

CHAPTER 3

VIRTUALIZING A TEST AND DEVELOPMENT LAB

Now is the time to realize all of the benefits of virtualizing your test and development lab.

→ 2

VIRTUALIZING A TEST
AND DEVELOPMENT LAB

→ 4

CONSOLIDATING VOLATILE
IT ENVIRONMENTS

→ 7

CASE STUDY

→ 9

BUILDING YOUR
ENVIRONMENT

→ 10

EXPANDING YOUR LAB



Virtualizing a TEST AND DEVELOPMENT LAB

↳
VIRTUALIZING
A TEST AND
DEVELOPMENT
LAB

↳
CONSOLIDATING
VOLATILE IT
ENVIRONMENTS

↳
CASE STUDY

↳
BUILDING YOUR
ENVIRONMENT

↳
EXPANDING
YOUR LAB

IT PROFESSIONALS AND developers always need access to complex technologies—directory services, email services, databases, Web servers, and so on—for a variety of reasons, but mostly for testing and development purposes. To do this, they run laboratories—IT labs that include all of the required technologies to support our efforts. In addition, many organizations provide and manage their own training centers. These are similar in nature, if not in kind, to test and development laboratories. Unfortunately, none of these environments are treated the same.

Training environments often have up-to-date technologies because they need to present trainees with everything they'll use in production. Development environments must also have the most current technologies because they need the latest and greatest to produce new code. However, test environments are often

built with leftover computers that already belong in a scrap heap. In the end, organizations are left with several official and unofficial environments jumbled together in no particular fashion in an effort to get systems up and running.

In an ideal situation, organizations would connect these systems in a unified infrastructure that would support all services. But that is often difficult to do. Development projects, in particular, have their own budgets for hardware acquisitions. These projects can contain multiple environment layers for unit, functional, integrated, staging and pilot or production testing—each layer can have its own hardware. However, each system will have very low utilization ratios and will be at rest most of the time. If you try to set up two development projects on the same machines, you'll learn that it isn't possible.

Many training classrooms also

house far-from-ideal setups. Sometimes each classroom will use a different system. Often, classrooms must use complex procedures to reset each system after every class

so all students start at the beginning of the training process.

In a time when most CIOs state that their goals are to develop a flexible and efficient infrastructure, this

↳
VIRTUALIZING
A TEST AND
DEVELOPMENT
LAB

↳
CONSOLIDATING
VOLATILE IT
ENVIRONMENTS

↳
CASE STUDY

↳
BUILDING YOUR
ENVIRONMENT

↳
EXPANDING
YOUR LAB

VIRTUAL MACHINES AND SOFTWARE LICENSING

EVEN THOUGH YOU'RE working with VMs, you still have to be conscious of licensing issues, especially if you're building a permanent laboratory. Licensing VMs is very similar to how you would image disks from physical computers.

- ▶ **Template virtual machine:** A template VM is one that is ready to be duplicated on your network. It doesn't require a license because it is a machine that's used only to seed other machines. The machine doesn't actually get used as is. Once you've copied the template VM and begin personalizing it, you need a license for it.
- ▶ **Running VMs:** Each machine that is individually named and running on a constant basis needs its own license.
- ▶ **Copied VMs or snapshots:** Each copy of a VM does not need its own license as long as it hasn't been renamed and is using the same IP address in each copy. Because it uses the same name and has the same IP address, only one copy of the machine can run at any time.
- ▶ **Copied and renamed VMs:** Each time you copy a VM and rename it, you need to assign a license to it. A renamed machine is treated as a completely different machine; therefore, it needs a license.

If you're running Windows infrastructures, you should be using either Microsoft Developer Network or TechNet Plus subscriptions for your laboratories. These subscriptions give you access to 10 or more licenses of each Microsoft product, though each license needs activation. This is the best way to test new technologies or develop new software on Windows networks.

If you're running non-Windows software or operating systems, you should verify with your manufacturer to see which licensing scheme offers the best choice for testing and development support. ■

situation cannot continue. Unfortunately, both IT infrastructures and mentalities are slow to change. Worse yet, IT budgets have fixed expenses in spite of being confronted with changing business needs.

