

Types of Networks

by Sophia



WHAT'S COVERED

In this lesson, you will learn about the various types of data communication networks. These networks include local area networks (LANs) and other types of computer networks. You will also learn about basic network designs, including some similarities and differences between peer-to-peer networks and client-server networks.

Specifically, this lesson will cover the following:

1. What Is a Network?
2. Types of Networks
 - 2a. Local Area Network (LAN)
 - 2b. Wireless Local Area Network (WLAN)
 - 2c. Virtual Local Area Network (VLAN)
 - 2d. Wide Area Network (WAN)
 - 2e. Personal Area Network (PAN)
 - 2f. Metropolitan Area Network (MAN)
 - 2g. Campus Area Network (CAN)
 - 2h. Storage Area Network (SAN)
3. Network Architecture
 - 3a. Peer-to-Peer Networks
 - 3b. Client-Server Networks

1. What Is a Network?

A **computer network** is a system of computers and other digital devices connected to each other to share resources. Shared resources may include data, files, printers, network storage, access to the internet, and several other things. From a business perspective, the ability to share resources helps reduce cost and improve efficiency.

⇒ **EXAMPLE** An office with 20 workers can share one networked printer rather than have 20 stand-alone printers attached as a **peripheral device** to each worker's computer. A peripheral device is an electronic device that is outside the computer's system unit (external to the computer's enclosing case) but is used by the computer to which it is connected, such as a printer or a scanner.

All types of digital devices can be attached to a network, including desktops, laptops, workstations, and smartphones. Any computer attached to a network can be called a **host**.



BIG IDEA

From a business perspective, computer networking is fundamentally about saving money by enabling the sharing of resources. From a technology perspective, networking is fundamentally about building highly available connections that enable the secure transmission of digital data, including text, voice, and video.



TERMS TO KNOW

Computer Network

Computers and other digital devices connected to each other to share resources.

Peripheral Device

An electronic device that is outside the computer's system unit (external to the computer's enclosing case) but used by the computer to which it is connected, such as a printer or a scanner.

Host

Any computer attached to a network.

2. Types of Networks

There are many types of networks. One of the distinguishing features of a network is the size of the geographic area that it covers. Another feature is whether the network is wired or wireless. **Wired networks** use various types of network cables to carry signals from device to device. Wireless networks use the **radio frequency (RF)** spectrum as a signal carrier.



TERMS TO KNOW

Wired Networks

Networks that use various types of network cables to carry signals from device to device.

Radio Frequency (RF)

That part of the electromagnetic spectrum, between about 3 kHz and 300 MHz, within which radio waves are transmitted.

2a. Local Area Network (LAN)

A **local area network (LAN)** is usually restricted to a particular geographic location such as an office building, a single department within a corporate office, or even a small office or home office (**SOHO**).

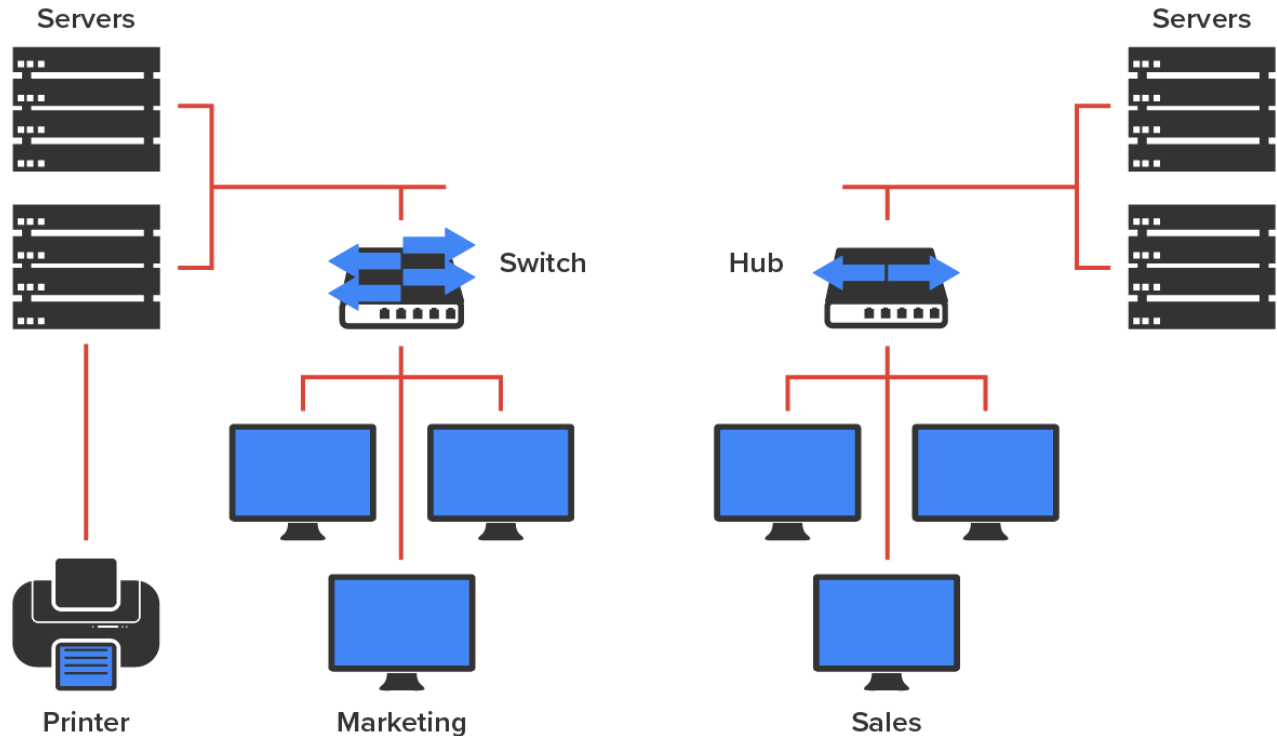
⇒ **EXAMPLE** You have most likely used a LAN if you have ever operated a computer or digital device at school or at work.

