CRAY
THE SUPERCOMPUTER COMPANY

Cray CX1™ Supercomputer

We Take Supercomputing Personally

Cray CX1 System Highlights

The Cray CX1 combines the power of a high performance cluster with the affordability, ease-of-use and seamless integration of a workstation. Equipped with up to 16 powerful Intel® Xeon® quad-core processors, and state-of-the-art visualization and storage capabilities, the Cray CX1 supercomputer delivers performance leadership across a broad range of applications and standard benchmarks, all in a compact, self-contained system that runs on standard office power.

Designed for Performance

- Configured and Optimized for High Performance Computing (HPC)
- Industry-Standard Hardware and Software

"Ease of Everything" Computing

- Integrated HPC Operating Environment
- Windows® HPC Server 2008 or Red Hat® HPC
- Simple Setup and Operation
- Plug-and-Play Components with Redundancy

Purpose-Built for Offices, Laboratories or Other Constrained Environments

- Deskside or Rack-Mount Form Factor
- Active Noise Cancellation
- Standard Office Power

World's Most Versatile Cluster

- Up to Eight Blades per Chassis
- Single- or Dual-Socket Intel Xeon Compute Blade
- High performance NVIDIA® Tesla™ GPU Compute Blade
- Breakthrough High-End NVIDIA Quadro Graphics Blade for Visualization
- High-Capacity Storage Blade

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With an integrated Windows or Linux operating environment, the Cray CX1 supercomputer empowers any user to apply HPC power to challenging science, engineering and design problems. Purpose-built and priced for individuals or departmental workgroups, the Cray CX1 supercomputer is simple to configure, deploy, administer and use. With the Cray CX1 supercomputer, Cray takes the HPC cluster out of the data center and places it where you need it most.

A New Era of High Performance Computing

Scientists and engineers know that HPC can make all the difference – taking days or weeks off project timelines and solving problems that would otherwise be unapproachable. Unfortunately, until now HPC has been available only to the few. Those computational scientists who could master a domain science, program in parallel, distribute algorithms, manage an HPC cluster, and were fortunate enough to work in an organization with supercomputing resources could put HPC to work. For the rest, technical problems languished on the desktop – stuck on a scientist's or engineer's workstation, slowing time to market and negatively affecting cost, competitiveness and quality.

Built for performance, the Cray CX1 high-productivity supercomputer bridges the gap from conventional desktop workstations to traditional HPC clusters, providing the kind of breakthrough productivity gains not seen since the introduction of the technical workstation in the 1980s.

The Cray CX1 supercomputer system makes easy work of complex applications used in the financial services, manufacturing, digital media, life sciences and energy industries, as well as the traditional applications used in the government, defense and higher education sectors. The Cray CX1 supercomputer provides the ideal computing resource for small engineering firms and departments within universities and large enterprises. With the Cray CX1 system, users don't need elaborate programming knowledge or a large IT staff to manage a complex HPC cluster. Instead, individual users or departments can easily operate and maintain the system themselves, giving them the supercomputing resources to push the boundaries of science, engineering and discovery.

Designed for Performance

Designed and optimized for HPC, the Cray CX1 supercomputer delivers industry-leading performance at an affordable price. Drawing on the system's best-of-breed, industry-standard hardware and software, researchers and scientists can tackle the most challenging computational problems.

The Cray CX1 supercomputer is a complete high performance product – not an assembly of components typical of HPC clusters. Each Cray CX1 system chassis can support up to eight blades for high performance computation, graphics and storage, using up to 16 of the fastest dual- and/or quad-core Intel Xeon processors, up to four high performance NVIDIA Tesla GPU computing processors, and up to 32 gigabytes of memory per blade. This "super" computer is housed in a compact deskside or rack-mountform factor. Users can connect up to three chassis with the system's internal switch infrastructure. Using external InfiniBand and Gigabit switches, the Cray CX1 system also offers extraordinary scalability.

