CYBERNETICS

Slash Costs and Improve Operations with Server, Storage and Backup Virtualization

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Virtualization consolidates resources to obliterate waste in IT, and the associated cost savings make this transformational technology appropriate for businesses of all sizes – small, medium and large. This paper discusses the affordability, reliability, scalability, and recoverability of the virtual data center relative to a traditional data center with direct attached storage; and it quantifies in detail the cost savings of virtualization for the small business. It also highlights several additional benefits of implementing a virtual data center with Cybernetics' miSAN D Series iSCSI SAN.

Affordability

Consider a small company with six servers. This example illustrated in the chart below accounts for the servers with associated hardware and software for basic operations and traditional backup. The obvious omission is the tape backup hardware device itself, which is common to both solutions and does not impact the relative cost differences. This six-server data center will cost about $18,000:

Six Servers	Hardware	Windows 2008	Applications	Add 1 TB Disk Storage	Add Backup Software	Grand Total
Mail Server	$650	$600	$700	$380	$1,245	$3,575
Sales	$650	$600	$700	$380	$1,245	$3,575
Marketing	$650	$600		$380	$250	$1,880
Accounting	$650	$600	$700	$380	$1,245	$3,575
Production	$650	$600	$700	$380	$1,245	$3,575
Backup Server	$650	$600			$775	$2,025
	$3,900	$3,600	$2,800	$1,900	$6,005	$18,205

This data center has no redundancy and no failover whatsoever. If any of the disk drives or servers experiences a failure, the entire department is down until the problem can be resolved and the server and data can be recovered. This is complicated by the fact that traditional servers are plagued with a classic dissimilar hardware problem. If a traditional server fails, recovery from backup requires an identical hardware server platform for a fast recovery.. With a dissimilar replacement hardware server, the operating systems and applications must be loaded from scratch before any data recovery can even begin. This applies to every board and chip in the server, so the likelihood is very low that an exact duplicate of any given server will be available into the future. Traditional server operating systems are locked to the hardware, making the recovery effort complicated and time consuming.

In a virtualized environment, a similar "six-server" configuration will cost a little more at $19,000:

Six Virtual Servers	Hardware	Windows 2008 Data Center with Hyper-V	Applications	Add 6 TB SAN RAID	Grand Total
Physical Server	$1,000	$3,400	$700	$8,000	$13,100
	$1,000	$3,400	$700		$5,100
			$700		$700
			$700		$700
	$2,000	$6,800	$2,800	$8,000	$19,600

An important difference is that this virtualized data center has more powerful and reliable servers and delivers complete redundancy and failover. If one server fails, the virtual servers will simply restart on the other hardware server. Another benefit is that virtual servers are never dependent on a particular hardware server platform. If server hardware fails, any server can quickly be installed to replace it. By contrast, in the traditional data center with DAS (direct attached storage), any single server or single disk failure results in downtime.

The role of the iSCSI SAN storage is critical in the virtual environment because storage virtualization lends fluidity to data accessibility. Just as virtual servers are unfettered by hardware, SAN storage is completely removed from any server hardware platform. When a virtual server fails over, it transparently maintains the data connection. With a Cybernetics miSAN iSCSI SAN, all storage is virtualized and protected with RAID + hot spare redundancy. Because the Cybernetics miSAN D Series supports both SCSI and iSCSI boot, so there is no need for direct attached storage at all.

An important source of cost reduction in the virtual data center is in the backup software. Cybernetics' miSAN D Series iSCSI SAN backs itself up to tape without a backup server or backup software. Data is streamed directly from the high-speed RAID array to the SCSI attached tape drive. Because the backup is handled at the hardware level by the miSAN D Series, it is a serverless, background operation, and the backup does not create any network traffic. The backup streams over the dedicated SCSI bus at the maximum possible rate of the tape drive, which is the optimal operating condition for the tape drive and the media, improving the reliability and longevity of tape backup.

