

Solution Showcase

VM Insight: The Critical Path to App-aware Infrastructure

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Abstract: As virtual environments scale, understanding how each virtual machine impacts the underlying infrastructure becomes a necessity for efficient data center design and timely issue diagnosis. Capturing this information, however, typically requires complex and costly manual processes. While these issues have been somewhat remedied at the endpoints (e.g., storage and servers), the network continues to be a challenge, generating a “fog” that hides data congestion and impedes identifying a resolution. A new technology standard delivers automatic virtual machine (VM) awareness across the entire data path. Leveraging this technology, storage network leaders Brocade and Cavium can now deliver individual VM Insight across the storage network for a more efficient data center at scale.

Overview

Virtualization technology has transformed the data center, in part by freeing workloads from being tied to a specific set of infrastructure elements, dramatically increasing efficiency and flexibility by dividing hardware components across multiple virtual servers. At scale, however, this freedom introduces complexity that can hold back digital businesses. As organizations eke every last bit of performance and capacity out of the infrastructure, driving up utilization, performance shifts and spikes create disruptions. When this happens, the hardware abstraction provided by virtual environments hinders resolution. For example, if traffic patterns change, it’s not easy to isolate what caused the disruption. When you add a new workload, how can you ensure that the new app gets the right resources, while the existing workloads are still supported? Addressing these challenges requires the ability to correlate infrastructure resources to specific applications. At scale this practice is often manual, time-consuming, and costly.

The applications and data are what matters to the business; the infrastructure is only a means to an end. Scaling IT to meet the demands of a modern digital business requires automation, while complex manual processes slow down initiatives and waste resources. In an ideal world, all infrastructure elements could be managed at the application level, or, at least, the virtual machine level as a proxy for the application. Remedies are available at the server and enterprise storage level, but addressing the network in the middle has remained a challenge. Leveraging a new technology standard, Brocade and Cavium are now able to automatically align VMs with all of the critical elements along the data path—not just the storage and the servers, but the storage network as well, offering the ability to carry the identification of individual VMs across the storage network. The result is an end-to-end data path that is now VM-aware, with the potential to speed up infrastructure design, and deliver more efficient data center architectures, faster diagnosis, and more timely issue resolution.

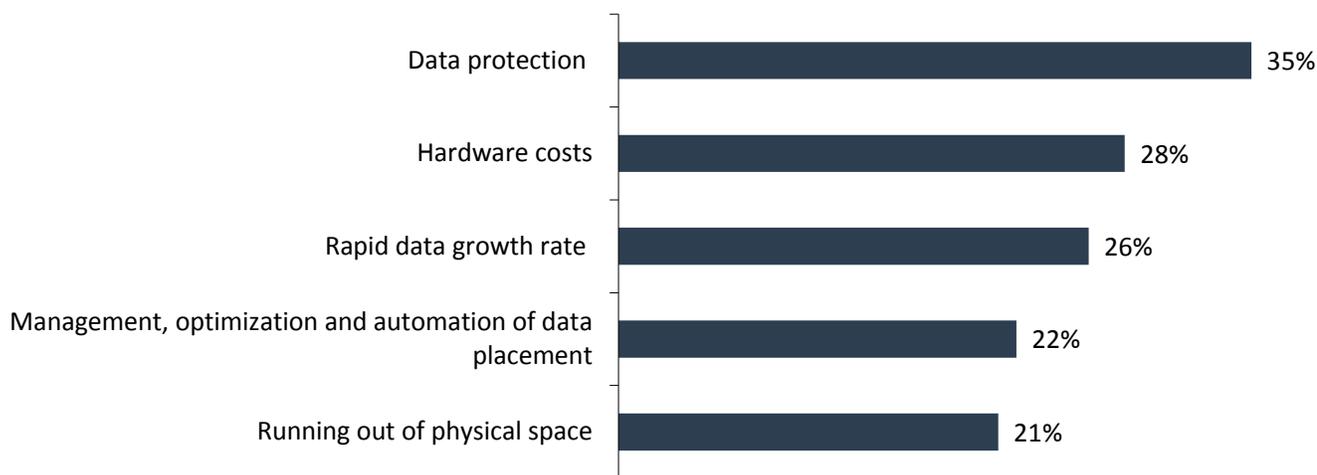
Management Complexity Is Hindering the Modern Business