With the Cray CX1 supercomputer's breakthrough power, affordability and ease of installation and use, Cray is democratizing HPC – placing computing capabilities previously reserved for large research centers into the hands of technical workstation users. In fact, a Cray CX1 system would have ranked as one of the TOP 500 most powerful supercomputers in the world in 2004. Now, all of that computational power, previously accessible only to the few, is available to everyone.

"Ease of Everything" Computing

Until now, a huge chasm has separated the conventional workstation from the HPC cluster. While clusters can provide significant performance potential, they tend to be ad-hoc, custom-built collections of compute boxes. They are also much more difficult to use than desktop workstations, requiring complex software environments that are hard for individuals to access, let alone optimize for results. In addition, traditional clusters require ample power, space, and cooling, as well as significant IT infrastructure and support.

Designed to deliver a complete "out of the box" supercomputing experience, the Cray CX1 system can be fully configured and ordered online. The system ships with all Operating System (OS) and cluster management software preinstalled and preconfigured – providing a setup almost as fast and easy as powering up a new laptop. It features competitive pricing and a modular design, allowing users to continually incorporate new technology over time and protect their investment. The Cray CX1 supercomputer also delivers parts redundancy in the areas where users need it most, helping to ensure that their machines are available and productive to meet the constant demands that HPC work places on high performance systems.

Purpose-Built for Offices, Laboratories, Workgroups and Departments

In the past, high performance computing meant having a dedicated datacenter that could meet the unique requirements of cluster systems. Today, the Cray CX1 supercomputer can deliver industry-leading performance in a system that rests in a simple deskside pedestal and plugs into a standard wall outlet. The Cray CX1 system also incorporates innovative active noise cancellation technology, providing a quiet supercomputer that complies with NR45 and NC 40-50 office noise regulations.

Efficient Supercomputing

The enormous power and cooling requirements of conventional HPC clusters demand a dedicated room, translating into a large carbon footprint. The Cray CX1 supercomputer was designed from the ground up to provide a leaner, more efficient HPC solution, with power efficiency as high as 92 percent. Its compact size and the extensive use of 100% recyclable aluminum in the chassis also makes it half the weight of its nearest competitor, resulting in a lower environmental impact during shipping–from reduced energy consumption to lower carbon emissions. And with the generous use of recycled materials, from the paper used for the manuals to the packing and shipping materials, the Cray CX1 supercomputer is one of the most environmentally friendly systems available today.

World's Most Versatile Cluster

The Cray CX1 supercomputer is the only HPC system in the world to offer high performance compute, graphics and storage capabilities in a single, integrated office-environment chassis. This versatility allows users to customize a Cray CX1 system to fit their needs. The system's high-end visualization capabilities, for example, often eliminate the need for a separate workstation.

Each Cray CX1 chassis can be configured with up to eight blades. Blades can include up to 16 Intel Xeon dual- or quad-core processors and up to 32 gigabytes of memory per blade, and each are available in the following configurations:

- Single-socket processor compute blade for memory bandwidth-intensive applications
- Dual-socket processor compute blade for CPU-intensive applications
- Dual-socket processor graphic blade with NVIDIA Quadro® professional graphics board
- Dual-socket processor Tesla GPU computing blade with NVIDIA Tesla GPU computing processors
- Dual-socket processor storage blade with support for up to eight SAS/SATA 2.5" HDD or RAID 0,1,5,6,10,50

The system also supports Layer-2/Layer-3 Gigabit Switch and InfiniBand DDR/QDR interconnects.

Integrated HPC Operating Environment

To bring HPC capabilities to desktop-bound engineers and scientists, the Cray CX1 supercomputer offers multiple operating environments:

Windows HPC Server 2008 *Windows HPC Server 2008*—Cray and Microsoft have partnered extensively to create a superior out-of-the-box experience for the HPC user. The Cray CX1 system ships pre-configured with Windows HPC Server 2008 along with installation routines that make configuration and setup a simple and straight-forward process.

