1

NETWORKING FUNDAMENTALS

PROJECTS

Project 1.1  Understanding Key Concepts
Project 1.2  Identifying Basic Components
Project 1.3  Understanding Network Types
Project 1.4  Preparing for Network Installation
Project 1.5  Installing Windows Server 2008
Overview
Understanding the basic networking standards, including the OSI, DoD, and Internet networking models, is important. These models provide common terms for describing network operations and ways of describing and comparing network components.

This project reviews common networking terms and terms relating to networking standards.

Outcomes
After completing this project, you will know how to:
- identify key terms and concepts related to networking basics
- identify key terms and concepts related to network components and network types

What you’ll need
To complete this project, you will need:
- the following worksheet

Completion time
20 minutes

Precautions
None

The worksheet includes a list of terms related to networking standards and components, with models given on the left and descriptions on the right. Match each term with the description that it most closely matches. You will not use all descriptions. Each description can be used only once.

__ Router
A. Process of having two computers recognize each other and open a communication channel

__ Hub
B. Block of data formatted for transmission over a network

__ Cable plant
C. Transmission media and network devices making up the physical structure of a network

__ Peer-to-peer
D. Specialized computer providing resources to a network

__ Wide area network
E. Connection device used to connect network cables at a central connection point

__ Client/server
F. Device that enables a computer to physically connect to a network

__ Connection
G. Network communication device used to connect two or more networks (subnetworks or network segments)

__ Infrastructure
H. Low-level protocol that is currently the protocol most commonly used
Network adapter
- I. Rules and standards defining network communications

Node
- J. Networking model based on all network entities being tracked and managed through a directory that provides centralized management and control

Packet
- K. Networking model with no centralized security or management control

Protocol
- L. Any uniquely identified network device

Ethernet
- M. Traditionally defined by LANs connected through the switched telephone network over a large geographic area

Server
- N. Path over which network devices communicate in a wired network infrastructure
- O. Means by which computers identify each other on a network
- P. Networking model that has centralized security control as a defining feature

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**Project 1.2 Identifying Basic Components**

**Overview**
An important part of understanding network fundamentals is the ability to recognize common network components. Many connectivity components are common to the majority of PC networks.

**Outcomes**
After completing this project, you will know how to:
- ▲ recognize common network components
- ▲ recognize wired and wireless networks

**What you’ll need**
To complete this project, you will need:
- ▲ the following worksheet

**Completion time**
15 minutes

**Precautions**
None
Match the letters to the networking terms listed under Figure 1-1. All terms will be used and each term will be used only once.

![Sample network](image)

Figure 1-1: Sample network

**Terms**

A. ___________________  
   Wired network

B. ___________________  
   Wireless network
   Hub

C. ___________________  
   Client computer
   Router

D. ___________________  
   Cable plant
   Wireless access point

E. ___________________

F. ___________________

G. ___________________
<table>
<thead>
<tr>
<th><strong>Project 1.3</strong></th>
<th><strong>Understanding Network Types</strong></th>
</tr>
</thead>
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<tr>
<td><strong>Overview</strong></td>
<td>You can identify and categorize networks in various ways. You can identify a network, for example, by type, architecture, and topology. <strong>Network type</strong> refers to whether the network is configured as a local, metropolitan, or wide area network. <strong>Architecture</strong> refers to the logical network design and networking model that defines features such as whether the network is based on centralized or decentralized security. <strong>Topology</strong> refers to the physical structure of the network and how network devices are connected. Identifying can get complicated because these categories can be mixed and matched in a number of ways. Just because you know the network type, you don’t necessarily know everything about its architecture and/or its topology. Although identifying and categorizing are each important, for now we focus on one way of identifying networks—by network type. You need to be able to compare and contrast local area networks (LANs), metropolitan area networks (MANs), and wide area networks (WANs) to determine the best solution to an organization’s needs.</td>
</tr>
</tbody>
</table>
| **Outcomes**    | After completing this project, you will know how to:  
- ▲ compare and contrast network types  
- ▲ choose a network type based on organizational requirements |
| **What you’ll need** | To complete this project, you will need:  
- ▲ the following worksheet |
| **Completion time** | 60 minutes |
| **Precautions** | None |

Read each of the networking scenarios and answer the questions that follow each scenario. You will be required to identify the appropriate network type and answer questions about how networking requirements might be met.

