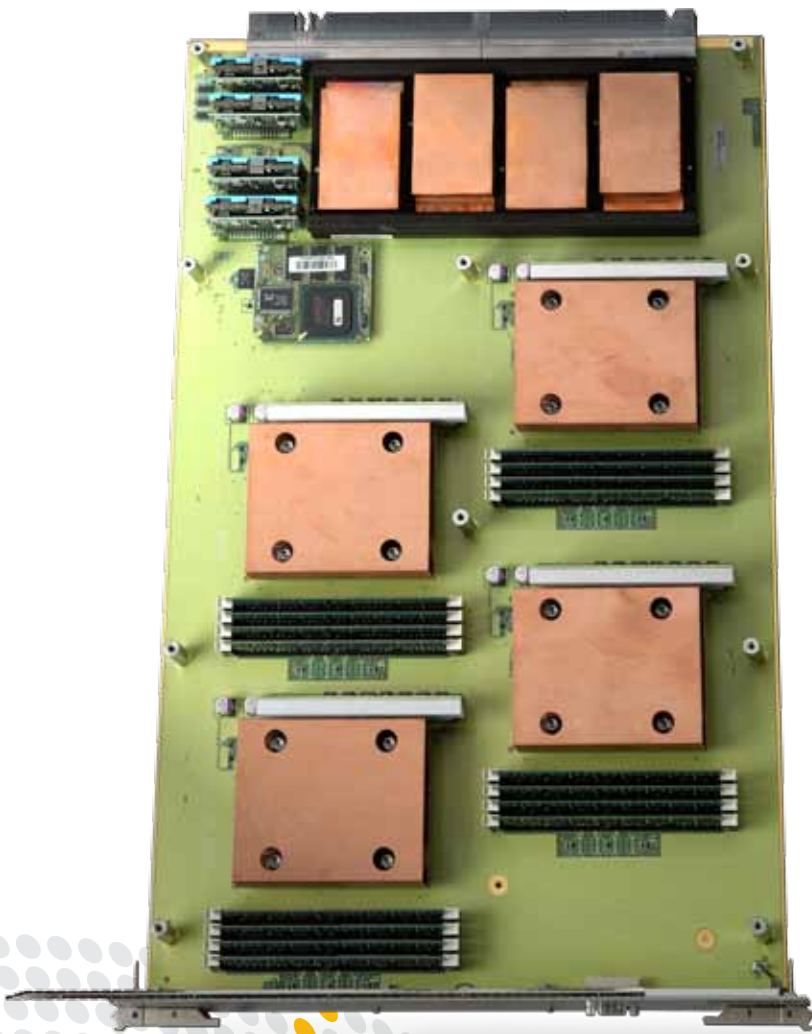# CRAY XMT

**The Cray XMT™ supercomputing system is a scalable massively multithreaded platform with globally shared memory architecture for large-scale data analysis and data mining.**

The Cray XMT system leverages Cray's MPP system design to create a scalable, reliable and economical multithreaded supercomputing platform.

## Architectural Overview

The Cray XMT design is based on Cray's massively parallel processing (MPP) compute blade but utilizes AMD Torrenza Innovation Socket technology to populate the AMD Opteron™ sockets with custom Threadstorm™ chips developed for multithreaded processing. A single Threadstorm processor can sustain 128 simultaneous threads and is connected with up to 8 GB of memory that is globally accessible by any other processor in the system.

Each Threadstorm processor is directly connected to a dedicated SeaStar2™ interconnect chip, resulting in a high bandwidth, low latency network characteristic of all Cray systems. This characteristic allows the Cray XMT platform to scale from 16 to over 8,000 processors providing over 1 million simultaneous threads and 128 TB of shared memory.

As another technology using the Cray XT™ infrastructure, the Cray XMT platform includes separate AMD Opteron-based service blades can be configured for I/O, login, network or system functions and can also provide scalar processing for applications that are best served by a combination of scalar and multithreading technologies.

The Cray XMT system runs an operating system which distributes a multithreaded kernel to the compute blades and standard Linux® on the service and I/O blades. This allows the compute nodes to focus on the application without being hampered by system administrative functions.

The system is purpose-built for parallel applications that are dynamically changing, require random access to shared memory and typically do not run well on conventional systems. Multithreaded technology is ideally suited for complex, graph-oriented databases and tasks such as graph analysis, pattern matching, and anomaly identification.

- Architected for large-scale data analysis
- Exploits the scalable Cray XT infrastructure
- Scales from 16 to over 8,000 processors providing over 1 million simultaneous threads and 64 TB of shared memory
- Separately dedicated compute, service and I/O nodes
- Incorporates custom Threadstorm multithreaded processor using AMD Torrenza Innovation Socket technology

## Programming Environment

The Cray XMT programming environment includes advanced program analysis tools for software development and tuning:

- C and C++ compilers
- Automatic parallelization
- STL and common math libraries
- Cross compiler on Linux processors
- gcc/g++ on Linux nodes
- Cray Apprentice2™ for compiler analysis and performance visualization

## Cray XMT Specifications

| | |
|---|---|
| CPU | 500 MHz single 64-bit Threadstorm processor |
| | 128 threads per processor |
| | 4 or 8 GB per processor |
| | AMD Opteron socket 940 compatible |
| | 30W design |
| | 96 CPUs per cabinet (max), 8024 CPUs per system (max) |
| I/O | Controlled by specialized service nodes based on the AMD Opteron processor |
| | Uses PCI-X interfaces associated with service nodes |
| | 2 Gb/s fibre channel disk interfaces to DDN and Engenio RAID systems |
| | 1 GbE and 10GbE network connections |
| Software | Operating system distributes multithreaded kernel (MTK) to compute blades and runs SUSE Linux on service and I/O blades allowing compute nodes to focus on the application without being hampered by system administrative functions. |
| MTK Operating System | Monolithic OS provides global shared memory view of the system API based on BSD 4.4 with Cray extensions |
| Compilers | C/C++ optimizing compiler targets instruction set architecture; aggressive automatic parallelization capability |
| | Support for various hierarchies of parallelization within a single processor or across multiple processors |
| | Support for Cray XMT extensions to ease parallel programming (sync, future variables, future statements, pragmas) |
| | Tightly integrated with debugging and performance analysis tools |
| Power | 15-22.5 kW (15.3-22.9 kVA) per cabinet, depending on configuration 80 AMP at 200/208VAC (three-phase, ground), 63 AMP at 400 VAC (three-phase, neutral, ground) |
| Cooling Requirement | Air cooled, air flow: 3000 cfm (1.41 m3/s), intake: bottom, exhaust: top. |
| Dimensions (Cabinet) | H 80.50 in. (2045 mm) x W 22.50 in. (572 mm) x D 56.75 in. (1441 mm) |
| Weight (Maximum) | 1,529 lbs. per cabinet (694 kg) |
| Regulatory Compliance | UL 60950-1; CAN/CSA–C 22.2 No 60950–1; CB Scheme Investigation to IEC/EN 60950-1 |
| Safety | FCC Class A, DOC Class A, VCCI Class, CISPR 22, EN 50022 Class A, AS/NZS 3548, EN 50082-1, EN 61000-3-2, EN 61000-3-3, Statskontoret 26.2 Category 1 IEC/EN 60950-1 FCC Class A, DOC Class A, VCCI Class, CISPR 22, EN 50022 Class A, AS/NZS 3548, EN 50082-1, EN 61000-3-2, EN 61000-3-3, Statskontoret 26.2 Category 1 |

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THE SUPERCOMPUTER COMPANY