Virtualizing Business-Critical Applications on VMware vSphere

WHITE PAPER
Table of Contents

Executive Summary .................................................. 3
Introduction ............................................................ 3
  The Virtualization Journey ....................................... 3
  VMware vSphere And VMware vCenter .............................. 4
Application Performance ........................................... 4
  Virtual Machine Scalability ...................................... 4
  Better Application Scalability On Multicore Servers ............... 6
  What About Databases? .............................................. 6
  What About SAP? .................................................... 8
  What About Exchange? ............................................ 8
Consolidation .......................................................... 9
  Database Consolidation .......................................... 9
  Software License Consolidation .................................... 10
"Applications as a Service" In The Private Cloud .................. 11
  Accelerate The Application Lifecycle ............................ 12
  Guarantee Application Quality Of Service ....................... 13
ISV Support ........................................................... 16
  Specific ISV Statements ......................................... 16
  Microsoft Support ................................................ 16
  Oracle Support ...................................................... 17
Conclusion .............................................................. 17
Executive Summary

In the past, most VMware® customers started their virtualization journey with the “easy applications”, such as test/dev environments and infrastructure applications. Starting at the low-end of the application spectrum helped customers to minimize risk while quickly virtualizing 20 percent to 30 percent of their infrastructure. Beyond that point, customers were often more hesitant to virtualize their business-critical applications. This reluctance was fueled primarily by concerns around performance, ISV support, and the relative risk of deploying an application on a newer, lesser known platform.

Today, customers are moving beyond these traditional concerns to virtualize their business-critical applications at an accelerated pace. According to a recent survey, 73 percent of customers report they virtualize business-critical applications in production, including SAP, databases, and Microsoft Exchange. What has changed? On the one hand, legacy concerns around performance and ISV support are no longer warranted. Moreover, customers are realizing that the value of virtualization extends far beyond basic consolidation, and that applications run better on the VMware private cloud, with faster application life cycle and improved application quality of service.

Application performance is no longer a barrier to adoption. VMware vSphere™ 4 provides outstanding scalability with VMware virtual machines, supporting up to eight virtual CPUs and 255GB RAM with minimal virtualization overhead—enough to support even large databases.

Consolidation and cost reduction, including infrastructure costs and software licensing costs, are strong drivers for virtualization. ERP systems, email applications, and databases consume large pools of over-provisioned servers. Virtualizing these applications yields consolidation ratios of 5:1 and higher. Through consolidation, customers are able to not only slash infrastructure costs, but also in many cases achieve 100 percent or greater improvement in the utilization of their expensive software licenses.

The entire application life cycle, from development to production, can be streamlined and accelerated with VMware. Developers and QA teams can deploy and share development environments on the fly. Preconfigured, multitier applications can be deployed in production in a matter of minutes instead of days or even weeks.

Application quality of service can be improved by ensuring performance and availability for all apps. With VMware, IT can monitor service levels, identify bottlenecks, and scale applications dynamically to ensure performance under variable load. The VMware business continuity capabilities—including High Availability (HA), Fault Tolerance (FT), and Site Recovery Manager (SRM)—protect all applications from hardware-related downtime without the complexity of application-level clustering.

The ISV ecosystem supporting VMware is strong and rapidly expanding. The four largest software vendors—Microsoft, IBM, SAP, and Oracle—have support statements in place for VMware. VMware is also supported by hundreds of smaller ISVs, and gaining support from many new ISVs each month.

Introduction

The Virtualization Journey

If you are one of the more than 150,000 companies worldwide that use VMware solutions, you have probably virtualized a significant portion of your datacenter. And like most, you probably started your journey by consolidating underutilized servers supporting lower-priority applications.

You made the right decision. You’ve probably already reduced your infrastructure TCO significantly through server consolidation. At the same time, you found that virtualization reduced operational complexity, simplified the lives of administrators and eliminated many manual, repetitive tasks. You now can plan capacity at a macro-level, provision systems at the touch of a button, and migrate applications live between hosts. Along with cutting annual power consumption by roughly 7,000kWh per consolidated server, you also reduced the annual carbon dioxide output of your data center by four tons of carbon dioxide for each server removed. In fact, virtualization may even now be a key component of your company’s energy efficiency strategy.

As your confidence in virtualization grew, so did your desire to virtualize a larger portion of your infrastructure. However, when it comes to virtualizing your large, business-critical applications, you may hesitate. Virtualizing the gears that run your business—databases, ERP system, email servers, industry-specific solutions, and more—feels like a completely different ballgame, and you may wonder whether the risk / return ratio is still worth it. In addition, these applications often have powerful “app owners” that may not be familiar with virtualization and often have their own specific objections: “will VMware have a negative impact on my application performance?”; “will the ISV give me the support I need?”; “what’s in it for me and my application?”; and, “if it’s not broken, why change?”.
While there are certainly specific challenges when it comes to virtualizing business-critical applications, the most common concerns are actually lingering misperceptions based on earlier incarnations of virtualization from years ago. In addition, virtualization is no longer just about consolidation and cost-savings. Today, advanced VMware customers are using virtualization to transform their IT infrastructure into a private cloud. **Applications really do run better on the VMware private cloud, with much faster dev-test-provisioning cycles, better service levels under unpredictable load, and simple, cost-effective availability.**

Join the many VMware customers on the next step of your journey to transform your infrastructure into a dynamic private cloud. Run your business-critical applications, including Exchange, SQL, SAP, and Oracle, on VMware vSphere with breakthrough performance and outstanding reliability. Build a flexible cloud computing infrastructure that can deliver business-critical applications as dynamic, cost-efficient, and reliable IT services.

