

The 5 Stages of Virtualization Adoption

Virtualization has helped companies worldwide transform their IT infrastructure to achieve huge savings in time, money, and energy while increasing flexibility, efficiency, and making it simple to have a comprehensive disaster recovery solution. As the pioneer in modern virtualization, VMware has revolutionized the IT industry, radically improving every dimension of the desktop and the datacenter, and the VMware virtualization platform has gained the support of the entire ecosystem of technologies—from servers to storage to networking to security to management to operating systems to applications.

Today, customers are using VMware virtualization in new and exciting ways, moving far beyond desktop and server consolidation to fully automate their IT infrastructure. VMware's broad and proven virtualization portfolio addresses a range of complex business needs that include infrastructure optimization, business continuity, application and desktop delivery, and green IT. The benefits to customers include substantially lower IT costs, huge reductions in energy consumption, greater choice of operating systems and thus applications, and a more automated and resilient systems infrastructure capable of responding dynamically and precisely to variable business demands.

Now, IT is entering the next major transformation: to cloud computing, which potentially can deliver order-of-magnitude gains in IT flexibility, agility, and cost-efficiency. As customers standardize on VMware Infrastructure as their new business computing platform, they are positioned to embrace cloud computing—pooling application resources in both local datacenters and remote compute clouds interchangeably, fluidly, safely, and orchestrated with efficient precision. With virtualization as their underlying architecture, companies are liberated from physical resource constraints and can radically transform the economics of IT.

On the way to this vision, customers tend to move through five distinct but overlapping stages of virtualization adoption. These stages map to VMware innovations and products. Over VMware's 10-year history, these innovations have made amazing new capabilities not only possible, but easy and commonplace, each step of the way.

Stage 1: Separate

The idea of virtualization was conceived in the mainframe world of the 1960s. VMware, founded in 1998, realized the value of revisiting the idea, modernizing it, and bringing it to industry-standard x86 systems.

The first stage of virtualization is to separate the logical function of a computer from its physical incarnation. This first step is critical as it breaks the tight—and constraining—bonds between the software (the operating system and applications) and the physical hardware on which it is installed. In essence, VMware virtualization encapsulates the OS and a software application, transforming this bundle of virtual hardware, OS, and application into a single software file—a virtual machine.

Virtual machines are better than physical machines, opening up tremendous new possibilities that are simply not possible in the physical world—much like the way electronic banking, by transforming bills into bytes, greatly increased the velocity, reach, and ease of commerce. In a VM, the OS doesn't "see" physical hardware, but sees virtual hardware instead, enabling what is contained in a VM to run in isolation from other VMs. Moreover, by turning hardware into software and transforming physical

capabilities into information, virtualization makes provisioning and managing the entire IT infrastructure faster, more flexible, and more efficient. VMs can be manipulated with the ease of any other software file; copied for backup and failover; carried by users on USB sticks; and easily moved through the network across machines, across datacenters, and around the world with lightning speed.

The first commercial applications of VMware virtualization were to streamline software development and testing and also to provide a way for multiple operating systems to run on the same machine at the same time. Running Windows applications on Linux was the first killer app for VMware.

VMware Workstation was introduced nine years ago, and today, in its sixth generation, it remains the runaway market leader and best product in its class. Workstation lets development, test, and QA engineers use a single machine to develop applications across a wide range of platforms and browsers more cost-effectively, efficiently, and safely.

VMware Fusion, introduced in 2007, brings the Mac and PC worlds together to let people use the hardware they want *and* the software that best serves their needs. With Fusion, Mac users can simultaneously and seamlessly run Mac OS X, Windows, and other PC-based applications on the same Mac. Users can quickly switch back and forth and easily share information between Mac and Windows, without rebooting.

The VMware ESX hypervisor was introduced in 2001. Its ability to separate a server OS from its hardware and also dynamically optimize resource management has ignited a global transformation in IT by enabling new levels of consolidation in the datacenter.

