

Licensing Microsoft Windows Server 2008 to Run with Virtualization Technologies

VMware's ESX Server, VMware's VMotion, Microsoft's System Center Virtualization Machine Manager, and Parallels' Virtuozzo

January 2009

Corporate Academic ♦ Open License ♦ Open License Value ♦ Select License ♦ Academic Select ♦ Enterprise Agreement

Summary

This document discusses how Microsoft® Windows Server® 2008 is licensed when used with virtualization technologies like VMware ESX Server, VMware VMotion, Microsoft System Center Virtual Machine Manager, or Parallels Virtuozzo.

Highlighted in the gray text boxes throughout the document are excerpts from the January 2009 Product Use Rights (PUR) and other relevant pieces of information. The Product Use Rights describes the use terms for all Microsoft products in Volume Licensing. For the latest complete version of the Product Use Rights, please visit <http://www.microsoftvolumelicensing.com/userights/PUR.aspx>.

In the following pages, we will discuss:

- Without Hyper-V™ versions of Windows Server 2008
- Assignment of licenses
- Storing instances
- Operating system environment
- Licensing of running instances of the software
- Licensing for peak capacity
- Running prior versions or other editions
- Virtualization rights for Windows Server 2008 Standard, Enterprise, and Datacenter and Windows Server for Itanium Based Systems
- Client Access Licenses (CALs) and External Connectors
- Clustering, Failing over, and Moving instances
- Licensing for VMware's ESX Server
- Licensing for VMware's VMotion and the Microsoft System Center Virtual Machine Manager
- Licensing for Parallels' Virtuozzo
- Comparing ESX Server, Virtuozzo, and Microsoft Virtual Server
- Determining which edition of Windows Server is most cost effective
- Additional resources

What's New in this Brief

- This brief replaces a previous version published in October 2007.
- Significant changes in this new version include:
 - Title and content updated for new version of Windows Server (formerly Windows Server 2003 R2)
 - Changes in External Connector reassignment policy
 - Changes to license reassignment policy
 - Changes to CAL requirements for accessing Windows Server 2008 in virtualized environments
 - References to the new server software license mobility rule described in the [Application Server License Mobility](#) Volume Licensing brief

Introduction

With the growing prevalence of virtualization technologies, many customers ask how they should license Windows Server products with these technologies. Before delving into licensing details and examples, however, it is useful to review some basic licensing concepts to understand how they apply in virtualized scenarios.

Without Hyper-V versions of Windows Server 2008

This brief describes the use rights for Windows Server 2008 products that include Hyper-V. The use rights for Windows Server 2008 products without Hyper-V are the same as their counterpart products with Hyper-V (Standard, Enterprise, and Datacenter).

Types of Licensing Models

Windows Server products can be licensed in one of two ways: Server/CAL or Processor/CAL.

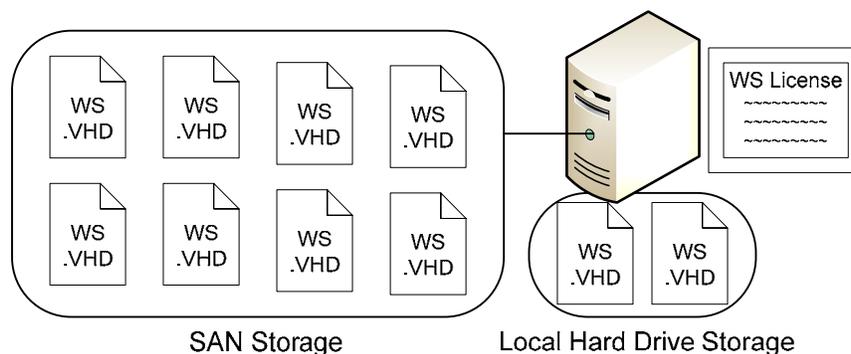
Assignment of Licenses

To run an instance of Windows Server software on your server, you must first assign a license to the server. By assigning a license to the server, you designate that server for use of the software and may run the software on that server. The number of instances you may run under one license depends on the Windows Server product you license. For Windows Server software, you can reassign server software licenses from one server to another, but not more often than every 90 days. There are some exceptions to this rule outlined in the Product Use Rights document. For example, you may reassign the license earlier than 90 days if you must retire the licensed server due to permanent hardware failure. Similar rules apply to Windows Server 2008 External Connector (EC) licenses. However, for Windows Server 2008 ECs, under certain conditions, there is a rule for license mobility within a server farm. For the server farm definition and more information about license mobility rules, including a comprehensive list of eligible server and EC licenses, please read the [Application Server License Mobility](#) Volume Licensing brief.

Storing Instances

If a server is licensed, then *stored or non-running* instances of Windows Server and other Microsoft servers do not require separate licenses. The use rights permit you to store any number of instances under each license. You can also store instances on a large storage area network (SAN) or store instances on your servers without needing additional licenses for each instance.

Figure 1.



In Figure 1, the physical server has one Windows Server license assigned to it, so the 10 stored instances across the SAN and server's hard drive do not require additional licenses.

Creating and Storing Instances on Your Servers or Storage Media. You have the additional rights below for each software license you acquire.

1. You may create any number of instances of the server software and additional software.
2. You may store instances of the server software and additional software on any of your servers or storage media.
3. You may create and store instances of the server software and additional software solely to exercise your right to run instances of the server software under any of your software licenses as described above (for example, you may not distribute instances to third parties).