**VMware vSphere And VMware vCenter**

VMware vSphere is the industry’s leading virtualization platform for holistically managing large collections of infrastructure—CPUs, storage, networking—as a seamless, flexible, and dynamic operating environment. Unlike traditional operating systems that manage an individual machine, VMware vSphere aggregates the infrastructure of an entire datacenter to create a single powerhouse with resources that can be allocated quickly and dynamically to any application in need.

VMware vSphere provides revolutionary benefits, but with a practical, non-disruptive evolutionary process for legacy applications. Existing applications can be deployed on VMware vSphere with no changes to the application or the OS they are running on.

VMware vSphere delivers the performance required to run business-critical applications in large-scale environments. VMware vSphere provides 2-4 times the performance of the previous generation platform (VMware Infrastructure 3) while keeping virtualization overhead at a very limited at 2-10 percent. With these performance numbers, VMware vSphere is able to run even large, resource-intensive databases, and, in many cases, enables applications to scale better on newer multicore servers.

VMware vSphere provides a set of application services that enable applications to achieve unparalleled levels of availability, security, and scalability. For example, with VMware vSphere, all applications can be protected from downtime with VMware High Availability (HA) and VMware Fault Tolerance (FT), without the complexity of conventional clustering. In addition, applications can be scaled dynamically to meet changing loads with capabilities such as Hot Add and VMware Distributed Resource Scheduler (DRS).

The **VMware vCenter Product Family** is the industry’s most advanced virtualization management platform, which unlocks the power of virtualization through proactive management and centralized control of virtual infrastructure. For example, VMware vCenter AppSpeed enables IT operations to monitor and ensure the service levels of distributed multilayer applications running on VMware vSphere. VMware vCenter Lab Manager 4 provides developers and application owners on-demand, self-service access to a library of application and development environments to accelerate develop and test cycles.

With the powerful capabilities of VMware vSphere, the VMware vCenter Product Family, and a growing ecosystem of over 500 technologies companies, the question has now shifted from “can I virtualize my business-critical apps?” to “can I afford not to?”. In this paper, we’ll explain why VMware vSphere is the best platform for delivering business-critical applications. We will address each of these six key considerations in order:

- Application performance
- Consolidation and cost reduction
- Delivering applications as a service in the private cloud
- Accelerating the application life cycle
- Guaranteeing application Quality of Service
- ISV support

**Application Performance**

There are two key performance considerations to keep in mind when virtualizing large resource-intensive applications. First, **each individual virtual machine must scale** to support the requirements of the application it is hosting. Second, many applications can actually achieve higher performance on vSphere than on physical servers, by **scaling out on multiple virtual machines** to better leverage the capacity of large multicore servers.

**Virtual Machine Scalability**

There is still a perception in the market that virtualization introduces a performance constraint on larger applications, especially IO-intensive applications such as databases and email servers. This perception was created with early versions of the VMware hypervisor, VMware ESX®, which did have scalability limitations and material overhead. This, however, was multiple product generations ago.
As is usually the case, perception lags reality. The latest versions of VMware ESX—3.5 and 4—have advanced by leaps and bounds over the early product generations. VMware has placed a significant focus on maximizing the performance of virtual machines, and as a result, ESX 4 has made tremendous progress in IO, CPU, and memory scalability over early product generations.

Today, virtual machines on ESX 4 can scale to eight virtual CPUs, 256GB of memory, and over 350,000 disk IOPS, while keeping overhead limited between 2 and 10 percent for the majority of applications. That translates to a 20x performance increase from ESX 2 to ESX 4. To put this performance in perspective, a single virtual machine today provides about the same performance as a Sun Fire 15K in 2002—a very large, multi-million dollar Unix server!

These advances in performance are charted in Figure 1. And what they mean for you is that resource-intensive applications perform very well on VMware vSphere. In fact, we have measured the resource requirements of more than 700,000 production applications running on x86 servers, and VMware vSphere is able to support more than 95 percent of those applications.

![Application Performance Requirements](source: VMware Capacity Planner assessments)
Better Application Scalability On Multicore Servers

Application scalability has lagged behind the evolution of high-end multicore servers. In 2005, large quad-socket servers had a total of 8 processor cores, but fast forward to 2010 and large quad-socket servers will have up to 64 processor cores. How many cores can your applications scale to? Unfortunately, the vast majority of applications cannot come close to using 64 cores in parallel. Most applications are only sufficiently multi-threaded to efficiently use between 2 to 8 cores in parallel. For example, Microsoft Exchange only scales to 8 cores, the average custom application is limited to four processors, and even Microsoft SQL Server is limited to about 32 cores.

