



CISNTWK-11

Microsoft Network Server

Chapter 1

Introduction to Windows Server 2008



Objectives

- Identify the key features of each Windows Server 2008 edition
- Understand client systems that can be used with Windows Server 2008
- Identify important general features of Windows Server 2008
- Plan a Windows Server 2008 networking model
- Understand and implement networking protocols used by Windows Server 2008

Windows Server 2008 Platforms

- The Windows Server 2008 platforms are as follows:
 - Windows Server 2008 Standard Edition
 - Windows Server 2008 Enterprise Edition
 - Windows Web Server 2008
 - Windows Server 2008 Datacenter Edition
 - Windows Server 2008 for Itanium-Based Systems
 - Windows Server 2008 Standard Edition w/o Hyper-V
 - Windows Server 2008 Enterprise Edition w/o Hyper-V
 - Windows Server 2008 Datacenter Edition w/o Hyper-V

Windows Server 2008 Standard Edition

- The most basic server version on which the other versions are based
- Designed to meet the everyday needs of small to large businesses
- Provides file and print services, secure Internet connectivity, and centralized management of network resources
- Supports multiprocessor computers and multiprocessor clients

Windows Server 2008 Standard Edition (continued)

- **Symmetric multiprocessor (SMP) computer**
 - A multiprocessor computer
- **Hyper-V**
 - Enables Windows Server 2008 to offer a **virtualization** environment
- Advantages of Hyper-V compared with Microsoft's earlier Virtual Server 2005 R2
 - Can run 32-bit and 64-bit operating systems at the same time
 - Can run on SMP computers
 - Can access larger memory segments

Windows Server 2008 Enterprise Edition

- Designed to meet the everyday needs of networks with applications and Web services
 - Requiring high-end servers and a high level of productivity
- Intended for midsized and large organizations that want the option to continue scaling their server operations upward
- Can also handle SMP computers
- Enables clustering

Windows Server 2008 Enterprise Edition (continued)

- **Clustering**

- The ability to increase the access to server resources and provide fail-safe services
 - By linking two or more discrete computer systems so they appear to function as though they are one
- Advantages
 - Increases computer speed to complete server tasks faster
 - Provides more computing power for handling resource-hungry applications

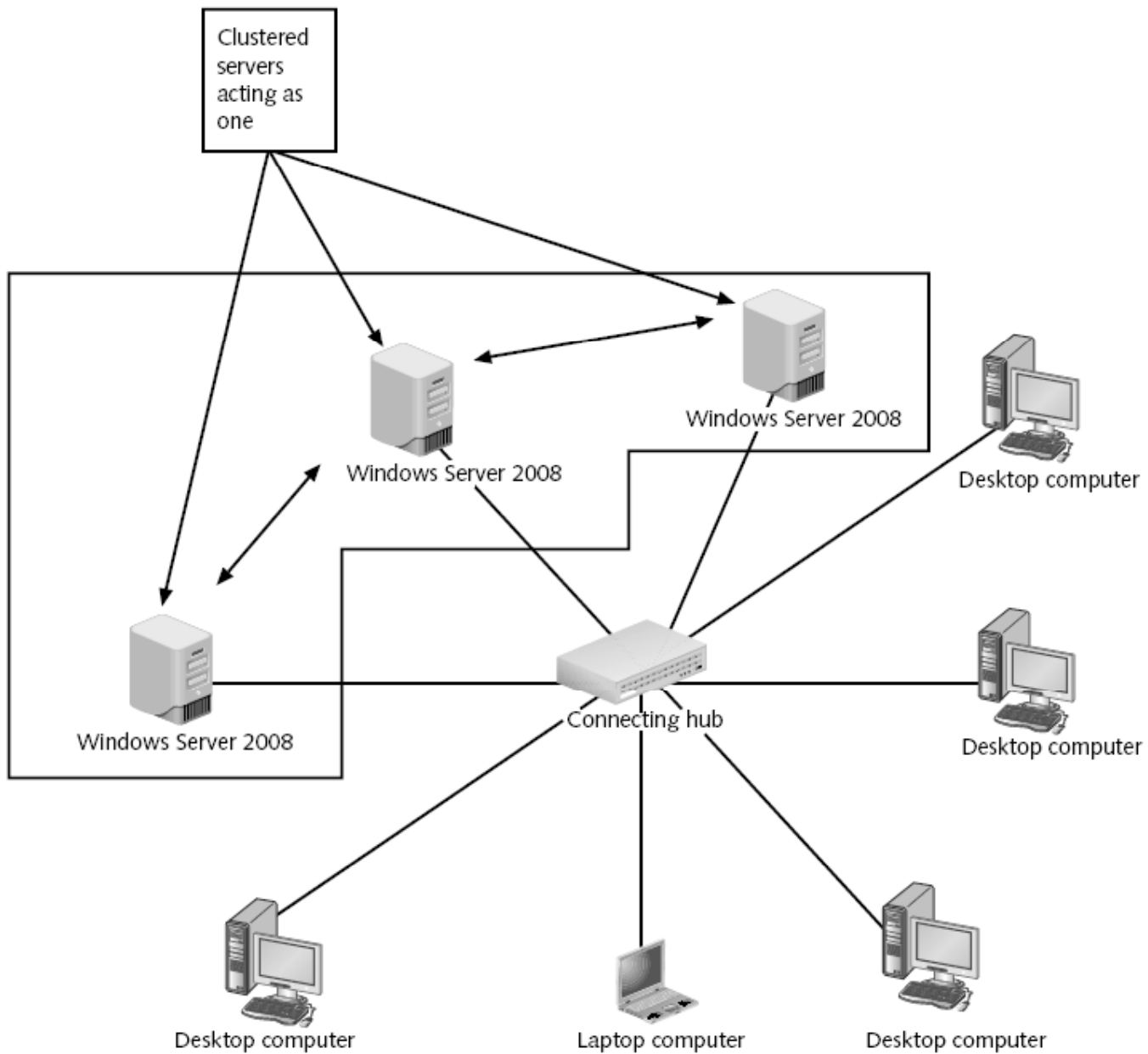


Figure 1-1 Three servers acting as one in a cluster

Windows Server 2008 Enterprise Edition (continued)

- **Hot-add memory**
 - The ability to add RAM without shutting down the computer or operating system
- **Fault tolerant memory sync**
 - Enables memory to resynchronize after transient memory problems so there is no interruption to current computing activities

Windows Server 2008 Enterprise Edition (continued)

- Microsoft Metadirectory Services
 - Facilitate multiple directory services to track and manage access to such resources as user accounts, shared folders, and shared printers
- Another option in Enterprise Edition is the ability to have unlimited numbers of users remotely access a server

Windows Web Server 2008

- Designed for hosting and deploying Web services and applications
- Supports multiple processors for scalability
- Particularly optimized to run Microsoft Internet Information Services
- Intended for small to large companies, or departments within an organization that develop and deploy a single Web site
- Cannot be used to manage directory resources via hosting Active Directory

Windows Server 2008 Datacenter Edition

- Designed for environments with mission-critical applications, very large databases, and information access requiring high availability
- Offers support for clustering with up to 16 computers
 - For SMP computers, offers support for 2 to 64 processors
- Enables hot-add memory for increased server availability

Windows Server 2008 Datacenter Edition (continued)

- **Hot-add processor**
 - Can be added to an empty processor slot while the system is running
- **Hot-replace processor**
 - Can replace a processor in an SMP system without taking the system down

Windows Server 2008 for Itanium-Based Systems

- The maximum RAM supported by Windows Server 2008 for Itanium-Based Systems is 2 TB
- Supports hot-add memory, hot-add processor, hot-replace processor, and SMP computers
- Supports server clustering for up to eight servers in one cluster
- Intended for resource-intensive applications

