



Chapter 1: Networking with Microsoft Windows 2000 Server



Learning Objectives

- Plan what network model to apply to your network
- Compare the differences between Windows 2000 Professional, Server, Advanced Server, and Datacenter
- Explain Windows 2000 capabilities as a server operating system



Learning Objectives (continued)

- Explain the new features in Windows 2000
- Describe the file systems that are compatible with Windows 2000 and choose the file system that is right for your server

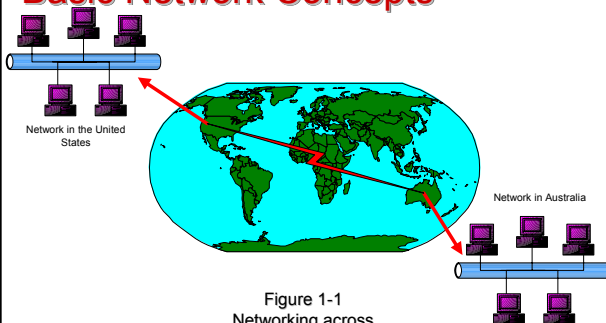


Basic Network Concepts

- Network Operating System (NOS)
 - Software that enables computer users to share computer equipment, software, and data, voice, and video transmissions
- Network
 - A communications system that enables computer users to share computer equipment, software, and data, voice, and video transmissions



Basic Network Concepts



Basic Network Concepts

- Client
 - A computer that accesses resources on another computer via a network or by a direct connection



Basic Network Concepts

● Workstation

- A computer that has its own CPU and may be used as a standalone computer for word processing, spreadsheet creation, or other software applications. It also may be used to access another computer such as a mainframe computer or file server, as long as the necessary network hardware and software are installed.



Peer-to-Peer Network Model

● Peer-to-peer network

- A network where any computer can communicate with other networked computers on an equal or peer-like basis without going through an intermediary, such as a server or host.
- Often used in very small organizations, such as a two to ten person office.



A Simple Peer-to-peer Network

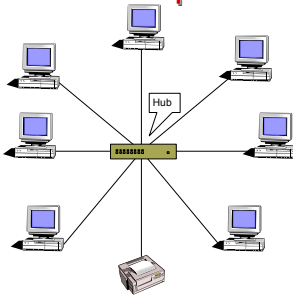


Figure 1-2 A simple peer-to-peer network without a server



Advantages of Peer-to-Peer Networking

- A group of computers can share files, folders, and printers
- Peer-to-peer networking is easy to set up
- Supports using workgroups
 - A Microsoft workgroup is a number of users who share drive and printer resources in an independent peer-to-peer relationship.



Disadvantages of Peer-to-Peer Networking

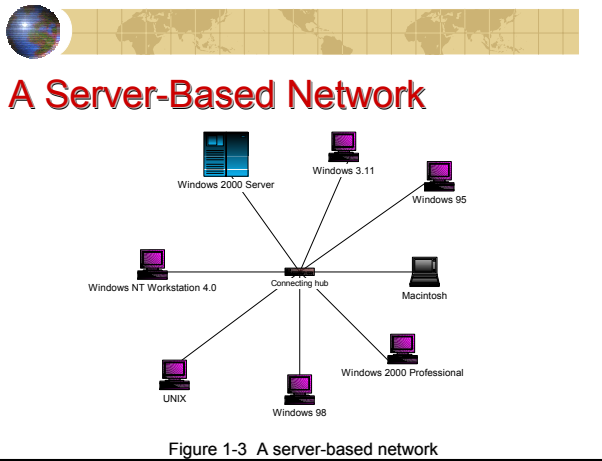
- Offers only moderate network security
- No centralized storage or account management
- Not effective for complex network management
- Not optimized for simultaneous access by over 9 or 10 computers



Server-Based Network Model

● Server-based network

- A model in which access to the network, to resources, and the management of resources is accomplished through one or more servers.
- Used particularly in medium and large organizations.



- ### Advantages of the Server-Based Model
- Provides extensive multiuser access to resources
 - Ideal for coordinated server and network management
 - Provides robust security to network resources
 - Contributes to fast network performance

- ### Disadvantages of the Server-Based Model
- Generally requires more advanced planning than peer-to-peer networking
 - Can be more complex to set up than peer-to-peer networking

- ### Using Windows 2000 Server in a Server-Based Model
- Enables extensive file, folder, and printer sharing
 - Access to resources can be centralized, decentralized, or a combination of both
 - Provides robust management of software applications
 - Provides a strong platform for e-mail, Web services, and e-commerce

- ### Using Windows 2000 Server in a Server-Based Model (continued)
- Enables coordinated backups of network data resources
 - Sharing of computer resources can be arranged to reflect the work patterns of groups within an organization
 - Server administration can save time and money when installing software and software upgrades

- ### Concept: Total Cost of Ownership
- Total Cost of Ownership: The cost of installing and maintaining computers and equipment on a network, which includes hardware, software, maintenance, and support costs.



