

Chapter 3

Networks and the Cloud

Chapter Objectives/Study Questions

- Q1.** What do business professionals need to know about networks and the Internet?
- Q2.** How does data move over a network?
- Q3.** How does a typical Web server move data on a network?
- Q4.** Why is the cloud the future for most organizations?
- Q5.** What are the typical cloud options?

List of Key Terms

- **Attribute** – in HTML, a variable used to provide properties about a tag.
- **Bluetooth** – a common wireless protocol designed for transmitting data over short distances, replacing cables.
- **Cable line** – a type of WAN connection that provides high-speed data transmission using cable television lines.
- **Cascading Style Sheet (CSS)** - the fonts and layout of all the elements on pages on a Web site so that the site has one consistent look and feel.
- **Cellular network** - also called a mobile network or wireless WAN (WWAN), is a communication network that uses radio signals to send and receive data to mobile users.
- **Cloud** – the *elastic* leasing of *pooled* computer resources over the *Internet*.
- **Digital subscriber line (DSL)** – operates on the same lines as voice telephones, but so that its signals do not interfere with voice telephone service. DSLs use their own protocols for data transmission.
- **Domain name** – a worldwide-unique name that is affiliated with a particular Internet address.
- **Economies of scale** - the decrease in average cost of production as the size of the operation increases.
- **Elastic** – the amount of resources leased can be increased or decreased dynamically, programmatically, in a short span of time, and organizations pay for just the resources that they use.
- **Ethernet** – descriptive name for the IEEE 802.x protocols.
- **Handover** - the switching of a mobile user from a network a base station to an adjoining cell when the user moves out of the original cell.
- **Hypertext Markup Language (html)** – the most common language for defining the structure and layout of Web pages.
- **Hypertext Transport Protocol (http)** – the protocol used between browsers and Web servers.
- **HTTPS** – an encrypted, secure version of HTTP.
- **IEEE 802.11 protocol** – wireless local area networking protocol.
- **IEEE 802.3 protocol** – wired local area networking protocol.
- **Infrastructure as a service (IaaS)** – the cloud hosting of a bare server computer or disk drive.
- **Internet** – world-wide network that links other networks together for email, the World Wide Web, FTP, etc.
- **Internet protocols and standards** – additions to TCP/IP that enable cloud-hosting vendors to provide processing capabilities in flexible yet standardized ways.
- **Internet service provider (ISP)** – provide network devices with access to the Internet.
- **Intranet** - A private Internet used exclusively within an organization.
- **IP address** – a protocol that identifies an address for every device connected to the Internet.

- **Local area network (LAN)** – connects computers that reside in a single geographic location.
- **Markup language** - the most common language for defining the structure and layout of Web pages.
- **Net neutrality** – the approach where all data moving on the Internet is treated equally (because some Internet participants use a great deal of the bandwidth on these Tier 1 networks compared to the rest of us).
- **Network** – a collection of computers that communicate with one another over transmission lines or wireless.
- **Peering** – an agreement that specifies how the data will move among providers.
- **Personal area network (PAN)** – a network that connects devices around a single person.
- **Platform as a service (PaaS)** – vendors provide hosted computers, an operating system, and possibly a DBMS.
- **Pooled** – the sharing of digital resources by many different organizations.
- **Private cloud** – in-house hosting delivered via Web service standards that can be configured dynamically.
- **Protocol** – a set of rules that two communicating devices follow.
- **Service-oriented architecture (SOA)** – standard protocols to publish a menu of services that an application provides, the structure of the data that it expects to receive, the structure of the data that it will produce, and the ways in which services can be requested.
- **Showrooming** – when someone visits a brick and mortar store to examine and evaluate products without the intention of them buying at that store.
- **Small office/home office (SOHO)** – LAN with fewer than approximately a dozen or so attached devices.
- **Software as a service (SaaS)** – provides hardware infrastructure, operating system and application programs on a subscription basis over a network—usually the Internet/Web.
- **Switch** – a special-purpose computer that receives and transmits wired traffic on the LAN.
- **Tag** – a HTML notation used to define a data element for display or other purposes.
- **TCP/IP protocol architecture** – the 5 protocol layers used by the Internet.
- **Three-tier architecture** – an arrangement of user computers and servers into three categories, or tiers: user, server, and database.
- **Web farm** – a facility that runs multiple Web servers. Work is distributed among the computers in a Web farm so as to maximize throughput.
- **Web page** – document encoded in HTML that is created, transmitted, and consumed using the World Wide Web.
- **Web server** – a program that processes the HTTP protocol and transmits Web pages on demand. Web servers also process application programs.
- **Wide area network (WAN)** – a network that connects computers located at different geographic locations.
- **Wi-Fi** - (Wide Fidelity) is a technology that allows devices to connect wirelessly to a LAN.

