

# Sun's Colorado Datacenter

Sun tackles its largest consolidation project to date with innovations that save on space, power, cooling, and operational costs

Success Story

## Business Issues

- Consolidate datacenters to reduce costs and improve operational efficiency
- Reduce energy consumption and related costs and environmental impacts
- Avoid construction and infrastructure costs
- Refresh server and storage technology to improve availability, performance, capacity
- Improve productivity by enabling pace

## Solution

Utilizing a pod architecture that simplifies power, cooling and connectivity, and refreshing servers and storage to the latest technology, Sun compressed 496,000 ft<sup>2</sup> of datacenter space from nine buildings in its Louisville, Colorado campus into 126,000 ft<sup>2</sup> of datacenter space at its Broomfield, Colorado location.

## Business Results

- Virtually eliminated raised floor space, avoiding \$4M in building costs
- Decreased power consumption by more than one million kiloWatt hours per month
- Increased chiller efficiency by 32%
- Reduced costs with free cooling for more than one-third of the year
- Removed lead and chemical waste
- Implemented a water treatment system that saves 675,000 gallons of water per year
- Received Ace awards for project of the year from the Associated Contractors of Colorado

## Products/Services/Solutions

- Sun SPARC Enterprise® M5000 servers
- Sun SPARC Enterprise T2000 servers with CoolThreads™ technology
- Sun Fire™ X4600 servers
- Solaris™ 10 Operating System
- Solaris Containers, Solaris Zones, and VMware ESX Server consolidation and virtualization technology
- Dynamic domains partitioning technology
- Sun StorageTek™ systems, including Sun StorageTek 8500 tape libraries

In 2004, Sun began an effort to get its mission-critical datacenters, communication and server rooms, and labs that were rife with duplication and inefficiency under control. Sun tasked its Global Lab and Datacenter Design Services team to reorganize and consolidate to reduce costs.

## Success at a glance

Using new hardware, software, power, cooling, and connectivity technology and applying principles learned in its European, Indian, and California datacenter consolidation projects, Sun recently completed the largest, most expensive and complex consolidation effort in the company's history. By simplifying the problem with innovations that foster modularity, scalability, and flexibility, Sun is experiencing extreme efficiency at its Colorado site without compromising performance.

## A huge task

After acquiring StorageTek, Sun began work compressing the nine buildings in its Louisville, Colorado campus into one. Nearly a year later the plan changed. The sale of the 440 acre campus meant that the StorageTek site needed to be consolidated into existing building space in Sun's Broomfield, Colorado campus located less than three miles down the road.

Sun needed to move a heavy concentration of engineering, services, and IT datacenters that serve development groups in Sun's storage business unit and corporate and customer support—fast. Over 496,000 ft<sup>2</sup> of datacenter space had to be compressed into five floors of office space. Coping with structural limitations, eliminating raised floors, living within shared and open environments, and handling the logistical nightmare posed by the volume of space to be moved and the tens of thousands of devices to be networked was daunting—not to mention the desire to increase efficiency.

## Creating a more flexible environment

The Louisville datacenter had isolated areas where managers controlled space. The new environment uses an integrated datacenter strategy with few walls and shared, free form space for greater flexibility. If the business unit reorganizes, or product lines change, managers can flex the space because the walls have been removed—literally.

## Innovating with a pod approach

Sun capitalized on the open space with a smart pod architecture, a self-contained group of racks or benches that optimize power, cooling, and connectivity efficiencies. The pod design is the building block that enables localized, scalable, efficient deployments that adapt quickly to business changes. Using innovative, yet simple techniques for connectivity, power, cooling, intelligent metering and monitoring, Sun created spaces that can reconfigure and adapt to different uses without redesign. Pods are flexible and can expand or contract quickly as equipment load changes. The highest density section of the new site includes 19 fully scaled pods supporting a range of platforms.

Since pods enable heat to be neutralized at the source, only 693 ft<sup>2</sup> of the original 164,751 ft<sup>2</sup> of raised floor space was replicated to handle mainframes. As a result, Sun avoided building 80,000 ft<sup>2</sup> of raised floor space and saved \$4M in costs. Through this exercise, Sun was able to enhance its tape library products to also work on raised floor and slab environments by enabling connectivity from the top or bottom.