Windows Server 2008 Versions Without Hyper-V

- The following non-Hyper-V versions of Windows 2008 are available:
 - Windows Server 2008 Standard Edition without Hyper-V
 - Windows Server 2008 Enterprise Edition without Hyper-V
 - Windows Server 2008 Datacenter Edition without Hyper-V
- When you purchase a version without Hyper-V, the cost savings is very small

Windows Server 2008 Versions Without Hyper-V (continued)

Table 1-1 Minimum hardware requirements for the Windows Server 2008 editions

Hardware	Standard Edition	Enterprise Edition	Web Server	Datacenter Edition	Itanium-Based Edition
CPU	1 GHz (x86) 1.4 GHz (x64) (2 GHz or faster is recommended)	1 GHz (x86) 1.4 GHz (x64) (2 GHz or faster is recommended)	1 GHz (x86) 1.4 GHz (x64) (2 GHz or faster is recommended)	1 GHz (x86) 1.4 GHz (x64) (2 GHz or faster is recommended)	Intel Itanium 2
Disk space	10 GB (40 GB or more recommended)	10 GB (40 GB or more recommended)	10 GB (40 GB or more recommended)	10 GB (40 GB or more recommended)	10 GB (40 GB or more recommended)
RAM	512 MB (2 GB or more recommended)*	512 MB (2 GB or more recommended)*	512 MB (2 GB or more recommended)*	512 MB (2 GB or more recommended)*	512 MB (2 GB or more recommended)*
Drive	DVD	DVD	DVD	DVD	DVD
Display	Super VGA or better	Super VGA or better	Super VGA or better	Super VGA or better	Super VGA or better
Interactive devices	Keyboard and pointing device	Keyboard and pointing device	Keyboard and pointing device	Keyboard and pointing device	Keyboard and pointing device

*On x86 systems, the RAM maximums are 4 GB for Standard and Web Server 2008 and 64 GB for Enterprise and Datacenter Editions. On x64 systems, the RAM maximums are 32 GB for Standard and Web Server 2008 and 2 TB for Enterprise and Datacenter Editions. For Itanium-based systems, the RAM maximum is 2 TB.

Using Windows Server 2008 with Client Systems

- The client workstation operating system most compatible with Windows Server 2008 is Windows Vista
- **Client**
 - A computer that accesses resources on another computer via a network
- **Workstation**
 - A computer that has its own central processing unit (CPU) and can be used as a stand-alone or network computer

Using Windows Server 2008 with Client Systems (continued)

- The overall goal of Microsoft is to achieve a lower **total cost of ownership (TCO)**
 - TCO is the full cost of owning a network, including hardware, software, training, maintenance, and user support costs
- **Domain**
 - A grouping of network objects, such as computers, servers, and user accounts, that provides for easier management
 - Computers and users in a domain can be managed to determine what resources they can access

Using Windows Server 2008 with Client Systems (continued)

- Advantages of using Windows Server 2008 and Windows Vista together include the following:
 - New capabilities to recover from many types of network communications problems
 - Newly written code for more efficient network communications
 - More network diagnostic capabilities
 - New code for better use of the network communications protocols
 - Use of Windows PowerShell commands and scripts in both Windows Server 2008 and Vista

Using Windows Server 2008 with Client Systems (continued)

- **Active Directory**
 - Database of computers, users, groups of users, shared printers, shared folders, and other network resources
- Windows Server 2008 supports UNIX and Linux clients using the **Subsystem for UNIX-based Applications (SUA)**

Windows Server 2008 Features

- Features include:
 - Server Manager
 - Security
 - Clustering
 - Enhanced Web services
 - Windows Server Core
 - Windows PowerShell
 - Virtualization
 - Reliability
 - Multitasking and multithreading

Server Manager

- **Server Manager**
 - Enables the server administrator to manage critical configuration features from inside one tool
- Server Manager is used to:
 - View computer configuration information.
 - Change properties of a system
 - View network connections
 - Configure Remote Desktop
 - Configure security, including the firewall and how to obtain updates

Server Manager (continued)

- Server Manager is used to: (continued)
 - Configure a multitude of server roles, from a basic file server to advanced network services
 - Add and remove features
 - Run diagnostics
 - Manage storage and backups

Security

- **Network Access Protection (NAP)**
 - An umbrella of security protection features that monitor and manage a server and its clients
- NAP has the following capabilities:
 - Identifies clients and other computers on a network that do not comply with the security policies
 - Limits access by noncompliant computers
 - Automatically updates or configures a noncompliant computer to match the security policies
 - Continuously checks throughout the entire network and server connection session

Security (continued)

- When you install Windows Server 2008, add a feature, or install a Windows component
 - An essential level of security is automatically implemented
- Windows Server 2008 also comes with the Security Configuration Wizard (SCW)
 - Simplifies security configuration

Security (continued)

- Other security features include:
 - File and folder permissions
 - Security policies
 - Encryption of data
 - Event auditing
 - Various authentication methods
 - Server management and monitoring tools

Clustering and Clustering Tools

- Windows Server 2008 offers tools to:
 - Test a cluster to ensure it is set up to accomplish the tasks for which it is intended
 - Migrate configuration settings from one cluster to another
 - Quickly configure a cluster and troubleshoot problems
 - Set up storage used in a cluster
 - Create better cluster storage performance and reliability
 - Secure a cluster and enable it to use new network capabilities

Enhanced Web Services

- Microsoft **Internet Information Services (IIS)**
 - Transforms Windows Server 2008 into a versatile Web server
- IIS has been redesigned to:
 - Include over 40 modules
 - Intended to enable IIS to have a lower attack surface
 - Provide easier application of IIS patches
 - Make it easier for network programmers to write network applications and configure applications for the Web

Windows Server Core

- Windows Server Core
 - A minimum server configuration
 - Designed to function in a fashion similar to traditional UNIX and Linux servers
 - Does not provide the following:
 - A graphical interface, just a command line
 - Graphical tools to configure the server
 - Extra services that you do not need
 - A mouse pointer on the screen
 - Windows Mail, Microsoft Word, search windows, and other software