- **XML** - (Extensible Markup Language) is a markup language like html but is machine-readable and was designed to enable the exchange of structured data over the Web.

MIS InClass 3

1. How accurate was the student's activity list? How accurate was your activity list?

Obviously the accuracy of the student's list will depend on what they include in the list.

A typical list will include the following steps:

- Get the material
 - Food production surface or a cutting board
 - Peanut butter
 - Jelly and jam
 - Sandwich bread
 - A butter knife
- Prepare the bread
 - Place the slices of bread on the cutting board
- Apply peanut butter to bread
 - Scoop peanut butter
 - Spread the butter onto slices of bread
- Apply jelly to bread
 - Scoop jelly
 - Spread the jelly onto slices of bread
- Make the sandwiches
 - Combine every 2 slices of bread together
- Eat the sandwiches
 - Save sandwiches for later

2. What makes this apparently simple process challenging to write down?

Materials- There are many steps involved this simple process and many materials (ingredients) can also be used to prepare these types of sandwiches.

Steps: The steps of preparing these sandwiches may also differ from one person to another.

3. How can a business improve its process of listing activities? If businesses struggle to articulate their activities, what things could be done to help make more accurate activity lists?

- Collaboration with employees and managers
- Discussions of the list
- Reviewing their competitors' process
- Hiring consultants (process engineers)
- Reading industry journals
- Reviewing business standards

4. Below your own activity list, make a list of the assumptions you are making. Once complete, share your list and listen to the lists of assumptions other students recorded. Are you surprised how many assumptions are necessary? Assumptions will vary among students.

Possible assumptions:

- One person is making the sandwiches
- Material (jelly and butter) has one flavor
- No other material is needed or added
- One type of bread used

5. Make a BPMN diagram of the Sandwich Making process. Assume two roles: a stationary assembler and a runner who gets the items from different spots in the kitchen.

6. If you operated a small business to make and sell 100 peanut butter and jelly sandwiches a day, would your process be structured or dynamic? What objectives would you specify? What IS might be helpful? For this IS, write down the procedure to use it.

The process is structured, all the sandwiches will be done in the same way and following the same steps.

Objectives:

- Shorten set-up time
- Shorten preparation time
- Minimize wasted material

IS might be helpful in keeping track of orders and inventory of material.

Procedure:

- Check the IS to see how many sandwiches are ordered
- Check the IS to determine how material available:
 - If material not sufficient order materials
 - If material sufficient continue
- Set up the sandwich preparation table
- Get the sandwiches material
- Start preparing sandwiches
- Deliver or ship sandwiches to customers

7. Can your business scale up to produce 1,000 sandwiches a day? If it did, would it produce economies of scale, where the average cost of making a sandwich decreases as the size of the operation increases? The cloud is based on economies of scale; how are the cloud economies of scale similar and different to your operation?

Yes, the more sandwiches that are produced per day, the more likely economies of scale will be achieved.

Yes, eventually the economies of scale will be achieved as the production volume increases.

The cloud operates in a way that as more computing resources (storage, processing, etc.) are leased to a client, the costs will go down. Therefore, when this businesses produces more sandwiches, it means that will have more operations, orders, materials, and customers to keep track of. This increased volume of operations requires more cloud processing and can lead to cloud economies of scale.

Using Your Knowledge

3-1. Suppose that you are Juan at CBI. List and describe three criteria you would use in helping CBI decide whether it should move a particular app to the cloud. Justify your criteria.

Student responses will vary, but should include at least some of the following:

- If users utilize a widely diverse collection of platforms and devices, then thin-client has an edge. If users are all on iPhones (for example), native has some advantages.
- Thin client has cost advantages and changes to the application rollout to all users at the same time. No need to prioritize which native application gets attention first.
- Thin client means one development team with a single skill set, whereas native may mean the need for several development teams with different skill sets.
- If users will often be away from Internet connectivity, then thin-client may be a problem. Native applications can be used offline.
- If the application requires access to device specific hardware, then native applications may be required (although HTML 5 is bridging this gap to some extent).
- The stability of the environment may also be of concern. Dynamic content isn't nearly as big an issue as is dynamic features. If the application itself is expected to change frequently, thin-client may have some advantages over native development.

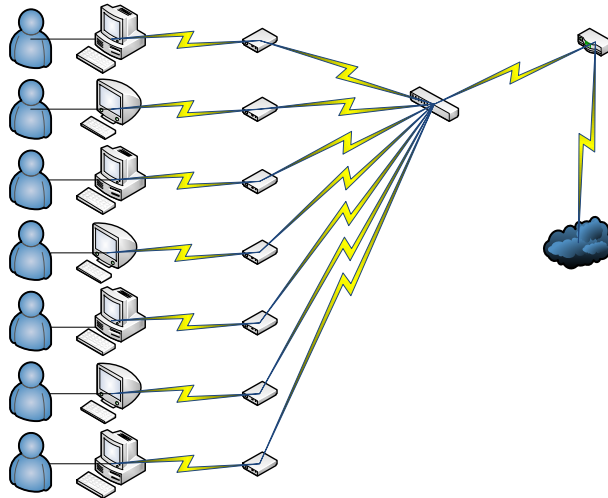
3-2. Suppose you manage a group of seven employees in a small business. Each of your employees wants to be connected to the Internet. Consider two alternatives:

Alternative A: Each employee has his or her own modem and connects individually to the Internet.

