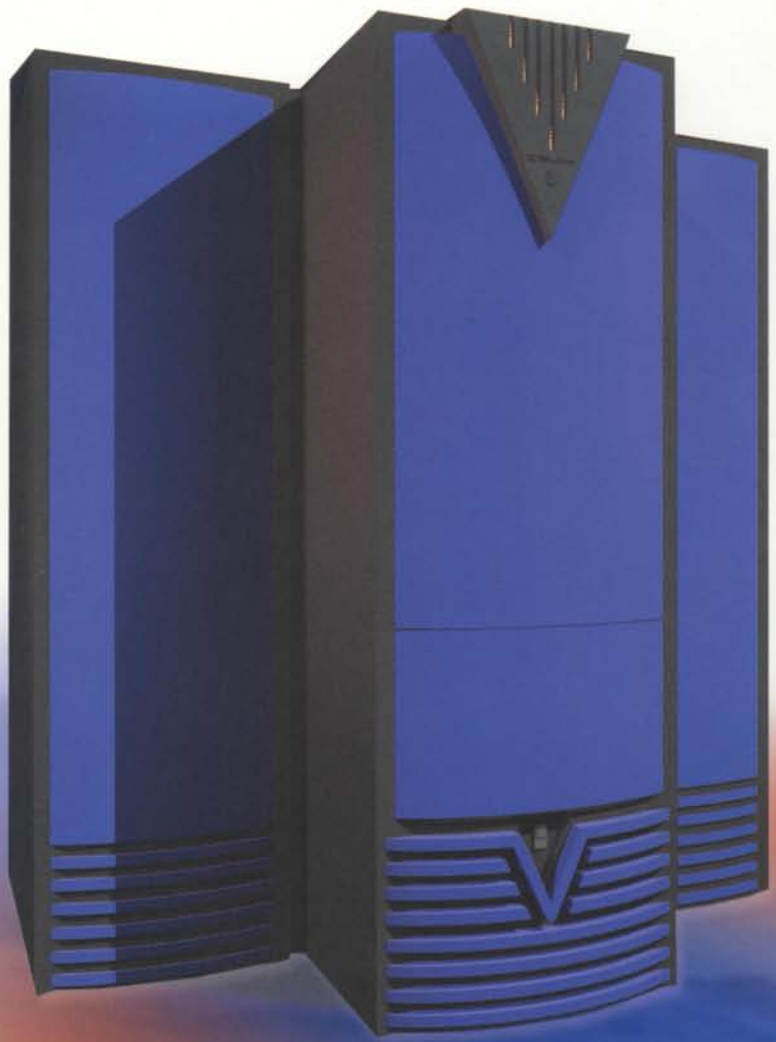
SiliconGraphics
Computer Systems

# CRAY® SVI™

## Supercomputing Series



Product Guide

comes from

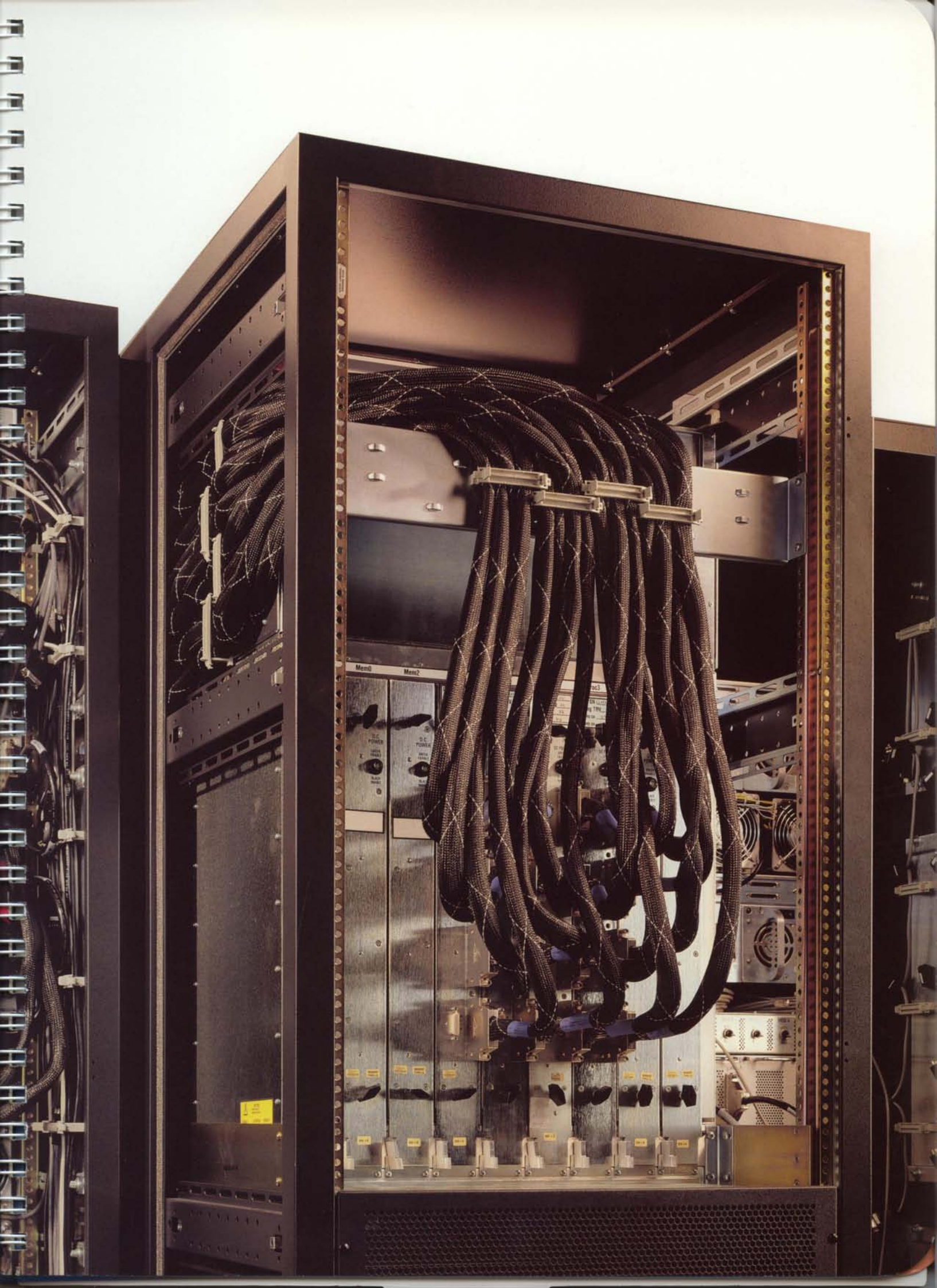
seeing and solving

your toughest

problems in

ways not

possible before.


Mem0
Mem2

# SCALABLE VECTOR: THE VECTOR OF THE FUTURE

Vector supercomputing has always offered the ultimate in processor performance. Now, the new scalable vector architecture from Silicon Graphics takes supercomputing to new levels of performance, affordability and scalability. Introducing the CRAY® SV1™ supercomputer, the first-generation scalable vector series from the world's leading producer of robust, cost-effective CMOS-based supercomputer systems. No other supercomputer product line combines world-class single-processor performance, scalability from entry-level to teraflops-level sizes, and the ability to run the industry-leading library of third-party vector applications.

The dramatic gains in performance and price/performance of the CRAY SV1 architecture create an even more compelling solution for supercomputer customers in the government, manufacturing, science and research, and related sectors. Advances in custom architectural designs, combined with use of industry-leading CMOS and industry-standard memory and disk technologies, enable CRAY SV1 customers to handle a wide range of mission-critical problems better, faster and more cost-effectively than ever before.

## MANUFACTURING

Computational fluid dynamics simulation of an aircraft in flight.

Production-hardened supercomputers are key engineering resources for major automotive and aircraft manufacturers. With their massive computational power and robust multi-user UNICOS operating system, vector supercomputers allow teams of engineers to "virtually design" models before they

The CRAY SV1 supercomputer is the first product in a series of systems that combines industry-leading expertise in both vector processing and scalable computing. In coming years, the company plans next-generation products that will offer even larger gains in per-processor performance and scalability.

VECTOR

are ever physically constructed. Virtual design greatly reduces costly physical testing and allows engineers to manipulate and test designs in ways that would never be possible with physical prototypes.

Simulation of an offset barrier frontal collision.

