UNIT 5   EVOLUTION AND BASIC CONCEPTS OF INTERNET

Structure

5.1   INTRODUCTION

There are so many networks exiting in the world, often with different hardware and software. But Internet is a term which is very common to all irrespective to any age group. Perhaps there is no such human being in the universes, who is unaware of the term Internet. In other words, Internet is the backbone of rapid growth of technological revolution. The word Internet is derived from Internetworking that is a collection of individual networks, connected by intermediate networking devices that function as a single large network. Network is a collection of terminals, computer servers and components which allow for the easy flow of data and use of resources between one another. In simple words, a network is a group of two or more computer systems linked together.

5.2 OBJECTIVES

After studying this unit, you will be able to:

• explain the concept of Network and the Internet;

• describe the History of Internet;

• explain the Internet Terminology;

• describe the ways by which the Internet can be connected ;

• list services provided by the Internet;

• know the importance of browsers in connecting the internet;

• describe the functions of a search engine; and

• describe the concept of E-commerce, various types of E-commerce, its application and security requirement needed for conducting electronic commerce.

5.3 HISTORY OF THE INTERNET

The Internet has a glorious history. It has come across a long way to reach its current position.When traditional circuit-switched telephone networks were considered too vulnerable, DoD (Department of Defence of USA) turned to its research arm, Advanced Research projects Agency (ARPA). ARPA was created in response to the Soviet Union's launching Sputnik in 1957 and had the mission of advancing technology that might be useful to the military. This network is popularly known as ARPANET. In the late 1970s, NSF (The U.S. National Science Foundation) found the enormous impact the ARPANET was having on University research, allowing scientists across the contry to share data and collaborate on research projects. However, to get on the ARPANET, a University had to have a research contact with the DoD, which many did not have. This lack of Universal access prompted NSF to set up a virtual network, CSNET, centered around a single machine at BBN that supported Dial-up lines and had connections to the ARPANET and other networks. NSF also founded some (eventually about 20) regional networks that connected to the backbone to allow users at thousands of universities, research labs, and museums to access any of the supercomputers and to communicate with one another. The complete network, including the backbone and the regional networks, was called NSFNET. It connected to the ARPANET through a link between an Interface Message Processors (IMP) and fuzzball in the Carnegie-Mellon machine room.

The number of networks, machines, and users connected to the ARPANET grew rapidly after TCP/IP became the only official protocol on 1st January 1983. When NSFNET and ARPANET were interconnected, the growth became exponential. So finally a global network was created, which connected all the types of networks around the globe, it is popularly known as the Internet.

Technically a machine is on the Internet if it runs the TCP/IP protocol stack, has an IP address and has the ability to send IP Packets to all other machines on the Internet. The mere ability to send and receive the electronic mail is not enough, since e-mail is

a gateway to many networks outside the Internet. However this issue is clouded somewhat by the fact that many personal computers have the ability to call up an Internet service provider using a modem, be assigned a temporary IP address and send IP packets to other Internet hosts. It makes sense to regard such a machine being on the Internet for as long as they are connected to the service provider's router.

With tremendous growth, the old informal way of running the Internet no longer works. In January 1992, the Internet Society was set up to promote the use of the Internet and perhaps eventually taken over managing it.

Traditionally, Internet had five main Applications as follows:

- E-mail

- News

- Remote Login

- File Transfer

- Research

Please answer the following Self Assessment Question.

Self Assessment Question 1   *Spend 3 Min.*

What is the Internet? How it differs from the network?

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5.4   THE INTERNET TECHNOLOGY

