

# Capacity Planning in Virtual Environments

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## Synopsis

*Virtualization changes the way just about everything is done in the data center, including capacity planning. Traditional physical server environments are fairly straightforward to plan for capacity, as they typically are dedicated to a single application. When your application outgrows its server hardware, you either upgrade it or buy a new server to replace it. This is similar to a house that is dedicated to a single family, once the family gets too large for the house, they can either expand it or get a bigger house. Where traditional servers might be like houses, a virtual environment is more like a city that has a lot of shared infrastructure and works together as a whole unit. As a result, trying to plan capacity in virtual environments becomes much more difficult.*

## Why capacity planning is important in virtual environments

Virtualization is all about the sharing of resources. You have to plan with the big picture in mind and take into account your virtual environment as a whole. A balance of resources is critical in a virtual environment since the server hardware used for virtualization is bigger and more expensive than traditional server hardware as it has to support many virtual machines (VMs) running on it. If resources are unbalanced on a host, it can lead to wasted resources, and since the whole point of virtualization is to make the most efficient use of all resources, this goes against the reasons that we virtualize in the first place. For example, if a host runs out of physical memory, it limits the number of VMs that can run on that host despite having plenty of other resources available to it. Sure, you can use memory over commitment, but performance severely degrades once your VMs start swapping to disk to make up for the lack of physical host memory. As a result, the lack of having enough physical memory available for VMs means that you are wasting resources and money.

Trying to keep your resources balanced isn't all that simple; you need to look at historical resource trends and usage to determine what that balance point is. Trying to calculate this manually is almost impossible. You need tools that can analyze your historical data and report how your environment has grown over time, how it stands today and how it will look in the future. Another area that further complicates resource calculations is spare capacity. If you are using High Availability in your environment, which most companies do, you have to maintain sufficient spare capacity to handle the load when host failures occur. So, you need a pool of resources that is unused at all times so you have enough resource capacity to handle VMs from failed hosts. Trying to factor spare capacity into your resource calculations can quickly get complicated, having a tool that can do this for you can make it a much easier exercise.

Capacity planning is also important to maximize your return on your investment (ROI) in virtualization. To get the most out of it you need to run it as efficiently as possible, having wasted resources reduces your ROI and decreases efficiency. A virtualized environment is complicated with lots of inter-related moving parts, and understanding the relationships between all the parts can be difficult. You don't want your virtual environment to become a money pit where you are constantly adding resources in different areas to keep it going. Making uninformed resource decisions can get very costly. Much like a recipe, you need to get all your ingredients perfectly combined to get the best possible outcome.

## Virtual crystal ball

One of the most difficult tasks with capacity planning is when it comes to predicting the future. You may have a general idea of your future growth needs for new VMs, so adding additional capacity may seem straightforward. The problem though, is your virtual environment is ever changing; how it looks today from a resource perspective will not be how it looks six months from now. VMs will most definitely be added, existing VMs may have resource allocations changed and some VMs may be retired. So how can you predict your future resource needs when you don't know what your environment will be like in six months? This becomes especially important when budgeting for the future. If you miscalculate your resource needs and budget for a certain amount, getting additional money later on may be difficult or impossible. Over-budgeting can be a problem as well as it may cause your budget to be cut if it becomes too large. As a result, you need to get the most accurate capacity planning forecast possible so you can accurately budget for your future resource needs.

In a virtual environment you need to leverage historical growth and trend statistics as a whole to accurately plan future capacity requirements. Growth isn't easily visible on a day to day basis, but if you look at two distance points in time it becomes much easier to distinguish growth patterns. It's rare to have a virtual environment shrink in size, the very nature of virtualization makes it too easy to create VMs and as a result, environments are always growing in size. In addition, workloads running on existing VMs can change over time. The resources assigned to a VM six months ago may have been OK back then, but as workloads grow so do resource requirements. All of this makes trying to predict the future very difficult. Unless you are a scientist or math major, trying to correlate all the data needed to predict future needs can be almost impossible.

One more complicating factor is the "what if?" scenarios. In many cases, you don't completely know what your future holds. Projects can spring up unexpectedly and the best-laid plans can often go awry. Therefore, you often have to use what-if scenarios to plan for future capacity needs. But how do you translate your what ifs into resource requirements? If that big project for the accounting department is approved and you have to implement 12 new VMs to support their project, how much additional capacity in each of the resource areas will you need on your hosts? Or, maybe you'll have to add new hosts and more storage, essentially becoming a guessing game. Trying to interpret all the possible what-if scenarios is enough to make your head spin.

