Guide to Networking Essentials 9th edition Tomsho Solutions Manual

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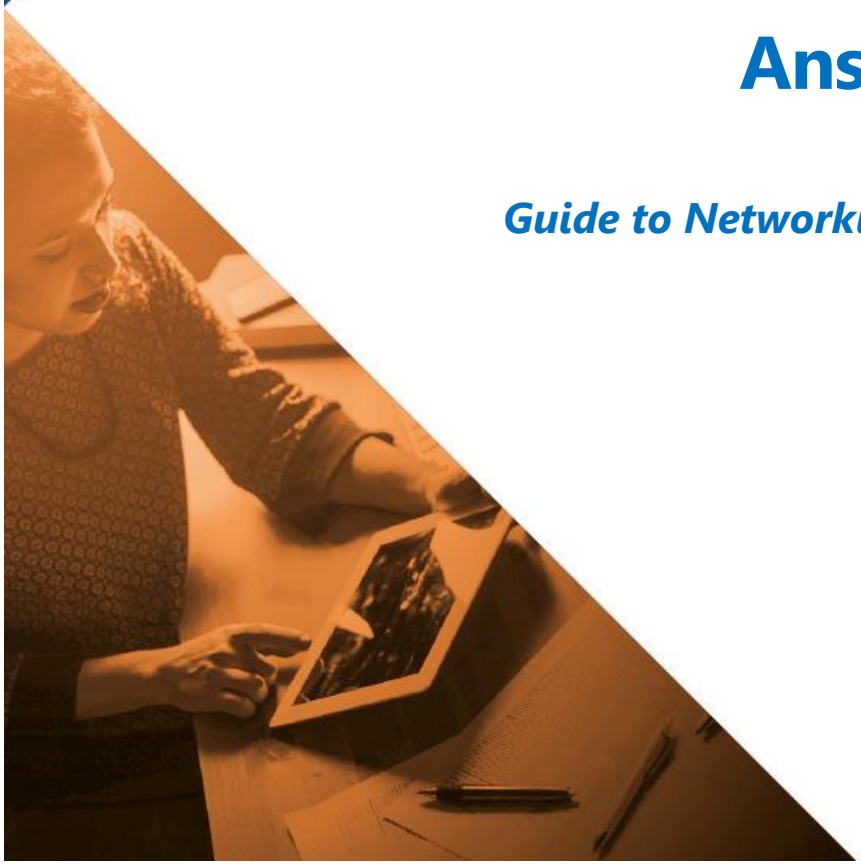
Practice Labs™

Answer File

Guide to Networking Essentials 9e



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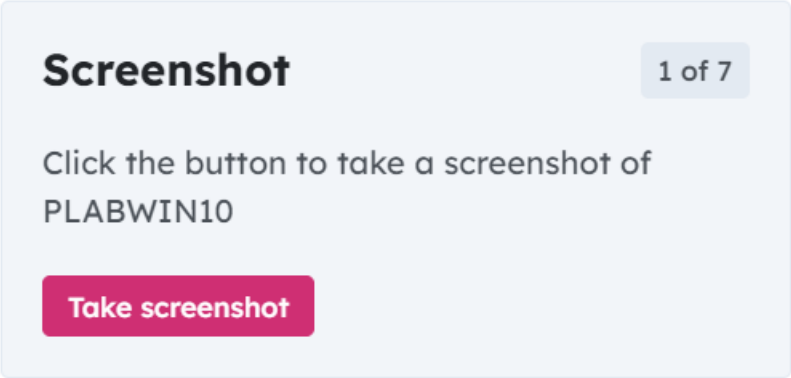
Introduction

The purpose of this document is to provide a quick reference guide for the inline questions found within the Practice Labs lab guides.

Screenshot assessment items are found at the end of each lab exercise. The learner should follow the steps within the lab guide and take a screenshot when they see the screenshot assessment item below.



Alert: The images in this document are to be used as a guide. The screenshots taken by the learner may vary!