The cost to add the redundancy and failover features of virtual machines to a traditional server data center can be very high. The addition of complete redundancy in servers (except the backup server) and storage for the traditional six-server data center brings the data center cost to $43,000:

Total Without Failover	Add Hardware Mirroring RAID Protection	Add Cluster Software	Total with Failover
$3,575	$586	$600	$8,922
$3,575	$586	$600	$8,922
$1,880	$586	$600	$5,532
$3,575	$586	$600	$8,922
$3,575	$586	$600	$6,932
$2,025	$586		$2,025
$18,205	$2,930	$3,000	$43,245

The only additional cost for complete redundancy in the virtual server scenario is a failover iSCSI SAN, bringing the total cost to just over $27,000:

Total without Storage Failover	Add Hardware Mirroring RAID Protection	Total with Failover
$13,100	$8,000	$21,100
$5,100		$5,100
$700		$700
$700		$700
$19,600		$27,600

Once the functionality playing field is leveled, the virtual server data center represents a cost savings of more than 36% over the traditional data center.

Under-utilization of storage represents a significant cost for the traditional data center. Recent estimates suggest that only 48-50% of storage is utilized. In a traditional environment, a large proportion of storage is direct attached, so unused capacity is simply not available to other users. By contrast, iSCSI SAN storage is available to every server in the network, giving network administrators complete freedom to allocate and re-allocate capacity as needed. The miSAN iSCSI SAN maximizes storage utilization, eradicating wasted disk space to maximize the return for the storage dollar.

In the example of the virtual server data center, improved storage capacity utilization can further reduce the total costs. Assuming 48% utilization, the total usable capacity of the 1TB mirrored storage on five servers is about 2.5TB. Reducing the capacity on a pair of miSAN iSCSI SAN models to 3TB of usable storage lowers the cost of the virtual data center from about $27,000 to about $24,000:

Six Virtual Servers	Hardware	Windows 2008 Data Center with Hyper-V	Applications	Add 6 TB SAN RAID	Add Hardware Mirroring RAID Protection	Grand Total
Physical Server	$1,000	$3,400	$700	$6,500	$6,500	$18,100
	$1,000	$3,400	$700			$5,100
			$700			$700
			$700			$700
	$2,000	$6,800	$2,800	$6,500	$6,500	$24,600

With improved storage utilization, the virtual data center results in over 43% cost savings compared to the traditional data center with six servers.

With energy costs on a meteoric rise, power and cooling have come to represent a significant portion of a data center's operating budget. Estimates range from 25% to 50%. By reducing the number of servers from 11 (with redundancy) or 6 (without redundancy) to 2 (with full redundancy), the costs of powering and cooling the data center are cut by at least two thirds.

A virtualized environment simply does not need the manpower required to keep the requisite number of hardware servers humming. There is less hardware, and therefore less opportunity for error. With miSAN iSCSI SAN virtualized storage, rebuild after a disk failure is automatic. Likewise, virtual server failover is automatic. The operating systems and applications are no longer locked down to a hardware platform, so that recovery is no longer the tedious, time-consuming task it has been historically. Whether through reductions in total staffing requirements, or better efficiency of IT staff, virtualization will reduce the ongoing operating expenses associated with IT personnel.

Reliability

Server reliability estimates vary wildly and are dependent on a multitude of factors, including system redundancy and age. Assuming a typical server MTBF (mean time between failure) of 60,000 hours, the six-server traditional data center will experience an average MTBF of 10,000 hours. Virtualization triples the reliability of the virtual data center.

	MTBF of Each Server	Divide by Number of Servers	Average MTBF in Hours
Two Servers (Full Redundancy)	60,000	2	30,000
Six Servers (No Redundancy)	60,000	6	10,000
Eleven Servers (Redundancy in Production Servers)	60,000	11	5,455

The virtual data center with two hardware servers and two miSAN iSCSI SAN models literally has no single point of failure, and it has automated fail-over if any single component does fail. Virtualization technology in both the servers and the storage is the best approximation toward 100% uptime in the data center.

