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Susan Snedaker

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Contents

Foreword

Any IT professional who's been in the business more than 15 minutes knows that the only constant is change. Staying up-to-date on computing technologies is an unrelenting process. Those that thrive in this industry are those that enjoy continuous learning and new challenges. That said, it's still a daunting task to keep on top of fast-changing technology. From worms and viruses to storage area networks to Wi-Fi, today's IT professional has to constantly take in vast amounts of data, sort through it for relevant pieces, and figure out how to apply it to his or her own network.

Windows Server 2003 is based on the technologies introduced or enhanced in Windows 2000. This updated operating system contains all the technological updates you'd expect, as well as a determined effort by Microsoft to improve security. Out of the box, Windows Server 2003 is more secure than any previous Microsoft operating system. It's locked down, it doesn't install unnecessary components, and it requires activation or enabling of some key features that are installed by default. Overall, this operating system is the most stable, secure operating system Microsoft has built. The focus on security is evident and anyone running a Windows-based network should take a serious look at upgrading to this new version – not only to take advantage of the new features such as support for the latest protocols, but to improve overall security.

This book is designed to give you the best of the best. Each chapter was specifically selected to provide both the depth and breadth needed to work effectively with Windows Server 2003 without extraneous or irrelevant information. Of course, it would be easy to fill volumes on Windows Server 2003 and the technologies that go into this operating system. What we've done instead is focus on what you really

need to know to plan, install, manage and secure a Windows Server 2003 network. You won't find arcane references to the technical specifications of RFC 2460 (IPv6 for those of you who were about to jump to the IETF website or geekier still, those who have the RFC index file on their desktop). What you will find is accurate, focused technical information you can use today to manage your Windows Server 2003 systems and networks. You'll find a practical blend of technical information and step-by-step instructions on common Windows Server 2003 tasks. You can read this book from cover to cover and become highly knowledgeable about Windows Server 2003, or you can flip to specific chapters as references for particular tasks. Either way, you'll find this is the best damn Windows Server 2003 book . . . period.

— Susan Snedaker

Many thanks for the good-natured guidance from my editor, Jaime Quigley, at Syngress. Thanks also to my fine friend and mentor, Nick Mammana, who long ago taught me it's both what you say and how you say it that matter. And last, but certainly not least, thanks to Lisa Mainz for being such a techno-geek. I've learned a lot watching you break the rules.

Chapter 1

Overview of Windows Server 2003

In this chapter:

- **What's New in Windows Server 2003?**
- **The Windows Server 2003 Family**
- **Licensing Issues**
- **Installation and Upgrade Issues**
- **Planning Tools and Documentation**

Introduction

The latest incarnation of Microsoft's server product, Windows Server 2003, brings many new features and improvements that make the network administrator's job easier. This chapter will briefly summarize what's new in 2003 and introduce you to the four members of the Windows Server 2003 family: the Web Edition, the Standard Edition, the Enterprise Edition, and the Datacenter Edition. We'll also discuss how licensing works with Windows Server 2003, and provide a heads up on some of the issues you might encounter when installing the new OS or upgrading from Windows 2000. We'll look at the tools and documentation that come with Windows Server 2003 to familiarize you with new features in this version of the Microsoft operation system.

Windows XP/Server 2003

Windows XP and Windows Server 2003 are based on the same code and are the client and server editions of the same OS, with the same relationship to one another as Windows 2000 Professional and Windows 2000 Server.

Windows XP is available in four 32-bit editions:

- Windows XP Home Edition
- Windows XP Professional
- Windows XP Media Center Edition
- Windows XP Tablet PC Edition

There is also a 64-bit version of XP, designed to run on the Itanium processor.
Windows Server 2003 comes in four editions (discussed later in this chapter):

- Windows Server 2003 Web Edition
- Standard Edition
- Enterprise Edition
- Datacenter Server

Server 2003 comes in both 32-bit and 64-bit versions.

Windows XP introduced a new variation to the 9*x* style GUI. The new interface is called LUNA and is also used by Windows Server 2003. The idea behind LUNA is to clean up the desktop and access everything needed from the Start menu. If you don't care for LUNA, both XP and Server 2003 also support the classic Windows 9x/NT 4.0 style GUI.

What's New in Windows Server 2003?

Windows Server 2003 improves upon previous versions of Windows in the areas of availability, reliability, security, and scalability. Windows 2003 is designed to allow customers to do more with less. According to Microsoft, companies that have deployed Windows 2003 have been able to operate with up to 30 percent greater efficiency in the areas of application development and administrative overhead.

New Features

Microsoft has enhanced most of the features carried over from Windows 2000 Server and has added some new features for Windows Server 2003. For example:

- Active Directory has been updated to improve replication, management, and migrations.
- File and Print services have been updated to make them more dependable and quicker.
- The number of nodes supported in clustering has been increased and new tools have been added to aid in cluster management.
- Terminal Server better supports using local resources when using the Remote Desktop Protocol.
- IIS 6.0, Media Services 9.0, and XML services have been added to Windows Server 2003.