Internet uses TCP/IP. TCP stands for Transmission Control Protocol and IP stands for Internet Protocol. Every host and router on the Internet has an IP address, which encodes its network number and host number which are usually written in Dotted Decimal Notation Ex: 212.32.46.1. There are two versions of IP, IPv4 and IPv6. Each IP Address is 32 bits long and is used in the Source address and Destination Address fields of IP packets. There are five classes as A, B, C, D and E. First two classes are for general networks or private network like LAN, Class C is defined for public network and accessible by any user on internet and class D stands for Multicast Address and class E is reserved for future use. Network's number is assigned by Network Information Centre (NIC) to avoid conflicts. The lowest IP address is 0.0.0.0 and the highest is 255.255.255.255. The IP address specifies a computer where the information is present, i.e. the physical domain on the Internet. The web server placed over Internet are registered to a domain. An IP address

registered to a domain is also known by the alias name. For example, a host with IP address like 212.15.20.4 can have host name as ignou and if this ip address is registered in the domain called ac.in, then the host can be identified in the network as ignou.ac.in, it is also possible to defined the alias of ignou.ac.in as www.ac.in or www.ignou.ac.in . One web server can serve multiple virtual web server and where each virtual server mapped or registered to different or unique names. For example, in the web server ignou.ac.in it is possible to defined virtual server physics.ac.in and english.ac.in and both the server may point to different web container on the same physical system or can redirect to any server on the network. All the servers / systems on the network on different network ID communicate each other through the particular path called gateway. Internet is also called and inter network, mean all networks are inter connected, each system on network can send or receive the packet from other network using one particular path which is also called next hop or gateway, in the internet world it is also some time called internet gateway, because a server on network may have multiple destination like one for back-up and one for back hand access and one if for www services. The back hand access or back up access may be required for system admin so the traffic of those specific can be routed on different gateway call back up gateway**.** The physical networks are called the Internet Backbone, which is called heterogeneous systems network.

Each domain name has an extension to it depending on the service provided by it. A domain name describes organizational or geographic realities. They indicate which country the network connection is in, what kind of organization owns it and the further details also.

There are six common domain top levels types:

.COM for Commercial Organizations	Ex: www.yahoo.com
.NET for Network Organizations	Ex:www.internic.net
.GOV for parts of Govt within US	Ex:www.nasa.gov
.EDU for educational Institutes	Ex:www.mit.edu
.MIL for classified Military networks	Ex:www.xxx.mil
.ORG for nonprofit Organizations	Ex:www.cdc.org

5.5 ACCESSING THE INTERNET

There are different ways to connect the IP base network or the internet. A home user can connect to public domain of the network through a service provider. One can access the service provider network over serial line like modem, or ADSL, or from cable line called broadband services, or through the Wireless network using blue tooth or wireless ADSL broadband modem, or from any wi-fi terminal of service provider. This mean, an end user need to connect to service provider and uses the backbone of service provider to sending or receiving the information or data. In the corporate network, a user or employee can connect to internet by login or connecting to local area network with proper authorization, provided if the corporate network is allowed to connect the public network with defined internet gateway.

There are three main ways to connect to the Internet. These methods include connecting via a LAN server, connecting via SLIP/PPP, or connecting via an online service.

Connect via LAN Server: This approach needs the user's computer to have specific protocol "Example IP" with specific configuration, which provides a set of communications rules that perform the complete functions of the seven layers of the OSI communication model. LAN servers are typically connected to the internet at 2 Mbps or faster. This type of connection is expensive, but cost can be spread over multiple LAN users.

Connect via Serial Line Internet Protocol/Point-to-point Protocol (SLIP/PPP): This approach needs that the users have modem and specialized software that allows them to dial into a server through a service provider at some specific cost. This type of connection is advantageous, for example, for employees working at home who need to access the Internet or their own Intranet.

Connect via an Online Service: This approach needs a modem, standard communication software and an online information service account with an Internet service provider. The cost includes the online service fee, per-hour connect charge and where applicable, e-mail service charges. There are so many Service providers throughout India like Satyam and Sify.

Connect through Broadband: This type of connection is very popular right now because here the data transfer speed is more than 256 KBPS without interruption. In India, almost all Internet Service Providers (ISP) provides Broadband connection with a very nominal cost.

5.6 SERVICES PROVIDED BY THE INTERNET

The Internet is provides four major types of services. These are communication, Information retrieval, Web services and World Wide Web (WWW). Communication services include electronic mail, USENET newsgroup, chatting, telnet, Internet telephony and Internet fax, etc. Information retrieval services include gophers, archie, WAIS, file transfer protocol and Veronica etc. Web service provides software application over the Internet. The WWW is an application that uses transport functions.