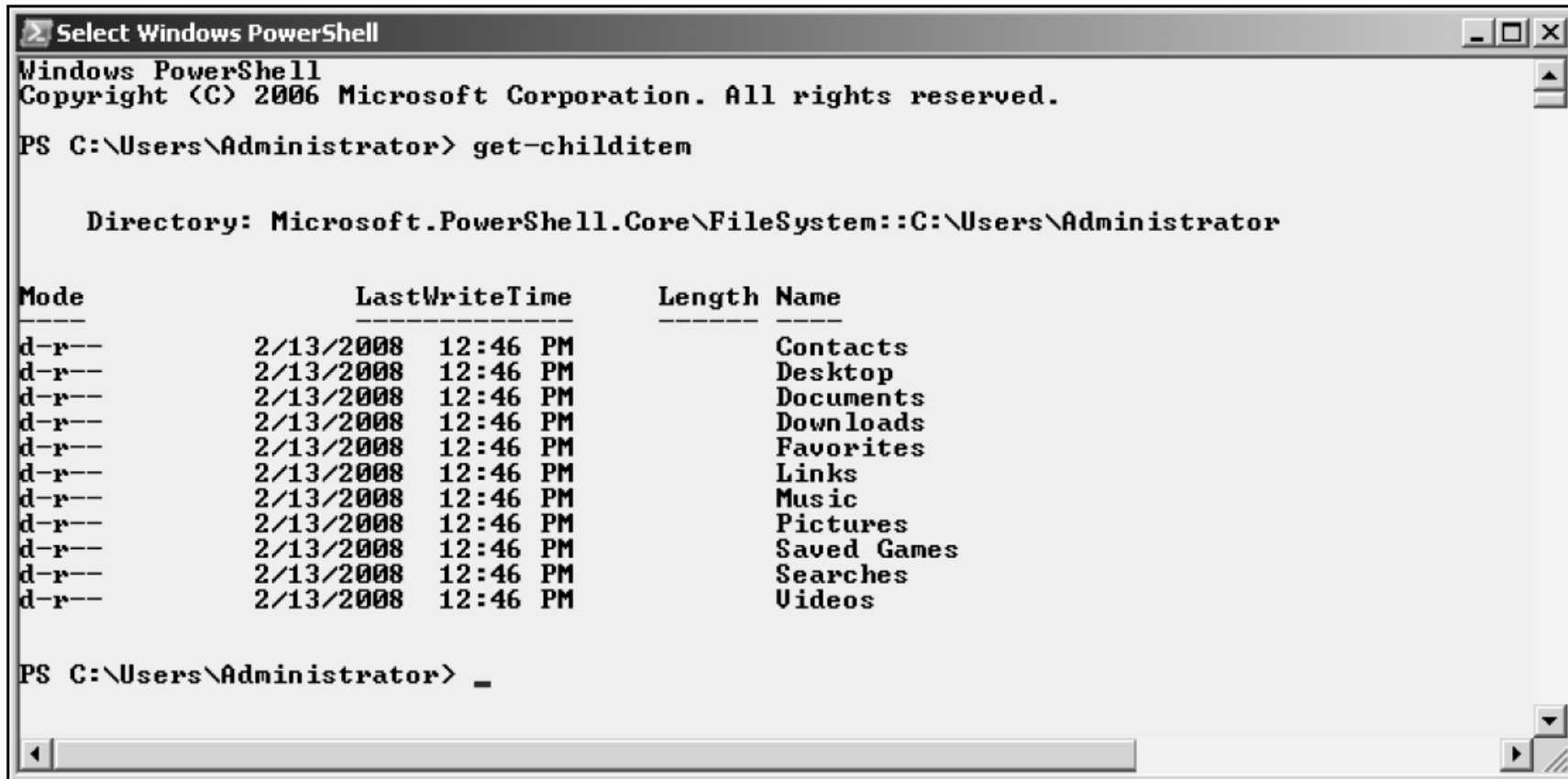
Windows PowerShell

- **Windows PowerShell**
 - A command-line interface that offers a **shell**
 - A customized environment for executing commands and scripts
- Can perform the following tasks with PowerShell:
 - Work with files and folders
 - Manage disk storage
 - Manage network tasks
 - Set up local and network printing options
 - Install, list, and remove software applications

Windows PowerShell (continued)

- Can perform the following tasks with PowerShell:
 - View information about the local computer, including user accounts
 - Manage services and processes
 - Lock a computer or log off
 - Manage IIS Web services
- Windows PowerShell offers over 130 command-line tools, also called **cmdlets**

Windows PowerShell (continued)



```
Select Windows PowerShell
Windows PowerShell
Copyright (C) 2006 Microsoft Corporation. All rights reserved.

PS C:\Users\Administrator> get-childitem

    Directory: Microsoft.PowerShell.Core\FileSystem::C:\Users\Administrator

Mode                LastWriteTime         Length Name
----                -
d-r--              2/13/2008 12:46 PM             Contacts
d-r--              2/13/2008 12:46 PM             Desktop
d-r--              2/13/2008 12:46 PM             Documents
d-r--              2/13/2008 12:46 PM             Downloads
d-r--              2/13/2008 12:46 PM             Favorites
d-r--              2/13/2008 12:46 PM             Links
d-r--              2/13/2008 12:46 PM             Music
d-r--              2/13/2008 12:46 PM             Pictures
d-r--              2/13/2008 12:46 PM             Saved Games
d-r--              2/13/2008 12:46 PM             Searches
d-r--              2/13/2008 12:46 PM             Videos

PS C:\Users\Administrator> _
```

Figure 1-3 Using Windows PowerShell for a directory listing

Virtualization

- Hyper-V provides the ability to run two or more operating systems on a single computer
- The Hyper-V capabilities include the following:
 - Compatible with clustering
 - Able to handle up to a four-processor SMP computer
 - Can be used with Windows and Linux operating systems
 - Compatible with different types of disk storage methods
 - Enables fast migration from one computer to another
 - Can house 64-bit and 32-bit operating systems

Reliability

- The operating system kernel runs in **privileged mode**
 - Protects it from problems created by a malfunctioning program or process
- The **kernel** consists of the core programs and the computer code of the operating system
- Privileged mode gives the operating system kernel an extra level of security from intruders
 - Prevents system crashes due to poorly written applications

Reliability (continued)

- Microsoft has introduced typical and protected processes
- **Process**
 - A computer program or portion of a program that is currently running
- Typical process
 - Like one on previous Windows systems in which the process can be influenced by a user or other processes
- Protected process
 - One for which outside influences are restricted

Multitasking and Multithreading

- **Multitasking**
 - The ability to run two or more programs at the same time
- **Multithreading**
 - The capability of programs written to run several program code blocks, or “threads,” at the same time
- **Preemptive multitasking**
 - Each program runs in an area of memory separate from areas used by other programs
 - Reduces the risk of one program interfering with the smooth running of another program

Planning a Windows Server 2008 Networking Model

- **Network**
 - A communications system enabling computer users to share computer equipment, application software, and data, voice, and video transmissions
 - Contains computers joined by communications cabling or sometimes by wireless devices
- Network operating system
 - Coordinates the ways computers access resources available to them on the network

