MODULE-1

Multimedia Communications

MULTIMEDIA COMMUNICATIONS:

INTRODUCTION:

Multimedia communication embraces a range of application and networking infrastructures. The term multimedia is used to indicate that the information or data being transferred over the network may be composed of one or more of the following media types:

→ **TEXT**: Text includes both unformatted text, comprising strings of characters from a limited character set and formatted text strings for the structuring, access & presentation of electronic documents.

→ **IMAGES**: Images includes digitized images of documents and pictures. It also comprises of computer generated images, lines, curves and circles.

→ **AUDIO**: Audio includes both low-fidelity & high fidelity speech like used in telephony and stereophonic music as used with compact discs respectively.

→ **VIDEO**: Video includes short sequences of moving images known as video clips. & complete movies & films.

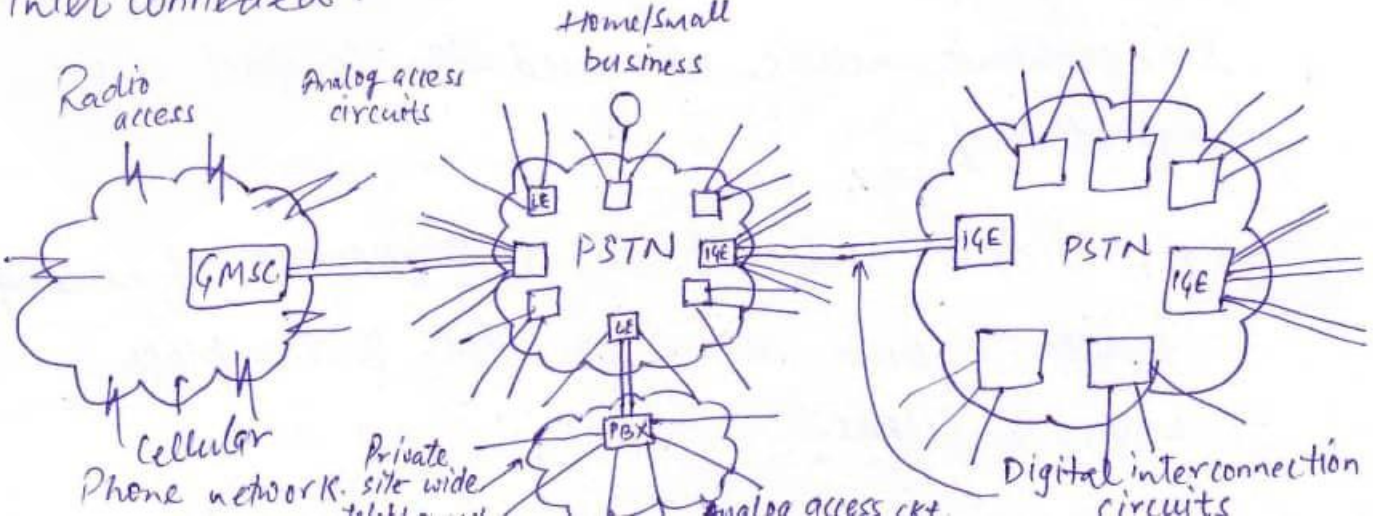
MULTIMEDIA NETWORKS :

There are basically five types of multimedia comm" Networks that provide multimedia communication Services :

