CRAY CS6400 Enterprise Server

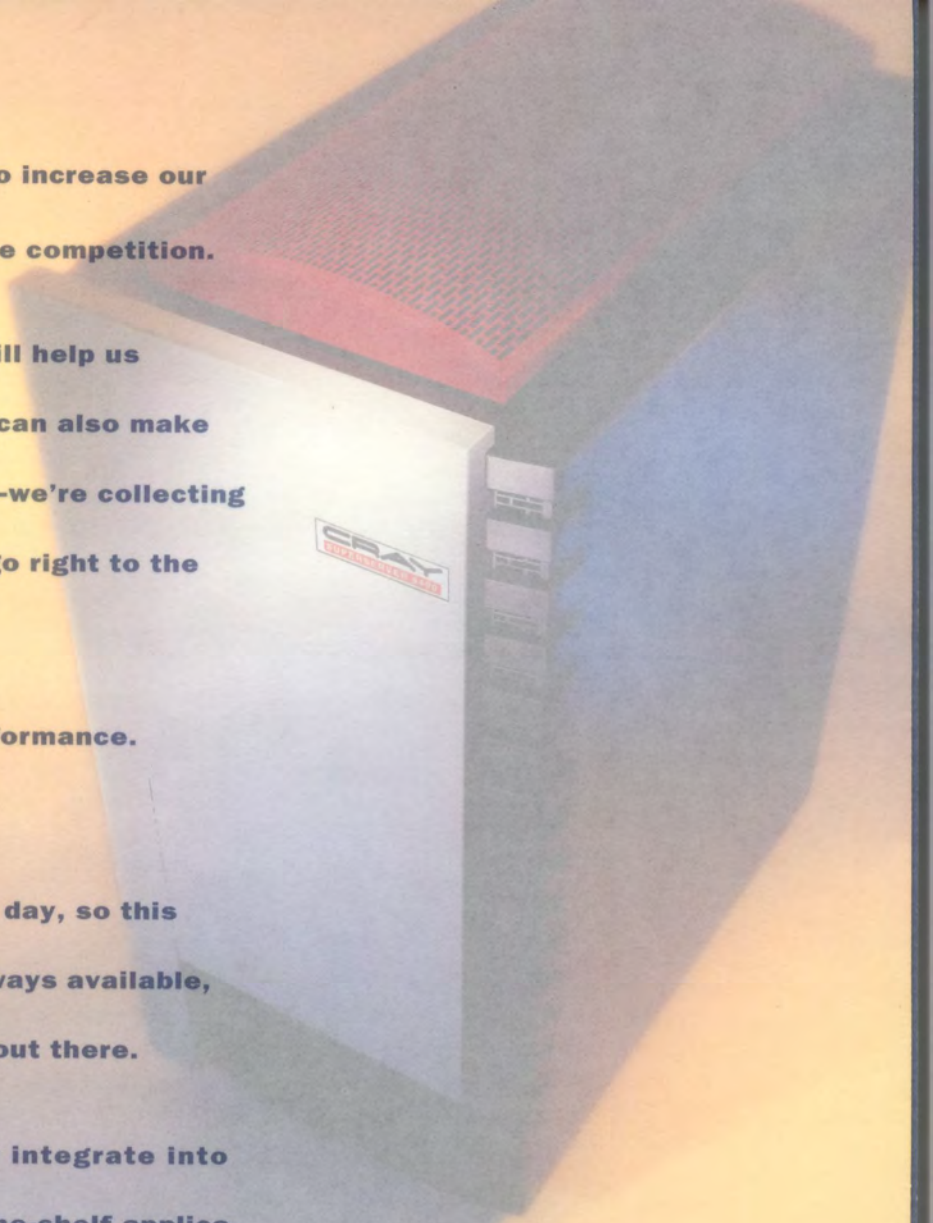
SERVING THE

BUSINESS

OF YOUR

ENTERPRISE

CRAY RESEARCH BUSINESS SYSTEMS



It's time to find new ways to increase our profitability. And outrun the competition.

