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# What's New in Windows Server R2

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In this chapter we cover what is new in Windows Server 2008 R2, and what has changed since the release of Windows Server 2008, along with some basic information about how the book is organized.

## What Is R2?

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Windows Server 2008 R2, or simply “R2” for short, is the second release of Windows Server 2008. It isn’t a completely new release, but rather adds additional features and refinements to the existing release.

## Release Cadence

Beginning with Windows Server 2003, Microsoft moved to a server release cycle that was designed to have a major release every three to five years (Windows Server 2003, Windows Server 2008), with a minor release at the approximate midpoint of the major release cycle (Windows Server 2003 R2, Windows Server 2008 R2). This change allowed Microsoft to move away from including new functionality in service packs (SPs), while providing customers with a more stable and predictable server environment.

An R2 release is more than an SP, but less than a full major release. Windows Server 2008 R2 includes Windows Server 2008 SP2, but it also adds many new features and functionality that were not part of Windows Server 2008.

## Licensing and Packaging Changes

There are some minor licensing changes included in Windows Server 2008 R2, and one completely new edition since the original release of Windows Server 2008. The new edition is Windows Server 2008 R2 Foundation, an original equipment manufacturer (OEM)-only edition that is an entry-level small-business solution limited to a maximum of 15 users, which has several other restrictions as well.

**MORE INFO** For more information on Windows Server 2008 R2 editions, including Windows Server 2008 R2 Foundation, and full details and edition comparisons for all Windows Server 2008 R2 editions, see: <http://www.microsoft.com/windowsserver2008/en/us/R2-editions.aspx>.

The licensing of Windows Server 2008 R2 is very similar to that of Windows Server 2008, and you can use Windows Server 2008 Client Access Licenses (CALs) for Windows Server 2008 R2 without having to upgrade your license. There is, however, one important difference that is introduced with Windows Server 2008 R2—there is no requirement to upgrade to Windows Server 2008 CALs when you install Windows Server 2008 R2 on a physical server that is only used with the Hyper-V role.

Another difference between Windows Server 2008 and Windows Server 2008 R2 licensing is caused by the name change from Terminal Services (TS) in Windows Server 2008 to Remote Desktop Services (RDS) in Windows Server 2008 R2. This is more than just a name change, and we cover the new features and functionality in depth in Chapter 4, “Remote Desktop Services and VDI: Centralizing Desktop and Application Management.” However, for the licensing, it really is just a name change—Windows Server 2008 R2 RDS CALs and Windows Server 2008 TS CALs can both be used for the full functionality of Windows Server 2008 R2 RDS.

There are also new license suite options in Windows Server 2008 R2, with the introduction of the new Virtual Desktop Infrastructure (VDI) Standard and Virtual Desktop Infrastructure Premium suites. We cover these new suite licenses in Chapter 4 when we talk about the new VDI functionality that R2 makes possible.

## The Focus for R2

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It would be presumptuous of us to talk about the “vision” that Microsoft had for Windows Server 2008 R2, but we can certainly see a pattern in where the major improvements are:

- Virtualization
- Management
- Scalability
- Web

- Networking and access
- “Better Together” with Windows 7

We take a look at each of these areas throughout this book, but let’s start with a quick high-level look at what has changed in each area.

## Virtualization

Direct support for server virtualization, in the form of the Hyper-V hypervisor, was one of the most important and highly anticipated improvements in Windows Server 2008. With the release of Windows Server 2008 R2, Microsoft extends Hyper-V virtualization to include support for client desktop virtualization, and adds important new capabilities for dynamic disk allocation, live migration, and improved scalability and redundancy. We cover the improvements in Hyper-V server virtualization capabilities in Chapter 3, “Hyper-V: Scaling and Migrating Virtual Machines.”

Virtualization, however, isn’t limited to machine virtualization, but also includes presentation virtualization (RDS), application virtualization (App-V), and client desktop virtualization (VDI).

Windows Server 2008 R2 adds improvements in RDS that provide a more seamless integration with Windows 7 clients, including full support for Windows Aero and multiple monitors. Application virtualization support in R2 is improved, and the addition of the Remote Desktop Virtualization Host (RD Virtualization Host) role service enables full desktop virtualization. We cover VDI and RDS in greater detail in Chapter 4.

## Management

There are substantial improvements in the way Windows Server 2008 R2 can be managed, both graphically and from the command line. A new version of Windows PowerShell provides enhanced remote capabilities and is now available as an installation option for Windows Server Core. Graphical management is also improved, with Server Manager now fully supported remotely, and many of the management consoles are better integrated into Server Manager, enabling remote management. The improvements in Windows PowerShell are covered throughout the book, and we cover the specifics of setting up remote Server Manager, installing Windows PowerShell in Server Core, and many of the changes to role-based administration in Chapter 2, “Installation and Configuration: Adding R2 to Your World.”

Windows Server 2008 R2 includes a new Active Directory (AD) schema that enables an AD Recycle Bin, a new set of Active Directory Windows PowerShell cmdlets, and improvements in daily AD administration.

Improvements in storage management and file server management are part of Windows Server 2008 R2. The new Windows File Classification Infrastructure (FCI) provides insight into your data by automating classification processes so that you can manage your data more effectively and economically. BranchCache improves bandwidth utilization of wide area

network (WAN) connections by enabling local caching of data on Windows Server 2008 R2 and Windows 7 computers at branch offices. Improvements in processor utilization, startup speed, and input/output (I/O) performance make the centralization of storage on iSCSI storage area networks (SANs) easier and more efficient. We cover the details of file system and storage improvements in Chapter 6, “File Server Role.”

