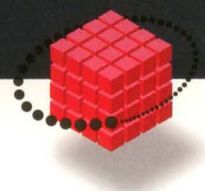


THE RIGHT TOOL AT THE RIGHT TIME

THE CRAY T3D MCA SYSTEM



With the CRAY T3D massively parallel system from Cray Research, a new generation of massively parallel processor (MPP) is born—one that combines the highest levels of sustained performance with the system software and programming environments needed to provide a production-oriented environment.

The CRAY T3D system integrates industry-leading DECchip 21064 (more familiarly known as DEC Alpha) microprocessors with super-computer-class communication and synchronization hardware in a shared distributed memory, multiple instruction multiple data (MIMD) multiprocessor system. Memory is physically distributed among the microprocessors but is globally addressable (any microprocessor can address any memory location in the system). The CRAY T3D system also takes advantage of Cray Research's proven supercomputer packaging and cooling techniques. As a result of this innovative design, Cray Research is transforming hundreds or thousands of independent RISC processors into a supercomputer-class MPP system—one that can address tens of gigabytes of memory, minimize communication overhead, and provide excellent light-weight synchronization.

System software and programming models exploit this hardware capability to sustain high performance for user applications. UNICOS MAX, the CRAY T3D system's distributed operating system, is a sophisticated enhancement of Cray Research's UNICOS operating system. Each microprocessor on the CRAY T3D system runs a minimal microkernel to handle frequently used functions, such as interprocessor communication and memory management. Higher level UNIX system calls are sent by way of a UNIX agent to be serviced by UNICOS running on the CRAY Y-MP or CRAY C90 host system. As a result, programs running on the CRAY T3D system access the same file systems, network protocols, and batch queuing as all other UNICOS applications.

Performance—supercomputer technology

- 32, 64, or 128 processing elements (PEs)
- 19.2 GFLOPS peak performance
- Up to 8 Gbytes (1 Gword) of globally addressable memory
- High-performance interconnect/3-D torus
- High-bandwidth, parallel I/O
- Air- or water-cooled

User productivity—integrated programming environment

- UNICOS MAX distributed operating system
- Standard UNIX operating environment
- Cray Research Adaptive Fortran (CRAFT) programming model
 - Work sharing
 - Data parallel
 - Message passing
- Cray Standard C programming environment
- Highly optimized PVM message passing library
- Optimized scientific libraries
- Cray TotalView debugger
- Advanced performance analysis tools

- Visual program browser
- CRAY T3D Emulator
- Automatic data conversion (IEEE, IBM, CDC)

Production capabilities—Cray Scalable Heterogeneous System

- Batch and interactive processing
- Large job processing
- Efficient parallel processing
- Full connectivity to UNIX and proprietary networks
- Security features (MLS, Kerberos, RIPS0, CIPSO)
- Extensive accounting and resource management facilities
- Scalable heterogeneous applications via PVM
- Network Queuing System (NQS)
- Automated hierarchical storage manager (DMF data migration facility)
- Tape volume management system
- Online tape support
- STK and ER90 support
- Disk striping

CRAY T3D MCA

Application developers can choose from a powerful set of Fortran and C programming environments. Each environment includes an industry-leading optimizing compiler, advanced performance analysis tools, programming tools with industry standard visual interfaces, and high-performance scientific and I/O libraries.

To provide the highest levels of application performance, CRAY T3D systems are coupled closely to the parallel vector architecture of the industry-leading CRAY Y-MP or CRAY C90 supercomputers. The Cray Scalable Heterogeneous System provides maximum flexibility to meet the needs of individual user workloads. Customers can choose from a wide variety of system solutions with different mixes of parallel vector and MPP computational capabilities—an offering unique to Cray Research.

The CRAY T3D MCA (multiple-cabinet, air-cooled) system offers CRAY Y-MP or CRAY C90 system customers all the benefits of the CRAY T3D architecture in a configuration that can be air- or water-cooled and scales down to only 32 processing elements. Running on commonly available 50 or 60 Hz power without the need for a motor-generator set, the CRAY T3D MCA system can be installed anywhere in the world without electrical conversion. The CRAY T3D MCA system is available in a range of sizes from 32 to 128 processing elements with peak performance scaling from 4.8 to 19.2 GFLOPS. Total system memory sizes range from 0.5 to 8 Gbytes.

