



CHAPTER 6: COMPUTER NETWORKING, INTERNET TECHNOLOGIES, AND E- COMMERCE SYSTEMS: CONCEPTS AND APPLICATIONS

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Abstract

This chapter provides a comprehensive introduction to computer networking, Internet technologies, and electronic commerce (e-commerce). It begins by defining computer networks and their importance in enabling communication, resource sharing, and information exchange among connected systems. Various types of networks such as LAN, MAN, and WAN are discussed, along with their characteristics including topology, protocols, and network architecture.

The chapter further explores Internet technology, describing how global networks are interconnected using standard protocols such as TCP/IP. Key components of the World Wide Web (WWW), including browsers, hypertext, HTML, URLs, and HTTP, are explained in detail. Additionally, modern Internet services such as email systems and search engines are examined, highlighting their structure, working mechanisms, and practical applications.

The chapter also introduces the concept of e-commerce, differentiating it from e-business and discussing its benefits, applications, and technological features. Various models such as B2C, B2B, and C2C are analyzed, along with the evolution and growth stages of e-commerce. Finally, the chapter addresses the limitations and challenges in the adoption of e-commerce technologies. Overall, this chapter provides a strong foundation for understanding networking and digital business environments.

Keywords: Computer Networks, LAN, MAN, WAN, Internet, TCP/IP, World Wide Web, HTML, URL, HTTP, Email Systems, Search Engines, E-Commerce, E-Business, Network Topology, Network Protocols, Digital Communication

Introduction to Computer Networking:- A computer network is a group of computer systems and other computing hardware devices that are linked together through communication channels to facilitate communication and resource-sharing among a wide range of users. Networks are commonly categorized based on their characteristics. Computers on a network are sometimes called nodes. Computers and devices that allocate resources for a network are called servers.

Networks are used to:-

- Facilitate communication via email, video conferencing, instant messaging, etc.
- Enable multiple users to share a single hardware device like a printer or scanner
- Enable file sharing across the network

- Allow for the sharing of software or operating programs on remote systems
- Make information easier to access and maintain among network users

There are many types of networks, including:-

- Local Area Networks (LAN)
- Personal Area Networks (PAN)
- Home Area Networks (HAN)
- Wide Area Networks (WAN)
- Campus Networks
- Metropolitan Area Networks (MAN)
- Enterprise Private Networks
- Internetworks
- Backbone Networks (BBN)
- Global Area Networks (GAN)
- The Internet

Network Characteristics

In addition to these types, the following characteristics are also used to categorize different types of networks:

- **Topology :** The geometric arrangement of a computer system. Common topologies include a bus, star, and ring.
- **Protocol :** The protocol defines a common set of rules and signals that computers on the network use to communicate. One of the most popular protocols for LANs is called Ethernet. Another popular LAN protocol for PCs is the IBM token-ring network.
- **Architecture :** Networks can be broadly classified as using either a peer-to-peer or client/server architecture.

Concept of LAN, WAN & MAN:- There are many types of computer networks, including the following:

- 1. LAN:-** A LAN (local area network) is a group of computers and network devices connected together, usually within the same building. By definition, the connections must be high speed and relatively inexpensive (e.g., token ring or Ethernet). Most Indiana University Bloomington departments are on LANs. A LAN connection is a high-speed connection to a LAN. On the IUB campus, most connections are either Ethernet (10 Mbps) or Fast Ethernet (100 Mbps), and a few locations have Gigabit Ethernet (1000 Mbps) connections.
- 2. MAN:-** A MAN (metropolitan area network) is a larger network that usually spans several buildings in the same city or town. The IUB network is an example of a MAN.
- 3. WAN:-** A WAN (wide area network), in comparison to a MAN, is not restricted to a geographical location, although it might be confined within the bounds of a state or country. A WAN connects several LANs, and may be limited to an enterprise (a corporation or an organization) or accessible to the public. The technology is high speed and relatively expensive. The Internet is an example of a worldwide public WAN.

