Internet Connectivity at Kalyani Government Engineering College

Dr. Swapan Kumar Mondal*

1. INTRODUCTION

Computers nowadays can store huge amount of data and also can process them very fast. It may be more useful if the data available in one computer could be shared across a group of computers. That is achieved using the computer network. The Internet is a global network of interconnection of thousands and thousands of such computer networks.

The Internet grew from ARPAnet which was formed in 1969 as a product of the Advance Research Project Agency. This was a network of government computers connected to exchange information and share programs. ARPAnet was later discontinued, but other networks which were primarily government and educational had been formed and interconnected. The resulting network of networks has come to be known as Internet. In 1993, graphical web browser known as mosaic was introduced followed by its protege, Netscape Navigator in 1994. Color and graphics appeared on the monitor in place of the previous version of plain text screen.

It is interesting to note that there is no central computer or authority to control Internet. It is collaborative and collective enterprise. Instead of having data to go to a central computer and then to it's destination, in Internet, the data has many ways to move from one point to another over the web of computers, through a protocol (rules implemented by software) called TCP/IP. TCP/IP breaks up data (text, image, voice etc.) into small packets which contain among with others, the source address and the destination address of the computers uniquely identified in the network. From point of origin, different packets of a single message may travel different paths to reach the destination and at the destination may combine together to form the original message.

2. GETTING INTERNET ACCESS

Getting Internet access in cities is easier but in remote places it is difficult. Some of the possible ways to get Internet access from a remote place are mentioned below.

2.1 Through telephone lines : Computer is connected to the Public Service Telephone Network (PSTN) available worldwide via a modem and telephone line. This "dial up access" method is not fast enough to access large volume of data, video or multimedia files due to lower bandwidth (hence effective speed) of a telephone line. With the introduction of data compression and error checking techniques, effective speed of communication through telephone line is still not very much encouraging. Fig–1 shows the connectivity of Internet through a telephone network.

2.2 Using cable TV network : Conventional cable TV network can be used for connectivity from the user to the Internet Service Provider (ISP). Speed and quality of transmission thus may improve the performance. Also the disadvantage to frequent interruption in PSTN lines are also eliminated. Fig–2 shows the Internet connectivity through cable TV network.

2.3 Terrestrial microwave : Microwave antennas are usually located at substantial heights above ground level in order to transmit over intervening obstacles. This is also called line of sight transmission and is used for telecommunication services, digital data transmission etc. But

* Asst. Prof. and Head, Dept. of Computer Seicence and Technology, Kalyani Government Engineering College, Kalyani–741 235

it's use is limited within a distance of several likometres. Fig–3 shows the connectivity through terrestrial microwave.

2.4 Satellite microwave : A communication satellite is, in effect, a microwave relay station. It is used to link two or more ground based microwave transmitter/receiver known as earth stations (or personal earth stations). The satellite receives transmission on one frequency band (uplink), amplifies (analog transmission) or repeats (digital transmission) the signal, and transmits it on another frequency (downlink).

Most satellites providing point-to-point service today use a frequency bandwidth in the range of 5.925 to 6.425 GHz for transmission from earth to satellite (uplink) and a bandwidth in the range of 3.7 to 4.2 GHz for transmission from satellite to earth (downlink). This combination is referred to as the 4/6 GHz band, or C band. Note that the uplink and downlink frequencies differ. For continuous operation without interference, a satellite cannot transmit and receive on the same frequency. Thus signals received from a ground station on one frequency must be transmitted back on another.

The C band is within the optimum zone of 1 to 10 GHz but has become saturated. Other frequencies in that range are unavailable because of sources of interference operating at those frequencies, usually terrestrial microwave. Therefore, the 12/14 GHz band, or Ku band, has been developed (uplink : 14 to 14.5 GHz; downlink : 11.7 to 12.2 GHz). At this frequency band, attenuation problems must be overcome. Thus relative to C band, the Ku band systems require higher uplink and downlink radiated power and greater transponder receiver sensitivity. However, smaller and cheaper earth-station receivers can be used. Ku band is particularly well suited for VSAT applications, although C band is also used for this purpose.