## Scalability

Windows Server 2008 R2 is the first version of Windows Server to support *only* 64-bit processors. Further, Windows Server 2008 R2 now supports up to 256 logical processor cores for a single operating system instance. Hyper-V virtual machines are able to address up to 64 logical cores in a single host. With the improvements in storage performance and efficiency, and reduced graphical user interface (GUI) overhead, this gives Windows Server 2008 R2 the ability to scale up to larger workloads. Additionally, the R2 version of Hyper-V also adds performance enhancements that increase virtual machine performance and reduce power consumption. Hyper-V now supports Second Level Address Translation (SLAT), which uses new features on today’s CPUs to improve virtual machine (VM) performance while reducing processing load on the Windows Hypervisor. These improvements increase your ability to consolidate workloads and servers onto fewer physical servers, reducing administration overhead, power consumption, and rack costs. Chapters 2 and 3 cover these improvements.

Network Load Balancing (NLB) allows Windows Server 2008 R2 to scale out across multiple servers. Windows Server 2008 R2 includes improvements in support for applications and services that require persistent connections and also improves the health monitoring of NLB clusters and the applications and services running on them.

## Web

Windows Server 2008 R2 includes Internet Information Services (IIS) 7.5, an improved and updated version of the IIS 7 that was included in Windows Server 2008. Windows Server 2008 R2 also includes a new Windows PowerShell provider for IIS to facilitate the automation of management tasks. This Windows PowerShell provider is available on Server Core installations of Windows Server 2008 R2 as well as full installations. IIS 7.5 also includes a new File Transfer Protocol (FTP) server that supports Internet Protocol version 6 (IPv6), Secure Sockets Layer (SSL), and Unicode characters.

Server Core can now include the Microsoft .NET Framework, giving administrators the ability to manage IIS from Windows PowerShell or IIS Manager. As with many other areas of R2, IIS 7.5 includes a Best Practices Analyzer (BPA) to simplify troubleshooting and configuration of IIS. For full details on the new version of IIS, see Chapter 7, “IIS 7.5: Improving the Web Application Platform.”

## Networking and Access

One of the most exciting new features in Windows Server 2008 R2 is DirectAccess, a new way to securely connect remote clients to the corporate network. The most common method has been virtual private networks (VPNs), which often require third-party client software running on the client, and can be time-consuming to configure and troubleshoot. With Windows Server 2008 R2 and DirectAccess, if the client is running Windows 7, the remote user has seamless, always-on remote access to corporate resources that does not compromise the secure aspects of remote connectivity.

DirectAccess works with the Network Access Protection (NAP) of Windows Server 2008 R2 to ensure that client computers meet your system health requirements, such as having security updates and antimalware definitions installed, before allowing a DirectAccess connection.

Clients that are connected via DirectAccess can be remotely managed by internal IT staff, allowing you to ensure that they are kept current with critical updates. DirectAccess is covered in Chapter 8, “DirectAccess and Network Policy Server.”

## Better Together with Windows 7

Many of the enhancements of Windows Server 2008 R2 are independent of the client operating system being used, but others, such as DirectAccess, only work with Windows 7 clients. Others, as is the case with the new RDS features, work better with a Windows 7 client, but are still important improvements even if you’re running Windows Vista or Windows XP.

Some of the things that make Windows 7 and Windows Server 2008 R2 work better together (and the technologies that enable them) are the following:

- Simplified remote connectivity for remote users (DirectAccess)
- Secure remote connectivity, even from public computers (Remote Workplace plus RD Gateway and RD Session Host)
- Improved branch office performance and security (BranchCache and read-only Distributed File System Replication [DFS-R])
- More efficient power management where the hardware supports it (Group Policy)
- Virtualized desktops (VDI)
- Improved removable drive security (BitLocker To Go)

## Top Reasons to Upgrade

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Windows Server 2008 R2 is not a free update to Windows Server 2008 unless you have Software Assurance (SA). So should you upgrade? And why?

Well, the short answer is yes, you should upgrade. The why is what this book is all about in many ways, but here are our top 10 reasons to upgrade:

- **Powerful hardware and scaling features** Windows Server 2008 R2 supports up to 256 logical processors. R2 also supports SLAT, which enables R2 to take advantage of the Enhanced Page Tables feature found in the latest AMD CPUs as well as the similar Nested Page Tables feature found in Intel's latest processors. The combination enables R2 servers to run with much improved memory management.
- **Improved Hyper-V** Hyper-V in Windows Server 2008 R2 can now access up to 64 logical CPUs on host computers—twice Hyper-V's initial number of supported CPUs. Live migration enables a highly fault-tolerant virtualization infrastructure, and dynamic addition and removal of disks simplifies backup scenarios and overall management of virtualized resources.
- **Reduced power consumption** Windows Server 2008 R2 supports Core Parking, which dynamically turns off unused processor cores when they aren't needed, reducing power consumption.
- **Reduced desktop costs** Windows Server 2008 R2 enables VDI technology, which extends the functionality of RDS to provide full desktop virtualization or application virtualization of key applications.
- **Improved server management** Windows Server 2008 R2 includes a new version of Windows PowerShell, which is now available on Server Core as well. Server Manager can now also be used remotely.
- **Improved branch office performance and security** Windows Server 2008 R2 includes BranchCache and read-only DFS-R, which extends the branch office scenarios introduced in Windows Server 2008.
- **Improved Web server** Windows Server 2008 R2 includes IIS 7.5 as well as a new FTP server. IIS 7.5 includes a new Windows PowerShell provider for IIS management.
- **Windows PowerShell v2** Windows Server 2008 R2 includes an improved and more powerful version of Windows PowerShell that has cmdlet support for remote management. Windows PowerShell is now available on Server Core in Windows Server 2008 R2.
- **Improved Remote Desktop Services** The new RDS features provide an improved and more seamless user experience, especially when the client is running Windows 7.
- **Improved mobile user experience** Mobile users running Windows 7 have seamless and continuous access to corporate resources through DirectAccess. And RD Web Access, shown in Figure 1-1, provides users running at least Windows XP SP3 with full access to published applications or desktops.