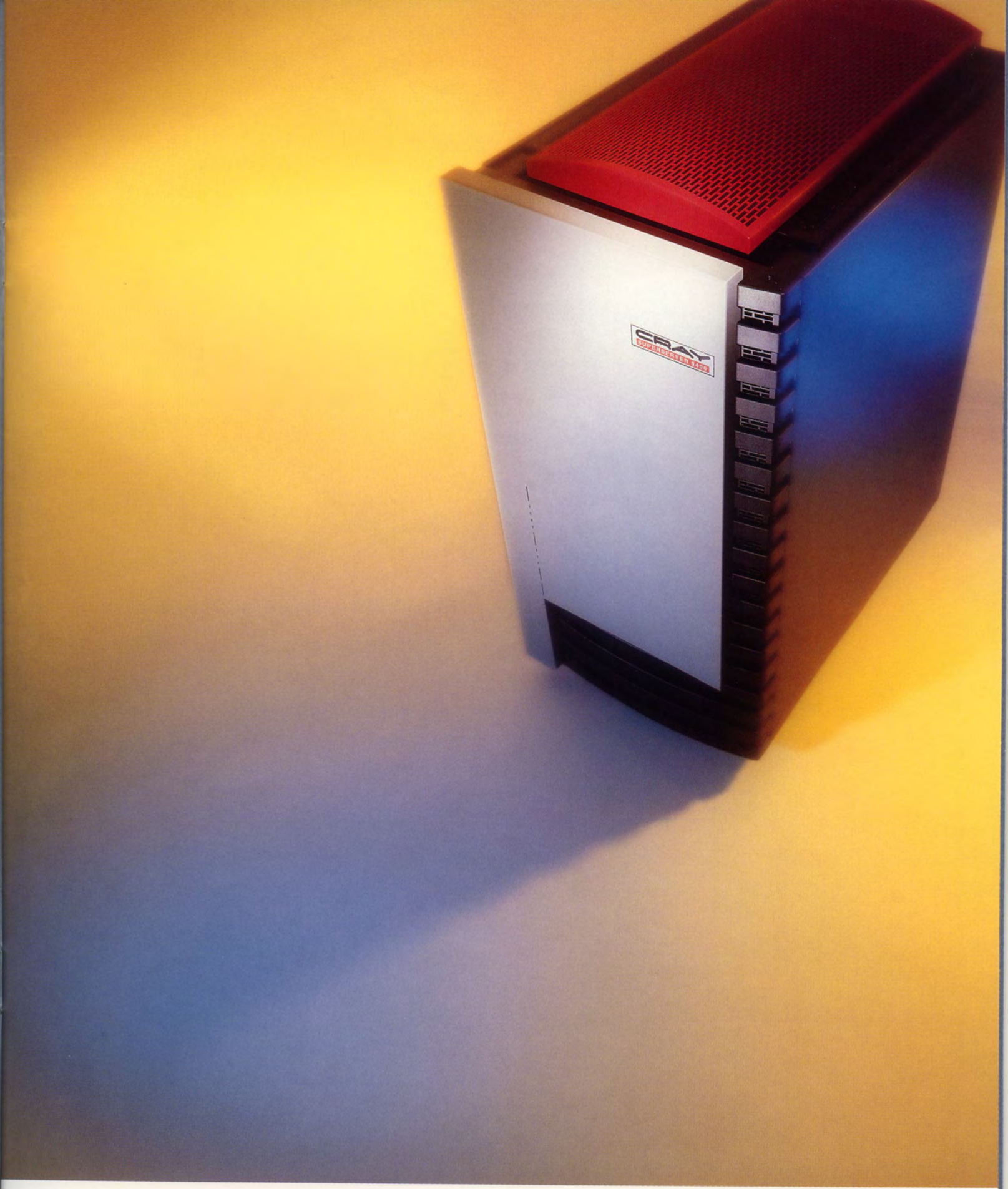
The right computer system will help us serve more customers. If we can also make superior business decisions—we're collecting more data all the time—it'll go right to the bottom line.

I need a system with top performance. At a good price.

Our company runs 24 hours a day, so this system has to be reliable, always available, and include the best service out there.

Our new system must easily integrate into the data center and use off-the-shelf applications so we can remain cost-effective. I want easy expansion—so the system can grow without disrupting our users—and guidance in designing and implementing complex IT projects.

It all comes down to performance, though. My users and customers expect the best.



SERVING THE BUSINESS OF YOUR ENTERPRISE

At last—a competitive edge. Now I make better decisions, based on larger sets of data, and in less time. No more bottlenecks.

A successful business constantly improves itself to serve its customers. After all, serving your customers is what your enterprise does best. And serving the business of your enterprise is what the CRAY CS6400 system and Cray Research Business Systems do best.

The CS6400 enterprise server is a high-performance symmetric multiprocessing (SMP) system created from industry-standard hardware and software. As a result, over 10,000 off-the-shelf UNIX applications run on the CS6400 system, including the ones your business counts on for:

Decision support systems (DSS) CS6400 performance—speed and storage capacity—enables business analyses that help you increase your revenue.