Despite these constraints, many businesses have moved forward with system consolidation projects to increase resource utilization and decrease costs and physical server footprints. Those organizations realize the gains through server virtualization projects—consolidating physical servers into virtual machines (VMs) running on host servers.

While organizations tend to proceed with these projects for production environments, few realize how useful and successful these physical consolidation projects can be for testing and training, as well as for development and other volatile IT environments. This chapter highlights some of the benefits of consolidating your test and development environments through virtualization, including costs savings, accelerated time to deployment and system consistency throughout your environment.

CONSOLIDATING VOLATILE IT ENVIRONMENTS

Using physical consolidation practices for volatile IT environments makes sense, especially at a time when companies are tightening their collective belts because of economic

hardships. If production server resources are only used at 10% to 15% of operational ratios, then it's likely that other environments have even lower operational ratios. In most

Using physical consolidation practices for volatile IT environments makes sense.

cases, volatile IT environments, such as test or development systems, are used only at high operational ratios during stress testing, pushing the service or application to its limits to see how it performs. In such cases, systems can run at upwards of 50% utilization ratios. Stress testing, however, occurs only at specific times during the staging or development process and can be scheduled. The rest of the time, machines tend to run at less than 5% utilization.

The goal of physical server consolidation is virtualization, which offers these environments the following additional benefits:

- You can virtualize more than 95% of the servers. Only specific machines with custom hardware dependencies will defy virtualization and require a dedicated physical system.
- Server virtualization is designed



VIRTUALIZING
A TEST AND
DEVELOPMENT
LAB



CONSOLIDATING
VOLATILE IT
ENVIRONMENTS



CASE STUDY



BUILDING YOUR
ENVIRONMENT



EXPANDING
YOUR LAB

CHAPTER ③ Virtualizing a test and development lab

to support maximum resource utilization. Some virtualization platforms are designed to share CPU capabilities and memory between VMs.

- The cost of these environments can be reduced because several available virtualization technologies are free.

- Server virtualization reduces costs because fewer physical machines are required to support multiple environments.

- The same physical machines can support several different volatile IT environments (FIGURE 1).

VMs can be saved as templates and deployed as needed to build

almost any environment.

- VM deployment times are significantly shorter than physical machine deployments. This can save resources and shorten deployment timelines and project completion timelines.

- When systems administrators build the source VMs or templates used to generate each environment, this can guarantee the consistency of each environment. Too often, developers build their own systems and take shortcuts because of time constraints. Then, when machines do not match production configurations, inconsistent test results may occur.

↳
VIRTUALIZING
A TEST AND
DEVELOPMENT
LAB

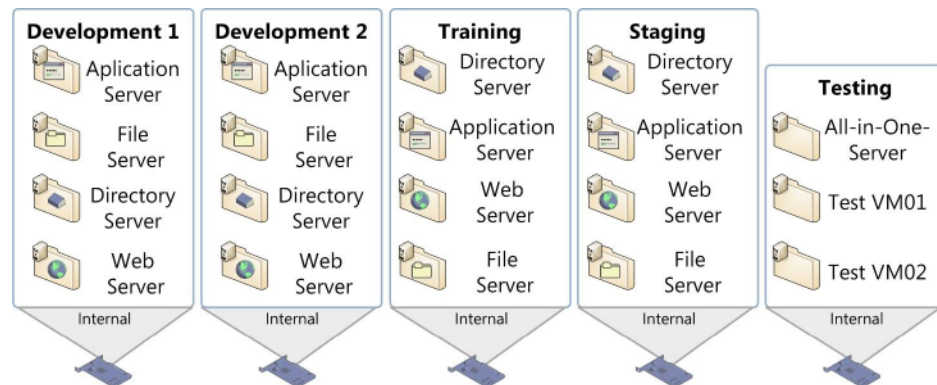
↳
CONSOLIDATING
VOLATILE IT
ENVIRONMENTS

↳
CASE STUDY

↳
BUILDING YOUR
ENVIRONMENT

↳
EXPANDING
YOUR LAB

FIGURE 1



A properly configured single host server can run multiple volatile IT environments.

