SOLARWINDS
WHITEPAPER

Why SysAdmins Should Pay Attention to Virtualization and Storage Performance

solarwinds

Follow SolarWinds:

It's important for system administrators to be aware of storage performance issues when ensuring application availability. Hardware resources are critical to application performance; similarly, the storage resources are critical to application performance. This is important because server virtualization can impact the storage layer.

- Datastore capacity and performance: Even if the VM that's experiencing problems isn't consuming a lot of storage, other VMs residing on the datastore might be consuming a lot of resources.
- Complexity in mapping VM to datastore to LUN: If there's a problem in the physical storage, this can impact several critical VMs.

In this whitepaper we will discuss how you can get end-to-end visibility from an application, all the way down to a storage level. This will provide answers to questions like, is the problem in the application, virtual environment, or storage components? Which applications are on a given datastore? Or which VMs have high latency? And so on.

Why is it important to monitor all tiers of the application stack, including storage?

You can go deeper with a server and application monitoring solution for diagnosing and troubleshooting key application performance issues. Unfortunately, you can't go beyond solving application issues. What if a virtual machine running your application has issues? You will have to go back and forth to find out whether there are performance issues in the VM or the application. Once you establish performance issues exists, then it's a bigger challenge to identify the origin of the issue. It can be an application component which is consuming too many resources or it can be an issue with the VM where CPU, memory, or storage resources aren't enough to support the VM or the applications running inside.

As system administrators, you're forced to go back and forth with multiple software tools to troubleshoot these issues. This is where having end-to-end visibility in to the app-stack, as we like to call it, will ensure there are no issues from an application down to a storage level and everything in between.

Components of an App-Stack
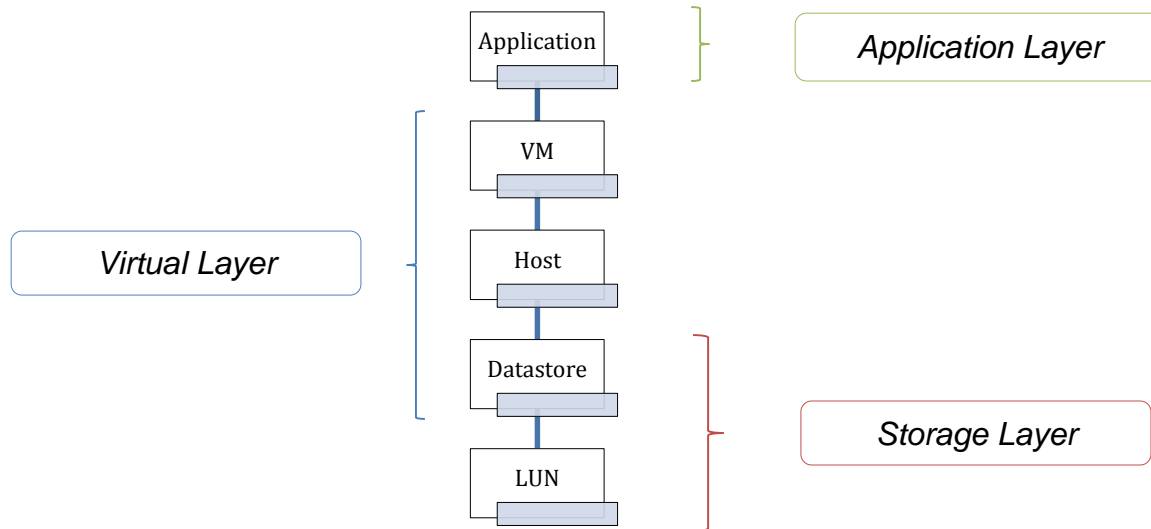
Applications Layer – Top of the Stack

Any business despite the type, size, or user base will use a set of basic applications, such as email servers, login access management like Microsoft Active Directory, database servers, and a few other web applications. If one of these applications is having an issue then it affects a lot of end users. For example, if your Exchange Server is having issues then it affects the basic operations of a business. Exchange server is a critical application and often employees have issues with their emails being slow or unable to access emails remotely.