Because of these limitations, the traditional deployment model of “one app per server” limits applications to only scale to a fraction of server capacity—leaving much of the compute capacity untapped. For larger CPU-intensive applications, this is becoming an increasingly important problem limiting application scalability and leading to increased infrastructure costs.

With VMware vSphere, many applications can be scaled out in multiple smaller application instances. Web servers such as Apache of Microsoft IIS, application servers such as Tomcat or WebSphere, and even Microsoft Exchange, can easily be scaled out on multiple virtual machines. This deployment model enables applications to efficiently use the capacity of large multicore servers, while preserving excellent isolation between multiple application instances.

What About Databases?

Databases are among the applications that customers are most concerned about on VMware, because of their resource requirements and the business-critical nature of these systems.
These concerns are unwarranted, however, as the capabilities provided by VMware vSphere are well beyond the needs of almost all databases, including Oracle and SQL.

In February 2009, VMware vSphere set a new benchmark in virtualized database performance. VMware vSphere was benchmarked with one of the most demanding workloads for virtualization: a resource-intensive OLTP database based on a fair-use implementation of TPC-C. This application is significantly more resource-intensive than average production databases, and hence puts a heavy load on the hypervisor. Even for this difficult workload, a single virtual machine in VMware vSphere, running Oracle 11g and Linux, achieved 85 percent of native performance with near-linear scalability from one virtual CPU to eight virtual CPUs. The virtual machine supported 8,900 transactions per second and drove about 60,000 disk IOPS—a massive amount of throughput that only a small fraction of databases actually require.

It is true that there are some exceptionally large databases out there, but it is the rare database indeed that can exceed performance capabilities provided by VMware vSphere. The reality is that almost all databases can run quite comfortably on VMware vSphere, with plenty of processing headroom to spare. Based on VMware Capacity Planner data compiled from tens of thousands of production servers in customer environments, the average production Oracle database requires only a fraction of the capacity that a virtual machine can deliver.

Case in point

“We have close to 60 Microsoft SQL Servers virtualized, some with a disk usage greater than 90 MB per second, which translates to 22,000 IOPS,” says Tom Gibaud, Manager of Information Technology at ViaHealth, a family of health care providers in New York state, including Rochester General Hospital. “These are SQL Servers that touch the patient and have a lot of traffic—if they’re down, it’s a major issue. Having them virtualized on VMware gives us greater reliability and more uptime.”

“We have a VMware-first policy, and have virtualized nearly 90 percent of our application environment,” adds Gibaud. “That shows how much confidence we have in VMware technology. Simply put, VMware helps us better manage our computing environment. For example, if we notice that there is a memory error on a server, it is very easy for us to vMotion that box somewhere else, replace the memory chip, and then vMotion it back. Try doing that with a data center full of physical servers!”

![Figure 3. Average Oracle Database Fits Easily in a Virtual Machine](www.getadvanced.net)
What About SAP?

Because they use a disproportionate share of datacenter resources, Enterprise Resource Planning (ERP) applications are ideal candidates for consolidation. An average SAP implementation uses about 50 servers, including a high ratio of non-production servers. VMware delivers the highest consolidation ratios in the industry for such applications, often exceeding 10:1. Virtualizing this one application saves customers 40 servers or more on average.

SAP software also performs very well on VMware vSphere. Using the standard SAP SD benchmark, a virtual machine running 1-4 virtual CPUs matches the performance of physical servers with less than 10 percent overhead.

Case in point

Checkpoint Systems International, a leading manufacturer of retail tracking, security, and merchandising solutions relies on SAP to produce, sell, ship, and invoice its products. Checkpoint migrated SAP modules from clustered physical servers to virtual machines in a phased approach, culminating in 2007 when they virtualized the two most critical pieces—the central SAP database and ERP instance. Checkpoint now has 20 SAP servers running on VMware at its primary site and three VMware hosts at its secondary site for disaster recovery purposes. With an 8:1 server consolidation ratio, Checkpoint has increased server utilization from 15 to 70 percent, cut power and cooling costs by more than a third, and accelerated provisioning from four to six weeks before to one hour now. Availability is up, and management time is down.

“Moving our SAP deployment on to VMware has made it easier to deliver a higher level of service to the business than was previously possible,” says Michael Nogger, Checkpoint’s IT Operations Manager for Europe. “Our lives are now significantly easier; we spend far less time performing upgrades and maintenance tasks, and our service delivery processes are incredibly streamlined.”

What About Exchange?

Microsoft Exchange scales extremely well on VMware vSphere. On one hand, a single virtual machine can match the performance of physical servers and support about 8,000 heavy user mailboxes. On the other hand, VMware vSphere can more than double the performance achieved from physical servers by scaling Exchange out in multiple virtual machines. VMware set a capacity record for a single 16-core server running Exchange 2007, doubling the number of heavy mailboxes supported from 8,000 to 16,000. The conventional deployment model is to deploy just one Mailbox Server per physical host. This configuration supports about 8,000 heavy user mailboxes and scales to about 8 cores. With VMware vSphere, Mailbox Servers can be scaled out in multiple virtual machines per physical host to use all the cores available.