SOURCE: RESOLUTIONS ENTERPRISES LTD.

CHAPTER ③ Virtualizing a test and development lab

↳
VIRTUALIZING
A TEST AND
DEVELOPMENT
LAB

↳
CONSOLIDATING
VOLATILE IT
ENVIRONMENTS

↳
CASE STUDY

↳
BUILDING YOUR
ENVIRONMENT

↳
EXPANDING
YOUR LAB

- VMs are simply a set of files in a folder, making them easier to back up and restore. Virtual environments use considerably less physical space than conventional laboratories.

Users can connect to VMs in any environment through their own workstation using standard network connections.

- VMs support the concept of snapshots—point-in-time images of a VM state that can be taken whether the machine is running or not. Each time users perform tasks and want to save the results, they can take snapshots. Then, if users perform subsequent tasks that don't work, they can return to a previous snapshot. This saves enormous amounts of time in that they can avoid rebuilding the system (FIGURE 2). Snapshots also support training environments because administrators need only to return to the snapshot to recover the original state of any training machine.

- VMs are completely isolated

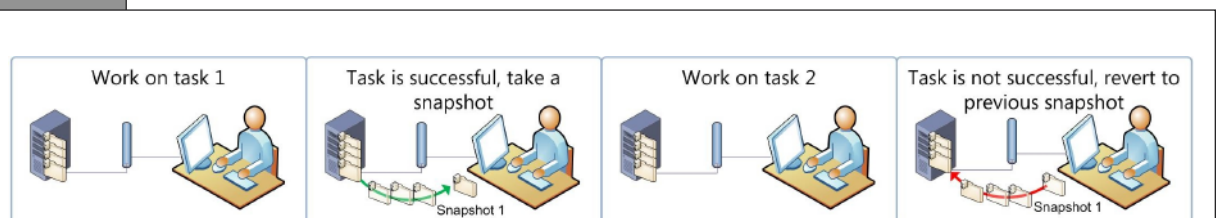
from one another because of the host server's network virtualization capabilities. In addition, users will not know they share host server resources because their environments will be completely contained.

- Virtualization technologies allow self-service VM provisioning and management, which enables systems administrators to perform other vital tasks within the network.

- Administrators can control how many resources are available to a VM. They can throttle certain resources to ensure that VMs don't consume all of the physical host's resources. This can guarantee that performance levels remain acceptable for each user sharing physical resources.

Organizations should decide to use virtualization to build laboratories in order to save costs, maintain consistency and reduce their carbon footprint. (Continued on page 8)

FIGURE 2



Snapshots make it easier to perform tests and maintain results of what worked.

SOURCE: RESOLUTIONS ENTERPRISES LTD.

CASE STUDY:

Mixing VM test and development with outsourcing

↳
VIRTUALIZING
A TEST AND
DEVELOPMENT
LAB

↳
CONSOLIDATING
VOLATILE IT
ENVIRONMENTS

↳
CASE STUDY

↳
BUILDING YOUR
ENVIRONMENT

↳
EXPANDING
YOUR LAB

AUTOMOTIVE PARTS supplier Delphi Corp., headquartered in Troy, Mich., hit a few roadblocks when setting up test and development in a virtual environment. Eventually, though, the company found a way to reap the benefits from this new architecture.

Delphi's biggest challenge was not determining how to run test and development on virtual machines (VMs) or whether the technology would work. Instead, it had difficulty getting its outsourcing partners on board to support it.

"Technology is always the easiest part," said Edward Mutz, principal architect, network and platforms at Delphi. "It's the political and contractual issues that hold up progress."

The automotive company has three IT outsourcing partners. One partner manages 4,000 applications—1,200 of which are classified as "mission critical." Another partner hosts Delphi's server operation (approximately 3,500 systems) and the third outsourcing partner manages all of the company's desktops.

The first partner's contract with Delphi required four servers per application: one for production, one for development and a third for testing, plus a database server rolled into the mix.

Virtualization has turned this picture on its head. In a virtual environment it's possible to set up a VM in a matter of minutes, tweak the application as needed and then shut down the VM once that's done. "We no longer needed 300 development servers sitting around doing nothing," Mutz said.