**FIGURE 1-1** Remote Desktop Web Access requires at least Windows XP SP3.

## Themes Visited Throughout the Book

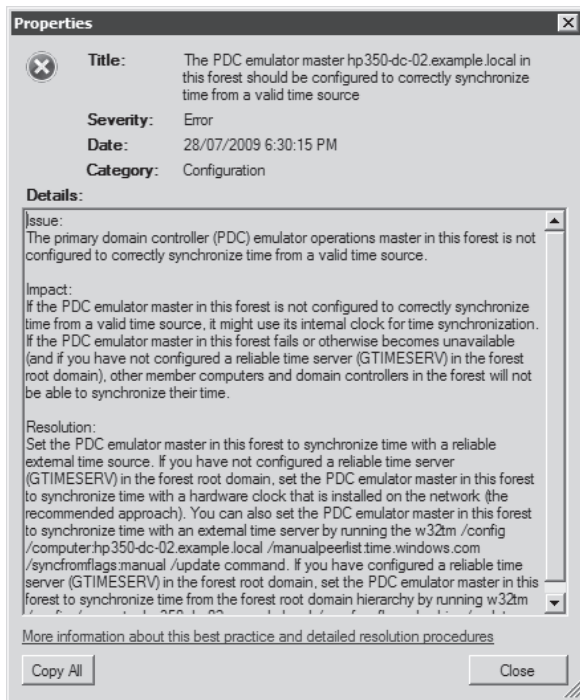
Throughout this book, we focus on what is new and different in Windows Server 2008 R2, and we assume that you have at least some familiarity with Windows Server 2008. Inevitably, there will be some overlap between the features that were introduced in Windows Server 2008, and the improvements or changes in R2. We try to keep from telling you what you already know about Windows Server 2008, but in some cases we need to set the stage as we go, so bear with us, please.

Two important additions in Windows Server 2008 R2 that we use throughout the book are the many new BPAs, and the new version of Windows PowerShell.

## Best Practice Analyzers

BPAs have been around for a while, but usually focused on server applications, such as Microsoft Exchange, or on suite products such as Windows Small Business Server. New in Windows Server 2008 R2 are several new BPAs that are directly integrated into Server Manager. These BPAs are part of the role-based management of Server Manager, and they scan for deviations from known best practices for the particular role. A typical error is shown in Figure 1-2.





**FIGURE 1-2** The Active Directory BPA.

The BPAs are an important new feature in Windows Server 2008 R2, and we cover them as we go through each area.

## Windows PowerShell 2.0

The other new feature in Windows Server 2008 R2 that crosses just about every chapter is Windows PowerShell 2.0. This new version of Windows PowerShell adds many new cmdlets, and has built-in support for running commands remotely. It is available for earlier versions of Windows operating systems, but it is installed by default in Windows Server 2008 R2. We use it to provide simple scripts or command-line ways of doing tasks throughout the book. An important design criterion for Windows PowerShell 2.0 was that it run Windows PowerShell 1.0 commands and scripts seamlessly. This protects your existing investment in Windows PowerShell scripting and makes it easy for you to extend your existing Windows PowerShell knowledge to encompass the new capabilities of 2.0.

# Installation and Configuration: Adding R2 to Your World

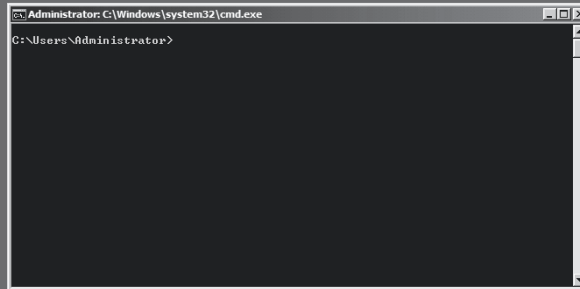
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Windows Server 2008 R2 uses the same basic installation and configuration methods as Windows Server 2008. The installer, originally introduced in Microsoft Windows Vista, is an image-based install that is noticeably quicker than earlier versions of Windows Server. Configuration continues the role-based model introduced in Windows Server 2008, now with a new ServerManager module for Windows PowerShell as an option for adding and removing roles and features. This new capability is also available on Server Core installations, a change from Windows Server 2008 where Windows PowerShell was not supported on Server Core.

Additionally, for Server Core, the command-line utility used to add and remove roles has changed. In Windows Server 2008, the utility is Ocsetup.exe, but in Windows Server 2008 R2, it is Dism.exe.

## Windows Server Core

If you're coming to Windows Server 2008 R2 from Microsoft Windows Server 2003, a brief explanation of Server Core is probably in order here. With the release of Windows Server 2008, Microsoft added a new installation option called Server Core. This installs a version of Windows Server that has a limited subset of available roles and functionality, and no graphical interface, as shown in Figure 2-1.

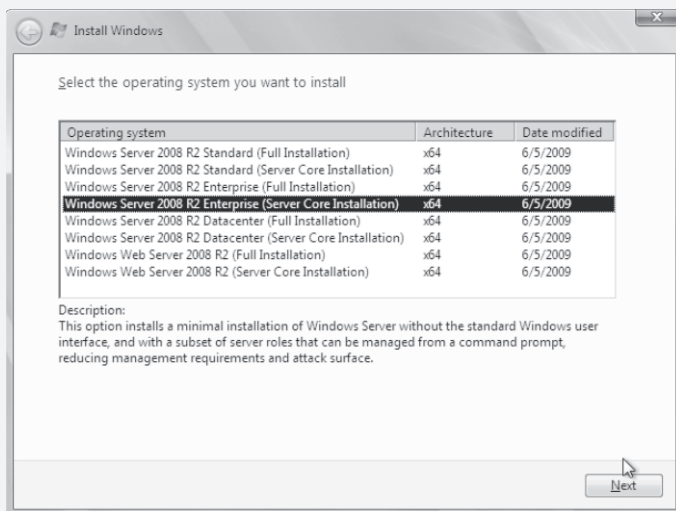


**FIGURE 2-1** The console interface of Windows Server 2008 R2 Enterprise Core.

Server Core is not a separate edition of Windows Server 2008 R2, it is an *installation option* that has a reduced footprint and reduced overhead, but still provides all the underlying server functionality of the roles that are available on it. You can't go out and buy a copy of Windows Server Core. Instead, you buy whatever version of Windows Server you need for your network, and when you install Windows Server, you choose a Server Core installation, as shown in Figure 2-2.

