

## **Network & the Internet Network Communication & Organization**

**K-2.NI.4** Model and describe how people connect to other people, places, information and ideas through a network.

**3-5.NI.4** Model how information is broken down into smaller pieces, transmitted as packets through multiple devices over networks and the Internet, and reassembled at the destination.

### **Learning Objectives**

- Understand the history and development of networking technologies;
- Define the key terms associated with networking technologies;
- Understand the importance of broadband technologies; and
- Describe organizational networking.

### **Introduction**

In the early days of computing, computers were seen as devices for making calculations, storing data, and automating business processes. However, as the devices evolved, it became apparent that many of the functions of telecommunications could be integrated into the computer. During the 1980s, many organizations began combining their once-separate telecommunications and information-systems departments into an information technology, or IT, department. This ability for computers to communicate with one another and, maybe more importantly, to facilitate communication between individuals and groups, has been an important factor in the growth of computing over the past several decades.

Computer networking really began in the 1960s with the birth of the Internet, as we'll see below. However, while the Internet and web were evolving, corporate networking was also taking shape in the form of local area networks and client-server computing. In the 1990s, when the Internet came of age, Internet technologies began to pervade all areas of the organization. Now, with the Internet a global phenomenon, it would be unthinkable to have a computer that did not include communications capabilities. This chapter will review the different technologies that have been put in place to enable this communications revolution.

## **A Brief History of the Internet**

The story of the Internet, and networking in general, can be traced back to the late 1950s. The US Government created the Advanced Research Projects Agency (ARPA). It was from ARPA, now called DARPA (Defense Advanced Research Projects Agency), that the Internet first sprang.

ARPA was the center of computing research in the 1960s, but there was just one problem: many of the computers could not talk to each other. In 1968, ARPA sent out a request for proposals for a communication technology that would allow different computers located around the country to be integrated together into one network. Twelve companies responded to the request, and a company named Bolt, Beranek, and Newman (BBN) won the contract. They began work right away and were able to complete the job just one year later: in September, 1969, the ARPANET was turned on. The first four nodes were at UCLA, Stanford, MIT, and the University of Utah.

## **The Internet and the World Wide Web**

Over the next decade, the ARPANET grew and gained popularity. During this time, other networks also came into existence. Different organizations were connected to different networks. This led to a problem: the networks could not talk to each other. Each network used its own proprietary language, or protocol (see sidebar for the definition of *protocol*), to send information back and forth. This problem was solved by the invention of transmission control protocol/Internet protocol (TCP/IP). TCP/IP was designed to allow networks running on different protocols to have an intermediary protocol that would allow them to communicate. So as long as your network supported TCP/IP, you could communicate with all of the other networks running TCP/IP. TCP/IP quickly became the standard protocol and allowed networks to communicate with each other. It is from this breakthrough that we first got the term *Internet*, which simply means “an interconnected network of networks.”

## An Internet Vocabulary Lesson

Networking communication is full of some very technical concepts based on some simple principles. Learn the terms below and you'll be able to hold your own in a conversation about the Internet.

**Packet:** The fundamental unit of data transmitted over the Internet. When a device intends to send a message to another device (for example, your PC sends a request to YouTube to open a video), it breaks the message down into smaller pieces, called packets.

**Hub:** A simple network device that connects other devices to the network and sends packets to all the devices connected to it.

**Bridge:** A network device that connects two networks together and only allows packets through that are needed.

**Switch:** A network device that connects multiple devices together and filters packets based on their destination within the connected devices.

**Router:** A device that receives and analyzes packets and then routes them towards their destination. In some cases, a router will send a packet to another router; in other cases, it will send it directly to its destination.

**IP Address:** An IP address is a unique address that identifies a device on the internet or a local network. IP stands for "Internet Protocol," which is the set of rules governing the format of data sent via the internet or local network.

**Domain Name:** A domain name refers to your website address. This is what users type in a browser's search bar to directly access your website. A domain name is unique and cannot be shared between different sites. For example: google.com.

**DNS:** DNS stands for "domain name system," which acts as the directory on the Internet. DNS translates human readable domain names (for example, www.amazon.com) to machine readable IP addresses (for example, 192.0. 2.44).

**Packet Switching:** Packet Switching is a mode of data transmission in which a message is broken into a number of parts which are sent independently, over a router.

**Protocol:** In computer networking, a protocol is the set of rules that allow two (or more) devices to exchange information back and forth across the network.

**The Dot-Com:** A dotcom, or dot-com, is a company that conducts business primarily through a website. A dotcom company embraces the Internet as the key component in its business.

**Web 2.0:** Is the second stage of development of the World Wide Web, characterized especially by the change from static web pages to dynamic or user-generated content and the growth of social media.

**Wireless Networking:** A wireless network connects computers without using network cables. Computers use radio communications to send data between each other.

**Wi-Fi (wireless fidelity):** Wi-Fi is a wireless networking technology that uses radio waves to provide wireless high-speed Internet access

**Mobile Network:** Mobile Network is a wireless networking technology for Cellular.

**Bluetooth:** Bluetooth is a standard for the short-range wireless interconnection of mobile phones, computers, and other electronic devices.

**VoIP:** Voice over Internet Protocol (VoIP), is a technology that allows you to make voice calls using a broadband Internet connection

**LAN and WAN:** LAN is (by definition) a local network, usually operating in the same building or on the same campus. When an organization needed to provide a network over a wider area (with locations in different cities or states, for example), they would build a wide area network (WAN).

**Client-Server:** Client-server is a relationship in which one program (the client) requests a service or resource from another program (the server)

**Intranet:** Intranet is a private network that is used to securely share company information among employees.

**Cloud Computing:** Cloud Computing is the practice of using a network of remote servers hosted on the internet to store, manage, and process data, rather than a local server or a personal computer.

## Study Questions

1. What were the first four locations hooked up to the Internet (ARPANET)?
2. What does the term *packet* mean?
3. Which came first, the Internet or the World Wide Web?
4. What was revolutionary about Web 2.0?
5. What was the so-called killer app for the Internet?
6. What makes a connection a *broadband* connection?
7. What does the term VoIP mean?
8. What is an LAN?

## Exercises

1. What is the IP address of your computer? How did you find out? What is the IP address of google.com? How did you find out? Did you get IPv4 or IPv6 addresses?
2. What is the difference between the Internet and the World Wide Web? Create at least three statements that identify the differences between the two.
3. Who are the broadband providers in your area? What are the prices and speeds offered?
4. Pretend you are planning a trip to three foreign countries in the next month. Consult your wireless carrier to determine if your mobile phone would work properly in those countries. What would the costs be? What alternatives do you have if it would not work?