Case in point

University of Plymouth, one of the UK’s most prominent universities virtualized 50,000 Exchange 2007 mailboxes on VMware. “We not only have a more manageable and flexible Exchange environment, but we have replaced Microsoft clustering with VMware’s built-in high availability solutions such as HA and vMotion. We couldn’t be happier with the uptime and performance of our Exchange implementation on VMware. VMware technology works for small companies all the way up to massive financial institutions. And clearly, it has worked for us,” explains Adrian Jane, Infrastructure and Operations Manager.

The benefits go far beyond Exchange performance. Application delivery has accelerated by an order of magnitude. “In our previous experience with migrating from Exchange 2000 to 2003, the mailbox migrations were quite slow,” says Jane. “With the VMware implementation of Exchange 2007, we found we could move between 1,000 and 5,000 mailboxes a night. It was about ten times faster.” Moreover, server provisioning time went from months to minutes, and disaster recovery time dropped from weeks to less than an hour.

With VMware, the university has reduced the number of server racks in its datacenter from 32 to 2, a 93 percent saving on floor space, and estimates annual savings on its electricity bill of about $90,000, and a reduction of its data center output of CO2 by about 170 tons per year.

“VMware is a strategy for us, not a product,” concludes Jane. “The system manages itself. The IT team and I can get on with doing things that are much more productive for the university.”
Consolidation

Cost reduction through consolidation remains a strong driver for virtualization. VMware vSphere delivers huge savings not only in hardware, power and administrative costs. In January 2008, CIO Magazine published the results of its “Virtualization in the Enterprise” survey of nearly 300 CIOs. When asked why they have virtualized their servers, 81 percent of the companies responded: “to cut costs via server consolidation.” Consolidation ratios of 10:1 or more are common, with some companies achieving 20:1. That adds up to a lot of savings.

These high consolidation ratios are also common with large, business-critical applications. The 8:1 consolidation ratio Checkpoint achieved for SAP is typical. Some customers have gone beyond that, comfortably achieving 10:1 consolidation ratios with SAP. For example, AstraZeneca, one of the world's leading pharmaceutical companies, consolidated its entire SAP environment to 50 – 60 virtual machines hosted on six HP servers, and as a result expects cost savings of more than €1 million over three years.

For Exchange, consolidation ratios are usually in the range of 5:1 to 10:1. Without VMware vSphere, each Exchange server role - mailbox server, edge, hub, and client - is deployed on a dedicated server. In addition, there are often dedicated standby servers for availability, as well as multiple Exchange hubs, creating ample opportunity for high consolidation ratios. Organizations such as the University of Plymouth, medical device manufacturer NuVasive, and packaging manufacturer Boise have taken advantage of this opportunity to cut down on hardware costs and ramp up on efficiency, flexibility, and agility.

In many cases, customers are also able to consolidate software licenses, sometimes by as much as 10:1.

• Some applications are licensed by “physical CPU”—for example Oracle databases and Microsoft SQL Server Enterprise Per Processor licenses. Organizations that have multiple instances of such an application can create a dedicated vSphere cluster for the application. By licensing all the physical processors in the cluster, they create an “all you can eat” environment on which an unlimited number of instances and virtual machines can be deployed. Consolidation ratios of 5:1 to 10:1 are common with this approach.

Database Consolidation

Database consolidation is an increasingly popular use case for VMware vSphere. Nearly all applications require their own database, and many organizations are faced with spiraling database sprawl and costs. Across the IT industry, Microsoft SQL Server is the single largest application in terms of number of x86 servers consumed! Databases also tend to be the most over-provisioned applications in the datacenter, and are very expensive due to high license costs and top-tier infrastructure requirements.

To control these costs, many organizations have undertaken database consolidation projects. Conventional database consolidation is typically done by either running multiple SQL or Oracle instances on a shared OS image (multi-instancing), or running multiple databases within a shared SQL or Oracle instance (shared instancing). These two traditional approaches can be successful, but also have significant challenges:

• There is generally a lack of OS configuration, security, fault, and resource isolation between database instances—and a single OS or SQL failure could result in dozens of databases and applications being down simultaneously.

• Load balancing between physical hosts is a complex undertaking that requires re-provisioning databases. A large workload spike on one physical host could result in unacceptable performance for many databases at the same time.

• It can be difficult to guarantee resources to any individual database. One misbehaving database could hog the resources of other, more critical databases.
VMware vSphere offers a much simpler and more efficient alternative. Figure 4 illustrates how some customers choose to have a dedicated database consolidation cluster—similar to what would be done with conventional database consolidation. However, consolidating databases with VMware vSphere delivers several unique benefits over conventional approaches:

1. **Fast consolidation with P2V:** With VMware vSphere, consolidating existing legacy databases is simple. Databases can be migrated with a simple physical-to-virtual (P2V) migration, or re-provisioned in a virtual machine with their existing OS and database configurations. This eliminates the need to re-test and update databases to run on standardized OS and database configurations.