- New networking technologies and protocols are supported, including Simple Object Access Protocol (SOAP), Web Distributed Authoring and Versioning (WebDAV), IPv6, wireless networking, fiber channel, and automatic configuration for multiple networks.
- New command-line tools have been added for easier administration.
- Software Restriction Policies allow administrators to control which applications can be run.
- All features of Windows have been updated to reflect Microsoft's security initiative.

New Active Directory Features

Active Directory was first introduced in Windows 2000 and Microsoft has made improvements to AD in Windows Server 2003. Windows 2003 enhances the management of Active Directory. There are more AD management tools now and the tools are easier than ever to use. Microsoft has made it painless to deploy Active Directory in Windows 2003. The migration tools have been greatly improved to make way for seamless migrations.

In the corporate world where mergers and acquisitions are common, things change all the time. With Windows Server 2003, you can rename your domains, a feature missing from Windows 2000. You can also change the NetBIOS name, the DNS name, or both.

Another problem with changes in the business environment is the need to configure trust relationships. With Windows 2000, if two companies merge and each has a separate Active Directory, they have to either set up manual nontransitive trusts between all of their domains or collapse one forest into the other. Neither of these is an ideal choice and is prone to error. The trusts are easy enough to set up, but then you lose the benefits of being in a single forest. Collapsing forests can require a lot of work, depending on the environment.

Windows Server 2003 Active Directory now supports forest-level trusts. By setting the trusts at the forest roots, you enable cross-forest authentication and cross-forest authorization. Cross-forest authentication provides a single sign-on experience by allowing users in one forest to access machines in another forest via NTLM or Kerberos (Kerberos is the preferred method, if all systems support it). Cross-forest authorization allows assigning permissions for users in one forest to resources in another forest. Permissions can be assigned to the user ID or through groups.

Not all improvements have to do with mergers and multiple forests. In the past, it was common practice for companies with many offices spread out geographically to build their domain controllers locally and ship them to the remote offices. This was because of replication issues. When a new domain controller is created, it must pull a full copy of the Active Directory database from another domain controller. This full replication can easily oversaturate a slow network link. However, with Server 2003, you can create a new domain controller and pull the Active Directory information from your backup media. The newly created domain controller now only has to replicate the changes that have occurred since the backup was made. This usually results in much less traffic than replicating the entire database.

The Active Directory Users and Computers tool (ADUC) has been improved to include a new query feature that allows you to write filters for the type of objects you want to view. These queries can be saved and used multiple times. For example, you might want to create a query to show you

all of the users with mailboxes on a specified Exchange server. By creating a query, you can easily pull up a current list with one click of the mouse. ADUC also now supports the following:

- Multi-object selection
- Drag-and-drop capabilities
- The ability to restore permissions back to the defaults
- The ability to view the effective permissions of an object

Group policy management has also been enhanced in Server 2003. The Microsoft Group Policy Management Console (GPMC) makes it easy to troubleshoot and manage group policy. It supports drag-and-drop capabilities, backing up and restoring your group policy objects (GPOs), and copying and importing GPOs. Where the GPMC really shines is in its reporting function. You now have a graphical, easy-to-use interface that, within a few clicks, will show you all of the settings configured in a GPO. You can also determine what a user's effective settings would be if he or she logged on to a certain machine. The only way you could do this in Windows 2000 was to actually log the user on to the machine and run *gpresult* (a command-line tool for viewing effective GPO settings).

In Windows Server 2003, the schema can now be redefined. This allows you to make changes if you incorrectly enter something into the schema. In Windows 2000, you can deactivate schema attributes and classes, but you cannot redefine them. You still need schema admin rights to modify the schema, but now it is more forgiving of mistakes.

The way objects are added to and replicated throughout the directory has been improved as well. The Inter-Site Topology Generator (ISTG) has been improved to support a larger number of sites. Group membership replication is no longer "all or nothing" as it was in Windows 2000. In Windows Server 2003, as members are added to groups, only those members are replicated to your domain controllers and global catalog (GC) servers, rather than the entire group membership list. No more worrying about the universal group replication to your GC servers.

Every domain controller caches credentials provided by GC servers. This allows users to continue to log on if the GC server goes down. It also speeds up logons for sites that do not have a local GC server. No longer is the GC server a single point of failure. In fact, you no longer are required to have one at each site.

Active Directory now supports a new directory partition called the application partition. You can add data to this partition and choose which domain controllers will replicate it. This is useful if you have information you want to replicate to all domain controllers in a certain area, but you do not want to make the information available to all domain controllers in the domain.

Improved File and Print Services

Practically every organization uses file and print services, as sharing files and printers was the original reason for networking computers together. Microsoft has improved the tools used to manage your file system by making the tools run faster than before; this allows users to get their jobs done in less time and requires less downtime from your servers. The Distributed File System (Dfs) and the File Replication Service (FRS) have also been enhanced for Windows Server 2003, and Microsoft has made printing faster and easier to manage.

Enhanced File System Features

Windows 2003 supports WebDAV, which was first introduced in Exchange 2000. It allows remote document sharing. Through standard file system calls, clients can access files stored on Web repositories. In other words, clients think they are making requests to their local file systems, but the requests are actually being fulfilled via Web resources.

Microsoft made it easier to manage disks in Windows Server 2003 by including a command-line interface. From the command line, you can do tasks that were only supported from the GUI in Windows 2000, such as managing partitions and volumes, configuring RAID, and defragmenting your disks. There are also command-line tools for extending basic disk, file system tuning, and shadow copy management.