**Part A: Networking Scenario #1**

All of your company’s offices are located in Boston and the surrounding suburbs. You need to prepare a networking solution that enables employees in all six offices to communicate both internally in that office and, to a lesser extent, between the other offices. The farthest distance between any two offices is 50 miles. Most user resource requirements are met by servers located in the same office as the users who need to access them. The main communication requirements between offices relate to e-mail and periodic file transfers. You have been promised a budget sufficient to meet the requirements, but you have also been told to keep costs to a minimum.
1. What network type should you use to configure the complete network?

2. What network type should you use to configure each office?

3. How many internetwork connections would you typically configure at each office?

4. What are potential concerns related to the connections between the offices?

Part B: Networking Scenario #2

Your company occupies the top three floors of a building. Other companies have offices on the floors below you. You want to design the network that is as easy to manage as possible. You want to minimize the potential impact of problems on any one floor to the other two floors. You are implementing this network as a wired network.

1. What network type should you use to configure the complete network?

2. What network type should you use to configure each floor?

3. In general terms, describe how you would connect the floors.
4. What type of network device should you use to connect the computers on each floor?

___________________________________________________________________________

___________________________________________________________________________

5. What one component’s failure would prevent the floors from communicating with each other? How would this component failure impact communications between all of the computers on a single floor?

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

6. What role might the Internet have in this configuration?

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

■ Part C: Networking Scenario #3

You work for a nonprofit organization with an office in each state in the continental United States. Each office provides various support services to family farms located in the state for which it is responsible. You have nearly constant interoffice communication requirements. All networking expenses must be justified to the organization’s management board, and you are expected to find ways to keep these expenses to a minimum.

1. What network type should you use to configure the complete network?

___________________________________________________________________________

___________________________________________________________________________

2. What network type should you use at each office?

___________________________________________________________________________

___________________________________________________________________________
3. You need to keep the equipment, service, and support costs needed to connect the offices to a minimum. Describe, in general terms, what you should use as your communication backbone between the offices. Justify your answer.

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

4. Other than keeping cost to a minimum, what is the primary concern for interoffice connections?

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

### Project 1.4  Preparing for Network Installation

| Overview | Like so many other things in life, one of the fastest ways to learn the ins and outs of networking is to dive in and do it yourself. With modern technologies, all you need for a basic network is two or more computers with network adapters and appropriate operating systems and a communication path. If you’re setting up a wireless network (and don’t need to connect to a wired network), that’s all you need. For a wired network, you also need:
|          | • a network cable for each computer
|          | • a hub, switch, or other connection device
|          | We’re going to set up a wired network, so your first step is to make sure that you’ve made the necessary hardware connections. This project assumes that you are setting up a small, private, two-node network. If you are setting up a larger classroom network, your instructor may provide you with additional information and requirements. |
| Outcomes | After completing this project, you will know how to:
|          | ▲ identify minimum wired network hardware requirements
|          | ▲ install a network adapter
|          | ▲ connect a wired network
| What you’ll need | To complete this project, you will need:
|          | ▲ the connection instructions below
|          | ▲ two computers with Ethernet network adapters
|          | ▲ two network cables
|          | ▲ a hub or switch |
Below are the steps to connect a simple Ethernet wired network. Make sure that you have the required equipment available before you start. If connecting to an existing network, provide your network administrator with a copy of these instructions so that he or she can change them as necessary to meet network requirements.

**Part A: Install the Network Adapter**

Complete the following steps only if a computer does not have a built-in network adapter or if the network adapter is not already installed. Each computer must have a network adapter to complete the projects in this manual. Use caution during component installation. Electronic components are easily damaged, so be careful to avoid electrostatic discharge (shock) while installing the adapter.

1. Power off and unplug the computer.
2. Remove the computer cover.
3. Locate an open PCI expansion slot.
4. Remove the slot cover and insert the network adapter, checking that it is fully seated.
5. Replace the anchor screw to hold the network adapter in place.
6. Replace the computer cover.