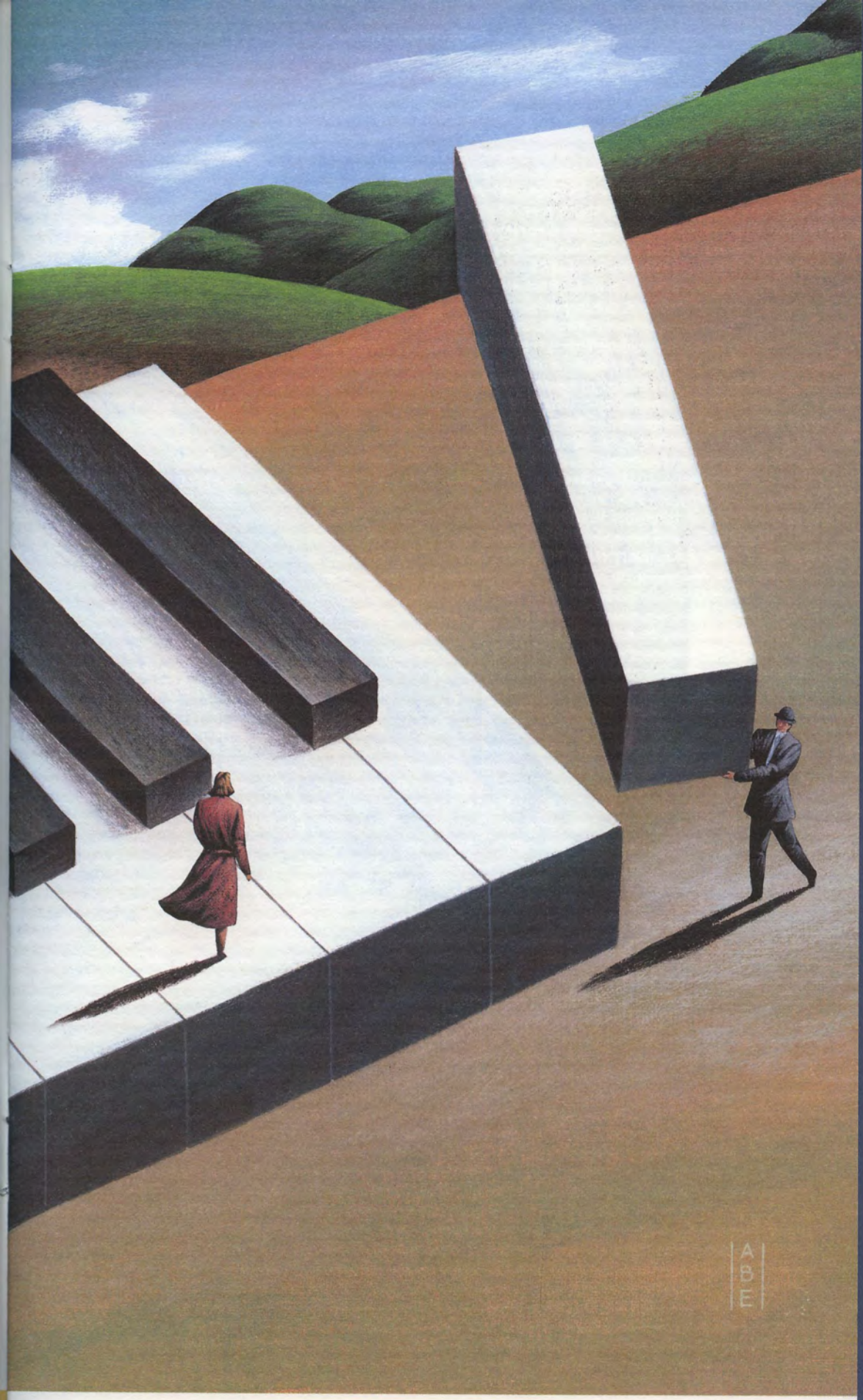
Data warehouse applications High-bandwidth I/O helps you quickly sift through trillions of bytes of data to pinpoint the answers you need.

Online transaction processing (OLTP) Hundreds to thousands of concurrent users can take advantage of rapid CS6400 response time to quickly serve your customers.

Business analytics Efficient scalability allows you to solve larger and more complex compute-intensive problems—with applications and data you already have in place.

Multimedia The ability to deliver large amounts of video and image data to large numbers of users—quickly—makes the CS6400 system ideal for incorporating multimedia applications into your business.

The open CS6400 system easily integrates with existing legacy and open systems. For enterprise computing consultation and integration, our CraySolutions group provides complete solutions through value-added services. In addition, Cray's service completes the support your business requires.