An Ethernet LAN is wired and is built using various types of cables installed on a building's premises. LANs typically have high **bandwidth** and low **latency**. A high bandwidth is good, because it means the network carries a large amount of data per second. A low latency is good, because there is very little delay. The most prominent LAN **protocol** is called Ethernet. We'll learn more about how Ethernet works later in the course.



KEY CONCEPT

The term “local” in the context of a LAN is the opposite of “remote.” So, a LAN provides end users with access to networked resources that are physically located in the office or building.



TERMS TO KNOW

Local Area Network (LAN)

An interconnection of computers that are in relatively close proximity to each other, such as within a building.

SOHO

Small office or home office.

Bandwidth

The rate of data flow in digital networks typically measured in bits per second; the bit rate.

Latency

A delay or a period between the initiation of something and the occurrence.

Protocol

A set of formal rules describing how to transmit or exchange data, especially across a network.

2b. Wireless Local Area Network (WLAN)

A **wireless local area network (WLAN)** is typically attached to a LAN to provide mobility to local users by way of an RF connection.

⇒ **EXAMPLE** You have very likely used a WLAN if you have ever connected your smartphone or laptop to the wireless network in your home or workplace.

The most prominent WLAN technology is called **Wi-Fi**. A WLAN infrastructure is built using various types of **access points** installed on a building's premises. You will learn more about wireless networking in future tutorials.



TERMS TO KNOW

Wireless Local Area Network (WLAN)

A network typically attached to a LAN to provide mobility to local users by way of a wireless RF connection.

Wi-Fi

A wireless data communication standard.

Access Point

A wireless radio that transmits and receives Wi-Fi signals.

2c. Virtual Local Area Network (VLAN)

A **virtual local area network (VLAN)** is a subnetwork of a LAN that enables specific groups of computers to communicate as if they were connected to the same network hardware.

⇒ **EXAMPLE** VLANs are employed for computers or digital devices at an enterprise. You may have interacted with a VLAN at work or at school. It could have had more than 250 **end users**.

VLANs will be discussed in more depth in future tutorials.



TERMS TO KNOW

Virtual Local Area Network (VLAN)

A subnetwork of a LAN.

End User

A person who uses a networked device.

2d. Wide Area Network (WAN)

A **wide area network (WAN)** is another example of a network. A WAN is a computer network that covers a large geographic area, and it is **scalable** to a global level. For example, a large national corporation may have its headquarters in New York City and have regional offices in Minneapolis, Miami, and San Francisco. The WAN is

the network that connects the LANs in the regional offices to each other. The WAN provides end users with access to resources located in remote offices. The internet is a worldwide WAN.



HINT

Besides the differing geographic coverage, a WAN differs from a LAN in that a WAN typically relies on leasing physical cabling infrastructure from a large telecommunications service provider.

