

Licensing Windows Server 2012 R2 for use with virtualization technologies

This brief applies to all Microsoft Volume Licensing programs.

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Licensing Windows Server 2012 R2 for use with virtualization technologies

Summary

This document discusses how Microsoft Windows Server 2012 R2 is licensed when used with virtualization technologies like VMware ESX/ESXi, Microsoft System Center 2012 R2 Virtual Machine Manager, or Parallels Virtuozzo.

Highlighted in the gray text boxes throughout the document are excerpts from the July 2012 Microsoft Volume Licensing [Product Use Rights \(PUR\)](#) and other relevant pieces of information. The PUR describes the use terms for all Microsoft products in Volume Licensing.

What's New in This Brief?

This brief replaces a previous version published in September 2012. It has been updated to reflect Windows Server 2012 R2.

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.

Licensing Model

Windows Server is licensed under the Processor/Client Access License (CAL) model.

Assignment of Licenses

To run an instance of Windows Server software on your server, you must license every processor on the server. For Windows Server Standard and Datacenter editions, each license covers up to two physical processors on a single server. For Windows Server Essentials, each license covers a single server that cannot exceed two physical processors. By licensing all of the processors on 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 depends on the Windows Server edition license that is assigned.

For Volume Licensing (VL) Windows Server licenses, you can reassign the software licenses from one server to another, but not more often than every 90 days. When reassigning a license, keep in mind that when you move the license from one server to another that your original server will still need to be appropriately licensed to cover all of the virtual OSEs that you may run on that server at any given time moving forward. There are some exceptions to the license reassignment 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 2012 R2 External Connector (EC) licenses. However, for Windows Server 2012 R2 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, read the [Licensing Microsoft Server Products in Virtual Environments](#) Volume Licensing brief.

Storing Instances

With a licensed copy of Windows Server 2012 R2 you can make any number of copies of the software and store them on any of your servers or storage media without requiring an additional Windows Server 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.

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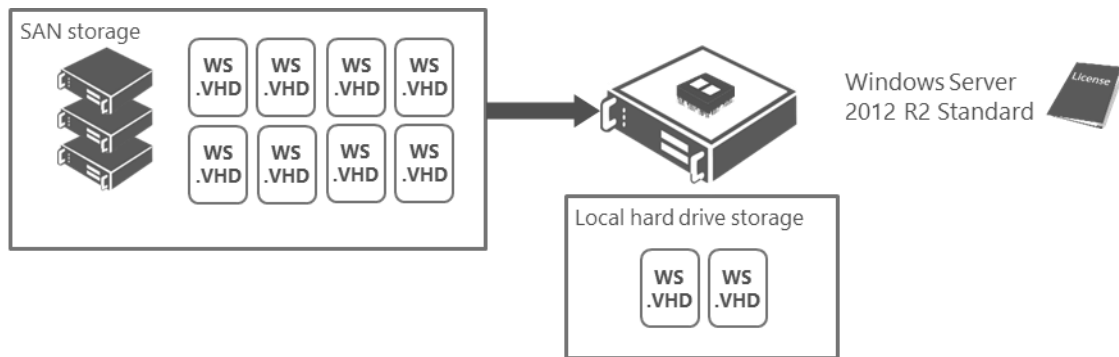


Figure 1. The physical server has one Windows Server license assigned to it, so the 10 stored instances across the SAN and server's hard drive do not require additional licenses because they are not running instances.

Operating System Environments

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 the following:

- ▶ 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
- ▶ 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:

- ▶ one physical operating system environment
- ▶ 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

Both Windows Server 2012 R2 Standard and Datacenter edition have the exact same features and capabilities; the only difference between these two editions is the virtualization rights. Windows Server 2012 R2 Essentials edition has a subset of these features that are focused on small business needs.

For customers that want to have a highly virtualized environment, Windows Server 2012 R2 Datacenter edition is the right edition to use. Windows Server 2012 R2 Datacenter edition will allow you to run unlimited virtual instances with each license on a single server. This allows you to grow as much as you need to, and with no limit there is no need to track how many instances you are running to ensure that you are compliant.