The Cray CX1 supercomputer with Windows HPC Server 2008 is an integrated solution stack that provides a simplified, common operating environment. This powerful combination offers consistent and integrated deployment, job submission, status and progress monitoring while delivering maximum compute performance and scalability, from workgroup HPC systems to some of the world's largest supercomputers, to the end user. Additionally, this scalable solution tightly integrates with existing desktop Windows infrastructures, allowing users to extend desktop technology and skills to the realm of HPC computing.

Windows HPC Server 2008 integrates with Windows Active Directory, security technologies and management and deployment tools. It supports traditional HPC MPI applications, as well as new interactive and service-oriented parallel applications using Microsoft.NET platform. In addition, Windows HPC Server 2008 easily integrates with existing Windows and Unix environments, making it an ideal platform for developing and running advanced HPC applications, including support for a high performance networking stack, C/C++, MPI, MPI.Net, F#, C#, Fortran, advanced debugging and tracing tools, including Vampir, along with Windows Performance Toolkit.

redhat.
R E A D Y
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Red Hat HPC — Red Hat HPC is an end-to-end software stack for high performance computing, providing all the tools needed to deploy, run, and manage a Cray CX1 system in one easy-to-install package. This solution integrates a powerful cluster software framework from Platform Computing, Platform Open Cluster Stack 5, with the performance, security, and stability of the Red Hat Enterprise Linux operating system.

Red Hat HPC includes a Linux operating system, device drivers, cluster installation and management tools, resource and application monitor, interconnect support and a job scheduler - Platform Lava, an entry-level job scheduler that provides an easy-to-use interface for production-level job execution, management and accounting. The software suite also includes a powerful node group and repository manager for deploying new updates, patches, and software packaged as kits, or for quickly re-imaging new nodes with no interruption in uptime.

intel ClusterReady The Cray CX1 supercomputer is a certified *Intel® Cluster Ready* system. This certification program was designed to establish a common specification among original equipment manufacturers, Independent Software Vendors (ISVs) and others for designing, programming and deploying clusters built with Intel components. For users, the certification means that the Cray CX1 system will support a wide range of Intel Cluster Ready ISV applications out of the box.

World-Class Service and Support

In addition to offering industry-leading technology and a comprehensive software environment, the Cray CX1 supercomputer also includes world-class Cray certified service and support. The system includes a three-year parts and labor hardware warranty, call center technical support and next-business day onsite service. Customers also have two options for ongoing software support. A 60-day starter kit offers phone and e-mail support and covers up to three incidents. For more advanced software support, Cray offers an OS support package that in-cludes coverage of more incidents and a higher level of support response. These proven support services enable users to receive fast, expert assistance.

A Proven Leader in HPC

Cray systems have been helping to solve the most challenging scientific and engineering problems for more than 30 years. With the Cray CX1 supercomputer, Cray's focus on high performance, quality, innovation and "ease of everything" operation opens a new era of HPC, bringing unprecedented power to more users than ever before.

blades
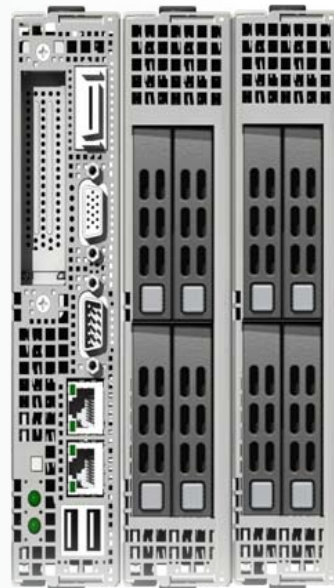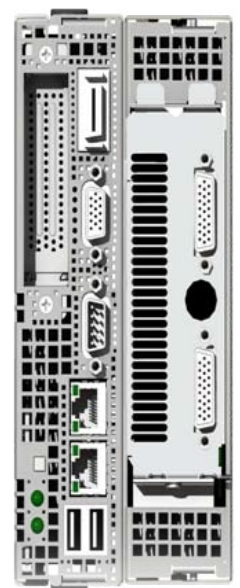
CN4800   CN5400   CS5404   CS5408   CV5401 / CT5401