System configurations

Multi-cabinet CRAY T3D Model	Processing Elements (PEs)	Total Memory (Gbytes)	CRAY T3D Cabinets	Peak Performance (GFLOPS)	Cooling
MCA32	32	0.5 or 2	1	4.8	Air or water
MCA64	64	1 or 4	1	9.6	Air or water
MCA128	128	2 or 8	1	19.2	Air or water

CRAY T3D MCA specifications

System

Peak performance 4.8 - 19.2 GFLOPS
Architecture Multiple instruction multiple data (MIMD) with hardware support for single instruction multiple data (SIMD) processing

Processing elements (PEs)

Microprocessor DECchip 21064 64-bit RISC
Local memory per PE 16 or 64 Mbytes (2 or 8 Mwords)
Data error protection SECCED
Clock speed 6.6 ns
Peak performance per PE 150 MFLOPS peak
PEs per system 32, 64, or 128

Memory

Technology 60 ns, 4-Mbit or 16-Mbit DRAM
Architecture Physically distributed, globally addressable
Total system memory 0.5 - 8 Gbytes (64 - 1024 Mwords)

Interconnect network

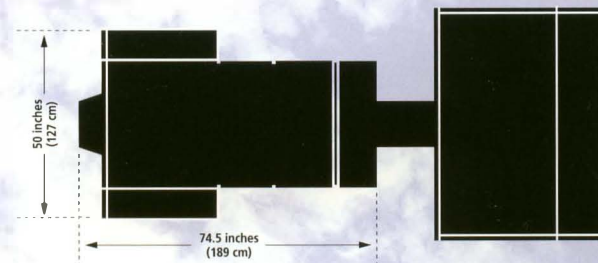
Topology 3-D torus
Peak bisection bandwidth 19.2 Gbytes/s

I/O

Number of I/O gateways 2 or 4
Peak I/O bandwidth 1.6 Gbytes/s
HISP channels 1 per I/O gateway@100 or 200 Mbytes/s bidirectional
LOSP channels 1 per I/O gateway@6 Mbytes/s bidirectional

Physical characteristics

Cabinet footprint area 20 ft² (1.9 m²)
Cooling unit footprint area 19 ft² (1.8 m²)



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THE RIGHT TOOL AT THE RIGHT TIME

THE CRAY T3D S/C SYSTEM



With the CRAY T3D massively parallel system from Cray Research, a new generation of massively parallel processor (MPP) is born—one that combines the highest levels of sustained performance with the system software and programming environments needed to provide a production-oriented environment.

The CRAY T3D system integrates industry-leading DECchip 21064 (more familiarly known as DEC Alpha) microprocessors with supercomputer-class communication and synchronization hardware in a shared distributed memory, multiple instruction multiple data (MIMD) multiprocessor system. Memory is physically distributed among the microprocessors but is globally addressable (any microprocessor can address any memory location in the system). The CRAY T3D system also takes advantage of Cray Research's proven supercomputer packaging and cooling techniques. As a result of this innovative design, Cray Research is transforming hundreds or thousands of independent RISC processors into a supercomputer-class MPP system—one that can address tens of gigabytes of memory, minimize communication overhead, and provide excellent lightweight synchronization.

System software and programming models exploit this hardware capability to sustain high performance for user applications. UNICOS MAX, the CRAY T3D system's distributed operating system, is a sophisticated enhancement of Cray Research's UNICOS operating system. Each microprocessor on the CRAY T3D system runs a minimal microkernel to handle frequently used functions, such as interprocessor communication and memory management. Higher level UNIX system calls are sent by way of a UNIX agent to be serviced by UNICOS running on the CRAY Y-MP or CRAY C90 host system. As a result, programs running on the CRAY T3D system access the same file systems, network protocols, and batch queuing as all other UNICOS applications.

Performance—supercomputer technology

- 128 or 256 processing elements (PEs)
- 19.2-38.4 GFLOPS peak performance
- Up to 2 Gwords (16 Gbytes) of globally addressable memory
- High-performance interconnect/3-D torus
- High-bandwidth, parallel I/O

User productivity—integrated programming environment

- UNICOS MAX distributed operating system
- Standard UNIX operating environment
- Cray Research Adaptive Fortran (CRAFT) programming model
 - Work sharing
 - Data parallel
 - Message passing
- Cray Standard C programming environment
- Highly optimized PVM message passing library
- Optimized scientific libraries
- Cray TotalView debugger
- Advanced performance analysis tools

- Visual program browser
- CRAY T3D Emulator
- Automatic data conversion (IEEE, IBM, CDC)

Production capabilities—Cray Scalable Heterogeneous System

- Batch and interactive processing
- Large job processing
- Efficient parallel processing
- Full connectivity to UNIX and proprietary networks
- Security features (MLS, Kerberos, RIPS0, CIPSO)
- Extensive accounting and resource management facilities
- Scalable heterogeneous applications via PVM
- Network Queuing System (NQS)
- Automated hierarchical storage manager (DMF data migration facility)
- Tape volume management system
- Online tape support
- STK and ER90 support
- Disk striping

CRAY T3D SC

Application developers can choose from a powerful set of Fortran and C programming environments. Each environment includes an industry-leading optimizing compiler, advanced performance analysis tools, programming tools with industry standard visual interfaces, and high-performance scientific and I/O libraries.