It can be a challenge to identify why there's a slow-down or application downtime. Under such situations, employees rely heavily on the system administrator's expertise to quickly diagnose and solve the issue before there's a major business impact. When it's time to diagnose the issue, one of the first things done is to check whether the email application is up or down. In you find the application to be up and running, the next thing you should look to diagnose is the application performance metrics. Exchange Server consists of the following key performance metrics which you should look at next to diagnose for issues:

- Application Service Availability: This metric shows you a high level overview and if your application is healthy, and fully functioning.
- Current Connections: It lets you determine the number of users using Exchange so you can easily schedule maintenance at a time that the least likely to impact users.
- Average Response Time: Measure how long users spend waiting for information they requested. The longer users spend waiting the more likely they're to think Exchange Server is down and call the helpdesk.
- Messages Delivered/Sent: Validates whether your users' emails are being delivered and that messages are being sent. You can monitor the mail flow to ensure the server is not being used as a spam relay or that your users' workstations have not been compromised by botnets.

Performance metrics vary for each application. What's applicable for Exchange server won't be applicable for Active Directory or database servers. If you find everything to be intact in the application, then you will need to go deeper to check if there are issues in the virtual server layer.

Virtual Layer – Middle of the Stack

Once you're sure the application is free from any issues, you should drill deeper into the virtual environment. If the application is running on a VM, the workload of the VM can potentially cause the application to run slowly. To continue from our Exchange Server example, if your Exchange Server application is running on a VMware or Hyper-V host, there are a few performance issues that you might encounter in your virtual environment that can affect the performance of the application itself:

- VM failure
- Performance issues with the VM's operating system
- Performance bottleneck in the VM or its resources
- Capacity of the host

If the application is having issues due to VM performance then you should continue your quest to diagnose whether VM resources and key metrics are in line with the optimum thresholds. There are usually hundreds of performance statistics that VMware vCenter or Hyper-V Virtual Machine Manager (VMM) generates. These stats give information about the overall performance of your virtual environment. Key performance indicators are vital to help you troubleshoot performance bottlenecks in your virtual environment. The following are a few key metrics that are specific to monitoring the virtual machine performance:

CPU
- CPU Ready: High CPU ready times will tell you there's a CPU bottleneck or when there's too many VMs on a host. VM performance becomes slower because they have to wait for CPU time on the host.
- CPU Usage: You will know the total amount of CPU usage by all VMs on the host. You can manage the utilization of CPU resources to each VMs on the host.

Memory
- Memory Ballooning and Swapping: Find out how much memory is being ballooned and swapped from/to a VM. Memory ballooning is the first sign that a VM is running low on memory. If this then progresses to memory swapping it can significantly reduce VM performance.
- Memory Active: Know how much host memory is really used by VMs. This will tell you how much guest physical memory is used by the VM and how much total memory is actively used by the host.
- Allocated Memory: Monitoring allocated memory to the VM is a good metric because if your VM is low on memory, it will cause performance problems with your applications.

Network
- Network Usage: Get a general indication on the amount of incoming network traffic. This gives you insights on how saturated your hosts NIC are and if you're nearing your maximum throughput capacity. If your VMs have the highest network traffic rates, you can then think of balancing high traffic VMs across multiple hosts.

You should make it a point to look at virtual storage performance since they're closely associated to your virtual environment. Having storage I/O bottlenecks affects the performance of your virtual environment. The bottlenecks are hard to diagnose and you will notice VM performance will gradually start deteriorating. Some of the key metrics you should look at in your virtual storage are:

Datastore

- Disk Space: Disk space is a crucial component to monitor in a virtual environment. Ensure that your datastore does not corrupt the performance of your applications.
- Storage I/O per second (IOPS): See the total disk I/O rate. This shows you how much disk activity is occurring in your virtual environment. You can see individual VM disk consumption, as well as the total of all VMs running on the host.
- Storage I/O Latency: If the datastore I/O exceeds a set threshold, then all hosts and VMs accessing the datastore may have issues with response time.

You also have to think about the entire virtual infrastructure because there are several components attached. If one VM is affected, other VMs that are part of the same group will have performance issues. When storage resources are put under pressure, the entire virtual environment will be affected.

Storage Layer – Bottom of the Stack

Once you've assessed VM and virtual environment performance, you should move to the bottom of the stack and look at physical storage performance. Physical storage has its own set of I/O bottlenecks that affect performance. Disk performance is affected when the disk is slow to respond to user workloads, when you have many applications hitting the disk, insufficient drives causing throughput and high IOPS, and bottlenecks in your RAID groups due to poorly configured storage drives.