5.6.1 Communication Service

This type of service is most popular both for personal and business community. A tremendous variety of data can be accessed through the Internet. Users are no longer strictly dependent on telephony for one-to-one communication. Also some of these services enable interactive communication with individuals and groups around the world who share personal and professional information.

Electronic Mail(E-mail)

E-mail is the most widely used application of the Internet. It is an application that allows an electronic message to be sent between individuals through World Wide Web. E-mail is not limited to simple text messages. Users can embed sound and images in their message and can attach files that contain text documents, spreadsheets, graphs and executable programs. For sending a mail, you have to write the e-mail address and subject matter in the specified column. CC (Carbon copy) and BCC (by carbon copy) options also can enable one to send the same matter to many addresses.

USENET newsgroup (forums)

It is a protocol that delineates how groups of messages can be stored on and sent between computers. Users send e- mail messages on a specific topic to the USENET server machine, which acquires this information by following this protocol. Users can log on to the server to read messages or have the computer automatically download messages to be read at the user convenience. It provides a form for the interested users on the Internet. This forum is divided into newsgroups. USENET newsgroups are international discussions groups in which people share information and ideas on a particular topic.

Chatting

It allows two or more people who are at a time connected to the Internet to hold live (real-time), interactive, written conversation. Internet Relay Chat (IRC) is a general chat program for internet though nowadays so many chat programs are easily available in the market. Chat groups are divided into channels each assigned its own topic of conversion. It is the third most-used application in the Internet after e-mail and search.

Instant Messaging

It is an online, real time communication between two or more people who are connected to the Internet. Users can send instant text messages to other users who are logged on. A window appears on the screen of all the people engaged in the messaging. Each window displays what one person is typing, in real-time. A number of companies are providing Instant Messaging like Yahoo, Hotmail and Indiatimes, etc.

Telnet

It allows users to be on one computer while doing work on another. It is the protocol that establishes an error-free but not secure access from source to target computers provided the target server running the telnet services. Users can log on to their office computers while travelling or from their homes. Also users can log on and use third-party computers that have been made accessible to the public, such as using the catalog of the U.S Library of Congress.

Internet Telephony

It is otherwise called as Voice over IP or VoIP. Here users talk across the Internet throughout the world to any personal computer as well as any phone line (Restricted by Law of any Country). It carries voice calls over the Internet, normally the data line and voice line communicate through the same communication media like cable with different frequency, VoIP can either partially or completely bypassing the public switched telephone networks. Sound quality may be poor due to Latency and Jitter.

Internet Fax

It is just similar to general fax techniques but it is possible only through the computer having Internet and Fax software. This application is useful because faxes can be sent long distances at local call rates and delivery can be guaranteed through store and forward mechanism.

Streaming Audio and Video

It allows the Internet users to see and hear data as it is transmitted from the host server instead of waiting until the entire file is downloaded. For Example, real network's real audio allows a web site to deliver an on-demand audio over the Internet and can work over connections. Streaming audio enables the broadcast of radio programs, music, press conference, speeches, and new programs over the Internet. It is well predicted that streaming audio and Internet telephony use will overlap and complement one another.

Real-Time Audio and Video

With the help of it, the transmission from source is live or only slightly delayed. These applications include point-to-point conversations between two people conferences among more than two people collaborative "white boarding" (where two or more users can interactively create graphic images) and shared hypermedia documents live broadcasts of news, talk shows, or sporting events and broadcasts of music and concerts.

5.6.2 Information Retrieval Services

It allows the users to access through the Internet, thousands of huge online library catalogs, as well as millions of databases that have been opened to the public by corporations, Government, and agencies and non-profit organizations. Apart from that, many users download free, high quality software made available by the developers over the Internet. This chapter will focus on five methods of accessing the computers and locating files. These are free to any Internet user. The Internet is a voluntary, decentralized collection of Networks with no central listing of sites and no central listing of the data located at those sites.

File Transfer Protocol (FTP)

It enables the users to access a remote computer and retrieve files from it. After the users have logged on to the remote computer, they can search the directories that are accessible to FTP, looking for the files they want to retrieve.

