

# White Paper

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## **Application Virtualization: An Opportunity for IT to do More with Much Less**

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## Introduction

Organizations that are looking for a chance to take a step up in terms of infrastructure performance, application portability, and efficiency have a new option. For decades, there has been a trend toward increasing abstraction between the user and the applications they want to use, and the underlying support infrastructure. Now, moving toward mainstream acceptance, application virtualization takes a logical next step and puts the application (and, by implication, the IT administrator) in the driver's seat—delivering responsiveness and performance while further enhancing utilization and cost-effectiveness. It is, in fact, an overdue development that completes the process of data center virtualization while enhancing manageability of applications. The benefits of this approach are wide ranging, making application virtualization something that enterprises should closely investigate as they consider their ongoing strategy and priorities.

## Virtualization at the Top of the Stack

IT is deep into the age of virtualization. While still not universally applied, virtualization is nonetheless so widespread as to be practically ubiquitous. In fact, virtualization is part of an overall trend in IT that is characterized by smarter, more flexible, and more cost-effective processing and service delivery. In general, virtualization tends to help centralize administrative tasks while improving scalability and resource utilization. When virtualization is discussed, server virtualization is what most people think of first. That's because, in general, server virtualization technology has been in the mainstream the longest; and it has been wildly successfully and helpful to IT operations. IT administrators have raced to consolidate physical servers and contain operating costs using virtualization. The technology has truly transformed the way data centers are designed and operated as well as how applications are deployed and managed. IT has discovered that virtualization delivers simplified management of resources; meanwhile, virtualization has repeatedly demonstrated that it can stand up to the demands of business. Indeed, in many instances IT has improved the quality of service and access to IT resources while streamlining IT process and stabilizing or reducing costs. In short, server virtualization has been a win all around, making this development comparable in its impact to the development of time-sharing half a century ago.

Server virtualization has also served as a launch pad for additional technologies that focus both upstream and downstream of the proverbial IT "operating stack." For example, developments in storage virtualization have served to complement the substantial economies demonstrated with server virtualization, which results in matching performance needs. Storage virtualization comes in two forms. One form is block virtualization, which separates logical storage from physical storage so that it may be accessed without regard to actual physical storage. The other is file virtualization which eliminates the dependencies between the data accessed at the file level and the location where the files are physically stored. These technologies have recently matured as server virtualization.

## Taking Virtualization to the Application

Surprisingly, another less familiar, but no less promising form of virtualization has been emerging, namely the application. Indeed, since it focuses on the "top" of the stack, it has the potential to significantly impact the IT world. Applications are what ultimately deliver the value to the business, drive revenue, improve productivity, and deliver intelligence. In short, applications rank as some of the world's most important business tools, so they are, in a logical sense, the "next candidate" for virtualization.

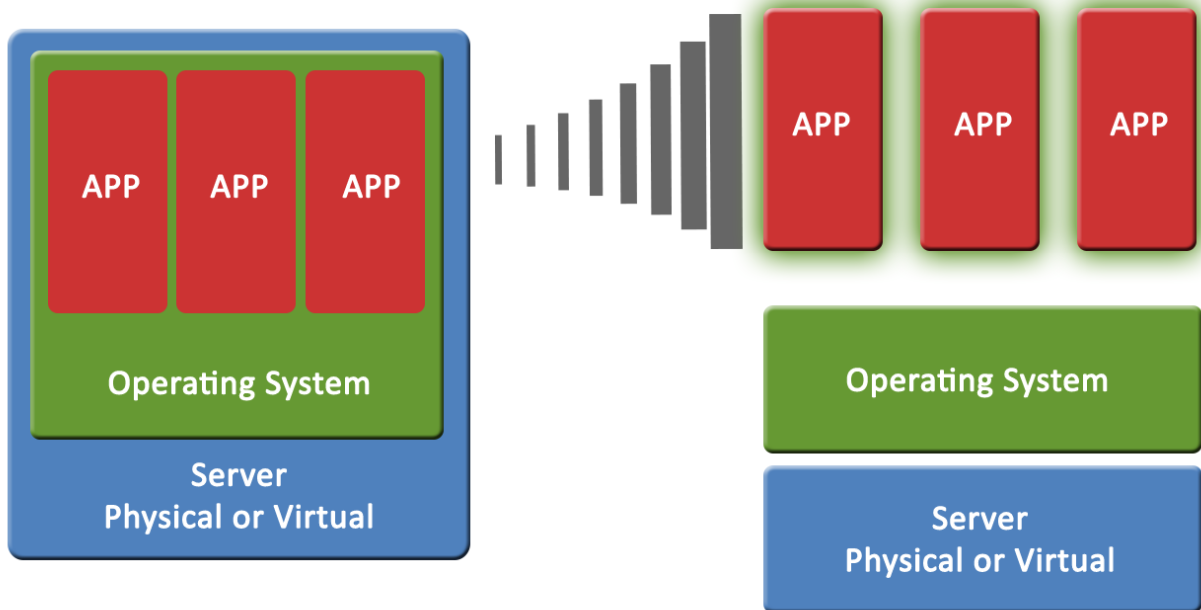
Application virtualization refers to software technology that enhances portability, manageability, and even compatibility by encapsulating applications relative to the operating system on which they depend. At runtime, applications "think" they are installed in a traditional machine (virtual or physical) with access to all the usual attributes that such capabilities imply.