Operating System Environment

To understand how licensing works under virtualization, it is critical to understand the definition of an operating system environment (OSE).

An “operating system environment” is:

- i. all or part of an operating system instance, or all or part of a virtual (or otherwise emulated) operating system instance which enables separate machine identity (primary computer name or similar unique identifier) or separate administrative rights, and
- ii. instances of applications, if any, configured to run on the operating system instance or parts identified above.

There are two types of operating system environments, physical and virtual. A physical operating system environment is configured to run directly on a physical hardware system. The operating system instance used to run hardware virtualization software (for example, Microsoft Virtual Server or similar technologies) or to provide hardware virtualization services (for example, Microsoft virtualization technology or similar technologies) is considered part of the physical operating system environment. A virtual operating system environment is configured to run on a virtual (or otherwise emulated) hardware system. A physical hardware system can have either or both of the following:

- i. one physical operating system environment
- ii. one or more virtual operating system environments

OSEs that include all or part of an operating system instance require separate licenses. Likewise, OSEs that include all or part of a virtual instance and enable separate machine identity or separate administrative rights require separate licenses.

Licensing of Running Instances of the Software

By assigning a license to a physical server, you have the right to run as many instances on that server as the software license allows. For example, Windows Server 2008 Standard permits two running instances at a time (one instance running in a physical OSE and one instance running in a virtual OSE). Windows Server 2008 Enterprise licenses permit up to five at a time (one instance running in a physical OSE and four instances running in virtual OSEs). If you choose to run all the permitted instances at a time (two under Windows Server 2008 Standard and five under Windows Server 2008 Enterprise license), the instance of the software running in the physical OSE may only be used to run hardware virtualization software, provide hardware virtualization services, or to run software to manage and service OSEs on the licensed server. However, instances of Windows Server 2008 Datacenter that run in physical OSEs do not have this limitation.

As described earlier, you may store any number of non-running instances of server software on a server or in a library. You may run these instances only on any server that is licensed. If you need to run more instances on the server than the license permits, you may assign additional licenses to the same server. By assigning several licenses to a server, you may run as many instances of the server software simultaneously as the assigned licenses combined allow.

As an example, suppose you have five licenses for Windows Server 2008 Standard assigned to a server. You may run one instance of Windows Server 2008 Standard in the physical OSE and up to five instances of Windows Server 2008 Standard in virtual OSEs on the server at the same time. The running instances could be retrieved from storage from the same or different servers or stored media.

Instance. You create an “instance” of software by executing the software’s setup or install procedure. You also create an instance of software by duplicating an existing instance. References to software include “instances” of the software.

Run an Instance. You “run an instance” of software by loading it into memory and executing one or more of its instructions. Once running, an instance is considered to be running (whether or not its instructions continue to execute) until it is removed from memory.

Licensing for Peak Capacity

Because a server must have assigned licenses equal to or exceeding the number of running instances, you need to consider what the peak capacity for the server will be. Even if you typically only need one running instance, you must license for the peak capacity if you occasionally need a second running instance at the same time.

For example, if you have one Windows Server 2008 Standard license assigned to a server, you may run one instance of Windows Server 2008 Standard in the physical OSE and one instance of Windows Server 2008 Standard in a virtual OSE on the server at the same time. You may not run a second instance of the software in another virtual OSE on the server. If you need to run a second instance in a virtual OSE periodically, then you must assign a second license to the server.

The following outlines the maximum number of running instances in virtual OSEs each Windows Server 2008 edition permits:

Product	Maximum permitted running instances in a virtual OSE per license
Windows Server 2008 Standard	One
Windows Server 2008 Enterprise	Four
Windows Server 2008 Datacenter	Unlimited
Windows Server 2008 for Itanium Based Systems	Unlimited
Windows Web Server 2008	One*

*Windows Web Server 2008 permits you to run an instance in either one physical OSE or one virtual OSE, but not both at the same time without additional licenses. From a licensing perspective, you need a license for each instance running at the same time whether in a physical or virtual OSE.

Running prior versions or other editions

In place of the licensed version, you may run prior versions or lower editions in any of the OSEs of the licensed server. For example, if you have a server licensed for Windows Server 2008 Enterprise, you may run instances of Windows Server 2008 Standard or Windows Server 2003 R2 Enterprise Edition or Windows Server 2003 R2

Standard Edition in any of the allowed five instances on the server. As an extension of the above rights, you may also run prior versions of lower editions. You may not run more instances on the server than your licenses allow.

Virtualization Rights for Windows Server 2008 Standard, Enterprise, Datacenter and Windows Server 2008 for Itanium Based Systems

The number of instances of Windows Server 2008 that may be run simultaneously on a server varies by edition of Windows Server. Please also see the Product Use Rights for details.

- **Windows Server 2008 Standard:** Assigning a single license of Windows Server 2008 Standard to a server permits you to run one instance of the software in one physical and one virtual OSE on that server. If you run both the permitted instances at the same time, the instance of the server software running in the physical OSE may only be used to run hardware virtualization software, provide hardware virtualization services or to run software to manage and service the OSEs on the server. To run more than two instances of Windows Server 2008 Standard on a server, you need to assign a Windows Server 2008 Standard license for each additional running instance in a virtual OSE, or, alternatively, assign a higher-level edition that permits more than one running instance in the virtual OSE at a time (for example, Enterprise or Datacenter). You are permitted to assign as many licenses as needed to one server to license the number of running instances you require. You may run instances of prior versions of the server software instead of Windows Server 2008 Standard in any of the OSEs on the licensed server.