Stage 2: Consolidate

By encapsulating each application and OS in its own virtual machine, the VMware ESX hypervisor enables multiple applications and OSs to run on any hardware regardless of configuration and to share the same underlying hardware safely. Organizations use this technology to partition x86-based servers into multiple virtual servers and **consolidate** multiple applications and heterogeneous OSs on the same hardware and across different hardware configurations, increasing utilization and reducing costs. They also use this technology to rapidly provision their applications without needing to worry about differences in underlying hardware configurations or having to go through the complexities of building new systems.

Server consolidation was the next killer app for virtualization because of the need to tame “server sprawl.” As low-cost x86 servers proliferated in the 1990s and 2000s, combined with an industry-wide “one application per server” approach, the result was low utilization and high hardware and operational costs. Servers became the equivalent of gas-guzzling SUVs, powerful pieces of equipment chugging along 24/7 and utilizing only a small percentage of their capacity. With VMware ESX, thousands of customers, from small organizations to global enterprises, have eliminated 90% or more of the servers in their datacenter, improved the utilization rates of the remaining servers from 5-15% before to 60-80% now, and doubled or tripled their server-to-administrator ratios. All of this reduces hardware and operating costs by as much as 50%, while also accelerating provisioning time for new servers by up to 70%. It also leads to greener IT, cutting datacenter power consumption by 80-90% and radically reducing CO2 emissions. Each server removed saves around 7,000 kilowatt hours (kWh) of power and eliminates four tons of CO2, which is equivalent to taking 1.5 cars off the road or planting 55 trees in a year.

VMware ESX hypervisor, the first commercial hypervisor for industry-standard systems, is the global engine of server consolidation. VMware ESX is one of IT’s great inventions, its impact on computing compared by some customers to the Windows operating system. Today, VMware ESX is the core VMware virtualization technology production-proven by tens of thousands of customers worldwide,

including all of the Fortune 100 and 92% of the Fortune 1000. Now in its third generation, it provides unique, cutting-edge capabilities:

- VMware ESX delivers the highest scalability, reliability, and performance for running the most demanding applications. *Redmond Magazine* recently ranked the VMware ESX hypervisor as the most reliable IT product—ahead of #2, the mainframe—calling its code “virtually bomb-proof.” Eighty-five percent of VMware’s customers use ESX in production to run mission-critical applications such as Microsoft Exchange, SQL Server, and SAP. In fact, VMware ESX recently set the world record for Exchange by hosting 16,000 user mailboxes on a single server.
- VMware ESX is rigorously tested and certified for over 250 different types of servers, 60 operating systems, 260 storage arrays, and 75 applications, making it the most broadly deployable and trusted virtualization platform in the world.
- VMware ESX is also highly cost-efficient. Its advanced resource scheduling and unique transparent memory management techniques often deliver twice the consolidation ratios of competing virtualization technologies.

To extend the benefits of server consolidation even more widely, VMware and its hardware partners are making one-click virtualization available with the VMware ESXi hypervisor. The industry’s smallest-footprint hypervisor, at 32MB, and the only OS-independent virtualization platform, ESXi does not incorporate a general-purpose OS. Removing the operating system from the hypervisor eliminates many of the security vulnerabilities of the OS, while removing the static tie between the OS and the server unleashes much of the power of virtualization. ESXi’s small size is perfectly suited for integration with hardware servers and delivers unsurpassed security and reliability. ESXi is currently shipping embedded in servers from all of the major x86 vendors, including Dell, Fujitsu Siemens Computers, HP, IBM, and NEC. Customers get VMware pre-integrated and pre-configured for the hardware platform of their choice, ready for immediate standalone server consolidation.

Stage 3: Aggregate

Standalone server consolidation is focused on the cost savings derived from running multiple virtual computers on a single physical computer. The next stage of virtualization lets a company **aggregate** a collection of computers into a pool of resources—including CPU, memory, storage, and networking—that can flexibly provide computing resources anywhere, on-demand. This resource pool is also more resilient than individual computers. Should one computer in the pool crash, others seamlessly pick up the workload and continue the job. Instead of overprovisioning compute capacity, IT organizations can provision capacity on-demand. Similarly to the way just-in-time inventory management revolutionized how manufacturers purchase and utilize computer components, just-in-time dynamic capacity management revolutionizes how IT purchases and utilizes computing, with unprecedented flexibility and economic benefits.