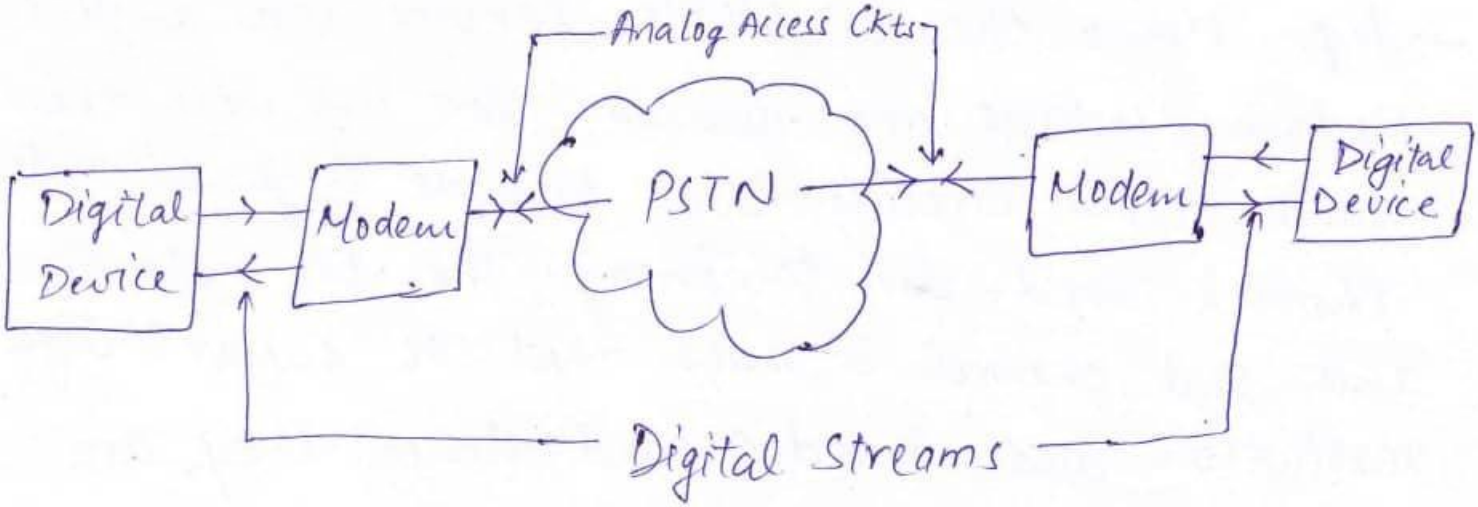
→ telephone networks.
→ data networks.
→ broadcast television networks
→ ISDN : Integrated Services digital networks
→ Broadband multiservice networks.

1. Telephone Networks :

PSTN have been in existance for many years & gone through many changes. They are basically designed to provide a basic switched telephone service, which now become a plain Old telephone service POTS, with the advent of other network types. Initially such networks spanned just a single country but later the networks of different countries were inter connected.

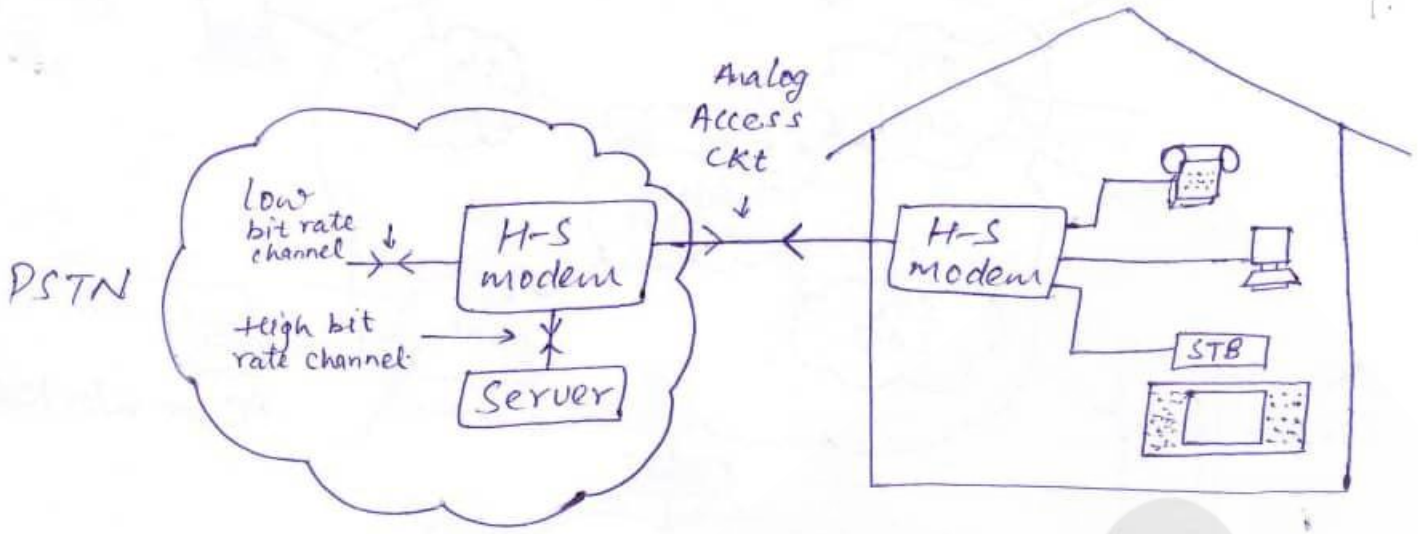


→ Above fig. shows the network components of a Telephon n/w. The telephones located in the home or in small business are connected directly to their nearest local exchange & those located in a large site are connecte to a private switching office known as PBX. The PBX provides a switched service between any two telephon that are connected to it. It is also connected to LE which enables the telephones to make call through a PSTN. Also we have cellular phones networks which provide a similar service to mobile subscribe by means of handsets that are linked to the infrastructure by Radio. The switches used in such type of networks is known as MSCs: Mobile switch centers. Cellular phone networks are also connected to switching office in PSTN which allows the subscribers to make call to one another. Finally International calls are routed to and switched by IGEs: International Gateway exchanges.