Because of it's high speed VSAT based satellite communication is one of the best choices to access Internet. A typical satellite based internet working system is shown in Fig–4.

3. EXISTING FACILITY OF KALYANI GOVT. ENGG. COLLEGE :

3.1 The technology : The technology used is called IP advantage. It is the combination of Integrated Satellite Business Network (ISBN) and Direct PC. ISBN is a two-way transmission system for data and voice traffic between a HUB and many remote locations (Personal Earth Stations or PES). All ISBN traffic is carried digitally between the HUB and remote PES via one or more transponders aboard a Geostationary Satellite.

A single large, sophisticated HUB station supports many small PES stations. The HUB-to-PES direction of transmission is termed outroute, while the PES-to-HUB transmission is termed as inroute. Since the remote stations have small antenna and low transmit power levels, the inroute signals are relatively weak. The HUB, with its high power amplifier, transmits a sufficiently strong signal for reception by the small remote stations, and the large HUB antenna with its large receiver gain compensates for the weak signals transmitted by the remote stations.

The Time Division Multiplexed outroute is a 512 Kbps continuous bit stream, consisting of concatenated (i.e., linked together) packets. The HUB ports are polled regularly, according to the class of service, with each port allowed to transmit soon or all of its queued packets before the next port is permitted to transmit. Each port transmits packets in a first-in-first-out manner.

The ISBN inroute, from the remote station to the HUB, consists of multiple, independent Time Division Multiple Access (TDMA) of 64 Kbps bit streams. Inroute data is packetized and transmitted as bursts. The assignment of time slots in which each user is permitted to transmit their burst of traffic is centrally controlled at the HUB and can be tailored to the needs of each user.

3.2 The structure : The connectivity of the Internet at our college is shown in Fig–5. INSAT–

2C transponders are used for communication purposes among the PES, HUB, gateways etc. KU-band frequency (11-14 GHz) is used for signals. A dedicated high speed (512 Kbps) downloading machine is directly connected with the PES which is called Direct PC. The campus LAN is connected to PES to use the ISBN facility (64 Kbps). The main earth station is situated at Delhi, where the processing of packets to decide the route to be followed to reach the destination takes place. Accordingly the packets are sent either to gateways (for sending the packets destined to other networks) or to other PES (to send packets to a network connected to this satellite itself through another PES). Other networks are accessed through VSNL, Sprintnet, KDD-Japan, MIC etc. using gateways.

The domain name of the IP addresses provided at our college is kucse.wb.nic.in for our college. That means any user wants to open an account to e-mail will always have the form as *name*@kucse.wb.inc.in. Where *name* is the identification name of the particular user and must be unique within the college.

The disadvantage of the system is that the communication is attenuated during rain, snowfall etc. That means during heavy downpour, the effective communication speed decreases considerably.

3.3 Present limitations : As 3 numbers of IP addresses are available for general use, 3 machines can be configured directly to use the Internet in graphics mode. However other machines connected in the LAN can also browse the Internet but in the text mode only. To solve this problem proxy servers should be used as shown in Fig–6. At the most 3 such proxy servers can be configured using 3 available IP addresses. Once the proxy server is used, any terminal connected to the LAN can be used to browse the network in graphics mode.

4. USES OF INTERNET

Internet may be used for disseminating any type of information one can think of sharing with others. Whether it is technological information, business information, art and culture, music, history, etc. Internet has got everything. The type of uses to which an Internet connection can be put to is continuously getting enhanced. This has been made possible by the availability of hypertext information, worldwide web, video and audio files. Some of the uses of Internet are mentioned below.

4.1 Electronic mail (e-mail) : E-mail is a tool that allows one user on the Internet to send a message to another user on the Internet. The message travels practically in no time over the network to the addressee. All e-mail messages may contain text or pictures and sound encoded as text, but most often it is plain text.