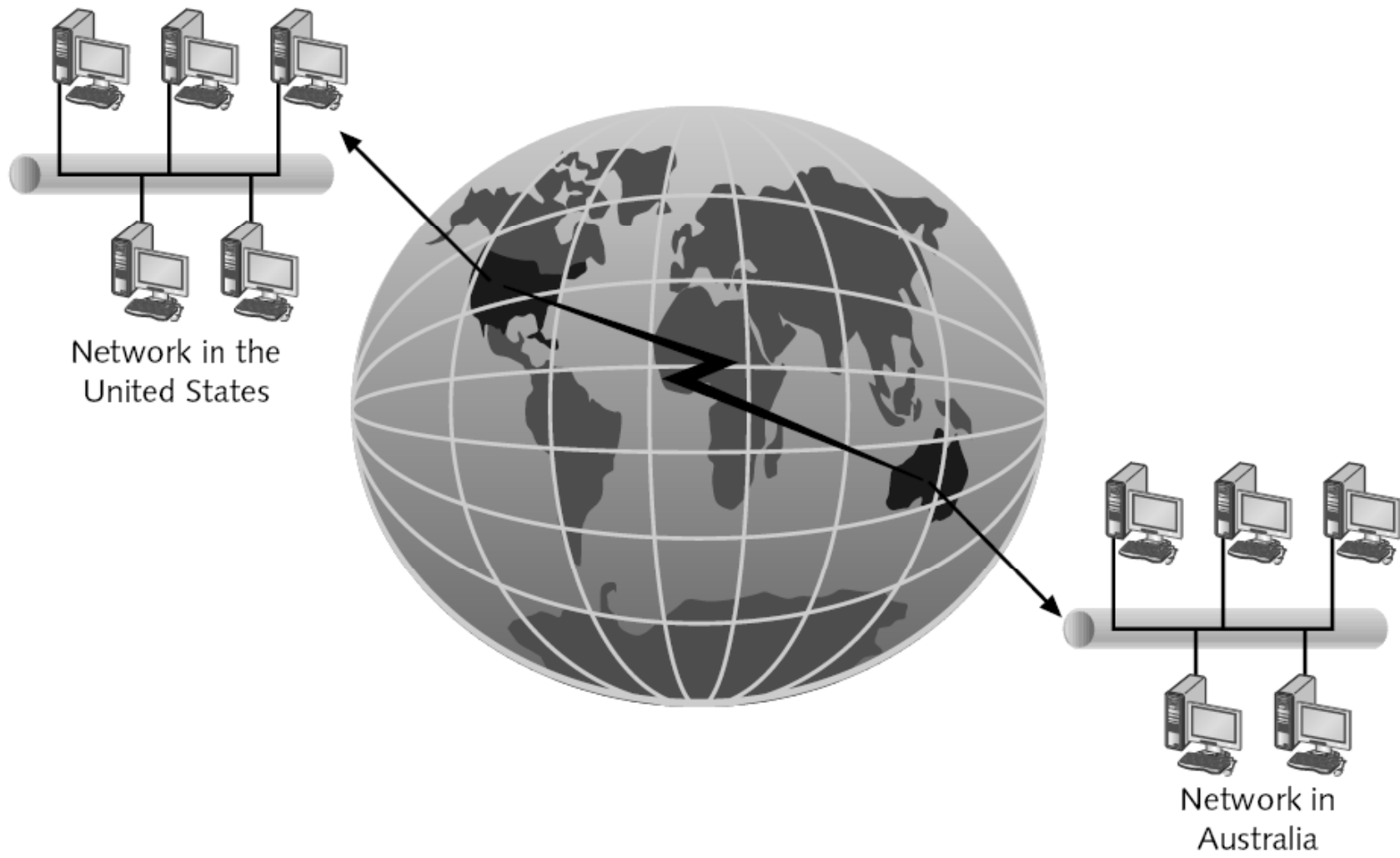


Figure 1-5 Networking across continents

Planning a Windows Server 2008 Networking Model (continued)

- Workstation or client network operating system
 - Enables individual computers to access a network, and in some cases, to share resources on a limited basis
- **Peer-to-peer networking**
 - Focuses on spreading network resource administration among server and nonserver members of a network
- **Server-based networking**
 - Centralizes the network administration on one or more servers

Peer-to-Peer Networking

- Uses workstations to share resources such as files and printers and to connect to resources on other computers
 - No special computer is needed to enable workstations to communicate and share resources
- Can be effective for very small networks
- Disadvantages
 - Management of network resources is decentralized
 - As the network increases in size, administration becomes more difficult

Peer-to-Peer Networking (continued)

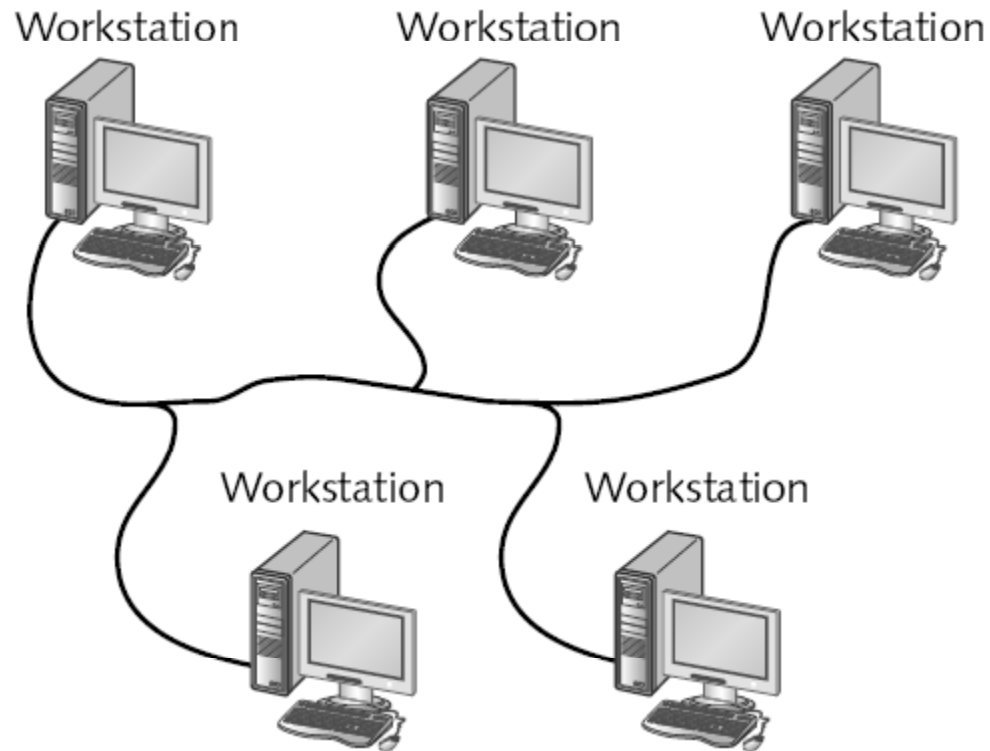


Figure 1-6 A simple peer-to-peer network without a server

Peer-to-Peer Networking (continued)

- Each of the users is responsible for the security of their own resources
- Generally designed for about 10 workstations or less
- Can often experience slow response times
 - Because this model is not optimized for multiple users accessing one computer
- **Workgroup**
 - A number of users who share drive and printer resources

Server-Based Networking

- **Server**
 - A single computer that provides extensive multiuser access to network resources
 - Can handle hundreds of users at once
 - Fast response when delivering the shared resource
 - Less network congestion when multiple workstations access that resource
- **Advantages**
 - Users only need to log on once to gain access to network resources
 - Security is stronger

Server-Based Networking (continued)

- Advantages (continued)
 - All members can share computer files
 - Printers and other resources can be shared
 - All members can have electronic mail (e-mail) and send messages to other office members through an e-mail server
 - Software applications can be stored and shared in a central location
 - Important databases can be managed and secured from one computer

Server-Based Networking (continued)

- Advantages (continued)
 - All computers can be backed up more easily
 - Computer resource sharing can be arranged to reflect the work patterns of groups within an organization
 - The server administrator can save time when installing software upgrades

