Wouldn't it be nice to simplify your server setup, putting all of your important business applications in one place, and get better performance, simpler management, and lower costs? Virtualization lets you do just that.

Server virtualization is one of the hottest trends in business today because the benefits are impressive and no company is too small to reap them. With it, you can

- save money, time, and space by improving server utilization
- have fewer servers to purchase, manage, power, and protect
- manage your servers more efficiently
- make vital business data more secure and available
- deploy new servers and applications in minutes—and remove them just as quickly when you no longer need them
- employ "green" technology standards and use less energy
- host multiple applications on a single server
- control, monitor, and optimize your IT infrastructure

Whatever your level of knowledge about virtualization, if you would like to learn more about the value it can bring to your business, this paper is for you. After you've read it, you can dig deeper by exploring the other reports in our study. To do so, just click the different report tabs at the top of this page.

WHAT IS VIRTUALIZATION—AND HOW DOES IT HELP MY COMPANY?

Virtualization is a simple approach to computing that brings value to companies of every size. Through virtualization, you take multiple business applications that have traditionally resided on their own servers and bring them together to run on a single physical server.

Each of these applications runs on an operating system (OS) in its own *virtual machine* (VM), independent of the other VMs on the server. The applications behave just as if they were located on individual physical servers.

By setting up one or two servers to house virtual machines, you gain the ability to respond quickly and easily to the inevitable fluctuations in your business needs, along with the ability to keep your data running 24/7.

Figure 1 displays a traditional non-virtualized setup with five OS-application pairs, each running on its own physical server. Figure 2 shows a virtualized setup in which the five OS-application pairs are in separate VMs that are all running on one physical server. These VMs share the physical server's hardware resources.

Modern servers have hardware enhancements that make it much easier and more efficient to run many VMs simultaneously on one server than to run each OS-application set on separate physical servers.

Replacing many physical servers with one is only the beginning of the advantages of virtualization.

BUY FEWER SERVERS, GET MORE OUT OF EACH

You wouldn't continually run your dishwasher with only one or two plates in it, wasting water and electricity; such underutilization would make no sense. However, when it comes to servers many businesses are doing something analogous. Studies have shown that businesses typically use as little as 10 percent of their servers' total capacity.

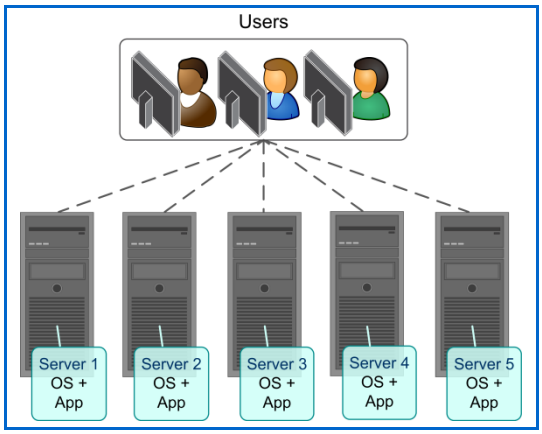

Figure 1: A traditional non-virtualized server setup.

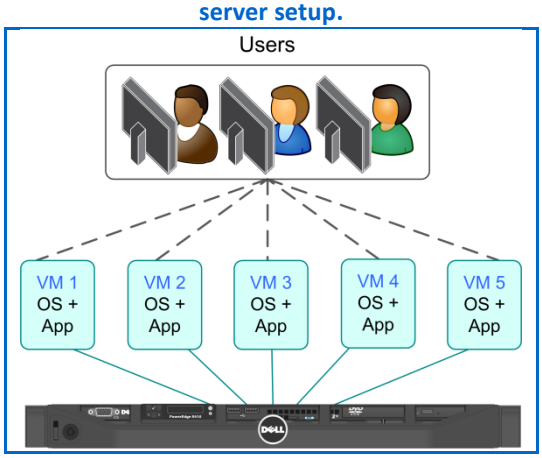

Figure 2: A virtualized server setup.

Why don't businesses utilize the resources they pay good money for? Often, they run only one main application per server in an attempt to minimize the impact of a crash or conflict on other applications.