For customers that want to have a lightly virtualized environment, Windows Server 2012 R2 Standard edition is the right edition to use. Windows Server 2012 R2 Standard edition will entitle you to run one instance in the physical OSE

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and two instances in the virtual OSE with each license. If all of the allowed instances are running then the instance in the physical can only be used to manage the virtual instances. If you want to run more than two virtual OSEs on the server you can assign additional Windows Server 2012 R2 Standard licenses (often referred to as "stacking"), increasing the number of total virtual OSEs on that server by two with each license. You will need to assign the appropriate number of Windows Server 2012 R2 Standard licenses to cover the highest number of virtual instances you may run at any given time. For example, if you want to run four virtual OSEs on a server, you will need to assign two Windows Server 2012 R2 Standard edition licenses to that server; each license granting you the right to run two virtual OSEs for a total of four. If you want to run a fifth virtual OSE on that server you will need to assign an additional Windows Server 2012 R2 Standard license.

For small businesses that want to use virtualization as part of their backup and recovery plan, Windows Server 2012 R2 Essentials is the right edition to use. Windows Server 2012 R2 Essentials edition entitles you to run one instance in the physical OSE and one instances in the virtual OSE. If you want to run more than one virtual OSE (for example, have a lightly or highly virtualized environment) you can do so by assigning a Windows Server 2012 R2 Standard or Datacenter license to the server. A second Windows Server 2012 R2 Essentials license cannot be assigned to the server to increase the allowed virtual OSEs on that server.

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.

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For Windows Server 2012 R2 Datacenter Edition:

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 2012 Standard:

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

- ▶ 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 one physical operating system environment, and
 - two instance of the server software in one virtual operating system environment.
- ▶ If you run all allowed instances 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 2012 R2 Essentials:

Running Instances of the Server Software. The license you assign:

- ▶ 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 one physical operating system environment, and
 - one instance of the server software in one virtual operating system environment.
- ▶ If you run all allowed instances 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.

Licensing for Peak Capacity

Because a server must have assigned licenses equal to or exceeding the number of running OSEs, 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 2012 R2 Standard license assigned to a server, you may run one instance of Windows Server 2012 R2 Standard in the physical OSE and two instances of Windows Server 2012 R2

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Standard virtual OSEs on the server at the same time. You may not run a third instance of the software in another virtual OSE on the server. If you need to run a third instance in a virtual OSE periodically, then you must assign a second license of Windows Server 2012 R2 Standard edition to the server.

In the case of Windows Server 2012 R2 Essentials, a second Windows Server 2012 R2 Essentials license cannot be assigned to the server to increase the allowed virtual OSEs on that server.

The following outlines the maximum number of running instances in virtual OSEs **each** Windows Server 2012 edition license permits the following:

Product	Maximum permitted running instances in virtual OSE per license
Windows Server 2012 R2 Essentials	One
Windows Server 2012 R2 Standard	Two
Windows Server 2012 R2 Datacenter	Unlimited

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. If you have Windows Server 2012 R2 Datacenter edition you will have the right to run the bits of any prior version or lower edition (Datacenter, Enterprise, Standard or Essentials). If you have Windows Server 2012 R2 Standard edition, you will have the right to run the bits of any prior version of Enterprise, Standard or Essentials edition. If you have Windows Server 2012 R2 Essentials edition, you will have the right to run the bits of any prior version Essentials edition. You should remember that the ability to run previous version or edition bits does not change the licensing or support terms in which you can use the product; the purchased product (Windows Server 2012 R2) rights apply. This means that the license will continue to cover the processors or sever stated in the Product Use Rights and the virtualization rights do not change.

Client Access Licenses and External Connectors

Windows Server Standard and Datacenter editions 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 2012 R2 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:

- ▶ run hardware virtualization software,
- ▶ provide hardware virtualization services, or,
- ▶ 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.

You also do not need Windows Server CALs to access any instance of Windows Server 2012 R2 that is running a Web or an HPC workload

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.

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Windows Server 2012 R2 Essentials edition does not require a CAL to access the server because this edition is limited to 25 User Accounts. If you need to have more than 25 users access the server, you will need to assign a Windows Server Standard or Datacenter edition license and purchase Windows Server CALs for each user or device.

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, read the [Licensing Microsoft Server Products in Virtual Environments](#) 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.