CS6400 scalability

means that I won't

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It's modular—

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THE GROWTH YOUR BUSINESS REQUIRES

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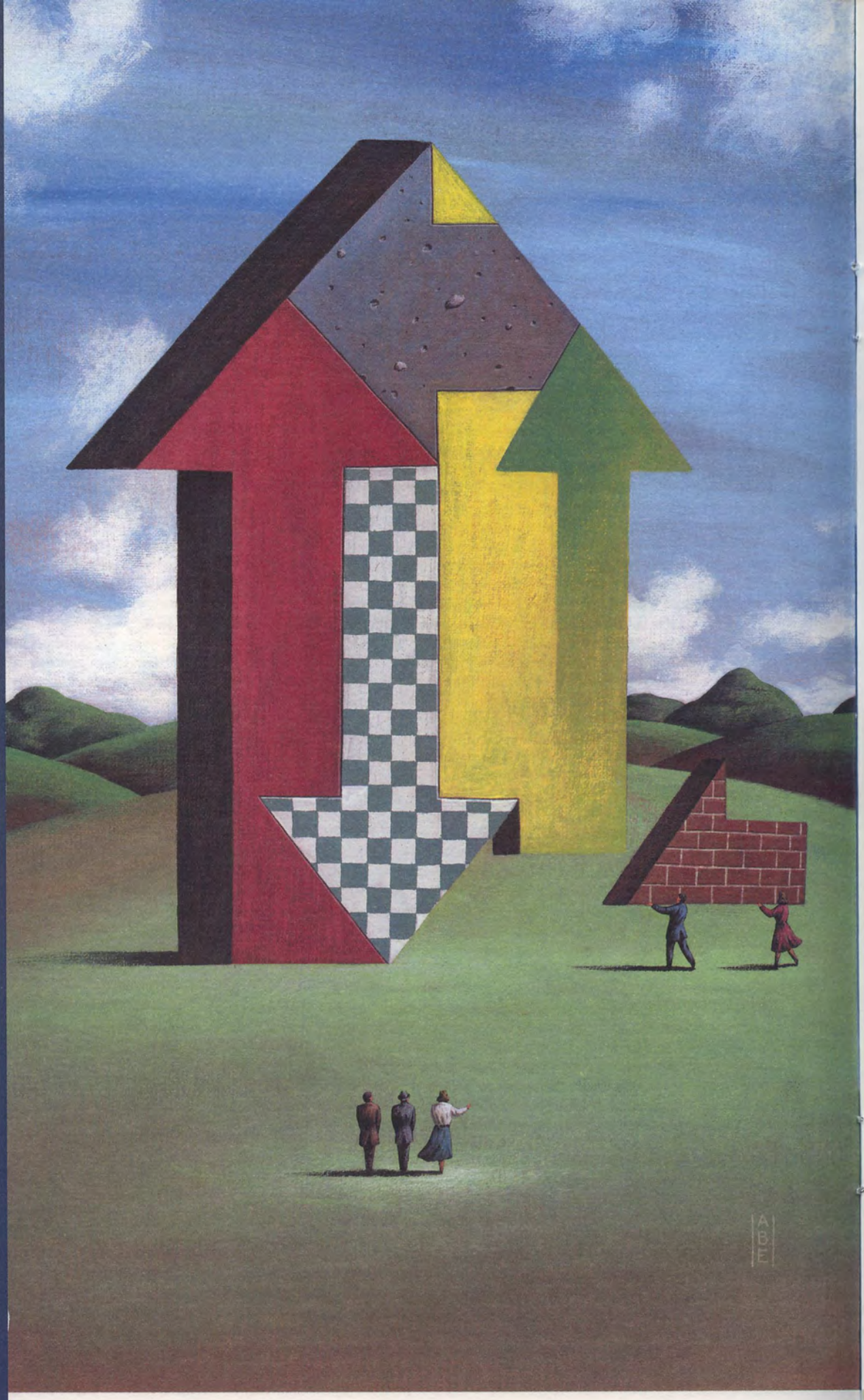

WE PROVIDE THE COMPONENTS TO

No matter how successful you become, CS6400 scalability—unequaled on real work—provides the computing growth path a successful business needs today and tomorrow.

GROW YOUR COMPUTER WITH YOUR BUSINESS

The CS6400 system efficiently handles the business world's largest data-oriented problems by delivering industry-leading performance and price/performance. It does so by incorporating up to 64 SuperSPARC processors, 16 Gbytes of shared memory, and 5 Tbytes of mass storage.

Balanced and maximized system performance comes from the CS6400 system's unmatched system bandwidth of 1.76 Gbytes/s, delivered by the 4-XDBus interconnect, the basis of the CS6400 design. These factors facilitate speedy and scalable communications between processors, memory, disk storage, network connections, and IEEE-standard peripheral devices.

The CS6400 system simultaneously retrieves, processes, and stores data through its overall I/O bandwidth of 800 Mbytes/s. By taking advantage of this parallel I/O architecture, complex queries and transactions can quickly address the largest of databases.

As your databases and computing requirements grow, you can easily expand your system simply by adding combinations of additional I/O, memory, or processor modules. The CS6400 system's modular design and hot swap capability let upgrades and expansion take place online, usually without disrupting system operations or your applications.