Unfortunately, having underutilized servers not only increases power consumption and necessitates more physical space, it also requires more equipment and hardware maintenance, which increases operating costs.

Additionally, each new application might require a new server (and all the added work that comes with setting it up and maintaining it).

In contrast, virtualization gives you the confidence to run multiple applications on each server without fear of a single application bringing down the entire server. If an application crashes and hurts one VM, the others keep running.

Companies that virtualize can enjoy 80 percent server utilization—and still leave some capacity for especially busy times. They can fit 10 or even more virtual servers onto a single physical server—and eliminate those extra machines and the costs of running them.

Figure 3 depicts this difference in server utilization when consolidating five servers into one.

Having fewer servers to buy, power, and maintain saves you time and money.

RESPOND TO CHANGING BUSINESS NEEDS

A virtualized environment makes it easy to reallocate computer resources among applications as needs dictate. One instance where this is useful is when your company is phasing out an older application in favor of a newer one. Today, all your employees are using the older app, but over the next several weeks, your IT staff will be moving groups of employees to the updated version. Virtualization makes this kind of migration a snap—each time a new group of users makes the switch, IT can reduce the resources allocated to the old VM and expand those allocated to the new VM.

Consider also a scenario where your IT staff is testing a new application. They can create a moderately resource-intensive VM for the pilot period and then, once the new app is ready to go live, dedicate the full complement of resources with a few mouse clicks.

SPEND LESS TIME MANAGING SERVERS

Virtualization also greatly simplifies server management, saving your IT staff time. A single server with virtual machines is much easier to set up, use, and maintain than a physical server. Setting up a VM is easy—you can create one with a few clicks of the mouse, load the server operating system into it, install the application you want, and start the VM. From start to finish, the process takes only a few minutes.

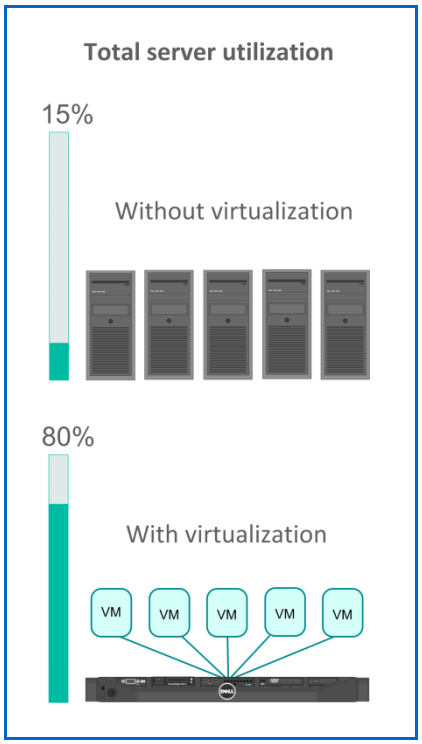

Figure 3: Improved server utilization with virtualization.

Setting up a physical server might easily have taken you a week or more in the past when you include the time to order it, receive it, configure and test the hardware, ensure you have enough power for it, and so on.

As your business grows and you need to expand the number of servers and applications you use, the savings from virtualization increase. Instead of having to buy a new server, you just copy an existing VM and install an application on it. It's so easy that you can now afford to experiment with new applications at minimal cost and downtime.

If you no longer need a VM, you can remove it just as easily. This kind of flexibility is impossible in a traditional, non-virtualized setting, where each new application requires a new physical server.

Because virtualization reduces the time you have to spend managing your servers, you free staff time to focus on improving other aspects of your business' computing activities.

IMPROVE SERVER SECURITY

The applications and operating systems on virtual machines are completely isolated from one another and depend on only the single physical server. If one VM crashes, the crash does not affect any of the other VMs. Moreover, you can restart the failed VM with just a click of the mouse.

Similarly, each VM is isolated from the physical server on which it runs. It cannot tamper with that server.

In addition, if a virus or a software problem compromises a virtual machine, you can shut down that VM easily and restart a new, clean copy of it in moments.