All pods use 225 amp, three-phase Universal Electric Starline Track Busways that let power changes for any type of outlet be completed in minutes. Designed to accommodate average loads of 8 kW per cabinet, pods can handle varying rack loads up to 30 kW. Average power and cooling capacity can be doubled without major construction. While this future proofing required 10% to 15% of additional investment in pipe work and floor space to enable the modules to snap into place, it is expected to pay for itself in less than one year.

#### Greening the datacenter

Sustainability is important at Sun, for both its ecological and economic impact. The datacenter is designed to save on water and cooling and reduce chemical use. Power in the pods is supplied using an innovative flywheel UPS that removes the need for batteries. Variable frequency drives on fan coils, motors, and pumps for chilled water let datacenter managers match consumption with demand.

The datacenter has the world's first and largest installation of Liebert's advanced XD cooling system with integrated intelligence that enables dynamic cooling to match the heat load at the source. A water side economizer uses outside air to cool heated water returning from the datacenter. Chillers can be turned off for over one-third of the year by using outside air to cool the water that cools the equipment.

Dolphin water treatment eliminates chemicals. Power pulses damage bacteria and prevent build-up in pipes and increase heat exchange. All hot and cold aisle temperatures, busways, cooling and power units, and rack PDUs are metered and monitored to help ensure the site operates efficiently. Outdoor light and reflective white ceilings with perimeter sensors shrink lighting demand and reduce energy use.

#### Providing connectivity everywhere

System density spurs massive connectivity requirements. All Intermediate Distribution Frames (IDF) and supporting network equipment was moved from centralized switching rooms into pods, substantially decreasing the cabling required. Datacenter floors are interconnected to let equipment be used by many groups rather than replicating environments or moving machines. Over 270 miles of infrastructure cabling is used — 240,000 feet of environmental monitoring, 750,000 feet of copper, and 450,000 feet of fiber — to support 40,000 fiber and 20,000 copper ports connecting areas on five floors.

#### Utilizing servers more effectively

Replacing outdated systems with the latest technology facilitates space savings and other efficiencies. While the Colorado datacenter houses more tape and disk storage products than compute systems, Sun was able to utilize server consolidation to great effect. In one area, the team consolidated 63 servers and 30 direct attached storage devices onto two Sun Fire X4600 servers utilizing Solaris Zones technology and VMware ESX Server software.

In addition, the virtual tape library group replaced 19 legacy enterprise-class servers with two Sun SPARC Enterprise M5000 servers. Dynamic domains are used to partition the hardware. Solaris Containers are applied on top of the domains to replicate the application environments that were running on the old hardware. In the end, Sun achieved an impressive 88% square footage compression and avoided building 5,000 ft<sup>2</sup> of datacenter space, saving the company \$2.3M.

#### Coping with structural limitations

Calculations for current and future cooling and power, and weight loads, let Sun concentrate

equipment and strategically reinforce floors while optimizing support connections to tap into power and cooling feeds. In fact, moving the largest tape configuration — ten Sun StorageTek 8500 libraries that act as one virtual device and can store over 14 PB of data — revealed that the floor flexed up to three inches. By consolidating datacenters, this potential customer problem was identified and resolved before it was experienced externally.

#### Optimizing storage innovation workflow

Sun's Colorado datacenter is where storage innovation happens. As a result, it is the most heterogeneous of Sun's datacenters, including platforms from Sun, HP, Dell, and IBM that run the Solaris Operating System, Windows, Linux, AIX, and more. Over 75 products are tested concurrently every month, and configurations that represent customer environments are replicated to facilitate testing and help solve problems quickly. In addition, a Customer Solution Center resides in the heart of the datacenter, letting customers interact directly with development and test engineers.

By interleaving advanced manufacturing, test, and development in highly flexible datacenter space, Sun achieved great economies of scale, removed duplication, and streamlined workflow. With more communication, the storage business has increased its pace and efficiency and gained a competitive advantage.

#### Let Sun help you do the same

Sun has experienced great success in tackling its global datacenter portfolio, overcoming many operational and technical challenges. For more information on how Sun's Data Center Efficiency Services practice can help you streamline operations and achieve similar results, visit [sun.com/datacenterdesign](http://sun.com/datacenterdesign).