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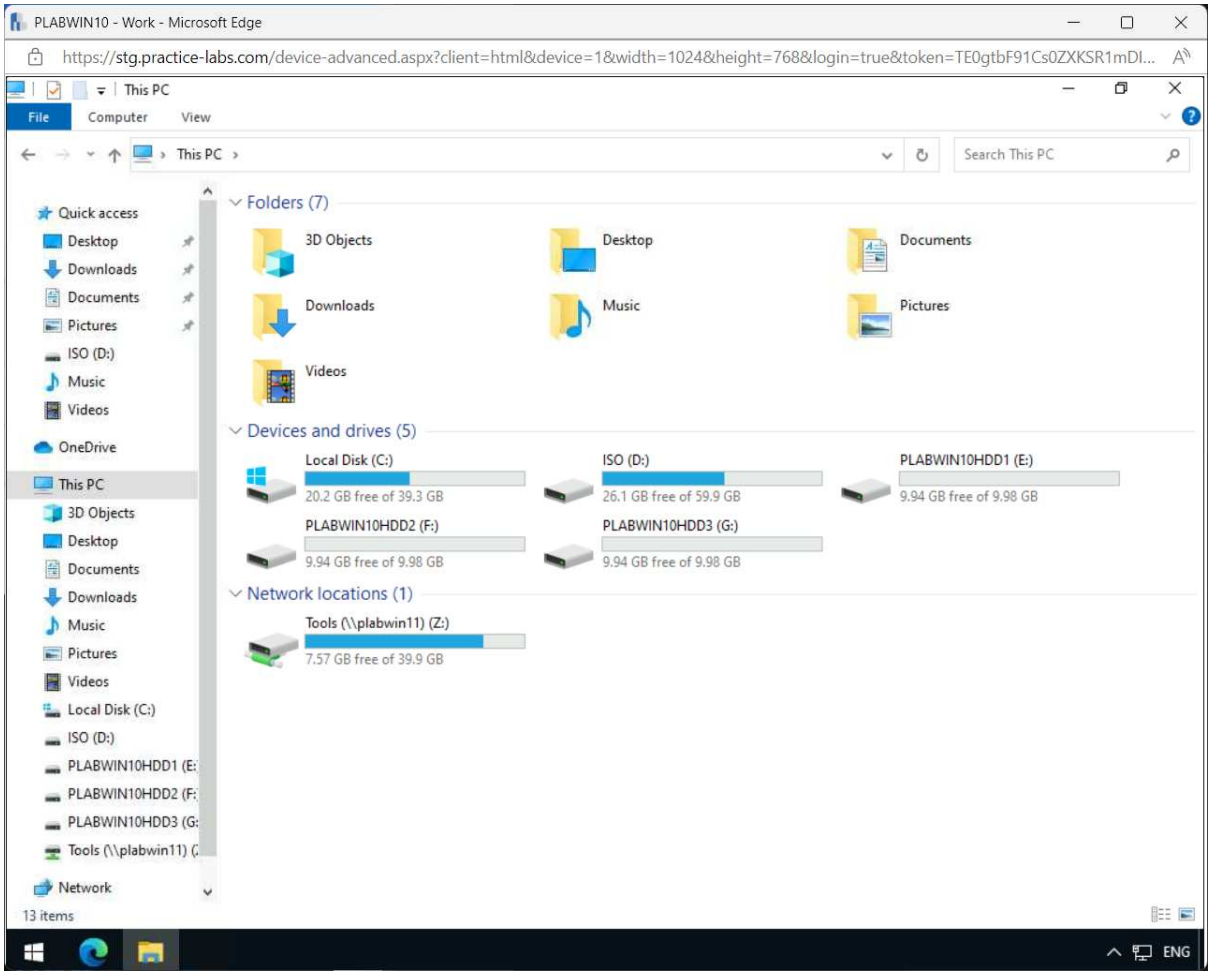
Module – Configuring Networking Settings on a Windows Device

Below are the inline questions found in the summary of Configuring Networking Settings on a Windows Device.

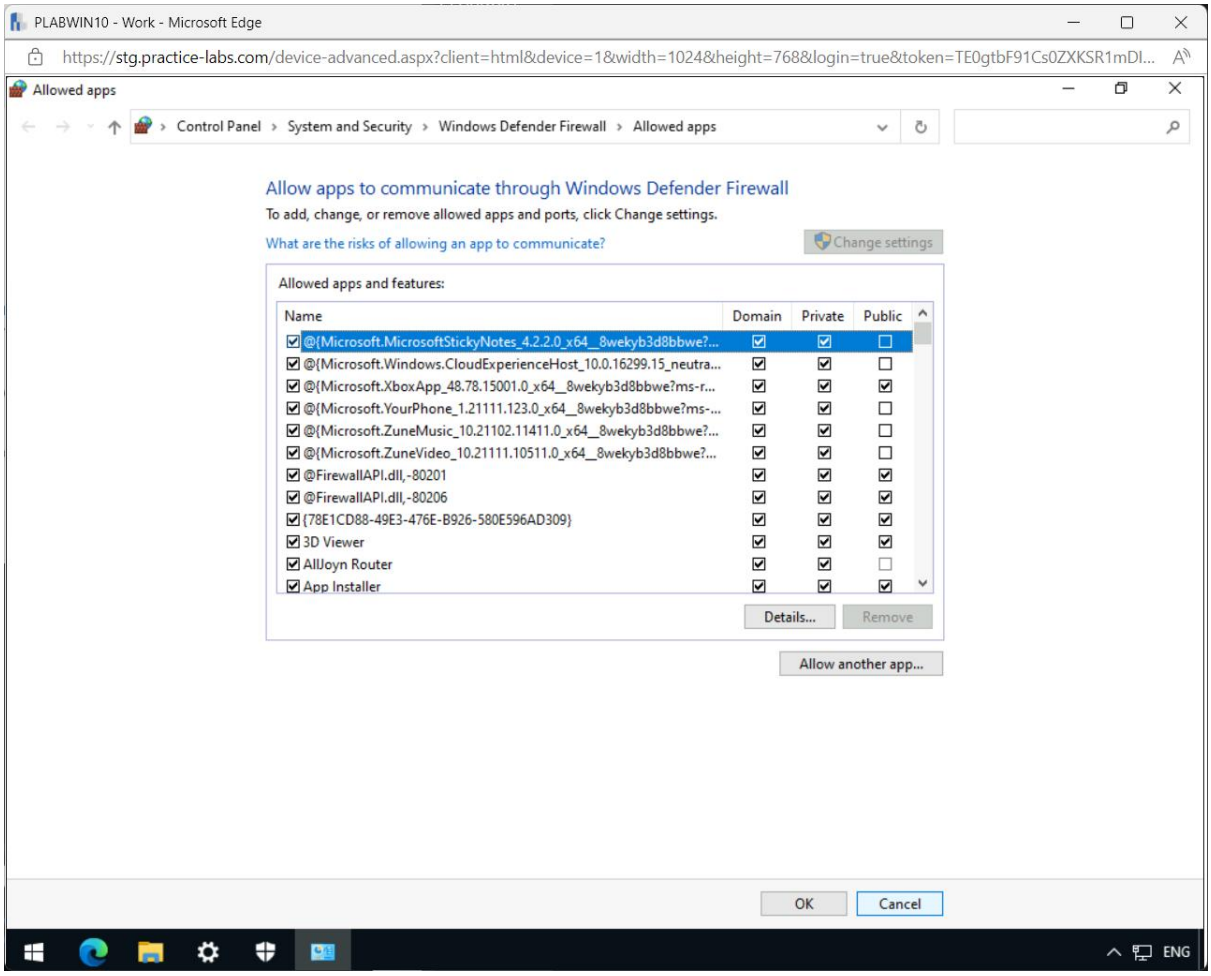
Question	Answer 1	Answer 2	Answer 3	Answer 4	Answer 5	Correct Answer
What are the advantages of using a Windows Workgroup? [Choose two that apply]	Central control of user profiles	**Easy to setup**	**Users decide who shares a resource**	Permissions are managed by group policy	Requires a Windows Domain Controller server	2,3
What is the main reason for the introduction of IPv6 addressing?	Hexidecimal is easier to use than binary	Use of 32-bit binary addressing system	It is required by Windows 11	**Number exhaustion in IPv4**		4
Which of these are NOT used in IPv4 addressing?	IP Address	Default Gateway	**MAC Address**	Name Server	Subnet Mask	3
Which of the following are advantages of File Servers? [Choose all that apply]	**Backup**	**Access control**	**File sharing**	**Remote access**	**Security**	1,2,3,4, 5
Which of the following addresses have a slash notation of /24?	Class A	Class B	**Class C**	Class D		3