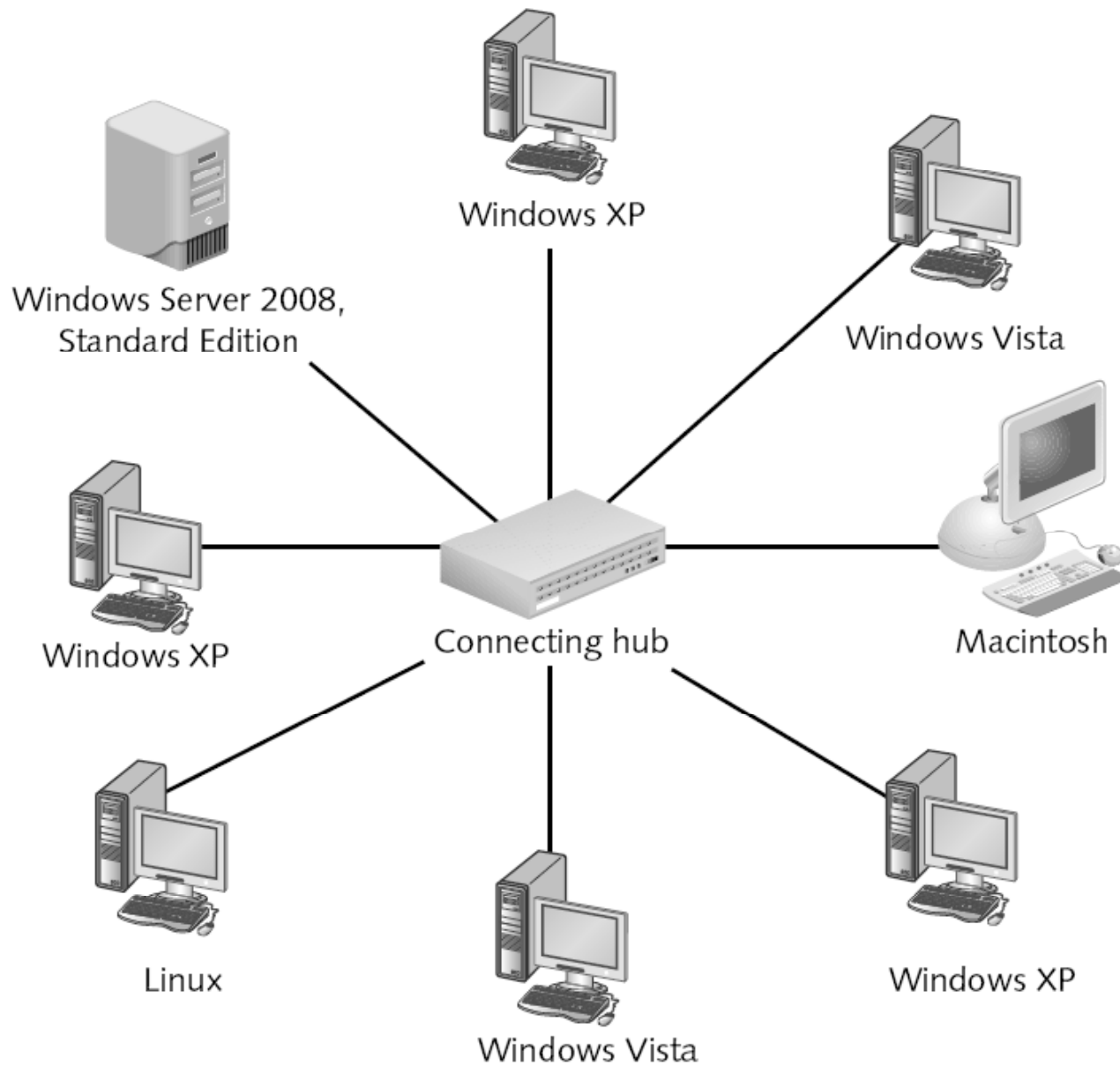


Figure 1-7 A server-based network

Protocols for the Windows Server 2008 Networking Model

- A **protocol** consists of guidelines for the following:
 - How data is formatted into discrete units called packets and frames
 - How packets and frames are transmitted across one or more networks
 - How packets and frames are interpreted at the receiving end
- **Packets and frames**
 - Units of data transmitted from a sending computer to a receiving computer

Protocols for the Windows Server 2008 Networking Model (continued)

- Windows Server 2008 and its clients primarily use the **Transmission Control Protocol/Internet Protocol (TCP/IP)**
 - A suite of protocols and utilities that support communication across LANs and the Internet
- **Local area network (LAN)**
 - A network of computers in relatively close proximity

Transmission Control Protocol

- **Transmission Control Protocol (TCP)**
 - Provides for reliable end-to-end delivery of data by controlling data flow
- TCP is also considered a **connection-oriented communication**
 - Ensures that packets are delivered, that they are delivered in the right sequence, and that their contents are accurate

Internet Protocol

- **Internet Protocol (IP)**
 - Provides network addressing to ensure data packets quickly reach the correct destination
- Two versions: IPv4 and IPv6
 - IPv4 is used by default on most networks
- IP also provides for routing data over different networks
 - Routing is accomplished through a device called a **router**
- IP also handles fragmenting packets

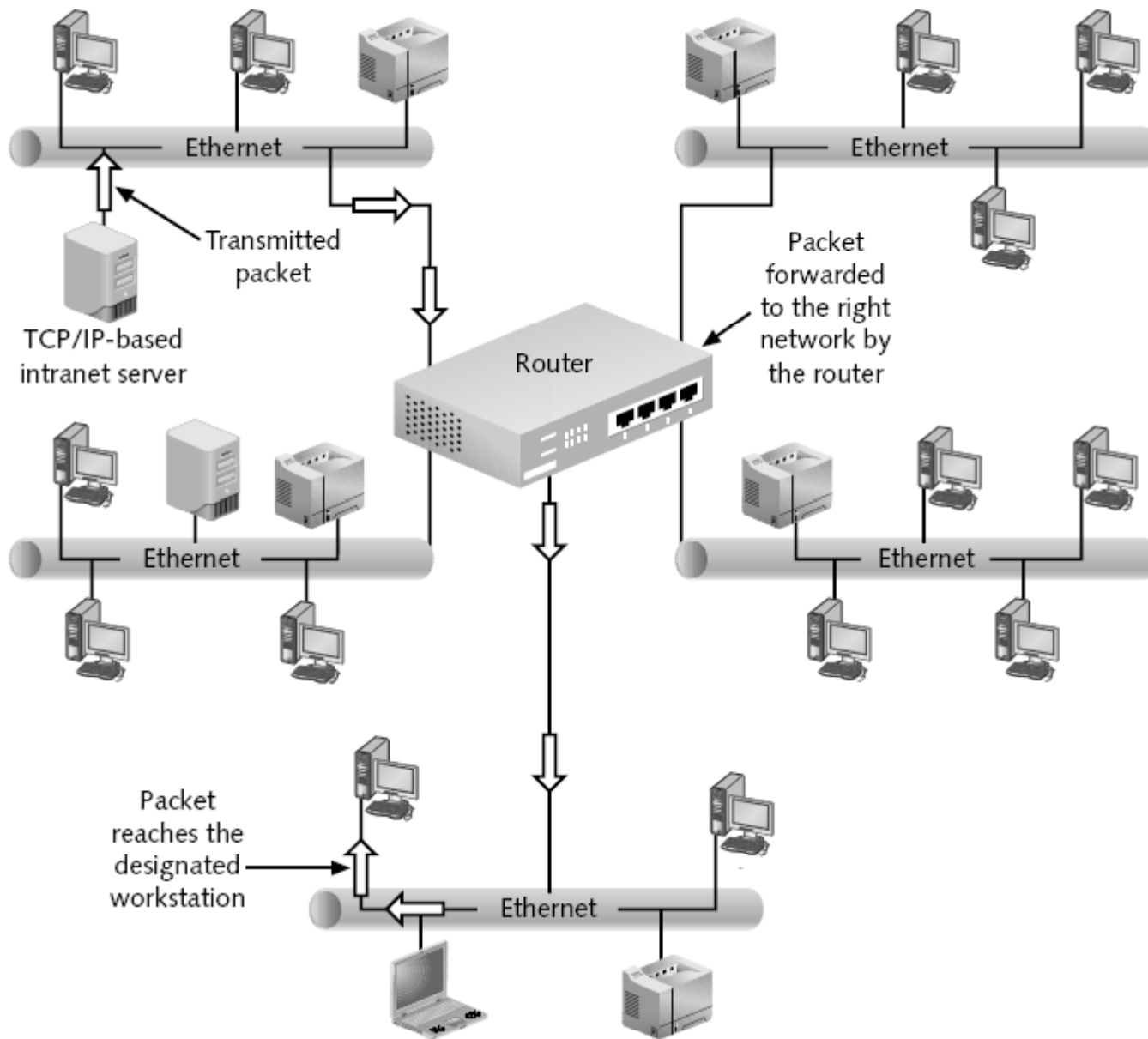


Figure 1-8 A router forwarding packets to a designated network

Internet Protocol (continued)

- The **IP address** format is called the **dotted decimal notation**
 - 32 bits long and contains four fields of decimal values representing eight-bit binary octets
- **Unicast**
 - A transmission in which one packet is sent from a server to each client that requests a file or application
- **Multicast**
 - Server is able to treat all clients as a group and send one packet per transmission that reaches all clients

Internet Protocol (continued)

- **Broadcast**
 - Sends a communication to all points on a specific network
- **Subnet mask**
 - Shows the class of addressing used
 - Divides a network into subnetworks or subnets to control network traffic