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

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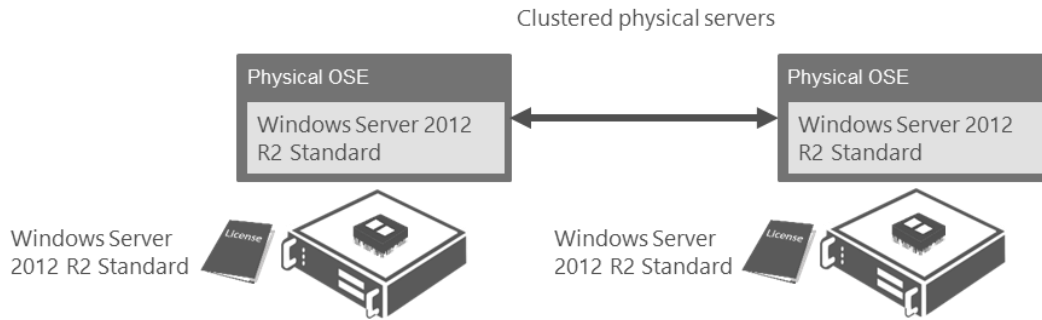


Figure 2A. Example: The servers are clustered, each licensed with Windows Server, and both running the same workload in parallel.

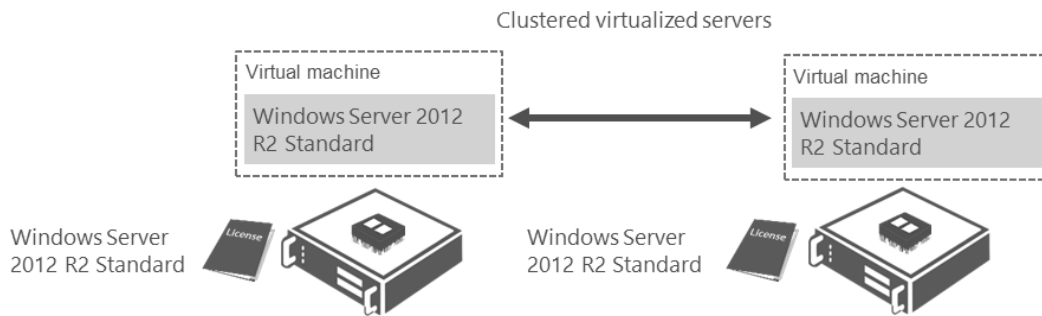


Figure 2B. Example: The servers are clustered, each licensed with Windows Server and both running the same virtualized workload in parallel.

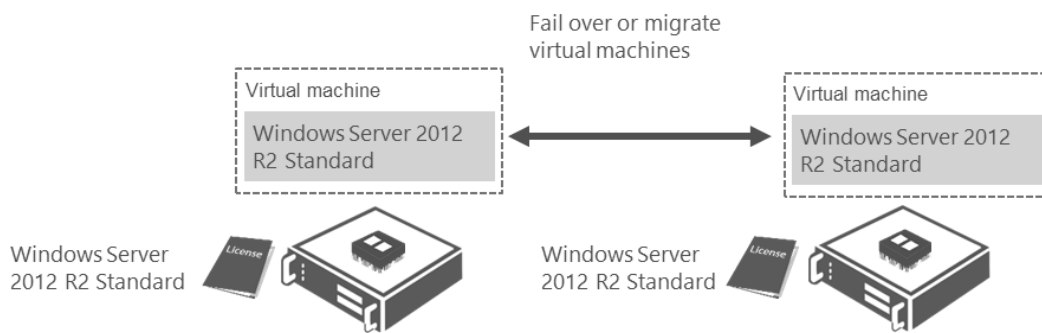


Figure 2C. Example: Both servers are licensed with Windows Server. The workload is moved from the first server to the second server.

Licensing Windows Server 2012 R2 for Use with Virtualization Solutions

If a server is running a hypervisor on bare metal (directly on top of the server hardware), such as VMware's ESX/vSphere), then Windows Server is not deployed as a host operating system in the physical OSE. However, a license is required for every physical processor on the server and every "guest OS" instance running in a virtual OSE should be appropriately licensed (Standard edition will allow up to two virtual instances with each license and Datacenter edition will allow an unlimited number of virtual instances with each license).