You need a license for each instance running at the same time whether in a physical or virtual OSE.

- **Windows Server 2008 Enterprise:** A Windows Server 2008 Enterprise license grants the right to run Windows Server 2008 Enterprise on one server in one physical OSE and up to four simultaneous virtual OSEs. If you run all five permitted instances at the same time, the instance of the server software running in the physical OSE may only be used to run hardware virtualization software, provide hardware virtualization services or to run software to manage and service the OSEs on the server. You may run instances of the Standard or prior versions in place of Windows Server 2008 Enterprise in any of the OSEs on the licensed server.
- **Windows Server 2008 Datacenter:** When Windows Server 2008 Datacenter is licensed for every physical processor in a server, the server may run the server software in the physical OSE and an unlimited number of virtual OSEs on the licensed server. You may run instances of Windows Server 2008 Standard or Windows Server 2008 Enterprise in place of any Windows Server 2008 Datacenter in any of the OSEs on the licensed server. Unlike with Standard and Enterprise, with Windows Server 2008 Datacenter, the instance of the server software running in the physical OSE may be used to run **any** software or application you have licensed. Because Windows Server 2008 Datacenter permits an unlimited number of simultaneous running instances on a licensed server, you have the flexibility to run instances of Windows Server in virtual OSEs without having to track the number of instances running or worry about being under-licensed.
- **Windows Server 2008 for Itanium Based Systems:** The virtualization rights for Windows Server 2008 for Itanium Based Systems are the same as those of Windows Server 2008 Datacenter. You may run any edition or prior version of Windows Server software for Itanium platforms instead of Windows Server 2008 for Itanium Based Systems in any of the OSEs on the licensed server.

For Windows Server 2008 Datacenter Edition and Windows Server 2008 Datacenter without Hyper-V and Windows Server 2008 For Itanium-Based Systems:

Running Instances of the Server Software.

- For each server to which you have assigned the required number of software licenses, you may run on the licensed server, at any one time:
 - One instance of the server software in the physical OSE, and
 - Any number of instances of the server software in virtual OSEs (only one instance per virtual OSE).
- However, the total number of physical processors used by those OSEs cannot exceed the number of software licenses assigned to that server.

- The software or your hardware may limit the number of instances of the server software that can run in physical or virtual operating system environments on the server.

For Windows Server 2008 Standard and Windows Server 2008 Standard without Hyper-V:

Running Instances of the Server Software. For each license you assign:

- You may run on the licensed server, at any one time:
 - one instance of the server software in one physical operating system environment, and
 - one instance of the server software in one virtual operating system environment.
- If you run an instance in the virtual operating system environment, the instance of the server software running in the physical operating system environment may be used only to:
 - run hardware virtualization software
 - provide hardware virtualization services
 - run software to manage and service operating system environments on the licensed server.

For Windows Server 2008 Enterprise and Windows Server 2008 Enterprise without Hyper-V:

Running Instances of the Server Software. For each license you assign:

- You may run on the licensed server, at any one time:
 - one instance of the server software in one physical operating system environment, and
 - up to four instances of the server software in virtual operating system environments (only one instance per virtual operating system environment).
- You may run on the licensed server an instance of Standard in place of Enterprise in any of the operating system environments.
- If you run all five permitted instances at the same time, the instance of the server software running in the physical operating system environment may be used only to
 - run hardware virtualization software
 - provide hardware virtualization services
 - run software to manage and service operating system environments on the licensed server.

Client Access Licenses and External Connectors

Most Microsoft servers require Client Access Licenses (CALs) and have an optional external connector (EC). The CAL and EC requirements are the same whether an instance is running in a physical or virtual OSE. CALs are required for each device or user that accesses an instance of server software directly or indirectly.

You do not need CALs for up to two devices or users to access your instances as long as these users or devices are only administering the instances. In the case of Windows Server 2008 only, you do not need a CAL to access an instance of the server software running on the physical OSE that is being used solely to:

- I. run hardware virtualization software,
- II. provide hardware virtualization services, or,
- III. run software to manage and service operating system environments on the licensed server.

However, you do need the appropriate CAL to access instances of the server software in any virtual OSEs on the server.

In addition, Windows Server 2008 does not require CALs or ECs for any user or device that accesses your software instances only through the Internet without being authenticated or otherwise individually identified through any means.

Users and devices licensed with a CAL can access any instances (physical and virtual) running on any physical server. Outside of the exceptions above, each physical server that requires external user access must have an EC assigned to it. Each EC permits external users to access any instance running on a server whether it be in a physical or virtual OSE. You do not need additional ECs for each virtual instance on a physical server.

In general, you may reassign an EC license, but not on a short-term basis. However, you may reassign an EC license sooner if you retire the server to which it was assigned due to permanent hardware failure. In addition, there is a rule that permits greater EC license mobility, under certain conditions, within a server farm. For the server farm definition and more information about the server software license mobility rule, including a list of eligible server and EC licenses, please read the [Application Server License Mobility](#) Volume Licensing brief.

Multiplexing hardware, software, or connections does not reduce the number of CALs required to access servers.

Multiplexing. Hardware or software you use to:

- Pool connections,
- Reroute information,
- Reduce the number of devices or users that directly access or use the product, or
- Reduce the number of devices or users the product directly manages

(sometimes referred to as “multiplexing” or “pooling”)—does not reduce the number of licenses of any type that you need.

