UNIT 10 WHAT IS INTERNET

Structure

10.0 OBJECTIVES

After reading this unit you will be able to:

- understand the concept of the Internet;
- know about the growth of the Internet; and
- learn the techniques of how the Internet is controlled.

10.1 INTRODUCTION

The Internet is a network of networks. It connects millions of computers and thousands of computer networks through out the world. The Internet has revolutionised our society, our economy and our technological systems. Over the

past century, important technological developments have created a global environment that is drawing the people of the world closer and closer together. About fifteen years ago, most of the world knew little or nothing about the Internet. It was the private enclave of computer scientists and researchers who used it to interact with colleagues in their respective disciplines. Today, the Internet's magnitude is thousands of times what it was only a decade ago. It is estimated that about 60 million host computers on the Internet today serve about 200 million users in over 200 countries and territories.

The Internet has revolutionised the computer and communications world like nothing before. The invention of the telegraph, telephone, radio, and computer set the stage for this unprecedented integration of capabilities. The Internet is at once a world-wide broadcasting capability, a mechanism for information dissemination, and a medium for collaboration and interaction between individuals and their computers without regard for geographic location. The Internet represents one of the most successful examples of the benefits of sustained investment and commitment to research and development of the information infrastructure.

10.2 DEFINITION

The Internet is the world's largest computer network that enables computers of all kinds to share services and communicate directly, as if they were part of one giant seamless global computing machine. It is a vast and sprawling network reaching into computer sites world-wide. The Internet is actually a "network of networks". The networks that comprise it are thousands of local-area networks-groups of computers including government supercomputers, campus-wide information systems, local area networks and individual workstations. Each of these different computers, connected on the Internet running on different platforms or operating systems, follows certain standards or rules of communication called protocols. The standard protocol used for Internet communication is called transmission control protocol, Internet protocol or TCP/IP. Standardized communication protocols allow similar, dissimilar, near and distant computers to communicate with one another.

The Federation National Council (FNC) in 1995 referred to the Internet as a Global Information System that - (i) is logically linked together by a globally unique address space based on the Internet Protocol (IP) or its subsequent extensions/follow-ones; (ii) is able to support communications using Transmission Control Protocol/Internet Protocol (TCP/IP) suite or its subsequent extensions/follow-ones, and/or other IP-compatible protocols; and (iii) provides, uses or makes accessible, either publicly or privately, high level services layered on the communications and related infrastructure described herein.

It may be seen that FNC has described the Internet as a global information system, and included in the definition is not only the underlying communications technology, but also higher-level protocols and end-user applications, the associated data structures and the means by which the information may be processed, manifested, or otherwise used. In many ways, this definition supports the characterization of the Internet as an "information superhighway". Like the federal highway system whose underpinnings include not only concrete lanes and on/off ramps, but also a supporting infrastructure both physical and informational, including signs, maps, regulations, and such related services and products as filling stations and gasoline, and the Internet has its own layers of ingress and egress, and its own multi-tiered levels of services.

The Internet Society (ISOC) defines the Internet as a "global network of networks" enabling computers of all kinds to directly and transparently communicate and share services throughout the world using a common communication protocol. It should not be seen as merely as a collection of networks and computers. The Internet is an architecture that provides for both communications capabilities and information services. Because the Internet is an enormously valuable, enabling capability for so many people and organizations, it also constitutes a shared global resource of information, knowledge, and means of collaboration and cooperation among countless diverse communities.

10.3 GROWTH OF INTERNET

The Internet which can be said to hence born thirty-five years ago as a US Defence Department Network called APPANET was initially set up with 4 hosts. In the early 80s there were only 213 registered hosts on the Internet. By 1986, the number had risen to 308 hosts connected throughout the world. By 1989, the number of networks connected had risen to five hundred. The Network Information Centre of the Defence Data Network Information Centre found 2,218 networks connected as of January 1990. By June 1991, the National Science Foundation Network Information Centre pegged it at close to four thousand. If we extrapolate based on current number the figure reached forty million people during 1996 one hundred million by 1998. Its current growth rate is 15 per cent monthly.

