



Virtualization – Virtual Machine Software is Just the Beginning

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VIRTUALIZATION — FROM MAINFRAMES TO INDUSTRY STANDARD SYSTEMS

With the inherent capabilities of computers, virtualization has become a major catch phrase being bandied about in the media today. Usually, the media mistakenly equates virtual machine technology, technology that can encapsulate all of the software that runs on a physical system and allows that capsule to run along side of others on a single system, with virtualization itself. It is often presented as something new and different rather than a well-established group of technologies with a long track record of success in data centers around the world. Suppliers, such as Intel, have been involved with all levels of virtualization technology for a very long time.

The exciting news is that virtualization technology, something that has been part of mainstream IT for decades, is now available as part of agile high volume, industry standard environments as well. It is due to the efforts of Intel and other suppliers of IT hardware and software that this has occurred.

THE WHAT AND WHY OF VIRTUALIZATION

WHAT IS VIRTUALIZATION?

Virtualization is the use of hardware and software technology to present a logical view of resources. This logical view is often strikingly different than the actual physical view. What does this really mean? System users may see the image of many different computers even though it is a single system. They may see many individual systems as a single computing resource. Individuals can be allowed to access computing solutions with devices that didn't exist when developers created the applications. Applications may appear to use devices that have long been considered obsolete even though none are actually present.

As one might expect, adding layers of software between the application and the underlying physical system could have performance implications. After all, the underlying systems are doing more work to support this logical or virtualized view to developers and users. Intel and other suppliers have been investing heavily in technology that would ease that burden and provide levels of performance in virtualized systems that closely approximates the performance of a physical system.

WHY VIRTUALIZATION?

With overall server utilization in many workload environments under 20%, the key to adoption of virtual machine software boils down organizations wanting to make the most of available technology, increase their levels of efficiency and agility; improve their ability to provide products and services to customers. In the end,

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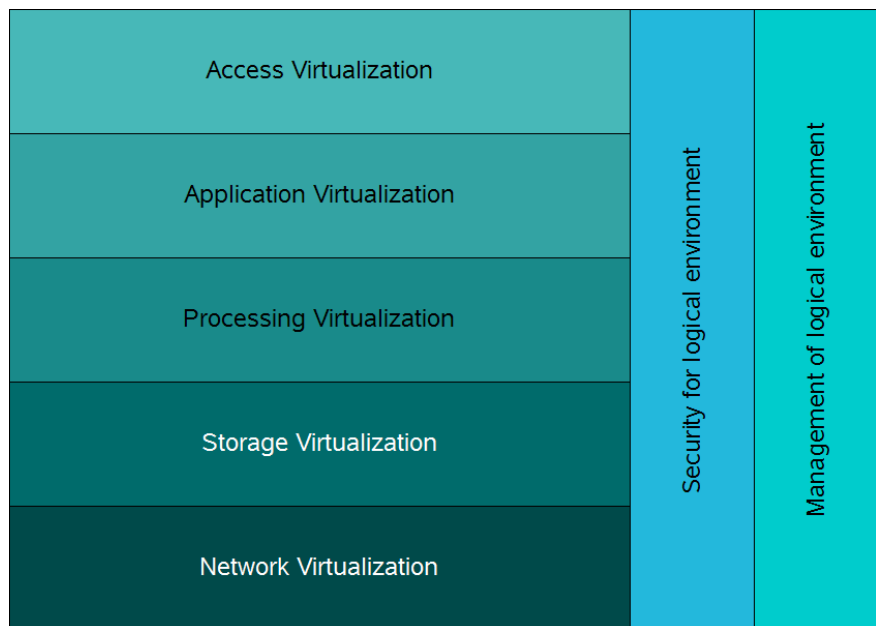
organizations are seeking ways to use technology to both increase its revenues and lower its costs.

- ☒ Virtualization can present the image that solutions never slow down or fail by deploying redundant systems. It can optimize the use of systems moment by moment throughout the day. Costs of hardware and software can be reduced in a virtual environment without letting staff-related costs go through the roof. Organizations can put many independent applications on a single system to make full use of the processing power of today's systems as they track Moore's Law. They could also use virtualization technology to spread work over many systems to achieve levels of scalability or performance that was simply unheard of just a few years ago.
- ☒ One of the areas offering the largest immediate return on investment is using virtualization technology to manage complete environments as a single domain even though they're really made up of a diverse collection of individual systems.