Exercise 1 – Screenshot



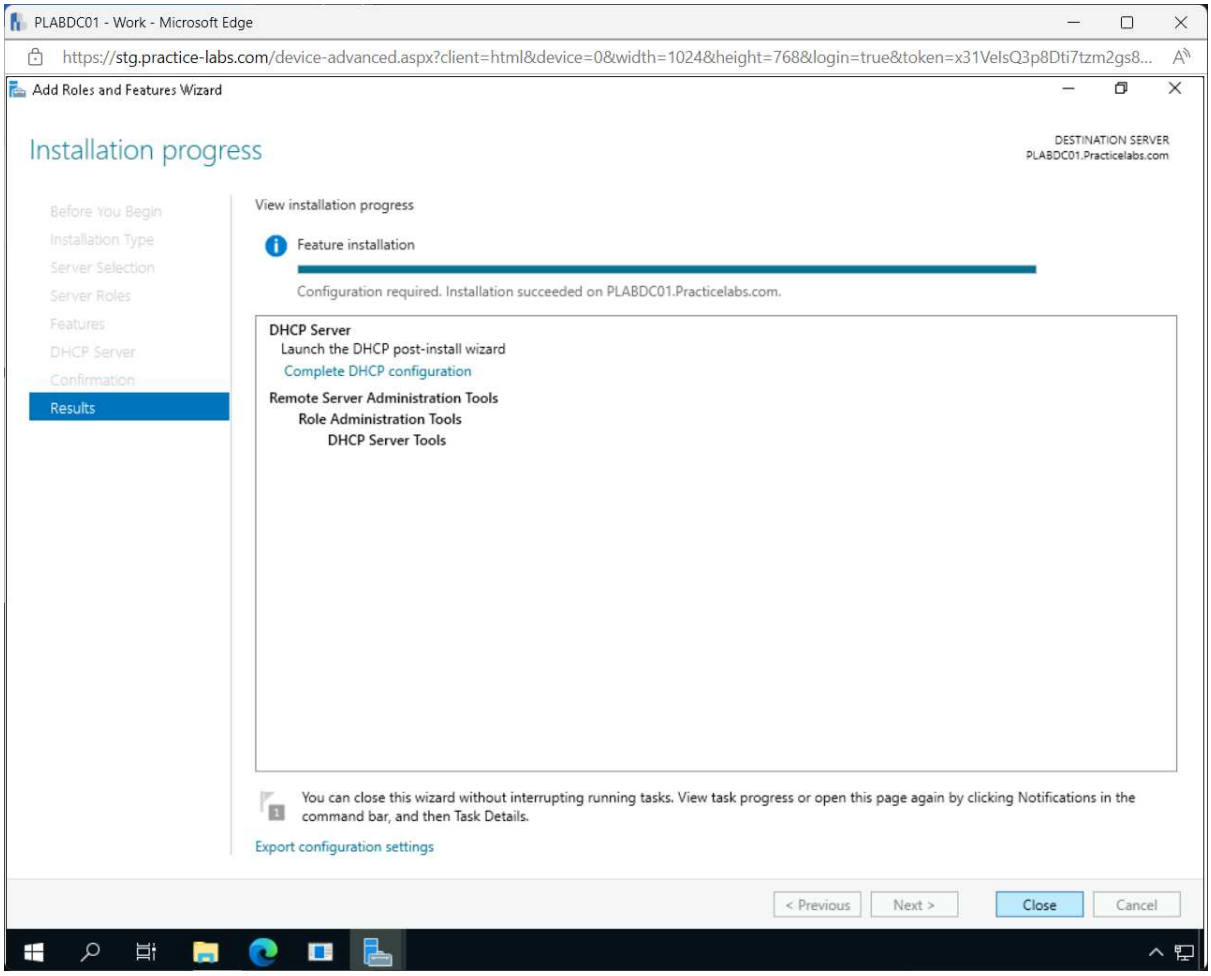
Screenshot of PLABWIN10: Displaying the File Explorer window with This PC selected on the left pane.