Clustering, Failing Over, and Moving Instances

Two common scenarios for higher availability and dynamic datacenters involve:

- Running the same workload simultaneously on two servers, or
- Running a workload on a primary server and periodically moving it to a second server due to a failure, load balancing, patching, or planned downtime.

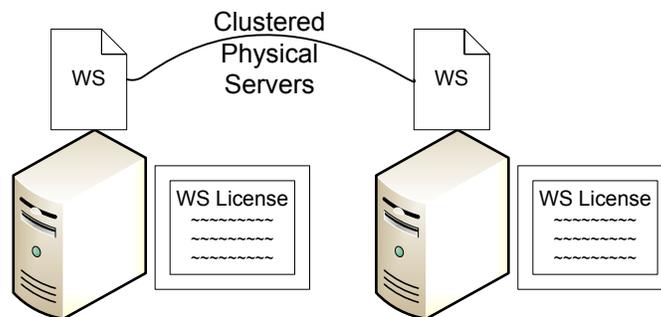
In both scenarios, regardless of whether the workloads are running in physical or virtual OSEs, each server must have the appropriate number of licenses assigned to it prior to the workload running on it. This holds true regardless of whether you plan the workload to:

- Always run on a single server.
- Run in parallel on the server as a backup when the primary server fails.
- Run the workload if the primary server is down.
- Load balance when the primary server has high use.
- Only run the workload during maintenance.

Please see the previous section, “License for Peak Capacity.”

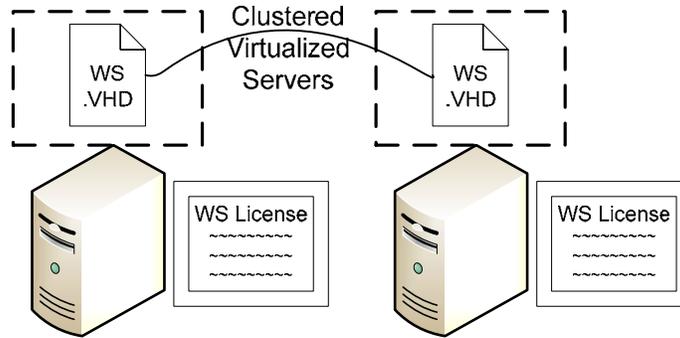
Figures 2A, 2B, and 2C demonstrate three examples of usage scenarios that are properly licensed.

Figure 2A.



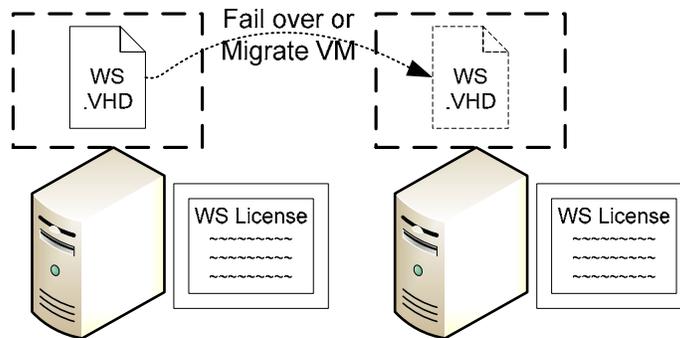
Example: The servers are clustered, each licensed with Windows Server and both running the same workload in parallel.

Figure 2B.



Example: The servers are clustered, each licensed with Windows Server and both running the same virtualized workload in parallel.

Figure 2C.



Example: Both servers are licensed with Windows Server. The workload is moved from the first server to the second server.

Windows Server Licensing on top of VMware's ESX

If a server is running ESX as the virtualization technology, then Windows Server is not deployed as a host operating system in the physical OSE. However, a license is required for every instance running in a virtual OSE.

If you have assigned a single license for Windows Server 2008 Standard to a server running ESX, then you may run one instance of Windows Server 2008 Standard at a time. The right to run an instance of Windows Server 2008 in the physical OSE cannot be used in this case since ESX runs on the physical OSE (and as a result, Windows Server 2008 cannot be deployed as the operating system on the physical OSE.)

If you have assigned a single license of Windows Server 2008 Enterprise to the server running ESX, then you may run up to four instances at a time of Windows Server 2008 Enterprise. You may not run a fifth instance under the same license since that right requires that the fifth instance be running hardware virtualization software and software managing and servicing the OSEs on the server.

Licensing for VMware's VMotion and the Microsoft System Center Virtual Machine Manager

The same licensing rules apply to Windows Server Clustering Services as VMotion and System Center Virtual Machine Manager. While VMotion and System Center Virtual Machine Manager move instances of virtual OSEs between physical servers, the licenses remain with the physical server to which they were assigned. When an instance is moved to a new physical server, that new server must already have appropriate licenses assigned to it (see "Clustering, Failing Over, and Moving Instances" above). Since Windows Server 2008 Datacenter permits an unlimited number of instances of the server software to run in virtual OSEs, in multi-server installations with VMotion, and System Center Virtual Machine Manager, it offers the greatest flexibility to move instances between servers without having to track the number of instances running or worry about being under licensed.

For Windows Server software, except in a few cases (see "Assignment of Licenses" above), licenses may only be reassigned to new hardware after 90 days. This, however, does not restrict the dynamic movement of virtual OSEs between licensed servers. As long as the servers are licensed and do not simultaneously run more instances than the number for which they are licensed, you are free to use VMotion and System Center Virtual Machine Manager to move virtualized instances between licensed servers at will.