Archie

It is a tool that allows to the user to search the files at FTP sites. It regularly monitors hundreds of FTP sites and updates a database (called an Archie server) on software, documents and data files available for downloading. By clicking on a list of Archie server, it will take them to another computer system where relevant files are stored. Once there, the archie server may allow users to continue their searches for files until they locate what they need actually.

Gophers

It is a computer client tool that enables the users to locate the information stored on the Internet gopher servers through a series of hierarchical menus. Most files and digital information that are accessible through FTP are also available through gophers. Each gopher server contains its own system of menus listing subject-matter topics, local files, and other relevant gopher sites. When the users access gopher software to search a specific topic and select an item from a menu, the server will automatically transfer them to the appropriate file on that server or to the selected server wherever it is located. Once on that server, the process goes on.

Veronica

It stands for Very Easy Rodent-Oriented Net wide Index to Computer Archives. It provides the capability of searching for the text that appears in gopher menus. When the user enters a key word, veronica will search through thousands of gopher sites to find the titles containing that keyword. It places these files on a temporary menu on the local server, so that the users can browse through them.

Wide Area Information Service (WAIS)

It also allows the users to locate files around the Internet. It is the most thorough way to locate a specific file, but it needs that the users know the names of the database they want to search. After the users specify the database names and key identifying words, WAIS searches for the key words in all the files in those databases. When the search is finished, users obtain a menu listing all the files that contain the key words.

Web Services

These are the unique pieces of computer codes (components) accessed through a web site that delivers a specific type of function. Web service allows us to transparently access the rich software content from any site on the web. In Web services the application code normally deployed to one or more web server but controlled by the app server. Web services accept the information as a input from the called program and return the output like XML format.

Sun's JSP is a Java platform tool which is mostly used for making Java based active server pages. It is also an object-oriented language that enables the programmers to build wide range of applications for the JAVA platform.

5.6.3 The World Wide Web (WWW)

This concept has changed the way in which the Internet used to work earlier. It is not the same as the Internet today. The Internet functions as the transport mechanism and the WWW is an application that uses those transport functions. It is a system with universally accepted standards for storing, retrieving, formatting, and displaying information via a client/server system. The web handles all types of digital information including text, hypermedia, graphics, and sound. It is very easy to use as it uses the graphical user interface.

The web is based on a standard hypertext language called Hypertext Markup Language (HTML), which formats documents and incorporates dynamic hypertext links to other documents stored on the same or different computers. HTML is a simpler subset of Standard Generalized Markup Language (SGML), and incorporates tables, applets, text flow around images, superscripts and subscripts. Using this hypertext links, (which are typically blue and underlined), the user points at a highlighted word, clicks on it and is transported to another document. Users are able to navigate around the web freely with no restrictions, following their own logic, needs, or interests.

Offering the information through the web needs establishing a home page, which is a text and a graphical screen display that usually welcomes the user and explains the organization that has created the page. In most cases, the home page will lead the users to other pages too. All the pages of a particular company or individual are

known as Web site. Most web pages provide a way to contact the organization or the individual. The person in-charge of an organization's web site is its web master.

For accessing a web site, the user must specify a uniform resource locator (URL), which points to the address of a specific resource on the web. For example, the URL for Indira Gandhi National Open University is http://www.ignou.ac.in. HTTP stands for Hypertext Transport Protocol, which is the communication standard used to transfer a page across the WWW portion of the Internet.

Please answer the following Self Assessment Question.

Self Assessment Question 2 *Spend 3 Min.*

What is Internet Telephony? How does it differ from chatting?

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5.7 BROWSERS

To get connected into the Internet, a browser is the minimum requirement. It is capable of communicating via HTTP, managing HTML and displaying certain data types such as Graphic Interchange Format (GIF) and Joint Photographic Experts Group (JPEG) for graphics. The two leading browsers are Internet Explorer from Microsoft and Netscape Navigator. The competition between both of them has been extremely beneficial for the users, providing them highly capable applications at almost no costs. Microsoft's strategy is to minimize the importance of the browser as a distinct application by building the browser functionality directly into its latest operating system. Netscape's strategy is to make the browser the core of a compelling suite of applications for corporate users.