→ Fig. shows digital transmission using modems of a telephone networks. As a speech signal is an analog signal which varies continously with time. A microphone is used to convert this speech signal into an analog electrical signal. ∴ of this Telephone networks works in circuit mode i.e a separate circuit is set up through the network according to the necessary capacity & duration of the call. The access ckts that link the telephone handsets to PSTN or PBX were designed therefore to carry the two-way analog signal associated with a call. The transmission circuits that interconnect them now operate in a digital mode to carry a digital signal over the analog access circuits requires a device known as a modem. On the sending end, the modem converts the digital signal output ~~by the~~ into an analog signal which is compatible to speech signal.

→ fig. shows the multiple service via an H-S Modem. Modems are available for use with the same access circuits that provide high bit rate channel used for telephony. The bit rate of this 2nd channel is such that it supports high resolution audio & video and hence they are



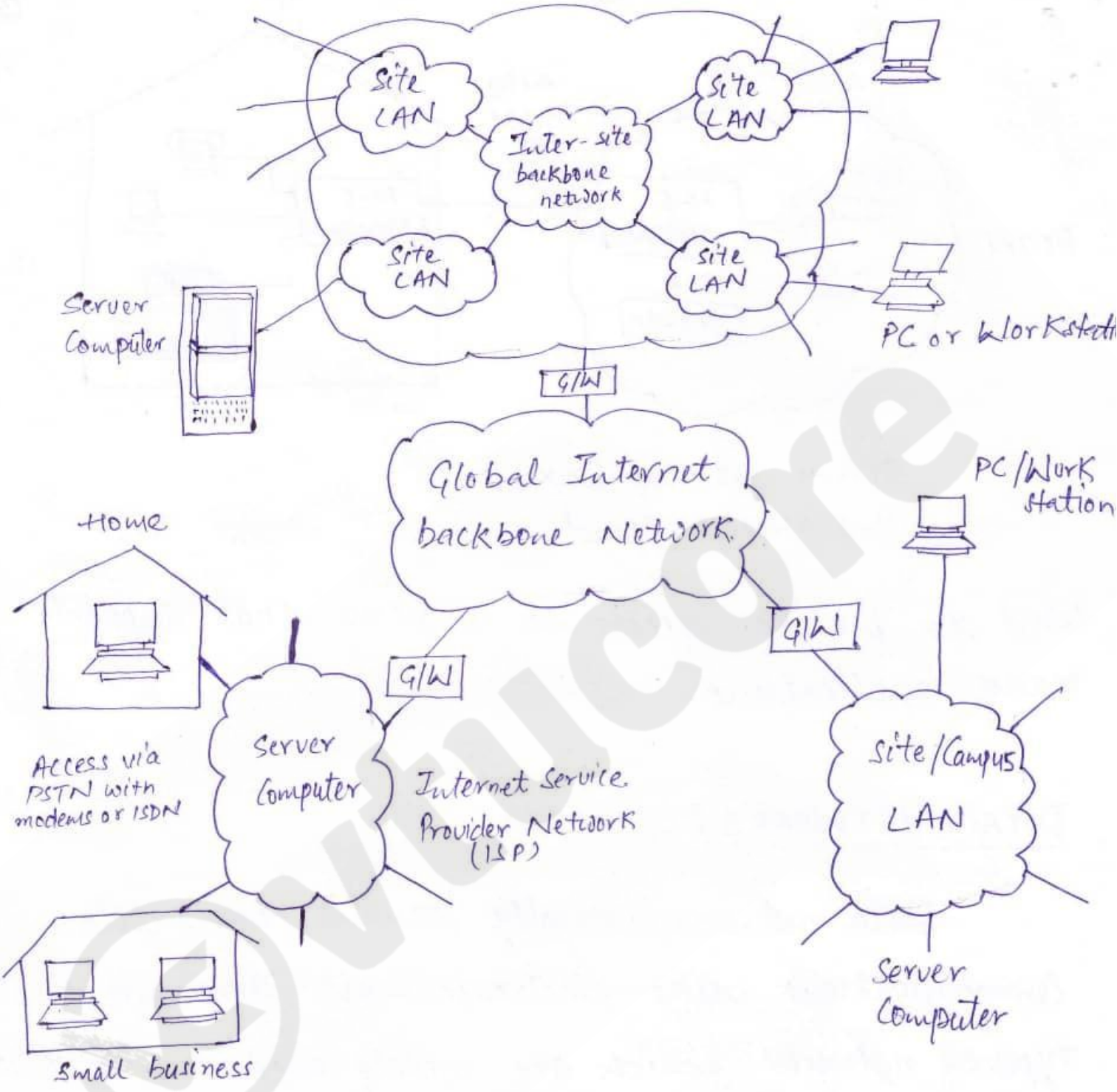
STB → Set top Box
H-S → High Speed.