Disk fragmentation is a problem that commonly plagues file servers. This occurs when data is constantly written to and removed from a drive. Fragmented drives do not perform as well as defragmented drives. Although Windows 2000 (unlike NT) included a disk defragmentation tool, it was notoriously slow. To address this, Microsoft beefed up the defragmenter tool in Windows Server 2003 so that it is much faster than before. In addition, the new tool is not limited to only specific cluster sizes that it can defrag, and it can perform an online defragmentation of the Master Fat Table.

The venerable CHKDSK (pronounced "check disk") tool, which is used to find errors on Windows volumes, has been revamped as well. Microsoft studies show that Windows Server 2003 runs CHKDSK 20 to 35 percent faster than Windows 2000. However, since Windows 2003 (like Window 2000) uses NTFS—which is less prone to errors than FAT file systems—you shouldn't have to run CHKDSK often.

Both the Dfs and the FRS have been improved. Dfs allows you to create a single logical tree view for multiple servers, so that all directories appear to be on the same server. However, they are actually on separate servers. Dfs works hand in hand with Active Directory to determine site locations for clients requesting data, thereby allowing clients to be directed to a server closest to them in physical proximity. FRS is used to replicate Dfs file share data. FRS now allows administrators to configure its replication topology and compress replication traffic.

One of the best file system improvements in Windows 2003 is shadow copies. After you enable shadow copies on the server and install the shadow copy client software on the desktop computer, end users can right-click on a file and view previous versions that were backed up via shadow copies. They can then keep the current version of the file or roll back to an early version. This will remove the burden (to some extent) of simple file restores from your IT staff and allow the users to handle it themselves.

Improved Printing Features

Even though we rely more on electronic communications than ever before, printing is still an important requirement for most companies. One of the more common reasons for small companies to put in a network is for the purpose of sharing printers (a shared Internet connection and e-mail are two other reasons). Microsoft has taken many steps to improve the printing experience in Windows Server 2003. Users who print long documents should notice a performance boost over Windows 2000, because 2003 does a better job of file spooling, print jobs should get to the printer faster.

Microsoft has also made printing easier to manage. Windows Server 2003 has command-line utilities for managing printer configuration, including print queues, print jobs, and driver management. System Monitor has counters for managing print performance.

Installing printers is easy in Windows 2003 because of plug-and-play (PnP) functionality. This allows you to physically connect the printer to the machine and have Windows set it up for you automatically (as long as the printer itself supports PnP). Windows 2003 supports over 3800 new print drivers.

Revised IIS Architecture

Internet Information Services (IIS) is Microsoft's Web server product. IIS 6.0 is included with all versions of Windows Server 2003. With this new version, Microsoft has made great leaps in the area of IIS reliability, availability, management, and security.

IIS 6.0 was designed so a problem with one application won't cause the server or other applications running on the server to crash. It provides health monitoring and disables Web sites and applications that fail too frequently within a defined period of time. IIS 6.0 can stop and restart Web sites and applications based on customized criteria (such as disk, CPU, or memory utilization). IIS 6.0 allows changing the configuration of your Web server without having to restart it. It is the most scalable version of IIS to date, supporting more Web sites on a single server than IIS 5.0. The actual IIS services stop and start much faster than before, helping to decrease Web site downtime.

Management of your Web server is easier in Server 2003, thanks to command-line scripting. The metabase is now stored in a plain-text XML configuration file. This improves backing up, restoring, recovering, troubleshooting, and directly editing the metabase. IIS 6.0 supports ASP .NET, .NET Framework, and a wide variety of languages. Since the .NET Framework doesn't depend on a specific language, almost any programming language will do.

One common complaint about Windows 2000 was that IIS installed by default; thereby creating an instant vulnerability on servers that were never intended to be Web servers. Microsoft recommends that you only install IIS when needed and lock it down so it only offers the services that your organization requires. In Windows Server 2003, IIS is not installed by default and is locked down by default when you do install it. This means that it will only deliver static content, unless you specifically configure it for dynamic content. IIS 6.0 requires an administrator to add necessary dynamic extensions to the Web services extensions list. Until they are added to this list, IIS will not support them; this will stop attackers from calling unsecured dynamic pages.

Enhanced Clustering Technology

A cluster is a group of servers that work together like one computer. Clusters can be used for performance reasons (to balance the load across two or more computers) or for fault tolerant reasons (to provide failover if one computer fails).

Microsoft added clustering support to its OS line in 1997 with Windows NT 4.0 Enterprise Edition. At that time, clustering was not commonly used. Only the really big IT shops could afford to put in clustered solutions because of the cost of the extra servers. Now that hardware has dropped in price, more and more customers are choosing to cluster their mission-critical systems. As Storage Area Networking (SAN) technology becomes more widespread, clusters are becoming fairly easy to set up. Like Windows 2000, Windows 2003 supports two types of clustering: Microsoft Cluster Service (MSCS) and Network Load Balancing (NLB).

Microsoft Cluster Service

MSCS uses two or more physically connected servers, called *nodes,* that communicate with each other constantly. If a node detects that another node is offline, it will take over the services provided by the offline node. However, this happens behind the scenes, and end users are unaware of the process (other than experiencing a small initial delay).