Likewise, you can transfer the applications and data on the compromised VM to the new one and so avoid any loss of data in the event of a VM crash.

You can copy VMs, move them, back them up, and so on. It's easy to save a copy of a VM to a file so that, if a VM is compromised, you can roll back the VM to the clean saved version without any trouble. This is much simpler than restoring a compromised physical server.

KEEP YOUR SERVERS RUNNING AND YOUR DATA AVAILABLE

Every business must ensure that critical data is always available and protected against computer failures and security breaches. Virtual machines provide a first level of isolation and protection against data loss.

While you may need to briefly interrupt normal work for software maintenance, e.g., to apply operating system upgrades or patches, with virtualization, such routine maintenance doesn't require you to take the physical server offline. You can apply upgrades or patches with a few mouse clicks, and then promptly return the VM to full operation, without the usual delays of booting a physical server.

Similarly, you can change how a VM uses system resources with a few clicks, whereas on a physical server, you would have to manually shut down the system and change its hardware.

With virtualization, it is easy to add more disk space, increase memory, add processors, and more. Managing and maintaining the resources a VM uses is considerably simpler and quicker than doing so for a physical server; it's the difference between spending hours tangled in cords and minutes clicking a mouse.

You may be wondering, "But what happens when the one physical server needs maintenance?"

Virtualized solutions can keep your business running even when your physical server needs work.

If the physical server the VMs run on crashes, so do the virtual machines themselves. Fear not, however: You can add a redundant server that automatically takes over if the first server fails. This way, no single hardware failure could cause data loss or downtime for your business.

Figures 4 and 5 depict the difference, with Figure 4 showing a simple one-server setup and Figure 5 showing a high-availability setup with a redundant server. Note: In these solutions, each server is connected to a *switch*, a hardware component that links pieces of equipment. The switches connect the servers to external *network storage*, which many users can access at once.

The connecting lines illustrate the possible paths that saved data can take from the server(s) to storage. In the high-availability solution, all data has duplicate pathways.

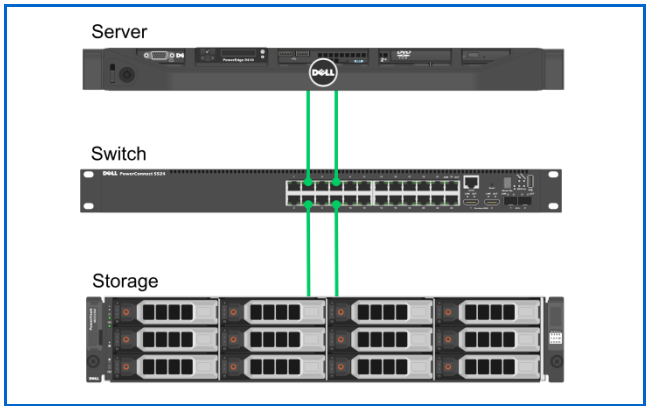

Figure 4: A standard one-server solution.

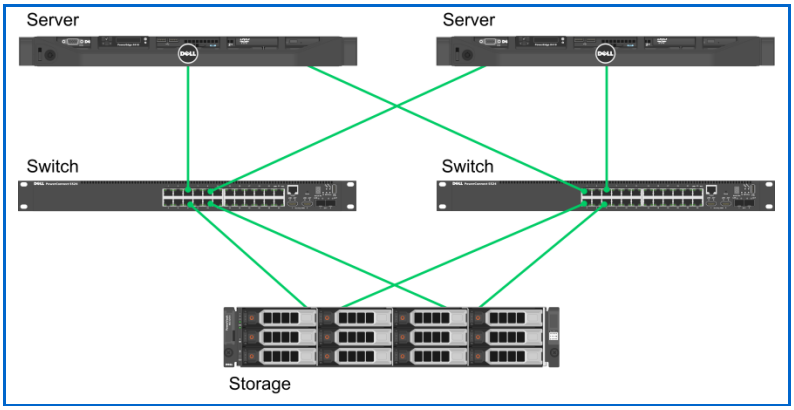

Figure 5: A high-availability solution with redundant servers.