CS6400 scalability means that I won't grow out of my system. It's modular—I can add all the pieces I want, when I want.

My business is always up and running, thanks to CS6400 reliability, availability, and serviceability.

Furthermore, you can use partitions to run crucial production applications 24 hours a day while running development projects in a separate environment—without affecting production. You can also dedicate part of the system to specific tasks to increase performance or guarantee resources.

AVAILABILITY DERIVED FROM RELIABILITY PROVIDES DEPENDABILITY

CS6400 system availability surpasses that of mainframes. Its reliability, availability, and serviceability (RAS) features keep your business on time, all of the time. Due to the CS6400 hot swap capability, module replacement does not disrupt users. Nor does a bus or power supply failure, thanks to redundant XDBuses and power supplies. And alternate I/O paths provide continuous I/O in the event of a controller failure.

Cray's standard service offerings allow the CS6400 system to provide 99.9 percent availability; the system can be configured for 99.98 percent availability via dual pathed peripherals and disk mirroring. For continuous availability, multiple systems can be redundantly coupled with failover software. CS6400 serviceability is enhanced by the system service processor (SSP), a separate workstation equipped with diagnostic and administrative tools.

HIGH-PERFORMANCE POWER FOR 10,000 APPLICATIONS

The CS6400 system delivers high-performance power to the over 10,000 commercial, off-the-shelf applications currently available for SPARC/Solaris platforms. These application solutions run without modification, allowing you to benefit from

AAA

"With the move to the CS6400 enterprise database server, easy access and use of this travel database and reservation system can be realized by our clubs. The speed and performance capabilities of the CS6400 system will enable us to progress with our plans for this important new piece of our business."

LOU FRESQUEZ, *Vice president and chief information officer, AAA*

The American Automobile Association (AAA) was searching for a computer system to support a new travel program offered by 1000 affiliated motor clubs throughout the U.S. and Canada.

AAA chose a 20-processor CS6400 system to run its large and expanding Informix OLTP database. AAA found that the CS6400 system could serve the required 1040 concurrent online users with a response time of less than two seconds. AAA also chose the CS6400 system for its scalability, expandability, and reliability/availability features.

BANK OF AMERICA

"... the bank is bulking up its marketing muscle with ultrafast parallel computers from Cray Research Inc., the king of supercomputing. Working in combination with the AT&T computers already in place, the Crays will grind through more data even faster—and, the bank hopes, identify more profitable sales opportunities before the competition does."

From **BUSINESS WEEK**, *July 30, 1995*

Bank of America, the second-largest U.S. bank holding company, has installed three CS6400 systems. These systems are used to run large data warehousing and DSS applications. The production systems manage a data warehouse expected to grow to more than 150 Gbytes within its first year, and support hundreds of PC users.

CITIBANK

"With the boost in speed we expect from our CS6400 system, we're targeting substantial reductions in key processing areas, keeping Citibank at the leading edge of the derivatives industry. The compatibility of the CS6400 system with applications we're already running on our networked workstations means we'll be able

The CS6400 runs the applications we want, without modification. It's from Cray— it's fast.

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to realize these benefits quickly and without a major software conversion effort."

GORDON CLANCY, *head of research and technology for Citibank's Global Derivatives business*

Citibank has integrated a CS6400 system with a network of Sun Microsystems workstations that are used for the company's derivatives applications.

ELECTRICITE DE FRANCE (EDF)

"We were looking for a high-performance UNIX server to support a variety of applications and a large number of users, and the CS6400 system was our choice. With its data center capabilities, scalability and excellent price/performance the system fits nicely into our existing network."

MICHEL PAVARD, *head of EDF's data processing and applied mathematics unit*

EDF, the world's largest electrical utility, based in Clamart, France, uses their CS6400 system for scientific, engineering, and data management applications serving users over EDF's extensive computer network.

MANCHESTER COMPUTING CENTRE

"Our benchmarks measured combined workload capacity, computational power and response time. With 175 users accessing eight separate 1 Gbyte datasets, the CS6400's response time was almost instantaneous, a fraction of a second."

FRANK SUMNER, *director of computing services, University of Manchester*

The Manchester Computing Centre, University of Manchester, uses a CS6400 system as the computing platform for the United Kingdom census data and other National Dataset (database) Services it provides to thousands of researchers. The CS6400 system won the procurement by clearly outperforming competing systems on rigorous benchmark tests.

ARCO

"We ran performance benchmarks against other systems and looked at price/performance, and the CS6400 came out on top."

RICH HOLMER, *manager of ARCO's Geophysical Acquisition and Processing Department*

ARCO engineers use the CS6400 system to process seismic data on the order of hundreds of gigabytes

to help the company find and extract oil more efficiently. The CS6400 system is networked to Sun and SGI workstations and an IBM 3090 mainframe.