Management of server roles can be done from the command line, or from remote management tools running on other computers in the network.

So, why choose Server Core? After all, most Windows Server administrators are a good deal more comfortable with the familiar Windows graphical interface than they are with the command line, and even an experienced administrator can find the single Cmd.exe window shown in Figure 2-1 a bit daunting. The two reasons we find most compelling are the reduction in resource usage—a Server Core installation is physically smaller and uses less RAM—and the improved security footprint—because there are fewer services and features installed, there is a smaller attack surface. This also has the added benefit of requiring fewer security-related updates and potentially fewer server restarts.



**FIGURE 2-2** Server Core is an installation option, not a separate product.

## System Requirements and Scalability

The system requirements for Windows Server 2008 R2 are essentially the same as for Windows Server 2008, with one very important exception: There is no 32-bit version of Windows Server 2008 R2. There are only 64-bit versions. The minimum system requirements are shown in Table 2-1.

**TABLE 2-1** Minimum System Requirements for Windows Server 2008 R2

COMPONENT	REQUIREMENT
Processor	Minimum: 1.4 GHz x64 processor
	Note: An Intel Itanium 2 processor is required for Windows Server 2008 for Itanium-Based Systems
Memory	Minimum: 512 MB RAM (384 MB for Server Core installation)
	Maximum: 8 GB (Foundation) or 32 GB (Standard) or 2 TB (Enterprise, Datacenter, and Itanium-Based Systems)
Disk Space Requirements	Minimum: 32 GB or greater (3.5 GB for Server Core installation)
	Foundation: 10 GB or greater Note: Computers with more than 16 GB of RAM will require more disk space for paging and dump files
Display	Super VGA (800 × 600) or higher resolution monitor
Other	Keyboard and Microsoft Mouse or compatible pointing device

## Processors and Memory

The Windows Server 2008 R2 editions support the same number of physical processors and RAM as Windows Server 2008 did, up to 64 processor sockets, and up to 2 terabytes (TB) of RAM, for Windows Server 2008 R2 Datacenter and Itanium versions. Table 2-2 shows the breakdown by edition.

**TABLE 2-2** Windows Server 2008 R2 Memory and Processors by Edition

EDITION	MAXIMUM # OF CPUS	MAXIMUM RAM
Web	4	32 GB
Standard	4	32 GB
Enterprise	8	2 TB
Datacenter	64	2 TB
Itanium	64	2 TB
Foundation	1	8 GB

Microsoft counts processor sockets, not logical processors, for most licensing purposes and for the consideration of maximum number supported. The exception to this is the Hyper-V role of Windows Server 2008 R2, which supports a maximum of 64 logical processors for a single physical server.

### Second Level Address Translation

Windows Server 2008 R2 adds support for the enhanced memory management capabilities of the newest Intel and AMD processors. AMD calls this Rapid Virtualization Indexing (RVI) and Intel calls it Enhanced Page Tables. In both cases, it allows the Hyper-V hypervisor to manage memory, especially of large-memory virtual machines (VMs), more effectively and with less overhead in the parent partition. Second Level Address Translation (SLAT) works by providing two levels of address translation. The additional page table is used to translate guest “physical” addresses to system physical addresses. Guest operating systems can now be allowed to directly manage their own page tables, without the need for the hypervisor to intercept those calls, reducing the overhead required for the Hyper-V parent to maintain shadow page tables in software.

## Power Consumption

Power consumption, and the carbon footprint it generates, is an ever increasing concern for most information technology (IT) managers these days. The cost of the power itself, along with the resulting cost of cooling to remove the excess heat generated, adds significantly to the overall cost of running a datacenter. Modern server processors have helped improve this by using less actual power per CPU, but this has been offset to some extent by the increasing need for more RAM and more CPUs. Windows Server 2008 R2 helps manage the overall power consumption of datacenters in several ways, including the following:

- **Server consolidation** Windows Server 2008 R2 supports more logical processors per physical Hyper-V host, giving you the ability to consolidate more workloads onto fewer physical servers.
- **Core parking** Windows Server 2008 R2 is able to take advantage of the ability of modern processors to dynamically enable and disable processor cores. When Windows Server recognizes that processors are being underutilized, it turns off or parks processor cores that aren't needed, reducing power consumption. When processor demand increases, Windows Server 2008 R2 reenables cores as necessary to maintain system performance.
- **Group Policy management of P-states** Windows Server 2008 R2 utilizes Group Policy to change the Advanced Configuration and Power Interface (ACPI) power-performance states (P-states) of the processors to manage the speed and power consumption of the processors.
- **Storage consolidation** Windows Server 2008 R2 is able to better utilize storage area networks (SANs), including booting directly from an SAN, allowing you to centralize and consolidate storage more effectively.

## Clustering

Windows Server 2008 R2 adds a new Cluster Shared Volume (CSV) feature to failover clustering to enable live migration of VMs. CSV volumes enable multiple nodes in the same failover cluster to concurrently access the same logical unit number (LUN). By storing the VHD files for a virtual machine on the CSV, migration of a VM happens without interruption of service. Also new in failover clustering is improved connectivity fault tolerance, and an enhanced cluster validation tool. More on clustering is discussed in Chapter 3, "Hyper-V: Scaling and Migrating Virtual Machines," when we talk about Hyper-V.