Despite already strong adoption for virtualization environments, investment continues to increase. ESG surveyed 641 IT decision makers on a number of topics related to their 2017 IT spending intentions. In this study, IT decision makers were asked to identify anticipated changes in their organization’s spending behavior by technology. Nearly half (49%) of IT decision makers indicated that they expected to increase spending on virtualization/private cloud software in 2017, with an additional 46% expecting that their spending on virtualization/private cloud software would remain the same as 2016.¹ As virtualization environments increase, strain is placed on the underlying IT infrastructure, including the storage infrastructure.

For example, in a separate ESG research study focused on the enterprise storage market landscape, 31% of storage decision makers identified supporting server virtualization/private cloud implementations as an IT initiative that they believed would significantly impact their storage spending in 2017 and beyond.² As part of the same study, participants also were asked to identify the top storage challenges in their organizations.

Figure 1. Top Five Data Storage Challenges

In general, what would you say are your organization’s biggest challenges in terms of its storage environment? (Percent of respondents, N=356)



Source: Enterprise Strategy Group, 2017

The data in Figure 1 presents a familiar story, as data protection, hardware costs, and the rapid growth of data persist as the most commonly reported storage challenges. As data growth increases, infrastructure becomes more costly and more difficult to protect. In addition, managing how data is placed across the infrastructure becomes more critical in order to ensure that hardware costs stay under control as data scales. As virtualized environments increase, however, the ability to understand how workloads align to specific infrastructure components, such as the servers, the storage, and the network, becomes more complex.

The Unsustainability of the Manual Management Status Quo

At the server level, applications can be isolated in dedicated vSphere clusters in an attempt to meet service level agreements (SLAs). At the storage layer, VM-level awareness is becoming more widely available. For example, in a separate ESG research study investigating storage industry trends around software-defined storage (SDS), when storage decision makers currently using the technology were asked to identify the factors that led to their organization’s consideration of

¹ Source: ESG Research Report, [2017 IT Spending Intentions Survey](#), March 2017.

² Source: ESG Brief, [2017 Storage Trends: Challenges and Spending](#), August 2017.

software-defined storage, the most commonly identified factor was the ability to simplify storage management by integrating storage and hypervisor management.³ So while the industry offers some answers for servers and storage, understanding how VMs align to the storage network is still a challenge.

With the emergence of all-flash storage, the role of the network in delivering performance has become even more critical, as the lower storage latencies seen with all-flash implementations typically shift the constraints to the storage network. As VMs scale, it is difficult to understand what is driving the traffic and impacting performance. Are the right apps benefitting from performance boosts or are lower priority workloads usurping the gains? What is the most efficient method to increase performance? What is the best way to diagnose performance hiccups or issues? You can try to extrapolate network bandwidth constraints by relying only on endpoint device views or SNMP traps and API access that deliver statistics only after an issue has occurred, but that can be complex and time-consuming. For some added insight, you could leverage VMotion to the separate VM to better understand what happens. But do you run the risk of impacting a production application just because the right diagnostic information is not available? Ultimately, none of these options are ideal, and at scale, this level of manual investigation is unsustainable.

ESG was recently able to discuss the challenges of the manual investigation process and the complexity of isolating performance issues down the VM with a senior storage engineer for an enterprise firm in the financial services sector. He said, "It is a pain... It's a messy process due to our lack of tools... and storage and virtualization are managed by separate teams." When describing a specific example, he said, "For the last incident we spent two weeks on a resolution, and the root cause is still not known today."