Netscape's Browser Suite

It includes Netscape Navigator, Netscape Mail, Netscape Instant Manager, Netscape Composer and Netscape Address Book. The suite provides functions for running web applets, audio playback, streaming media, web content, and Net2phone for free PC-to-phone calls anywhere within the United States. Netscape communicator is a comprehensive set of components that integrates e-mail, web-based word processing, and chat to allow users to easily communicate, share and access the information.

Microsoft's Internet Explorer

This software comes with the window operating system for free. AS Netscape has established its own market, so Microsoft embarked on a strategy to gain market share and penetrate the installed base. It also provides all the facilities that are

provided by Netscape. At present, IE 6.0 version is very much popular in the browser market. IE 7.0 from Microsoft is the most reliable browser available today for PC world. Many browsers are platform/OS oriented.

Beside these two browsers, there are so many browsers available in the market, like Fire Fox, which comes with so many advanced options.

Offline browsers (pull products) enable a user to retrieve pages automatically from web sites at predetermined sites, often during the night. Web Whacker and Web Copier are offline browsers that allow the users to define a group of sites by their URLs and then download the text and images from those sites to their local storage.

Please answer the following Self Assessment Question.

Self Assessment Question 3   *Spend 3 Min.*

Name two leading browsers

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5.8   SEARCH ENGINE

Search engine is the most popular option after e-mail over the Internet. These are the programs that return a list of web sites or pages (with URLs) that match a selected criteria. To use one of the publicly available search sites, the user navigates to the search engine's site and types in the subject of the search.

Goggle is the largest, search engine and the first search engine to index more than one billion pages. Goggles method of searching is called Page Rank. The more links there are to a page, the higher it moves in Goggle's ranking. Page Rank improves both recall and precision ratio.

Meta search engine automatically enters search queries into a number of other search engines and returns the results. Example of it includes All4one, Meta crawler and starting point.

Some popular search engine URLs are given here:

Alta Vista   *altavista.com*

Excite   excite.com

LookSmart   looksmart.com

Yahoo   Yahoo.com

MSN   search.msn.com

Oingo   oingo.com

5.9 E-COMMERCE

Electronic commerce (e-commerce) has changed the life style of the society. With the help of e-commerce, it is possible to buy, sell and exchanging the products, services and information via computer networks, primarily through the Internet. Though the definition of E-commerce is quite debatable, still it is very much useful for both individual and the corporate.

5.9.1 Types of E-commerce

Previously it was assumed that e-commerce is applicable only to a business community. But with the great use of high-speed technology, the idea has been changed. At present, basically five types of E-commerce can be summarized here:

- Business-to-Consumer (B2C) E-commerce;

- Business-to-Business (B2B) E-commerce;

- Consumer-to-Consumer (C2C) E-commerce;

- Peer-to-Peer (P2P) E-commerce; and

- Mobile Commerce or M-commerce.

In India, E-commerce is not so much successful as it was desired because Indian customers mostly believe in the practical market as they are very much economical and they have no good faith upon the product provider through E-commerce or other mode of net booking.

On the other part, the product provider does not give so much positive attention to the net customer as there is no direct contact between both of them. For better E-commerce, it is very much vital that a good faith must exist between the product provider and the customer.

5.9.2 Application of E-Commerce

E-commerce has various forms of applications. Some of them are described here:

1) Electronic Payments: This is the best form of payment throughout the universe at present. Electronic payments can be done through the following ways: electronic credit cards, electronic cash, smart cards, electronic fund transfer (EFT), and e-wallets and purchasing cards.

2) Banking Gateway: E-commerce plays a vital role in the banking sector for inter-bank transactions and building a separate gateway for the unified banking gateway.

3) E-Governance: Now the government of India has initiated total online transactions for tax payment, phone bill payment, loan EMI payment from banks, etc.

5.9.3 Security in Electronic Payment

Two main issues need to be considered under this topic: what is needed in order to make EC payment safe, and another one is which methods can be used for?