Exercise 2 – Screenshot



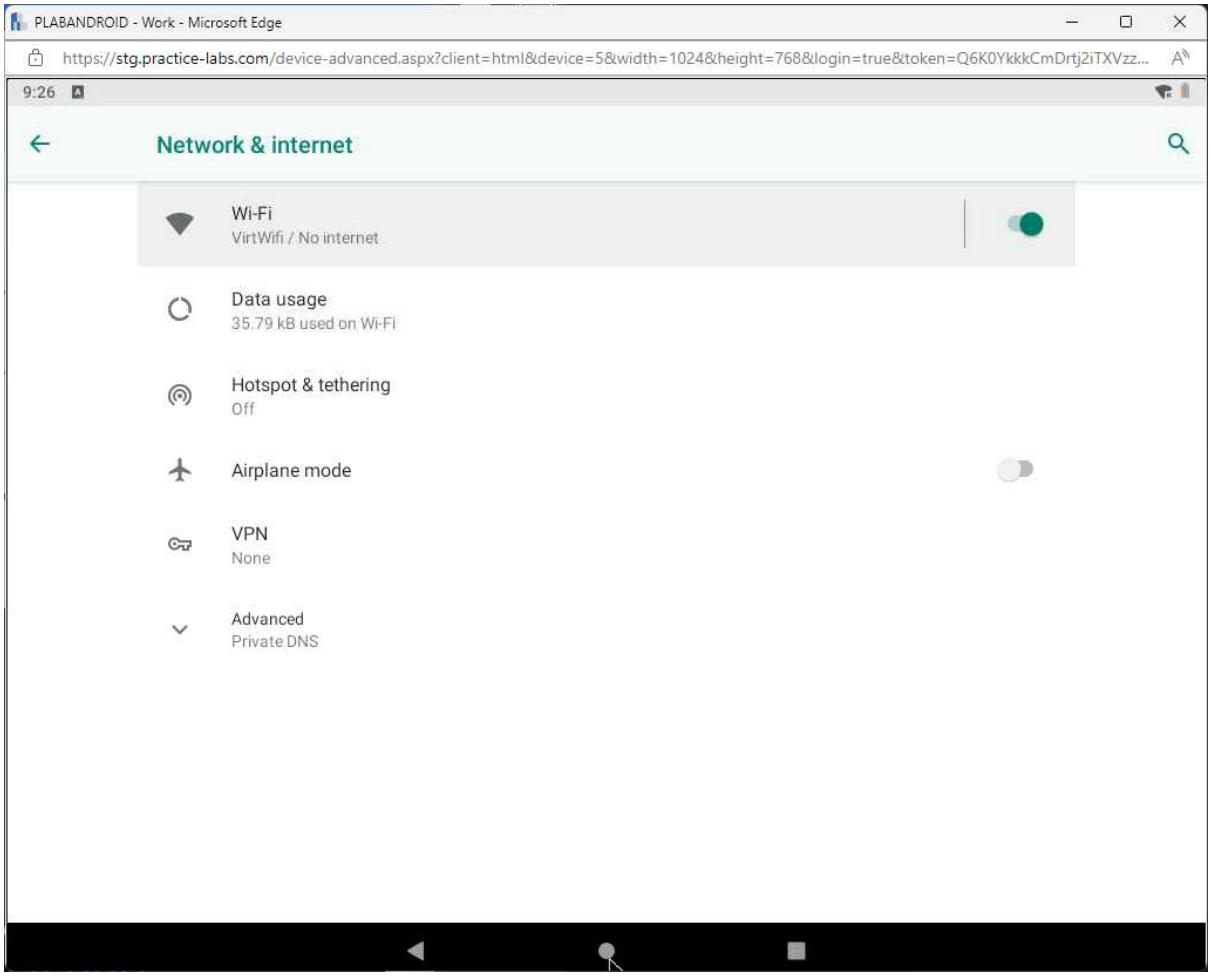
Screenshot of PLABWIN10: Displaying the Allowed apps to communicate through Windows Defender Firewall window.

Exercise 3 – Screenshot



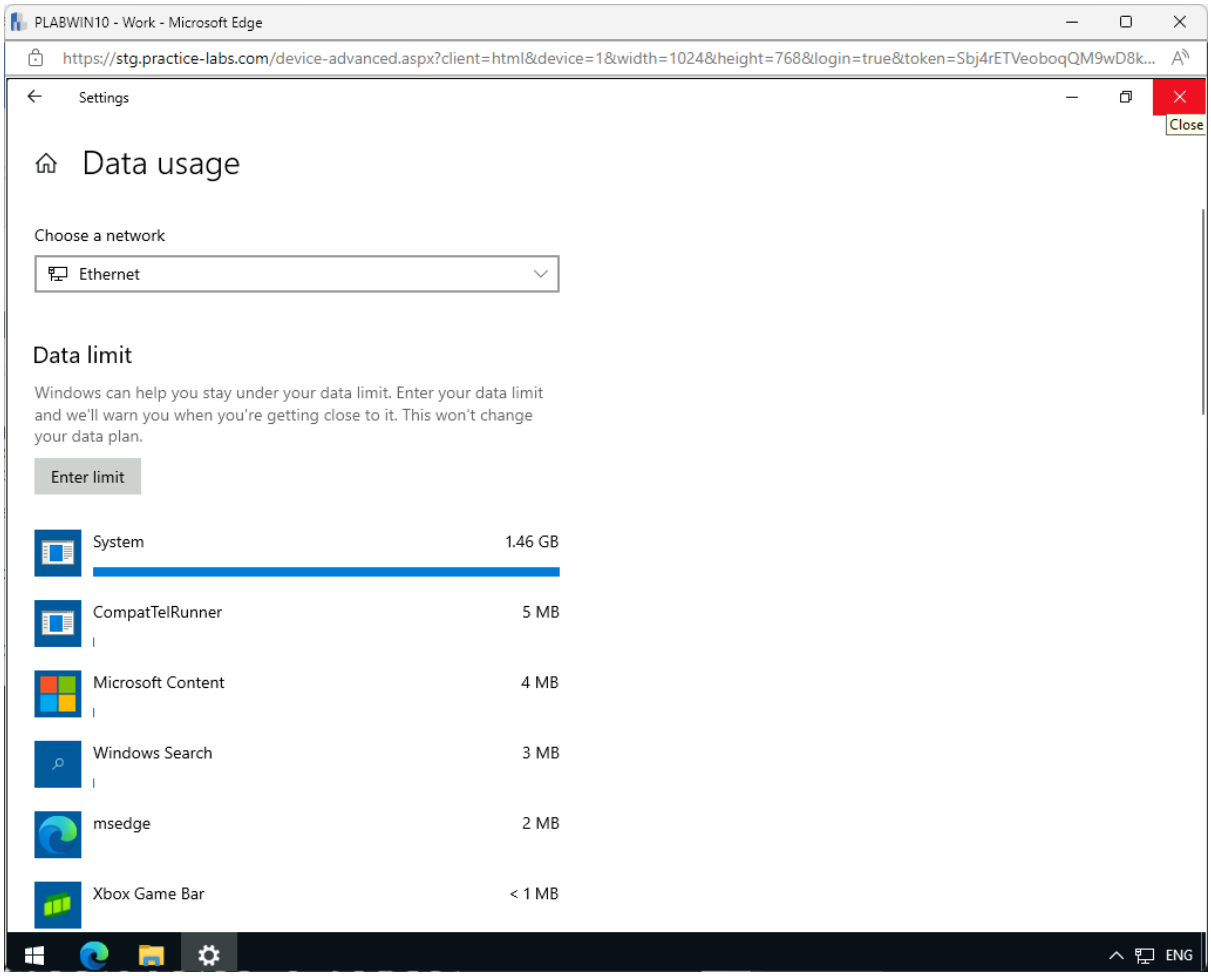
Screenshot of PLABDC01: Displaying successful installation of the DHCP server.

