THE VALUE OF VIRTUALIZATION:

OPTIMIZING GOVERNMENT DATA CENTERS

INDUSTRY PERSPECTIVE

Tintri

carahsoft

Federal agencies are adopting virtualization to meet demands for optimizing performance, but legacy data storage creates bottlenecks that can undermine the benefits promised by virtual applications. Storage designed to accommodate virtualized workloads can provide the performance, flexibility and end-to-end visibility needed to modernize and optimize data centers.

THE DEMAND FOR OPTIMIZATION

Governments at all levels — federal, state and local — are under pressure to do more with less. This does not mean merely cutting budgets. Real economy is beginning to come from optimizing IT infrastructure to improve performance, productivity and flexibility. Advances in information technology are transforming government operations, creating efficiency, decreasing the time and manpower needed for tasks, improving access to data and enabling online delivery of services.

One of the driving advances in federal IT today is virtualization. Virtualization, the separation of an application from the hardware it runs on and the underlying operating system, allows agencies to rapidly provision resources, adapt quickly to changing requirements and optimize the use of existing computing capacity. Virtual applications can help agencies benefit from economies of scale and reduce the physical footprint of their information infrastructures. This helps agencies respond to continuing demands to cut costs while becoming more agile and making better use of growing volumes of data.

Unfortunately, various elements in the information infrastructure evolve at different rates. Legacy systems being maintained in the enterprise can hamper the ability to realize the full benefit of more modern technology as it is introduced.

Data storage is an example of this. Traditional centralized storage systems still in use in many government data centers are not designed to effectively support virtualized applications. Storage resources are not effectively used and virtual applications are not efficiently served. The result is a cumbersome infrastructure that is management-intensive and provides no guarantees of performance or visibility at the application level where the data is being most used.

To help address this issue in public-sector IT, GovLoop partnered with Tintri, an industry leader in building VM-aware storage specifically for virtualized applications, to discuss why a system designed from the ground up to provide storage for virtualized workloads is needed to address the issues created by virtualization. We spoke with Dennis Sheehan, Director, Systems Engineering at Tintri, about how storage that is virtual-machine-aware and designed to accommodate virtual workloads can help modernize and optimize federal data centers so that agencies get the most from their virtualization investments.

THE DATA CENTER OPTIMIZATION INITIATIVE

The number of federal data centers grew from just 432 in 1998 to more than 1,100 by 2009. In 2010, the government began an effort to control this rapid growth with the Federal Data Center Consolidation Initiative (FDCCI). The FDCCI set a goal of shutting down 40 percent of the total data centers in existence, or 800, by 2015.

Despite the consolidation effort, the General Services Administration found that the number of data centers continued to grow, and within two years there were 3,133. The target for closures was upped to 1,200 facilities.

In March 2016, the White House proposed replacing the FDCCI with the Data Center Optimization Initiative (DCOI), which focuses not only on consolidating and reducing the number of facilities, but optimizing them to improve efficiency and reduce operating costs. The new initiative calls for the increased use of virtualization "to enable pooling of storage, network and compute resources, and dynamic allocation on-demand." It also emphasizes the ability to "measure progress toward ... server utilization and virtualization metrics."

Unfortunately, the traditional storage technology now being used in many government data centers does not provide the visibility needed to effectively meet these goals when used with virtual applications.

VIRTUAL APPLICATIONS

Virtualization is not new to government. As with private-sector organizations, agencies have turned to virtual applications to deploy new functionality more quickly across large enterprises, allowing them to operate at the pace of business.

Virtualization means separating an application from the hardware it runs on and the underlying operating system (OS). The OS's runtime environment is replaced by a virtualization layer and a single file replaces many separate instances of the app. The virtualized application can run in many different environments, which can eliminate most interoperability problems. This lets agencies quickly respond to changing business requirements and meet growing demands for data access and business analytics.

Virtualization is the cornerstone for rapid application deployment, accommodating mobile computing and enabling cloud computing. It promises agencies the flexibility to expand their IT infrastructure both organically as well as externally, using cloud service providers (CSP) to meet the growing demand for new applications and data storage requirements. It also can reduce administration and management costs by creating a single software baseline.

The more applications that can be virtualized, the greater the economies of scale that can be achieved while minimizing the physical footprint needed to operate and maintain the applications.

But data storage technology often has not kept pace with the development of virtual applications in data centers. Newer technologies such as flash and tiered storage can replace or supplement the traditional spinning disk array to improve speed and capacity. But they do not address the issues of visibility and quality of service that are unique to virtual workloads.