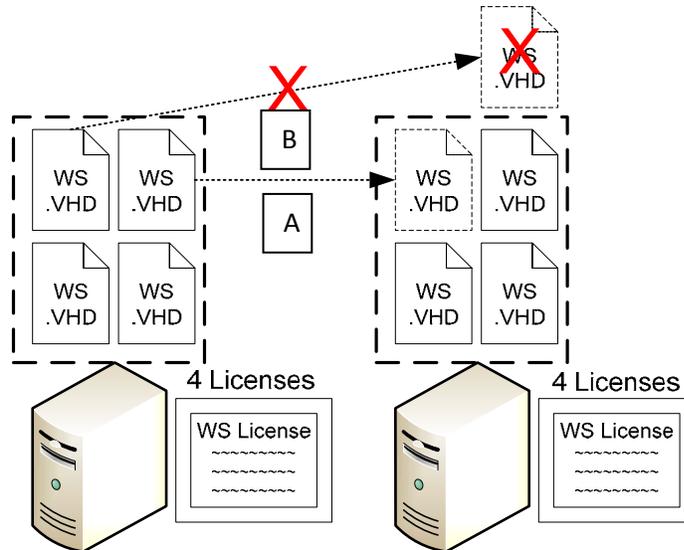
Reassignment of license:

For Windows Server software: You may reassign a software license, but not on a short-term basis (in other words, not within 90 days of the last assignment). You may reassign a software license sooner if you retire the licensed server due to permanent hardware failure. If you reassign a license, the server to which you reassign the license becomes the new licensed server for that license.

Server Repartitioning (Windows Server 2008 Datacenter and Windows Server 2008 for Itanium Based Systems). You may reassign licenses sooner than permitted above, when you:

- Reallocate processors from one licensed hardware partition to another,
- Create two or more partitions from one licensed hardware partition,
- Create one partition from two or more licensed hardware partitions as long as (i) prior to repartitioning, each hardware partition is fully licensed, and (ii) the total number of licenses and processors remains the same.

Figure 3.

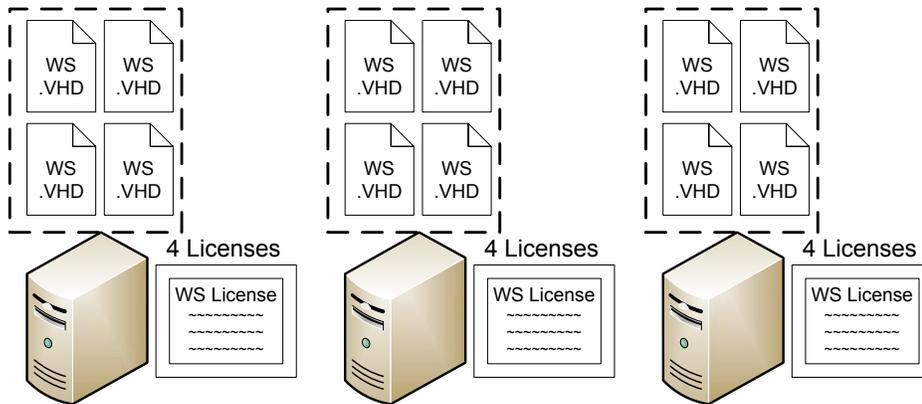


Example: As shown in Figure 3, if each server has four licenses for Windows Server 2008 Standard, and the second server is already running three instances of Windows Server 2008 Standard in virtual OSEs, then VMotion or System Center Virtual Machine Manager (Windows Server Clustering Services, scripting, or manual administration) may move one (Example A above) instance of Windows Server 2008 Standard from the first server to the second server. But the user may not move a second instance (Example B above), because moving the second instance would cause the second server to become under licensed; it would have five running instances but only the rights to run four at one time.

The following scenarios demonstrate how to license three dual-processor servers properly for use with VMotion and System Center Virtual Machine Manager to move instances among the three servers. The first scenario (Figure 4A) shows the “standard” running state of the three servers where the three servers are each licensed with four licenses of Windows Server 2008 Standard. They are running four instances of Windows Server 2008 Standard in virtual OSEs.

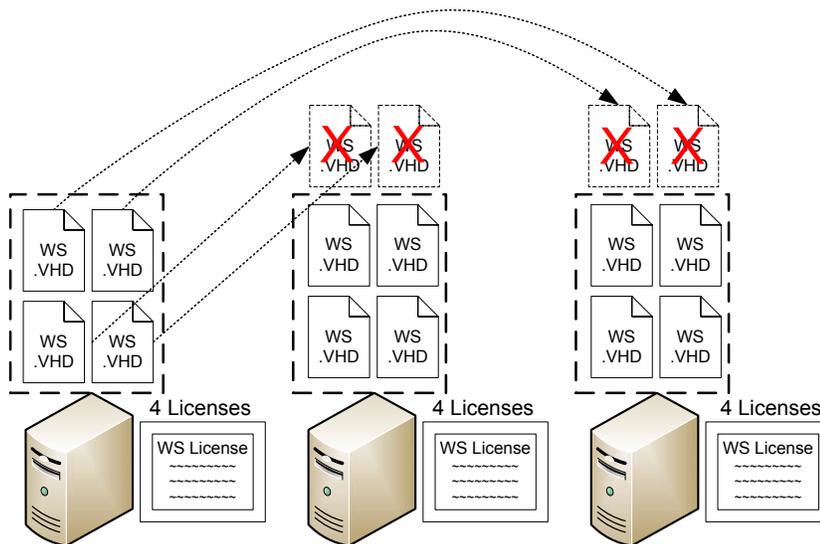
The second, third, and fourth scenarios (Figures 4B, 4C, and 4D) show the result of VMotion or System Center Virtual Machine Manager’s movement of two of the instances from the first server to the second server and the remaining two instances to the third server. In the second scenario (Figure 4B), the second and third servers are under-licensed. The third and fourth scenarios (Figures 4C and 4D) show two options to license the migration of instances of Windows Server properly.