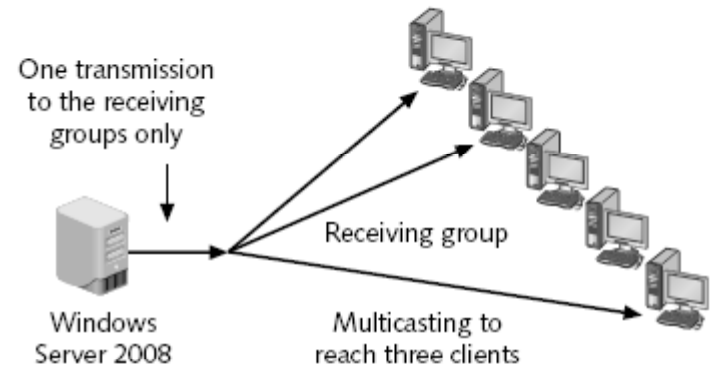
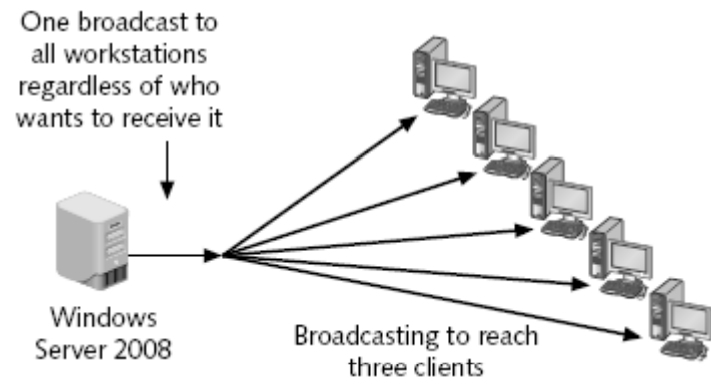
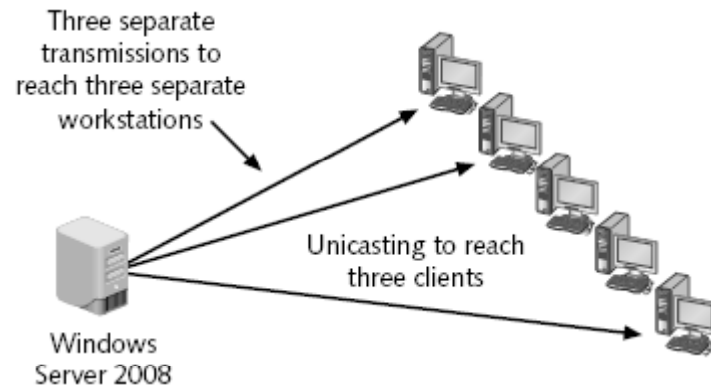
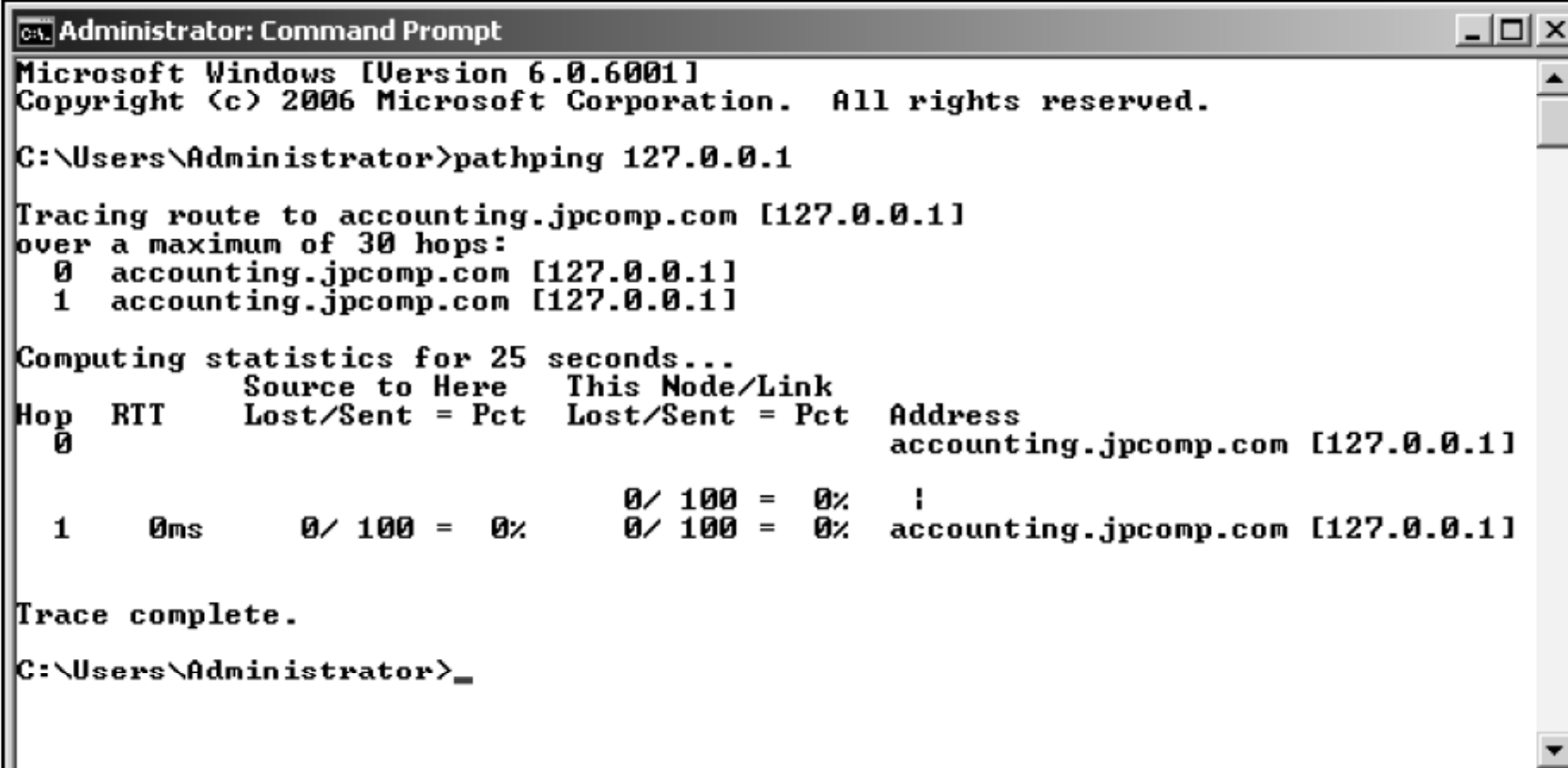


Figure 1-9 Unicasting, broadcasting, and multicasting

Internet Protocol (continued)

- IP address considerations
 - The network number 127.0.0.0 cannot be assigned to any network
 - The address 127.0.0.1 is known as the loopback address
 - No one can use private IP addresses on the Internet
 - Designed for use on a private network behind a **Network Address Translation (NAT)** device
 - See Table 1-2
 - Cannot assign a network number to a computer or any other host on the network

Internet Protocol (continued)



```
Administrator: Command Prompt
Microsoft Windows [Version 6.0.6001]
Copyright (c) 2006 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>pathping 127.0.0.1

Tracing route to accounting.jpcomp.com [127.0.0.1]
over a maximum of 30 hops:
  0  accounting.jpcomp.com [127.0.0.1]
  1  accounting.jpcomp.com [127.0.0.1]

Computing statistics for 25 seconds...
Hop  RTT      Source to Here   This Node/Link   Address
  0                               Lost/Sent = Pct  Lost/Sent = Pct
  0                               0/ 100 = 0%     0/ 100 = 0%     accounting.jpcomp.com [127.0.0.1]
  1    0ms     0/ 100 = 0%     0/ 100 = 0%     |
                               accounting.jpcomp.com [127.0.0.1]

Trace complete.

C:\Users\Administrator>_
```

Figure 1-10 Testing a local TCP/IP installation using the loopback address

Internet Protocol (continued)

Table 1-2 Reserved IP network numbers

Network number	Subnet mask	IP address range
10.0.0.0	255.0.0.0	10.0.0.1–10.255.255.255
172.16.0.0–172.31.0.0	255.255.0.0	172.16.0.1–172.31.255.255
192.168.0.0	255.255.255.0	192.168.0.1–192.168.255.255

Internet Protocol (continued)