This high levels of connectivity has resulted in an unparalleled degree of communication, collaboration, resource sharing, and information access. The host population of the Internet has been doubling every year since 1981. What has driven this growth more than anything is the openness of the academic community. That openness shows up in the technology of the Internet, its economics and its culture. Internet has become a forum for human communication in a wide variety of disciplines ranging from computers, medicine, bio-sciences and social sciences, etc., to art, music, sports and other recreations.

Since the early 80s, when the US government began to share their network technology with the world, there has been growth on a scale that is hard to imagine. To put it into better perspective, in the early 80s there were only 213 registered hosts on the Internet. By 1986, this number had risen to 2,308 hosts.

According to the Internet Society, a non-profit society that studies and promotes the use of the Internet, 134 countries had full Internet connection and an additional 5 countries had limited access (for example, 3-mail only) in 1996. Surveys performed by the International Data Corporation and Matrix Information and Directory Services found that as of September 1997 there were between 53 and 57 million users of the Internet worldwide. By January 1999 there were about 50 million internet connections worldwide. The figure grant to 200 million users in 200 countries and territories by the year 2001. Today's telephone system is still much larger: about 3 billion people around the world now talk on almost 950 million telephone lines (about 250 million of which are actually radio-based cell phones). Also, the total numbers of host computers and users have been growing at about 33% every six months since 1988 - or roughly 80% per year. The telephone service, in comparison, grows an average of about 5-10% per year. That means if the Internet keeps growing steadily the way it has been growing over the past few years, it will be nearly as big as today's telephone system by about 2007.

10.4 INTERNET CONTROL AND ASSOCIATED ORGANIZATION

The Internet can be mentioned as a collection of autonomous inter-connected networks using various common protocols and standards. The Internet protocols and standards are being defined from time to time by various international organization and committees after rigorous testing and reviewing. It can, however, be said that no single person, organization, government or group owns or controls the Internet. The governing bodies of various organizations can be said as controlling authorities of certain parts of the Internet. For example the ICANN oversees the domain name management; the IANA acts as the clearing house for protocol parameters, etc. The following organizations can be said to be controlling the Internet.

10.4.1 Internet Standards Organizations (ISOC)

The Internet Society is a non-profit, non-governmental, international, professional membership organization. Its more than 150 organization and 6,000 individual members in over 170 nations worldwide represent a veritable who's who of the Internet community. It provides leadership in addressing issues that confront the future of the Internet. The work of the Internet Society focuses on four "pillars:" standards, public policy, education and training, and membership. ISOC is closely associated with the activities of the Internet Engineering Task Force (IETF), the Internet Architecture Board (IAB), the Internet Engineering Steering Group (IESG), and the Internet Research Task Force (IRTF).

ISOC is also active in areas such as censorship/freedom of expression, taxation, governance, and intellectual property. The Internet Society has helped train many of the key information technology leaders around the world through programmes such as the annual Network Training Workshops, Sustainable Internet Training Centers, and sponsorship of the Internet Fiesta. The Society is governed by a Board of Trustees elected by its membership around the world.

The Society's individual and organization members are bound by a common stake in maintaining the viability and global scale of the Internet. They comprise the companies, government agencies, and foundations that have created the Internet and its technologies as well as innovative new entrepreneurial organizations contributing to maintain that dynamic.

10.4.2 The Internet Engineering Task Force (IETF)

The Internet Engineering Task Force (IETF) is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. It is open to any interested individual around the world. At the technical and developmental level, the Internet is made possible through the creation, testing and implementation of Internet Standards. These standards are developed by the IETF. The standards are then considered by the Internet Engineering Steering Group, in consultation with the Internet Architecture Board. The RFC Editor, supported by the Internet Society, is responsible for preparing and organizing the standards in their final form. More information can be obtained from the IETF web site at http://www.ietf.org.

