Microsoft

Transform the data center
Customer Solution Case Study

nGenx
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Cloud Service Provider Builds Cost-Effective Storage Solution to Support Business Growth

Overview

Country or Region: United States
Industry: Hosting

Customer Profile

Headquartered in Overland Park, Kansas, nGenx Corporation offers desktop-as-a-service and cloud-based application delivery services. nGenx offers products and services via agent and white label programs.

Business Situation

To meet growing customer expectations for performance and availability, nGenx wanted to improve the performance and reduce the cost of its storage solution that supports its hosted desktop services.

Solution

nGenx used storage enhancements within Windows Server 2012 R2 to build a Server Message Block 3 shared storage solution for its Hyper-V deployment on a File and Storage Services cluster.

Benefits

- Enhanced performance to meet customers' needs
- Reduced storage requirements to save money
- Improved storage availability to boost application reliability
- Increased business agility
- Improved manageability to reduce IT labor

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Rick Dehlinger, Chief Technology Officer, nGenx Corporation

As a cloud service provider, nGenx Corporation knows the critical role that storage plays in its desktop-as-a-service business. To ensure that its storage solution reliably and efficiently serves customers' hosted applications with data, nGenx turned to the latest storage technologies in Windows Server 2012 R2. nGenx built a Server Message Block–based storage solution by using the File and Storage Services server role running in a failover cluster and gained a cost-effective alternative to an expensive storage area network (SAN) solution built using industry standard hardware. While testing parallel storage migrations on the failover cluster, the IT team saw an aggregate throughput of 16 gigabits per second on a single teamed network connection.

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Situation

Founded in 2000, nGenx Corporation continually evolves its desktop-as-a-service and cloud-based application delivery offerings by staying at the forefront of cloud technologies. As a result, nGenx customers benefit from innovative product offerings, such as the nGenx Control Panel, which they use to retain complete control over their IT environments. nGenx services are also provided in Service Organization Controls (SOC)-certified facilities, which signifies that nGenx processes and facilities are tested to ensure that customer data is protected.

"Today, we are seeing a huge demand for hosted desktop services: small to enterprise businesses want to provide their employees with reliable access to their business applications—on any device, anywhere business is conducted—without having to invest in and maintain all the infrastructure, including storage, behind those applications," says Rick Dehlinger, Chief Technology Officer at nGenx Corporation. "Our strategy has always been to take the latest technologies from Microsoft and build an extremely well-managed system in the cloud to provide hosted virtual desktops and other cloud-based services available in a secure, multitenant configuration. This strategy enables us to stay abreast of customer demands."

While nGenx has some clusters in production running Windows Server 2008 R2, the company is committed to using the Windows Server 2012 operating system with Hyper-V virtualization technology and Microsoft System Center 2012 data center solutions to improve management efficiency and control operational costs at its data centers, in addition to platform expansion into third-party infrastructure like Windows Azure. Until recently, nGenx had been using Windows Server 2012 and System Center 2012 Service Pack 1.

Improving storage performance, while reducing storage costs, significantly contributes to running an efficient, lean data center. As a cloud service provider, nGenx knows that storage plays a critical role in providing competitive cloud and data center services. With a growing number of new applications and expectations for accessing those applications from any device, continuous service is key to customer satisfaction. One way to provide that level of service is to ensure that storage solutions reliably and efficiently serve applications with the stored data they require to run. Configuring and managing storage solutions so that they continue to provide this uninterrupted service is challenging and traditionally required expensive storage area network (SAN) solutions and proprietary software.

nGenx wanted to improve how it handles storage to meet its customers' increasing availability and performance requirements, by exploring ways to reduce the overall cost to its customers. For its Hyper-V clusters, nGenx had already taken some steps in this direction by deploying Cluster Shared Volumes (CSV) on its Windows Server 2008 R2 Hyper-V clusters. CSV is a feature in earlier versions of Windows Server in which shared disks containing a NTFS file system volume are simultaneously accessible to all nodes within a failover cluster. CSV simplifies storage with clustered Hyper-V hosts. Its existing Windows Server 2008 R2 clusters accessed a NetApp storage solution through Fibre Channel over Ethernet.

"Our existing storage investments, traditional SANs, are doing their job, however, they are not evolving fast enough to meet our performance and cost expectations," says Dehlinger. "We are also trying to avoid becoming tied to one vendor, especially on infrastructure where we know we're going to be continuously investing. As we expand our provider and tenant infrastructure to leverage third-party IaaS [infrastructure as a service] and the Windows Azure platform, we have less control over the physical storage

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infrastructure available. Given the game changing improvements in native Windows Server storage, we began looking for alternative ways to boost our storage performance and application availability while reducing overall costs."