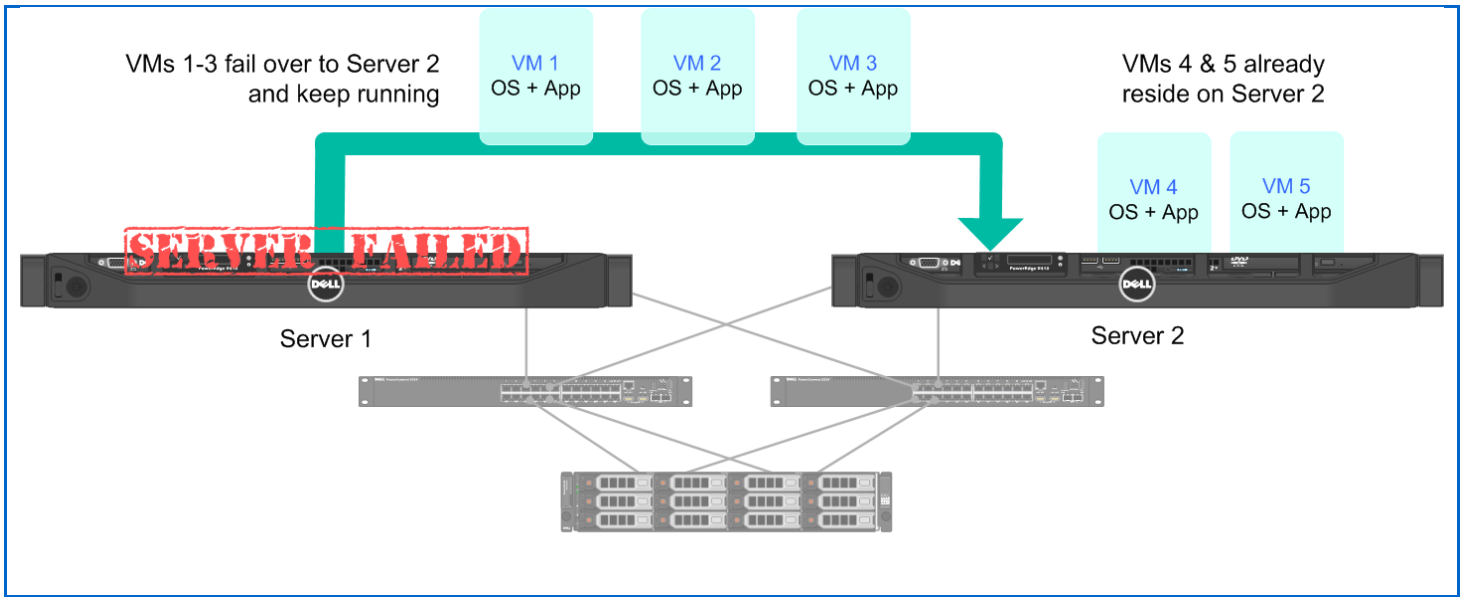

Figure 6: VM failover keeps your workloads running even when a physical server fails.

As Figure 6 shows, you can set things up so that, in the event of an unexpected physical server failure, the VMs on that server automatically move to the other server. This can happen so quickly that the VMs are back in service within a few minutes.

When a physical server needs routine maintenance, you simply move the VMs on that server to the other server with a few mouse clicks. This allows you to carry out routine server maintenance without downtime, which means IT staff need not be in the office late, and your customers and workers need not suffer the inconvenience of being unable to access important data.

In the past, only larger companies had the budget and expertise for these sorts of solutions. With new virtualization technologies and ever more affordable servers, this redundancy is inexpensive and easy; you, too, can enjoy constant server availability.

GET BETTER DATA PROTECTION

Data loss can be a calamity. Having to fix servers or reconstruct lost data from archives and other backup media is a major headache. Moreover, data loss can threaten your relationship with your customers. You often can't respond quickly to their needs if your server setup is out of commission.

Virtualization improves data protection by making it easy to recover from hardware failure. As we mentioned, in a high-availability solution with two servers, the VM is restored automatically and almost instantaneously. In the single-server solution, as long as you have been regularly backing up your VMs, you can easily restore your VM to any device that can host virtual machines.