2. **Isolation:** Databases consolidated on VMware vSphere preserve perfect isolation between instances (configuration, fault, security, and resource isolation). Databases can run on their own OS and SQL version, and a single OS failure will only impact a single database. This is an obvious benefit of virtualization, but not possible with conventional database consolidation approaches.

3. **Resource guarantees:** Guarantee and control resources with great precision to ensure that each database delivers its required service levels, with no risk of misbehaving databases taking over critical resources from other databases.

4. **Load balancing:** With VMware vSphere, when a host is running out of capacity, databases can be migrated in real-time and with no downtime to other hosts. This eliminates the need to over-provision, increases consolidation ratios, while maximizing database service levels.

### Software License Consolidation

Consolidation can deliver tremendous cost savings not only on infrastructure, but also on software licenses. Many applications are licensed by physical processor. When processors are utilized only at 5-15 percent of their capacity, the software licenses are also under-utilized at the same levels. For example, this is the case for relatively expensive Microsoft SQL Enterprise licenses (processor licensing), as well as Oracle database licenses.

For customers running a relatively large number of these applications licensed per physical processor, you should consider

![Figure 4. vSphere is Ideal Platform for Database Consolidation](www.getadvanced.net)
creating dedicated vSphere clusters for running those applications. Once all the physical processors have been licensed, you have an “all you can eat” cluster from a licensing standpoint. By consolidating, you significantly increase both infrastructure and license utilization. The example in Figure 5 shows a customer who moved eight individual databases each running on a dedicated host to one shared cluster running eight DB instances. With Enterprise Edition, you only need to license the physical processors—thereby reducing the required licenses from 16 down to 8, and reducing overall costs by more than 70 percent.

“Applications as a Service” In The Private Cloud

Software development and IT operations are two very different entities. While they have a common objective—to deliver high-quality, dynamic IT services in support of business requirements—they operate at opposite ends of that objective.
Developers care mostly about building better business functionality faster, while IT administrators care mostly about ensuring service levels at the lowest possible cost. Modern application architectures (SOA, Web services) and frameworks (e.g., Java, .NET, Rails, Grails) increase development efficiency dramatically, but IT administrators are having an increasingly difficult time running these modern applications on rigid, inflexible IT infrastructure. Some of the challenges frequently encountered by IT administrators include:

- **Provisioning** an increasingly large number of applications, with updates and changes being rolled out faster than ever before

- **Accurate capacity planning** to ensure the performance of a multitude of applications under unpredictable load, without over-provisioning and while keeping costs under control

- **Ensuring application service levels** across distributed, interconnected applications

- **Ensuring application availability** across multiple application tiers and managing multiple app-specific clustering solutions

IT administrators need a better way to build, run and manage applications; they need a platform that is as advanced as the applications being developed. Applications should be provisioned on-demand in the labs and in production, with guaranteed quality of service, and through a self-service interface accessed directly by application teams.

VMware vSphere and VMware vCenter provide the ideal platform to develop and run both legacy and next-generation applications: a full set of capabilities and solutions to streamline the entire “build-run-manage” cycle, bringing down the barriers between development and production. With VMware, application teams and IT administrators are able to accelerate the application life cycle from development to production, and guarantee application quality of service.

**Accelerate The Application Lifecycle**

With VMware, the entire application life cycle can be accelerated and applications can be provisioned on demand, through a self-service interface, by application owners. VMware vSphere and the VMware vCenter Product family enable:

- **Faster, more efficient application development** through self-service developer provisioning of pre-configured development stacks (e.g. LAMP)

- **Streamlined release cycles** by transparently sharing test configurations between development, QA, and production. A production application can be quickly cloned into the labs, or a new app can be automatically promoted through the release cycle

- **On-demand provisioning** of applications in production by creating standard, optimized multitier application configurations (vApps) that can be deployed in a matter of minutes while eliminating manual provisioning and configuration of operating systems and applications

**Faster Development and QA With VMware vCenter Lab Manager**

Modern application frameworks and architectures enable developers to develop new business functionality faster than ever before. Unfortunately, the speed of innovation is all too often hindered by the rigidity of the underlying infrastructure. For example, when starting a new application project, developers often have to request a new development environment. Provisioning this environment is a process that can take days or even weeks, holding back development cycles. Faced with this challenge, many developers turn to third-party cloud service providers as an alternative to the internal infrastructure. Unfortunately, applications developed on third-party cloud environments can be very difficult to migrate back to the internal infrastructure once they are ready for production.

VMware vCenter Lab Manager, part of the VMware vCenter Product Family, provides the ideal platform to support modern development projects. Lab Manager transforms the internal development infrastructure into a dynamic, self-service private cloud. Developers can deploy their own pre-configured, multitier development stacks (e.g. LAMP stack) in a matter of minutes through a self-service interface. They can also capture and share any system configuration with other members of their development team, prototype new applications rapidly, test software releases on a broader range of system configurations and capture, reproduce and resolve defects more easily.