If you have assigned a single license for Windows Server 2012 R2 Standard to a server running ESX/ESXi, then you may run two instances of Windows Server 2012 R2 Standard at a time. The right to run an instance of Windows Server 2012 R2 in the physical OSE cannot be used in this case since ESX/ESXi runs on the physical OSE (and as a result, Windows Server 2012 R2 cannot be deployed as the operating system on the physical OSE).

If you have assigned a second Windows Server 2012 R2 Standard edition to the server running ESX/ESXi, then you may run up to four instances at a time of Windows Server 2012 R2 Standard. You may not run a fifth virtual instance under the same license. You could, however, run a fifth instance of Windows Server if it is running as a physical instance on top of the server hardware.

Licensing for VMware vMotion and Microsoft System Center 2012 R2 Virtual Machine Manager

The same licensing rules apply to Windows Server Clustering Services as VMware vMotion and System Center Virtual Machine Manager. While VMware 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 the [Clustering, Failing Over, and Moving Instances](#) section). As Windows Server 2012 Datacenter permits an unlimited number of instances of the server software to run in virtual OSEs, in multi-server installations with VMware 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 the [Assignment of Licenses](#) section), 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 each server individually does not run more instances than the number for which it is licensed, you are free to use VMware vMotion and System Center Virtual Machine Manager to move virtualized instances between licensed servers at will.

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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. 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.

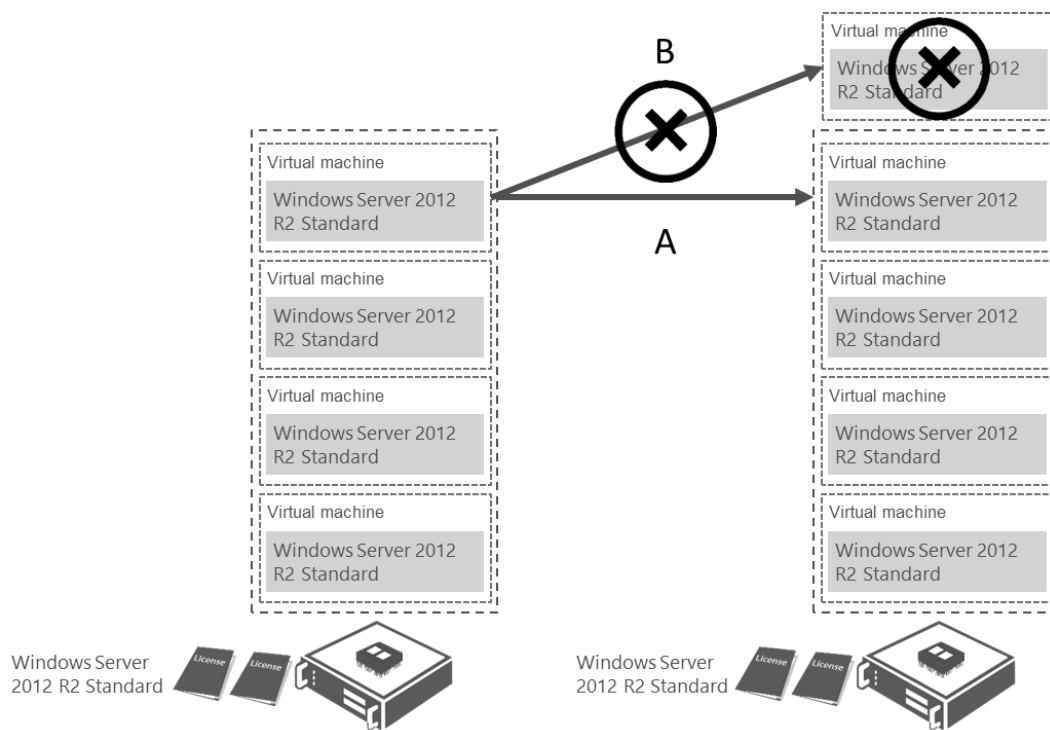


Figure 3. Example: If each server has two licenses of Windows Server 2012 R2 Standard, and the second server is already running three instances of Windows Server 2012 Standard in virtual OSEs, then VMware vMotion or System Center 2012 R2 Virtual Machine Manager (Windows Server Clustering Services, scripting, or manual administration) may move one (Example A above) instance of Windows Server 2012 R2 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 VMware 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 two licenses of Windows Server 2012 R2 Standard. They are running four instances of Windows Server 2012 R2 Standard in virtual OSEs.