used to provide access to servers that supports many applications.

DATA NETWORKS:

Data networks basically provides basic data communications like electronic mail. There are two types of networks which are widely used and i.e X.25 network & the internet. As X.25 is relatively low bit rate data applications so it is not suited to multimedia communication.

The internet has a collection of interconnec networks which operates using the same set of protocols.



G/W — Gateway
CAN — Local Area Network
ISDN — Integrated Services digital Network

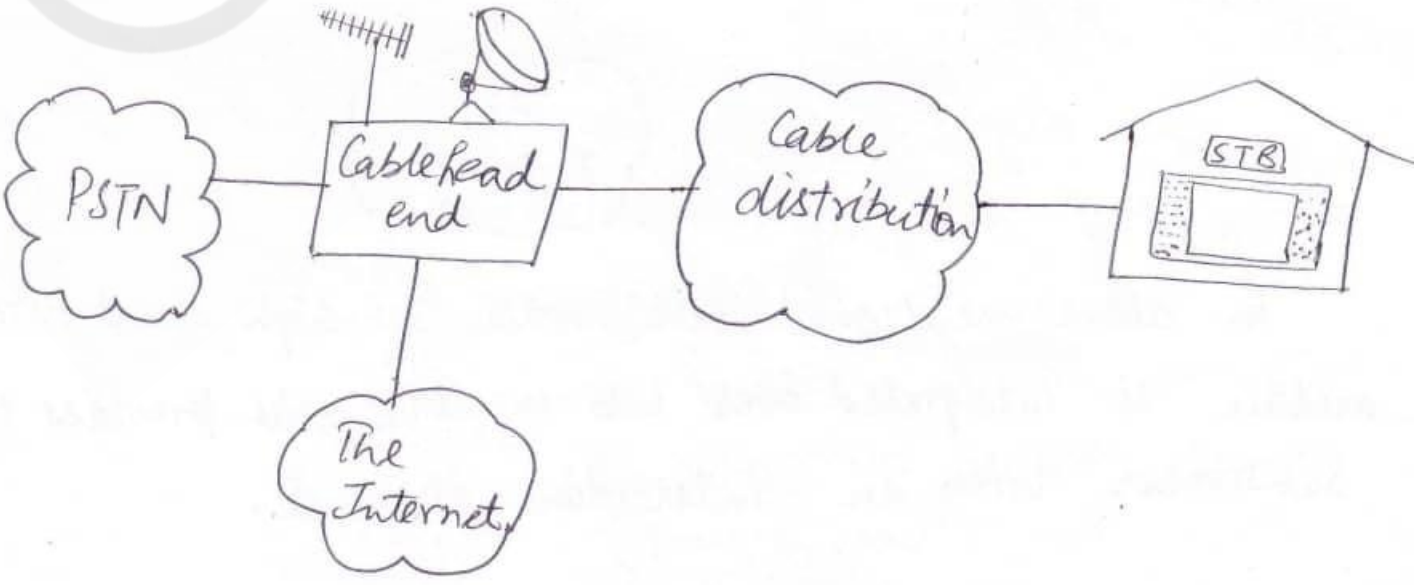
fig. shows in case of a user at home or in a small business, access to the internet is through an intermediate Internet service provider (ISP) n/w.

The user devices are connected to ISP n/w either through PSTN or ISDN which provides access at a higher bit rate.