10.4.3 The Internet Engineering Steering Group (IESG)

The IESG is responsible for the technical management of IETF activities and the Internet standards process. The IESG is directly responsible for the actions associated

with entry into and movement along the Internet "standards track," including final approval of specifications as Internet Standards.

10.4.4 Internet Architecture Board (IAB)

The Internet Architecture Board (IAB) is a technical advisory group of the Internet Society. Its responsibilities include:

1) IESG Selection: The IAB appoints a new IETF chair and all other IESG candidates from a list provided by the IETF nominating committee.

2) Architectural Oversight: The IAB provides oversight of the architecture for the protocols and procedures used by the Internet.

3) Standards Process Oversight and Appeal: The IAB provides the oversight of the process used to create Internet Standards. The IAB serves as an appeal board for complaints of improper execution of the standards process.

4) RFC Series and IANA: The IAB is responsible for editorial management and publication of the Request for Comments (RFC) document series, and for the administration of the various Internet assigned numbers.

5) External Liaison: The IAB acts as representative of the interests of the Internet Society in liaison relationships with other organizations concerned with standards and other technical and organizational issues relevant to the world-wide Internet.

The IAB acts as a source of advice and guidance to the Board of Trustees and Officers of the Internet Society concerning technical, architectural, procedural, and (where appropriate) policy matters pertaining to the Internet and its enabling technologies. More information is available from the IAB web site at http://www.iab.org.

10.4.5 Internet Assigned Numbers Authority (IANA)

The Internet Assigned Numbers Authority (IANA) is the central coordinator for the assignment of unique parameter values for Internet protocols such as Internet addresses, domain names, protocol numbers, and more. The IANA is chartered by the Internet Society (ISOC) for the same.

10.4.6 IETF RFCs and the RFC Editor

The Requests for Comments (RFCs) form a series of notes, started in 1969, about the Internet. The notes discuss many aspects of computer communication, focusing on networking protocols, procedures, programmes, and concepts but also including meeting notes, opinion, and sometimes humorous anecdotes.

The specification documents of the Internet protocol suite, as defined by the Internet Engineering Task Force (IETF) and its steering group the IESG, are published as RFCs. Thus, the RFC publication process plays an important role in the Internet standards process.

The RFC Editor is the publisher of the RFCs and is responsible for the final editorial review of the documents. The Internet Society funds the RFC Editor's function. The IETF RFC Editor web site at http://www.rfc-editor.org/overview.html can be seen for further details.

10.4.7 European Telecommunications Standards Institute

The European Telecommunications Standards Institute (ETSI) is a non-profit organization whose mission is to produce telecommunications standards.

10.4.8 Internet Research Task Force (IRTF)

The Research Groups work on topics related to Internet protocols, applications, architecture and technology. Research Groups are expected to have the stable long-term membership needed to promote the development of research collaboration and teamwork in exploring research issues. IRTF provide the forum for this. Participation in IRTF activities is by individual contributors rather than by representatives of organizations. The IRSG from time to time holds topical workshops focusing on research areas of importance to the evolution of the Internet, or more general workshops to, for example, discuss research priorities from an Internet perspective. More information is available from the IRTF web site at http://www.irtf.org.

10.4.9 The Internet Corporation for Assigned Names and Numbers (ICANN)

The Internet Corporation for Assigned Names and Numbers (ICANN) is a non-profit corporation that was formed to assume responsibility for the IP address space allocation, protocol parameter assignment, domain name system management, and root server system management functions previously performed under U.S. Government contract by IANA and other entities.

10.4.9.1 The World Wide Web Consortium

The World Wide Web Consortium (W3C) develops interoperable technologies (specifications, guidelines, software, and tools) to lead the Web to its full potential as a forum for information, commerce, communication, and collective understanding. More information can be had from the web site at http://www.w3.org/

10.4.9.2 International Telecommunication Union

The ITU, headquartered in Geneva, Switzerland, is an international organization within the United Nations System where governments and the private sector coordinate global telecom networks and services.