4.2 Usenet : This can be termed as the more public form of e-mail. While mail lets us send a message to a specific person or group, network news allows a message to be put up on an "electronic bulletin board". Usenet is the international meeting place, where people gather to meet their friends, discuss the day's events, and many other things. There is, however, a distinction between Usenet and Internet. Both are separate systems. All Internet sites can carry Usenet, but so do many non-Internet sites.

4.3 Remote Login–TELNET : Telnet is a utility, which allows the net user to log on to another system and use various services available on that "host". The user can TELNET into huge databases to do research or even TELNET into libraries around the world to check if they have a certain book that he is looking for.

4.4 File Transfer Protocol (FTP) : This is a facility which lets users copy files from a remote host to their host and vice versa.

4.5 Archie : Archie is a search program that can look through hundreds of different FTP sites

and tell us where all of the files that we want are located. It is actually a collection of servers. Each of these servers is responsible for keeping track of the locations in several different anonymous FTP sites. All the Archie servers can talk to each other and they pool their information into a huge global database that is periodically updated.

4.6 Gopher : This utility was developed at the University of Minnesota, and it is a menu-driven application that allows the net user to hop around the globe looking for information in various information libraries or servers. Gopher has interconnected menus that allow one to go deeper and deeper until he finds the information that he is looking for.

4.7 World Wide Web : Commonly called www, the World Wide Web facility links all the "documents" in the servers on the Internet, just as Gopher interconnects different menus. This is based on "hypertext" and "URLs—Universal Resource Locations". The user can access the Web through a "browser", which can read documents, access files by FTP, read Usenet news group and Telnet into remote sites. The www, thus has become the ultimate information utility on the Internet responsible for carrying out most of the Net's applications. It provides the members of the Internet community with an opportunity to create and permanently develop a global field comprising texts as well as images animation etc.

4.8 Internet Tools : For exchanging of information on the net, there are tools called as the Internet Tools. The Internet encompasses several tools, some of which are electronic mail (e-mail), file transfer protocol (FTP), gopher, Telnet and the World Wide Web (www). The advent of graphical web browsers has brought the World Wide Web on the forefront and pushed some on the other tools to the background.

5. MANAGERIAL HEADACHES

First of all it should be noted that the maximum bandwidth available is fixed. So the effective performance of accessing the Internet will depend on how many users are actually accessing the net at a time. Specially in case of browsing in graphics mode, merely a few users can lead to a bottleneck of speed. So it will be a suicidal measure to give access to all the machines in graphics mode. Another problem is with the downloading of big files/software. If all the machines are given free access to download (to store in hard disk) the software/file, then within a short time (may be within a few hours!) the hard disk may be full, leaving no room for other activities. So to manage this some sort of restrictions should be imposed.

Glossary :

* **Bandwidth :** How much "stuff" you can send through a connection. Usually measured in bits-per-second. A full page of English text is about 16,000 bits. A fast modem can move about 15,000 bits in one second. Full-motion full-screen video would require roughly 10,000,000 bits-per-second, depending on compression.

* **Browser :** A client program (software) that is used to search through information provided by a specific type of server.

* **Client :** A software program that is used to contact and obtain data from a server software program on another computer, often across a great distance. Each client program is designed to work with one or more types of server programs.

* **E-mail :** Electronic Mail Messages, usually text, sent from one person to another via computer. E-mail can also be sent automatically to a large number of addresses by the use of a mailing list.

* **File-transfer protocol (FTP) :** A method of transferring one or more files from one computer to another on a network or phone line.

* **Gateway :** A computer that connects one network with another when the two networks use different protocols.

* **Host :** A computer on the Internet that one may be able to log on to. One can use FTP to get files from a host computer, and use other programs such as Telnet to make use of the host computer.

* **Internet Protocol (IP) :** The transport layer protocol used as a basis of the Internet. IP enables information to be routed from one network to another in packets and then reassembles when they reach their destination.

* **IP Number :** A four-part number separated by dots (e.g. 165.113.254.2) which uniquely identifies a machine on the Internet which has a unique IP number. If a machine does not have an IP number, it is not really on the Internet. Most machines also have one or more Domain Names that are easier for people to remember.