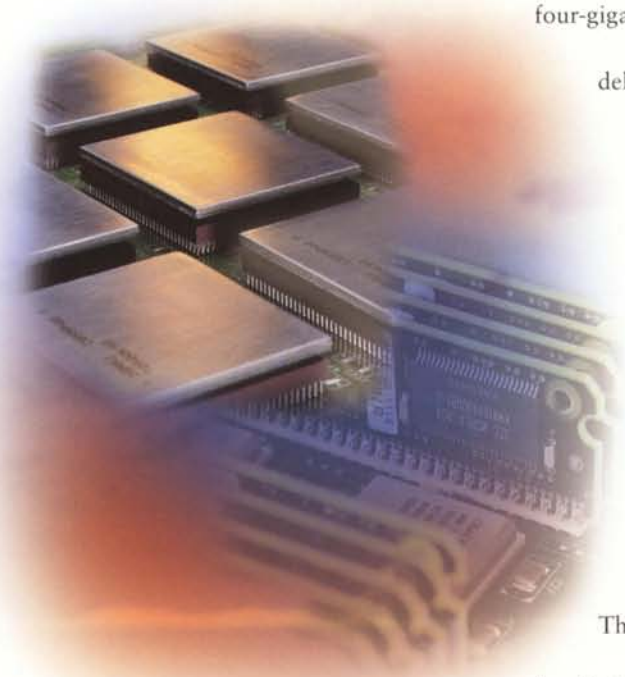
*"The Cray system is used ... in analyzing new vehicle platforms to meet corporate and customer requirements. This work would be next to impossible without the Cray system."*

RON BIENKOWSKI, EXECUTIVE ENGINEER
TECHNICAL COMPUTING CENTER
CHRYSLER CORPORATION

# Performance Innovation: The Multi-Streaming Processor

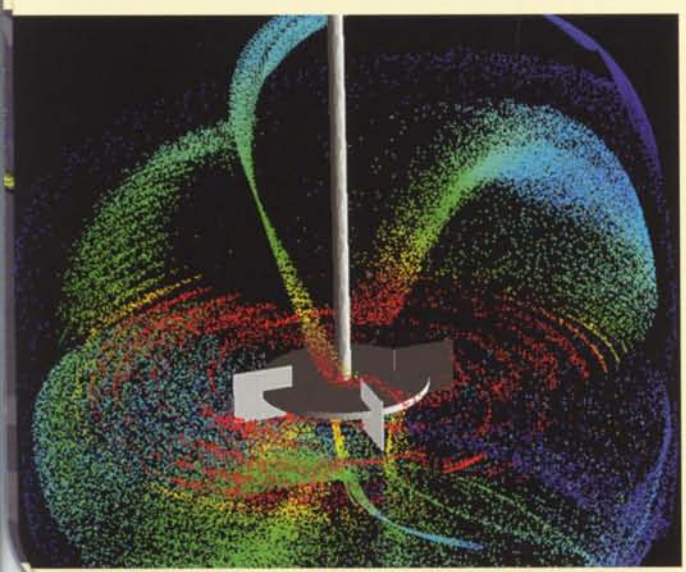
In the design of the CRAY SV1 supercomputer, Silicon Graphics has forged a new processing technology – the Multi-Streaming Processor (MSP) – that delivers four gigaflops of peak CPU performance.

Each CRAY SV1 node can be configured into two types of vector processors; the ultra-performance four-gigaflop MSP, plus standard scalable vector processors that deliver one gigaflop in peak performance. CRAY SV1 system administrators can reconfigure the combination of MSP and standard processors to match their workload plans. No computer in the world provides as much flexibility in matching computing resources with computing needs.



The CRAY SV1 MSP has eight vector pipes and serves as the workhorse for computation-intensive applications. The standard processor has two vector pipes and is designed to handle both the less-demanding application workloads as well as many I/O and system-management operations. A fully configured node of a CRAY SV1 supercomputer contains six MSPs and eight standard processors. Each processor type scales within a CRAY SV1 chassis and can be harnessed in a supercluster of additional chassis nodes for outstanding throughput scaling.

## SCIENCE



Simulation of a stirred tank with a radial flow impeller using FLUENT.

From the research lab to giant pharmaceutical companies, scientists are using vector supercomputers as vital research tools. Drug researchers conduct virtual experiments to help speed development times of

# System Balance

CRAY-branded supercomputers have long been designed with balance in mind – fast processors mean little without fast memory and I/O. The CRAY SV1 system upholds this tradition with another key advance: the ability to run vector computations through high-bandwidth, custom-streaming cache memory. This innovation substantially increases effective memory bandwidth while using cost-effective DRAM memory technology.

The new CRAY SV1 series unites leading CMOS and DRAM implementations with outstanding performance. Advances in CMOS and DRAM technologies in recent years have dramatically improved their capabilities in high-end computing.