Exercise 4 – Screenshot



Screenshot of PLABANDROID: Displaying the Network & internet window.

Exercise 5 – Screenshot



Screenshot of PLABWIN10: Displaying the Settings – Data usage window.

Module – Networking Topologies and Architecture

Below are the inline questions found in the summary of Networking Topologies and Architecture.

Question	Answer 1	Answer 2	Answer 3	Answer 4	Correct Answer
In which network topology each device in the network is connected to a central hub of communication or switch?	Mesh	Bus	**Star**	Ring	3
In Hyper-V, each virtual machine network adapter connects to which of the following devices, to enable network communication?	vNIC	**vSwitch**	vHub	vRing	2
Within a Virtual Machine (VM), which of the following emulates a physical network interface card?	**Virtual Network Adapter**	Virtual Network Switch	Virtual Network Hub	Ring Topology	1
In which network topology are all nodes connected directly to all other nodes?	Bus	Ring	Hub and Spoke	**Mesh**	4
What capability groups multiple host network adapters into one logical interface?	Grouping	**NIC Teaming**	Bonding	Link Aggregation	2

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Instructor Manual

Greg Tomsho, Guide to Networking Essentials 2026, 9798214012667;

Chapter 1: Introduction to Computer Networks

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Purpose and Perspective of the Chapter

This chapter starts you on the path toward acquiring the skills to manage a large corporate network or simply configure a home network with a wireless router. This chapter begins by discussing the computer and its role in a network to give you a foundation for the topics in this book. Next, you will examine the components of a network and the fundamentals of communication between computers. Many new terms are introduced and defined, and the varied types of networks and network servers you might encounter are described.

Chapter Objectives

The following objectives are addressed in this chapter:

1. Describe basic computer concepts, components, and operations
2. Explain the fundamentals of network communication
3. Define common networking terms
4. Compare different network models

Chapter Outline

1. An Overview of Computer Concepts
    i. At the heart of a computer network is the computer. Networks were created to facilitate communication between computing devices, which ultimately facilitates communication between people. So, to better understand networks, how they work, and how to support them, you must have a solid understanding of computer operations. In fact, most of the devices you encounter when working with a network involve a computer. The most obvious are network servers and workstations that run operating systems, such as Windows, Linux, UNIX, and Mac OS X. Not as obvious are devices such as routers and switches, which move network data from computer to computer and network to network.
    a. Basic Functions of a Computer
        i. Input Components—A user running a word-processing program types the letter A on the keyboard, which results in sending a code representing the letter A to the computer.
        ii. Processing Components—The computer's CPU determines what letter was typed by looking up the keyboard code in a table.

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iii. Output Components—The CPU sends instructions to the graphics card to display the letter A, which is then sent to the computer monitor.

b. Storage Components

i. Storage components are a major part of a computer's configuration. Generally speaking, the more storage a computer has, the better it performs. As you saw in the previous section, most storage components are both input and output devices, allowing data to be saved (output) and then accessed again later (input). When most people think of storage, they think of disk drives, CD/DVD drives, and USB or flash drives. However, there are two main categories of storage: short-term storage and long-term storage.

ii. RAM: Short-Term Storage

a. Is so-called because the data in the storage is not maintained when power is turned off to the device. Random access memory (RAM) is short-term storage on a computer. RAM is a very high-speed storage component that is used to store the operating system, computer programs, and associated data that are currently running on the computer. RAM does not retain any data when the power is off. When the power on a computer is turned on, the operating system and other programs are loaded into RAM.

iii. Long-Term Storage

a. Maintains its data even when there's no power. Examples include hard disks, CDs/DVDs, solid-state drives (SSDs), and USB flash drives as well as other types of removable media. Long-term storage is used to store document and multimedia files as well as the files that make up applications and the OS.