To provide the highest levels of application performance, CRAY T3D systems are coupled closely to the parallel vector architecture of the industry-leading CRAY Y-MP or CRAY C90 supercomputers. The Cray Scalable Heterogeneous System provides maximum flexi-

bility to meet the needs of individual user workloads. Customers can choose from a wide variety of system solutions with different mixes of parallel vector and MPP computational capabilities—an offering unique to Cray Research.

The CRAY T3D SC (single cabinet) configuration provides a standalone solution by integrating up to 256 PEs with up to four CRAY Y-MP host CPUs in a single cabinet. Peak performance of the CRAY T3D SC system scales from 19.2 to 38.4 GFLOPS, and total memory sizes range from 2 to 16 Gbytes.

System configurations

Single-cabinet CRAY T3D Model	Processing Elements (PEs)	CRAY T3D Memory (Gbytes)	CRAY T3D Peak Performance (GFLOPS)	Host CPUs	Host Memory (Mwords)	Cooling
SC128	128	2 or 8	19.2	1- 4	64	Water
SC256	256	4 or 16	38.4	1- 4	64	Water

CRAY T3D SC specifications

Integrated host system

CRAY Y-MP CPUs	1 - 4
Peak performance	333 MFLOPS per CPU
Central memory	64 Mwords (512 Mbytes) SRAM
I/O clusters	1 - 3
SSD-E/32i capacity	32 Mwords (256 Mbytes)

CRAY T3D system

Peak performance	19.2 - 38.4 GFLOPS
Architecture	Multiple instruction multiple data (MIMD) with hardware support for single instruction multiple data (SIMD) processing

Processing elements (PEs)

Microprocessor	DECchip 21064 64-bit RISC
Local memory per PE	16 or 64 Mbytes (2 or 8 Mwords)
Data error protection	SECCDED
Clock speed	6.6 ns
Peak performance per PE	150 MFLOPS peak
PEs per system	128 or 256

Memory

Technology	60 ns, 4-Mbit or 16-Mbit DRAM
Architecture	Physically distributed, globally addressable
Total system memory	2-16 Gbytes (256-2048 Mwords)

Interconnect network

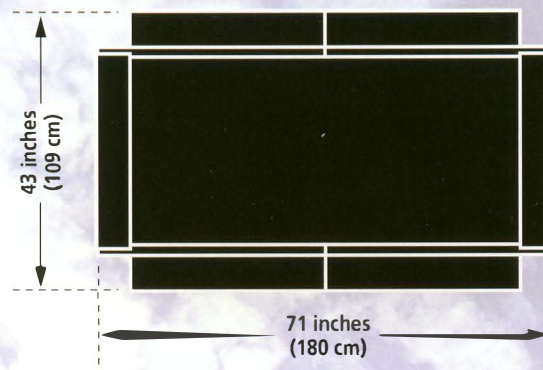
Topology	3-D torus
Peak bisection bandwidth	19.2 Gbytes/s

I/O

Number of I/O gateways	2 - 4
Peak I/O bandwidth	1.6 Gbytes/s
HISP channels	1 per I/O gateway@100 or 200 Mbytes/s bidirectional
LOSP channels	1 per I/O gateway@6Mbytes/s bidirectional

Physical characteristics

Cabinet footprint area	20 ft ² (1.9 m ²)
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THE RIGHT TOOL AT THE RIGHT TIME

THE CRAY T3D MPP SYSTEM



With the CRAY T3D massively parallel system from Cray Research, a new generation of massively parallel processor (MPP) is born—one that combines the highest levels of sustained performance with the system software and programming environments needed to provide a production-oriented environment.

The CRAY T3D system integrates industry-leading DECchip 21064 (more familiarly known as DEC Alpha) microprocessors with supercomputer-class communication and synchronization hardware in a shared distributed memory, multiple instruction multiple data (MIMD) multiprocessor system. Memory is physically distributed among the microprocessors, but is globally addressable (any microprocessor can address any memory location in the system). The CRAY T3D system also takes advantage of Cray Research's proven supercomputer packaging and cooling techniques. As a result of this innovative design, Cray Research is transforming hundreds or thousands of independent RISC processors into a supercomputer-class MPP system—one that can address tens of gigabytes of memory, minimize communication overhead, and provide excellent lightweight synchronization.

