

Emerging Technology

Server Virtualization

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Definition

Server virtualization is an up-and-coming technology that is still not widely used but is becoming more common in both the public and private sectors. Server Virtualization essentially lets one computer do the job of multiple computers by sharing the resources of a single computer across multiple environments (VMware, 2008). Virtual servers allow you to host multiple operating systems and multiple applications locally and in remote locations (VMware, 2008).

There are three different approaches to server virtualization in use today: the Virtual Machine Model, Para-virtual Machine Model, and OS-Level Model.

In the Virtual Machine Model each guest runs on a virtual imitation of the hardware layer (XenSource, 2008). In this model guests are ignorant of their host's operating system because the system does not realize it is not operating on hardware. This model does require computing resources from the host, so a virtual machine monitor (VMM) is used to coordinate instructions to the CPU (TechRepublic, 2008).

The Para-virtual Machine Model also uses a VMM, but in this model the VMM modifies the guest operating system's code. This process is called porting, which is used so it can utilize privileged system calls moderately (TechRepublic, 2008). Para-virtual machines can also run multiple operating systems.

The OS Level Model is not the same as the Virtual Machine Model or the Para-virtual

model. An OS Level virtualization runs a single OS kernel as its core and exports operating system functions to each of the guests (XenSource, 2008). In this model guests must use the same operating system as the host, but reduces CPU usage overhead (TechRepublic, 2008). OS Level Model requires greater security because a failure or security breach could affect other guests. An OS Level virtual server is capable of hosting thousands of guests at the same time (TechRepublic, 2008).

Alternatives

There are two main alternatives to server virtualization in the market today: traditional servers and blade servers. Traditional servers are the servers we use every day and they can be found in most organizations in the U.S. The definition provided by VMware states, “A traditional server is an application device that performs services for connected clients as part of the client-server architecture,” (VMware, 2008). Blade servers on the other hand are a computer used to reduce the amount of infrastructure required to service each computer in a rack (WebGlossary, 2008). In a blade system there is an enclosure which deals with the network connection and power connection. This enclosure takes the physical space of one traditional server, but can store up to eight blade servers (WebGlossary, 2008). These alternatives will be referred to throughout this paper.

Benefits

There are many benefits to server virtualization when compared to traditional servers or blade servers. Server virtualization can provide for greater flexibility, consolidation, recovery, reliability, as well as reduced utility costs.

Virtual servers allow businesses to decouple processing from their physical hardware, enabling IT departments to respond efficiently to any changes in demand (Taylor, 2007). This technology also allows businesses to quickly release new products and services to offsite premises, including remote offices and contract personnel (Taylor, 2007). This also has implications for expansion into new markets. Also, software developers can develop and test their code on multiple operating systems which reduces development and testing time. This also facilitates faster response time to market changes, also increasing flexibility. It also gives the enterprise a central location for all application updates, so instead of having to update a number of dispersed systems for each new upgrade the IT team can launch an upgrade from one central location (XenSource, 2007).

Server consolidation is the most obvious benefit of server virtualization. Virtualization can save a large company hundreds of square feet in storage. Traditional servers can take up valuable storage rooms or even entire basement floors in large corporate offices, but with server virtualization that number can be greatly reduced. Blade servers make more efficient use of space compared to traditional servers but do not even compare to virtual servers.

Virtualization can also have benefits in the disaster recovery areas of IT. With the addition of streaming, server virtualization can make software migration easier (Taylor, 2007). This improves both system backup, and recovery. Improving system backups and recovery will decrease downtime and maintain productivity. The best recovery benefit of server virtualization is that virtualization can duplicate critical servers (Taylor, 2007).

This means if one server goes down another is still functional, and business can continue without interruption. IT personnel can repair the failed server while employees continue to operate on the secondary server, eliminating downtime (Taylor, 2007). These same principles also have implications for system reliability. Blade servers and traditional servers require additional hardware and software to have this capability. Generally, it is too expensive and difficult for organizations to implement a duplicate system like this with traditional or blade servers.

Reduced heating, cooling and electrical costs are also benefits of server virtualization. When you consolidate physical servers you eliminate computing hardware that use large amounts of electricity and require mass amounts of air conditioning to cool. Take VistaPrint Ltd. as an example. VistaPrint switched from traditional servers to blade servers, then from blade servers to virtualization. With the blade servers VistaPrint was using 32,000 watts of power each month and required 9.1 tons of air conditioning to cool (Collett, 2008). Once VistaPrint switched to virtualization the company saved over \$500,000 over three years and reduced their energy consumption by 75% (Collett, 2008). On an even larger scale, this technology has the potential to save companies millions of dollars and greatly reduce environmental impact.

Challenges

As a new technology, server virtualization has a few challenges that should be addressed by any company considering implementing this technology. Some of the challenges of server virtualization include: bandwidth and security (XenSource, 2008).

When considering server virtualization, businesses should consider their network needs and ensure they have the appropriate bandwidth to meet those requirements. For example, “instead of having one server which uses 100MBPS of Ethernet cable, now 10 or even 100 virtual servers will have to share the same physical connection” (Taylor, 2007). Many companies have invested tons of money into server virtualization only to junk the whole system because they did not think to improve their network connections. The large bandwidth requirements essential to virtualization performance can become too large for some organization’s existing systems. The organization is then forced to upgrade their network, thus increasing costs. Blade servers and traditional servers do not require additional bandwidth to be operational.

Managing security is also an issue concerning server virtualization. With virtualization there are more systems to secure, more points of entry for the system, more vulnerabilities to patch, and more interconnection points to monitor (Taylor, 2007). Also, access to the host environment becomes a security priority because it provides a gateway to multiple guest images and applications (XenSource, 2008). If someone was able to hack into the host server they would also have access to the multiple virtual operating systems contained within that server. This could also add to the proliferation of a virus or worm. A virus or worm implanted into one host environment could affect hundreds of other systems contained in that one hardware unit. The ease of software migration also adds to this danger. Organizations should be aware of the increased security requirements compared to traditional and blade servers. When deciding to switch from traditional servers to virtualization, organizations should consider the amount of security

necessary to maintain the system.

Conclusion

In conclusion, server virtualization is an optimistic solution to the traditional or blade server. This technology is more flexible, reliable, and costs less to operate. Although organizations may find themselves faced with the challenges of bandwidth and security many companies have already taken the risk and have converted to virtualization. Intel, Dell Computers, Microsoft and the U.S. military are just some examples of companies that have already implemented virtualized systems into their networks. In order to stay competitive, I believe that this technology will soon replace traditional and blade servers in most large organizations around the World.

Works Consulted

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