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NEXSAN
NST STORAGE
FOR THE
VIRTUAL DESKTOP

Nexsan's innovative product, the NST5000™, is a hybrid storage system with unified protocols and highly dense storage for a combination of great performance, low cost, and high capacity in a small footprint.

The NST5000 is a unified storage system simultaneously supporting iSCSI, CIFS and NFS, which enable customers to support any application with the best suited protocol for optimal use. The NST5000 is a hybrid storage system, utilizing DRAM, NVRAM and SSD in a single pool of cache memory, with highly dense spinning disk behind it for a maximum capacity of greater than 1PB.

The result is a system that transparently provides real-time performance improvement over traditional storage systems at a fraction of the price of pure SSD storage systems. This translates into over 54,000 iSCSI IOPS, 64,000 NFS ops/sec,100,000 CIFS ops/ sec and latency of less than 2 ms at a price as low as $.65/GB. This kind of price/ performance balance in concert with spinning disk capacity makes the NST series ideal for virtual desktop implementations.

THE VIRTUAL DESKTOP STORAGE CONUNDRUM

There are two important factors that are critical to the success of any virtual desktop implementation, and both are directly impacted by the storage system involved. These are:

- The performance requirement for each virtual desktop
- The capacity requirement for each virtual desktop

Determining the performance required for each virtual desktop is a fairly simple calculation. First calculate the number of IOPS required based on the number of virtual desktops deployed. The rule of thumb for virtual desktop performance ranges from 5 IOPS per light user, 10 IOPS per moderate user to 15-20 IOPS for a heavy user. It is common to engineer for peak performance times. In the case of VDI, it is not improbable that all desktops boot up at the same time causing what is known as a boot storm. If the VDI storage system is going to support other applications simultaneously, those performance requirements must be factored in as well.

Performance is only one half of the equation for most companies. Capacity per virtual desktop is also critical, along with the cost per GB. For most companies the economics must make sense, otherwise the VDI project is a non-starter. The objective is to obtain the right balance between price and performance. This is especially true with virtual desktop applications because user storage is being moved from cheap, local disks to an enterprise-class storage system.

THE NEXSAN NST SERIES NUMBERS

The Nexsan NST series delivers 54,000 IOPS, and can therefore support between 2,700 and 10,800 virtual desktops, depending on how heavy or light the usage. Even in a heavy usage environment, the NST series supports thousands of virtual desktops with IOPS available for other applications.

NEXSAN

Beyond the price/performance attraction of the NST series, the cost/capacity is equally as compelling. With 500TB of capacity at $.65/GB, cost per user ranges from a high of $120 per user to a low of $30 per user (approximate), depending on user load. This kind of pricing on an enterprise-class storage system is in fact more than competitive with the local disk drives installed on PCs.

These two variables, performance and capacity, do not act independently of one another. Design and behavior of virtual desktop deployments have implications for each.

MASTER IMAGES AND ANTI-VIRUS SCANS

One of the ways to significantly reduce capacity requirements is to create a master image of all your desktops. The master image includes the operating system and applications that are shared by all virtual desktops. However, using a master image results in an enormous amount of read requests from all virtual desktops during boot up and login. Consider hundreds or even thousands of virtual desktops hammering the storage system for that single master image at the same time.
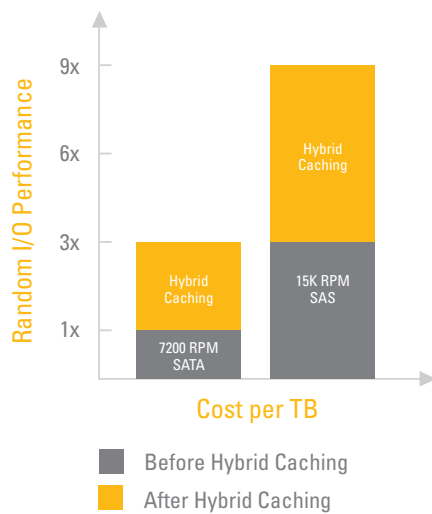
There are other ways that desktop performance is different than other applications. Anti-virus scans will periodically run across the thousands of virtual desktops deployed, creating performance challenges. Desktop I/O also has a different balance of reads and writes compared to other applications, there is a much higher percentage of writes from Desktops compared to almost any other application.

AUTOMATED TIERING AND VDI ENVIRONMENTS

Automated tiering is a policy-based process that monitors how frequently data is accessed. Based on this single criterion, it determines where to store data. The theory is that frequently accessed data should be stored on fast storage and dormant data on slower storage. The flaw in this logic is that the majority of I/O is not performance hungry, even if it is frequently accessed. This means that with tiering, data is being stored on the most expensive storage tier regardless of whether it will benefit the associated application. Ultimately, this negatively impacts the price/performance ratio.

To correctly address application performance requires real-time monitoring and matching I/O performance to those demands. Automated tiering monitors data over a period of time – minutes, hours, days and even weeks in order to move data based on access frequency, not application I/O demands. Automated tiering can be valuable, but it was not designed to improve real-time performance.