The second, third, and fourth scenarios (Figures 4B, 4C, and 4D) show the result of VMware vMotion or System Center Virtual Machine Manager’s movement of two of the instances from the first server to the second server and the

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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.

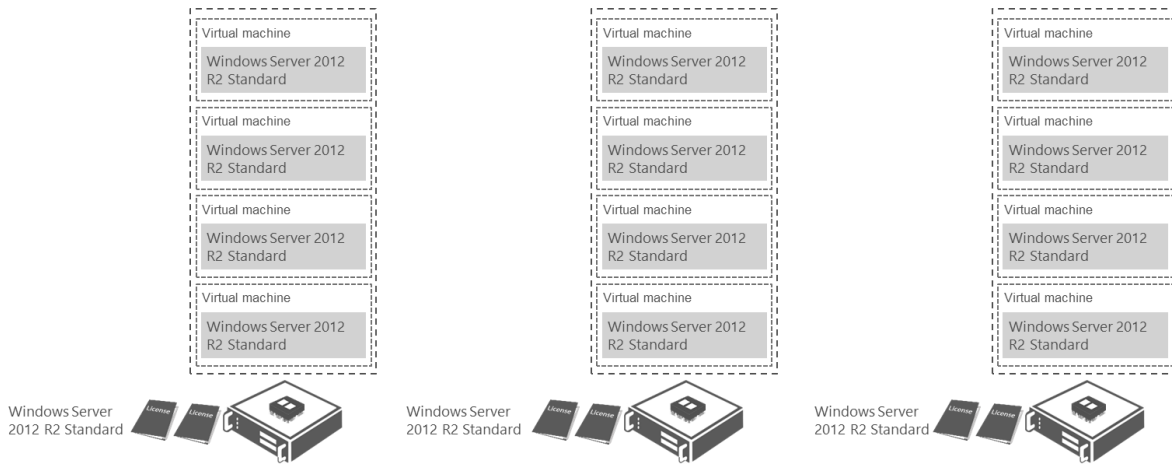


Figure 4A. The instances of Windows Server running in a virtual OSE may not be moved from the first server to the second or third server, because the second and third servers are each licensed with four instances of Windows Server 2012 R2 Standard and are already running four instances of Windows Server 2012 R2 Standard before the attempted migration begins.