Figure 4A.



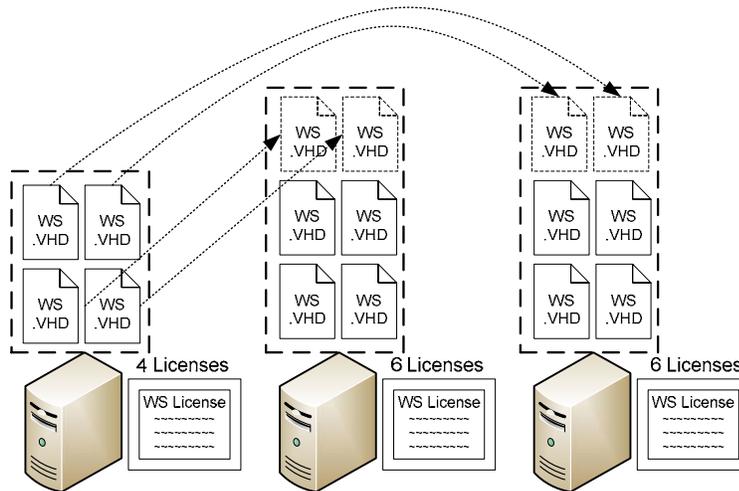
The three servers are properly licensed to run four instances of Windows Server, because they are each licensed with four licenses of Windows Server 2008 Standard.

Figure 4B.



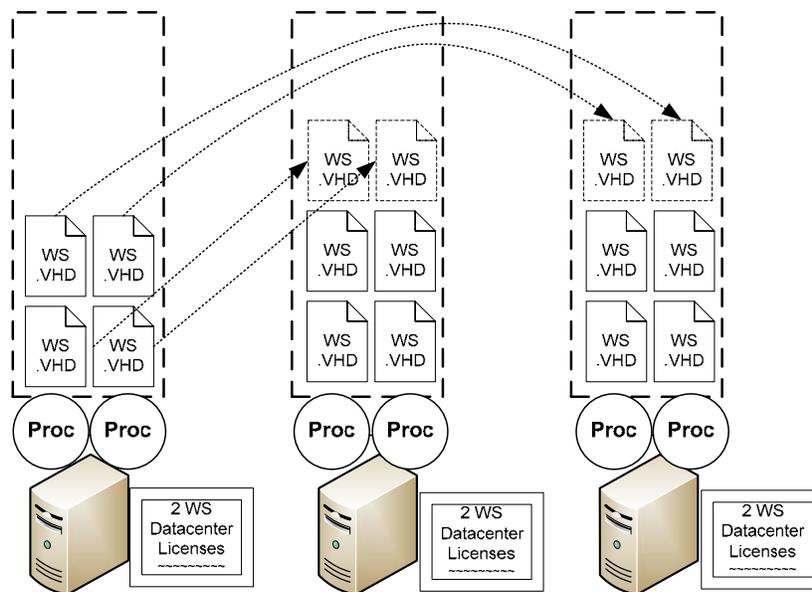
The instances of Windows Server running in a virtual OSE may not be moved from the first server to the second or third server, because the second and third servers are each licensed with four instances of Windows Server 2008 Standard and are already running four instances of Windows Server 2008 Standard before the attempted migration begins.

Figure 4C.



Two of the instances of Windows Server 2008 Standard may be moved from the first server to the second and the remaining two instances may be moved from the first to third server, because the second and third servers each have six licenses of Windows Server 2008 Standard and were only running four instances of Windows Server 2008 Standard prior to the migration.

Figure 4D.



Instead of licensing the servers with enough Windows Server 2008 Standard licenses to meet the largest number of simultaneously running instances of Windows Server, the processors in the servers could be licensed with Windows Server 2008 Datacenter. This would allow an unlimited number of instances of Windows Server to run simultaneously in virtual OSEs. Because the servers have two processors, two Windows Server 2008 Datacenter licenses would be

Microsoft | Volume Licensing

required for each server. Windows Server 2008 Datacenter licensing provides the flexibility to move instances of Windows Server without concern about maintaining license compliance.

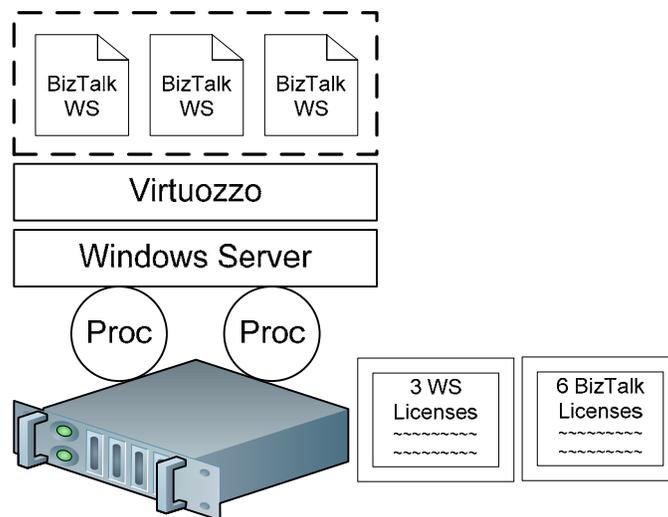
Licensing for Parallels' Virtuozzo

On a single physical server, Parallels' Virtuozzo software creates running instances of Windows Server in virtual OSEs that run on top of Windows Server. These running instances—also referred to as a “silo,” “isolated partition,” or “VE” (Virtualized Environment)—act as the host operating system. They share the same kernel of the host Windows Server operating system, but have isolated registry settings, operating system libraries, operating system processes, and application software. These virtual OSEs also enable separate machine identity or administration rights.