* **Lan :** Local Area Network. A group of connected computers, usually located in close proximity (such as the same building or floor of the building) as data can be passed between them.

* **Leased line :** Refers to a phone line that is rented for exclusive 24-hours, 7-days-a-week access between your location to another location.

* **Login :** Noun or a verb. Noun : The account name used to gain access to a computer system. Unlike a Password the login name is not a secret. Verb : The act of entering into computer system, e.g. "Login to the WELL and then go to the GBN conference".

* **Netscape Navigator :** A Window-based, Windows Sockets-compliant program that lets one access information on the World Wide Web. This is an improvement on Mosaic.

* **Packet :** A chunk of information sent over a network. Each packet contains the destination address, the sender's address, error-control information, and data.

* **Ping :** A network management tool that checks to see whether one can communicate with another computer on the Internet. It sends a short message to which the other computer automatically responds. If the other computer does not respond to the ping, one usually cannot establish communications.

* **TCP/IP :** Transfer Control Protocol/Internet Protocol. The system networks use to communicate with each other on the Internet.

* **Telnet :** The command and program used to login from one Internet site to another. The Telnet command/program gets you to the "login" prompt of another host.

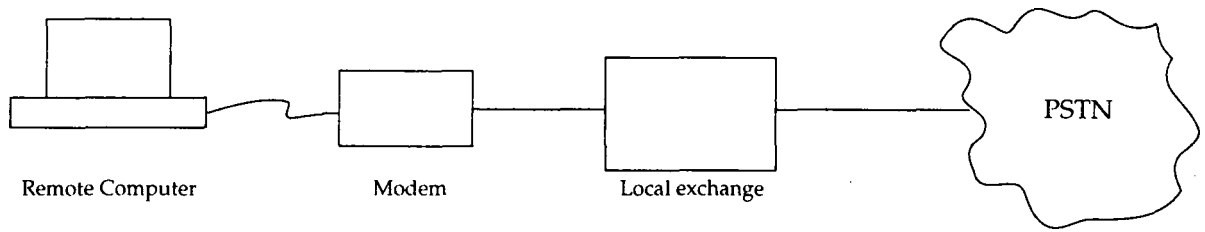* **WWW :** World Wide Web. A hypermedia-based system for accessing information on the Internet.

