Thinking Machines Corporation

Connection
Machine

CM.5
Scale 5

CM-5 Scale 5

CM.5

Offering high-performance computing beyond the reach and below the price of traditional liquid-cooled vector computers, the CM-5 Scale 5 supercomputer supports scientists pursuing Grand Challenge applications and data centers needing to provide fast access to hundreds of gigabytes of on-line data.

Scale 5 systems support a variety of processing-intensive, file-intensive, and general-purpose applications. A processing-intensive Scale 5, equipped with new SuperSPARC processing nodes, has a peak floating-point performance of more than 80 Gflops. A file-intensive Scale 5, similarly equipped, offers 20,000 Mips of processing power, 704 Gbytes of storage, and a sustained input/output transfer rate of 528 Mbytes/sec.

A single CM-5 Scale 5 may be divided into distinct partitions, each a complete computing environment unto itself. And you can establish timesharing controls within each partition.

Each Scale 5 processing node is composed of a 40-MHz SuperSPARC microprocessor, 32-128 Mbytes of memory, and a network interface. Four optional vector units can be added for a total per-node performance of 160 Mflops. The applications you develop on a Scale 5 can run unchanged on larger or smaller CM-5s.

All CM-5 processing nodes and I/O modules are interconnected by the industry's only truly scalable network. The Data Network handles high-bandwidth, point-to-point data transfers. It is optimized to support applications with complex, irregular, and dynamic data structures. A Scale 5 Data Network has up to 1,024 addresses to which you can attach processing nodes, disk storage units, and other I/O devices. The system's bisectional bandwidth ranges from 640 to 2,560 Mbytes/sec, depending on the configuration.

A Scale 5 system's Control Network handles coordinated interactions that involve many processors, such as broadcasting and synchronization. The Diagnostic Network provides, under supervisor control, privileged access to all system components.

Disk storage nodes plug into the CM-5 to form a Scalable Disk Array (SDA). A processing-intensive Scale 5 has 12 disk storage nodes, a 176-Gbyte storage capacity, and a 132-Mbyte/sec data-transfer rate. A file-intensive system has 48 disk storage nodes, a 704-Gbyte storage capacity, and a 528-Mbyte/sec transfer rate. A highly efficient data protection scheme guards against media- and transfer-induced data loss. The SDA is NFS-mountable for remote network access.

Like all CM-5s, a Scale 5 system uses CMOST (Connection Machine Operating System with Timesharing), an enhanced version of UNIX, which is optimized to support parallel computation, communication, and I/O. CMOST provides a complete range of functionality, including timesharing, batch processing, NFS, NQS, and UNIX-style security. CMOST also includes the Scalable File System (SFS), which supports the Scalable Disk Array.

Each Scale 5 supports up to 24 SPARCstation 10 Control Processors. Control Processors let you manage partitions, provide system administration services, control I/O, and provide links to SDAs, Integrated Tape Systems (ITS), and FDDI network connections.

Whether you perform billions of calculations or rapidly sift through gigabytes of data, Thinking Machines can assemble a system to suit your needs. A table on the facing page illustrates processing-intensive, file-intensive, and balanced Scale 5 systems.

Scale 5 System Capabilities

CMOST	UNIX operating system
CM Fortran	Data parallel Fortran
C*	Data parallel C
CMAX	Fortran 77-to-CM Fortran conversion tool
CMMD	Message passing library
CMSSL	Scientific Software Library
CMX11	X Window-based graphics package
CM/AVS	AVS-based distributed visualization system
Prism	OSF/Motif-based environment for application evaluation and data visualization

- Totally air-cooled

- Completely compatible with all CM-5 systems, from the Scale 3 to the teraflops Scale 7

- Supports both message passing and data parallel global address space programming models

- Supports up to 24 SPARCstation 10 Control Processors, each with 64 Mbytes of memory and 1 Gbyte of disk storage

- Supports direct connections from the CM-5 Data Network to Scalable Disk Array (SDA), Integrated Tape System (ITS), as well as FDDI and HIPPI network connections

- Includes 3 credits for training classes

Scale 5 System Summary

	Processing-Intensive Configuration	Balanced Configuration	File-Intensive Configuration
Processing nodes	512	256	128
Network addresses	1,024	1,024	1,024
Storage nodes	12	24	48
Hardware performance[1]			
Peak floating-point operations (Gflops)	83	41	20
Peak integer operations (Gops)	83	41	20
Memory			
Capacity (Gbytes)	16-64	8-32	4-16
Bandwidth (aggregate Gbytes/sec)	328	164	83
Scalable Disk Array (SDA)			
Storage capacity (Gbytes)	176	352	704
Data transfer rate (Mbytes/sec)	132	264	528
Communications link	1 CM-5 HIPPI	2 CM-5 HIPPIs	4 CM-5 HIPPIs
Interprocessor communications bisectional bandwidth (Mbytes/sec)[2]	2,560	1,280	640

[1] Using 4 vector units per processing node
[2] Bisectional bandwidth for random communications, all nodes active

Physical Dimensions (processing-intensive configuration)

Height, in. (cm)	86	(218)
Width, in. (cm)	330	(835)
Depth, in. (cm)	120	(307)
Weight, lb. (kg)	15,000	(6,900)

Power Characteristics (processing-intensive configuration)

Primary power: Per cabinet/console	100A 3-phase/15A 1-phase or 100A 3-phase/2A single-phase
Voltage: Cabinet/console	208/115; 115 or 380/220; 220
Hertz	50 or 60
Power cord	5-conductor hardwired to cabinet
Power dissipation	
Maximum	96,500W / 330,000 BTU/hr.
Typical	72,500W / 250,000 BTU/hr.

Environmental Specifications (processing-intensive configuration)

Maximum ambient air temperature (at floor inlet)	73°F (23°C) maximum
Relative humidity, non-condensing	20%-80% max wet bulb 77°F (24°C)

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