VMware was the first to take advantage of shared storage in conjunction with virtualization by developing a unique, high-performance cluster file system; and the first to introduce centralized virtualization management with VMware VirtualCenter, which enables administrators to provision, monitor, and manage their virtual datacenters through a single console. Then, with the introduction of VMware’s unique live migration capability—VMotion—VMware unleashed a range of new capabilities not possible in the physical world. VMotion leverages the complete virtualization of servers, storage, and networking to move running VMs from one physical server to another without any downtime and with zero impact to end users. Storage VMotion extends the capabilities of live migration to enable dynamic rebalancing of storage. VMware customer surveys show that the majority of customers have moved into the aggregation stage, with 62% using the capabilities of VMware VMotion in their virtual datacenters.

Another unique innovation is VMware Distributed Resource Scheduler (DRS). VMware DRS continuously monitors utilization across resource pools and intelligently aligns resources with business needs and changing priorities. Working in tandem with VMotion, DRS ensures application service levels by detecting when VM resources are constrained and migrating live VMs to underutilized servers. DRS also minimizes electricity consumption through Distributed Power Management (DPM). When a cluster of VMs needs fewer resources, DPM consolidates workloads and puts hosts in standby mode to reduce power consumption. When resource requirements of workloads increase, DPM brings powered-down hosts back online to ensure service levels are met.

These and other innovations transform IT infrastructure into pools of shared resources that can expand and contract on the fly, and be instantaneously repurposed and redirected where they are needed most. The sharing of resources makes computing more economically and environmentally efficient. It also makes virtual machines the best place to run applications. Because resources can be allocated to any application as needed, virtual machines deliver guaranteed application performance. Should unplanned downtime occur through a server failure, for example, virtual machines are protected simply by moving them to other servers. Security is another capability that is better in the virtual than in the physical world. VMware Infrastructure opens new possibilities for hardening virtual machines and eliminating security threats before they reach the OS or the applications. For these reasons, VMware customers rely on VMware to run their most mission-critical applications. Today, more than 85% of VMware Infrastructure customers are running production-level environments and more than 50% are running enterprise applications on VMware.

Virtual infrastructure is also the best way to deliver and manage desktops. By extending virtualization to the desktop with VMware Virtual Desktop Infrastructure, IT administrators can deploy virtual machines on PCs and deliver a complete desktop experience that is easy to manage, fast to deploy, less costly to maintain, always-current, and radically more secure. Virtual desktops are protected from disaster, disruption, attack, or theft, and are therefore the best and safest environments in which to run applications and store user files and data. In addition, VMware virtual desktops are always-current because thousands of virtual machines can be updated instantly from the datacenter without touching a single desktop. Workforces running VMware virtual desktops get a full PC experience both online and offline, allowing them to work from anywhere and be more productive.

Stage 4: Automate

Even more efficiencies come when an IT staff moves to the next stage to *automate* the services they provide for users. Today's IT departments must be able to respond to rapidly changing business conditions such as unexpected downtime or disasters while complying with IT policies and standards. Virtualization offers tremendous opportunities to automate more IT tasks than ever before: server provisioning, capacity planning, load balancing, disaster recovery, power management, and more. Automation leads to better response times, higher levels of availability, and less mind-numbing, error-prone manual work for the IT staff.

VMware, as with virtualization, is leading the industry in automation with its industry-leading suite of application and infrastructure management products for the datacenter. These products, which run on top of VMware Infrastructure, are designed to automate the traditionally manual processes of application delivery and business continuity. This is possible because the uniform virtual machine container can be managed independently from the operating system and applications that are inside, and can easily inherit policies and scripted workflows.