- IP address considerations (continued)
 - Cannot assign the highest number on a network to a host
 - This address is interpreted as a broadcast message for the subnet
 - All computers on the subnet would receive the packet

Internet Protocol (continued)

- Internet Protocol Version 6
 - Provides a logical growth path from IPv4
- New features include:
 - A 128-bit address capability
 - A single address associated with multiple network interfaces
 - New IP extension headers that can be implemented for special needs, including more routing and security options

Internet Protocol (continued)

- IPv6 addressing enables one IP identifier to be associated with several different interfaces
 - Can better handle multimedia traffic
- IPv6 is designed so that addresses can be configured using a wide range of options
 - Enables better communications for routing and subnetting
- IPv6 packet can be encrypted for security
 - Can increase the communication delays on a network

Internet Protocol (continued)

- Static and dynamic addressing
 - **Static addressing**
 - Involves assigning a dotted decimal address that becomes each workstation's permanent, unique IP address
 - **Dynamic addressing**
 - Automatically assigns an IP address to a computer each time it is logged on
 - Uses the **Dynamic Host Configuration Protocol (DHCP)** to detect the presence of a new workstation and assign an IP address to that workstation

Internet Protocol (continued)

- **Default gateway**
 - The IP address of the router that has a connection to other networks
 - Used when the host computer you are trying to contact exists on another network
- Name resolution
 - **Domain Name System (DNS)**
 - A TCP/IP application protocol that enables a DNS server to resolve (translate) domain and computer names to IP addresses, or IP addresses to domain and computer names

Internet Protocol (continued)

- NetBIOS Names
 - The primary means of locating computers on a Windows-based network
 - Prior to Windows 2000 Server
 - **Windows Internet Naming Service (WINS)**
 - Windows Server (all versions) service that enables the server to convert NetBIOS workstation names to IP addresses

Internet Protocol (continued)

- Host names
 - The preferred method of resolving computer names to IP addresses in Windows Server 2008
 - **Dynamic Domain Name System (DDNS)**
 - A modern DNS application
 - Enables client computers to automatically register their IP addresses in DNS without intervention by a user or network administrator

Physical Addresses and the Address Resolution Protocol

- **Address Resolution Protocol (ARP)**
 - Used to acquire the physical addresses associated with a computer's **network interface card (NIC)**
- Every NIC has a physical address, or **media access control (MAC) address**
- For computers to communicate with each other
 - They must know the MAC addresses of each other's network interface cards
- Proper communications using TCP/IP rely on both IP addresses and MAC addresses

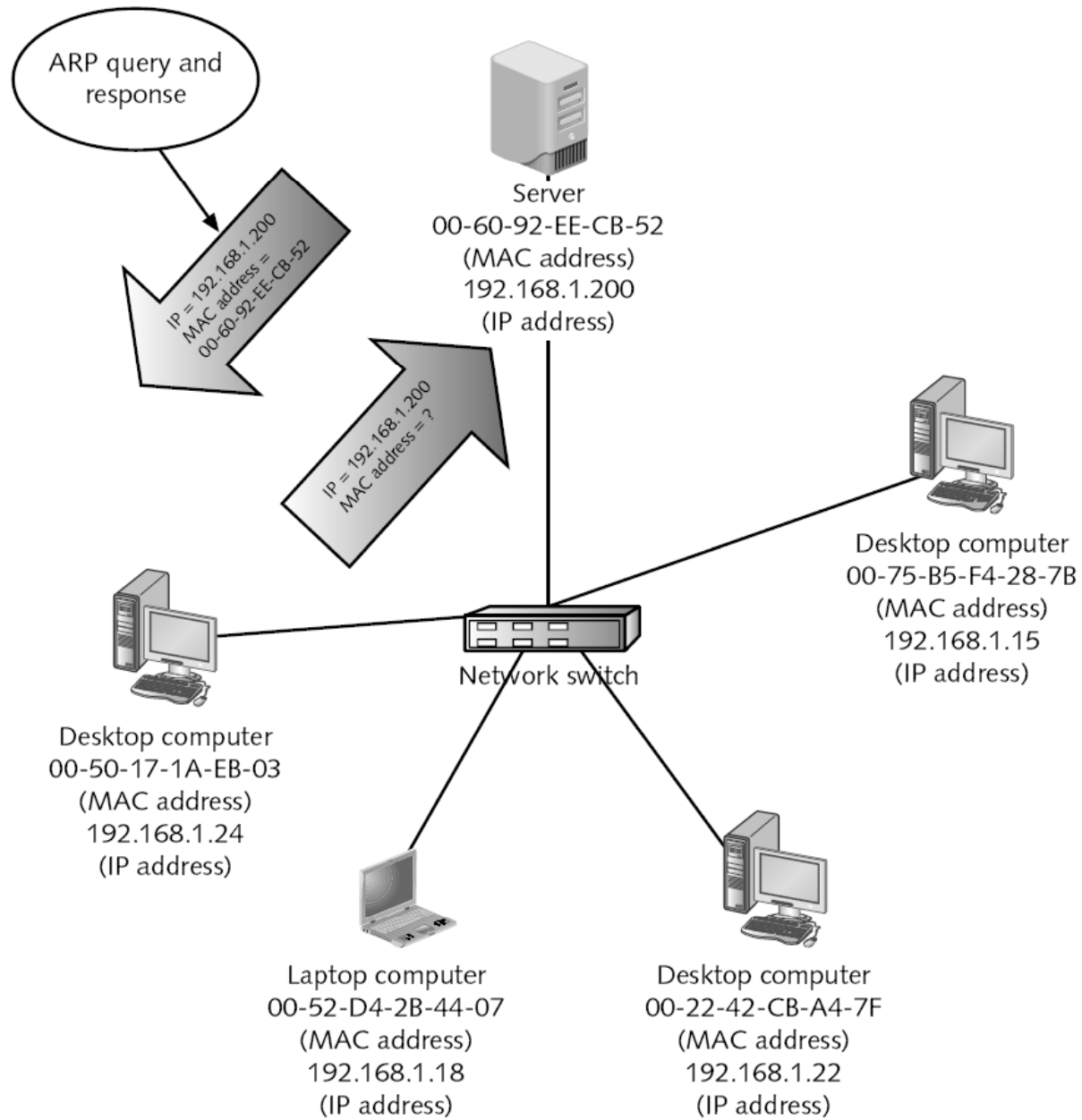


Figure 1-11 Using ARP to query the MAC address

Implementing TCP/IP in Windows Server 2008

- Implementing TCP/IP involves two tasks:
 - Verifying it is enabled
 - Configuring it