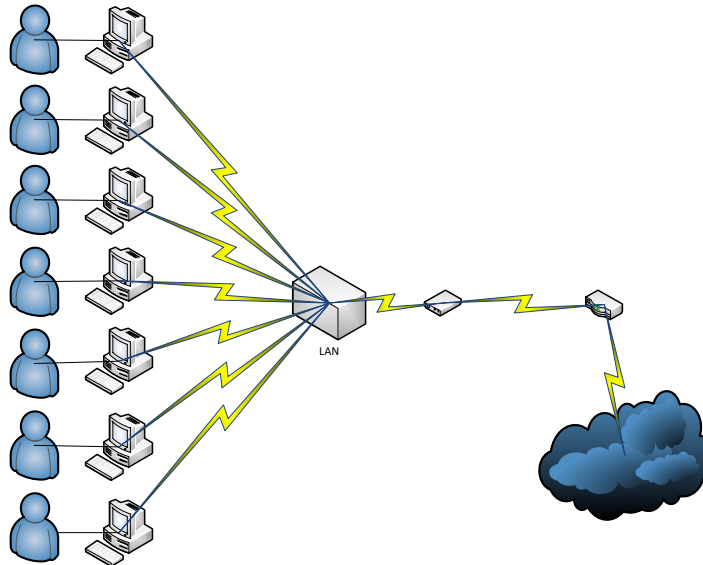
Alternative B: The employees' computers are connected using a LAN, and the network uses a single modem to connect.

a. Sketch the equipment and lines required for each alternative.

If each employee had his or her own modem:



If each employee connects to a LAN:



b. Explain the actions you need to take to create each alternative.

For both alternatives, each user will need a workstation. The first alternative will require seven individual modems, whereas the second alternative will only require one modem for the entire LAN. The second alternative will require a hub for each workstation in the LAN to connect to. The hub is then connected to the modem.

c. Which of these two alternatives do you recommend?

The second alternative would be recommended. Alternative B allows members of the LAN to utilize common resources like printers in addition to reducing the equipment requirements found in alternative A.

3-3. Net neutrality is an issue that continues to be challenging for the government. Do you favor net neutrality, or would you prefer a more commercial structure where content providers can be charged a premium to move their packets faster?

Students' opinions will vary with some students supporting others opposing the idea of net neutrality.

Supporters: they want equality to all data and all users of the Internet pay the same fees or premiums.

Opponents: they want different levels of data traffic with different prices so that users can choose which level they want according to their needs and how much they can afford to pay.

3-4. In Google search, type in “What is my IP address.” Also, again using Google, discover your school’s IP address.

Answers will vary widely and will be composed of four sets of digits.

3-5. Look up articles on the Internet about peering agreements. Describe two current peering issues faced by major networks.

Peering agreements that specify how the data will move among providers.

Issues that can arise in this arrangement include:

- a. The size of data traffic on network is much larger than the size of data traffic on another assignment so free peering between the two networks becomes an issue. For example, a recent study found that Netflix is the source of approximately 37% of all Internet traffic in the US from 9.00 pm to 12.00 am.
- b. Another issue is that some network may not open all the traffic points to data traffic from other networks and, as a result, slow down data traffic of those networks.

3-6. In this chapter, we only briefly discussed TCP/IP, the Internet protocol suite. Read more about TCP/IP at Wikipedia using the term Internet Protocol Suite. Where and when did the Internet protocol suite begin? How long did the Internet use TCP/IP before the advent of the Web?

The Internet protocol suite resulted from the research that was done by the Defense Advanced Research Projects Agency (DARPA) in the late 1960s.

About 35 years. From the start of the research in the 1960s until the Internet became available to the public in the mid1990s.

3-7. Read more about personal area networks and specify two products that you would buy, assuming you have the funds, and the reasons you would buy them.

A personal area network (PAN) is a network that connects personal devices such as computers, phones, tablets, and laptops.

With wireless and Wi-Fi communication, any device can be easily connected to a PAN.

3-8. Using Google, discover which cloud providers are using the cloud and the size of their contracts. Describe three of these large customers, their cloud vendor, and the size of the contract.