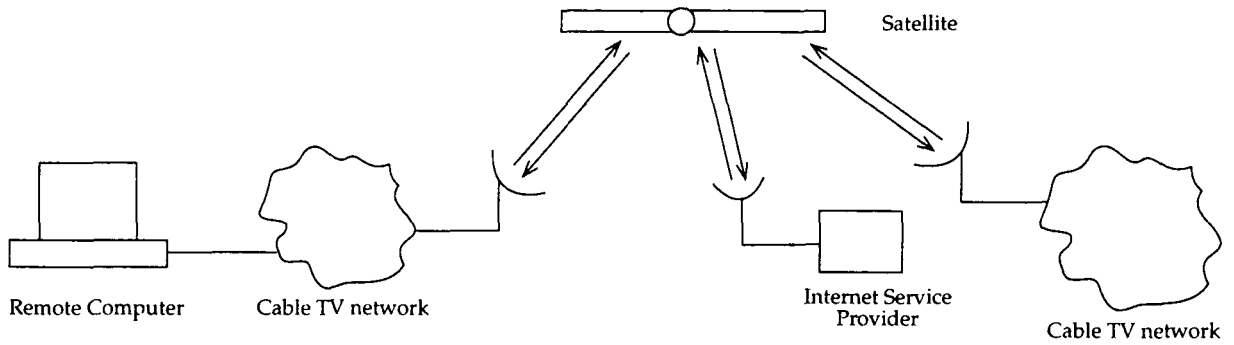Fig 1 : Connectivity through telephone network
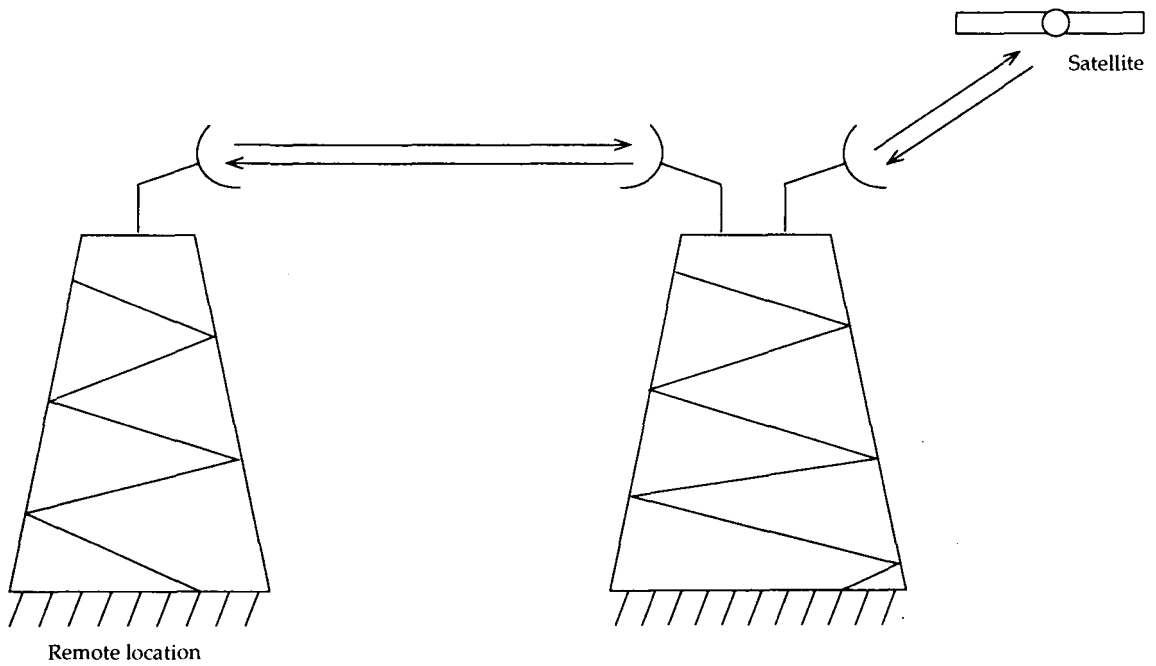
Remote Computer   Modem   Local exchange   PSTN

Fig 2 : Connectivity through cable TV network

Satellite

Remote Computer   Cable TV network   Internet Service Provider   Cable TV network