As with other virtualization technologies, each physical and virtual running instance of Windows Server requires a Windows Server license. However, because every instance shares the same kernel as the host operating system, Virtuozzo is technically unable to run more than one edition of Windows Server on the physical server. As a result, you must choose a single edition when using Virtuozzo for both physical and virtual OSEs.

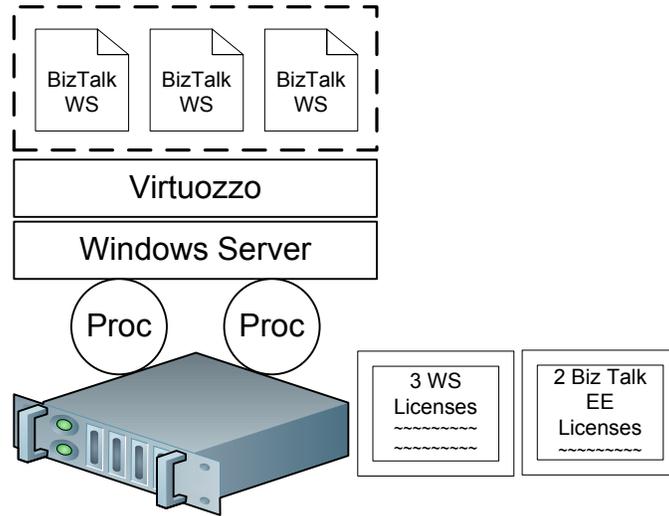
Furthermore, all instances are exposed to all physical processors in the server. For example, the instances on a two-processor server would each have two virtual processors, and the instances on a four-processor server would each have four virtual processors. This distinction is important for Microsoft server applications that are licensed on a “per processor” licensing model, such as Microsoft SQL Server® 2008 and Microsoft BizTalk® Server 2006. Finally, it is important to note that some Products Use Rights permit you to run different editions in different OSEs on the licensed server. Because Virtuozzo instances share the same kernel, you cannot take advantage of this right.

Figure 5.



Example: As shown in Figure 5, a two-processor server with three running instances of BizTalk Server in virtual OSEs must have six processor licenses for BizTalk Server. Three Windows Server 2008 Standard licenses are required since the server is running three instances of Windows Server 2008 Standard in the virtual OSEs and one instance in the physical OSE.

Figure 6.



Example: As shown in Figure 6, a two-processor server with three instances of BizTalk Server 2006 Enterprise Edition running in virtual OSEs only needs two processor licenses of BizTalk Server Enterprise Edition due to the unlimited virtualization rights of BizTalk Server Enterprise Edition when the physical processors are licensed. Three Windows Server 2008 Standard licenses are required since the server is running three instances of Windows Server 2008 Standard in the virtual OSEs and one instance in the physical OSE.

Comparing ESX Server, Virtuozzo, and Microsoft Virtual Server

Five scenarios are repeated with Windows Server 2008 Standard, Enterprise, and Datacenter to demonstrate the number and estimated cost of Windows Server licenses with ESX, Virtuozzo, and Virtual Server running on a two-processor server. The cost estimates for the Windows Server editions are based on Open agreement Estimated Retail Prices in the United States. **The estimates do not include any applicable taxes or the cost of ESX or Virtuozzo.** Virtual Server is available for free download or cost of media.

Windows Server 2008 Standard

Scenario Number	Physical Processors in the Server	Running Instances of Windows Server in a Virtual OSE	Windows Server 2008 Standard Licenses / Estimated Cost		
			VMware's ESX	Parallel's Virtuozzo	Windows Server 2008 Standard License cost Server
1	2	4	4 / \$2,901.52	4 / \$2,901.52	4 / \$2,901.52
2	2	8	8 / \$5,803.04	8 / \$5,803.04	8 / \$5,803.04
3	2	10	10 / \$7,253.80	10 / \$7,253.80	10 / \$7,253.80
4	2	20	20 / \$14,507.60	20 / \$14,507.60	20 / \$14,507.60

Windows Server 2008 Enterprise

Scenario Number	Physical Processors in the Server	Running Instances of Windows Server in a Virtual OSE	Windows Server 2008 Enterprise Licenses / Estimated Cost		
			VMware's ESX	Parallel's Virtuozzo	Windows Server 2008 Standard License cost
1	2	4	1 / \$2,357.	1 / \$2,357	1 / \$2,357
2	2	8	2 / \$4,714	2 / \$4,714	2 / \$4,714
3	2	10	3 / \$7,071	3 / \$7,071	3 / \$7,071
4	2	20	5 / \$11,785	5 / \$11,785	5 / \$11,785
5	4	20	5 / \$11,785	5 / \$11,785	5 / \$11,785

Windows Server 2008 Datacenter

Scenario Number	Physical Processors in the Server	Running Instances of Windows Server in a Virtual OSE	Windows Server 2008 Datacenter Licenses / Estimated Cost		
			VMware's ESX	Parallel's Virtuozzo	Windows Server 2008 Standard License
1	2	4	2 / \$4,810	2 / \$4,810	2 / \$4,810
2	2	8	2 / \$4,810	2 / \$4,810	2 / \$4,810
3	2	10	2 / \$4,810	2 / \$4,810	2 / \$4,810
4	2	20	2 / \$4,810	2 / \$4,810	2 / \$4,810
5	4	20	4 / \$9,620	4 / \$9,620	4 / \$9,620

To create additional scenarios, the Windows Server Virtualization Calculator tool is available at: <http://www.microsoft.com/windowsserver2003/howtobuy/licensing/calculator.msp>.