NEXSAN HYBRID CACHING

Random I/O Performance

9x

6x

3x

1x

Hybrid Caching

Hybrid Caching

7200 RPM SATA

15K RPM SAS

Cost per TB

■ Before Hybrid Caching
■ After Hybrid Caching

The value of the Nexsan hybrid caching is that operates automatically and transparently in real-time and is well suited for virtual desktop environments, whether it's boot storm or virus scans.

In contrast, VDI environments are characterized by real-time performance demands. Boot storms and anti-virus scans happen in real-time and therefore must be addressed in real-time, both potentially impacting performance in a big way. Trying to use automated tiering to address these demands would suggest placing master images and anti-virus software on the expensive high performance storage tier, dramatically increasing the cost of the VDI deployment to the point of undermining the reason to use automated tiering in the first place.

PURE SSD STORAGE SYSTEMS

With storage performance requirements increasing at a steady pace, the industry has recently turned to solid-state storage as an answer to all performance problems. And with vendors touting outsized performance numbers in these systems, it's attractive to think they can solve all our storage problems. However, buyer beware. While an all-SSD system can offer unprecedented performance, the associated cost and limited capacities mean that all but a few customers and applications can use and benefit from an all-SSD system.

Another frequent method for using solid-state is to add SSDs into traditional storage arrays alongside spinning disk. While this will meet the capacity requirements of most installations, the impact on performance may be quite limited or nonexistent. And yet, the impact on price remains substantial, again negatively impacting that crucial price/performance balance.

In particular for VDI deployments utilizing a pure SSD storage system is not practical because the price is simply too high, and capacities are far too low.

A SMALL AMOUNT OF SOLID-STATE DRAMATICALLY IMPROVES PERFORMANCE

Nexsan has developed unique and high performance hybrid caching technology to accelerate the performance of underlying spinning disks by up to 10X. Most, if not all, storage systems provide some caching techniques that improve performance. Typically, storage controllers have a memory pool that stores data temporarily then purges it as the memory pool fills up. A number of techniques are used such as storing recent data into memory, keeping track of data that is frequently accessed, algorithms that monitor blocks of data that are typically requested together and pre-fetches that data into cache before the application requests it.

Obviously, the greater the capacity of the cache memory pool, the higher the performance. Keep in mind, the point is about achieving optimal price/performance. The cost of DRAM and NVRAM is higher than SSD and far greater than HDD. Therefore, most storage controllers minimize the size of their cache memory pool.

NEXSAN UNIFIED STORAGE

PRICE / PERFORMANCE LEADERSHIP

PERFORMANCE – SAS DRIVES

NEXSAN NST5100™	31 drives	18TB
NEXSAN NST5300™	144 drives	86TB
NEXSAN NST5500™	216 drives	130TB

Tuned for high performance

- Up to 100,000 ops/sec
- As low as 1.23 ms latency
- Less than $2 per ops

CAPACITY + PERFORMANCE – SATA DRIVES

NEXSAN NST5100™	31 drives	93TB
NEXSAN NST5300™	240 drives	720TB
NEXSAN NST5500™	360 drives	1PB

Tuned for capacity + performance

- Up to 54,000 IOPS
- Only $.65 per GB
- Supports over 1PB of storage

Nexsan hybrid caching combines DRAM, NVRAM and SSD into a single pool of cache memory that accelerates both reads and writes. The relatively lower price of SSD compared to DRAM and NVRAM enables a large pool of flash to significantly increase performance. The Nexsan NST series supports over 2.8 TB of cache memory. This eclipses the cache capabilities in other storage systems, resulting in a far more compelling and flexible price/performance ratio.

It is also important to note that Nexsan addresses performance before the I/O goes through the storage controller, the RAID engine and disk drives – each of which adds latency. The result is high performance that is cost effective.

VDI IN A MIXED ENVIRONMENT

It is rare that anyone just utilizes a storage system for a single application such as VDI. However, VDI can impact the performance of other applications. It is not uncommon that VDI implementations have locked up HDD-only storage systems, not only freezing the virtual desktops but also making all of the applications inaccessible to users. That is why it is important to provide the necessary performance, so all applications work optimally.

One major advantage that Nexsan NST series has over other storage systems is that it natively supports CIFS, NFS and iSCSI. Files are the fastest growing data type, and they are becoming bigger and bigger with more graphics, images, audio and video. Databases and email applications are faster and easier to manage using block-based protocols such as iSCSI. Additionally, over two-thirds of all VMware users and most Microsoft Hyper-V users use SAN-based storage. Leveraging the best protocol for your application is the smart approach.

NEXSAN NST AND VIRTUAL DESKTOPS

Nexsan hybrid caching solves the VDI price/performance conundrum. It balances high performance with cost effective storage. Thousands of virtual desktops can be deployed on Nexsan's NST series storage while easily shared with database and email applications, as well as file storage.

Additionally, the NST series has scalable density enabling growth from 18 TB to over 1 PB in a single, logical storage system. Like all Nexsan storage, the NST series has half the drive failure rate compared to the industry average as well as being the most power efficient. Furthermore, the NST series is intelligent and provides a wide range of features including thin provisioning, AutoMAID, snapshots, asynchronous replication and much more.

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