Windows 2000 Professional

- Designed for workstation use
- Used with Windows 2000 Server to reduce the TCO
- Supports up to two processors
- Handles up to 4 GB of RAM



Windows 2000 Server

- A full featured server operating system
- Supports up to four processors
- Handles up to 4 GB of RAM
- Offers a wide range of services and user connectivity options



Example Windows 2000 Server Services

- Handles virtually unlimited user connections (depending on the hardware)
- Active Directory management
- Network management
- Web-based management services
- Network-wide security management



Example Windows 2000 Server Services (continued)

- Network storage management
- Remote network access
- Terminal services
- Distributed file services
- High-speed network connectivity
- Application services and network printer management



Windows 2000 Server Versions Target Applications

- Windows 2000 Server
 - Provides full server services as a file, print, Web, e-mail, and e-commerce server
- Windows 2000 Advanced Server
 - Intended for high-end enterprise networks that use server clustering
- Windows 2000 Datacenter
 - Intended for large databases



Windows 2000 Server Versions Compared

- Windows 2000 Server
 - Up to 4 processors and 4 GB of RAM
- Windows 2000 Advanced Server
 - Up to 8 processors, 8 GB of RAM, and supports server clustering
- Windows 2000 Datacenter
 - Up to 32 processors, 64 GB of RAM, and supports server clustering



Server Clustering

- Clustering: The ability to share the computing load and resources by linking two or more discrete computer systems to function as though they are one.



Clustering

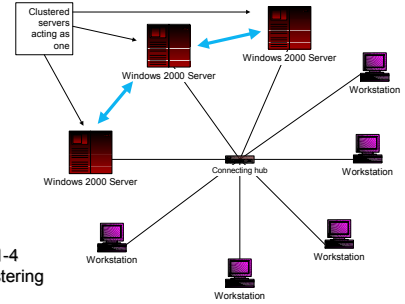


Figure 1-4 Server clustering



Windows 2000 Server Fundamental Capabilities

- Sharing Resources
- Managing Resources
- Scalability and compatibility
- Reliability



Windows 2000 Server Fundamental Capabilities

- Fault tolerance
- Internet integration and e-commerce



Sharing Resources

- Data files and folders
 - Centralized access and fast searches, particularly when the Active Directory is implemented
- Printers
 - Easily configured and published printer resources
- Application Software
 - Network installation or option to run software on the server



Mapped Drive or Folder

- Mapped drive or folder
 - A disk volume or folder that is shared on the network by a server or workstation.
 - It gives designated network workstations access to the files and data in its shared volume or folder.
 - The workstation, via software, determines a drive letter for the shared volume, which is the workstation's map to the data.



Shared Drives

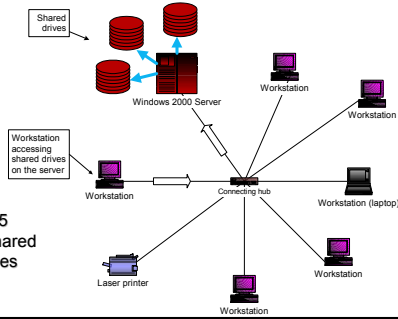


Figure 1-5
Accessing shared server drives



Managing Resources

- Windows 2000 provides a coordinated way to manage network resources
- The Active Directory is one example of a resource management tool



Resource

- Resource: has two meanings depending on the context
 - On an Windows 2000 Server network, a file server, shared printer, or shared directory that can be accessed by users
 - On a workstation or server, a resource is an IRQ, I/O address, or memory that is allocated to a computer component, such as a disk drive or communications port



Security

- Windows 2000 Server is designed to be compatible with the U.S. Government's C2 top secret class of security:
 - File and folder protection
 - Account and network access passwords
 - File, folder, and account auditing
 - Server access protection on a network
 - Server management controls



Concept: Scalability

- Scalable: A computer operating system that can be used on small to large computers, such as those with a single Intel-based processor and larger computers, such as those with multiple processors.



Concept: Symmetric Multiprocessor

- Symmetric Multiprocessor (SMP): A type of computer with two or more CPUs that share the processing load.



Windows 2000 Server Host System Compatibility

- Windows 2000 Server can communicate with many kinds of other host operating systems.
 - IBM mainframe
 - Novell NetWare
 - UNIX
 - Banyan
 - DEC



Windows 2000 Server Client System Compatibility

- Typical operating systems that access Windows 2000 Server as clients are:
 - MS-DOS
 - Windows 3.x, 95/98
 - Windows NT, 2000
 - Macintosh
 - UNIX



Reliability

- Windows 2000 Server is reliable because the kernel operates in privileged mode
- MS-DOS and Windows 16-bit programs run in the virtual DOS machine so they do not impact 32-bit programs and the operating system, which are running at the same time



Concept: Operating System Kernel

- Kernel: An essential set of programs and computer code that allows a computer operating system to control processor, disk, memory, and other functions central to the basic operation of a computer.