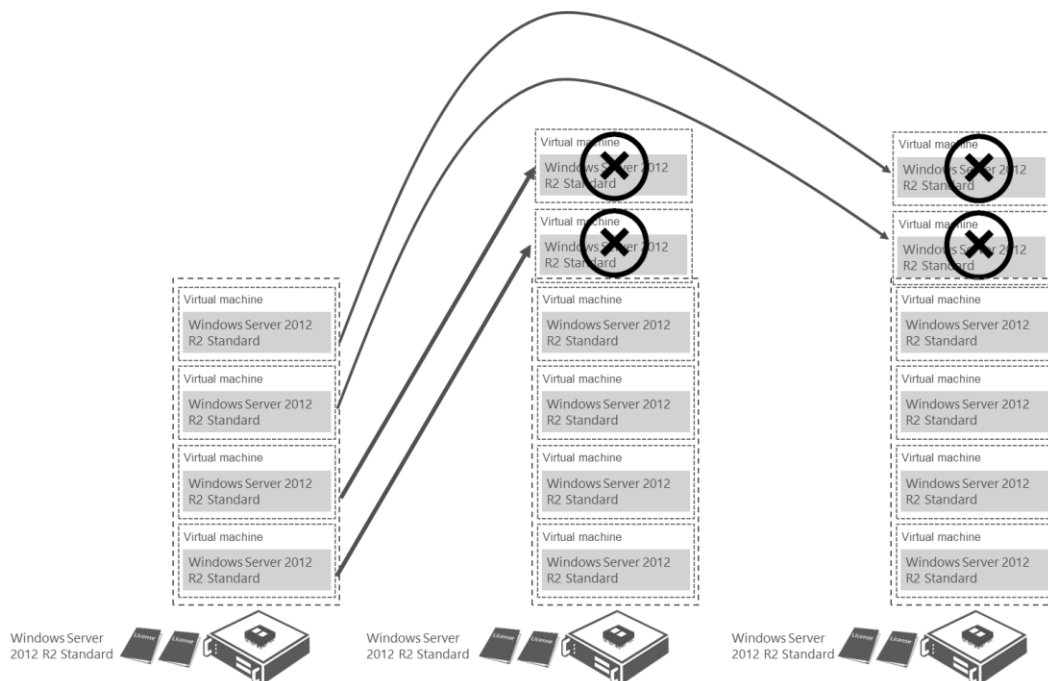


Figure 4B. The instances of Windows Server running in a virtual OSE may not be moved from the first server to the second or third server, because the second and third servers are each licensed with four instances of Windows Server 2012 R2 Standard and are already running four instances of Windows Server 2012 R2 Standard before the attempted migration begins.

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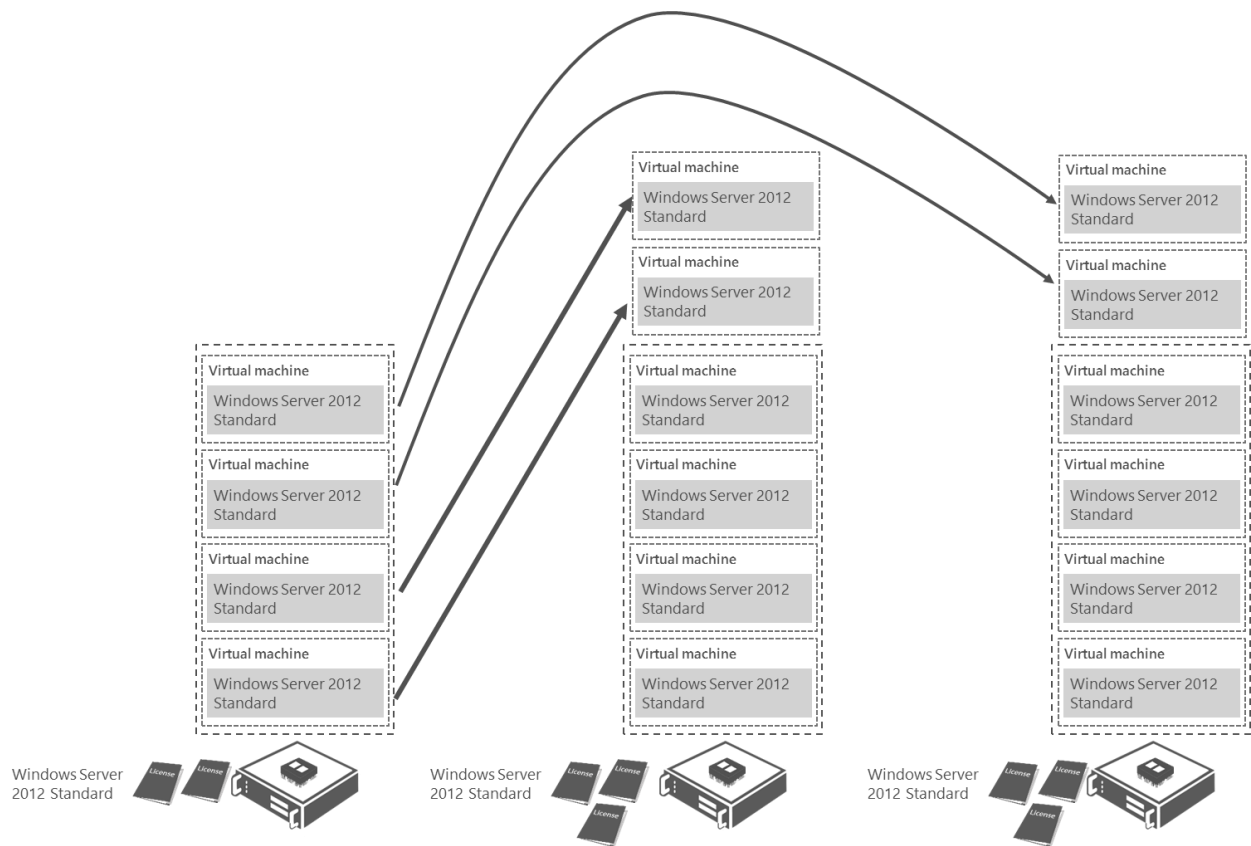


Figure 4C. Two of the instances of Windows Server 2012 R2 Standard may be moved from the first server to the second and the remaining two instances may be moved from the first to third server, because the second and third servers each have three licenses of Windows Server 2012 R2 Standard and were only running four instances of Windows Server 2012 R2 Standard prior to the migration.