MSCS is traditionally used with mail servers, database servers, and file and print servers. MSCS is supported in Windows Server 2003 Enterprise Edition and Windows Server 2003 Datacenter Edition. Some of the new features of Windows Server 2003 clustering include:

- The support of more nodes in a cluster. Enterprise Edition and Datacenter Edition both support eight nodes.
- Clustering now integrates with Active Directory and creates a computer account for the virtual cluster name.
- Clustered applications can now use Kerberos authentication.

Network Load Balancing

NLB is available in all versions of Windows Server 2003. Unlike MSCS, where only one server offers the services at a time, NLB nodes all offer services at the same time. The NLB cluster is accessed via a virtual name (a name that represents the group of servers as an entity), and whichever server is least busy answers the request (there is a little more to it, but this is good enough for now).

If one server goes offline, there is no transferring of services because all servers offer the services already. When a server goes offline, it is removed from the rotation of servicing requests until it comes back online. NLB is generally used with Web servers, application servers, terminal servers, and streaming media servers. NLB Manager is a new tool in Windows Server 2003 that provides a central point for managing and configuring NLB clusters.

There are many new features for NLB in Server 2003. NLB now supports multiple network interface cards (NICs), allowing a single server to host multiple NLB clusters. You can use virtual clusters to set up different port rules for each cluster IP address, so that each IP address represents a different resource (Web page, application, and so forth). The Internet Group Management Protocol (IGMP) is now supported when NLB is configured in multicast mode. Using IGMP limits cluster traffic on the switch to the ports that have NLB server connected to them. This helps prevent switch flooding. (Switch flooding occurs when every server in an NLB cluster sees every packet addressed to the cluster.) NLB now supports IPSec traffic.

New Networking and Communications Features

Windows Server 2003 adds a number of new networking technologies that enable it to grow with the needs of your business. For example:

- It supports IPv6, which was created to overcome the limited number of addresses in IPv4 (previous versions of NT use IPv4). Windows Server 2003 supports IPv4/IPv6 coexistence through technologies such as Intra-site Automatic Tunnel Addressing Protocol (ISATAP)

and 6to4. Internet and remote access functionality have been enhanced in Windows Server 2003.

- Point-to-Point Protocol over Ethernet (PPPoE) allows making broadband connections to an Internet Service Provider (ISP) without having to load any software.
- Windows can now use IPSec over NAT.
- Remote Authentication Dial-In User Service (RADIUS) has been improved to provide better control over network access and easier troubleshooting of authentication problems.
- Microsoft's implementation of RADIUS, Internet Authentication Service (IAS), can send its logs to a Microsoft SQL Server and it now supports 802.1X authentication and cross-forest authentication.

In Windows 2000, IPSec was not supported through a NAT server. This was a serious drawback for some companies, as it meant they could not VPN through the NAT server using IPSec or the Layer Two Tunneling Protocol (L2TP), which uses IPSec for encryption. This restriction has been removed in Windows Server 2003. Both IPSec connections and L2TP connections using IPSec are supported over NAT when you have a Server 2003 VPN server. This is done using a technology called NAT traversal, or NAT-T. On the client end, the Microsoft L2TP/IPSec VPN client supports NAT-T. It can be downloaded at www.microsoft.com/windows2000/server/evaluation/news/bulletins/l2tpclient.asp and can be installed on Windows 98, ME, and NT 4.0 Workstation.

The Internet Connection Firewall (ICF) functions as a personal software-based firewall and provides protection for computers connected to the Internet or unsecured networks. ICF protects LAN, VPN, dial-up, and PPPoE connections by making it easier to secure your server against attacks. With ICF, only the services that you need to offer are exposed. For example, you can use ICF to filter the network connection of your DNS server so that only DNS requests are passed through. ICF is included with the 32-bit versions of the Standard and Enterprise Editions of Windows Server 2003. It is not included with the Web and Datacenter Editions, or with any of the 64-bit versions.

Improved Security

You might have noticed that Microsoft is paying more attention to concerns about security. Many of the new features discussed thus far relate in one way or another to security. One of the key components of Windows Server 2003 security is the Common Language Runtime (CLR) software engine. It reduces the number of security vulnerabilities due to programming mistakes, and makes sure that applications have appropriate permissions to run and that they can run without any errors.

EFS encrypts files that are stored on NTFS-formatted partitions so that it can only be decrypted by the person who encrypted the file, those with whom he or she shares the file, or a designated recovery agent. The sharing of encrypted files is new to Windows XP/Server 2003. In Windows 2000, this was not possible because only the person who encrypted the file had the correct keys to decrypt it. Now, the person who encrypts the file can choose to give other people the ability to decrypt the file as well, and the file encryption key (FEK) is protected by the public key of each additional person who is given authorization. Encrypted files appear just like normal files in Windows Explorer. However, only authorized users can access them. Anyone else will be denied access. EFS now supports encrypting offline files and storing encrypted files in Web folders.

Microsoft provides a single sign-on environment for users via Credential Manager. Credential Manager provides a secure place for users to store their passwords and X.509 certificates. When a resource is accessed, the correct credentials will be pulled from Credential Manager without prompting the user for action. In large complex environments in which you can have three or four user accounts, this is a great benefit. No longer do you have to key in your domain, username, and password each time; you set it up once and then Credential Manager does all of the work.