This contract, however, was based

In a virtual environment, you can set up a VM in a matter of minutes and then tweak the application as needed.

on physical machine management. Although it was a battle to renegotiate the contract to support test and development on VMs, the outsourcing partner eventually agreed to it.

Delphi now has 200 production applications running on VMs; the VMs also run the test and development environment as needed. With fewer physical machines, it meant fewer full-time staff members were required to manage the smaller environment. This enabled Delphi to save money in some of its outsourcing contracts. —Jo Maitland

(Continued from page 6)

SIMPLE STEPS TO VIRTUALIZATION

Moving to virtual volatile IT environments is relatively simple and can be done in a few quick steps. It doesn't have to be an overly expensive venture either, because current hardware is much less expensive in terms of dollars for processing power. Don't overcomplicate the project. The key

to a successful virtualization project is to keep it simple.

First, obtain the proper hardware. Host servers require a great deal of resources, including multi-core CPUs and large amounts of RAM, network adapters and storage. For example, you can start with small-footprint servers that have one quad-core CPU, up to 8 GB of RAM and include a large amount of storage. Prices range

↳
VIRTUALIZING
A TEST AND
DEVELOPMENT
LAB

↳
CONSOLIDATING
VOLATILE IT
ENVIRONMENTS

↳
CASE STUDY

↳
BUILDING YOUR
ENVIRONMENT

↳
EXPANDING
YOUR LAB

STEPS TO BUILDING VOLATILE IT ENVIRONMENTS

ONCE YOU'VE IDENTIFIED the hardware you want to use and on which virtualization technology you will rely, you're ready to build your laboratory environment. Follow these steps to set up your new virtual laboratory.

- 1 Start with the base server configuration for the host servers. This means installing additional RAM, network adapters and disks as required.
- 2 Begin the base server installation for the host servers. This means installing the hypervisor on bare-metal machines.
- 3 Plan adequate storage space, an average of 500 GB or more, for the following:
 - Storing all laboratory data
 - ISO or DVD files for all required operating systems and software
 - VM images that will be created during all testing
 - Backup data of virtual hard disks
- 4 Download and prepare the VM for evaluation tools.
- 5 Create new VMs or transform existing physical machines into VMs.
- 6 Build multiple environments to support testing graduations.
- 7 Prepare a self-service portal for end users to manage their own VMs. ■

from \$350 to \$2,000 for a loaded server, and the machines fully support server virtualization. Additionally, you don't need to buy new hardware if you can recover a similar system from existing machines.

Next, obtain a free virtualization engine. All major virtualization vendors offer top-level virtualization engines at no cost. Some virtualization engines are bare-metal hypervisors, which means that they don't require an underlying OS to operate.

Other free virtualization products may require that an OS is installed before installing the server. Using such software-based virtualization products, however, can reduce performance. On the plus side, though, these tools can run on older hardware

and can help to further reduce laboratory costs.

BUILDING YOUR ENVIRONMENT

After selecting which virtualization engine to use, it's time to start building your virtualization environment. A simple method for doing this is to perform physical to virtual (P2V) migrations, which can be done for free using certain tools.

The next step would be to point to all test and development machines that make up your environments and gradually convert each one to a VM. Some tools support online conversions or conversions that occur while machines are delivering services to users.

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VIRTUALIZING
A TEST AND
DEVELOPMENT
LAB