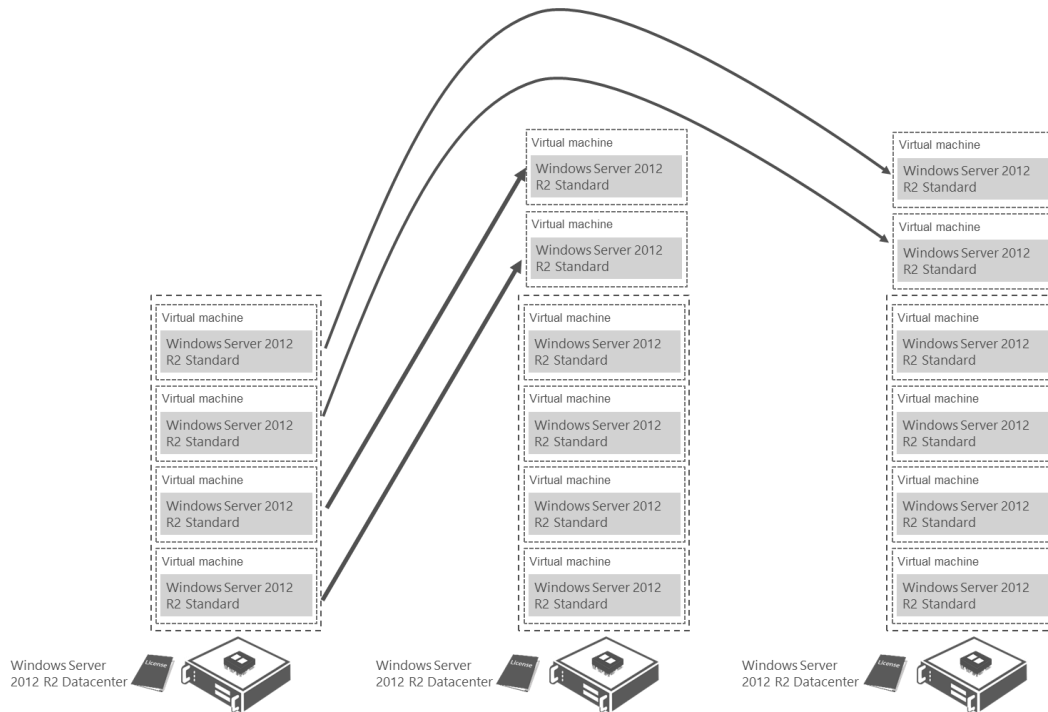


Figure 4D. Instead of licensing the servers with enough Windows Server 2012 R2 Standard licenses to meet the largest number of simultaneously running instances of Windows Server, the processors in the servers could be licensed with Windows Server 2012 R2 Datacenter. This would allow an unlimited number of instances of Windows Server to run simultaneously in virtual OSEs. Because the servers have two processors, one Windows Server 2012 R2 Datacenter licenses would be required for each server. Windows Server 2012 R2 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 2010. 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.