PREPARE FOR THE FUTURE WITH SPACE TO GROW

Being able to easily copy virtual servers to a single physical server means you aren't locked into the hardware limitations of any particular physical server. You can replace multiple older servers with a single newer one, and place multiple virtual servers on your new physical server. If you want to increase the computing power available to your applications, you can easily move your VMs to a new and more powerful physical server, again with a few mouse clicks.

Virtualization lets you access more of the capabilities of your physical servers and makes it easy to move to a new physical

server if necessary to gain more computing power.

Adding future software products is also easier than ever. Building new VMs is simple. Some software companies even sell their software in pre-built virtual machines. You simply download the prebuilt VM (also called a *virtual appliance*) and instantly have a VM running the new software.

USE LESS POWER & SPACE

Virtualization is green technology, good for you and for the environment. Because it reduces the number of physical servers you need, it saves you space and power.

It can be difficult to find sufficient floor space for physical servers. Cramming physical servers into a space also increases cooling costs, because every server generates substantial heat.

Virtualization reduces the number of servers, which means you consume less electricity. Because power and cooling shortages cause server or storage downtime in about half of server installations, a reduction in energy use also minimizes this risk.

According to a recent Dell estimate, moving from five servers to a single server can save you as much as $12,000 a year in power costs.[1]

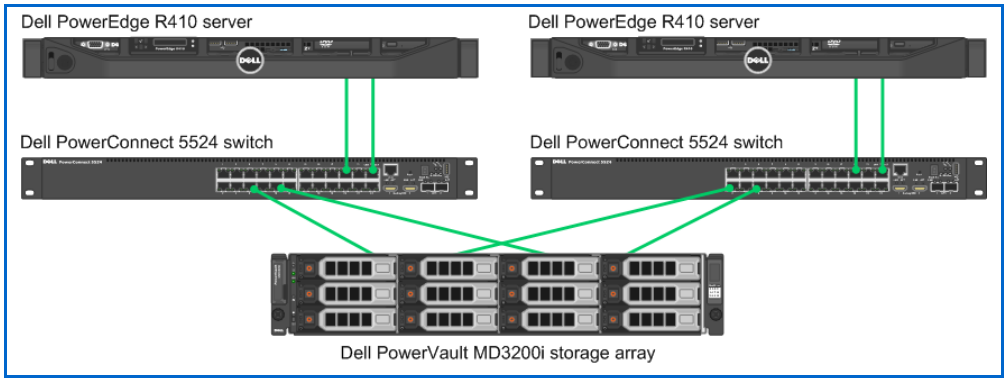

Figure 7: The Dell 2-2-1 solution.

THE DELL APPROACH

Dell is ready to help you move to a virtualized computing environment. Dell provides support and services to help you move in the right technological direction for your business. Dell has extensive experience providing server solutions to small businesses and is a leader in the implementation of virtualization solutions.

Dell 2-2-1 solutions provide virtualization for smaller businesses. Figure 7 shows one such 2-2-1 solution, which includes the following components:

- Two Dell PowerEdge™ R410 physical servers, running either VMware® vSphere® or Microsoft® Windows Server® 2008 R2, that provide the safety of a redundant solution
- Two sets of network connections between the servers, via two Dell PowerConnect™ 5524 high-performance switches
- One Dell PowerVault™ MD3200i storage array or EqualLogic PS4100 or PS6100 for data storage

The two servers share the network switch connections and the network storage.

To learn about our first-hand experiences with server virtualization using the Dell 2-2-1 solution, see our additional reports and benefits video.

To help guide customers through mission-critical IT decisions, Dell provides software like the Dell Performance Analysis Collection Kit (DPACK). This application gives you a true sense of your current IT environment and helps you identify areas for further optimization.

[1] http://i.dell.com/sites/content/business/smb/sb360/en/Documents/wp-improve-datacenter-perf.pdf (based on an estimate of $200 per server per month)

ABOUT PRINCIPLED TECHNOLOGIES

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We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help our clients assess how it will fare against its competition, its performance, its market readiness, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 25 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.

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