Fig 3 : Connectivity through terrestrial microwave

Satellite

Remote location

Satellite with transponder

VSAT

VSAT

VSAT

HUB

Remote LAN

Remote LAN

Fig 4 : Satellite based internetworking

PES   IPA-VSAT

DPC

Direct PC

HUB
of
KGEC

LAN
of KGEC

DNS

Main earth
station at
Delhi

ISBN HUB

DPC HUB

Connected to gateway or
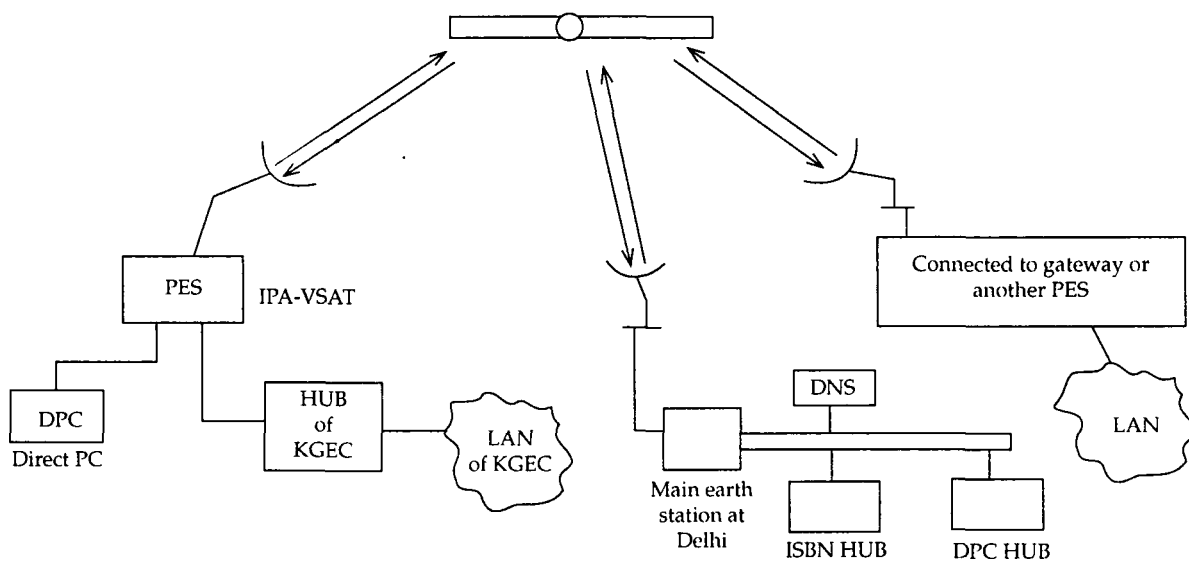another PES

LAN
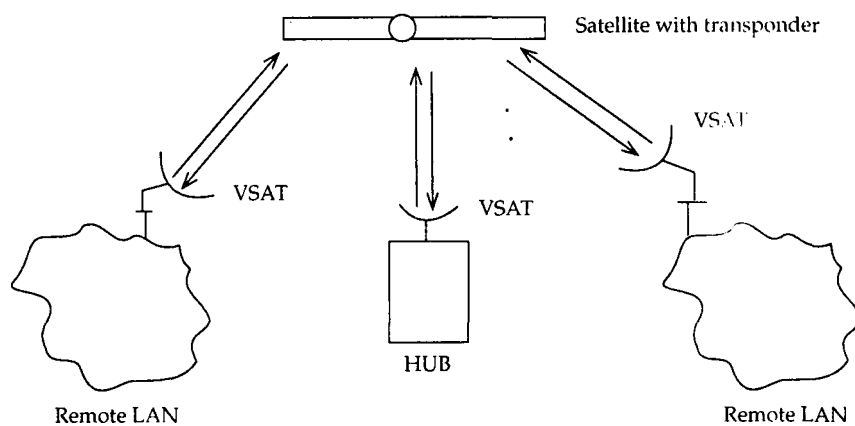
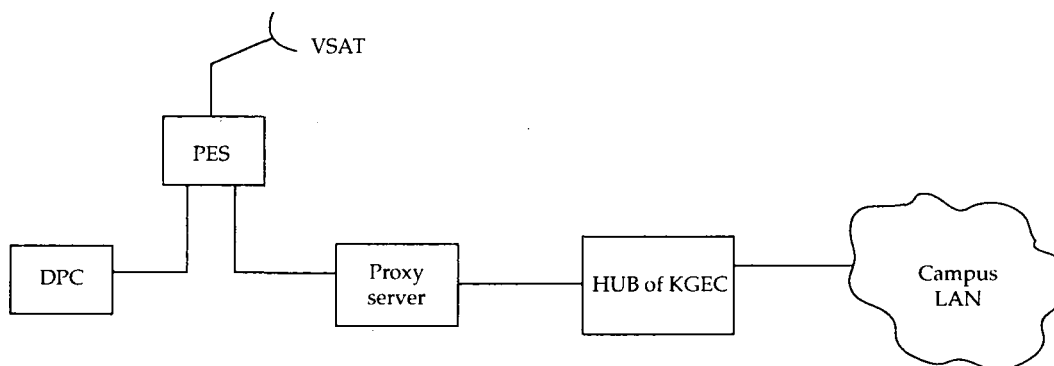Fig 5 : Internet connectivity at Kalyani Govt. Engg. College

VSAT

PES

DPC

Proxy
server

HUB of KGEC

Campus
LAN

Fig 6 : Use of a proxy server

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