Chassis Enclosure	Form Factor: 7U modular enclosure (rackmount and/or pedestal)
	Dimensions: W 12.22" (31.04 cm) x H 17.5" (44.45 cm) x D 35.5" (90.42 cm)
	Weight: - Chassis with all I/O modules (Gigabit and InfiniBand) and power supplies - 62.2 lbs (28.3 kg) - Chassis fully loaded w/ blades and I/O modules - 136.6 lbs (62 kg)

Power Supplies	1600 watt hot-plug power supplies
	- Based on high efficiency and "power factor correction"
	    1600W @ 120V = 13.33A (92% efficiency: 14.40A)
	    1600W @ 220V = 6.66A (92% efficiency: 7.19A)
	- Redundant power supplies support 2+2 (fully pop., full redun.) or 1+1 (half pop., full redun.)
	or 1 or 2 + 0 (non-redun.) modes
	- Power supplies require 110 or 200+ volt AC input
	Cray offers a wide range of power distribution options for the CX1

	Dimensions: W 4.274" (108.56 mm) x H 1.543" (39.19 mm) x D 21.52" (546.61 mm)
	Weight: 5.9 lbs (2.68 kg)
Cooling Fans	Chassis comes standard with hot pluggable, redundant fan modules based on Smart Energy Technologies
Input Device	Front control panel with touch screen graphical LCD - Supports initial configuration wizard - Local server nodes, enclosure, and module information
	Two USB "pass-throughs" in front and back

Enclosure I/O Modules	Up to two fabrics, featuring Ethernet switches providing uplink scalability and high speed InfiniBand modular switches (8 ports SDR, 12 or 24 ports DDR)
	
	Ethernet Switch
	16 RJ-45 auto-sensing 10/100/1000 Mbps UTP ports
	- Bandwidth: 32 Gbps (non-blocking)
	- Forwarding Mode: Store-and-forward
	- Forward rate: 10 Mbps port = 14,800 packets/sec; 100 Mbps port = 148,000 packets/sec;
	  1000 Mbps port = 1,488,000 packets/sec
	- Latency: 100 to 100 Mbps = 40 μ (max); 1000 to 1000 Mbps = 10 μ (max)
	- Queue buffer memory: 512 Kbytes per port
	- Status LED: Power, activity and link indicators for each port, link and speed indicators built into
	  each RJ-45 port

	IBS12DDR/IBS24DDR 12 or 24 Ports InfiniBand Switch IBS12DDR - Twelve -4X 10/20Gbps (SDR/DDR) CX4 ports with support for optical adapters and cables - Subnet Management software - Embedded management with Linux OS with Ethernet and secure shell access - Ultra-low latency < 180ns - InfiniBand v1.2 compliant - Dual redundant auto-sensing - Status LED: Power, activity and link indicators for each port, link and speed indicators built into each CX4 port - IBS24DDR–Optional 12-4X 10/20Gbps CX4 Ports daughter card (for a total of 24 ports) - 480Gb/s (SDR) or 960Gb/s (DDR)
Management	*Web-based Remote System Management*
	Graphical Mode Console Redirection
	Performance monitoring
	Remote control: Graceful power shutdown and reboot, hard power shutdown and reset without notice
	System Management: Local System Management Application, Windows Management Instrumentation (WMI)
	Reports: System Information, Health Log, Adminstration, Application for local management
	Pager Alerts and E-mail Alerts
	SNMP support
	Health monitoring: CPU and system temperatures, system voltages, CPU and chassis fans, power failure
	IPMI 2.0 support

Intel Xeon inside™
Powerful.
Efficient.

Windows® HPC Server 2008

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