You can now control which software can run on a machine via software restriction policies. These policies can be applied at the domain, site, OU, or locally. You define a default security level that either allows or disallows software to run via the Group Policy Object Editor Snap-in. Among other things, software restriction policies can be used to prevent viruses and other harmful programs from running on your PC, and can also be used to limit end users to only running the programs needed for their job.

Windows Server 2003 supports the IEEE 802.1X protocols. This standard allows authorization and authentication of users connecting to Ethernet and wireless local area networks (WLANs). Windows Server 2003 supports authentication via Extensible Authentication Protocol (EAP) methods, such as smart cards.

Auto-enrollment and auto-renewal of certificates makes it easier to quickly deploy smart cards. Certificate Services now supports incremental (a.k.a. delta) Certificate Revocation Lists (CRLs), which means that the server can just push down the changes to the client and not have to push the entire CRL every time.

Another new security feature of Windows Server 2003 is Passport Integration. Passport is integrated with Active Directory and supports mapping AD user accounts to Passport accounts. Users can use Passport for a single sign-on to all of the supported systems.

Better Storage Management

In an effort to keep up with the changing times, Microsoft has greatly increased the level of built-in SAN support in Windows Server 2003. The Virtual Disk Service (VDS) provides a unified interface for multivendor storage devices. VDS discovers the storage devices in your network and gives you a single place to manage them.

You can now create and mount a SAN volume from within Windows. In previous versions of Windows, you had to do this from within your SAN application. Also included in Windows 2003, via the driver development kit, is multipathing input/output (MPIO). MPIO allows up to 32 different paths to external storage (for example, SAN).

Microsoft has also put a lot of work into the backup features of Windows Server 2003. The Volume Shadow Copy Services allows you to create a snapshot (or an exact copy) of volumes on your SAN. Clients can then perform shadow copy restores on their own. In other words, clients can look at a list of shadow copies performed on their data and choose to restore their own data from a given snapshot. *NTBackup* also uses shadow copies to make sure that all open files are backed up.

Improved Terminal Services

Terminal Server allows client workstations to function as terminal emulators. Terminal Services client software is installed on the local workstation, allowing it to connect to the terminal server and receive its own desktop session. Multiple clients can run sessions simultaneously. All processing takes place on the server. The client machine is only responsible for managing the keystrokes and mouse

clicks, which are passed over the network to the terminal server via the Remote Desktop Protocol (RDP).

Although RDP is the native protocol for Microsoft Terminal Server and is used with clients running the Windows 2000 Terminal Services client or the XP/2003 Remote Desktop Connection (RDC) client, the Server 2003 terminal server can also be configured to accept connections from Citrix clients using the ICA protocol.

In Windows Server 2003, Remote Administration mode has been renamed to Remote Desktop for Administration and it is installed by default. This works like the Remote Desktop feature in Windows XP. As in Windows 2000, you are still limited to two simultaneous remote desktops at a time. However, there is one improvement: you can now take over the local console session. Terminal Services in Application Server mode is now simply called Terminal Server.

The Windows Server 2003 Terminal Server and Remote Desktop for Administration support more local client devices than in Windows 2000. Now the local client file system, audio output, printers, serial ports, smart cards, and clipboard are supported making it easier for clients to use their local resources while connected to the terminal server. RDP 5.1 is a much more robust client than RDP 5.0 (Windows 2000). It supports display configurations up to 24-bit color at up to 1600x1200 resolution. It also allows customizing the client experience based on available bandwidth. In other words, unnecessary features can be turned off when connecting over a slow link to optimize performance.

Terminal Server is one of the most used features of Windows 2000. It allows users to connect from their local machines and run desktop sessions off of the server. The local workstation at this point is functioning as a "thin client" because all processing is taking place on the server. One common complaint about Terminal Server in Windows 2000 is a lack of support for local resources.

This has been improved in Windows Server 2003. You can now share information easily between your local disk and the server. You no longer must map a drive back to your local workstation. You can print to locally attached printers and use locally attached serial devices. You can redirect the sound from the terminal server to come out of your local speakers. All of these things make using Terminal Server an even more transparent process to the end user.

New Media Services

Microsoft has redesigned Media Services. The version of Media Services in Windows Server 2003 is version 9.0. It is managed via the Windows Media Services Microsoft Management Console (MMC). Media Services provides audio and video content to clients via the Web (Internet or intranet). According to Microsoft, Media Services has been improved in four areas:

- Fast streaming
- Dynamic content
- Extensibility
- Industrial strength

Fast Streaming

Media Services supports fast streaming to ensure the highest quality streaming experience possible even over unreliable networks (for example, wireless networks). Streaming refers to sending video and/or audio in compressed form over the network and playing the data as it arrives. There are four parts that make up fast streaming:

- **Fast start** Supplies instant-on playback without a buffering delay.
- **Fast cache** Supplies always-on playback by streaming to cache as quickly as the network will support and by playing back the stream to the client from cache.
- **Fast recovery** Sends redundant packets to wireless clients to ensure that no data is lost due to connectivity problems.
- **Fast reconnect** Supplies undisturbed playback by restoring connections if the client is disconnected during a broadcast.

