ecora

Real Help for Migrating
to a Virtual Infrastructure

The Growth of Virtualization—Why Now?

Since the late 1990s, exponential increases in CPU power combined with plummeting hardware prices have lead to an explosion of servers in the modern IT organization. This "one application to one server" philosophy made tremendous sense when it came to managing the deployment of new solutions across the enterprise.

Over time, however, this approach has lead to a proliferation of under-utilized assets (both software and hardware); the sheer quantity of physical servers has contributed to a vast increase in management, complexity, maintenance, and utility costs. In the continuing effort to reduce costs and increase efficiency, the "virtual machine"—a concept dating back to mainframe days—has been quickly gaining popularity. Mainframe veterans may remember the days of IBM's VM operating system. Today, technologies like VMware, Microsoft® Virtual Server, and LPARS dominate the x86 scene.

A Yankee Group Report from January 2007, *SMB Infrastructure Goes Virtual*, asserts, "the initial and obvious benefits of virtualization were server consolidation and higher server utilization. As the products matured, other benefits such as disaster recovery, high availability, easier management and backup, and improved security started to be realized."

Virtualization offers other benefits as well. There is, for example, the savings in physical space allocated to host servers, and the reduction in power consumption as the number of physical servers is reduced. In California, Pacific Gas & Electric announced a rebate program for customers who migrate their physical servers into a virtual environment.

"Virtualization technology is helping our customers realize significant energy and cost savings, while addressing critical data center capacity issues," explained Helen Burt, senior vice president and chief customer officer for PG&E. "By providing financial support, we hope to increase industry adoption of this technology."

In their *2006 Global Server Virtualization Survey*, Yankee Group found that sixty-two percent of respondents already had a virtualization solution in place, or are in the process of migration. Of those having existing virtualized servers, VMware is the clear leader, with 55% of the market.

In spite of the advantages that virtualization provides, challenges remain. The ease and flexibility in creating virtualized servers have helped consolidate where servers are located—greatly reducing the number of physical machines—but have, simultaneously, resulted in an enormous increase in the number of logical servers. And, as the number of servers has grown exponentially, so has the configuration complexity facing IT departments.

Successfully consolidating physical servers into a virtual environment requires careful planning, accurate documentation, intelligent decision-making, and ongoing oversight and management of the changes to your physical and virtual infrastructure. This paper shares five considerations to help ensure that your efforts are a success.

1. Before You Begin: Survey the Existing Landscape

Before you start planning how to redeploy all that recovered hardware and floor space, it's critical to know what your application and server environments really look like.

How many instances of SQL Server are running, and on which machines? What other applications besides the DNS server are running on that Linux box? How many production IIS servers are supporting that CRM deployment? As applications come in and out of service, migrate from version to version, and eventually drop out of use altogether, they often leave behind installed components, or services that support later versions of the application, or even entirely different applications. A perfect example of this is a database that hosts data for multiple applications. Before making wholesale changes to your infrastructure, perform an audit to validate what you do know about and identify those things that you may have forgotten to assess their currency.

"Sometimes, we get a list of servers that need to be migrated. But in too many scenarios, we're just told, 'Hey, I want to virtualize'… If the customer doesn't provide a list of the servers they want to virtualize, you need to look at everything. But, how do you get the 'everything' information if the customer doesn't even know what it is?"

—Jaymes Davis,
Virtualization Practice
Manager at Entisys

Easier said than done, you say? Indeed, if your infrastructure has been poorly documented, you do have a good deal of work ahead of you. You can begin with a physical inventory, then examine each box process by process, application by application…and hope you find everything. But there's no guarantee you won't overlook that critical LDAP service.

Today, there are several solutions, including third-party consultants and compliance software, which can reduce the time this process takes from weeks to just a few hours.

Many consultants rely on software solutions that can identify, precisely, what is in the customer's environment. Once the systems to be virtualized have been identified, these software solutions provide detailed configuration information for each server.

Even if you have kept meticulous records, verifying and re-documenting a system remains critical when an application has been running in the physical environment for some time. With turnover common in most IT departments, it is quite likely that the administrator who installed and configured the application is no longer available. In fact, it's likely that no one knows which settings have been altered, either at the time of installation or over the course of the application's life. If you are forced to re-install, reconfigure, or "tune" the application as it is migrated to a virtual server, having a current "known-good" picture of the application's settings and OS environment is invaluable.

2. Determine What To Virtualize

Once you have assembled a thorough picture of what lives where, you can begin to assemble a list of candidate applications and servers to virtualize. Not all systems are ideal candidates for virtualization.