Internet technology:- Internet technology is the ability of the Internet to transmit information and data through different servers and systems. Internet technology is important in many different industries because it allows people to communicate with each other through means that were not necessarily available.

Concept of Internet technology:- The Internet is a global collection of computer networks that are linked together by devices called routers and use a common set of protocols for data transmission known as TCP/IP (transmission control protocol / Internet protocol). The primary purpose of the Internet is to facilitate the sharing of information. There are many different tools used on the Internet to make this possible. Some of the more common tools include email, listservs, newsgroups, telnet, gopher, FTP, and the world wide web. Probably the most popular of all Internet tools is the world wide web.

World Wide Web (WWW):- The WWW is a collection of Internet sites that can be accessed by using a hypertext interface. Hypertext documents on the web contain links to other documents located anywhere on the web. By

clicking on a link, you are immediately taken to another file or site to access relevant materials. The interesting thing about Hypertext links is that the links might take you to related material on another computer located anywhere in the world, rather than just to a file on your local hard drive.

Basic WWW Concepts:-

- **BROWSER** -- A WWW browser is software on your computer that allows you to access the World Wide Web. Examples include Netscape Navigator and Microsoft Internet Explorer. Please know that a browser can't work its magic unless you are somehow connected to the Internet. At home, that is normally accomplished by using a modem that is attached to your computer and your phone line and allows you to connect to, or dial-up, an Internet Service Provider (ISP). At work, it may be accomplished by connecting your workplace's local area network to the Internet by using a router and a high speed data line.
- **HYPERTEXT AND HYPERMEDIA** -- Hypertext is text that contains electronic links to other text. In other words, if you click on hypertext it will take you to other related material. In addition, most WWW documents contain more than just text. They may include pictures, sounds, animations, and movies. Documents with links that contain more than just text are called hypermedia.
- **HTML (HYPERTEXT MARKUP LANGUAGE)** -- HTML is a set of commands used to create world wide web documents. The commands allow the document creator to define the parts of the document. For example, you may have text marked as headings, paragraphs, bulleted text, footers, etc. There are also commands that let you import images, sounds, animations, and movies as well as commands that let you specify links to other documents. If you wanted to create your own web page, you would need to know HTML or be able to use a tool that can generate HTML.
- **URL (UNIFORM RESOURCE LOCATOR)** -- Links between documents are achieved by using an addressing scheme. That is, in order to link to another document or item (sound, picture, movie), it must have an address. That address is called its URL. The URL identifies the host computer name, directory path, and file name of the item. It also identifies the protocol used to locate the item such as hypertext, gopher, ftp, telnet or news.
- **HTTP (HYPERTEXT TRANSPORT PROTOCOL)** -- HTTP is the protocol used to transfer hypertext or hypermedia documents.
- **HOME PAGE** -- A home page is usually the starting point for locating information at a WWW site.
- **CLIENTS AND SERVERS** -- If a computer has a web browser installed, it is known as a client. A host computer that is capable of providing information to others is called a server. A server requires special software in order to provide web documents to others.

Email Services:- E-mail, in full electronic mail, messages transmitted and received by digital computers through a network. An e-mail system allows computer users on a network to send text, graphics, and sometimes sounds and animated images to other users. On most networks, data can be simultaneously sent to a universe of users or to a select group or individual. Network users typically have an electronic mailbox that receives, stores, and manages their correspondence. Recipients can elect to view, print, save, edit, answer, forward, or otherwise react to communications. Many e-mail systems have advanced features that alert users to incoming messages or permit them to employ special privacy features. Large corporations and institutions use e-mail systems as an important communication link between employees and other people allowed on their networks. E-mail is also available on major public online and bulletin board systems, many of which maintain free or low-cost global communication networks.

In short electronic mail, email (or e-mail) is defined as the transmission of messages over communications networks.