## Scalability

A key design goal was to provide higher performance for Windows Server 2008 R2 on similar hardware. Windows Server 2008 R2 features that improve performance and scalability for applications and services include the following:

- Support for larger workloads by adding more servers to a workload (scaling out)
- Support for larger workloads by utilizing or increasing system resources (scaling up)

## Increased Workload Support by Scaling Out

The Network Load Balancing (NLB) feature in Windows Server 2008 R2 allows you to combine two or more computers into a cluster. You can use NLB to distribute workloads across the cluster nodes to support a larger number of simultaneous users. NLB feature improvements in Windows Server 2008 R2 include the following:

- Improved support for applications and services that require persistent connections using the new IP Stickiness feature in NLB clusters
- Improved health monitoring and awareness for applications and services running on NLB clusters

## Installation

Installation of Windows Server 2008 R2 uses the same general steps as Windows Server 2008, with the exception that you won't be prompted for a license key during the installation, as you are with some distributions of Windows Server 2008. We do not cover the detailed step-by-step of Windows Server installation here—that's adequately covered in many places, including [http://technet.microsoft.com/en-us/library/dd540768\(Ws.10\).aspx](http://technet.microsoft.com/en-us/library/dd540768(Ws.10).aspx).

We focus in this section on the various upgrade scenarios and what is and isn't supported. The general rule is that upgrades of the same architecture, language, edition, and platform from Windows Server 2003 SP2, Windows Server 2003 R2, and Windows Server 2008 are supported. Upgrades from beta builds of Windows Server 2008 R2 are not supported, and upgrades from versions of Windows Server prior to Windows Server 2003 SP2 are not supported.

If you are running a 32-bit version of Windows Server, even if the underlying hardware is 64-bit, there is no upgrade available.

The specific supported upgrade scenarios are shown in Table 2-3.

**TABLE 2-3** Supported Upgrade Scenarios for Windows Server 2008 R2

SOURCE VERSION	SUPPORTED TARGET VERSION OF WINDOWS SERVER 2008 R2
<b>FROM WINDOWS SERVER 2003 (SP2, R2)</b>	
Datacenter	Datacenter
Enterprise	Enterprise, Datacenter
Standard	Standard, Enterprise



FROM WINDOWS SERVER 2008	
Datacenter	Datacenter
Datacenter Core	Datacenter Core
Enterprise	Enterprise, Datacenter
Enterprise Core	Enterprise Core, Datacenter Core
Foundation (SP2 only)	Standard
Standard	Standard, Enterprise
Standard Core	Standard Core, Enterprise Core
Web	Standard, Web
Web Core	Standard Core, Web Core

There are a couple of omissions in the upgrade paths that are worth pointing out. There is no upgrade path for Itanium versions of Windows Server—the expectation is that a full, clean install will be performed. There is also no way to upgrade to Windows Server 2008 R2 Foundation. If you have Windows Server 2008 Foundation, which shipped at the SP2 level, you can upgrade to Windows Server 2008 R2 Standard only.

Also, Microsoft does support upgrades from both the Release Candidate (RC) and Interim Development Server (IDS) builds of Windows Server 2008.

Even where it is technically possible and supported to upgrade, in our experience it's always worth considering a clean installation. This is especially true if the server being upgraded has already gone through one or more upgrades to get to its current level.

## Schema Updates

Joining a computer running Windows Server 2008 R2 to an existing Active Directory domain doesn't require an update to the Active Directory schema. However, before you can make a computer running Windows Server 2008 R2 a domain controller, you do need to prepare the forest and the domain that will have an R2 domain controller. To prepare the forest, follow these steps:

1. Log on to the domain controller that holds the Schema Master flexible single master operations (FSMO) role with an account that is a member of the Schema Admins group.
2. Copy the contents of the \Support\Adprep folder on the Windows Server 2008 R2 DVD to a local folder.
3. Open a command prompt *as administrator* and change to the directory where you copied the files.
4. Run the following command:

```
Adprep /forestprep
```

5. Allow the changes to replicate before preparing the domain.

If you're installing Windows Server 2008 R2 into an existing forest, but a new domain, you don't need to do anything else, but if you're installing into an existing domain, you'll need to prepare that domain using the following steps:

1. Log on to the domain controller that holds the Infrastructure Master FSMO role with an account that is a member of the Domain Admins group.
2. Copy the contents of the \Support\Adprep folder on the Windows Server 2008 R2 DVD to a local folder.
3. Open a command prompt *as administrator* and change to the directory where you copied the files.
4. Run the following command:

```
Adprep /domainprep /gpprep
```

5. Allow the changes to replicate before installing the new Windows Server 2008 R2 domain controller.

**MORE INFO** See [http://technet.microsoft.com/en-us/library/cc731728\(Ws.10\).aspx](http://technet.microsoft.com/en-us/library/cc731728(Ws.10).aspx) for more information on Adprep.exe.