10.5 INDIAN SCENARIO

The use of the Internet was limited to Government organizations, Business Houses and Corporate Offices during the 80s. It was with the introduction of PCs in the 90s the Internet became popular at offices and homes and during late the 90s the Net virtually became a household name in India. The sudden splurge in the Internet front is in a large way owed to the increasing number of private ISP market mushrooming all over the country, offering the cyber voyage for more and more competitive prices. In a splash of time, the Internet in India has come to be viewed as the most vital medium for information, entertainment, communication and the sole means for electronic commerce. Today, everywhere one looks, the signs of the Internet's arrival and adoption loom large. And as the Internet proliferates, so will e-commerce and e-business. This is now a universally recognized fact. Therefore boosts in the expansion of the Internet in the country will not only help India become a vital part of the

emerging global economy, it will also enable its citizens to avail the benefits of the web enabling experience. Though we still lag behind stalwarts like China, Japan and Taiwan in terms of Internet usage yet the gradual quickening of the pace of India's Internet growth can be judged by the India Internet Log Book 2000, which reports over 1.8 million subscribers (and more than 5.5 million users). And the estimated figure by 31 December 2003 is a whopping 50 million!

A survey indicates that India's Internet subscribers increased from a meagre 0.7 million in November 1998 to over 1.8 million by 31 December 2000. This significant boost to the country's Internet plans can be to the Government, which has announced several landmark decisions that have helped increase Internet penetration in India. A Nasscom Internet survey was conducted in 68 cities / towns in India in January 2001 (accounting for over 92 per cent of the total Internet users in the country) on Internet Usage Trends and came up with some interesting findings: More than 200 cities and towns in India have Internet connectivity.

As of December 2000, there was a PC base of 5 million PCs. Out of these, there were more than 3.7 million machines that had Pentium I and above processors (i.e., machines which could be effectively used for the Internet). More than 175 private ISPs would be fully operational by June 31, 2001 (out of the projected 500 licenses to be given by that date). At least 12 private international gateways for the Internet are expected in the same period. Seven private international gateways are already operational by December 2000. Over 81 per cent of the PCs sold during financial year 1999-2000, were driven by the need to access the Internet. More than 86 percent of top 100 corporate companies (who responded to the survey) have endorsed the Internet and e-commerce as being an integral part of their corporate strategic framework for the next year. 91 per cent of India's corporate Web sites are located overseas. The capital cities (New Delhi and other state capitals) today account for 79 per cent of Internet connections across the country. It is estimated that by 2003, the number of Internet connections in India will grow to 10 million from the current 2.3 million.

10.6 TRENDS

As we struggle to envision what may be commonplace on the Internet in a decade, we are confronted with the challenge of imagining new ways of doing old things, as well as trying to think of new things that will be enabled by the Internet, and by the technologies of the future. In the next ten years, the Internet is expected to be enormously bigger than it is today. It will be more pervasive than the older technologies and penetrate more homes than television and radio programming. Computer chips are now being built that implement the TCP/IP protocols and recently a university announced a two-chip web server. Chips like this are extremely small and cost very little and they can be put into anything. Many of the devices connected to the Internet will be Internet-enabled appliances (cell phones, fax machines, household appliances, hand-held organizers, digital cameras, etc.) as well as traditional laptop and desktop computers. Information access will be directed to digital objects of all kinds and services that help to create them or make use of them.

In the field of communication, high-speed networking has also been developing at a steady pace. From the original 50,000 bit-per-second ARPANET, to the 155 million bit-per-second NSFNET, to today's 2.4 - 9.6 billion bit-per-second commercial

networks, we routinely see commercial offerings providing Internet access at increasing speeds. Experimentation with optical technology using wavelength division multiplexing is underway in many quarters; and test beds operating at speeds of terabits per second (that is trillions of bits-per-second) are being constructed.

Building on the tremendous success of the last ten years in generalizing and adapting research Internet technology to academic needs, the university community has joined together with government and industry partners to accelerate the next stage of Internet development in academia. One such example is Internet 2.