Like other forms of virtualization, embracing application virtualization is something of a leap of faith. Traditionally, applications have been "bolted" to the server and operating system, which has inhibited movement, maintenance, and scalability. But what would happen if we could decouple the application from the OS and underlying server, virtual or physical? This process could work just as server virtualization decoupled virtual machines from the

physical hardware, and as storage virtualization liberated data to live where it can be kept most efficiently. Imagine the potential benefits of liberating applications, too.

Figure 1. *Contrasting the Traditional Stack with a Virtualized Application Stack*

On the left, a traditional “stack” is shown, with applications bound to an operating system and an underlying physical or virtual server. On the right, the applications have “migrated” to an arrangement where the relationship is preserved, but the applications are no longer tightly bound to the underlying OS or server.



Source: Enterprise Strategy Group, 2012.

### The Benefits of Taking Virtualization to the Application

The benefits of server virtualization have been hard to ignore, but being able to encapsulate applications through application virtualization and, in return, introduce improved operating flexibility, mobility, and further consolidation of servers, can deliver substantial benefits, too. However, just as with server virtualization, application virtualization requires a fundamental shift for an organization to maximize their ROI for enterprise/mission-critical application environments. Because the potential benefit of application virtualization is “new” it can be initially difficult to define, comprehend, and quantify in terms of any given organization. In part, this is because the benefits appear in many different forms rather than at a single, easy-to-measure point. In addition, experience is still limited, providing few definite “rules of thumb.”

At a high level, application virtualization enables three big shifts in how IT does business:

- Enterprise and mission-critical application instances are able to move freely and transparently within and between heterogeneous physical and virtual environments, with very little interruption in service. This is revolutionary on its own, adding a new level of flexibility to IT deployment strategies.
- The cloud beckons, and application virtualization allows organizations to create a standardized, shared, and elastically scalable private cloud application platform, delivering improved value. Application virtualization leverages the inherent flexibility of the cloud for maximum effect.

- From an operational standpoint, application virtualization means that IT is able to reduce complexity, cut expenditures, and clarify operational stack inconsistency, while improving overall operational efficiency, especially for mission-critical applications. The exact match of resources needed for any task is available for that task while capacity waste is further minimized.

More concretely, application virtualization can help IT organizations reduce the number of server hosts, operating systems, and software environments that need to be managed while simultaneously providing a simple way to shift workload flexibly from one server host to another. Although it might seem like a tall order, this process can actually be done while still maintaining high availability and permitting zero performance compromises.

### **Additional Application Virtualization Benefits**

Additional key benefits which application virtualization can deliver include:

- Application virtualization does not depend on the hypervisor layer. Although the hypervisor layer can be incorporated, it is not required.
- Hosting is independent with application virtualization. It doesn't matter what the host is—as long as it is running the right software you can move to it or from it.
- No modification is required from the underlying application in order to achieve application virtualization because of the capabilities of the enabling software. The application maintains its “standard” form, simplifying deployment, ongoing operations, and maintenance.
- Application virtualization shares many of the key benefits of server virtualization, but further extends the value of having virtualization at multiple tiers. Considered in another way, application virtualization provides a fine-grain approach to virtualization, allowing the benefits to be closely tuned to the actual requirements.

### **Disappearing Hosts**

A fundamental economic and operational benefit of application virtualization is actually a reduction in the number of hosts required by an organization; this benefit applies across both physical hosts and/or virtual hosts. This benefit is achieved through application virtualization by stacking application instances. How is this possible? The concept is simple.

Applications may currently have their own physical or virtual servers, which implies a dedicated stack with the application sitting atop the operating system and the server. Organizations typically adopt that setup to avoid compatibility issues and to enhance performance of applications that are considered critical or just “finicky.” With application virtualization, however, you can run multiple applications on exactly the same physical or virtual server, each in its own “container” without having to face any compatibility issues. This improves overall utilization, ultimately saving money without reducing performance.

This set-up maximizes the host's CPU utilization without impacting adjacent applications or running into compatibility issues. On an ongoing operational basis, application virtualization allows an organization to change the application instance, stacking density on the fly to achieve the desired CPU utilization metric and get a maximum return on the application host investment. In other words, when you need maximum performance, you can get it. But you have the flexibility to change, at any time, to a denser, more efficient mix—in effect, tuning application performance to meet SLAs or cost requirements.