## Installation Process

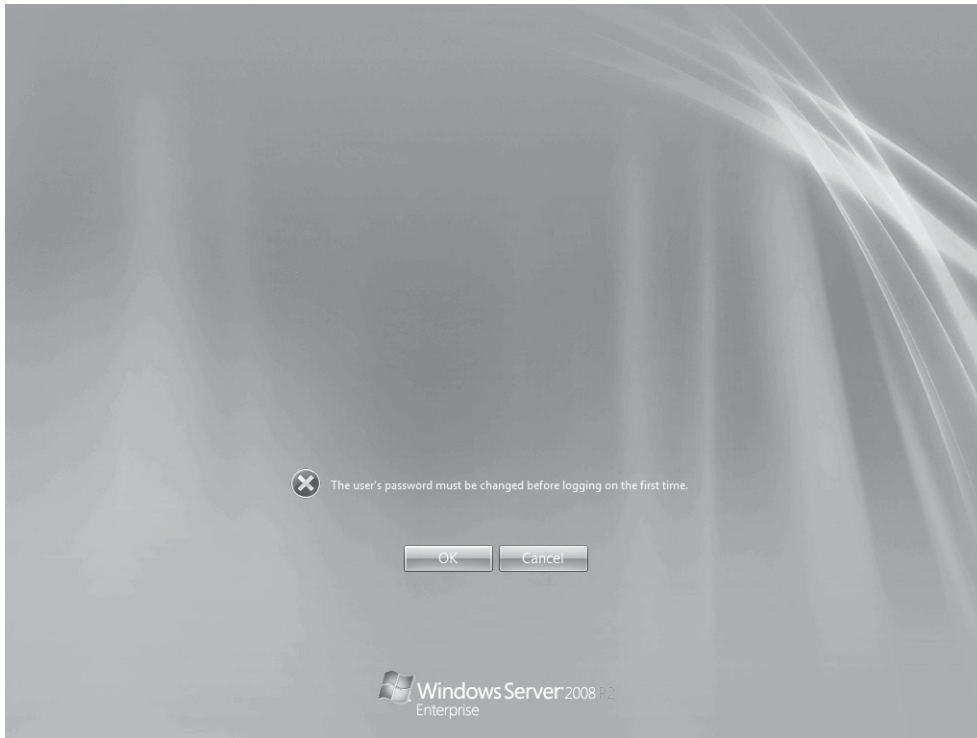
The installer for Windows Server 2008 R2 is the same installer that was introduced with Windows Vista. Before you start the installation on x64 systems, however, you need to verify that you have *digitally signed* drivers for any hardware that will be used on the server. Starting with Windows Server 2008, all drivers for x64 versions of Windows Server must be digitally signed or they will not load during the boot process. This can cause the server to fail to boot, or to have hardware unavailable, so it's a good idea to make sure you have all the drivers you need before you start.

Windows Server 2008 R2 doesn't require a license key to install, but you will need to provide one within 60 days to continue to use the software. As you can see in Figure 2-2, you must choose the edition of R2 you want to install. This choice must match the license key you use to activate the software or activation will fail.

## Configuration

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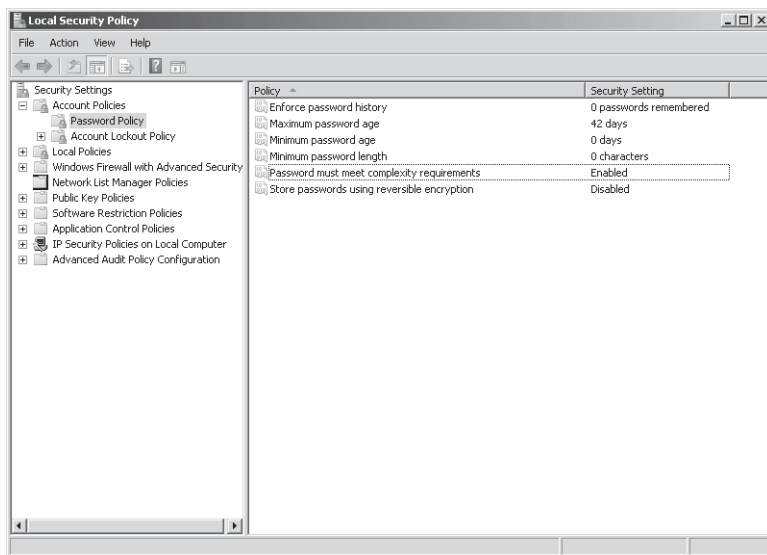
The final step of the Windows Server 2008 R2 installation is setting the password on the Administrator account, as shown in Figure 2-3.



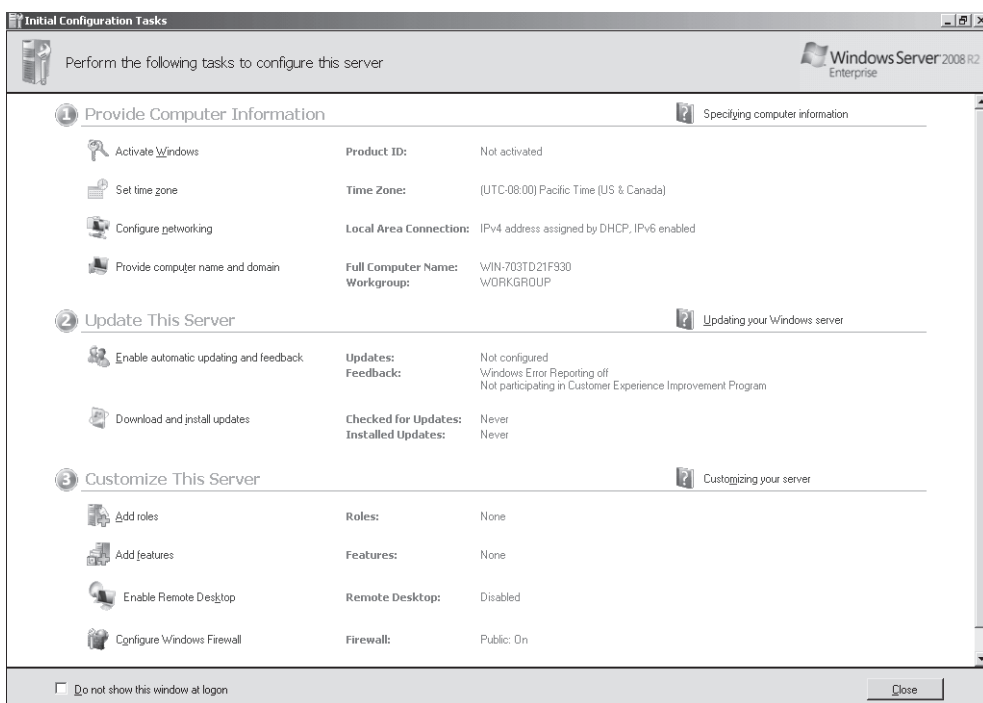
**FIGURE 2-3** Setting the initial Administrator password.