**Part B: Build the Network**

1. Place the hub (or switch) within easy distance of both computers.
2. Connect one end of a network cable to the first open port on the hub. A sample hub with attached cables is shown in Figure 1-2.
3. Attach the other end of the network cable to the network adapter port on the first computer, as shown in Figure 1-3.
4. Repeat steps 3 and 4 for the second computer.
5. Plug in the hub to the AC power.

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<th>Project 1.5</th>
<th>Installing Windows Server 2008</th>
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<tr>
<td><strong>Overview</strong></td>
<td>Microsoft Windows Server 2008 is a version of Microsoft’s server operating system. It can be used in a server-only role or as a peer server as both a client and a server. In this case, we are using a 180-day trial version of Windows Server 2008. You will be prompted for network configuration information during Windows Server 2008 installation. You can set configuration parameters at that time, but you also have the option of going back and changing your network configuration as needed.</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td>After completing this project, you will know how to:</td>
</tr>
<tr>
<td></td>
<td>▶ install Windows Server 2008</td>
</tr>
<tr>
<td></td>
<td>▶ configure networking parameters</td>
</tr>
<tr>
<td></td>
<td>▶ verify successful installation</td>
</tr>
<tr>
<td><strong>What you’ll need</strong></td>
<td>To complete this project, you will need:</td>
</tr>
<tr>
<td></td>
<td>▶ Project 1.4 completed</td>
</tr>
<tr>
<td><strong>Completion time</strong></td>
<td>60 minutes (approximate, depending on computer configuration and speed)</td>
</tr>
<tr>
<td><strong>Precautions</strong></td>
<td>The instructions in this project assume you will be setting up a two-node network with one computer running both Windows 7 Professional or Enterprise and Windows Server 2008. If you are deploying the Windows Server 2008 computer as part of a larger classroom network, your instructor will provide you with alternate instructions for configuring network parameters. Note that the host computer should have sufficient hard disk capacity (approximately 20GB) and sufficient RAM (a minimum of 4GB) to complete these exercises using virtual machines.</td>
</tr>
<tr>
<td></td>
<td>If you are adding the Windows Server 2008 computer to an existing network, you should also review the project steps with your network administrator. Your network administrator may need to make changes or additions to the installation instructions.</td>
</tr>
</tbody>
</table>
Part A: Prepare for Installation

This project provides the instructions for installing Windows Server 2008 from an installation CD or downloaded trial version software and configuring networking parameters. Required parameters include the computer name and TCP/IP address parameters. Your instructor may provide alternate values for some configuration parameters. If so, record those below:

- Computer name: ______________________
- IP address: ______________________
- Subnet mask: ______________________

This project assumes that you will be configuring the computer with a single disk partition. If your computer needs to be configured differently, your instructor will provide you with alternate partitioning instructions, which will replace Steps 4 through 7 below.

1. Open your VMWare Player as in Figure 1-4.

![VMWare Player Image](image)

```
Figure 1-4: VMWare Player
```

2. Choose Create a New Virtual Machine and then choose either Installer disc if you have access to a Windows Server 2008 Install DVD or Installer Disc Image file (iso) if you downloaded the Demo Windows Server 2008 file referred to earlier, as in Figure 1-5.
3. Choose Windows Server 2008 Standard as the version to install.
   Use Student01 for your personalized Windows full name or the instructor assigned name and number.
   Use P@SSwθrd (0 = zero) for your password, and if you have access to a Windows Product Key, enter it here as Figure 1-6 shows.
Note: If you do not have access to a key, you can still install Windows Server 2008, but you'll be unable to activate it later. Make sure that you enter the product key to activate Windows within the 30-day grace period. After the grace period of 30 days ends, your system will not boot and you may have to reinstall the copy again.

4. Leave the default name as Server2008 and choose a location to store your virtual machine. In this case, it’s being saved to a removable hard drive in a file called My Virtual Machines\Server2008, as in Figure 1-7.
5. Accept the default size for the virtual hard drive and storage (refer to Figure 1-8).