Dynamic Content

Media Services supports advertisements and server-side playlists. Advertising support is very flexible, in that ads can be placed anywhere and used as often as wanted in the playlist. You can even use data gathering tools such as cookies to personalize your ads, and all ad data can be logged for further analysis. Server-side playlists are great for clients that don't support client-side playlists. Server-side playlists can contain live data or preexisting content. They allow you to customize the way your content is presented to clients and to make changes quickly and easily without any delay in service.

Extensibility

Microsoft has exposed over 60 Media Services interfaces and their properties, making Media Services a very open platform. Customization can be achieved by using the Microsoft supplied plug-ins or by using the SDK to create your own plug-ins. You can use scripting languages you already know (such as Perl, Visual Basic, Visual Basic Scripting Edition, C, Visual C++, and Microsoft JScript) to customize Media Services.

Industrial Strength

Microsoft boasts that Media Services is the most scalable, reliable, and secure solution on the market today. Media Services in Windows 2003 supports twice as many users per server as Windows 2000. It supports HTTP 1.0/1.1, RTP, RPSP, HTML v3.2, FEC, IPv4/6, IGMPv3, SNMP, WEBM/WMI, SMIL 2.0, SML, SML-DOM, and COM/DCOM. All Media Services plug-ins run in protected memory to guarantee reliability. Many common authorization and authentication methods are supported, such as digital rights management and HTTP Digest. Microsoft provides a Web-based interface, an MMC snap-in interface, and command-line support for administering your media servers.

XML Web Services

XML Web Services are building-block applications that connect together via the Internet. These services provide reusable components that call functions from other applications. It doesn't matter how

these applications were built, the types of devices used, or the OS on the devices used as long as they support XML, because XML is an industry standard. XML Web Services are made available in Windows Server 2003 because of the .NET framework. XML Web Services help provide effective business-to-business (b2b) and business-to-consumer (b2c) solutions.

The Windows Server 2003 Family

The Windows Server 2003 family comes in four different editions: Web Edition, Standard Edition, Enterprise Edition, and Datacenter Edition. It also comes in both 32-bit and 64-bit versions.

Why Four Different Editions?

Although all organizations are different, most would fall into one of three categories: small, medium, and large. The networking needs of organizations in each of these categories are different.

Typically, small organizations are concerned with performance versus cost. They want good performance, but it can't cost a fortune. Large companies want the best performance possible. They aren't as concerned with cost, as long as the product performs as expected. Medium-sized companies fall somewhere in the middle. They sometimes need a little more out of an OS than what a small company will settle for, but they don't need the high-end equipment and features used by very large companies.

Microsoft has tried to create a different edition of Windows for each type of organization, so that all companies can use Windows Server 2003 without overpaying or sacrificing performance. Companies should buy the minimum version of Windows that provides all of the needed features.

Members of the Family

As noted, there are four editions of Windows Server 2003: Web Edition, Standard Edition, Enterprise Edition, and Datacenter Edition. Each edition has its own benefits:

- Web Edition is the least expensive and least functional version. However, if your server is only used for hosting Web pages, then it is a perfect choice.
- Standard Edition is the next step up from Web Edition. Most of the features in Windows Server 2003 are supported in Standard Edition.
- If you need features not provided by Standard Edition or hardware not supported on Standard Edition, then Enterprise Edition would be the next logical choice. Almost every feature in Windows Server 2003 is supported in Enterprise Edition.
- If you need to use Windows System Resource Manager or you need super powerful hardware, then Datacenter Edition is your only choice.

Be sure to pick the version that most closely matches your needs. There are huge differences in price as your work your way up the chain. There is no reason to pay for more than what you need, but you don't want your organization hobbled by limited functionality.

Web Edition

Prior to the release of Windows 2003, if you wanted to have a Windows server function only as a Web server, you would have to buy a copy of Windows 2000 Server and use IIS. This was a waste of money and functionality, because most of the features of Server would never be used. Now there is a version of Windows designed to function exclusively as a Web server, Windows Server 2003 Web Edition. This will save companies a great deal of money and possibly give Microsoft a larger share of the Web server market. There is a difference in price (list price) of around $700 to $800 between Web Edition and Standard Edition Server.

Web Edition is meant to host Web pages, Web applications, and XML services. It supports IIS 6.0, ASP.NET, and .NET Framework. Web Edition supports up to two processors and 2GB of RAM. Client access licenses (discussed later in the chapter) are not required when connecting to Web Edition. However, you are only allowed 10 inbound simultaneous SMB connections, to be used for content publishing (this limit does not apply to Web connections). Web Edition allows you to install third-party Web server software such as Apache, Web availability management software such as Microsoft Application Center, and database engine software such as Microsoft SQL Server 2000 Desktop Engine (MSDE).

Web Edition does *not* support the following functions:

- Internet Authentication Services (IAS)
- Microsoft Metadirectory Services
- Domain controller functionality
- Universal Description, Discovery, and Integration Services (UDDI)
- Remote Installation Services

Standard Edition

Windows Server 2003 Standard Edition is the replacement for Windows 2000 Server. It is meant for small to medium-sized businesses and contains most of the features discussed thus far in the book. It is not limited in functionality like Web Edition and it supports up to four CPUs and 4GB of RAM. Standard Edition is a great choice for file and print servers, Web servers, and application servers that don't need to be clustered. It can also function as a domain controller. Microsoft expects Standard Edition to be the most widely used version of Windows Server 2003.