UNIVERSITY OF WARSAW

"We chose the Cray Research CS6400 because of its fast data interchange between processors, memory, and I/O, which are important for our parallel computation algorithms."

DR. ANDRZEJ WIERZBICKI, *professor at the Warsaw University of Technology and chairman of the Research Council of the Polish Wide-Area Scientific Computer Network*

The Warsaw University of Technology (Politechnika Warszawska), recently nominated for a Computerworld/Smithsonian Leadership Award for innovative technology, uses a CS6400 system for scientific engineering computations in chemistry, aeronautics, electronics, informatics, and telecommunication.

SICAN

"The CS6400 is an outstanding option for us since most of our codes now run on our more than 50 Sun systems. We know that these same codes will run without recompilation on the CS6400, which will provide a central, powerful and cost-effective resource for our many desktop Sun users. In effect, the CS6400 allows us to upgrade each of our workstations with one single purchase."

HANS WEINERTH, *chairman and chief executive officer, SICAN*

German electronics firm SICAN, based in Hannover, has installed a CS6400 system for highly scalar electronic computer-aided design (ECAD) applications, as well as for data management.

GARTNER GROUP

"...Cray Research has produced a system that is not quite SMP and not quite MPP, but has the best of both."

From **GARTNER GROUP,** *March, 1994*

INTERNATIONAL DATA CORPORATION

"Cray's more than 20 years of experience in the industry has allowed it to develop both the expertise and infrastructure necessary to support data center operations. [The CS6400 system]

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provides the highest level of SMP scalability of any product on the market... [The CS6400 system] operates at the highest component speed of any SPARC/XDBus products..."

From **INTERNATIONAL DATA CORPORATION,** *August, 1995*

ABERDEEN GROUP

"IS decision makers who have a requirement for very high-end UNIX and RDBMS-based applications owe it to their enterprise users to thoroughly investigate Cray Business System division offerings as part of their business decision process."

"Cray has the tools, systems platforms, and the services to address the application requirements of enterprise customers who are now willing to migrate from existing, proprietary systems to open systems."

"Technologically, Cray's system design is stellar."

From **ABERDEEN GROUP,** *June, 1995*

SUN MICROSYSTEMS

"We're excited about the [CS6400 system] from Cray. They're using their expertise in high-performance computing to deliver very powerful systems that complement our products. This is a big win for users and the SPARC world."

SCOTT MCNEALY, *Chairman and CEO, Sun Microsystems, September, 1993*

ORACLE CORPORATION

"Oracle and Cray are the acknowledged leaders in enterprise scalability. We are working very closely with Cray in many customer projects to deliver one of the industry's best mainframe alternatives."

JOSEPH VASSALLO, *Vice President of the Solaris Products Division at Oracle Corporation, August, 1995*

INFORMIX SOFTWARE

"The CS6400 system provides a natural high-end platform for our SPARC/Solaris users. We have a strong customer base and a wealth of experience in many of Cray's target markets. We are excited about the anticipated high performance of our product on this new enterprise server and expect to see much interest."

TIM SHETLER, *Vice President of Product Marketing, Informix Software, October, 1993*

the specialized hardware and software products for commercial and technical applications in areas such as:

Telecommunications Customer services, customer billing, network operations and administration, and marketing and customer analysis.

Financial services Marketing analysis, order processing, telemarketing, business analytics, fraud detection, and back office operations.

Government Crime prevention, text retrieval, general administration, and threat analysis.

Retail and manufacturing Financial controls, customized marketing, inventory management, order processing, and supply chain integration.

Transportation and hospitality Crew scheduling, ticket pricing, and customer reservation systems.

We have taken our Solaris compatibility one step further by creating strategic alliances with key software partners (Oracle and Informix among them) so their applications can fully use the power offered by the CS6400 system.

STANDARD DEVELOPMENT SOFTWARE

For custom application development, the CS6400 system supports standard compilers, libraries, and tools such as CraySoft's Fortran 90 Programming Environment. Other standards-based development tools include SunSoft's Professional Fortran, C, C++, Cobol, and Ada compilers, as well as computer-aided software engineering (CASE) applications, fourth-generation languages (4GL), and other products from independent software vendors.

The CS6400 runs the applications we want, without modification. It's from Cray—it's fast.

Compatibility, applications, availability and a large install base are what I look for in an operating system—Solaris on a CS6400 system fulfills these requirements.

The CS6400 system also supports the CraySoft LibSci Numerical Library, more than 1000 high-performance parallelized mathematical modeling routines useful for analytical applications and business and technical simulation.