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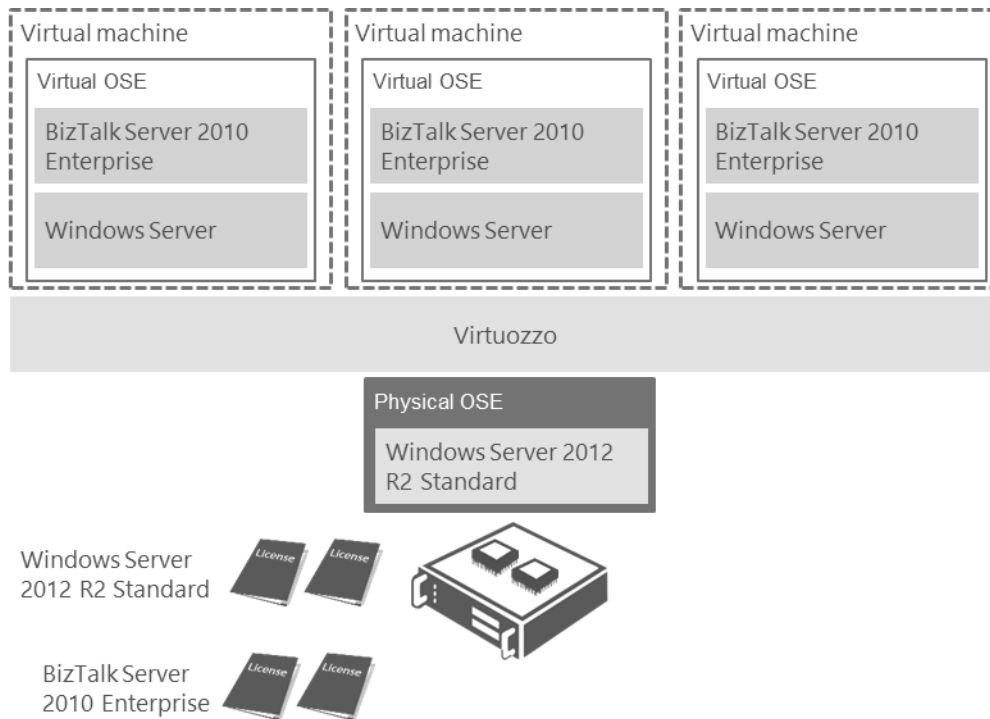


Figure 5: Example: A two-processor server with three instances of BizTalk Server 2010 Enterprise running in virtual OSEs only needs two processor licenses of BizTalk Server 2010 Enterprise due to the unlimited virtualization rights of BizTalk Server Enterprise when the physical processors are licensed. Two Windows Server 2012 Standard licenses are required since the server is running three instances of Windows Server 2012 R2 Standard in the virtual OSEs and one instance in the physical OSE.

Comparing ESX/ESXi Server, Virtuozzo, and Microsoft Hyper-V

The cost of using Windows Server does not change based on the hypervisor being used since the use rights (virtualization, number of permitted instances etc.) do not vary with the type of hypervisor (ESX/ESXi or Virtuozzo or Hyper-V). As explained earlier the price for Windows Server is dependent on the number of physical processors on the server, the edition and, in the case of Windows Server Standard, the number of instances that you want to run on a server.

To research Microsoft Volume Licensing for Windows Server, use [Microsoft License Advisor](#).

Additional Resources

- ▶ Microsoft Virtualization Solutions: <http://www.microsoft.com/en-us/server-cloud/virtualization/default.aspx>
- ▶ Volume Licensing Briefs:
 - Licensing Microsoft Server Products in Virtual Environments: <http://www.microsoft.com/licensing/about-licensing/briefs/virtual-licensing.aspx>
 - Step-up Licenses: <http://www.microsoft.com/licensing/about-licensing/briefs/stepup-license.aspx>

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- ▶ Volume Licensing Product Use Rights: <http://www.microsoft.com/licensing/about-licensing/product-licensing.aspx>
- ▶ Microsoft License Advisor: <http://www.microsoft.com/licensing/mla/default.aspx>

Appendix 1

Determining Which Edition of Windows Server Is Most Cost-effective

Windows Server Essentials provides features that are ideal for a small business looking for a first server that will also help connect them to the cloud. To assist in their backup and recovery plans, it includes the ability to host a virtual instance of itself.

Windows Server Standard and Datacenter have the exact same features, so the most cost-effective edition of Windows Server for your virtualization needs will depend solely on the number of instances that will run on the server. If you want to run a lightly virtualized or physical environment, then Windows Server 2012 R2 Standard edition is the right edition. With this edition you can grow your virtualization needs two instances at a time with each assigned license to the server. If you want to run a highly virtualized environment with room for growth and do not want to have to worry about tracking the number of virtual instances you are running (and allow any previous version or edition to run in those virtual instances), then Windows Server 2012 R2 Datacenter edition is the right edition.

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