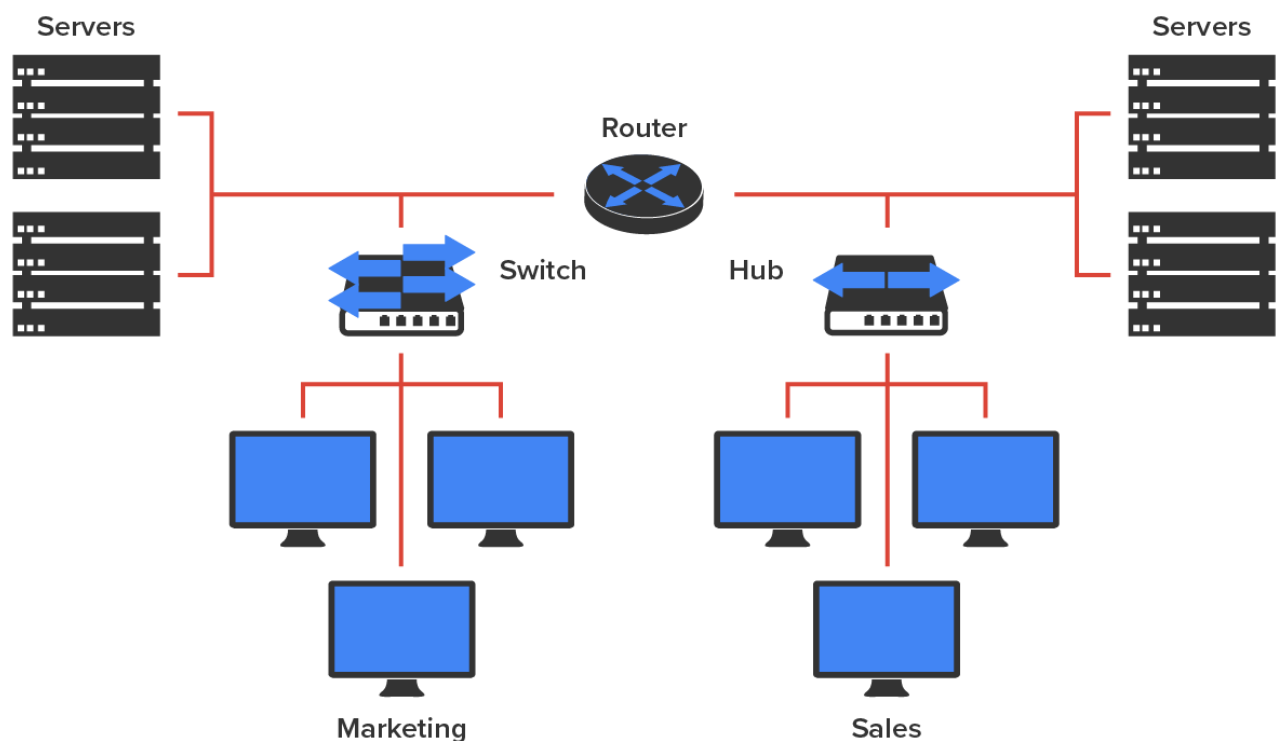


KEY CONCEPT

WANs typically have low bandwidth and high latency, whereas LANs have high bandwidth and low latency.

⇒ **EXAMPLE** You have most likely used a WAN if you have ever accessed the internet.

The following is a diagram of a WAN:



TERMS TO KNOW

Wide Area Network (WAN)

A computer network that covers a large geographic area.

Scalable

Able to be changed in scale; resizable.

2e. Personal Area Network (PAN)

A **personal area network (PAN)** is a type of **wireless** computer network that covers a very small geographic area. This is typically an area of about 30 ft. A PAN uses **Bluetooth**, which is a wireless protocol.



DID YOU KNOW

When you connect your laptop or smartphone to peripheral Bluetooth devices like car audio systems, speakers, headsets and headphones, and smartwatches, you have very likely used a PAN.



TERMS TO KNOW

Personal Area Network (PAN)

A type of wireless computer network that covers a very small geographic area.

Wireless

Communication without a wired connection, such as by radio waves.

Bluetooth

Wireless protocol used in personal area networks.

2f. Metropolitan Area Network (MAN)

A **metropolitan area network (MAN)** is a much larger network than a PAN. A MAN is a computer network that covers the area of a large city. This can include an area of up to a 25-mi radius.

⇒ **EXAMPLE** You have very likely used a MAN if you have ever operated a computer or digital device at a workplace that has multiple office locations in the same city.