As the number of applications running in VMs grows and reaches critical mass in a customer's datacenter, administrators need to answer questions such as: Have the VMs been properly approved? Do they meet compliance and other company standards? Who owns them? Are they still in use? Which ones can be deleted? And so on. Three of VMware's new application and infrastructure management products focus on automating the entire lifecycle of IT services, from initial request to final retirement. VMware Lifecycle Manager allows companies to implement a consistent and automated process for requesting, approving, deploying, updating, and retiring virtual machines; the automation and control of the entire VM lifecycle eliminates manual and repetitive tasks that often introduce errors, and also enables the business to be in strict compliance with IT policies and standards. VMware Lab Manager provides fast and simple self-service provisioning of multi-tier virtual machine-based environments; the result is faster software development, increased software quality, and improved outsourcing flexibility and security. VMware Stage Manager streamlines and accelerates the application change, configuration, and release management cycle. By automating and providing visibility into the stages of the release process—from integration to testing to staging to user acceptance and to production—Stage Manager simplifies management, minimizes errors, and speeds application delivery.

VMware has also automated disaster recovery, which has been a significant challenge for many organizations. VMware Site Recovery Manager is a pioneering new product for disaster recovery. Traditional disaster recovery plans for datacenters depend on complex instructions tailored for each application and hardware configuration, which are contained in large runbooks that are nearly impossible to keep accurate and up-to-date. Site Recovery Manager uses the hardware independence of virtualization and the uniform virtual machine container around the application to completely simplify business continuity planning and testing. It scripts the recovery process to automate the right order of steps, makes testing trivial since the virtualized environment can be cloned and so run in parallel with production, and radically reduces the risk and complexity of implementing disaster recovery by making processes tractable for all applications.

Stage 5: Liberate

As virtualization becomes pervasive, a common infrastructure is being laid across datacenters and bridging corporate boundaries that will enable resources on-premise and off-premise to be combined securely into a single compute cloud. This infrastructure enables companies to *liberate* themselves from the constraints imposed by physical datacenters, and run their businesses without the huge costs associated with over-provisioning resources for peak demands, failover, or disaster recovery. This infrastructure is the foundation of a computing environment with complete transparency across local and off-premise clouds that will proactively ensure quality of service by tapping resources, independent of location, where power is cheapest or energy is greenest.

The IT industry is now moving toward this vision of cloud computing, and virtualization is the infrastructure on which it is being built. Each stage of virtualization adoption makes the next stage possible and builds cumulatively on the previous stages. Through separation, apps run as is; they don't need to be changed when ported to the cloud's software stack. Consolidation shrinks the footprint of the datacenter to an easier-to-manage, more cost-effective virtual platform. The pooling of resources in the aggregation stage, and the automation of the infrastructure underlying the pooled resources, enables capacity to be distributed on-demand wherever needed. Moving through the stages of virtualization, companies gain the benefits of each stage while at the same time building the infrastructure that will support cloud computing.

As new innovations come forth from VMware and the virtualization ecosystem, they will expand the virtual platform to enable cloud computing on each company's own terms. Resources pooled in local datacenters or remote compute clouds will be interchangeably, fluidly, and safely shared, tracked, and

charged-back to the user. Multiple instances of VMware VirtualCenter in different clouds will be able to coordinate with each other. Extending vMotion to the WAN will enable geo-balancing on a global scale. The management and security framework will be enhanced and extended across multiple clouds. And virtual appliances—pre-built, pre-configured, ready-to-run enterprise applications packaged with an operating system inside a virtual machine—will increasingly become the way that applications are deployed, virtualization-ready. They can simply be dropped on the infrastructure and they run, and soon they will be automatically tracked and directed where they need to go, when, and what to do when they get there.

Some of this is already happening in early examples of the on-premise cloud. BT, for example, is building the next-generation, cloud computing-ready infrastructure on VMware. BT's virtual platform pools business processes, applications, IT infrastructure, user access, and the network in a self-healing, automated, service-oriented infrastructure with integrated service-level management and built-in business continuity. The system provides dynamic geo-balancing across BT's datacenters in North America, South America, the UK, Europe, Asia, and Australasia. On the user level, it enables virtual desktops to follow users as they travel, and on the enterprise level it enables workloads to be automatically redistributed not only to meet capacity needs but also to take optimal advantage of eco-friendly locations where electricity can be tapped at much lower costs.

Cloud computing is the next logical stage in the adoption of virtualization and the transformation of IT. VMware is increasingly recognized as the operating system for cloud computing, the essential infrastructure that is making it a reality.