The default password policy for Windows Server 2008 R2 is to require a minimum of six characters, with at least three of the four categories of characters: lowercase, uppercase, numbers, and nonalphanumeric characters. Passwords expire in 42 days, by default. Once a server is joined to a domain, the policies of the domain will apply for domain accounts, but the local security policy will still apply for local accounts, as shown in Figure 2-4.

Once the password is set, you'll see the Initial Configuration Tasks Wizard, as shown in Figure 2-5. This wizard is also known as the Out of Box Experience (OOBE) and is similar to the one from Windows Server 2008, with the addition of the Activate Windows option. The OOBE is a useful wizard for the initial configuration of a server, providing easy access on a single page to most of the tasks you need to get your server up and running.



**FIGURE 2-4** The Local Security Policy controls password policies for local accounts.



**FIGURE 2-5** The Initial Configuration Tasks Wizard, or OOBE.

## Role-Based Configuration

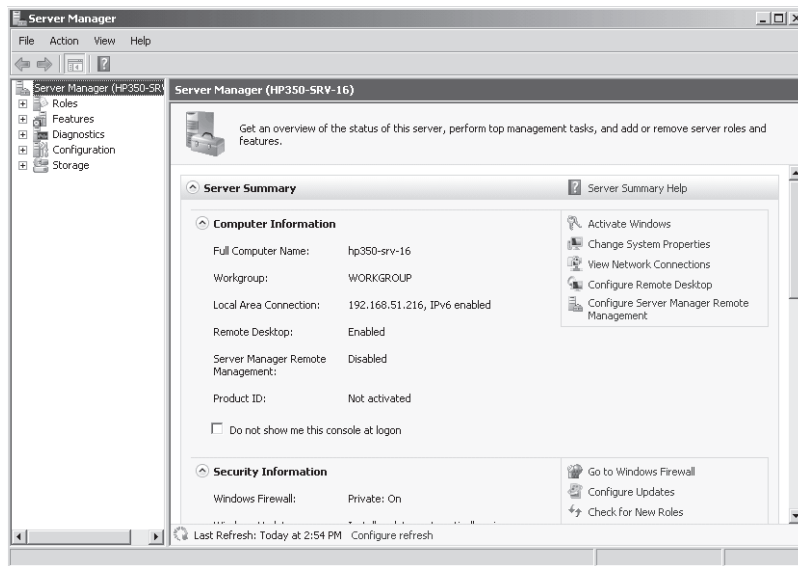
If you're familiar with Windows Server 2008, you'll already have a good start on the role-based configuration that is used in Windows Server 2008 R2, but if you're new to Windows Server 2008, then a quick overview should help. Windows Server 2008 and Windows Server 2008 R2 both use role-based configuration. All the features and roles that are available to the server are physically installed on the server's hard drive, as part of the image-based install. You don't ever have to worry about finding the right DVD for your server if there's an update or you need to add a new feature or role because all the necessary files are already on the hard drive.

When you want to enable specific functionality on the server, you add the *role*, *role service*, or *feature* that includes that functionality. This is an important change that ensures that each role gets only the services and features enabled that are required by the role and no others, limiting the overall attack surface of the server. Enabling the role also configures the Windows Firewall for that role, enabling the role or feature to work without opening up unnecessary ports that could create an unintended security risk.

There are 17 possible roles and 42 different features that can be enabled on Windows Server 2008 R2 Enterprise Edition.

## Server Manager

The primary graphical interface for server management in Windows Server 2008 R2 is the Server Manager console, shown in Figure 2-6.



**FIGURE 2-6** The Server Manager console.

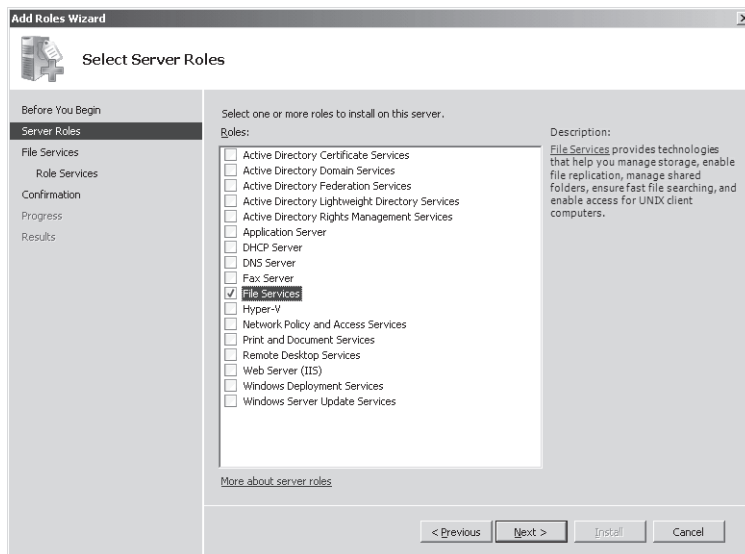
The Server Manager console includes integrated management consoles for the roles and features that are enabled on the server. New in Windows Server 2008 R2 is the ability to run the Server Manager remotely without having to open a Remote Desktop session to the remote server.

Also new in the R2 version of Server Manager are Best Practice Analyzers (BPAs) that are directly integrated into the Server Manager for those roles that have them.

## Adding Roles, Role Services, and Features

Adding a role, role service, or feature in Windows Server 2008 R2 can be done from Server Manager, from the Initial Configuration Tasks Wizard, or from Windows PowerShell. The Server Manager and Initial Configuration Tasks Wizard experience is essentially the same as it was in Windows Server 2008, but the option to use Windows PowerShell is new.