iv. Data Is Stored in Bits

a. Whether storage is long-term or short-term, data on a computer is stored and processed as binary digits ("bits," for short). A bit holds a 1 or 0 value, which makes representing bits with electrical pulses easy. For example, a pulse of 5 volts of electricity can represent a 1 bit, and a pulse of 0 volts (or the absence of a pulse) can represent a 0 bit. Bits can also be represented as pulses of light, as with fiber-optic cable: A 1 bit is represented

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by the presence of light and a 0 bit as the absence of light.

v. Bits, Bytes, Megabytes, and Beyond
    a. Some types of computer information are expressed in bits and others are expressed in bytes. For example, when we talk about how fast a network connection is, the speed is usually expressed in bits, as in 100 million bits per second or 100 Mbps. When we talk about how much data a disk drive can store, the capacity is expressed in bytes, as in 100 billion bytes or 100 GB. Notice that when expressing bits, a lowercase b is used, but when expressing bytes, an uppercase B is used.

c. Personal Computer Hardware
    i. Most people are familiar with personal computer (PC) hardware. Other types of computers, such as minicomputers and mainframes, are usually locked away in a heavily air-conditioned room and privy only to the eyes of IT staff. The basic hardware used to build a PC or a mainframe differs only in the details. This section describes four major PC components housed in a computer case
    ii. The Motherboard and Its Components
        a. The motherboard is the nerve center of a computer, much like the spinal cord is the nerve center of the human body. It's a network of wires and controlling circuits that connects all computer components, including the CPU, RAM, disk drives, and I/O devices, such as network interface cards.
    iii. Computer Bus Fundamentals
        a. A bus is a collection of wires carrying data from one place to another on the computer. There are many bus designs and formats, each for a particular purpose. Although bus types come and go, it's safe to say that replacements for an older bus design will almost certainly be faster than their predecessor.
    iv. Storage Device Fundamentals
        a. Most desktop computers and laptops are likely to come with a hard drive as their primary long-term storage component. Hard drives consist of magnetic disks, called "platters," that store data in the form of magnetic pulses. These magnetic pulses are maintained even when power is turned off. Each pulse represents a single bit of data.

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v. Solid-State Drives
   a. Solid-state drives are used in place of hard drives in many systems because of their speed and reliability. An SSD uses a type of storage called “flash memory” that contains no moving parts and has faster access times than a mechanical hard drive. SSDs are more expensive than hard drives when you compare the price per giga byte of storage. SSDs are most often used in mobile devices (such as laptops, smartphones, and tablets) but are also found on high-performance desktops and servers, either supplementing, or replacing, hard drive storage.

vi. RAM Fundamentals
   a. RAM, the main short-term storage component on a computer, consists of capacitors to store data and transistors to control access to data. Capacitors require power to maintain the bits they store. Because RAM requires continuous power to store data, it’s referred to as volatile memory.

vii. Firmware Fundamentals
   a. A key component of every computer is its firmware. Firmware is a computer program stored in nonvolatile memory, such as ROM or flash memory. Nonvolatile memory is a type of storage that maintains its data after power is removed. Firmware is located on the motherboard and is executed when the computer is first powered on. The firmware on most PCs is called the basic input/output system (BIOS) or Unified Extensible Firmware Interface (UEFI). A main function of the BIOS or UEFI is to instruct the CPU to perform certain tasks when power is first applied to the computer, including initializing motherboard hardware, performing a power-on self-test (POST), and beginning the boot procedure.

d. Computer Boot Procedure

i. To take a computer from a powered-off state to booting and running an OS, such as Windows or Linux, the following steps must take place:
   1. Power is applied to the motherboard.
   2. The CPU starts.
   3. The CPU carries out the firmware startup routines, including the POST.

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4. Boot devices, as specified in the firmware configuration, are searched for an OS.
5. The OS is loaded into RAM.
6. OS services are started.

2. The Fundamentals of Network Communication
    i. A computer network consists of two or more computers connected by some kind of transmission medium, such as wires or electromagnetic waves. After they're connected, correctly configured computers can communicate with one another. The primary motivation for networking was the need for people to share resources, such as printers and hard drives, to share information such as word-processing files, and to communicate by using applications such as e-mail. These days, most businesses can't function without easy access to the most commonly used network of all, the Internet. In other words, they need to be online.
    a. Network Components
        i. Network interface card—A network interface card (NIC) is an add-on card that's plugged into a motherboard expansion slot and provides a connection between the computer and the network. Most computers have a network interface built into the motherboard, so no additional card is necessary; however, servers often have four, six, or more network interfaces.
        ii. Network medium—A means of connecting a computer's NIC to the rest of the network. Network medium can be a cable composed of wires or glass that plugs into the NIC and makes the connection between a computer's network interface and the rest of the network.
        iii. Interconnecting device—Although this component isn't always necessary because two computers can be connected directly with a cable and small wireless networks can be configured without an interconnecting device, most networks include one or several of these components.
        iv. Network clients and servers—Network client software requests information that's stored on another network computer or device. Network server software allows a computer to share its resources by fielding resource requests generated by network clients. Network client software can be an integral part of well-known applications, such as Web browsers and e-mail programs.