Key performance metrics you need to look at are:

- Disk Latency: Get a comprehensive picture disk queue and response time. This gives you meaningful information on whether or not disks have latency and performance issues.
- Disk Read/Write: See how much data is transferred to disk during read/write process. You will face disk latency issues when the counter shows a higher value.
- Disk Usage: See overall disk activity. Ensure there's enough storage capacity in the disk before an issue affects users.

There are several different components that affect storage performance. It can caused by your RAID levels, number of disks in your RAID group, type of disk drives, and disk performance capabilities. For you to be sure that storage doesn't affect the performance of the app-stack you can follow certain best practices and ensure optimum storage performance.

- Optimizing RAID type will mean that you could have improved storage availability and performance. Having a better RAID level will ensure there's seamless read/write when data is accessed from a drive.
- Having SSD in place of old disks will make data access instantaneous. SSDs reduces access time, lowers operating temperature, and improves I/O speed and capacity.
- When different applications share the same storage resource, it causes a lot of back and forth to the disk ultimately affecting disk performance.
- If you have a large cache the read/write becomes better and reduces the number of I/O bottlenecks.

You need all the visibility you can get to avoid storage performance issues. Look at storage performance and isolate hotspots if you have a multi-vendor SAN environment. Drill down to see IOPS at the LUN or RAID level and diagnose the location of the issue.

Why SysAdmins Should Keep a Close Eye on the App-Stack

The app-stack takes you beyond diagnosing issues in your application. You get end-to-end visibility on what's happening in your virtualized application stack – application, VMs, host, clusters, and datastores. Seamlessly go between app-stack layers to troubleshoot application issues in a virtualized environment, look at capacity planning, performance monitoring, VM sprawl control, configuration management, and chargeback automation.

For applications in a physical server or in a virtual environment, you can automatically see the application performance from both sides. You have the ability to see which applications have issues due to any given virtual resource. Instantly see what applications are dependent on a given virtual resource to ensure that issues are addressed before your end users make a report. The virtualized application stack goes beyond what the hypervisor can see. It helps you answer and solve issues, such as:

- Why are my applications slow?
- Which of my datastores are busy?
- Which applications and VMs are associated to a datastore?
- Is there any CPU or memory or storage capacity I can reclaim?

Monitoring the App-Stack

Adding more resources may look like it can solve some performance issues in your virtualized application stack. But remember, there's always the question of how much can you keep spending to add more resources? Also, how often do you have to keep going back to your decision makers for budget approvals? There is no point in figuring out where to start troubleshooting for issues as they occur in your virtual environment. For you to be able to keep a close eye on everything from the application to the datastore, you need a proactive monitoring solution that will simplify identification and troubleshooting of application performance, storage capacity, and keeping your virtual resources under control.

About Virtualization Manager

SolarWinds® Virtualization Manager delivers integrated VMware and Microsoft Hyper-V capacity planning, performance monitoring, VM sprawl control, configuration management, and chargeback automation; all in one awesomely affordable product that's easy to download, deploy, and use.

Key features of Virtualization Manager include:

- Real-time dashboards simplify Identification & troubleshooting of performance, capacity & configuration problems
- Identifies VM sprawl, helps you reclaim & optimize space & reduces licensing costs
- Integration with Server & Application Monitor provides application stack management from app to datastore
- Easy to download, deploy, and use – start monitoring your VMs in less than an hour

Q LEARN MORE »   **[↓] DOWNLOAD FREE TRIAL**

About SolarWinds

SolarWinds (NYSE: SWI) provides powerful and affordable IT management software to customers worldwide. Focused exclusively on IT Pros, we strive to eliminate the complexity in IT management software that many have been forced to accept from traditional enterprise software vendors. SolarWinds delivers on this commitment with unexpected simplicity through products that are easy to find, buy, use, and maintain, while providing the power to address any IT management problem on any scale. Our solutions are rooted in our deep connection to our user base, which interacts in our online community, thwack®, to solve problems, share technology and best practices, and directly participate in our product development process. Learn more at http://www.solarwinds.com.