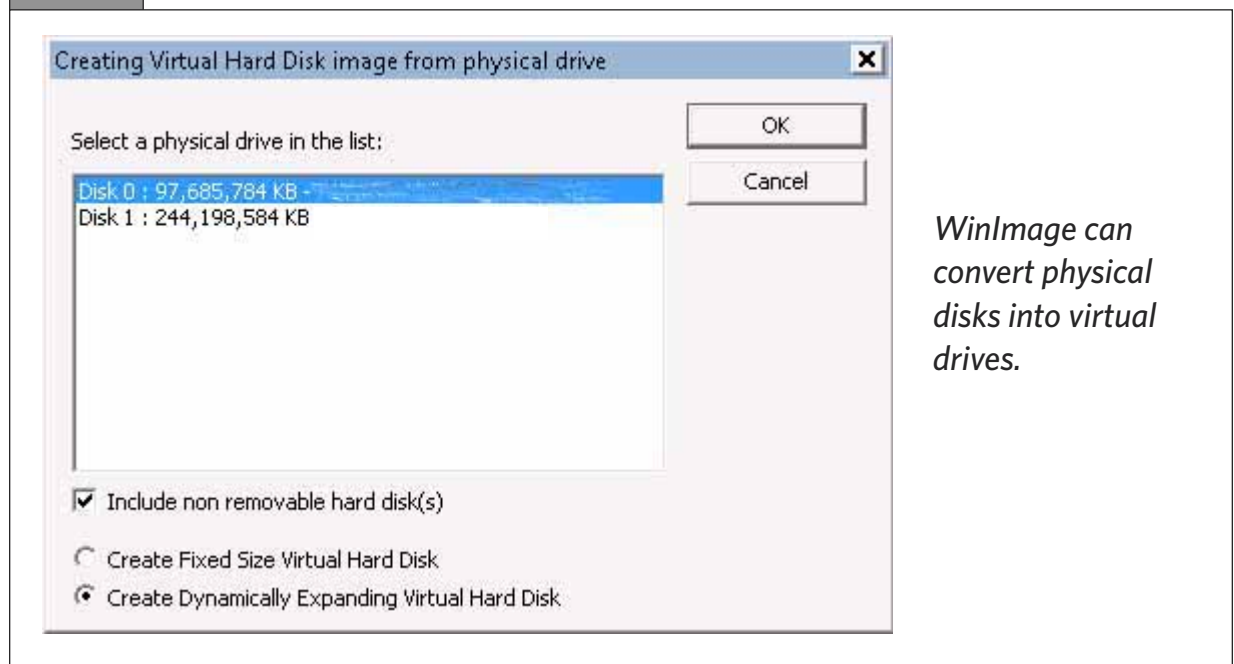
↳
CONSOLIDATING
VOLATILE IT
ENVIRONMENTS

↳
CASE STUDY

↳
BUILDING YOUR
ENVIRONMENT

↳
EXPANDING
YOUR LAB

FIGURE 3



WinImage can convert physical disks into virtual drives.

WHAT ARE THE NEXT STEPS IN VIRTUALIZATION?

After users have worked with VMs in their environments, you might want to consider adding more VMs to the laboratory. For example, if you decide that the free or evaluation technologies you used met your needs, consider buying them. That way, you don't need to restart the deployment process. You can simply activate the machine you're already using.

You may also want to investigate using storage area networks (SANs) to centralize all files comprising your VMs in an effort to improve laboratory performance. SANs cost more money, so you won't want to move to this level until the new virtual labs have proven records of performance and cost reductions. Keep in mind that you must still put proper backup and recovery practices into place.

If you face recalcitrant testers and developers, you can actually perform the migration without telling them you have done so. For example, one administrator converted all of the company's new systems to VMs

without telling anyone in the organization. Later, when the CIO said it was time to convert all systems to virtualization, he was surprised to learn that more than 60% of the infrastructure was already running on a hypervisor. Converting without telling anyone is a viable option but should be done cautiously.

Although it's possible to use free and evaluation versions of many virtualization tools, don't skimp on other components. For example, one customer used poor-quality networking cables on host servers just because it was too much work to run another cable through the floorboards. But, each time someone walked past the host servers, the cable would pop out and users would lose contact with more than a dozen VMs.

There are several other benefits when moving to a virtual infrastructure for the volatile IT environments in your network. Generally, you'll have less work and more fun doing your job, and you might even have some spare time once the project is complete. ■

↳
VIRTUALIZING
A TEST AND
DEVELOPMENT
LAB

↳
CONSOLIDATING
VOLATILE IT
ENVIRONMENTS

↳
CASE STUDY

↳
BUILDING YOUR
ENVIRONMENT

↳
EXPANDING
YOUR LAB



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- ▶ [Using virtualization for testing and development environments](#)
- ▶ [What is Microsoft Hyper-V?](#)

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