Virtualization is a bigger topic and has a larger impact than many in the industry understand. Suppliers, such as Intel, have made it possible for industry standard systems to take advantage of this technology

VIRTUALIZATION — MAINSTREAM TOOLS

There are many layers of technology that virtualize some portion of a computing environment. Each of these tools can be applied to making industry standard systems part of a larger, more efficient, more productive computing environment. Here's a graphical representation of those tools.



Let's quickly review how each type of virtualization helps organizations.

- ☒ Access Virtualization makes it possible for nearly any type of device to be used to access nearly any type of application over just about any type of network. Using this technology, developers aren't forced to change applications to allow individuals get things done using a hand held device, a thin client, a laptop computer or even a desktop system.
- ☒ Application virtualization creates a protected environment that makes it possible to automatically restart an application in case of a failure, start

another instance of an application if the application is not meeting service level objectives, or provide workload balancing among multiple instances of an application.

- ☒ Processing virtualization hides the physical hardware configuration and makes it possible, on the one hand, to present a single system as if it were many or, on the other hand, to present many systems as if it were a single resource. Tools such as Intel® Virtualization Technology (Intel® VT) really help with the tasks found in this layer.
- ☒ Storage virtualization presents a logical view of storage that allows many systems to share a single storage device that's located on the network.
- ☒ Network virtualization presents a logical view of network resources that is secure and managed.
- ☒ Management and security software makes it possible administrators to treat many systems as a single computing resource.

These layers of technology are not new to Intel. The company has been working with many in the industry to bring these technologies to users of industry standard systems. One of the most prominent examples is Intel® Virtualization Technology (Intel® VT). It is a set of processor and I/O enhancements to Intel® server and client platforms that can simplify the tasks performed by virtual machine software (part of the virtual processing layer).

SUGGESTIONS FOR SELECTING PLATFORMS AND VIRTUALIZATION TECHNOLOGY

It is important to have a clear picture of the organizations goals before selecting a specific type of virtualization technology or hardware platform. Depending upon the organization's requirements and goals, different technologies come to the forefront. Organizations often seek higher levels of performance, greater agility, and increased scalability, consolidation of many workloads onto a smaller number of physical systems or creating a unified management domain.

Regardless of the organizations' goal or goals for the use of virtualization technology, it wise to select a platform that has the biggest "ecosystem." That is the platform that is supported by the largest number suppliers. Organizations' would be wise to consider platforms that have a broad set of systems, data management software, development tool software, virtualization software, application software and management software.

This focus on a common hardware architecture that offers hardware assists for virtualization technology will, in the end, reduce the costs of hardware acquisition while still offering the organization the ability to track performance improvements over time.

WHAT DOES THE FUTURE HOLD?

Suppliers, such as Intel, are focusing a great deal of investment on virtualization technology at all levels of the model. They are also working with suppliers of systems, operating system software, data management software, application development as well as the suppliers of application development framework software in order to offer organizations a highly optimized set of virtualization solutions at the lowest possible cost. Through the efforts of Intel to increase virtualization optimization and decrease power consumption, IT managers have the capability to increase their overall system utilization while decreasing costs by 50% or greater. Here's a few of the likely improvements virtualization technology will provide in the near future.

- ☒ Optimal use of an organizations systems will be assured because applications, application components and data will be moved to the most appropriate environment on a moment by moment basis
- ☒ Organizations will find it much easier to add processing power as needed to meet their own service level objectives
- ☒ New technology will co-exist and work efficiently with more established technology.
- ☒ Applications will be accessible from nearly any type of network-enabled device, over just about any network, from nearly anywhere without organizations being forced to re-implement or re-design their applications
- ☒ Application performance, scalability and reliability will increasingly be built into the environment rather than being a matter of tedious or complex design
- ☒ Applications and data will be increasingly secure and protected thus removing the fear IT management has of security breaches, malicious Email messages and the like.
- ☒ Individual software developers will no longer have to care which system is working for them, where it is located or what type of software is supporting them. They'll be able to focus on the task at hand rather than being asked to take on the role of system operators.

Virtualization technology, combined with advances in processor, I/O and other technology will make it possible for high volume, industry standard systems to be deployed for everything from decision support to collaborative environments to high volume transactional applications to high performance modeling.

For more information on Intel's role in virtualization, please visit <http://www.intel.com/technology/itj/2006/v10i3/preface.htm>