Enterprise Edition

Windows Server 2003 Enterprise Edition is the replacement for Windows 2000 Advanced Server. Enterprise Edition is meant for any sized business, but includes features most often desired by enterprise-level organizations. It provides high performance and reliability. All of the features supported in Standard Edition are supported in Enterprise Edition, as well as support for clustering up to eight nodes. It supports more powerful hardware than Standard Edition, and can use up to eight processors and up to 32GB of memory. There is a 64-bit version of Enterprise Edition for Intel Itanium machines. The 64-bit version supports up to eight processors and up to 64GB of RAM. Enterprise Edition is good for companies that need features or hardware not supported in Standard Edition.

Datacenter Edition

Datacenter Edition is Microsoft's high-end OS. It is meant for companies that need the most reliable and scalable platform available. You cannot buy the Datacenter Edition software and install it yourself; only approved equipment vendors can buy it and they must install it onto approved hardware. Datacenter Edition contains all of the features found in both Standard Edition and Enterprise Edition; in addition, it adds the Windows System Resource Manager to aid in system management. Datacenter Edition supports up to 32 processors and 64GB of memory in the 32-bit version. The 64-bit version supports up to 64 processors and 512GB of memory. If performance and reliability are at the top of your list (and cost is near the bottom), then Datacenter Edition is an excellent choice.

Licensing Issues

Microsoft based the Windows Server 2003 licensing structure on Windows 2000's structure. However, they have changed some things. This section is not the final word when it comes to Microsoft licensing. This section is meant to serve as a guide on the basics of Windows 2003 licensing. To order licenses, contact your Microsoft Software Advisor. In the United States, call (800) 426-9400, or visit the Microsoft Licensing Program Reseller Web page (http://shop.microsoft.com/helpdesk/mvlref.asp). In Canada, call the Microsoft Resource Centre at (877) 568-2495. Outside of the United States and Canada, please review the Worldwide Microsoft Licensing Web site (www.microsoft.com/worldwide).

There are a few rules that you need to know about Microsoft's licensing schemes:

- You have to purchase a product license for every copy of the OS you are going to install.
- Every network connection that is authenticated requires a Windows Client Access License (CAL). Anonymous connections do not require a CAL (for example, anonymous access to a Web page). Windows CALs are not required for Windows 2003 Web Edition, as it is meant to serve Web content only.
- Every Terminal Server session made by a user or device requires a Terminal Server Client Access License (TS CAL). TS CALs are not required for Windows Server 2003 Web Edition, as it is meant to serve Web content only.

The product license allows you to install the OS onto a machine. The CAL allows devices or users to connect to that machine. Microsoft's reasoning behind this is that everyone pays the same price for the base OS, but companies with more connections pay more than companies with fewer connections. This allows them to price according to usage.

There are two licensing modes supported in Windows 2003:

- **Per Server mode** Requires a Windows CAL for each connection. These are assigned to each server and cannot be shared between servers. You are allowed one connection for each CAL assigned to the server. Once the maximum number has been reached, no more connections are allowed.

- **Per Device or Per User mode (formerly called "Per Seat" mode)** Requires that each device or user have its own Windows CAL. These allow the device or user to connect to an unlimited number of servers. With Per Device or Per User mode, the server will not limit the number of connections made as it does in Per Server mode.

Generally, Per Server mode will be most cost effective if you have only one or two servers, and clients that don't always connect at the same time. Per Device or Per User mode will be most cost effective if you have many servers to which your clients need to connect.

Microsoft has two types of CALs, User CALs and Device CALs. User CALs are purchased for every user that makes a connection to a Windows 2003 server. Device CALs are purchased for every machine that makes a connection to a Windows 2003 server. Microsoft recommends that you use either User CALs or Device CALs, but not both at the same time. User CALs are best when you have more machines than users and your users log on to multiple machines to access the servers. Device CALs are better when you have more employees than machines and your users share machines. User CALs and Device CALs are available for both Windows and Terminal Server. Device CALs and User CALs cost the same.

Windows 2000 supported the System Equivalency license for Terminal Server. The System Equivalency license stated that if your client was running the same OS version as the terminal server, then you did not have to buy a Terminal Server CAL (thus, a Windows 2000 Pro machine connecting to a Windows 2000 terminal server did not need a TS CAL). Windows 2003 no longer supports System Equivalency licenses. However, Microsoft does have a Terminal Server licensing transition plan. You can receive a free TS CAL for every copy of Windows XP that you own at the time of the Windows 2003 launch (April 24, 2003). Check out the Microsoft licensing page for more information (www.microsoft.com/licensing).

New to Windows 2003 is the External Connector (EC) license. ECs enable external users to access your server without requiring that you buy CALs for them. External users are people who are not employed by your company. Terminal Server also has an EC license called the Terminal Server External Connector (TS-EC). The EC license is replacing the Internet Connector and TS Internet Connector licenses.