**On-Demand Provisioning With vApp**

Application provisioning can be a cause of major inefficiencies. IT administrators must support the overhead of configuring each application tier, including the hardware, OS and application. At the same time, configuration errors and configuration drift are very common, often leading to application downtime. To make matters worse, provisioning isn’t limited to production environments, but often includes test, development and training systems. Over time, these systems often fall out of sync with production systems, resulting in inaccurate testing and QA cycles.

With VMware vSphere, once an app is ready to be rolled out into production, application teams are able to package the application as a vApp; a golden image of the application that can be provisioned on demand onto the production infrastructure. A vApp is essentially a template of a multitier application. It includes multiple pre-configured virtual machines containing the different application tiers (e.g., Web, app, database). The virtual machines are pre-integrated through network fencing, and the virtual machine boot sequence can be customized.
vApp technology dramatically improves provisioning efficiency. vApps are generated directly by the application teams, ensuring that the copy running in production is the optimal configuration. They can be provisioned on demand in a matter of minutes, eliminating the weeks of lead time typically required to provision a new application. Different instances of the application remain identical, eliminating configuration drift. vApps can be cloned from production into the labs in a single operation, to rapidly create test environments that are an identical copy to production.

“VMware obsoletes many manual processes and lets us be more pro-active and innovative,” says Jay M. Leone, Lab Manager for Avaya, a market leader in voice and data technology for the enterprise. “I can’t think of any other product, process, or project that has had a greater impact in our daily activities. Everything just runs with little interference. We’ve become hugely reliant on VMware to help us test our software better and faster. Ultimately, we’ve found VMware not only offers invaluable tools, but a way of life.”

Guarantee Application Quality Of Service

Ensuring the performance and availability of production applications is a daunting task. Applications are not always developed with scalability, availability and manageability in mind. Yet IT administrators are expected to ensure the business’s required service levels—for every single application and application tier.

VMware enables IT organizations to ensure application quality of service (QoS) through effective performance monitoring, dynamic scalability, and built-in high availability and disaster recovery for all applications. VMware provides a platform that can automatically ensure application availability, performance, and security at the lowest possible cost. VMware vSphere and the VMware vCenter Product Family enable:

- Accurate capacity planning for each virtual machine to ensure service levels without over-provisioning
- Performance monitoring of multilayer applications to quickly pinpoint performance bottlenecks
- Dynamic scalability of applications to ensure service levels under unpredictable or increasing load
- Simple, cost-effective availability for all applications without the complexity of clustering
- Automated disaster recovery for all applications

Case in point

As a power infrastructure manufacturer, Alstom has built the plants that supply around 20 percent of the world’s electrical power—with VMware running in back. “It’s not just about saving money on hardware, but also about simplifying things like application provisioning, maintenance, high availability, and disaster recovery,” says Dirk Holzwarth, Alstom’s virtualization Team Leader. “Thanks to VMware, my wife and kids see me more often.”

Recently, Alstom’s CEO decided he wanted Blackberry up and running within two months. With physical infrastructure this would have taken four months - with VMware, it took only one - and half the staff. The IT team spent a few weeks creating virtual machine templates that met their requirements and then provisioned Blackberry from the templates in a matter of hours onto the VMware platform.

“It is important for us to keep operational costs low. We have standardized on VMware Infrastructure and its comprehensive application management toolset to improve flexibility and maximize operational efficiency,” says Daniel Liyew, Alstom’s Director, Data Centre Service Line.

Now the company’s IT department is moving to VMware vSphere 4 with the expectation of even higher efficiency. “These efficiency gains improve even more with VMware vSphere 4,” continues Liyew, “thanks to features like VMware Host Profiles and VMware vNetwork Distributed Switch. These features will allow us to deploy new hosts more quickly, achieve standardization, and more efficiently manage our virtualized environment to reduce our operational overhead.”

Right-Size Applications With VMware vCenter CapacityIQ

Sizing applications can be a nightmare. Provide too much capacity and your costs go through the roof. Provide too little capacity and break your service levels. With the growing number of applications to manage, it is increasingly difficult to right-size capacity to meet service levels while keeping costs under control.

VMware vCenter CapacityIQ enables IT operations to size both the underlying physical infrastructure as well as the virtual machines running on the infrastructure. It provides historical trending data and identifies under- and over-provisioned virtual machines. For example, IT administrators can identify a virtual machine that is about to run out of capacity before service levels get impacted. CapacityIQ also identifies underutilized or idle virtual machines, allowing IT operations to reclaim unused capacity and minimize costs.
Identify Performance Bottlenecks With VMware vCenter AppSpeed

Even with an optimally sized infrastructure, SLA violations are still a fact of life due to unforeseen workload spikes or performance bottlenecks. Unfortunately, infrastructure teams typically have limited visibility into the source of bottlenecks, and have many unanswered questions such as “What’s the infrastructure impact on service levels?” and “What is the source of performance bottlenecks?” Because of this lack of visibility, when an end-user complains about slow response times, the situation often turns into a “finger-pointing game” between infrastructure and application teams.