Typical Components of an Email System:- Most email systems include a rudimentary text editor for composing messages, but many allow you to edit your messages using any editor you want. Some systems will also provide basic formatting, including bold, italics, font color and HTML. You can use the program to send the message to a recipient by specifying the recipient's address. You can also send the same message to several users at once. This is called broadcasting.

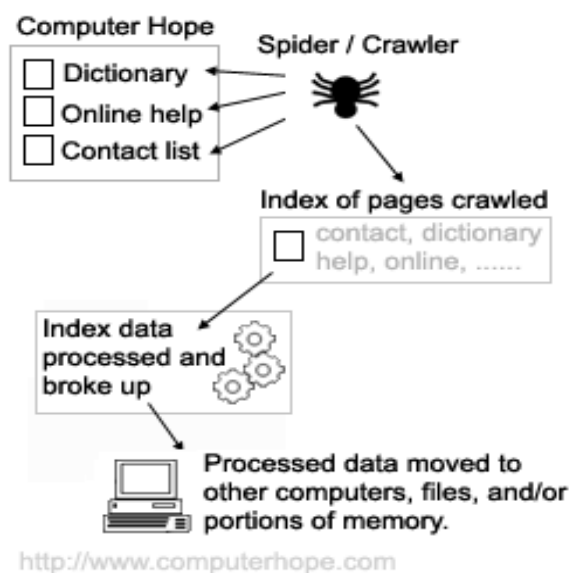
Sent messages are stored in electronic mailboxes until the recipient fetches them. To see if you have any mail, you may have to check your electronic mailbox periodically, although many systems alert you when mail is received. After reading your mail, you can store it in a text file, forward it to other users, or delete it. Copies of memos can be

printed out on a printer if you want a paper copy.

Search Engines:- A search engine is a software program or script available through the Internet that searches documents and files for keywords and returns the results of any files containing those keywords. Today, there are thousands of different search engines available on the Internet, each with their own abilities and features. The first search engine ever developed is considered Archie, which was used to search for FTP files and the first text-based search engine is considered Veronica. Today, the most popular and well-known search engine is Google.

How to access a search engine:- For users, a search engine is accessed through a browser on their computer, smart phone, tablet, or another device.

How a search engine works:- Because large search engines contain millions and sometimes billions of pages, many search engines not only just search the pages but also display the results depending upon their importance. This importance is commonly determined by using various algorithms. As illustrated in the figure below, the source of all search engine data is a spider or crawler, which automatically visits pages and indexes their contents.



Once a page has been crawled, the data contained within the page is processed and indexed. Often, this can involve the steps below.

- Strip out stop words.
- Record the remaining words in the page and the frequency they occur.
- Record links to other pages.
- Record information about images or other embedded media.

The data collected above is used to rank the page and is the primary method a search engine uses to determine if a page should be shown and in what order.

Finally, once the data is processed it is broken up into one or more files, moved to different computers, or loaded into memory where it can be accessed when a search is performed.

What is e-commerce? How does it differ from e-business? Where does it intersect with e-business?

E-commerce, in the popular sense, can be defined as: The use of the Internet and the Web to conduct business transactions. A more technical definition would be: E-commerce involves digitally enabled commercial transactions between and among organizations and individuals. E-commerce differs from e-business in that no commercial transaction, an exchange of value across organizational or individual boundaries, takes place in e-business. E-business is the digital enablement of transactions and processes within a firm and therefore does not include any exchange in value. E-commerce and e-business intersect at the business firm boundary at the point where internal business systems link up with suppliers. For instance, e-business turns into e-commerce when an exchange of value occurs across firm boundaries.

Benefits of E-commerce :- There are many benefits of bringing one's business to the Web. An e-business can offer personalized service, high-quality customer service and improved supply chain management. E-commerce in a way is equivalent to automation and innovation of commercial activities. It is absolutely clear that automation brings a number of distinct advantages including lesser investment. Automation frees valuable labor from menial tasks and also encourages the people concerned to pursue new and ideally beneficial initiatives, which would not have happened previously. We discuss the benefits of each model explained above.