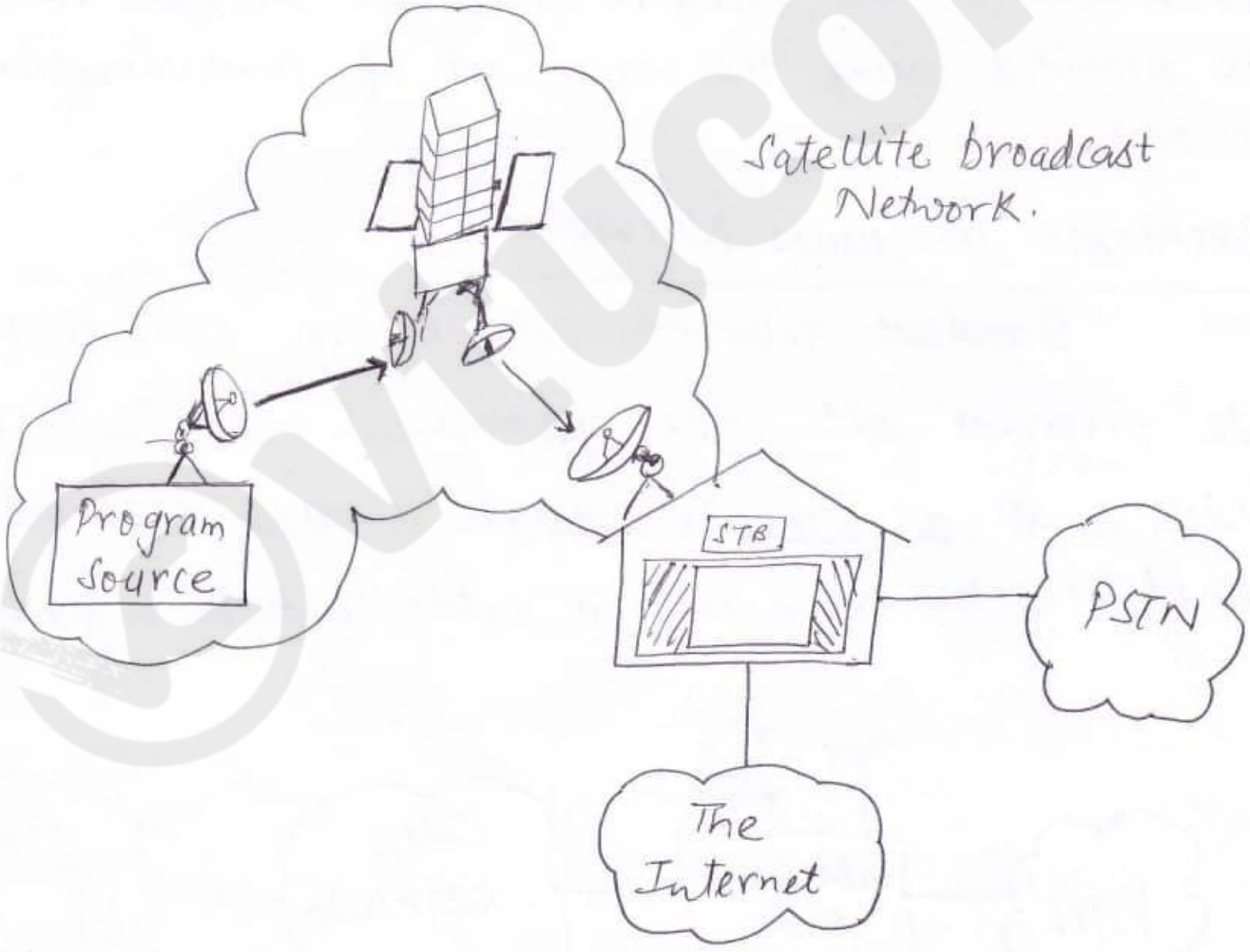
Business users obtain access either through a site/Campus network. In case of a single user site, the network is known as a LAN. For an enterprise n/w consisting multiple sites the sites are interconnected together using an intersite backbone network to provide communication. The enterprise network is then known as an intranet since all internal services are provided using the same set of communication protocols.

BROADCAST TELEVISION NETWORKS:

Broadcast Television networks are used to distribute programs out wide geographical areas. In case of larger areas, a satellite network is used to broadcast. While in town or a city a cable network is used.