No company is better positioned to take advantage of these continuing advances than Silicon Graphics. For nearly a decade, products such as CRAY J90™ and CRAY® Origin2000™ supercomputers have propelled Cray systems to the leadership position in cost-effective, reliable CMOS-based supercomputers.

The backbone of the CRAY SV1 interconnect and I/O architecture is the GigaRing™ I/O channel. This high-performance, counter-rotating, dual-ring channel moves large amounts of data via high-bandwidth connections among CRAY SV1 nodes. Supported industry-standard networking protocols include HIPPI, FDDI, Ethernet and ATM. Disks and tapes are supported by SCSI, ESCON, Fibre Channel-arbitrated loop and IPI connections.

BALANCE

life-saving medicines. And physicists and astronomers find vector supercomputers invaluable in their research into the outer and inner reaches of the universe.

*"The vector architecture has always provided speed, but its lack of scalability has limited it. The Silicon Graphics scalable vector product line eliminates that concern for me."*

DR. JOSEPH VILLAFRANCA, VICE PRESIDENT OF MACROMOLECULAR STRUCTURE
BRISTOL-MYERS SQUIBB

# SCALABILITY

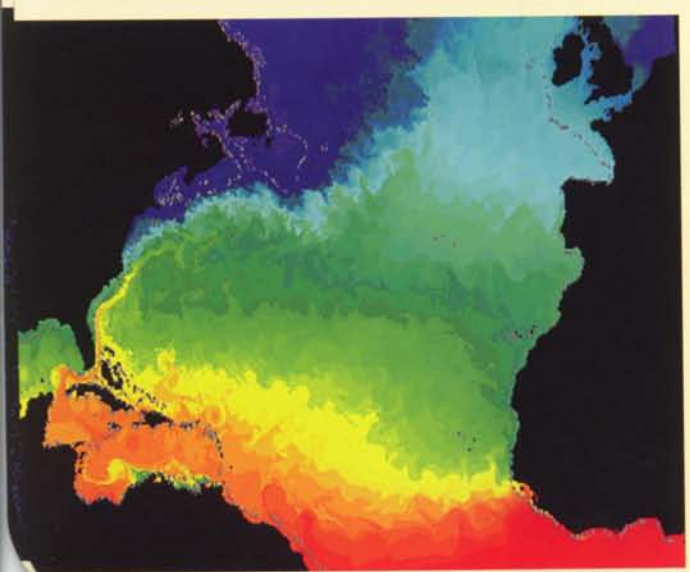
Through superclustering technology pioneered by Silicon Graphics, the CRAY SV1 supercomputer provides a cost-effective solution to scale beyond the resources available within a single node. The CRAY SV1 supercomputer scales to 32 nodes with up to one teraflop of peak CPU performance and more than one terabyte of memory.

Each node in the cluster is a high-performance flat-memory UNICOS® system, providing supercomputer performance and tools. Superclustering capabilities such as the production-ready UNICOS operating system, Fortran and C++ programming environments

**CRAY SV1 CONFIGURATION OPTIONS**

| CRAY SV1 | CRAY SV1-1A | CRAY SV1-1 | CRAY SV1-4 | CRAY SV1-8 | CRAY SV1-32 |
|---|---|---|---|---|---|
| Peak System Performance GFLOPS | 8 to 16 | 8 to 32 | 32 to 128 | 64 to 256 | 256 to 1024 |
| Number of CPUs: | | | | | |
| 4 GFLOPS CPUs | Up to 3 | Up to 6 | Up to 24 | Up to 48 | Up to 192 |
| Plus 1 GFLOPS CPUs | 4+ | 8+ | 32+ | 64+ | 256+ |
| or if all 1 GFLOPS | 8 to 16 | 8 to 32 | 32 to 128 | 64 to 256 | 256 to 1024 |
| CPU Clock (Mhz) | 250 | 250 | 250 | 250 | 250 |
| Number of SMP Nodes | 1 | 1 | 4 | 8 | 32 |
| Memory Size (GBs) | 2 to 16 | 4 to 32 | 16 to 128 | 32 to 256 | 128 to 1024 |
| Memory Technology | DRAM | DRAM | DRAM | DRAM | DRAM |
| Cooling Options | Air | Air | Air or Water Assisted | Air or Water Assisted | Water Assisted |

## GOVERNMENT / ENVIRONMENTAL



Simulation of ocean temperature.

The Department of Defense and other government agencies use vector supercomputers for a variety of tasks, including the design of advanced military equipment and capabilities, communications analysis, signal processing and the improvement of national security. Government

and compiler tools provide flexible options for configuring high performance networks, while balancing workload and allocating the appropriate resources to each job.