Scalability

There is no cost associated with adding servers in a virtual data center. For example, a payroll server can be created with the existing resources. Testing servers can be created and then decommissioned at no cost. By contrast, each additional server will cost at least $1630 in the traditional data center cited here, and the backup software agents will add from $250 to $1245 per additional server. Backup software expense is not required in the virtual data center with a miSAN D Series iSCSI SAN, because the miSAN backs itself up directly to a SCSI attached tape drive.

Virtualized storage also makes adding disk capacity a painless process. The virtual disk does not physically touch the server, so capacity expansion is simply a matter of pointing the server to a new virtual disk drive, which appears exactly as though DAS has been added to the server – the user just sees a new drive letter. There is no risk of a SCSI bus lock up to bring down the server during the process. And because the iSCSI SAN is true, block level storage, there is none of the overhead associated with a NAS file server. Adding storage no longer means server sprawl - adding file servers with overhead intensive operating systems. The miSAN D Series is simply storage.

Recoverability

The virtual data center has several layers of protection to guard against every conceivable threat. The servers themselves can operate on either of the two server hardware platforms. If one hardware server fails, the virtual servers will continue to operate while IT resolves the hardware issue. The disk storage capacity is isolated from the server hardware platforms, and operates with RAID + hot spare reliability.

A pair of miSAN D Series iSCSI SAN units can be configured as a high availability pair to support automatic failover in the event of a RAID failure, for no single point of failure and uninterrupted operations. The miSAN D Series includes snapshot backup at the disk drive level for quick recovery from accidental deletions or corruption. Deduplicated change level data can be replicated via WAN for offsite recovery. All data stored on the miSAN can be written off to USB disk, or to a direct attached tape drive for long-term archive copies.

Time to recovery is critical to any data center. Cost of downtime estimates range from thousands to millions of dollars per hour, depending on the type of business. Even if the cost of downtime is estimated conservatively at $1500 per hour, a single event could pay for the entire virtual data center. Without redundancy and failover, a single server with 1TB of storage could easily take two days to recover. Assuming two 8-hour days at $1500 per hour, the total cost of downtime is $24,000 – roughly the cost of a highly available, fully redundant data center. The virtual data center just paid for itself.

Industry Sector	Hourly Cost of Downtime
Manufacturing	$28,000
Transportation	$90,000
Retail, Catalog Sales	$90,000
Retail, Home Shopping	$113,000
Media, Pay Per View	$1,100,000
Banking Data Center	$2,500,000
Financial, Credit Card	$2,500,000
Processing	$2,600,000
Brokerage	$6,500,000

Average Cost of Unplanned Downrime for Various Industries.
Source: Contingency Planning Research

Conclusion

The benefits of virtualization with iSCSI SAN are compelling. Virtual data centers, overall, are more affordable, reliable, scalable, and recoverable than the traditional data center with direct attached storage. Cybernetics' miSAN D Series iSCSI SAN not only delivers the full benefits of virtualized storage, but its exclusive SANDR Technology with its onboard backup features adds another level of performance, convenience, and cost savings that can provide instantaneous return on investment.

About Cybernetics

Founded in 1978 and headquartered in Yorktown, Virginia, Cybernetics specializing in the design and manufacture of high performance disk, tape, and virtual tape storage solutions, including the miSAN family of iSCSI SAN and Virtual Tape Library solutions. Our product line features cutting edge technologies which have been rigorously tested to deliver seamless compatibility and solid reliability, along with innovative – and exclusive – features that provide greater functionality, data accessibility, and return on investment than any other storage solutions provider can match. Cybernetics' dedication to innovative, high quality products, backed by the best in support in the industry, has made it a widely recognized leader in the data storage industry.