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v. Protocols—When clients and servers need to send information on the network, they must pass it to network protocols, which define the rules and formats a computer must use when sending information across the network. A network protocol can be likened to a human language.

vi. NIC device driver—After a network protocol has formatted a message correctly, it hands the data off to the NIC device driver (or simply, NIC driver) for transmission onto the network. NIC drivers receive data from protocols and then forward this data to the physical NIC, which transmits data onto the medium.

b. Steps of Network Communication

i. Most network communication starts with a user needing to access a resource on another computer, such as a Web server or file server. A user's attempt to access network resources is summarized in these basic steps:

1. An application tries to access a network resource by attempting to send a message to it.
2. Network client software detects the attempt to access the network. Client software formats the message generated by the application and passes the message on to the network protocol.
3. The protocol packages the message in a format suitable for the network and sends it to the NIC driver.
4. The NIC driver sends the data in the request to the NIC, which converts it into the necessary signals to be transmitted across the network medium.

c. Layers of the Network Communication Process

i. Each step of a client accessing network resources is often referred to as a "layer" in the network communication process. Each layer has a specific function to accomplish, and all the layers work together.

d. How Two Computers Communicate on a LAN: Some Details

i. The layers of the network communication process give an overview of how network communication works. However, few details have been provided on what each layer accomplishes. This discussion focuses on computer addresses and how they're used during network communication. Computers that participate in a network must have an address associated with their network interface so that messages can be delivered to the right device on the network. If you think of the phone

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system as a large network, each phone has a number so that messages can be sent to specific phones. In a computer network using a protocol such as TCP/IP (the most common network protocol), computers have two addresses: a logical address and a physical address. The logical address is the Internet Protocol (IP) address, and the physical address is called the Media Access Control (MAC) address.

3. Network Terms Explained
    i. Every profession has its own language with its own unique terms and acronyms. Learning this language is half the battle of becoming proficient in a profession, and it's no different in computer and networking technology. The following sections explain some common terms used in discussing computer networks. Because some of these terms are associated with network diagrams, a number of figures are included in the following sections to show different ways of depicting networks.
    a. LANs, Internetworks, WANs, and MANs
        i. A small network that is limited to a single collection of machines and connected by one or more interconnecting devices in a small geographic area is called a local area network (LAN). LANs also form the building blocks for constructing larger networks called "internetworks."
    b. WLANs, CANs, and PANs
        i. There are other types of area networks: a wireless LAN, known as a WLAN, a campus area network, known as a CAN, and a personal area network, known as a PAN. A wireless LAN (WLAN) is much like a traditional LAN, except, as the name implies, it is wireless. A WLAN, like a LAN, consists of network devices such as computers and servers and an interconnecting device called an access point.
    c. Internet, Intranet, and Extranet
        i. The Internet is a worldwide public internetwork that uses standard protocols, such as TCP/IP, DNS, HTTP, and others, to transfer and view information. It's a public network because the devices such as routers and Web servers that make up much of the network are accessible by anyone who is connected to the Internet. An intranet, on the other hand, is a private network, such as a school or company network, in which the devices and servers are available only to users connected to the company network. Many of the same protocols and technologies used on the Internet are used to access information on an intranet. An

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extranet sits somewhere between the Internet and an intranet. It allows limited and controlled access to internal network resources by outside users. It's used when two organizations need to share resources, so controls are put in place to allow this sharing without making resources available to the wider Internet.

d. Packets and Frames
    i. When computers transfer information across a network, they do so in short bursts of about 1500 bytes of data. Each burst, or chunk, of data has the same basic structure; specifically, each chunk of data contains the MAC addresses and IP addresses of both the sending (source) and receiving (destination) computers. So, to transfer a small word-processing file, only one chunk of data transfer might be needed, but large photo or music files are first divided into several hundred or even thousands of chunks before they're transferred. After each chunk of data is sent, the computer pauses momentarily.
    ii. Packets
        1. The chunks of data sent across the network are usually called "packets" or "frames." Packet, the more well-known term, is often used generically to mean a chunk of data sent over the network. However, this term does have a particular meaning: It's a chunk of data with source and destination IP addresses (as well as other IP protocol information) added to it.
    iii. Frames
        1. A frame is a packet with the source and destination MAC addresses added to it. In addition, frames have an error-checking code added to the back end of the packet, so the packet is "framed" by MAC addresses (and other network interface information) on one end and an error-checking code on the other. A frame is like a letter that's been addressed and stamped and is ready to deliver.

e. Clients and Servers
    i. Client
        1. A client, in networking terms, can be a workstation running a client OS, such as Windows 11, or the network software on a computer that requests network resources from a server. In addition, you can refer to a physical computer as a client computer. What the term "client" means, therefore, depends on the context in which it's used.
    ii. Server

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1. When most people hear the word “server,” they conjure up visions of a large tower computer with lots of hard drives and memory. This image is merely a computer hardware configuration that may or may not be used as a server, however. In short, a computer becomes a server when software is installed on it that provides a network service to client computers. In other words, you can install certain software on an inexpensive laptop computer and make it act as a server. By the same token, a huge tower computer with six hard drives and 256 GB of RAM can be used as a workstation for a single user.

4. Network Models
    i. A network model defines how and where resources are shared and how access to these resources is regulated. Network models fall into two major types: peer-to-peer and server-based (also called client/server). This discussion of network models addresses the role that computers play on the network and how these roles interact. Server-based networks are the most common in business settings, but understanding both types is essential, especially as they compare with each other.

    a. Peer-to-Peer/Workgroup Model
        i. In a peer-to-peer network, every user must act as the administrator of his or her computer’s resources. Users can give everyone else unlimited access to their resources or grant restricted (or no) access to other users on the network. To grant access, users must create user accounts and passwords for each user who will access shared resources on their computers. The username and password for accessing a computer are called credentials. If you have five computers in a peer-to-peer network, each user might have to remember as many as five different sets of credentials. Because of the lack of centralized authority over resources, controlled chaos is the norm for all but the smallest peer-to-peer networks, and security can be a major concern because not all users might be educated in creating secure passwords.

    b. Server/Domain-Based Model
        i. Server-based networks allow centralized control over network resources, mainly by providing an environment in which users log on to the network with a single set of credentials maintained by one or more servers running a server OS. Server OSs are designed to handle many simultaneous user logons and requests for

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shared resources efficiently. In most cases, servers are dedicated to running network services and shouldn't be used to run user applications. You want to reserve servers' CPU power, memory, and network performance for user access to network services.