B2C applications are beneficial to existing retail stores and companies as this innovative application allows them to increase their customer base and hence their revenue. E-commerce helps them to reach entire demographics that they might not be able to reach in a physical or "bricks and mortar" store. B2C is highly beneficial for consumers as it gives them access to a world of stores instead of the stores in their neighborhood. It brings a competitive trend giving consumers access to a wide variety of choices and lower prices. Some B2C web sites allow consumers to name their own prices for a variety of goods and services. Thus e-commerce brings forth such kinds of beneficial, consumers-oriented innovations.

B2C allows companies to extend their existing services to consumers as well. Consumers are able to order a special item to be delivered to a nearby store for pickup is a handy service that increases customer loyalty and this is possible only due to the advent of B2C. B2C applications open up a new world for companies that are not well known to outside world before.

B2B is extremely beneficial to businesses because of its potential to drastically reduce the cost. By making communication easier and faster, using new technologies and standards, the quicker the inventory can move, the more efficient the process. Further on, B2B applications help automate communication between companies. This, apart from streamlining the process, helps reduce the potential for errors and helps provide better goods and services.

B2B2C applications help B2C companies to raise profits. By leveraging the benefits of B2B to streamline and improve business, B2C companies have the ability to make more money by growing revenue and cutting unnecessary costs. Also a company which is successful in one area of e-commerce can capitalize on this success and knowledge gathered to other areas of their e-commerce plan.

C2C and C2B2C applications allow consumers to interact themselves. This helps businesses to have a fairly easy revenue stream and consumers have access to an entirely new way to purchase and sell goods and services.

Unique features of e-commerce technology:- The unique features of e-commerce technology include:

- Ubiquity: It is available just about everywhere and at all times.
- Global Reach: The potential market size is roughly equal to the size of the online population of the world.
- Universal standards: The technical standards of the Internet and therefore of conducting e-commerce, are shared by all of the nations in the world.
- Richness: Information that is complex and content-rich can be delivered without sacrificing reach.
- Interactivity: E-commerce technologies allow two-way communication between the merchant and the consumer.
- Information density: The total amount and quality of information available to all market participants is vastly increased and is cheaper to deliver.
- Personalization/Customization: E-commerce technologies enable merchants to target their marketing messages to a person's name, interests and past purchases. They allow a merchant to change the product or service to suit the purchasing behavior and preferences of a consumer.
- Social technology: User content generation and social networking technologies

Growth of E-commerce:- There are three different stages in the evolution of e-commerce.

The three stages in the evolution of e-commerce are innovation, consolidation, and reinvention. Innovation took place from 1995-2000 and was characterized by excitement and idealistic visions of markets in which quality information was equally available to both buyers and merchants. E-commerce did not fulfill these visions during its early years, however. After 2000, e-commerce entered its second stage of development: consolidation. In this stage, more traditional firms began to use the Web to enhance their existing businesses. Less emphasis was placed on creating new brands. In 2006, though, e-commerce entered its current stage, reinvention, as social networking and Web 2.0 applications reinvigorated e-commerce and encouraged the development of new business models.

Limitations in growth of E-commerce:- One major limitation to the growth of e-commerce is the price of

personal computers. Another limitation is the need for many people to learn complicated operating systems, at least in comparison to other technologies such as the television or the telephone. People must also learn a set of sophisticated skills to make effective use of the Internet and e-commerce capabilities. Another limitation is the unlikelihood that the digital shopping experience will ever replace the social and cultural experience that many seek from the traditional shopping environment. Finally, persistent global income inequality will exclude most of the world's population, who do not and probably will not in the foreseeable future, have access to telephones or PCs. Social and cultural limitations are likely to be tougher to overcome than technological limitations.

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