Solution

In the lead-up to the release of Windows Server 2012 R2 and System Center 2012 R2, nGenx was invited to join the Microsoft Technology Adoption Program (TAP). One of the areas the company chose to focus on was the storage enhancements available within the File and Storage Services server role of Windows Server 2012 R2. "Our experience with the TAP confirmed that Microsoft is serious about cloud computing and the cloud," says Dehlinger. "You can see it in the code: Microsoft has delivered a truly innovative hybrid cloud operating system. Throughout the TAP, the Microsoft team was absolutely fabulous in its responsiveness to our questions and issues, and the quality of the resources they brought to the table."

The Latest in File-Based Storage Solutions

Dehlinger and his team evaluated several non-traditional SAN storage products and technologies, looking for ways to achieve the company's business goals of increasing capacity and performance while reducing costs. Given the promising results of a pilot using Windows Server 2012 Scale-Out File Server technologies, they were also keen to experience the improvements and additional capabilities in the next-generation Windows storage technologies.

Instead of continuing to invest in traditional, and expensive, Tier 1 SAN storage, nGenx ultimately decided to build a storage abstraction solution using the File and Storage Services server role running in a failover cluster and a variety of back-end storage technologies. The solution will ultimately serve storage to Hyper-V clusters using 10 gigabit Ethernet and Server Message Block 3 (SMB3) from a continuously available active-active Windows file server cluster. SMB3 is the protocol used by Microsoft for file services. Hyper-V over SMB3 was introduced in Windows Server 2012, which supports SMB file storage on Hyper-V virtual machines running on industry-standard servers. For high availability, the shared storage can be placed in a Windows failover cluster. Using this configuration, a Windows storage solution can scale out linearly, transparently failover, and update itself, and nGenx can use both traditional and modern storage technologies behind the scenes. "A Windows Server 2012 R2 storage solution fits our needs and provides a bridge between existing and future storage technology investments," says Dehlinger.

Building a Pilot Storage Cluster

To prove the viability of the solution, the team built a pilot File and Storage Services cluster using Windows Server 2012 R2 Preview running on Cisco Unified Computing System (UCS) B200 M3 servers. The File and Storage Services cluster is sitting in front of existing NetApp and Dell Compellent storage. It is serving storage to a Hyper-V cluster, on top of which runs a virtual file server cluster that is running on Windows Server 2012.

"The virtual file server cluster serves the hosted virtual desktops for one of our customers in the healthcare field," says Dehlinger. "The results were fantastic. The solution survived all the failure scenarios we threw at it, and even improved the performance we've otherwise seen from our traditional SAN storage. Even though this customers' desktops are now accessing a clustered storage solution running on Windows Server 2012 R2 preview code, we felt confident enough to consider it a production system. Great new technology, along with exemplary go-live support from Microsoft, made it all possible."

Shared Virtual Hard Disk

nGenx used the shared virtual hard disk (VHDX) capability of Hyper-V in Windows

Server 2012 R2 Preview. Until this release, it was not possible for multiple virtual machines to access the same VHDX file and see the VHDX as shared storage, unless iSCSI or virtual Fiber Channel adapters are used. This new capability, which allows attached VHDXs to be shared via virtual SCSI controllers, enables shared storage for use within a failover cluster, such as the File and Storage Services storage solution that Dehlinger and his team built at nGenx. As a hosting service provider, nGenx benefits from the simplified provisioning, tenant isolation, and storage technology abstraction that this feature enables.

Other Enhanced Storage Capabilities in Windows Server 2012 R2

Another new capability with Windows Server 2012 R2 is live migration of virtual machines, and their associated storage, over SMB3. nGenx can use this capability to take advantage of the SMB Multichannel feature and simultaneously stream live migrations across multiple network cards.

Dehlinger and his team also took advantage of enhancements to CSV in Windows Server 2012 R2 Preview. The team used these enhancements to allocate a higher percentage of the total physical memory on the blade servers to the CSV cache, thereby enabling the servers to use system memory as a high performance read cache. "We are running these file servers on blades that have a lot of memory in them, so we bumped up the CSV cache allocation to take advantage of that available memory," says Dehlinger. "The combination proved quite powerful and effective. In our testing, we saw substantial reduction in the IO load on our existing shared storage and significantly improved performance in our virtual machine workloads."

Also, in Windows Server 2012 R2 Preview, CSV functionality has been enhanced to include support for data deduplication, a feature that was introduced in Windows Server 2012. Data deduplication is used to reduce the disk space requirements of files. It involves finding and removing duplication within data without compromising its fidelity or integrity. With data deduplication, nGenx can store more data in less physical space. With Windows Server 2012 R2, data deduplication can now be used with CSV and File and Storage Services clusters to minimize storage requirements for the virtual hard disks of hosted desktops.