## Capacity planning is more than just predicting the future

While predicting your future needs is important, there is more to capacity planning than simply trying to figure out your resource requirements down the road. Capacity planning is also about right-sizing your environment and making sure you are not needlessly wasting any of your existing resources. If you have too much stuff in your house, rather than going out and buying a bigger house, why don't you first get rid of what you don't need and then see if you still need a bigger house. Rightsizing is critical in virtual environments; too often, we take our mentalities and practices from the physical world and apply them to the virtual world. This means VMs too often are given more resources than they actually need to support their workloads. Application owners often want as many resources as they can get, even if their applications won't end up using them. Trying to locate VMs that have over-allocated resources can be difficult, you have to examine the long-term resource usage to see if a VM is using all of its resources or not. In large environments, trying to go from VM to VM to see if it is oversized can be a very time consuming task.

Besides oversized VMs, you often have dead or zombie VMs running in your environment that may have been used once for a period of time and were then forgotten about. These VMs continue running and consuming resources even though they are not actively being used anymore. Identifying these types of VMs is almost impossible. If a VM is powered off, it's easy to see its being used. But, if it's powered on, how can you tell if it's still being used or not? One way to identify these types of VMs is to look at telltale signs like the user login history, file

activity and resource activity. While these signs can offer clues that point towards a zombie VM, having to play detective to see if a VM is indeed no longer used can be quite time consuming.

One last thing to keep in mind with capacity planning is bottlenecks. You may have plenty of resources available on a host, but if access to your resources becomes constrained then your resources aren't doing you much good. While bottlenecks are not directly related to capacity planning they should be factored in to ensure that your pathways to your resources are sufficient and not a limiting factor to accessing them.

## How SolarWinds can help you with capacity planning

Trying to manually plan capacity can be difficult and time-consuming, you have to collect performance and usage data, look at current inventories, analyze data and then figure out how much capacity you need to add in each resource area. With all the many variables such as maintaining spare capacity, rightsizing and what-ifs, capacity planning can be a real headache. Fortunately, SolarWinds has you covered. SolarWinds Virtualization Manager can do all the heavy lifting and number crunching for you and make capacity planning as easy as a few clicks of a mouse. Virtualization Manager has a three-prong attack when it comes to capacity in virtual environments: management, optimization and planning.

- Operations management – allows you to see capacity issues as they occur by monitoring resource usage in real-time. This allows you to both detect and predict where bottlenecks are incurring in your environment so you can quickly resolve them. You can also receive notification of pending or predicted resource shortages on clusters, datastores, and VMs so you can proactively take steps to prevent them.
- Optimization – allows you to project when you will run out of resources based on historical trends while accounting for redundancy, N-1 planning constraints, and any desired resource ceilings. It also allows you to answer the what-if questions to see what would happen when adding capacity to your environment. Optimization also allows you to understand capacity usage from an application/workload perspective, which enables you to make capacity decisions consistent with business priorities.
- Planning – allows you to identify stale, zombie, orphaned, or rogue VMs as well as over- or under-allocated VMs so you can rightsize your environment, allowing for more accurate planning. Knowing where your capacity goes is important so you can also report on usage by business unit and departments for effective showback, billing, and chargeback. It can also help you determine how much more CPU, memory, and/or storage you need to buy for your environment. If you're looking at cloud computing, it can also help determine how much it would cost to run all or part of your virtual deployment in the public cloud.

The virtual capacity planning and management capabilities in SolarWinds Virtualization Manager enable you to efficiently plan, manage, budget, purchase, and report on the capacity of shared resource pools in your virtualized environment.

## Summary

Capacity planning isn't a one-time event, it is an ongoing process that must be continually done so your virtual environment remains healthy and grows in a controlled manner. Resources are the most precious component to your virtual environment and serve as the fuel for your VMs. Some resources like disk space usage are fairly obvious and easy to track, but there is a lot going on behind the scenes at the virtualization layer that isn't readily apparent. A host has many tricks up its sleeve to help make the most efficient use of resources, which can make the interpretation of resource usage more difficult. Surprises are the last thing that anyone wants to see in a data center, so staying informed is critical to making sure you are not surprised and can make informed decisions in a timely manner.

SolarWinds Virtualization Manager can be your crystal ball to help you understand your resource usage in the past, the present and in the future. Virtualization Manager can provide you with recommendations and justifications that you need for growing your environment. By eliminating the guesswork, you can go to management with the confidence necessary to get funding and avoid being called out because you made uneducated guesses and came up short. With Virtualization Manager, capacity planning in your virtual environment has never been easier or more powerful and helps ensure that you get it right the first time.

## About the Author

Eric Siebert is an IT industry veteran, author and blogger with more than 25 years of experience, most recently specializing in server administration and virtualization.

Siebert has published books, including his most recent, *Maximum vSphere* from Pearson Publishing and has authored training videos in the Train Signal Pro series. He also maintains his own VMware information web site, vSphere-land.com, and is a regular blogger and feature article contributor on TechTarget's SearchServerVirtualization and SearchVMware web sites. Siebert has presented at VMworld in 2008 and 2010 and has been recognized as a vExpert by VMware in 2009 and 2010.

## 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>.

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