In a separate conversation, a product specialist for storage for a major retail business described a similar scenario and said, "There are many applications that can cause similar problems and we could not pinpoint which VM was causing the problem, when you have bad traffic or bad packets on the network coming out from the virtual machines you cannot figure it out with the ESX hardware. We can check if this particular machine is sending errors or bad packets, but we can't figure out which particular virtual machines is causing the problem." When the conversation moved to discussing the power of VM awareness at the network, he said, "With VM tagging enabled, we can pinpoint the virtual machines... We can troubleshoot performance problems faster."

VM Insight: Enabling End-to-end VM-aware Infrastructure

Unlike endpoint devices, network technologies are often defined by their interoperability. The more universally applicable the network is, the more flexible it tends to be. As such, the Fibre Channel standards (T11) group introduced a new standard that offers the ability to carry the identification of individual VMs across the storage network. VMware is the first hypervisor to take advantage of this capability and the technology to track VMs is available within the storage network via Brocade's VM Insight technology, Cavium's QLogic Fibre Channel adapters with VM-ID technology, or with Broadcom's Emulex adapters. The resulting solution delivers granular insight into the application health and performance for each VM. Furthermore, this standard-based identification is highly scalable and flexible to support different hypervisors and other virtualization technology.

The technology offers the ability to monitor and trend the conversations between servers and storage. It does not monitor information, however, but rather the metadata of how many I/O transactions are taking place. Some examples of VM-level information include: throughput at a flow level to monitor bandwidth utilization per workload, total I/Os at a flow level to monitor workload profiles over time, first response times (maximum and average) for an I/O request, Exchange Completion Time (ECT) for I/O latency (maximum and average), and outstanding I/Os in the queue, maximum and average all tracked at a VM level.

³ Source: ESG Research Report, [Software-defined Storage \(SDS\) Market Trends](#), February 2017.

Business Benefits of a VM-aware Data Path

Once the entire data path becomes VM-aware, resource cycles are no longer wasted on just attempting to understand the infrastructure. The result improves the efficiency of both operational and capital resources and delivers a variety of business benefits, including:

- **Faster diagnosis of performance issues when they occur:** When issues arise, don't just diagnose the issue down to several components—with VM Insight, you can automatically identify the VM involved rather than trying to discern what happened in a post-event investigation.
- **Faster and more efficient IT infrastructure design:** With improved understanding of the requirements for each VM, the number of VMs on the infrastructure can be increased with confidence. It also becomes easier to ensure the right performance is delivered to the right VM without unnecessarily over-allocating hardware. Additionally, technology is designed to support future infrastructure innovations. For example, VM Insight is designed to work with NVMe over Fibre Channel.
- **More efficient scaling to ensure performance issues do not emerge:** Bottlenecks in the data path are identified automatically. This ensures that when the infrastructure needs to scale, the right resources are deployed to the right workloads at the right time.
- **The liberation of critical personnel resources for new growth projects rather than the isolation of performance issues:** The digital business can only grow as fast as its people can deliver new projects and initiatives. Every day lost to diagnosing unnecessary issues is a day not being applied to new growth opportunities. With a proper level of reporting, resources can be deployed on higher value objectives.

All of these benefits stem from a central theme: Modern IT infrastructures are scaling too quickly to be bogged down by manual processes. Compute is managed at the VM level, storage is quickly become more VM-aware, and the storage network is the final piece to delivering the next level in IT infrastructure efficiency.

The Bigger Truth

Almost by definition, digitally enabled businesses are dependent upon the IT organization not only to deliver necessary services, but also to become business drivers. As a result, IT resources often must scale ahead of business growth, rather than just keep pace. The bottom line is that the speed of IT services impacts the bottom line more than ever. Delivering the necessary pace demands automation, and the first step toward this level of automation is removing complex, time-consuming manual processes from routine tasks. This new standard leveraged by Brocade and Cavium extends VM awareness through the network, delivering the likely final piece to achieve end-to-end alignment between the virtual machine and the infrastructure. With this level of insight, data center management shifts from manual, reactive, and costly to automatic, proactive, and efficient.

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