HOW CHAMPION CAN HELP

Our time-tested methodology of...

- Discovery
- Analysis
- Recommendation
- Implementation
- On-going Lifecycle Support / Management

...Has yielded 100% results for our clients in the following areas:

- Increased productivity by 40%-60% with centralized management (VirtualCenter)
- Increased reliability with 60% - 70% improved uptime (VI3 HA)
- Reduced administration costs by up to 80% (Lower the number of Physical servers to maintain)
- Achieved savings of up to 60% on hardware maintenance

Expertise

- VMware VIP Premier Partner
- VMware Authorized Consultant (VAC)
- 7 VMware Certified Professionals (VCP)
- 40 VMware Sales Professionals (VSP)
- 30 Pre- and Post- Sales Engineers
- VMware Infrastructure 3 (VI3)
- Virtual Desktop Infrastructure (VDI)
- VMware Lab Manager
- Physical to Virtual (P2V) Migration Services
- **Installed more than 1000 VMware Servers**

Champion can assist with:

- Proof of Concepts
- VMware Design & Architecture
- Needs Analysis & Requirements
- ROI & Financial Justifications
- Capacity Planning
- Consolidation Assessments
- All of your Virtual Environment needs:
 - Storage
 - Backup
 - Disaster Recovery
 - System Management
 - Microsoft Licensing
 - Security
 - Network Requirements
 - Server Sizing

Direct from VMware

"What sets Champion Solutions Group apart from other resellers is their strategic operational approach to Virtualization. They are not focused on just selling a license, but rather the operational and ROI benefits the customer will realize as a result of the Virtualization solution. In 2008, these strategic operational discussions will be the key differentiator in this business, and Champion is at the forefront."
Vice President U.S. Commercial Division – VMware

Direct from our Customers

"I would like to thank you for the outstanding job you did in setting up and configuring the City of Hollywood's VMware servers. You exceeded our expectations in every aspect of the project. Your job expertise and knowledge were crucial in getting our servers up and running successfully."



"You know, other people just like to send you a brochure that says here's what we can do. But we want to touch it, feel it, really see what a technology can do. We spent two days down there with Champion's engineers. They spent a great deal of time just asking us questions about our company and our systems and how it all worked together, so they could find the best solution for us. And they did!"



"IT needs to be able to adapt rapidly to any business request that comes to it. The results we've been able to achieve give business units confidence in our ability to deliver and help them work more efficiently. Being able to set up a production server in hours translates into the developer being able to develop instead of waiting, the marketing manager being able to get feedback on marketing projects quickly. They don't have to wait for deployment or wait for things to be recovered. It greatly contributes to the company's agility."



"Our servers are critical to a truly satisfying customer experience. And because we work in a sensitive environment, we can't afford to lose data or availability due to a disaster or disruption. By using Double-Take for Virtual Systems with VMware's virtualization products, we can continue to work effectively and efficiently – even during a system crash or outage. We don't miss a beat, which is crucial to our mission."



Learn More

Take the next step. For questions or to discover how Champion can help your business develop a Virtualization strategy, contact Champion Solutions Group at 800.771.7000.

Additional Information

Virtualization Roadmap

This article explores the "Virtualization Roadmap", which helps organizations journey through four superhighways of Virtualization (Server, Storage, Application, Desktop) in order to maximize your investment.

http://www.championsg.com/Champions_InnSite_v10.nsf/pages/virtualizationroadmap

Case Studies

To learn more about these customers' stories, as well view additional application briefs, we recommend the following site:

http://www.championsg.com/Champions_InnSite_v10.nsf/pages/nr_app_briefs_home

Go Green

The green initiative is closely aligned with Virtualization. Champion has created this webpage as an additional resource for exploring environmentally-friendly solutions.

http://www.championsg.com/Champions_InnSite_v10.nsf/pages/begreen



**Champion Solutions Group • Corporate Headquarters • 791 Park of Commerce Blvd. Suite 200
• Boca Raton, FL 33487 • 800-771-7000 • FAX: 561-997-4043 • www.championsg.com**