APPLICATIONS SOAR OVER A STANDARD OPERATING SYSTEM

The CS6400 system operates under the Solaris operating environment, with Cray extensions for commercial processing. Solaris is a highly threaded, SMP implementation of UNIX System V Release 4. Certified SPARC Compliant, our operating environment conforms to all generally accepted industry standards such as the SVR4 applications binary interface, POSIX 1003.1, X/Open, XPG3, and XPG4.

Parallel processing support, real-time features, disk striping, and disk mirroring enhance performance and protect data. The system allows data backup and restoration while applications continue to run. System and network security are also part of the operating environment. UNIX network batch management and load balancing are available through CraySoft's Network Queuing Environment (NQE).

The sophisticated CS6400 tape management subsystem provides secure and unattended operations, as well as ANSI/IBM labeled tape support, user access to tape files by name instead of reel number, security on labeled tapes using UNIX file permissions, the Cray/REELlibrarian tape catalog, volume sets, tape drive reservations, and StorageTek and Exabyte robotic device support.

CS6400 performance

gives my users the

fast responses they

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THROUGH CS6400 POWER AND PERFORMANCE

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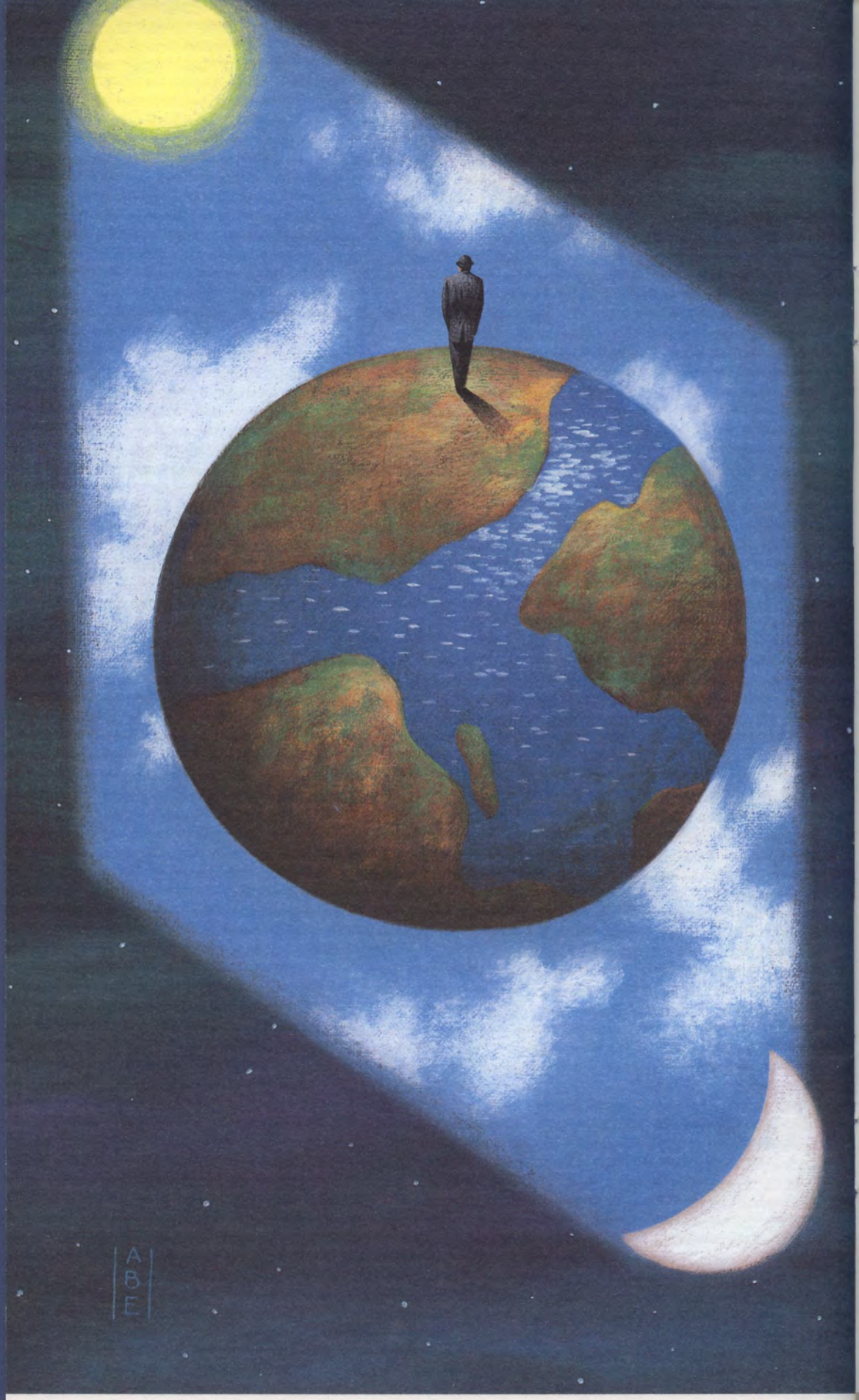

RELY ON CS6400 AVAILABILITY TO KEEP

CRAY SERVICES ASSURE COMPREHENSIVE SOLUTIONS

Cray Research Business Systems provides startup and consulting services through our CraySolutions group, which provides the knowledge and expertise necessary to solve the business world's Grand Challenges. CraySolutions offerings include business process improvement, core business systems selection and implementation, DSS and data warehousing consultation, and custom business applications development, along with training and project management.