Metropolitan area Ethernet (MAE) is a MAN service. MAEs are based on Ethernet standards. They can connect a customer to a larger network and the internet. If metro Ethernet is available, businesses can use it to connect their offices together. This setup presents another very cost-effective connection option. Some **metro Ethernets** use **multiprotocol label switching (MPLS)** networks in the **internet service provider (ISP)**. They do this by providing Ethernet or a **fiber-optic cable** to the customer as a connection.



TERMS TO KNOW

Metropolitan Area Network (MAN)

A computer network that covers the area of a large city, up to about a 25-mi radius.

Metro Ethernet

A metropolitan area network (MAN) connection service provided by a telecommunications service provider.

Multiprotocol Label Switching (MPLS)

A networking technology that routes traffic using the shortest path based on labels to handle forwarding.

Internet Service Provider

A company that provides internet access for a fee.

Fiber-Optic Cable

A type of networking cable made of glass that transports light to represent data.

2g. Campus Area Network (CAN)

Another regionally based LAN is the **campus area network (CAN)**. This is a network that encompasses several buildings. Although a LAN is typically confined to a single building, it provides data, services, and connectivity to the outside world to those who work in a corporate office or headquarters.

⇒ **EXAMPLE** You have very likely used a CAN if you have ever operated a computer or digital device on a college or corporate campus.



TERM TO KNOW

Campus Area Network (CAN)

A network that encompasses several buildings.

2h. Storage Area Network (SAN)

The final network in this tutorial is the **storage area network (SAN)**. This network is composed of high-capacity storage devices that are connected by a high-speed private network (separate from the LAN) using a storage-specific switch. This storage information architecture facilitates the collection, management, and use of data. These networks are typically fiber-optic networks.

⇒ **EXAMPLE** You have most likely used a SAN if you have ever operated a computer or digital device to save a file to the network of a large university or company.



REFLECT

As you can see, there are networks for many different applications. The key to network design is ensuring that the type of network you choose to implement is best suited for your application.



TERM TO KNOW

Storage Area Network (SAN)

A network of high-capacity storage devices that are connected by a high-speed connection.

3. Network Architecture

There are different ways to construct a network, just like there are different ways to build a house or an office building. You may already be familiar with the word “architecture” as it relates to building design. Similarly, the term **network architecture** simply means the structure and design of a network.



TERM TO KNOW

Network Architecture

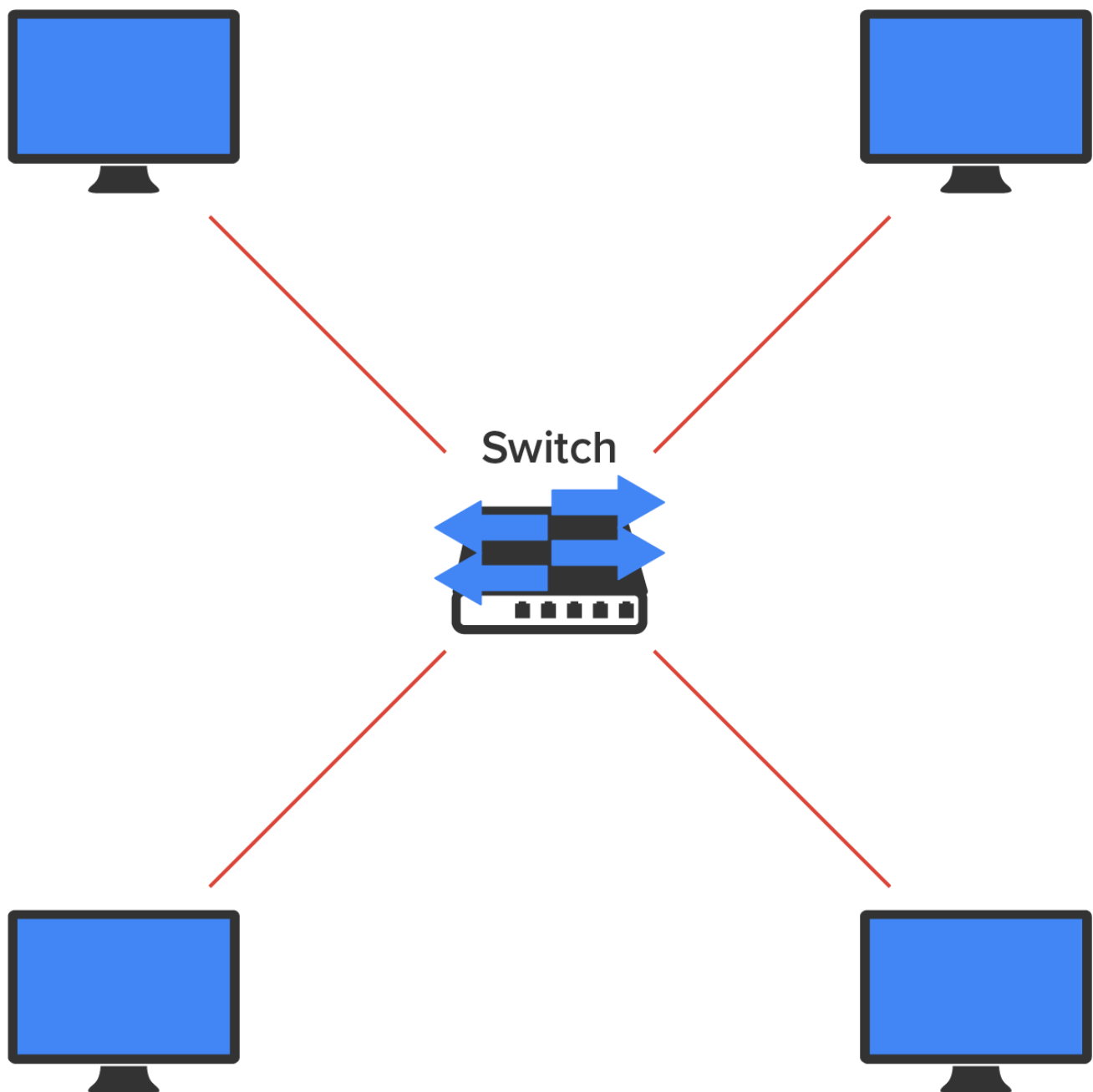
The design of a computer network.

