

Save Money, Increase Performance and Reduce Latency Through Use of SSDs in Virtualization Deployments

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Executive Summary

The unprecedented growth of data is causing application, server and desktop sprawl. Both server and desktop virtualization technologies have been deployed to relieve the strain that this growth creates and its effects on the compute and storage infrastructure. These virtualization schemes, however, are impacting network and user productivity in a negative fashion—users attempting to access their applications suffer excessive wait times caused by boot storms, decreased performance and increased latency. And the number of servers and storage organizations needed to handle this growth is increasing dramatically.

Traditionally, magnetic hard drives (HDD) have been deployed in virtualized environments to accommodate this growth and serve as the shared storage that virtual servers will access. Because of latency issues with HDDs and their resulting effects—the I/O blender, boot storms and idle staff—they can no longer be relied on to provide a productive and efficient virtualization environment. With the advent and increasing maturity of solid-state drives (SSD) and flash memory technologies (which have in implementation achieved price parity with magnetic HDDs) those effects no longer need to occur.

The Challenges Brought on by Server/Desktop Virtualization

Server and desktop virtualization have brought a number of challenges to the modern data center and its operations. Let's take a look at some of the problems.

Magnetic hard drives can't keep up with performance

Traditionally, IT has used HDDs for storing data in their data center networks. As the network grows and performance suffers, more HDDs have been deployed.

HDDs, which are mechanical devices, need to spin up the drive and move the read/write head to the correct location on the correct platter in order to retrieve data, resulting in latency. As the amount of data that needs to be stored grows, the capacity of HDDs is also increasing—from the 1TB capacities of the recent past to 8-10TB capacities of today. This growth in capacity causes another problem: access to the drive is not constant and access times degrade as the disk becomes larger and the read/write head has more space to traverse.

The I/O blender effect appears

The rise of virtualization has created opportunities for lowering costs via consolidation of server resources and storage. Unfortunately, once virtualization popularized the use of shared storage, it created a new wave of problems. It turns out that the transition to virtualized shared storage looked great in theory and on paper, but the reality is that once IT began to migrate resource-intensive applications to virtual infrastructures, storage went from being a bottleneck to being the bottleneck. One reason for the struggle with managing virtual

storage is the I/O blender effect. With physical storage connected to physical servers, I/O requests queue sequentially and are then processed by the server-resident host bus adapter (HBA) in the order they are received. However, with virtualized shared storage serving multiple virtual machines (VMs) at once, the storage I/O queue becomes scrambled, with I/O requests from multiple VMs mixing together in the queue. Even workloads that have been optimized for sequential I/O performance can have their I/O requests scrambled with other VMs running on a server, thus degrading overall performance. The I/O blender effect means that virtual storage performance will be adversely affected.

Boot storms wreak havoc

If these problems weren't enough, the mechanics of virtualization of the desktop enters in. When a large number of desktops boot to the network or power on at the same time at the start of the day and users attempt to log in, a phenomenon called a boot storm or login storm results. Boot storms cause a huge drag on throughput, I/O and host server performance.

Boot storms, however, aren't isolated only to the start of the day. They may occur when the day shift crew switches to the night shift or when the operating system is patched or other software is upgraded, thus forcing a reboot.

The result is a decrease in network throughput, server performance and storage I/O. And then there's those disgruntled workers who want to be productive and access their applications but have to wait until their computers boot up.

Scalability of VMs and desktops supported

As the amount of data being virtualized grows and throughput and latency issues occur, the effect on the infrastructure quickly becomes apparent. The number of desktops supported in virtual desktop infrastructures (VDI) decrease per server. That effect is not limited to VDI deployments; it exists with server virtualization too. As latency and performance issues crop up, the number of virtual machines supported per server is fewer.

As the number of servers increases to meet the virtualized workloads, more racks need to be added, resulting in more floor space consumed and more power and cooling for the servers—all while serving the same number of users.

Using SSDs and Flash Technologies to Rectify Virtualization Issues

These challenges can be addressed using Micron's ultra-high-performance, enterprise-class SSDs, which accelerate how quickly data is accessed in server and desktop virtualization environments.

Considering the use of Micron PCIe-based adapters in servers hosting virtual machines and virtual desktops is a wise decision for many reasons. There are many large benefits to using Micron SSDs/flash technologies:

SSDs speed access times

Micron SSDs reduce the wait times and increase performance in VDI and hosted server environments. Internal testing of Micron SSDs vs. traditional HDDs showed that the average wait time was reduced from

9-plus minutes with an HDD-based solution to just 13 seconds for an SSD-based solution.¹

SSDs solve the I/O blender effect

Using SSDs instead of HDDs delivers random I/O performance that is orders of magnitude better—at a lower cost per IOPS. SSDs have the storage performance needed to remove the storage bottlenecks that slow systems down and make workers unproductive.

SSDs eliminate boot storms

Micron's ultra-high performance SSDs appear as a data store within the VMware framework. Because the SSD is so much faster than traditional HDDs, virtual machine users can log in much more quickly and be more productive. With Micron SSDs, slowdowns caused by boot storms are virtually eliminated.

SSDs allow increased scalability of VMs, applications and users

By maximizing performance and application uptime, SSDs allow a virtualized environment to support a greater number of users. Because performance problems disappear and users are satisfied with their access to applications, IT staff is freed from constantly tweaking and tuning performance and can be reassigned to handling more strategic initiatives.

SSDs improve throughput, reduce latency, power and floor space

SSDs allow virtualized environments to experience speedy performance and reduce latency. When

¹ "P420m PCIe SSD Boot Storm Testing in Virtualized Environments," Micron Technology, 2014

compared to rotating hard disk drives (HDDs), SSDs have much lower latency, faster read/write speeds and support many more IOPs.

Virtualization environments containing SSDs are able to reduce floor space as well as power and cooling requirements. A PCIe-based SSD adapter provides much better performance than a rack of HDDs. By replacing HDDs with SSDs, the number of racks can be reduced, resulting in more floor space and less power and cooling.

SSDs reduce both cost and the number of servers deployed

If servers are constrained by data I/O, they become underutilized and more servers need to be deployed to meet the demands of VM users. SSD-enabled servers allow increased performance and result in fewer servers and lower overall deployment costs.

Virtualization deployments that use SSDs in their servers can experience an increase in their return on assets—they can serve up data faster, support more users and increase performance, all while lowering operating costs.

Conclusion

With virtualization becoming commonplace in data center environments, latency and performance issues have a great effect on the network and its users. Deploying Micron SSDs in servers hosting either desktops or applications running in virtual machines can result in reduced latency; increased performance; savings in floor space, power and cooling; and, most importantly, contented and productive users.

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