Security requirements needed for conducting Electronic Commerce (EC) are:

- Authentication for identity for both the parties;

- Integrity for unaltered transactions;

- Non-repudiation for unjustified denial of placing orders;

- Privacy for identity to be secured; and

- Safety for providing the credit card number over the Internet.

Security Protection: Several methods and mechanism can be used for the security protection. One of the most used mechanisms is Encryption. Encryption is a process of making messages indecipherable except by those who have an authorized decryption key. The key is a code composed of a very large collection of letters, symbols, and numbers. For example, "A" might be coded as some other forms like 123 etc.

Encryption is of two types, one is symmetric key and another one is symmetric key, which is known as Public Key Infrastructure (PKI). Public Key Infrastructure also includes digital certificates and signature, which are provided by the trusted third party, called Certified Authority (CA).

Security Protocols: Protocols are a set of rules and procedures that govern the transfer of information. Two major payment protocols are being used in E-commerce.

Secure Socket layer (SSL): It is a mostly used protocol on the Internet payment system. It may be of 40 bits, 64 bits and 128 bits. It appears as a lock symbol in the bottom of the browser. It is very important for a net user when he pays through the credit cards to know that the site is SSL secured and is valid. As a user, you may also read all about SSL from that SSL certificates.

Secure Electronic Transactions (SET): It is also very useful for credit card transactions, but due to its more cost and complexity, it is very less used over the net transactions.

Please answer the following Self Assessment Question.

Self Assessment Question 4   *Spend 2 Min.*

Fill in the blanks:

i) With the help of _____, it is possible to buy, sell and exchange the products, services and information via the computer networks.

ii) There are _____ types of E-commerce.

Let us now summarize the points covered in this unit.

5.10 SUMMARY

- ARPANET was the first Network in the world.

- Internet is defined as the network of networks. It has mainly the following applications:

E-mail,

Search,

File Transfer,

Research, and

Electronic Transactions.

- The Internet is based upon TCP/IP protocol. Every host and router over the Internet has a unique IP address. All IP addresses are 32 bits long.

- The lowest IP address is 0.0.0.0 and highest is 255.255.255.255.

- There are six common top levels domains: com, net, gov, edu, mil and org.

- At present, broadband connection is the best one to access the Internet for home or remote users (speed more than 256 Kbps).

- World Wide Web (WWW) is the basic infrastructure on which HTTP works.

- Browsers are the browsing software for the Internet. For example, the Internet Explorer.

- Search Engines are the internet Tools to search a file from various locations from the Internet within some seconds.

- E-commerce is the electronic way on which buying, selling and exchange of products is possible over the Internet.

- Secure Socket Layer (SSL) is the Internet security protocol for online financial or secure transactions. 40 bits, 64 bits and 128 bits SSL are available in the market.

- Due to the demand of the Internet, many challenges have to be faced in future regarding Internet Regulation, New Technology, Internet Expansion and Internet Privacy etc. As far as India is concerned, it should formulate a suitable Data protection legal framework to cope with the International standard. Again the Information Technology Act 2000 has to be modified with strong a technological as well as legal concept.

5.11   TERMINAL QUESTIONS

1) Define IP. Why every computer on the Internet has a unique IP address? What is its length?

2) E-commerce has changed the life style. Examine it critically.

3) What is the security over the Internet for Monetary Transactions?

5.12   ANSWERS AND HINTS

Self Assessment Questions

1) A network is a group of two or more computer systems linked together. The Internet is network of Computer Networks.

2) Chatting allows two or more people who are at a time connected to the Internet to hold live (real-time), interactive, written conversation. Internet Telephony is also called as voice over IP or VoIP. Here the users talk across the Internet throughout the world to any personal computer as well as any phone line (restricted by law of any country).

3) Internet Explorer from Microsoft and Netscape Navigator.

4) i) E-commerce, and (ii) five.

Terminal Questions

1) Refer to section 5.4 of the unit.

2) Refer to section 5.9 of the unit.

3) Refer to section 5.9.3 of the unit.

5.13 REFERENCES AND SUGGESTED READINGS

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2. Turban, Rainer and Potter. Introduction to Information Technology. 2nd ed. John Wiely & Sons, INC 2003, 2004.