The prices in the examples are in U.S. dollars and represent an estimated retail price on March 1, 2008 for Open Business Agreements. The prices shown do not include any applicable taxes. Any amounts should not be considered as a commercial proposal or offer from Microsoft. Microsoft provides this material solely for informational purposes and actual prices and payment terms may vary. Prices for licenses acquired through Microsoft resellers are determined by the reseller.

Appendix 1

Determining Which Edition of Windows Server Is Most Cost-effective

The most cost-effective edition of Windows Server for your virtualization needs depends on the number of instances per processor that will run on the server. (Windows Server 2008 Enterprise and Datacenter may provide additional flexibility to add instances and have clustering and other functionality not available in Windows Server 2008 Standard.)

- Standard is the most cost-effective if you want to run up to three simultaneous instances in a virtual OSE on the server.
- Enterprise is most cost-effective if you want to run four simultaneous instances in a virtual OSE per processor. Enterprise is licensed by server, not per processor, but more than one Enterprise license may be assigned to a server to have the rights to run more than four instances of Windows Server. For example, one license for Enterprise for a one-processor server running four instances of Windows Server in a virtual OSE is slightly less expensive than one Datacenter processor license. In addition, two licenses for Enterprise for a two-processor server running eight instances of Windows Server in a virtual OSE is slightly less expensive than two processor licenses for Datacenter.
- Datacenter is most cost-effective for running more than four instances per processor. At four instances per processor, Datacenter is slightly more expensive than Enterprise, but provides room to add instances in a virtual OSE on the server at no additional cost. The flexibility gained from “unlimited” virtualization rights reduces concern of licensing compliance.

Price per License for Each Edition		Server	# of Processors	# of VMs on Server	Number of Licenses Needed			Price for Each Edition		
					Standard	Enterprise	Datacenter	Standard*	Enterprise*	Datacenter
Standard*	\$ 719	1	1	1	1	1	\$ 719	\$ 2334	\$ 2381	
Enterprise*	\$ 2334	2	1	4	4	1	\$ 2876	\$ 2334	\$ 2381	
Datacenter	\$ 2381	3	1	5	5	2	\$ 3595	\$ 4668	\$ 2381	
		4	4	32	32	8	\$ 23008	\$ 18672	\$ 9524	

The illustration is based on Open agreement Estimated Retail Prices in the United States and compares the license requirements and estimated cost for instances of Windows Server running in virtual OSEs in four server configurations.

The Windows Server Virtualization Calculator is a tool that can help you determine the number of Windows Server licenses and estimated cost by edition (Standard, Enterprise, and Datacenter) for your virtualization scenarios to find the most cost-effective edition. It is available at:

<http://www.microsoft.com/windowsserver2003/howtobuy/licensing/calculator.msp>.

The prices in the examples are in U.S. dollars and represent an estimated retail price on March 1, 2008, for Open Business Agreements. The prices shown do not include any applicable taxes. Any amounts should not be considered as a commercial proposal or offer from Microsoft. Microsoft provides this material solely for informational purposes and actual prices and payment terms may vary. Prices for licenses acquired through Microsoft resellers are determined by the reseller.

Additional Resources

Microsoft Virtualization Solutions:

<http://www.microsoft.com/windowsserversystem/virtualization/default.aspx>

Volume Licensing Briefs:

- Licensing Microsoft Server Products in Virtual Environments:
http://download.microsoft.com/download/3/d/4/3d42bdc2-6725-4b29-b75a-a5b04179958b/Licensing_Microsoft_Server_Products_in_Virtual_Environments.docx (Microsoft Word file, 2.24 MB)
- Application Server License Mobility:
http://download.microsoft.com/download/3/d/4/3d42bdc2-6725-4b29-b75a-a5b04179958b/Application_Server_License_Mobility_VL_Brief.doc (Microsoft Word file, 226 KB)
- Multi-core and Hyper-threading Processor Licensing:
http://download.microsoft.com/download/f/1/e/f1ecd771-cf97-4d98-9a1b-b86e3f24e08f/multicore_hyperthread_brief.doc (Microsoft Word file, 79.4 KB)
- Step-up Licenses: http://download.microsoft.com/download/a/6/9/a69a4aa0-717a-4f73-bbcd-9d7451fd9bbc/stepup_license_v4.doc (Microsoft Word file, 117 KB)

Volume Licensing Glossary: <http://www.microsoft.com/licensing/resources/glossary.aspx>

Volume Licensing Product Use Rights: <http://www.microsoftvolumelicensing.com/userights/PUR.aspx>

Windows Server Virtualization Calculator:

<http://www.microsoft.com/windowsserver2003/howtobuy/licensing/calculator.aspx>