VMware vCenter AppSpeed is a performance monitoring product optimized for vSphere and designed to end the “finger-pointing game.” AppSpeed is delivered as a virtual appliance and requires no agents within the virtual machines. It passively listens to network traffic going through the virtual switching infrastructure, and provides the following information to IT administrators:

- Automatically discovers and maps business services to individual apps, virtual machines, and ESX hosts. IT administrators gain deep visibility into how the different business services relate to the underlying infrastructure.
- Monitors end-user service levels including transaction latency, throughput, and error rate.
- Quickly identifies bottlenecks by breaking down the performance of business services to individual applications, virtual machines, and ESX hosts.

Scale Dynamically To Ensure Service Levels

When performance bottlenecks do occur, it is often necessary to scale an application to restore service levels. Unfortunately, when running on dedicated physical servers, re-sizing applications requires re-provisioning on larger physical hosts, which is a time consuming and highly disruptive undertaking. Databases are a good example. Administrators have to forecast capacity requirements years in advance and translate that estimate into system specs, including CPU and memory. If conditions change, the app must be re-provisioned, causing downtime, disruption, and serious unhappiness in the corner offices.

VMware vSphere provides a number of capabilities that enable IT operations to scale applications dynamically:

- **Hot Add** allows IT administrators to increase the capacity of a virtual machine with no downtime. For example, a Microsoft SQL virtual machine could be increased from 2 to 4 virtual CPUs and from 4 to 8GB of memory on the fly. Microsoft Windows 2008 and SQL 2008 can self-tune for the increased capacity, enabling the new SQL instance to handle more load while continuing to meet service levels.

- **VMware Distributed Resource Scheduler (DRS)** enables IT administrators to perform live migrations of virtual machines in a DRS cluster from a small, overutilized host to a larger host with more available capacity.

- **Finally**, if the application can be scaled out (for example in the Web tier) VMware vSphere enables fast provisioning of an additional application instance to handle increased load.
Protect All Applications With Simple And Cost-Effective Availability

Ensuring availability of your applications is difficult. Each application component must be made highly available, and operations teams often struggle with a proliferation of different clustering and availability options. The Web tier is fairly simple to protect using network load balancing, the application tier can be clustered, but databases are typically the most difficult tier to protect. Databases can be protected using Microsoft Clustering, database mirroring, or high-end options such as Oracle RAC. Unfortunately, these solutions are so complex and expensive that only the most critical databases tend to be protected—less than 10 percent of database instances on average. This is clearly a problem as 90 percent of databases are vulnerable to unplanned downtime, potentially impacting important business services.

VMware provides a range of capabilities that extend availability to 100 percent of applications, without the complexity or cost of clustering (see Figure 6).

VMware HA, a feature of VMware vSphere, provides automated application restart in the event of ESX host failure or OS failure within the virtual machine. It is automatically available for any application running on VMware vSphere. VMware HA is simple and does not require OS or app-level clustering. It is also very cost effective because it doesn’t rely on dedicated standby servers, and in many cases allows the use of lower cost OS and application licenses.

VMware vMotion eliminates planned downtime for host maintenance. When maintenance is required on a physical host, for example for a hardware or BIOS update, all applications can be live migrated to another host for the duration of the maintenance.

VMware FT protects any application against host failure with continuous availability, without any data loss or downtime. VMware FT creates virtual machine “pairs” that run in lock step—essentially mirroring the execution state of a virtual machine. To the external world they appear as one instance (one IP address, one application)—but they are fully redundant instances.
Automated Disaster Recovery For All Applications
Disaster Recovery is inherently simpler with VMware. Once an application is virtualized, it is encapsulated in a virtual machine and abstracted from the underlying hardware. Virtual machines are easy to replicate to a failover site, and can be launched on any available ESX host—eliminating the need to have dedicated standby hardware in the failover site.

VMware Site Recovery Manager 4 accelerates recovery and ensures successful recovery by automating the recovery process and eliminating the complexity of managing and testing recovery plans. Site Recovery Manager eliminates complex manual recovery steps and removes the risk and worry from disaster recovery.

Case in point
Campbell Clinic, a 400-person healthcare provider, had already implemented VMware Infrastructure 3 for the consolidation benefits; “We’ve virtualized everything from Exchange to SQL to SharePoint,” says Justin Lauer, Campbell Clinic’s IT Manager, “and in doing so, we’ve been able to nearly halve our total number of boxes.” When vSphere 4 launched, Campbell Clinic migrated its production applications, including most of its business-critical healthcare applications that provide access to patient medical records and surgery-center practice management systems, to the latest platform.

Campbell Clinic is also leveraging VMware vSphere Data Recovery to provide quick, simple, and cost-effective backup and recovery. “For smaller businesses with finite IT resources, simplicity becomes a critical requirement, which is something VMware understands,” says Lauer. “With the new VMware Fault Tolerance in VMware vSphere 4, we can provide zero downtime, with continuous protection against hardware failures. Unlike clustering software, VMware FT did not require application-level customization and my staff was able to configure it with a couple of mouse clicks.