10.6.1 Internet2

The transition from government-supported backbones to a totally privatized system in the U.S. has led to the development of a new system of backbones called Internet 2, the Next Generation Internet. Proponents of Internet 2 believe that privatization of the Internet has detracted from the Internet's development, putting the focus more on business profits and less on acdemics, research and teaching needs.

Internet2 is a collaborative effort to develop advanced Internet technology and applications vital to the research and education missions of higher education. Over 140 U.S. universities, working together with partners in industry and government, are leading the Internet2 project. Internet2 is working to enable applications, such as telemedicine, digital libraries and virtual laboratories that are not possible with the technology underlying today's Internet. As a project of the University Corporation for Advanced Internet Development (UCAID), the Internet2 project is not a single separate network, but rather joins member network application and engineering development efforts together with many advanced campus, regional, and national networks. Internet2 promises to address this problem by focusing its attention on the next generation of university networks, a system that promises to be 100 times faster than today’s system.

The goals of Internet2 are to create a world-class network that will support the national research community; develop a new generation of applications that push the envelope of this new leading edge network; and make the new services resulting from Internet2 available to every level of education and to the Internet community at large. Internet2 universities, working with industry, government and other research and education networking organizations are addressing the major challenges facing the next generation of university networks by:

- First and most importantly, creating and sustaining a leading edge network capability for the national research community.
- Second, directing network development efforts to enable a new generation of applications to fully exploit the capabilities of broadband networks.
- Third, working to rapidly transfer new network services and applications to all levels of educational use and to the broader Internet community, both nationally and internationally.

10.6.2 Internet3

Similar to the origin of the Internet, the root of the emerging Internet3 also lies with the US government and academics. These include the US government's Next Generation Internet (NGI) initiative, the National Science Foundation' (NFS) and Very High Bandwidth Network Service (VBNS). As computer and communication

corporate giants such as IBM, CISCO and Intel will eventually benefit with the development of Internet3, they too are active participants in this new Internet project.

Initiated in October 1996, NGI aims to foster a partnership between academia, industry and government to develop technologies that will be essential to sustain the USA's technological leadership in computing and communications and enhance the country's economic competitiveness. The NGI by the end of the year 2002 aims to demonstrate the new Internet work with a capacity of 1 Terra-bps and over 10 advanced applications that will leverage this bandwidth. The Internet3 promises a large number of new applications on a very high-speed network.

Self Check Exercise

1) How is Internet controlled?

2) What are Internet2 and Internet 3 ?

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10.7 SUMMARY

The unit discussed the definition, growth and development of the Internet, Internet control and the associated organization. The unit further explains the role of the Internet in India and its future use in the international context. Therefore the Next Generation Internet called Internet2 as well as Internet3 which promises a large number of new applications on a very high speed network, have been discussed to appraise the students about the changing scenario or trends of Internet.

10.8 ANSWER TO SELF CHECK EXERCISES

1) The Internet is a collection of interconnected networks that no single entity owns. The overall system is controlled by a group of volunteers dedicated to promoting the exchange of information using the Internet. The group is known as the Internet Society, which maintains the Internet through several subgroups. The Internet Architecture Board authorizes network and protocol standards used by the Internet and allocates and keeps track of Internet Resources, including addresses. The Internet Engineering Task Force concerns itself with operational and technical difficulties that might arise in the daily operation of the system. Lastly the Internet Research Task Force keeps its eyes on developments that may be made to improve the services provided by Internet.

2) Internet2 is a consortium being led by 200 universities working in partnership with industry and government to develop and deploy advanced network applications and technologies, accelerating the creation of tomorrow's Internet.

   Internet3 includes the US government’s Next Generation Internet (NGI) initiative to provide high bandwidth network service.

10.9 KEYWORDS

E-Commerce : Conducting business (buying and selling products) on-line.

Gateway : A node on a network that serves as an entrance to another network.

Root Server : There is one central, or "A", server that replicates changes to the other servers on a daily basis.

Super Computer : An extremely fast computer that can perform hundreds of millions of instructions per second.

10.10 REFERENCES AND FURTHER READING

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