA® Tesla® GPU accelerators, Intel® Xeon® Scalable processors, and Cavium ThunderX2™ processors you need for your applications.

Combined with a robust and easily upgradable hardware and software environment, the result is a hard-working system you can configure to meet your unique goals.
Cray takes a holistic, integrated, “system-centric” approach to system design. It means when you have a Cray supercomputer, you have a one of the world’s most complete and robust HPC systems — one developed, tested, and validated against the most demanding HPC applications.

The XC supercomputer series embodies this approach. It’s not an assemblage of cluster-like commodity components. It’s a tightly integrated system designed to scale and perform reliably to the highest node counts.

With a comprehensive scope of extreme performance interconnects, processing, packaging, cooling, power options, file systems, supervisory systems, OS and software development environments, the XC series delivers a quality, reliable HPC solution.

Additionally, XC supercomputers scale key software applications, upgrade easily, and tightly couple the interconnect and software environment.

**INDUSTRY-LEADING INTERCONNECT**

The Aries™ interconnect is an innovative intercommunications technology implemented with a high-bandwidth, low-diameter network topology called Dragonfly. It provides substantial improvements on all network performance metrics for HPC: bandwidth, latency, message rate, and more.

Delivering unprecedented global bandwidth scalability at reasonable cost across a distributed memory system, this network provides global access to all of the memory of parallel applications and supports the most demanding global communication patterns.
EXTREME SCALE & COMPATABILITY

The XC series provides complete workload flexibility. It runs both highly scalable custom workloads as well as industry-standard ISV jobs via the Cray Linux Environment (CLE). Cluster Compatibility Mode runs Linux/x86 versions of ISV software without any requirement for porting, recompiling, or relinking. Or Extreme Scalability Mode can optimize performance for custom codes.

SYSTEM RESILIENCY FEATURES

Failures happen when scaling to a massive level. But applications must still run to successful completion in the presence of those errors. The Aries interconnect uses error correcting code (ECC) to protect major memories and data paths within the device. ECC, combined with the Aries adaptive routing hardware, provides improved system and applications resiliency.

Additionally, if a program terminates abnormally, NodeKARE™ (Node Knowledge and Reconfiguration) runs diagnostics on involved compute notes, removes unhealthy ones from the compute pool, and allocates subsequent jobs only to healthy nodes.

SOFTWARE ENVIRONMENT

The XC software stack includes a package of HPC-optimized programming tools, Linux OS, and a scalable analytics suite. The Cray Linux Environment is a suite of high-performance software designed to run large, complex applications and scale efficiently to more than 500,000 processor cores. Also, many ISV applications are available “out of the box,” benefiting from Cray’s network and MPI libraries. The Cray® Urika®-XC AI and analytics software suite helps you unlock sophisticated insights with a robust set of tools including Apache® Spark™, TensorFlow™, Cray Graph Engine, Python with distributed Dask, BigDL Distributed Deep Learning, Jupyter Notebooks and many more.

INVESTMENT PROTECTION

The XC series is engineered for easy, flexible upgrades — a feature that prolongs your system’s lifetime and your investment. As new technology advancements become available, you can take advantage of them deep into your system’s life cycle. Adaptive supercomputing means system longevity.

DATA STORAGE OPTIMIZED FOR THE XC SERIES

- **Cray® ClusterStor®** storage systems bring industry-leading performance, scalability, data protection, and availability configured for your requirements and budget. Built-in energy efficiencies, easy installation, and Cray service and support maximizes your investment without increasing it.

- **Cray® DataWarp® I/O accelerator** uses flash storage to speed up storage performance to applications and compute nodes. It reduces the cost of delivering storage performance by up to 5x over HDD-based file systems.
## PROCESSING OPTIONS
- Intel® Xeon® Scalable processors, Cavium ThunderX2™ processors, and NVIDIA® Tesla® V100 GPU accelerators

## MEMORY
- 64-256 GB per node
- Memory bandwidth: up to 153 GB/s per node

## COMPUTE CABINET
- Up to 384 sockets per cabinet, upgradable with processors of varying core counts
- Peak performance up to 1 PF per system cabinet

## INTERCONNECT
- 1 Aries™ routing and communications ASIC per 4 compute nodes
- 48 switch ports per Aries chip (500 GB/s switching capacity per chip)
- Dragonfly interconnect: low-latency, high-bandwidth topology

## SYSTEM ADMINISTRATION
- Cray System Management Workstation (SMW)
- Single-system view for system administration
- System software rollback capability

## RELIABILITY FEATURES (HARDWARE)
- Integrated Cray Hardware Supervisory System (HSS)
- Independent, out-of-band management network
- Full ECC protection of all packet traffic in the Aries network
- Redundant power supplies; redundant voltage regulator modules
- Redundant paths to all system RAID
- Hot swap blowers, power supplies, and compute blades
- Integrated pressure and temperature sensors

## RELIABILITY FEATURES (SOFTWARE)
- HSS system monitors operation of all OS kernels
- Lustre® file system object storage target failover; Lustre metadata server failover
- Software failover for critical system services including system database, system logger, and batch subsystems
- NodeKARE™ (Node Knowledge and Reconfiguration)

## OPERATING SYSTEM
- Cray Linux Environment (includes SUSE Linux SLES11, HSS and SMW software)
- Extreme Scalability Mode (ESM) and Cluster Compatibility Mode (CCM)

## COMPILERS, LIBRARIES & TOOLS
- Cray Compiler Environment, Intel Compiler, PGI Compiler, GNU compiler
- Support for the ISO Fortran standard (2008) including parallel programming using coarrays, C/C++ and UPC
- MPI 3.0, Cray SHMEM, other standard MPI libraries using CCM; Cray Apprentice and CrayPAT™ performance tools; Intel Parallel Studio Development Suite (option)

## JOB MANAGEMENT
- PBS Professional job management system
- Moab Adaptive Computing Suite job management system
- SLURM (Simple Linux Unified Resource Manager)

## EXTERNAL I/O INTERFACE
- InfiniBand, 40 and 10 Gigabit Ethernet, Fibre Channel (FC) and Ethernet

## DISK STORAGE
- Full line of FC, SAS and IB based disk arrays with support for FC and SATA disk drives, ClusterStor® data storage system

## PARALLEL FILE SYSTEM
- Lustre, Data Virtualization Service (DVS) allows support for NFS, external Lustre and other file systems

## POWER
- 90 kW per compute cabinet, maximum configuration
- Support for 480 VAC and 400 VAC computer rooms
- 6 kW per blower cabinet, 20 AMP at 480 VAC or 16 AMP at 400 VAC (three-phase, ground)

## COOLING
- Water cooled with forced transverse air flow: 6,900 cfm intake

## DIMENSIONS (CABINETS)
- H 80.25” x W 35.56” x D 76.5” (compute cabinet), H 80.25” x W 18” x D 59” (blower cabinet)

## WEIGHT (OPERATIONAL)
- 4,500 lbs. per compute cabinet - liquid cooled, 900 lbs. per blower cabinet

## REGULATORY COMPLIANCE
- EMC: FCC Part 15 Subpart B, CE Mark, CISPR 22 & 24, ICES-003, C-tick, VCCI
- Safety: IEC 60950-1, TUV SUD America CB Report
- Acoustic: ISO 7779, ISO 9296