Figure 1-7: New Virtual Machine Wizard: Name the Virtual Machine

Figure 1-8: New Virtual Machine Wizard: Specify disk capacity
6. In some cases, for a complete installation, you need to “customize hardware” from the next window. Click on the **Customize Hardware** Button as Figure 1-9 shows.

![New Virtual Machine Wizard](image)

*Figure 1-9: New Virtual Machine Wizard: Ready to create virtual machine*

7. Choose the **New CD/DVD**, and click the **Advance** button (refer to Figure 1-10).
8. Choose the **Legacy Emulation** radial and click **OK**.
9. Highlight the **Network Adapter** and click on the **Host-only** radial, as shown in Figure 1-11.

![Figure 1-10: Advanced: Virtual device node](image)

![Figure 1-11: Virtual machine settings: Network adapter](image)
10. Click *OK* to finish.

11. You will first see a window with the peripheral on your computer, and then likely a warning about downloading VMWare Tools. Download and install these tools if asked.

12. When the VMWare Tools have downloaded, you will see the **Product Key Activation Screen**. Do not enter a key and uncheck the **Automatically activate Windows when I am online** radial (refer to Figure 1-12).

![Figure 1-12: Install Windows: Product key entry](image)

13. Ignore the warning about activating your Windows, click *No*, and you’ll then see the **Windows** install screen. **Note:** This step could take some time, so be patient.

14. When complete, your virtual machine will restart, as in Figure 1-13.

![Figure 1-13: Install Windows: Restart](image)
15. Complete the installation. **Note:** This step may take some time. Refer to Figures 1-14 and 1-15.

![Figure 1-14: Complete the installation](image1)

![Figure 1-15: Install Windows: Completing the installation](image2)

16. Remember to have your mouse cursor within the virtual machine; to do so, click anywhere inside it. To get it out of the virtual machine, hold `Ctrl + Alt`.

Congratulations! You have successfully created a Virtual Windows 2008 Server Appliance!

**Note:** The first time you log on, Windows will continue to configure the server. To log on to a virtual machine, push `Ctrl + Alt + Insert` to get to the log on screen, which is shown in Figure 1-16.
Part B: Configuring Windows 2008 Server

1. Log on as Administrator, as shown in Figure 1-17.

2. Change your password. Note: The first time you log on to Windows Server 2008, it will ask you to change your password. Use P@SSw0rd again.

You will receive a message that your password has been reset, and your virtual machine will begin configuring the desktop.
3. The VMware Tools may install. If so, the virtual machine will reboot, and you will be ready. Log in and continue your lab projects configuring and using Windows 2008 Server (refer to Figure 1-18).

![Figure 1-18: VMware Tools: Installing VMware Tools](image)

4. After the machine has rebooted, log on as administrator and begin configuring your Server per the following information (also refer to Figure 1-19):
   - Computer name: **MainServer00**
   - Password: **P@SSw0rd**
   - Confirm password: **P@SSw0rd**
   - Set date and time according to your local time zone.
   - IP address: **192.168.1.11**
   - Subnet mask: **255.255.255.0**
   - Workgroup or computer domain: **BUSICORPWG**
5. Choose **Configure Networking** and right-click on the **Local Area Network** Icon to choose properties from the drop down menu, as shown in Figure 1-20.
6. Select **Internet Protocol Version 4 and Properties** (refer to Figure 1-21).
   Input the indicated IP address.
7. Click OK, exit the network connections window, and configure the computer name and time zones as indicated.
8. Reboot the virtual machine.

■ Part C: Verify Installation

1. Press Ctrl + Alt + Del to open the Log on to Windows dialog box.
2. When the log on screen displays, log on as Administrator using the password specified during installation.
3. If prompted to adjust screen resolution, follow the on-screen prompts to complete the process.
4. Open the Start menu, point to All Programs and then to Accessories, and then select Command Prompt to open a Command Prompt window.
5. Type ipconfig and press Enter.
6. Verify that the computer name and IP address reported are the same as the address specified during installation.
7. Type exit and press Enter to close the Command Prompt window.
8. Open the Start menu and select Shut Down. When prompted, type a reason for shutting down in the Comment prompt and click OK. Refer to Figure 1-22 for what this screen looks like.

![Image of the Shut Down Windows screen]

Figure 1-22: Shut down Windows