The market shares change rapidly in this area. Currently the top cloud providers are:

Amazon Web Services – 34%

Microsoft Azure – 11%

Google Cloud Platform – 5%

Collaboration Exercise 3

- 3-9. List the attributes you want in a router. One is cost. What are three other important attributes to consider when buying a router? Specify the highest and lowest value for these attributes for use in your fraternity/sorority.**

Almost all routers today are Wi-Fi and wireless, the three most attributes to look for in a router:

1. Speed (megabits per second); speeds change and increase constantly.
2. Range (size of the house or geographic area it can cover) speeds change and increase constantly.
3. Additional features such as encryption, firewall, etc.

- 3-10. For you to advise your house on how to update its system, what are three specifics the decision-makers need to know before they hire someone? That is, based on your reading of the discussion boards, what are three topics most houses must decide before they can proceed?**

Important factors to consider:

1. Number of users who will be using the system.
2. The size of the house.
3. Types of applications used to determine size of data traffic upload and download.

- 3-11. Using Google or other search engines, read about how athletes are using wearable devices. Describe four ways that athletes and coaches can use wearable devices to improve performance (for example, some soccer clubs use them to measure player workload, and baseball teams have used them to measure bat head speed and glove location).**

Track how long players exercise with regular and elevated heart rates.

Monitor specific muscles and joints for possible injuries.

Inform trainers when players may be getting overworked.

Measure and record a wide range of sport and game statistics about players.

- 3-12. Again using a search engine, discover how wearables can help students in the classroom. Describe four ways that students and teachers can use wearable devices to improve performance.**

The uses of these devices are not limited. Anything that can be done on a computer or laptop, can be on these wearable devices. Here are some common uses of wearable devices in the classroom:

- Some head wearables can monitor when students need to take a brain break and stretch and exercise.
- Can be used for distance learning via like a computer or laptop.
- Show live videos and do translation.
- Display supplemental material during classes.
- Record lectures, presentations, and demonstrations in the class.

3-13. Finally, use a search engine to learn how wearables can be used by the elderly. Describe three ways that older individuals can use wearables in ways that improve their quality of living.

- Some devices detect when an elderly person falls and inform emergency services.
- There are devices that can monitor heartbeats and blood pressure of elderly people.
- Some devices can act as hearing or vision aids to the elderly to help them hear and see better.

Case Study 3

McDonald's: New Options for that Burger

3-14. Everyone does not have a smartphone. Should McDonald's delay its order app until a greater number of clients own a smartphone? Should it develop and use this technology outside of the United States first?

No, McDonald's shouldn't delay its order app.

Smartphone use is increasing exponentially. Within no time, a huge percentage of McDonald's customers worldwide will own smart phones. Thus, McDonald's should develop and use the app as soon as possible to attract more customers and enhance its services and operations.

3-15. Some of the advantages of the cloud are mentioned. Are there other advantages of the cloud that will benefit McDonald's?

- Cloud services are much cheaper than in-house computing.
- Cloud offers better and faster accessibility worldwide.
- Updates to cloud computing services are faster and cheaper.
- Cloud services are maintenance-free from the customer's side.

3-16. Read about Bluetooth on the Internet or in Extension 2. Why use a Bluetooth network? What are some advantages of Bluetooth?

Bluetooth is very easy, convenient, affective wireless communication method to connect devices in a small geographic area such as a house, a classroom, or office. Advantages of using a Bluetooth communication:

- Simple connection setup: Setting up a Bluetooth connection between two devices is quick and easy.
- Compatibility: Bluetooth is a universal standard and compatible with any other device that supports Bluetooth, regardless of make, model or design.
- Less hardware: Almost all devices have a built-in Bluetooth chip.
- Security: When a person wants to connect two devices using Bluetooth he/she must make both devices visible to pair the two devices and establish the connection. Once paired, you can turn off visibility and keep the device closed to new connections.
- A Bluetooth connection must be authenticated using a PIN or code to connect two devices.

3-17. Do you or your friends use the Starbucks' order app? If so, what makes it attractive?

Answers will vary.

Students use the Starbucks' order app for many reasons such as:

- Convenience
- Saves time
- No waiting
- Know about new flavors and drinks

3-18. Does McDonald's have a social responsibility to employ people rather than machines.

Probably not, since it is legal and other business are always trying to minimize their workforce and overhead costs by moving their operations to other countries where labor is not expensive, McDonald's is entitled to pursue its interests and the interests of its shareholders.

3-19. What are the advantages and disadvantages for McDonald's to outsource the development of the phone app?

Advantages	Disadvantages
Save in-house labor costs Leverage the expertise of software developers at the outsourcing firm	Communication with the development people Understanding the app

3-20. What are other uses of IT at McDonald's that would help?

Students might come up with several apps that they have seen or used with other restaurants, stores, or similar outlets.

Customers Relationship Management (CRM) is a useful IT that McDonald's can used to effectively manage its relationships with customers.