The best virtualization candidates run applications with low to moderate memory and CPU requirements, as well as low to moderate transaction throughput. Running multiple applications with high memory and CPU requirements on a single VM can result in resource contention, leading to poor performance. High transaction volume applications, like real-time data logging applications, may be difficult to tune on a system that hosts numerous VMs. Try to take a snapshot of each system's resource utilization, both at rest and under load, to determine minimum and maximum resource utilization.

Applications which require a great deal of I/O, like databases, may also be poor choices for virtualization. Because a virtualized environment is so dynamic, an I/O-intensive application that is constantly hitting the disk is likely to suffer performance degradation if it shares a cluster with other applications that regularly access that disk.

With distributed applications, it may make sense to virtualize only a few of its components. For instance, if a SQL server needs to communicate with a web server, you must assess the relative advantages and disadvantages of virtualizing both rather than just one or the other. Depending on the relative load of all the components, you can still benefit from a partial migration.

Another important consideration is the operating system that hosts the application. While most modern x86 operating systems work well in virtualized environments, some versions of Linux and other *nix operating systems may require upgrades or patches. In addition, if you are using one of the various flavors of Vista in your data center, be aware of Microsoft's position on virtualization and Vista. It is currently against Microsoft's license agreement to use Vista's "home" versions in a virtualized environment.

And one last thing to consider. While the concept of virtualization has matured rapidly, there are still applications—from vendors that include Microsoft—which are not supported when deployed in a virtualized environment. Check with your application vendors to ensure that you won't encounter support roadblocks if and when a problem arises.

"Ecora's Auditor software is key to our assessment process. It allows us to quickly—and without the use of agents—evaluate the customer's environment and confirm the best candidates for virtualization."

—Jaymes Davis
Entisys

Ecora Auditor can collect and report on all those not-so-obvious environment and configuration settings that are frequently overlooked. Having this information available makes it easy to compare and verify the application's state in the new virtual machine once migration has taken place.

3. Consolidate Applications and Services

Once you've identified the servers and applications to virtualize, look for ways to consolidate potentially redundant services and applications. Having four instances of SQL server, all running at 10% utilization, is a waste of SQL licenses.

VMware offers VMware Capacity Planner, a hosted IT capacity analysis and planning tool that enables the delivery of accelerated, more accurate and benchmarked capacity planning and server consolidation assessments. Solutions like this are useful, but you should apply your own "rule-of-thumb" assessment. You'll get more predictable results if you establish your own baseline for the systems you want to consolidate than if you apply generic standards. Once you establish your baseline, software solutions exist that can identify current settings and generate reports that reveal systems that don't meet your configuration "gold standard."

Memory Structures

System Global Area (SGA)

The System Global Area (SGA) memory structure is generally the largest single memory structure in Oracle. The SGA is divided into four parts; Fixed Memory, Variable Memory, Database Block Buffers, and Redo Buffers.

- The **Fixed Size is 453492** bytes.
- The **Variable Size is 109051904** bytes.
- The amount of memory allocated for **Database Buffers is 25165824** bytes.
- The amount of memory allocated for **Redo Buffers is 667648** bytes.a

Memory is allocated to the Database Buffer cache using the following formula (DB_BLOCK_BUFFERS * DB_BLOCK_SIZE)

- **DB_BLOCK_BUFFERS=0 buffers**.
- **DB_BLOCK_SIZE=8192 bytes**.

The initialization parameter **LOCK_SGA** is set to **FALSE**. The SGA **will not** be locked in memory.

Program Global Area (PGA)

The Program Global Area memory requirements change based on user demand. The following represent baseline values. These values should be checked regularly as part of the normal DBA operation.

Instance **test1** has used **48433500** bytes, with a maximum "highwater" mark of **49342468** bytes.

User Global Area (UGA)

The USer Global Area memory requirements change over time based on user demand. These values should be checked regularly as part of the normal DBA operation. The following represent base line values.

Instance **test1** has used **1381768** bytes, with a maximum "highwater" mark of **1643624** bytes.

The **Sort Area Size** is set to **524288** and Oracle will retain **0** for future sorts per session.

Ecora Auditor can identify memory allocation and usage for existing platforms, like this instance of an Oracle database, to ensure data used for capacity planning is based on accurate information.

Your environment may also have redundant applications that can be eliminated altogether. By way of example, consider the following scenario.