3a. Peer-to-Peer Networks

Computers connected to each other in a **peer-to-peer network** do not have a centralized controller; they are all peers, meaning that when it comes to authority, they are all equal. In a peer-to-peer network, there is no single machine that manages access to networked resources for all the other computers.

⇒ **EXAMPLE** If you need to access a file on a peer-to-peer LAN as seen below, no extra permission will be required. Peer-to-peer LANs are not usually used in large businesses today, because there is no management. These differ from client-server LANs, which do require management. We will discuss client-server LANs later in this tutorial.

The graphic below shows a basic peer-to-peer network:



TERM TO KNOW

Peer-to-Peer Network

A network of connected peer computers with no central controller.

3b. Client-Server Networks

A **client-server network** is a network in which a **server** provides controlled access to networked resources in response to **client** requests.



KEY CONCEPT

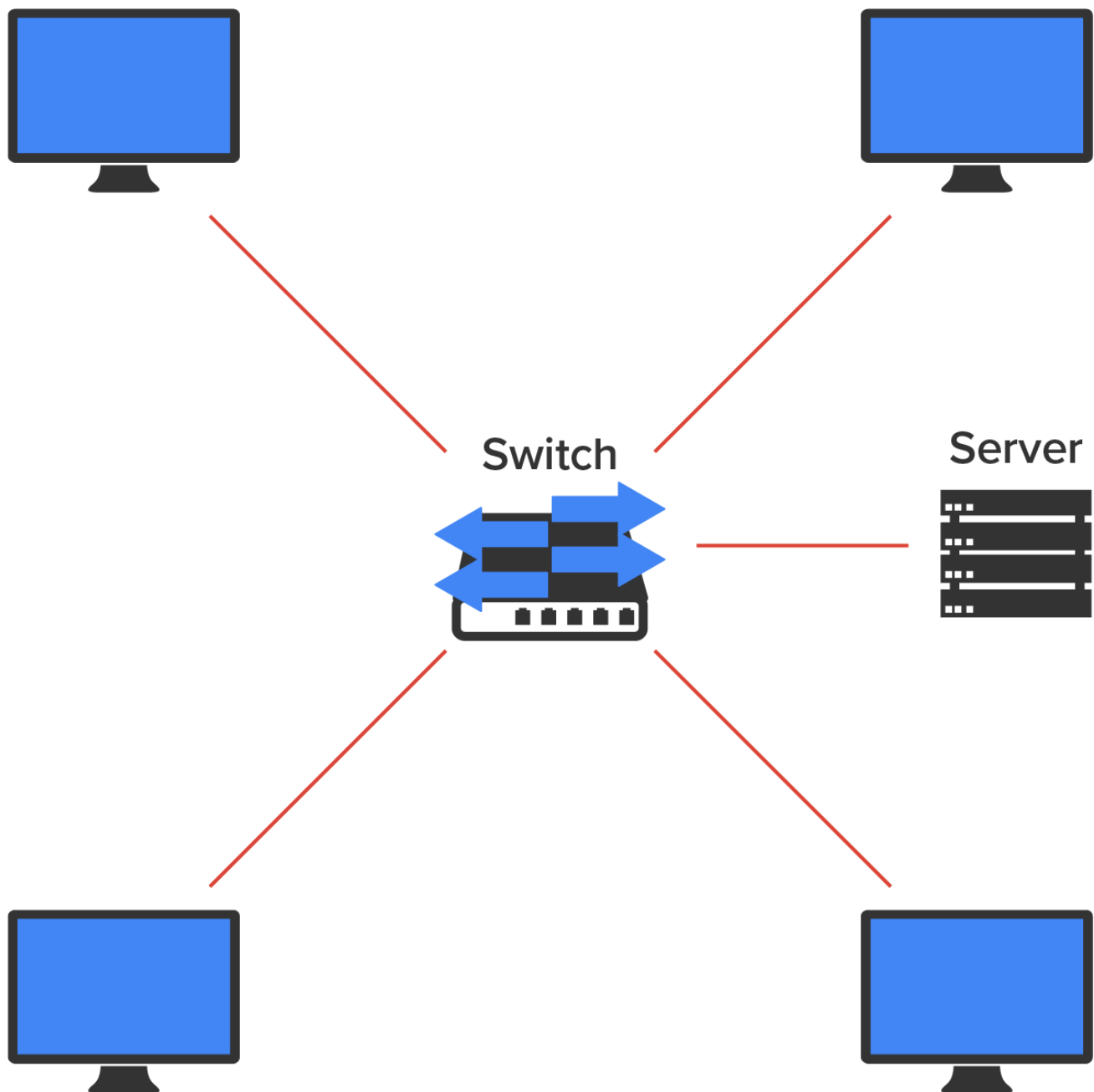
A server is a powerful computer running a **network operating system** that responds to client requests.

A client-server network is fundamentally different from a peer-to-peer network, since clients request resources from servers, which control access to shared resources.

⇒ **EXAMPLE** A client sends a request to a server for a resource such as a website or access to a file.

This architecture is primarily used in large businesses today because of the privacy and security concerns that these server-controlled systems can handle.

The graphic below shows a basic client-server network.



TERMS TO KNOW

Client-Server Network

A network in which a client computer requests resources from a server computer.

Server

A powerful computer running a network operating system that responds to client requests.

Client

A computer that requests a service.

Network Operating System

Software for controlling the allocation and use of various hardware resources and access to networked resources.



SUMMARY