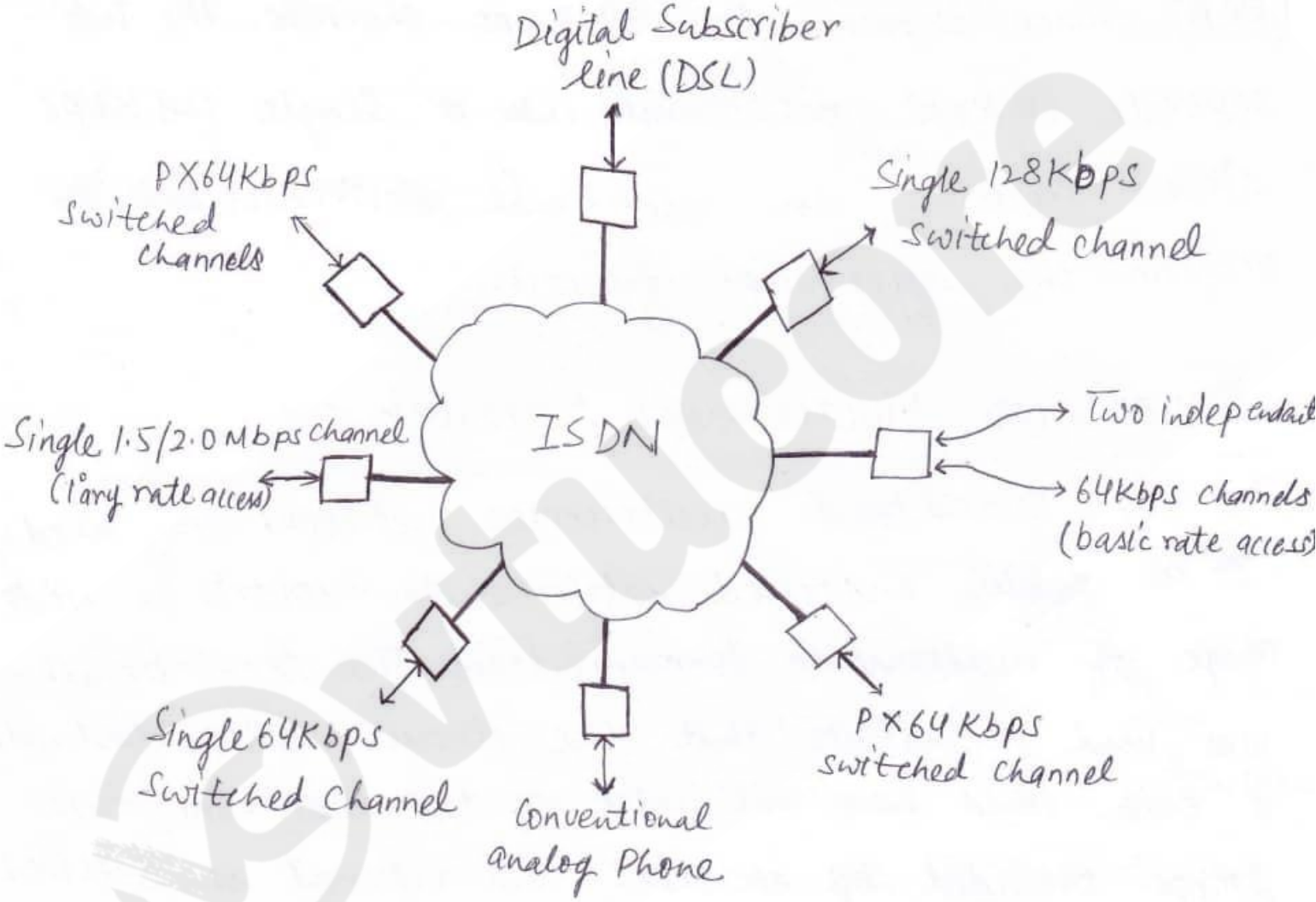
As the fig. shows, the set-top Box attached to the Cable distribution network provides not only control of the television channels that are received but also access to other services. The low bit rate channel is used to connect the subscriber to the Internet. Cable Distribution networks provide access to MM comm^n service that are available with PSTN & Internet.



In above mentioned case, when a high speed PSTN modem is integrated ~~over~~ into the STB this provides the Subscriber with an interaction channel.

INTEGRATED SERVICES DIGITAL NETWORKS: ISDN

ISDN is designed to provide PSTN users with the capability of additional services. This allow users



either to have two different telephone calls in progress simultaneously or two different calls such as a telephone call & a data call. With an ISDN the access circuit is known as a digital Subscriber line (DSL).

