

Virtualization 101: Understanding The Basics

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Virtualization has gone from being a niche technology over the past few years to being an essential part of infrastructure and data center planning. The introduction of any new technology, however, can add layers of complexity and, if improperly executed, can eliminate any of the savings such technology initially offered. Investing some up-front time to planning and research will go a long way in allowing you to create a stable and scalable virtual infrastructure.

Platforms

When it comes to virtualization, your options are vast: Virtual Server, Hyper-V, VMware ESX, ESXi (installable), Virtual Center, VMware Server, vMotion, HA, Storage vMotion, 32 and 64 bit, hypervisors, guest operating systems, host operating systems. What about support? How do you make sense of it all?

First, let's clear up the jargon.

Virtualization software can be split into two broad categories, host based virtualization and hypervisors. For the sake of brevity we'll look at the product offerings of the two market leaders in virtualization, Microsoft and VMware.

Host-based v Hypervisor

Host based products require an underlying operating system to 'host' the virtualization software. VMware Server (previously called GSX), Microsoft's Virtual Server and their desktop counterparts require either Windows or Linux to host virtual machines. These solutions are fine for small scale testing or for running an additional machine or two, but they don't truly scale beyond a few virtual machines because of the overhead of the operating system.

Hypervisors (Microsoft's Hyper-V and VMware's ESX 3.5 and ESXi 3.5 product) are a thin layer of software between the server hardware and the virtual machines themselves. Since there is no host or, in Microsoft's case, a minimal host OS (except the hypervisor itself), hypervisors can scale to support a greater number of virtual machines and add additional features that would tax or overwhelm host based products.

VMware v Microsoft

Let's underscore some important differences.

VMware's Distributed Resource Scheduling (DRS) and vMotion allow VMware's ESX product to dynamically balance loads across nodes in a cluster that share storage. This means that you can literally move one virtual server to another node in the cluster with nary a dropped packet. This allows maintenance on VMware boxes to occur during the day, or depending on your comfort level, dynamic organization of your VMware environment according to your server's demand (for example, end-of-month sales reports).

Don't mistake vMotion for high availability or fault tolerance; VMware has a different product called HA (High Availability) to add failover capability to the ESX infrastructure. This product, however, restarts the machine on another node; it doesn't dynamically move it as vMotion does.

Microsoft's Hyper-V has Quick Migration that allows for the same functionality as VMware HA. Fault tolerance is handled by Microsoft Cluster Services (MSCS) in Windows 2008. Currently Microsoft has no comparable product for vMotion.

Memory

VMware allows for memory over-commitment. This allows administrators to over-commit memory to a series of machines. Presuming this is planned correctly, and certain software drivers have been installed in your guest virtual machines, you are able to use memory that has been 'allocated' to other virtual machines should one machine need a temporary boost of memory to perform a disk clone, provide reporting or perform any other memory intensive task. This allows a VMware environment to scale up to a large number of machines per server, depending of course, on how you are loading your server and how those resources are utilized.

Microsoft's Hyper-V does not currently allow for memory over-commitment. You must allocate memory to each machine, and memory cannot be shared should one machine require more memory than is available.

Storage

Microsoft has a recommended limitation of One Virtual Machine per LUN and a maximum of 23 LUNs per Host. VMware LUN connectivity is not limited in this fashion and the number of virtual machines on a LUN is limited by best practices as indicated by the storage vendor.

Support

There is also the issue of support. VMware and Microsoft both support virtualized Windows guests and Linux, although Microsoft only officially supports Novell's SUSE Linux. VMware has support for a wide range of Linux distributions, Solaris and other Unix distributions.

Initially, there was concern in regards to supporting Microsoft technologies on VMware. VMware has since passed Microsoft's Server Virtualization Validation Program, assuring cooperative support between the vendors in case of any support issue escalations.

Though Microsoft's virtualization product may be a bit less mature in terms of features, it shines in cost comparisons. Microsoft includes Hyper-V in its Windows 2008 distribution and provides guest licensing breaks with its enterprise and datacenter versions.

Virtual Machine Density, Cluster and Network Redundancy

Microsoft IT's production configuration consists of three hosts, one reserved for host failure. Microsoft IT is seeing an average consolidation ratio of roughly six virtual production machines per host (Dual processor, 8 to 12 cores and 32GBs of RAM).*

VMware ESX supports up to 64 hosts in a cluster. All of VMware's production environment runs on HP C7000 Blades. VMware sees an average consolidation ratio of 10.4 machines per host.**

Lastly, Hyper-V does not support NIC Teaming. This creates single points of failure in the virtual machine infrastructure that could cause downtime.

Conversely, VMware supports NIC Teaming for network redundancy.

Things to Consider

In summation, the key 'win' around virtualization is better utilization of the servers you may already have or are considering purchasing. Sure you'll see vendors talk about gains in power consumption and cooling, but it is likely that as you convert your physical environment to virtual you will experience additional growth, testing environments you could never afford before, temporary application sandboxes that become permanent and other factors that will cause your virtual environment to grow beyond your original estimates.

So on the plus side, you will have a x-fold increase in capacity for virtual servers. For the cost of RAM upgrades and perhaps some additional Network Interface cards, you will experience a level of flexibility in infrastructure that may surprise you. On the minus side, you may find that you are taxing your server, network and/or storage infrastructure. This is especially true when looking at 'clustering' virtual resources.

As an additional note, this article compares VMware and Hyper-V in their current versions. Microsoft is said to be working on rapidly closing much of the functionality gap between these two products.

Whatever your situation may be, Taos is here ready with the expertise to help you test, plan or implement a virtualization solution

* - <http://technet.microsoft.com/en-us/library/cc974012.aspx>

** - <http://vinternals.com/2009/04/microsoft-myths-and-realities/>