In this lesson, you learned **what a network is**. You also learned about some of the basic features associated with the different **types of networks**. This included more networking vocabulary. You also learned to compare the **network architecture** of two networks: **peer-to-peer** and **client-server**, which differ in the permissions required to access data in the network.

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TERMS TO KNOW

Access Point

A wireless radio that transmits and receives Wi-Fi signals.

Bandwidth

The rate of data flow in digital networks typically measured in bits per second; the bit rate.

Bluetooth

Wireless protocol used in personal area networks.

Campus Area Network (CAN)

A network that encompasses several buildings.

Client

A computer that requests a service.

Client-Server Network

A network in which a client computer requests resources from a server computer.

Computer Network

Computers and other digital devices connected to each other to share resources.

End User

A person who uses a networked device.

Fiber-Optic Cable

A type of networking cable made of glass that transports light to represent data.

Host

Any computer attached to a network.

Internet Service Provider

A company that provides internet access for a fee.

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Network Operating System

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Network architecture

The design of a computer network.

Peer-to-Peer Network

A network of connected peer computers with no central controller.

Peripheral Device

An electronic device that is outside the computer's system unit (external to the computer's enclosing case) but used by the computer to which it is connected, such as a printer or a scanner.

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Scalable

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A network of high-capacity storage devices that are connected by a high-speed connection.

Virtual Local Area Network (VLAN)

A subnetwork of a LAN.

Wi-Fi

A wireless data communication standard.

Wide Area Network (WAN)

A computer network that covers a large geographic area.

Wired Networks

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