THE LEGACY CHALLENGE

Legacy IT systems were designed around individual physical servers and the infrastructure was built to meet the requirements of siloed applications. As needs and capabilities evolved, changes to applications could require enormous time, effort and coordination between departments to adjust the server-storage infrastructure to meet these needs. Legacy IT infrastructure does not provide an agile, flexible IT environment – and it often discourages change.

Even with the benefits of virtualization, many IT shops continue to struggle to keep up in a legacy environment with growing business demands and application proliferation. Virtualization helps the IT infrastructure maximize utilization of each server's CPU and memory, but unless storage technology is optimized for virtual applications, the full benefits cannot be fully realized or even accurately measured.

BOTTLENECKS AND BLIND SPOTS

Although usage of computing resources can be maximized by virtualization, the demands created by virtual applications can create performance issues and management complexity. Traditional storage was not designed to handle the workloads of virtual applications. And because various elements of the new environment are each being managed separately, there is no overall visibility into the performance of these elements.

The storage industry has attempted to address the virtual workload issue with technologies such as flash storage to replace traditional disk arrays; hybrid storage consisting of both flash and disks; and tiered storage, which prioritizes data based on how it is being used. These can help improve performance, but do not address management complexity. And when performance problems persist, because there is no overall system visibility, there is no effective way to troubleshoot to find the solution.

Hyper-convergence is another attempted storage solution. It is a software-centric architecture that integrates compute, storage, networking and virtualization resources in a commodity hardware box. This converged tier can in theory reduce the pain of managing storage separately, but in many environments it is difficult to maintain control over the whole infrastructure that is required to make this solution scale adequately. Scalability can also be a challenge since you have to scale both compute and storage together. One can add storage-only nodes with some of the hyperconverged technologies, but then they lose the benefit of hyperconvergence, causing additional management overhead in terms of keeping all the nodes balanced in a mixed workload environment.

Virtualizing multiple workloads makes it harder for administrators to see the impact of new workloads, find bottlenecks and identify problems such as misconfiguration of virtual machines and shared infrastructure. Traditional storage architectures provide only limited visibility into a virtual environment. Performance can be evaluated on the level of the logical unit number (LUN) of the storage device being addressed or of the volume or file system. But these architectures cannot isolate the performance of virtual machines or provide insight into that performance. Without access to "real-time" relevant performance metrics, administrators cannot ensure that performance goals are being met. In an effort to better understand and control the impact of virtualized workloads, administrators sometimes resort to allocating a single LUN or volume for a single virtual machine. But because of limitations in scaling and the increased management overhead of traditional storage architectures, this is not a practical solution.

Identifying the cause of performance bottlenecks can be time-consuming, frustrating and inconclusive. It requires repeatedly gathering and analyzing data to form a hypothesis and then testing each hypothesis. In large enterprises, this can involve coordination between multiple people and departments and can take days or even weeks. And there is no guarantee of an answer at the end of the process.

Gaining insight into a virtualized environment using traditional storage architectures can also require deployment of separate, complex software solutions. Even then, days can be spent troubleshooting performance issues because of the complexity of the solutions and the lack of skills on staff.

Because of these limitations, some agencies avoid mixing workloads on the same storage system, resulting in siloed architectures that undermine the effectiveness of virtualization.

THE VM-AWARE STORAGE SOLUTION

A system designed from the ground up to provide storage for virtualized workloads is needed to address the issues created by virtualization. Tintri, which creates a match between virtualized workloads and storage, provides such a solution.

The Tintri approach provides VM-aware storage that is simple to deploy and built to handle the disparate and often performance-intensive workloads created by virtualization and multiple applications in a modern IT infrastructure. Through its performance analytics, Tintri provides end-to-end visibility from the virtual application server through the network infrastructure to the underlining storage. This allows virtualization administrators to see and measure the "real-time" performance, latency and throughput for individual applications. These performance analytics are also used by system to assign performance reserves that guarantee performance to VMs as well as implement VM Scale-out that uses 30 days of history (up to 1 million data points every 10 minutes) to predict and place the VMs on the right system/datastore. Because Tintri was designed for virtualized workloads, it provides predictable application performance through individual quality of service (QOS) performance lanes for each virtual application.

