Smart Storage That Sees, Learns and Adapts — A Strategic White Paper

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The Move to Virtualization and Software-Defined Infrastructure

The IT world is becoming increasingly virtualized. A recent Enterprise Strategy Group (ESG) survey[1] revealed that one-third of respondents had already virtualized more than half of their x86 servers. But that percentage is expected to increase significantly over the next few years. Analysts and experts all agree that almost all new IT workloads are now being deployed in virtual environments.

Many enterprises started their virtualization journey by focusing on their tier 2 and 3 applications. Impressed with the results of their first initiatives, these organizations have been actively extending virtualization to include their key tier 1 applications and end-user desktops, taking advantage of the unmatched flexibility, agility, scalability, and availability that virtualization can bring to their business-critical systems.

This wide-spread adoption of virtualization is driving a software-defined approach to IT infrastructure – using the flexibility and configurability of software to decide how, when, and where virtual machines and applications are running and stored. This software-centered design does not tie the datacenter into any particular configuration; it enables IT to flexibly configure and scale the virtual infrastructure to best serve applications and end users. But a true software-defined infrastructure is not possible without a storage platform designed and optimized for the unique needs of virtualized environments.

Where Traditional Storage Fails

Although virtualization has improved the performance and manageability of the servers in the enterprise, it has created extra workload for the storage platform. The majority of enterprises embarked on the path to virtualization using general-purpose storage based on LUNs and volumes. Most were happy with the results they obtained while they still had the initial exuberance to tackle the many challenges general-purpose storage presents in virtualized environments. But they are now suffering from inadequate storage performance and the tremendous strain on their already over-loaded IT staff.

The storage management burden is due in large part because of a significant mismatch between the capabilities of traditional storage and the demands of virtualized environments. General-purpose storage was designed to meet the needs of every system and application in the customer's environment. But by trying to solve a wide range of problems with just one dated approach, the environment effectively becomes the "jack of all, the king of none." There are four main challenges enterprises face when using general-purpose storage in virtual environments, including increased complexity and management, inadequate storage performance, insufficient data protection, and the disappointingly low ROI of their virtualization initiatives:

- **Management Complexity.** Virtualization has simplified the management of compute infrastructure with use of virtual machines, but has made storage management much more complex. IT administrators spend an excessive amount of time configuring and managing their storage to meet the requirements of the virtual environment. These tasks are complex, error prone and time-consuming for IT organizations using general-purpose storage. Analyst research reports and recent VMware surveys agree that in typical IT environments, two-thirds of all IT resources are spent on management, leaving only one third for more strategic initiatives. That statistic may actually be lower considering the additional burden of storage administration in increasingly virtual environments.

- **Storage Performance.** Virtualization places additional demands on storage performance. IT administrators must ensure proper configurations so performance doesn't suffer when multiple users' applications need simultaneous access to shared storage, or there are heavy workloads during crunch times. Some IT organizations try to solve the problem by paying lots of money for very fast, flash-only

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1   ESG Research Report: 2013 IT Spending Intentions Survey
     (http://www.esg-global.com/research-reports/research-report-2013-it-spending-intentions-survey/)

storage solutions. IT can throw any workload at these systems with decent results, but it comes at a significant price and can still be unpredictable in rapidly changing virtual environments. Other IT organizations try to improve performance by bolting flash options onto their traditional storage systems or by adding disks to their existing legacy solutions. With either of these approaches, enterprises end up significantly over-provisioning capacity, since the storage isn't intelligent enough to automatically tune itself for various virtualized applications. Scaling storage to meet the growth in virtualization can also be a challenge. Deploying additional storage systems to meet growing performance and capacity needs increases administrative overhead. Using a traditional scale-out storage approach doesn't solve the problem as it adds unnecessary complexity and it still requires administrators to manually organize storage for virtualization.

- **Data Protection.** The need to have VM-level data protection and availability is key in a virtualized environment. General-purpose storage solutions look at backup/recovery from a volume or LUN level versus at the VM-level. This contributes to additional complexity as IT administrators have to keep closer watch on the VM to LUN mapping. There are ways to look at data protection from an application level, but that adds significantly more cost and complexity. Replication for business continuity and disaster recovery suffers from the same challenges except they extend over the network. The management complexity and bandwidth costs are the top reasons why IT organizations shy away from deploying disaster recovery.

- **TCO and ROI.** Virtualization has significantly increased the costs of storage management and the underlying storage infrastructure, negatively impacting the ROI of virtualization. Enterprises need storage solutions designed specifically for virtualization in order to improve TCO and ROI.

The Cure for the Storage Mismatch: Tintri Smart Storage

Tintri smart storage is the first storage solution designed from the ground up to meet the unique challenges of virtual environments and eliminate the complexity associated with managing storage. We refer to this as **storage that sees, learns and adapts**. Built using the industry's first and leading application-aware storage architecture, Tintri VMstore enables enterprises to easily and cost-effectively maximize the benefits of their current and future server and desktop virtualization deployments, all without having to manage the storage environment.

VMstore is easily deployed as a datastore into virtual environments and delivers the performance, density and control virtualized servers and desktops need from storage in a compact form factor. Table 1 contains a list of features and functionality in the Tintri VMstore that can help you make your virtualization and software-defined infrastructure initiatives a success.