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Note About Live Virtual Machine Labs

The live virtual machine labs provide hands-on practice that will help students learn the material covered in each module. Throughout the labs students will encounter gradable assessments in the form of multiple-choice questions, as well as requests to use lab functionality and record screenshots of their live virtual machine lab desktop, noting their progress in the lab.
The introduction in the content pane in each live virtual machine lab provides a list of learning outcomes that students should be able to do after they complete the module. There is also a list of the exam objectives that each lab covers. The main focus of the live virtual machine labs is to cover the practical, hands-on aspects of the exam objectives. The labs do not map directly back to the topics covered in each module of the book or MindTap course. It is recommended that students refer to course materials to research theoretical topics in more detail.
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Additional Discussion Questions

The following are discussion questions that do not appear in the text, PPTs, or courseware (if courseware exists)—they are for you to use as you wish. You can assign these questions several ways: in a discussion forum in your LMS; as whole-class discussions in person; or as a partner or group activity in class.

1. Have any of the students installed/configured a LAN before? If so, ask them to briefly discuss their experiences.

2. Do students have previous experience with PC repair and maintenance? If so, ask them to briefly discuss their experiences.

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Additional Activities and Assignments

The following are activities and assignments developed by Cengage but not included in the text, PPTs, or courseware (if courseware exists)—they are for you to use if you wish.

1. Students should research a list of operating systems (client or server) and detail their hardware requirements. They should then compare the benefits of Microsoft and non-Microsoft solutions in relation to hardware requirements.

2. Give students the chance to look at network comparisons of small, home peer-to-peer networks versus a larger domain-based server network. Ask them to identify what services they have in common (DHCP, DNS).

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Additional Resources

External Videos or Playlist

- **Computer & Technology Basics**
- **Primary & Secondary Storage**
- **Network Devices - Hosts, IP Addresses, Networks - Networking Fundamentals**
- **Full Course on Network Fundamentals**

Internet Resources

- **A basic breakdown of a computer's parts and functions**
- **Types of Media Used in Computer Networking**
- **Windows network architecture and the OSI model**
- **Introduction to LANs, WANs, and Other Kinds of Area Networks**
- **Basics of Computer Networking**
- **How to Set Up a Server Network**

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- Networking terms and definitions
- The Essential Guide to Client-Server Networks: Benefits and Examples
- How Home Networking Works
- Networking Fundamentals: How data moves through the Internet
- Practical Networking

External Audio Resources

- Podcast 66 - Setting up a Home Network
- Podcast: How to secure and speed up your home Wi-Fi network

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Appendix

Generic Rubrics

Providing students with rubrics helps them understand expectations and components of assignments. Rubrics help students become more aware of their learning process and progress, and they improve students' work through timely and detailed feedback.
Customize these rubric templates as you wish. The writing rubric indicates 40 points and the discussion rubric indicates 30 points.

Standard Writing Rubric

Criteria	Meets Requirements	Needs Improvement	Incomplete
Content	The assignment clearly and comprehensively addresses all questions in the assignment. 15 points	The assignment partially addresses some or all questions in the assignment. 8 points	The assignment does not address the questions in the assignment. 0 points
Organization and Clarity	The assignment presents ideas in a clear manner and with strong organizational structure. The assignment includes	The assignment presents ideas in a mostly clear manner and with a mostly strong organizational structure.	The assignment does not present ideas in a clear manner and with strong organizational structure. The assignment includes

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	an appropriate introduction, content, and conclusion. Coverage of facts, arguments, and conclusions are logically related and consistent. 10 points	The assignment includes an appropriate introduction, content, and conclusion. Coverage of facts, arguments, and conclusions are mostly logically related and consistent. 7 points	an introduction, content, and conclusion, but coverage of facts, arguments, and conclusions are not logically related and consistent. 0 points
Research	The assignment is based upon appropriate and adequate academic literature, including peer reviewed journals and other scholarly work. 5 points	The assignment is based upon adequate academic literature but does not include peer reviewed journals and other scholarly work. 3 points	The assignment is not based upon appropriate and adequate academic literature and does not include peer reviewed journals and other scholarly work. 0 points
Research	The assignment follows the required citation guidelines. 5 points	The assignment follows some of the required citation guidelines. 3 points	The assignment does not follow the required citation guidelines. 0 points
Grammar and Spelling	The assignment has two or fewer grammatical and spelling errors. 5 points	The assignment has three to five grammatical and spelling errors. 3 points	The assignment is incomplete or unintelligible. 0 points

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Standard Discussion Rubric

Criteria	**Meets Requirements**	**Needs Improvement**	**Incomplete**
Participation	Submits or participates in discussion by the posted deadlines. Follows all assignment instructions for initial post and responses. 5 points	Does not participate or submit discussion by the posted deadlines. Does not follow instructions for initial post and responses. 3 points	Does not participate in discussion. 0 points
Contribution Quality	Comments stay on task. Comments add value to discussion topic. Comments motivate other students to respond. 20 points	Comments may not stay on task. Comments may not add value to discussion topic. Comments may not motivate other students to respond. 10 points	Does not participate in discussion. 0 points
Etiquette	Maintains appropriate language. Offers criticism in a constructive manner. Provides both positive and negative feedback. 5 points	Does not always maintain appropriate language. Offers criticism in an offensive manner. Provides only negative feedback. 3 points	Does not participate in discussion. 0 points

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