Concept: Windows 2000 Privileged Mode

- Privileged mode: A protected memory space allocated for the Windows 2000 kernel that cannot be directly accessed by software applications.



Concept: Virtual DOS Machine

- Virtual DOS Machine: In Windows 2000, a process that emulates an MS-DOS window in which to run MS-DOS or 16-bit Windows programs in a designated area of memory.



Concepts: Multitasking and Multithreading

- Windows 2000 reliability includes multitasking and multithreading.
 - Multitasking: The capability of a computer to run two or more programs at the same time.
 - Multithreading: Running several program processes or parts (threads) at the same time. Windows 2000 uses preemptive multitasking.



Concept: Fault Tolerance

- Fault Tolerance: Techniques that employ hardware and software to provide assurance against equipment failures, computer service interruptions, and data loss.



Example Windows 2000 Fault Tolerance Features

- Recovery from hard disk failures
- Recovery from lost data in a file
- Recovery from system configuration errors
- Protection from power outages
- Advanced warning about system and hardware problems



Internet Integration and Electronic Commerce

- Windows 2000 Server comes with many Internet-related services.
 - Web server
 - Intranet and VPN services
 - Media services
 - HTML and XML compatibility
 - FTP Services



New Windows 2000 Server Features

- Active Directory
 - A Windows 2000 database of computers, users, shared printers, shared folders, and other network resources, and resource groupings that is used to manage a network and enable users to quickly find a particular resource.



New Windows 2000 Server Features (continued)

- Web-based Enterprise Management (WBEM)
 - Standardizes the tools and interfaces used by administrators for a complete picture of the relationship between networks and the devices connected to networks.



New Windows 2000 Server Features (continued)

- Hierarchical Storage Management (HSM)
 - A storage management system that enables administrators to establish storage policies, archiving techniques, and disk capacity planning through automated procedures and the coordinated use of different media including tapes, CD-ROMs, hard drives, and zip drives.



New Windows 2000 Server Features (continued)

- Power management
 - Enables portions of a system, such as a monitor, to “sleep” when they are not in use



New Windows 2000 Server Features (continued)

- International language capability
 - Supports more languages and even multiple versions of the same language, such as English used in Britain or English used in the United States



Concept: FAT16

- Advantages
 - Supported by many small computer systems
 - Low operating overhead
 - Partitions up to 4 GB (in Windows NT or 2000)
 - File sizes up to 2 GB
- Disadvantages
 - Can become corrupted over time
 - Limited file and folder security and no auditing
 - Does not support long filenames



Concept: FAT32

- Advantages
 - More robust than FAT16
 - Enables smaller allocation units than FAT16 (in Windows 2000)
 - Supports volumes up to 32 GB in Windows 2000
 - Supports long file names
- Disadvantages
 - Limited file and folder security and no auditing
 - Cannot decrease cluster size



Concept: NTFS 4

- NTFS 4 is used in Windows NT 4.0 and has the following features
 - Support for long file names
 - Files can be compressed
 - Large file capacity
 - File activity tracking
 - Volume striping and volume extensions



Concept: NTFS 5

- NTFS 5 is used in Windows 2000 and has the following new features
 - Ability to encrypt files
 - No system reboot after creating extended or spanned volumes
 - Ability to reduce drive designations (mount drives)
 - Indexing for fast access
 - Ability to retain shortcuts and other file information when files are transferred between volumes
 - Ability to set disk quotas



CDFS and UDF

- Windows 2000 supports CDFS and UDF
 - Compact disk file system (CDFS) is a 32-bit file system used on standard capacity CD-ROMs.
 - Universal Disk Format (UDF) is a removable disk formatting standard used for large capacity CD-ROMs and DVD-ROMs.



Choosing a File System

- As a general rule, plan to use NTFS unless you need to use FAT16 or FAT32 for backward compatibility on a system, such as for a dual boot system.



Chapter Summary

- Network servers are used in familiar and expected places. One example of a familiar place is as a Web server.
- The use of server-based networks is outpacing peer-to-peer networks.



Chapter Summary

- Windows 2000 Server offers traditional and new server capabilities
 - File and printer sharing
 - C2-compatible security
 - Web and network communications
 - Network management capabilities
 - Active Directory



Chapter Summary

- NTFS is a central feature of Windows 2000 because it offers:
 - Strong security
 - Fault tolerance
 - File compression
 - Indexing
 - Disk quotas and File encryption



Chapter Summary

- Windows 2000 retains backward compatibility with:
 - FAT16
 - FAT32