Tintri Advantages	VMstore Features
Intelligent Storage Make virtualization predictable with storage built on the industry's first application-aware Storage architecture.	• Patented FlashFirst™ design ensures 99% of I/O transactions are served from flash – resulting in higher throughput with sub-millisecond latencies in a fraction of the physical footprint of traditional storage. • VM-level quality of service (QoS) and performance allocation ensure VMs are performing as expected – even in rapidly changing virtual desktop and server environments. • Virtualization-optimized VMstore lets IT work with auto-aligned VMs and not LUNs and volumes – providing the best performance without any tuning. • Quickly and easily scale by adding VMstore systems as building blocks managed by the virtualization layer.

Tintri Advantages	VMstore Features
Infrastructure Insight Keep virtualization operating in top form with comprehensive VM-level insight into the entire infrastructure stack.	• End-to-end VM-granular visibility into performance latency across compute, networking and storage enables IT to visualize virtualization bottlenecks. • Monitor VMs in real-time through a single pane of glass enabling admins to easily keep tabs on all VMs. • Monitor multiple geographically distributed VMstore systems as one with Tintri Global Center™.
VM Control Be in control of virtualization with VM granular management and automation.	• Work with VMs and vDisks instead of LUNs and physical disks and eliminate storage management overhead. • Use policies to trigger individual VM snapshots and unique WAN-efficient VM replication of individual VMs. • Take zero-space VM-granular clones through VMware tools driving efficiency.

Figure 1:   VMstore features and advantages.

Providing Unparalleled Performance and Efficiency

Tintri VMstore provides as much as 10x the storage performance and density of traditional storage solutions using its patented FlashFirst™ design. More information on the Tintri FlashFirst design and application-aware architecture can be found in the technical white paper, Tintri VMstore: smart storage for virtualization and cloud. Enterprises moving to Tintri for storage for their server and desktop virtualization deployments have been able to cut their storage footprint by 50% or more, while improving performance and responsiveness.

In addition to FlashFirst design, Tintri VM-level QOS and performance allocation on Tintri VMstore make it possible to cost-effectively support thousands of VMs including I/O intensive virtualized tier-one applications and latency sensitive end-user desktops on a single VMstore with consistent performance.

Scale performance and capacity by adding VMstore systems, which appear as datastores and can be leveraged by the virtualization layer using functionality such as VMware Storage DRS.

Making Virtualization Predictable

VMstore helps IT lower risk and keep virtual environments always optimized and protected – even in quickly changing conditions. In addition to delivering consistent VM performance using FlashFirst design and VM-level QOS and performance allocation, VMstore provides VM-granular data protection through frequent efficient snapshots and replication of individual VMs. This means admins can setup policies to protect hundreds to thousands of individual VMs without backup windows or manual tasks using Tintri SnapVM™ and ReplicateVM™ functionality. Accessing VM snapshots on VMstore system is painless due to seamless integration with the virtualization layer.

ReplicateVM provides the added benefit of making the most use of network bandwidth by de-duplicating and compressing data before it is sent over the wire resulting in substantial savings. The integrated VM-level data protection eliminates the complexity that comes with a separate storage solution for backing up individual virtual machines and improves Recovery Point Objectives (RPO) and Recovery Time Objectives (RTO). In addition, IT admins also get an end-to-end view of the complete VM infrastructure stack with Tintri. With this information they can troubleshoot performance bottlenecks in minutes versus hours or days and fix issues before they escalate.

Enabling Extra IT Productivity

With "set it and forget it" simplicity, new VMstore systems can be deployed in as little as two minutes and require zero tuning or configuration adjustments. Storage administrators can perform tasks such as deploying hundreds of clones through the virtualization tools without needing to touch the underlying storage, and achieve VM-level agility without dealing with nuances associated with traditional storage platforms. With this level of automation, it is not uncommon for storage admins to benefit from an order of magnitude improvement in productivity as validated by not only Tintri customers, but also independent third-party testing. This comes from removing the need to manage or tune storage and the high degree of integration with the virtualization management layer. With VMstore's unsurpassed administrative simplicity, enterprises can deploy applications quickly and easily, especially those with very noticeable impact such as virtualized tier-one applications, VDI, and software development and test environments.

Tintri is extending the concept of smart storage with Tintri Global Center™, a control platform that deploys as a standalone virtual appliance. Tintri Global Center enables administrators to centrally administer and control as many as 32 geographically diverse VMstore systems and their resident VMs. The architectural foundation upon which Tintri Global Center is built supports as many as a million VMs and will enable administrators to apply consistent policies across VMstore systems in future releases. Administrators will also be able to use REST APIs and PowerShell scripts for custom solutions for automation in the future with Tintri Global Center.

Improving TCO and ROI of Virtualization

By reducing the amount of storage infrastructure needed for their virtualized environments, streamlining manageability, and speeding time to market of new applications and services, enterprises are able to make substantial improvements to the TCO and ROI of their virtualization initiatives.

Getting Started

Tintri smart storage addresses the mismatch between storage and the demands of virtualization. Built on the industry's first and leading intelligent application-aware architecture, VMstore and Tintri Global Center have the intelligence to deliver unparalleled performance and efficiency and end-to-end insights into the infrastructure, while allowing for unmatched VM control.

Whether you are just getting started with virtualization, or are expanding virtualization to your desktops and business-critical apps, VMstore will help make your virtualization initiatives simple, predictable, scalable, and cost effective. Contact us to schedule a demo of the industry's first and only application-aware, smart storage solution today.

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