CASE STUDY: VM-AWARE STORAGE AT THE DEPARTMENT OF DEFENSE

The U.S. Department of Defense has realized the benefits of VM-aware storage from Tintri in several installations, improving efficiency, reducing the time for deployment of new virtual machines and easing management of storage systems.

The **U.S. Army Joint Systems Integration Lab** (JSIL) turned to Tintri to eliminate slowdowns in its existing SAN storage solution, which had been built for capacity rather than speed. JSIL experienced very slow read/write times, resulting in sluggish responses and unpredictable performance in the virtual machines supporting the virtualized training environment.

JSIL selected the Tintri VMstore™ T820 system, which has a simple, intuitive interface and went from in-the-box to up-and-running in less than two hours. With the Tintri system, JSIL:

- Saw a 220 percent speed increase in disk input/output
- Reduced installation and configuration time to less than two hours
- Eliminated all user complaints and trouble tickets related to system performance

The **DoD Cyber Range** is a closed lab that replicates real-world DoD networks for testing and simulation. It provides a realistic simulation and modeling environment to test capabilities and train personnel in preventing and defending against network intrusions. The Cyber Range manages more than 125 events a year for customers and needed the ability to provision hundreds or even thousands of VMs quickly, and then spin them down just as fast when the exercises were completed. Its traditional storage platform, with its LUN and volume approach to provisioning, could not scale quickly enough to meet these demands.

The Cyber Range also wanted to shrink its physical footprint, reducing cooling costs and power consumption while enhancing backup and replication of virtual machines.

The solution it chose to accomplish this was initially deployed two years ago on Tintri VMstore™ T540 and T650, for three networks of storage with corresponding backup arrays. Due to the success of the project the CyberRange has added to the deployment by adding additional Tintri T880 VMstore units to the configuration. It also is using Tintri ReplicateVM™ for disaster recovery, as well as Tintri Global Center™ to view multiple VMstores in a single "pane of glass." The new solution enables the rapid provisioning of pre-configured virtual machines without straining the system's ability to deliver high performance. With the Tintri solution, the Cyber Range was able to:

- Reduce time to deploy new VMs from two weeks to just minutes
- Increase storage performance
- Halve its data center footprint from 3 to 1.5 racks
- Reduce heat output and power consumption by 96 percent
- Simplify storage management and reduce training overhead
- Increase backup functionality

This solution provides storage designed from the ground up to support virtual applications, and is also simple to deploy and administer. Both virtualized server and storage infrastructure can be managed together, eliminating the need for separate administrators. This not only reduces costs but also helps increase the agility and scalability of the IT infrastructure to meet the rapidly increasing mission demands of modern government.

With this approach, detailed "real-time" performance statistics for each virtual machine and application from the host/application, network and storage are provided. Predictable, measurable and guaranteed performance for each application deployed on a Tintri VMstore allows organizations to focus on expanding new applications on demand and meeting the core mission-drivers at the speed of today's public-sector IT needs.

Virtualizing and consolidating multiple workloads can provide better utilization of IT resources, but requires a storage structure created specifically to support virtualized workloads. With a comprehensive view of virtual machines, including end-to-end tracking of "real-time" performance across the data center infrastructure, administrators can gain access to the metrics they need to ensure optimized performance for each virtual machine and the scale-out capability to independently grow the compute and storage infrastructure with the business demands.

ABOUT **TINTRI**

Tintri VM-aware storage is the simplest for virtualized applications and cloud. With implementations at over 60 government agencies including DoD and Civilian they all have said "No to LUNs." With Tintri they manage only virtual machines, in a fraction of the footprint and at far lower cost than conventional storage. Tintri offers them the choice of all-flash or hybrid-flash platform, converged or stand-alone structure and any hypervisor. Rather than obsess with storage, leaders focus on the business applications that drive value—and that requires that they keep storage simple.

For more information, visit www.tintri.com and follow us on Twitter: @tintri

ABOUT **GOVLOOP**

GovLoop's mission is to "connect government to improve government." We aim to inspire public-sector professionals by serving as the knowledge network for government. GovLoop connects more than 250,000 members, fostering cross-government collaboration, solving common problems and advancing government careers. GovLoop is headquartered in Washington, D.C., with a team of dedicated professionals who share a commitment to connect and improve government.

For more information about this report, please reach out to info@govloop.com.

www.govloop.com

Twitter: @GovLoop

1152 15th St NW, Suite 800
Washington, DC 20005

Phone: (202) 407-7421
Fax: (202) 407-7501

www.govloop.com
Twitter: @GovLoop