At the node level, UNICOS provides high-performance batch processing, data-handling capability, resource allocation, and security. Between nodes, CRAY SV1 clustering software provides automatic job-level workload distribution, distributed file access, support for distributed programs, high-performance shared data access, and single sign-on with DCE (Distributed Computing Environment), among other features. The CRAY SV1 superclustering technology supports several programming models, including MPI (Message-Passing Interface), OpenMP™ and SHMEM (Cray Shared Memory Access Library).

## Software Strength and Reliability

The CRAY SV1 supercomputer uses the proven UNICOS operating system, renowned for its scalability, flexibility and performance in a parallel environment. In addition, the CRAY SV1 software environment is fully compatible with the expansive and highly tuned UNICOS application catalog. The Silicon Graphics CF90™ Fortran compiler provides automatic vectorization; scalar optimization; and Autotasking®, a parallel-processing feature that automatically partitions individual programs so that the parts execute simultaneously on multiple processors. Autotasking works with both types of processors.

Through use of Year 2000-compliant UNICOS and proven hardware CMOS technology, the CRAY SV1 supercomputer will continue the tradition of reliability established by the CRAY J90™ CMOS supercomputer. Many CRAY J90 users have gone for years without a system interruption.

RELIABILITY

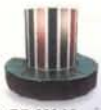
and private-sector weather and climate agencies around the globe also rely on vector supercomputers to process the data-laden models used in weather forecasts and climate research.

*"The (Cray) systems have proven that they can take on the challenge of our biggest, most complex problems."*

DR. BRUCE ROSS, ASSISTANT DIRECTOR,
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
GEOPHYSICAL FLUID DYNAMICS LABORATORY / GFDL

# Vector Leadership Through the Decades

Throughout the years, every release of a Cray-branded vector supercomputer set new standards in supercomputing. The CRAY-1® supercomputer, released in 1976, established an entirely new level of computer performance. In 1982, the CRAY X-MP™ introduction marked the first-ever use of multiple processors. In 1986, Cray Research was the first to use UNIX® as a supercomputer operating system. More recently, the CRAY J90 CMOS supercomputer set price/performance records for vector computing, and the CRAY T90™ top-end supercomputer neared the two gigaflop-per-processor mark and employed radical new interconnect technologies.



CRAY-1®

CRAY X-MP™

CRAY-2™

CRAY Y-MP®

CRAY C90™

**1991 – CRAY C90**

This was the high-end supercomputer of the early '90s. Peak performance equalled 16 gigaflops.

CRAY J90™

**1995 – CRAY J90**

The world's best selling and most reliable vector supercomputer.

CRAY T90™

**1994 – CRAY T90**

The world's most powerful vector supercomputer.

**1976 – CRAY-1**

Cray's first supercomputer. This system had a peak performance of 133 megaflops. The first system was installed at Los Alamos National Laboratory.

**1982 – CRAY X-MP**

This system was capable of 500 megaflops and was the world's first multi-processing supercomputer.

**1985 – CRAY-2**

At the time, the CRAY-2 system had the world's largest central memory of 2048 MB. The system had a peak performance of 1.9 GB.

**1988 – CRAY Y-MP**

This system was key to breaking the one gigaflop performance barrier. It has traditionally been the standard by which other supercomputers are compared.

Now, the **CRAY SV1** scalable vector supercomputer makes its own mark in the annals of supercomputing. The CRAY SV1 system more than doubles the current industry best in per-processor peak performance with a four gigaflops peak rate. Its scalability to a teraflop of peak performance sets a record in vector scalability. And its combination of advanced custom technology and commodity components results in huge gains in its price/performance.

**CRAY SV1™**

CRAY SV1

SiliconGraphics
Computer Systems


Cray Research, Inc.
Headquarters
655 Lone Oak Drive
Eagan, MN 55121
URL: http://www.cray.com

Silicon Graphics, Inc.
Corporate Office
2011 N. Shoreline Boulevard
Mountain View, CA 94043
(650) 960-1980
URL: http://www.sgi.com

U.S. 1(800) 800-7441
Europe (44)118-925.75.00
Asia Pacific (81) 3-54.88.18.11
Latin America 1(650) 933.46.37

Canada 1(905) 625-4747
Australia/NewZealand (61) 2.9879.95.00
SAARC/India (91)11.621.13.55
Sub-Saharan Africa (27) 11.884.41.47





1817 (6/98)