The CS6400 system is backed by service from Cray—one of the most respected service suppliers in the computer industry. Using service teams around the world, we channel Cray's resources into the high-quality, localized service you need.

PUTTING IT ALL TOGETHER

When you look at all aspects of creating a viable long-term enterprise information system, your computer systems play a crucial role. By packaging the CS6400 system with power, high availability, scalability for future growth, value-added services, high-quality service, and the ability to plug into any computing environment, Cray Research Business Systems has created a solution that your business can count on.

The CRAY CS6400—serving the business of your enterprise.

CS6400 performance gives my users the fast responses they need to do their jobs.

The CRAY CS6400,

serving the business

of my enterprise.

PHYSICAL

	System Cabinet	I/O Cabinet
Height	*68.5 inches (174 cm)*	*68.5 inches (174 cm)*
Width	*32 inches (81 cm)*	*32 inches (81 cm)*
Depth	*56 inches (142 cm)*	*47 inches (119 cm)*
Weight	*1150 pounds (521 kg) (fully configured with 64 processors)*	*1200 pounds (544 kg) (fully configured with 54 disks)*

CPU

CPUs per system	*4 to 64*
Clock rate	*60 or 85 MHz*
Word length	*32 bits*
On-chip cache	*20 Kbytes instruction cache; 16 Kbytes data cache*
External cache	*2 Mbytes*

MEMORY

Memory type	*4 or 16 Mbit DRAM with 0.6 µs latency*
Memory per system	*256 Mbytes to 16 Gbytes*

INTERCONNECT

System bus	*4 XDBus buses per system provide an aggregate 1.76 Gbytes/s bandwith*

I/O

SBus I/O	*Up to 16, IEEE conformant (50 Mbytes/s per SBus)*
SBus controllers	*Up to 64 SBus I/O controllers per system (4 per SBus)*
Throughput	*800 Mbytes/s aggregate*

PERIPHERAL CONNECTIVITY

Interfaces	*SBus, Ethernet, FDDI, HIPPI, SCSI-2, BMux (FIPS-60), ATM, Fibre Channel*

DISKS

Discrete disks	*SCSI-2*
Capacity per disk	*9 Gbytes per disk provides 5 Tbytes storage*
CD-ROM	*SCSI*
Arrays	*60 Gbytes each provides 3.6 Tbytes storage; RAID 0, RAID 1, RAID 5*

TAPES

Devices	*1/2-inch, 1/4-inch QIC-150, IBM 3480/3490/3490E, 8 mm EXABYTE, StorageTek*

NETWORK CONNECTIVITY

Protocols	*TCP/IP, SNA, IBM 3270 support, X.25, NFS*

PERFORMANCE

The CS6400 system is setting new performance and price/performance standards in client/server database applications. Recent examples at 60 MHz indicate the potential you can expect, though we're not done counting.

DSS	*39x speedup on 40 processors; 110 Mbytes/s transfer rate from disk through Oracle7*
Data warehouse	*Capacity of over 5 Tbytes of data*
OLTP (TPC-B)	*2025 tpsB at $1,110 per tpsB (28 processors)*
Numeric analysis	*63.5x speedup on options evaluation (64 processors)*
Throughput	*101,969 SPECrate-int92 (64 processors)*
Disk speeds	*11,000+ I/O operations per second; 260+ Mbytes/s transfer rate with 90 disks*
Numbers of users	*3000+ concurrent through Oracle*
I/O operations/s	*12,000 on 6 SBuses (measured); 30,000 for a fully configured system*
ATM network	*47.2 Mbytes/s over 4 channels*

For more information about the CS6400 enterprise system ask for the following publications. You can call, email, or fax us at the location listed below. These documents may also be viewed via the World Wide Web:

http://www.cray.com/PUBLIC/BSD/

8.5" X 11" SIZE:

CS6400 Technical Paper	*BSD.209.0795*
RAS Technical Paper	*BSD.205.0795*

A4 SIZE:

CS6400 Technical Paper	*BSD.210.0795*
RAS Technical Paper	*BSD.206.0795*

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