System software and programming models exploit this hardware capability to sustain high performance for user applications. UNICOS MAX, the CRAY T3D system's distributed operating system, is a sophisticated enhancement of Cray Research's UNICOS operating system. Each microprocessor on the CRAY T3D system runs a minimal microkernel to handle frequently used functions, such as interprocessor communication and memory management. Higher level UNIX system calls are sent by way of a UNIX agent to be serviced by UNICOS running on the CRAY Y-MP or CRAY C90 host system. As a result, programs running on the CRAY T3D system access the same file systems, network protocols, and batch queuing as all other UNICOS applications.

Performance—supercomputer technology

- 128 to 2048 processing elements (PEs)
- 307.2 GFLOPS peak performance
- Up to 16 Gwords (128 Gbytes) of globally addressable memory
- High-performance interconnect/3-D torus
- High-bandwidth, parallel I/O

User productivity—integrated programming environment

- UNICOS MAX distributed operating system
- Standard UNIX operating environment
- Cray Research Adaptive Fortran (CRAFT) programming model
 - Work sharing
 - Data parallel
 - Message passing
- Cray Standard C programming environment
- Highly optimized PVM message passing library
- Optimized scientific libraries
- Cray TotalView debugger
- Advanced performance analysis tools

- Visual program browser
- CRAY T3D Emulator
- Automatic data conversion (IEEE, IBM, CDC)

Production capabilities—Cray Scalable Heterogeneous System

- Batch and interactive processing
- Large job processing
- Efficient parallel processing
- Full connectivity to UNIX and proprietary networks
- Security features (MLS, Kerberos, RIPS0, CIPSO)
- Extensive accounting and resource management facilities
- Scalable heterogeneous applications via PVM
- Network Queuing System (NQS)
- Automated hierarchical storage manager (DMF data migration facility)
- Tape volume management system
- Online tape support
- STK and ER90 support
- Disk striping

CRAY T3D MC

Application developers can choose from a powerful set of Fortran and C programming environments. Each environment includes an industry-leading optimizing compiler, advanced performance analysis tools, programming tools with industry standard visual interfaces, and high-performance scientific and I/O libraries.

To provide the highest levels of application performance, CRAY T3D systems are coupled closely to the parallel vector architecture of the industry-leading CRAY Y-MP or CRAY C90 supercomputers. The Cray Scalable Heterogeneous System provides maximum flexibility to meet the needs of individual user workloads. Customers can

choose from a wide variety of system solutions with different mixes of parallel vector and MPP computational capabilities—an offering unique to Cray Research.

CRAY Y-MP or CRAY C90 customers can enhance their computer capabilities by integrating a CRAY T3D MC (multiple cabinet) system with existing Cray Research systems. The CRAY T3D MC is available in a wide range of sizes from 128 to 2048 processing elements with peak performance scaling from 19.2 to 307.2 GFLOPS. Total system memory sizes range from 2 to 128 Gbytes.

System configurations

Multi-cabinet CRAY T3D Model	Processing Elements (PEs)	Total Memory (Gbytes)	CRAY T3D Cabinets	Peak Performance (GFLOPS)	Cooling
MC128	128	2 or 8	1	19.2	Water
MC256	256	4 or 16	1	38.4	Water
MC512	512	8 or 32	1	76.8	Water
MC1024	1024	16 or 64	2	153.6	Water
MC2048	2048	32 or 128	4	307.2	Water

CRAY T3D MC specifications

System

Peak performance 19.2 - 307.2 GFLOPS
 Architecture Multiple instruction multiple data (MIMD) with hardware support for single instruction multiple data (SIMD) processing

Processing elements (PEs)

Microprocessor DECchip 21064 64-bit RISC
 Local memory per PE 16 or 64 Mbytes (2 or 8 Mwords)
 Data error protection SECCDED
 Clock speed 6.6 ns
 Peak performance per PE 150 MFLOPS peak
 PEs per system 128, 256, 512, 1024, or 2048

Memory

Technology 60 ns, 4-Mbit or 16-Mbit DRAM
 Architecture Physically distributed, globally addressable
 Total system memory 2 - 128 Gbytes (256 - 16,384 Mwords)

Interconnect network

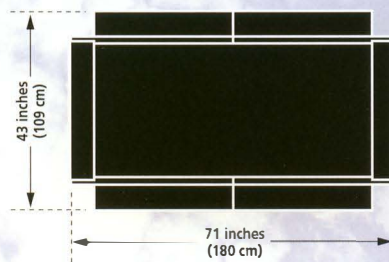
Topology 3-D torus
 Peak bisection bandwidth 76.8 Gbytes/s

I/O

Number of I/O gateways 2 - 32 (1 per 64 PEs standard)
 Peak I/O bandwidth 12.8 Gbytes/s
 HISP channels 1 per I/O gateway@100 or 200 Mbytes/s bidirectional
 LOSP channels 1 per I/O gateway@6 Mbytes/s bidirectional

Physical characteristics

Cabinet footprint area (each) 20 ft² (1.9 m²)



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