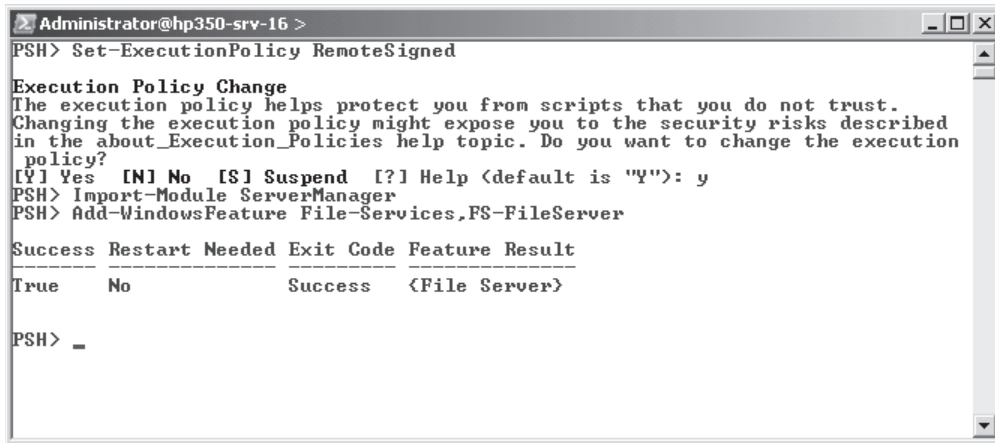
To use Server Manager to add a role or feature, select Server Manager (<servername>) in the tree pane and then, from the Action menu, select Add Roles (or Add Features). To add a role service for an already installed role, highlight that role in the tree pane and, from the Action menu, select Add Role Service. The Add Role Wizard, Add Role Services Wizard, or Add Feature Wizard will open. All three wizards are essentially the same. The Add Role Wizard is shown in Figure 2-7.



**FIGURE 2-7** The Add Role Wizard, with the File Services role selected.

A new alternative that makes it easier to script and automate the configuration of servers is Windows PowerShell. Windows Server 2008 R2 has a new ServerManager module that can be used to add or remove roles, role services, or features. Figure 2-8 shows a Windows PowerShell session that sets the execution policy to only require signing for scripts that originate

remotely, then imports the ServerManager module, and finally adds the File Services role, along with the File Server role service.



```
Administrator@hp350-srv-16 >
PSH> Set-ExecutionPolicy RemoteSigned

Execution Policy Change
The execution policy helps protect you from scripts that you do not trust.
Changing the execution policy might expose you to the security risks described
in the about_Execution_Policies help topic. Do you want to change the execution
policy?
[Y] Yes  [N] No  [S] Suspend  [?] Help (default is "Y"): y
PSH> Import-Module ServerManager
PSH> Add-WindowsFeature File-Services,FS-FileServer

Success Restart Needed Exit Code Feature Result
-----
True      No              Success    {File Server}

PSH> _
```

**FIGURE 2-8** Adding the File Services role using Windows PowerShell.

## Windows Server Core

The option to choose a minimal environment for running specific server roles was a very new installation option in Windows Server 2008, and that option has been enhanced in Windows Server 2008 R2 with the addition of Active Directory Certificate Services as a role, and the inclusion of Windows PowerShell as a supported feature.

Server Core is an installation option, not a separate edition of Windows Server 2008 R2. You can install Server Core regardless of which edition you are installing—it's really just a decision about interface and functionality.

## Configuring Server Core

Configuring and managing a Server Core installation is a bit different than a full installation of Windows Server 2008 R2. The initial configuration is especially different because the Initial Configuration Tasks Wizard isn't available. Once the server is configured, however, you can use standard remote management tools to manage the roles and features on the server, including using Server Manager.

The following steps outline how to perform a basic Server Core configuration to give the server a fixed Internet Protocol (IP) address and join it to the domain. These instructions assume you've completed the basic installation and set the default administrator password, and you are now staring at the blank Cmd.exe prompt shown earlier in Figure 2-1. Use the commands shown in Figure 2-9 to configure the network adapter for a fixed IP address of 192.168.51.4 with a Domain Name System (DNS) server at 192.168.51.2.



```
Administrator: C:\Windows\system32\cmd.exe

C:\>netsh interface ipv4 show interfaces

Idx      Met      MTU      State      Name
-----
3         5       1500     connected  Local Area Connection
1         50      4294967295 connected  Loopback Pseudo-Interface 1

C:\>netsh interface ipv4 set address name="3" source=static address=192.168.51.4
mask=255.255.255.0 gateway=192.168.51.1

C:\>netsh interface ipv4 add dnsserver name="3" address=192.168.51.2 index=1

C:\>
```

FIGURE 2-9 Setting a fixed IP address.

Now, join the server to the example.local domain using the following command:

```
Netdom join %computername% /domain:example.local /userd:example\Charlie /passwordd:*
```

Restart the server using **shutdown -r** and log back in with a domain administrator account to confirm that the domain join went as expected. Once you're back at the inspiring Server Core command line, you need to rename the computer something a bit more memorable than the random name given it during the initial install. The command to do this is Netdom again:

```
Netdom renamecomputer %computername% /newname:<yournamehere>
```

Answer Yes at the prompt, and then restart the computer after the rename and log back in with a domain administrator account.

Now, configure the firewall for remote administration and enable remote management through the firewall, using the commands shown in Figure 2-10.

```
Administrator: C:\Windows\system32\cmd.exe

C:\Users\Charlie>netsh advfirewall set currentprofile settings remotemanagement
enable
Ok.

C:\Users\Charlie>netsh advfirewall firewall set rule group="Remote Administration" new enable=yes

Updated 3 rule(s).
Ok.

C:\Users\Charlie>
```

FIGURE 2-10 Enabling remote management.