“If our applications go down, our doctors will not be able to access the information they need to treat patients,” adds Lauer. “Our business would effectively shut down. We have enabled VMware Fault Tolerance for these virtual machines, giving us peace of mind that our critical workloads will not experience any service interruption if the hardware fails.”

ISV Support
As the industry standard for virtualization, VMware vSphere has received strong ISV support. Today we have support statements in place from the four largest ISVs: Microsoft, IBM, SAP, and Oracle. In addition, hundreds of smaller ISVs officially support VMware, such as Cerner, Sybase, Tibco, and many others. The list of ISVs with official support for VMware is expanding rapidly with dozens of new ISVs each month.

VMware vSphere is transparent to applications and does not introduce functional changes. Hence, many of our customers choose to run their applications on vSphere even without official support statements from ISVs. In these situations, the vast majority of ISVs still choose to provide the level of support required by customers. Worst case, some ISVs might require that problems be reproduced on physical servers prior to providing support. This is an option that is seldom applied in practice. If in doubt, ask your ISV how many times they have requested “physical re-production,” and how many bugs they found to be related to ESX. For most ISVs, the answer is zero!

Specific ISV Statements
Microsoft Support
Back in August 2008, ESX 3.5 became the industry’s first third-party hypervisor to be validated under Microsoft’s Server Virtualization Validation Program. This means that VMware is now certified and officially supported for Windows and 31 applications, including Exchange 2007, SQL Server 2008, SharePoint 2007, and Dynamics CRM 4.0. Customers running these applications on VMware are guaranteed to receive collaborative support from Microsoft and VMware in the event of problems.

Microsoft has also removed the “vMotion tax.” In the past, licenses could not be moved between hosts more than once every 90 days without incurring a cost penalty, making it very difficult to take advantage of VMware vMotion. Microsoft lifted this restriction, freeing customers to use vMotion with Microsoft applications as frequently as desired without paying a licensing penalty.

Additional Microsoft support documentation can be found at these locations:
- http://support.microsoft.com/?id=897615
- http://support.microsoft.com/?id=956893
- http://windowsservercatalog.com/svvp
- http://support.microsoft.com/?id=957006
Virtualizing Business-Critical Applications

Oracle Support
Although some Oracle marketing documents imply that Oracle does not support VMware, and Oracle sales might tell you that VMware is not supported, we are pleased to clarify that Oracle does have a support statement in place for VMware. Oracle’s Metalink note 249212.1, published on MyOracleSupport, defines Oracle’s policy for supporting applications on VMware. This support policy is very similar to the types of support provided by other ISVs. And just like at other ISVs, Oracle’s known bug repository, Metalink, has not had a single ESX related issue logged in more than three years. Based on our experience with many VMware customers running Oracle in production on VMware, what it comes down to is that Oracle’s support organization will support you when you call.

Here are the facts from Oracle’s statement:

- Oracle will accept Support Requests on VMware for bugs already known to Oracle
- Oracle may accept Support Requests on VMware for bugs that are not seen by Oracle as being caused by virtualization
- Oracle maintains the right to require physical reproduction if they suspect VMware is “at fault” (though rarely enforced)
- Oracle RAC is the only product that is “expressly not supported” on VMware

Conclusion
Business agility depends on IT agility, and VMware vSphere enables IT to deliver. By standardizing on the vSphere internal cloud to virtualize 100 percent of your applications, you can reduce capital and operational costs by 50 percent, while providing a more dynamic platform for applications that streamlines the entire “build-run-manage” application cycle.

While virtualizing business-critical applications presents some unique challenges, the main legacy concerns around virtualization—specifically performance and ISV support—are a thing of the past. Application performance has improved steadily with multiple product generations, and with VMware vSphere, there is practically no application that cannot be virtualized from a performance standpoint. The four largest ISVs—Microsoft, IBM, SAP, and Oracle—have support statements in place for VMware. VMware is also supported by hundreds of smaller ISVs, and gaining support from tens of new ISVs each month.

With VMware vSphere, applications can be delivered as dynamic IT services on the internal cloud. Developer efficiency is increasing dramatically with modern application architectures and frameworks, but IT is having an increasingly difficult time delivering these modern applications on rigid, inflexible IT infrastructure. VMware vSphere and VMware vCenter provide the ideal platform to develop and run both legacy and next-generation applications: a full set of capabilities and solutions to streamline the entire “build-run-manage” cycle, bringing down the barriers between development and production. With VMware, application teams and IT organizations can accelerate the application life cycle from development to production, and guarantee application quality of service.

Now is the time to join the many VMware customers on the next step of your journey to transform your infrastructure into a dynamic internal cloud. Run your business-critical applications, including Exchange, SQL, SAP, and Oracle, on VMware vSphere with breakthrough performance and outstanding reliability. Build a flexible cloud computing infrastructure that can deliver business-critical applications as dynamic, cost-efficient, and reliable IT services.