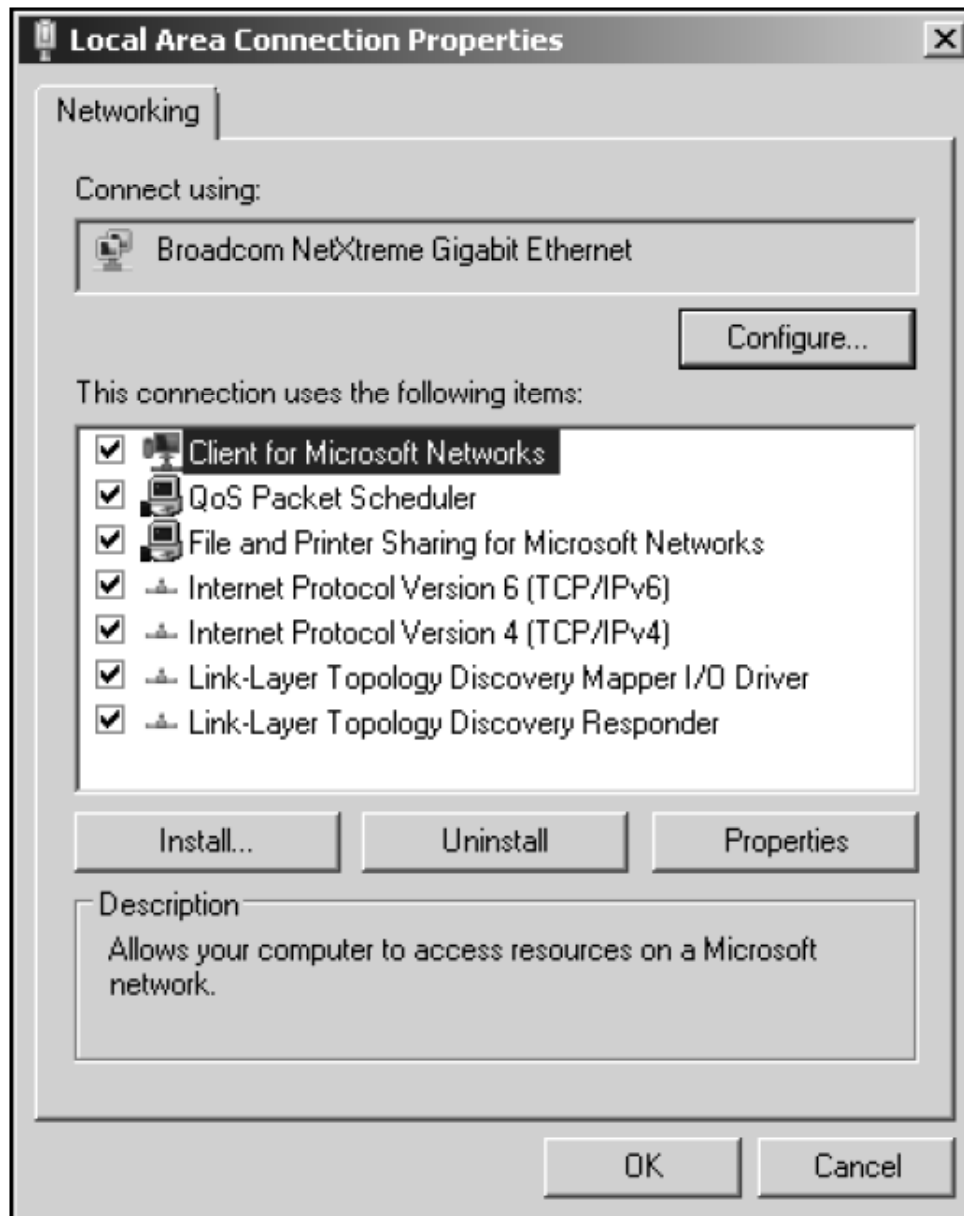


Figure 1-13 Viewing the network connection properties

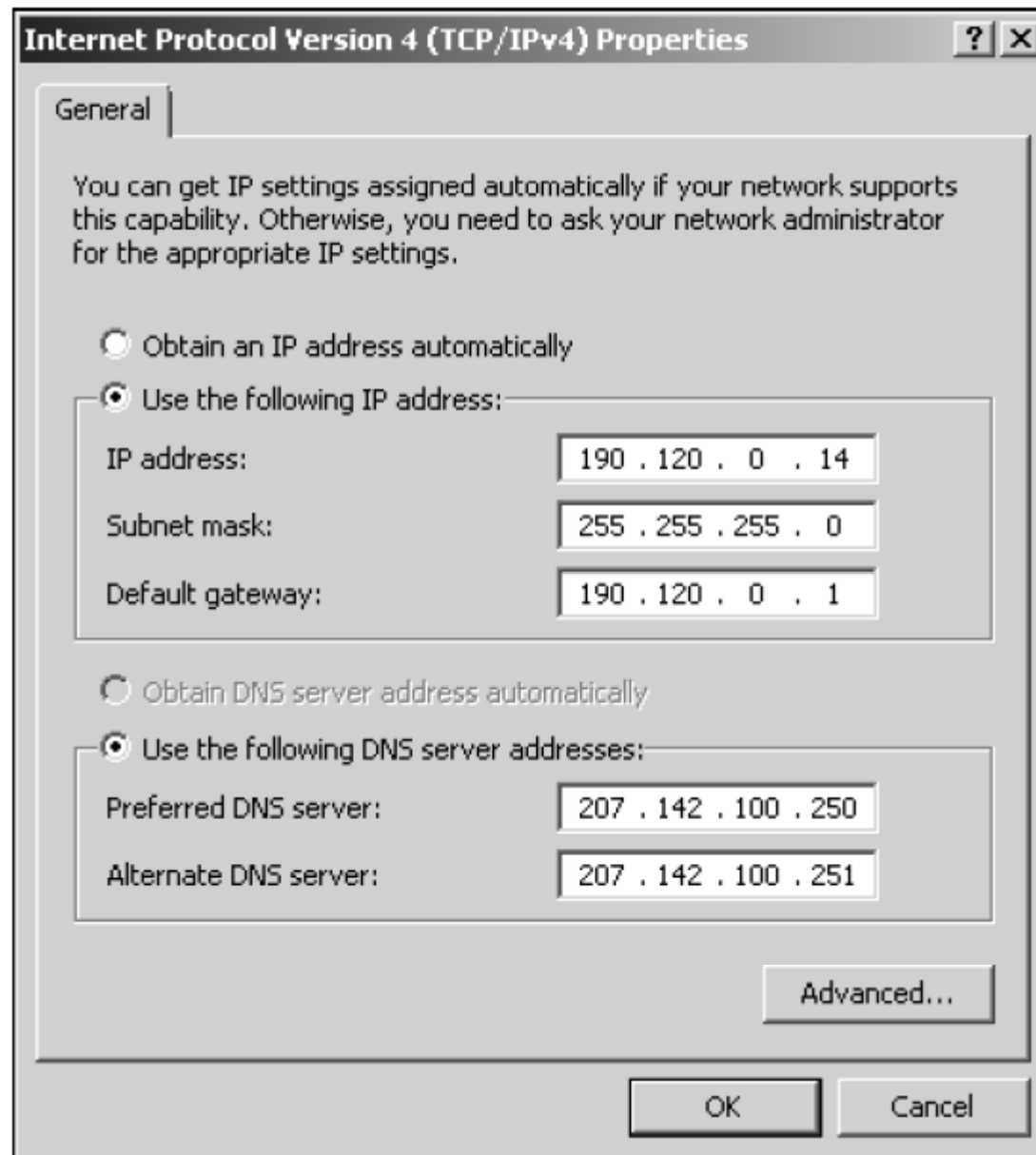


Figure 1-14 Static IP address configuration

Automated Address Configuration

- Automatic Private IP Addressing (APIPA)
 - Used to automatically configure the TCP/IP settings for a computer without using a DHCP server
 - Computer automatically assigns itself an IP address from the reserved range of 169.254.0.1 to 169.254.255.254 and a subnet mask of 255.255.0.0
 - Appropriate for small organizations that have only one network segment

Automated Address Configuration (continued)

- Dynamic Addressing Through a DHCP Server
 - Common for medium-sized and large networks
 - You must first install and configure a DHCP server on the network
 - In addition to assigning the IP address, the DHCP server can also assign the subnet mask, default gateway, DNS server, and other IP settings
 - Using a DHCP server can save you a great deal of administrative effort

Summary

- The Windows Server 2008 platforms include Standard Edition, Enterprise Edition, Datacenter Edition, Windows Web Server 2008, and Windows Server 2008 for Itanium-Based Systems
- Windows Server 2008 includes many vital features for security, clustering, virtualization, reliability, and multitasking and multithreading
- The two types of networking models used by Windows Server 2008 are peer-to-peer networks and server-based networks

Summary (continued)

- TCP/IP is the default protocol installed with Windows Server 2008
- TCP/IP is an industry-standard suite of protocols and application utilities that enable communication across local and wide area networks
- The two versions of IP are IPv4 and IPv6
- Every network device, such as a computer or router, must have a unique IP address to ensure network connectivity and the delivery of data
- IP addresses can be manually configured using static addressing or automatically configured