### **Additional Benefits**

While the most obvious benefits of application virtualization are in increased general efficiency, deployment efficiency, and flexibility, there are also big benefits in terms of reduced overall application and host software license and support costs. This reduction is a logical consequence of reducing the servers required to host application instances. The efficiency of hosting just what you really need is compelling and the savings can be

substantial. Indeed, in many cases, savings on licenses may significantly outpace the costs of application hosts (i.e., server hardware). Additionally, with application virtualization, it is even easier for organizations to track license usage. Application usage history can then be documented to help reduce license costs. Think about the resulting economics and consider how that might play out in your organization.

Similarly, application virtualization enables a much more consolidated and simplified storage footprint and simpler storage management. Again, the benefits flow logically from the more efficient application deployment model made possible by virtualization. Application virtualization reduces the number of servers needed for a given level of performance, so the entire storage footprint for the application instances can be more easily consolidated into a single pool, virtually or physically. There is little or no need to manage storage on a server-by-server basis and no requirement to have a backup job per server—or separate monitoring for each server's free space pool. Application, server, and storage become associated logically rather than physically and in a way that ensures the greatest efficiency in terms of network traffic, too.

It is sometimes hard to remember how much angst IT administrators expressed over the issue of physical server problems not so long ago. While reliability has improved, it is server virtualization that has helped to provide the higher level of “built-in” resiliency to which so many organizations have now grown accustomed. Providing high resiliency for all virtualized application instances will yield a similar benefit.

Because all virtualized application instances can be moved to any server, high availability becomes easy to implement with no requirement for doubling up hardware. IT simply specifies where the application instance should be restarted in the event of failure—from among any of the servers in the cloud or virtualized locally—ensuring the application instances will remain available under most circumstances while minimizing overall downtime. That's another way in which application virtualization can even help deliver to required SLAs: The application becomes the driver for stack efficiency and performance rather than the other way around.

## Improved IT Productivity

Remember plug and play, the chimerical vision of IT simplicity drawn from the old consumer electronics mantra? In fact, plug and play has gotten closer than ever with the advent of application virtualization. Now, enterprise and mission-critical application instances can be moved freely and transparently within and between heterogeneous physical and virtual environments. It's not a fussy process requiring management resources. This development also greatly impacts the need to buy servers matched to the application. In fact, application virtualization enables IT to mix servers from different vendors, from different hypervisors, with different processor/core types and speeds, different numbers of processors/core, and different memory configurations. It's not that it doesn't matter at all, but it doesn't matter much. The application in its container is portable, and can “plug and play” with the computing resources that are available rather than just with some idealized configuration.

Application virtualization tends to demand fewer resources than applications forced to run on separate virtual machines. And otherwise “incompatible” applications can generally be run side-by-side, on the same server at the same time. Conversely, the same technology may help protect the operating system as well as other applications from applications that might be buggy or damaged in some way. Likewise, security is better because of the fact that applications are logically isolated from the operating system itself. Then, conceptually, application virtualization functions as a kind of firewall.

Because of the way in which application virtualization simplifies hosting, it can reduce system integration and administration costs. If an organization needs to upgrade an operating system or migrate to a different operating system, then the fact that applications are virtualized simplifies the task. It is also possible to speed up application deployment through implementation of on-demand application streaming. Applications can also be rapidly provisioned to specific locations (e.g., a given desktop) when users move from one place to another. Application virtualization even makes it possible to copy applications on to portable media and then import them intact to client computers.

## The Bigger Truth

Although these are still early days for application virtualization, the technology is clearly the next step in the evolution of data center virtualization. It enables IT organizations to significantly reduce the costs to deploy enterprise/mission-critical applications and liberates thinking—and action—on a number of other planes. For example, when applications are virtualized, they can be moved freely and transparently without being locked into a hypervisor or a server. That is pretty remarkable. The added reward is availability. Everyone would like to be able to offer high availability, but the costs usually involved make this something only reserved for a few key applications. With application virtualization, high availability is a substantial fringe benefit that costs nothing.

Consider, too, the hardware underpinnings. Hardware refresh used to be nearly continual, often traumatic, and always expensive. It has become a tamer beast in the age of virtualization. But application virtualization makes the situation even better, helping to reduce or eliminate major disruption, proactive planning, and unforeseen costs. Further savings are delivered in the form of time, eliminating the need for planned and unplanned downtime and reduced capital expenditures.

Application virtualization enables companies to quickly adapt to change and business demand, improve the performance of applications and of IT in general, and enhance the intelligence and management of the whole IT environment. In short, it is a classic win-win.



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