If you were to run VMware's Performance Analysis tool, you might discover a cluster of Windows 2003 servers. However, Performance Analysis might not inform you that these servers are being used as Windows 2003 domain controllers. Yet if you did know they were domain controllers, you would know that you must determine their purpose prior to migrating Active Directory. Why are there multiple domain controllers? Are they being used to get access closer to certain groups of employees? Have they been deployed to fill out Global Catalog Services or change different PiSMA roles or something similar? Obviously, you must have the answers to such questions to determine the impact on your virtualized environment.

"One of the things Ecora allows us to do is put best practices and methodologies in place that we can scan against logically. We give customers the same result as the VMware Capacity Planner and the same normalizing of data, without the need to provide external access to their environment."

—Jaymes Davis,
Virtualization Practice Manager at Entisys

1.1.1 Domain Controllers

Domain controllers provide Active Directory directory services to network users and computers. They store directory data and manage user-domain interactions, including logon processes, authentication, and directory searches.

Table 1.3 Domain Controllers

Name	DNS Name	Operating System	Version	Service Pack	Created	Modified
TESTSRVDC	TESTSRVDC.SampleOrg.com	Windows 2000 Server	5.0 (2195)	Service Pack 3	01/22/2005 2:09:20 AM	07/16/2006 10:17:42 AM

Ecora's Auditor Professional provides important insight like identifying domain controllers used in Active Directory installations.

4. Size Your Host Environment (Capacity Planning)

The final step in planning your virtualization efforts is to analyze all the data you've acquired so that you can design a virtual environment that provides the greatest possible benefit. This last step—capacity planning—is where the proverbial rubber meets the road.

VMware states that a single ESX server can host up to 128 running virtual machines, and typically supports about ten running virtual machines per host processor. However, many capacity planners prefer a consolidation ratio of eight virtual machines per processor. In addition to processor speed, the amount of RAM is a major consideration in determining the number of servers to consolidate. For example, with 16 GB of RAM, a 16:1 consolidation ratio still falls within the 1 GB-per-VM rule of thumb that most virtualized environments follow.

When establishing your capacity plan, it's best to be conservative about storage as well. While aggressive shops may establish as many as sixteen physical ESX servers per storage area network (SAN) array, it is far safer and wiser to remain within a maximum ratio of eight physical ESX servers per SAN.

At this point in your process, you may want to bring in a consultant to check your work and offer advice, as a bit of additional insurance. As mentioned earlier, tools like Capacity Planner provide suggestions. But you can't beat the security of a tailored solution!

Now that you have your plan, all that remains is to install and migrate!

5. Time for Paperwork: Make Sure Your Migration is Properly Configured

The migration of data from the physical server to the virtual machine is complete, but your project is by no means finished. It is vital to run a comparison between the configuration settings as they were in the physical environment and the present settings of the virtual machines; doing so lets you immediately identify and correct unanticipated differences.

Once you complete this careful comparison, audit and document your new environment to support both future capacity planning exercises and disaster recovery planning. Use your new virtual environment as the opportunity to establish a solid documentation practice. And, because you now have a new baseline configuration, you can establish a regimen of regular evaluations that will identify both configuration drift and unplanned changes. By combining a healthy change management process with solid documentation and evaluation procedures, your new virtual environment will demonstrate greater operational efficiency and improved service levels to you and your customers.

"As a system administrator, you don't want to get called at 2:00 A.M. Not being greedy [by overextending VM capacity] is what keeps us from having problems."

—*Tom Becchetti,*
Senior Capacity Planner
"Capacity planner limits VMware consolidation ratio," Alex Barrett, SearchServerVirtualization.com, March 19, 2007

Summary

The availability of affordable, robust virtualization solutions for the x86 platform has brought this technology to the forefront in recent years. Virtualization brings so many benefits—server consolidation, higher server utilization, disaster recovery, high availability, easier management and backup, and improved security—that it will continue to drive both the development and adoption of virtualization technology. This, in turn, increases savings in physical space and reduces power consumption.

Despite the tremendous benefits of virtualization, there are still challenges. The ease and flexibility in creating virtualized servers has been effective in consolidating servers, but it has also resulted in a huge surge in the quantity of virtual servers in use. As that number rapidly rises, so does configuration complexity.

Successfully consolidating physical servers into a virtual environment requires meticulous planning, accurate documentation, intelligent decision-making, and careful management of the changes in your physical and virtual infrastructure.

Enterprise organizations looking to capitalize on the virtualization trend should invest in an automated solution that collects enterprise-wide configuration data and generates the detailed reports required for effective capacity planning. They should make this investment prior to beginning the complex migration process. Any such solution should also provide easily accessible, enterprise-wide visibility into the ongoing configuration changes required in both the physical and virtual environment.

About Entisys Solutions, Inc.

About Ecora Software

ecora