Looking Ahead to a Hybrid Cloud

nGenx is excited about the potential of running some of its workloads in Windows Azure and is pleased to see some of the Windows Azure technologies make their way into non-Microsoft data centers. The Windows Azure Pack for Windows Server, a collection of Windows Azure technologies which can provide a front-end for a cloud service provider, such as nGenx, offers a consistent experience that spans across its data centers and into the Windows Azure environment.

"When we built our system, we had the expectation that we would soon be running tenant workloads in third-party data centers," says Dehlinger. "As our business continues to expand and we outgrow our data center resources, nGenx will be using other IaaS providers. Microsoft, with its cloud operating system vision and its hybrid cloud technologies, is looking like the provider for us."

Benefits

With the release of Windows Server and System Center 2012 R2, nGenx will be building more file-based File and Storage Services clusters for application workloads with a goal to improve storage resilience and performance and increase business agility. "With File and Storage Services clusters in Windows Server 2012 R2, we can create high-performance, file-based storage for our Hyper-V deployment—without further investments in SAN technologies," says Dehlinger.

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Enhanced Performance to Meet Customers' Needs

nGenx built a high-performance storage solution by increasing the CSV cache limit for the failover cluster. Because these servers are not typically memory constrained, nGenx saw substantial performance gains by using the extra memory for the CSV cache. "With Windows Server 2012 R2, we can allocate up to 80 percent of total physical RAM to the CSV cache, an increase of 60 percent from the previous version," says Dehlinger. "We went from allocating 25 gigabytes to 200 gigabytes. While we haven't done a varied workload stress test yet to verify, we expect improvements in both read and write performance for a broader variety of concurrent virtual machine–based workloads."

Dehlinger and his team also noticed more predictable behavior with the storage traffic over SMB3 and its ability to take advantage of multiple paths and connections to the clustered file servers. "I initiated a large group of storage live migrations at the same time and saw an aggregate throughput of 16 gigabits per second, which is the most throughput I've ever seen on a single network connection," says Dehlinger. "The faster our storage solutions perform, the faster our applications run. That's what our customers want and we found this to be the most efficient, cost-effective way of providing that level of service."

Reduced Storage Requirements to Save Money

nGenx is well positioned to benefit from the latest enhancements in data deduplication because the company's primary workload is hosted desktops. "There is so much commonality between desktops and so much application data, which means we really benefit from data deduplication," says Dehlinger. "Our consolidation rates are as high as 90 percent, vastly reducing the amount of data we need to store."

Improved Storage Availability to Boost Application Reliability

In Windows Server 2012 R2, a failover cluster automatically live migrates all running virtual machines before shutdown. Dehlinger and his team tested this capability for both File and Storage Services storage and Hyper-V clusters. "We saw that the cluster roles seamlessly and automatically migrated over to their sister cluster members, and the virtual machines and associated storage continued operating without any issues," says Dehlinger. "This capability will help our service levels and application reliability."

Increased Business Agility

Shared VHDX reduces the amount of time it takes for nGenx IT staffers to set up failover clusters because they can configure virtual machines to use a shared VHDS file without making any corresponding storage configuration changes. The less time it takes to configure failover clusters, the more quickly IT staff can respond to the needs of the business.

"Also, we gain in agility as we move forward with our plans for introducing a new storage solution because, with shared VHDX, we have the ability to make storage changes without any negative impact on customers," says Dehlinger. "I am actively driving future storage investments away from our traditional SAN solutions, and now I have the freedom to do that without Impacting the daily operations and services used by our customers on the platform."

Improved Manageability Reduces IT Labor

nGenx can simplify how administrators deploy virtual clusters where virtual machines are used to quickly create highly available services in the application layer. Up to 64 virtual machines can share a single VHDX file on a SMB3 shared storage solution, eliminating the need for manually adding physical logical unit numbers.

For More Information

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Also, Windows Server 2012 R2 provides automatic rebalancing for failover clusters to reduce redirection traffic between the nodes, so nGenx administrators will not have to manually manage load balancing. "Automatic rebalancing of File and Storage Services clusters clients reduces the work that we have to do in the data center to provide optimal service to our customers, such as manually managing load balancing between the different nodes of a failover cluster," says Dehlinger. "The time saved helps us work on differentiating our desktop hosting services to grow market share."

Transform the data center

The hybrid cloud from Microsoft transforms the data center by extending existing investments in skills and technology with public cloud services and a common set of management tools. With an on-premises infrastructure connected to the Windows Azure platform, you can deliver services faster and scale up or down quickly to meet changing needs.

For more information about transforming the data center, go to:
www.microsoft.com/en-us/server-cloud/cloud-os/modern-data-center.aspx

Software and Services

- Windows Server Product Portfolio
  - Windows Server 2012 R2 Preview
  - Windows Server 2012
  - Microsoft System Center 2012 R2
- Technologies
  - Hyper-V

Hardware

- Server: Cisco Unified Computing System B200M3
- Network: Cisco Nexus 7000, 5000
- Storage: NetApp, Dell Compellent