Product Activation

Starting with Windows XP, Microsoft requires OSs to be authorized before a specified number of days pass, after which you won't be able to log on to the OS. Failure to activate only prevents logging on. Services and remote administration are not affected. Windows Server 2003 allows a 30-day grace period for product activation (for retail and OEM products). Companies that use volume licensing do not have to activate their software.

Windows includes an activation wizard. You can activate over the Internet or by phone. One important thing to remember about product activation is that the activation process keeps track of the hardware in your machine. If the hardware changes dramatically, you will have to reactivate your software within three days in order to continue logging on to the server. Microsoft does this to prevent people from purchasing one copy of the OS, activating it, making an image of it, and deploying that image to many more machines.

Installation and Upgrade Issues

Unless your company is buying its first Windows server, you are going to have to decide between upgrading and performing a clean install. Each method has advantages and disadvantages:

- Upgrading preserves many of your existing settings, such as users and groups, permissions and rights, and applications.
- Performing a clean installation can improve the performance of your hard drive, as it will be reformatted during installation. This also gives you a chance to change the partition and volume sizes used on your drives. Clean installs ensure that you don't carry over any existing problems that you might have with your current OS. Some administrators (the authors of this book included) prefer clean installs because they have seen many problems related to OS upgrades in the past. There is something comforting about starting from scratch.

Common Installation Issues

The biggest problems with installing a new OS are hardware and software incompatibilities. It is important to adhere to the recommended hardware specifications for Windows Server 2003. At a minimum, you need the following hardware configuration:

- 133 MHz processor
- 128MB of RAM
- 1.5GB hard drive

Remember that these are the bare minimums on which Windows Server 2003 will run. Obviously, on such old hardware, performance will suffer. Microsoft recommends at least a 550 MHz processor and 256MB of RAM. The more RAM the better.

You should always verify hardware compatibility before you start your installation. There is a system compatibility check you can run from the Windows Server 2003 CD that will check out your hardware for you automatically via the System Compatibility wizard. Even if all of your hardware is supported, you should always update your machine's BIOS to the most recent version.

Common Upgrade Issues

As stated earlier, you should always verify hardware compatibility and BIOS versions. You should always back up your existing system before you start your upgrade. If you have applications on your server, you should read the release notes on application compatibility. These are found in the docs folder on the setup CD (relnotes.htm).

When upgrading servers from NT 4.0 to Windows Server 2003, you must have Service Pack 5 or higher installed. You can perform upgrades from all server versions of NT 4.0 (Server, Enterprise Edition, and Terminal Server Edition). Upgrading Windows 2000 machines to Windows Server 2003 doesn't require any service packs to be installed first. Windows 2000 Server can be upgraded to Windows Server 2003 Standard Edition or Enterprise Edition. However, Windows 2000 Advanced Server can only be upgraded to Windows Server 2003 Enterprise Edition, and Windows 2000

Datacenter Server can only be upgraded to Windows Server 2003 Datacenter Edition. You must have at least 2GB of free hard drive space for all upgrades.

When upgrading Windows NT 4.0 domains to Windows Server 2003 domains, you must first make sure that DNS is installed and properly configured. You don't have to use a Microsoft DNS server, but your implementation of DNS must support service (SRV) records. Optionally, you might want it to support dynamic updates as well. If DNS does not support dynamic updates, you will have to manually create all of the needed SRV records. Before starting the upgrade, you should take one of your BDCs offline. This will allow you to roll back to your existing NT 4.0 environment if you should have problems with the upgrade. Always start your upgrades with the PDC, followed by the BDCs. After upgrading the PDC, you should set your forest functional level to Windows 2003 interim mode.

When upgrading Windows 2000 domains, you must first prepare the forest and the domain for Windows Server 2003 by using the ADPrep tool. You can prepare the forest by running *adprep.exe /forestprep* on the Schema Master, and you can prepare the domain by running *adprep.exe /domainprep* on the Infrastructure Master. ADPrep can only be run from the command line; there isn't an equivalent graphical tool. Unlike when you upgrade from NT 4.0 domains, you do not have to upgrade the PDC (technically the PDC Emulator) first. You can install a new Window 2003 domain controller into an existing Windows 2000 domain. When upgrading your domain controllers, you need to budget a little growing room for the Active Directory database. The database file (ntds.dit) might grow by up to 10 percent.

Windows Server 2003 Planning Tools and Documentation

Planning is the first step in building a reliable, secure, high-performance and highly available Windows Server 2003-based network. In this section, we'll begin with an overview of network infrastructure planning, introducing you to planning strategies and how to use planning tools.

This section also looks at legal and regulatory considerations, how to calculate total cost of ownership (TCO), and how to plan for future growth. We discuss how to develop a test network environment and how to document the planning and network design process.

Overview of Network Infrastructure Planning

Proper planning of a network infrastructure is essential to ensuring high performance, availability, and overall satisfaction with your network operations. In order to create a viable network design, you'll need an understanding of both the business requirements of your organization and current and emerging networking technologies. Accurate network planning will allow your organization to maximize the efficiency of its computer operations, lower costs, and enhance your overall business processes.

When planning for a new infrastructure or upgrading an existing network, you should take some or all of the following steps:

- Document the business requirements of your client or organization.