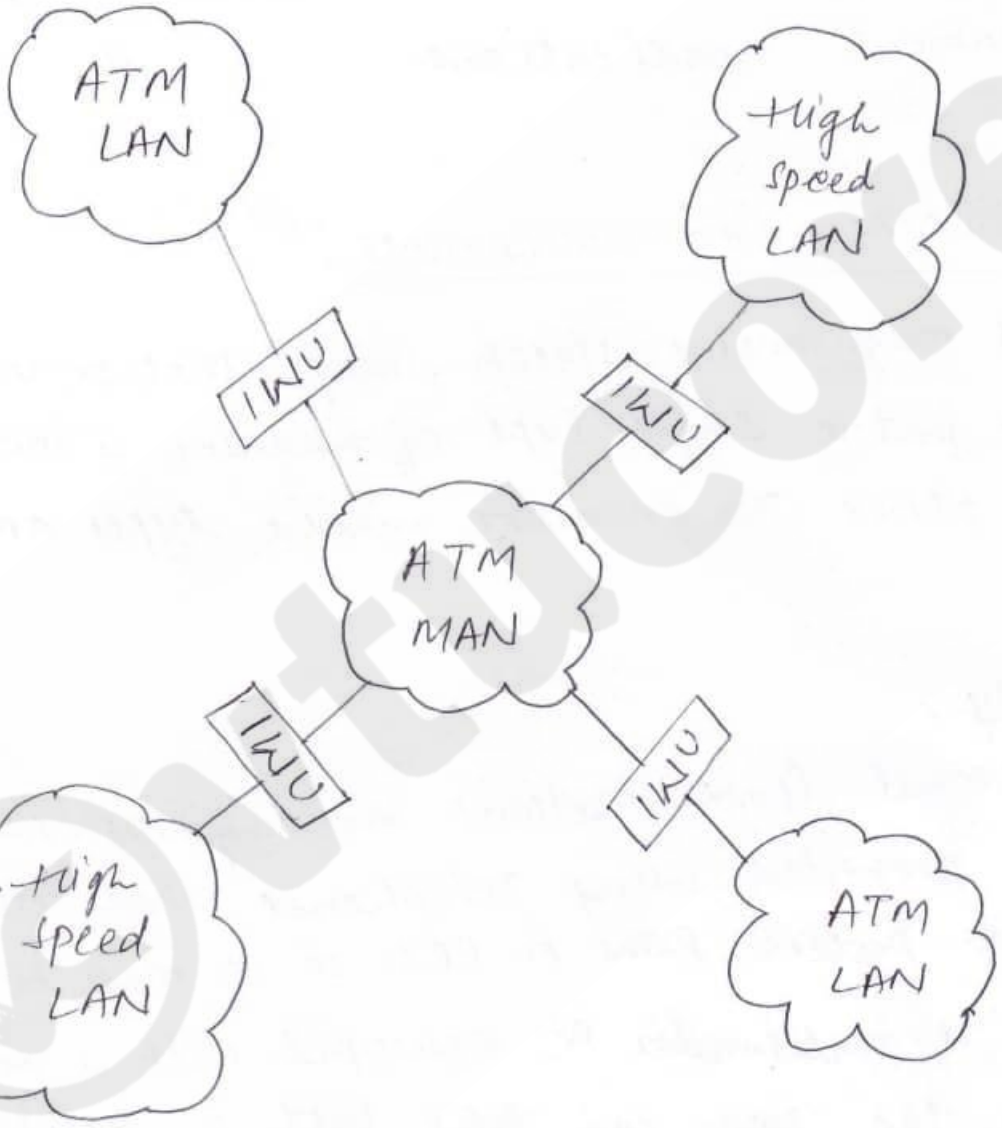
The digitization of a telephone-quality analog speech signal produces a constant bit rate binary stream of 64 Kbps. usually reffered to as bitstream. Hence the basic DSL of the ISDN is known as Basic rate access (BRA) which supports two 64 Kbps channels. The two separate 64 Kbps bitstreams into a single 128 Kbps stream requires an additional electronics box to perform the aggregation function.

BROADBAND MULTISERVICE NETWORK :

Broadband multiservice networks are used as public switched networks to support a wide range of multimedia communication. The term broadband was used to indicate that the circuits associated with a call could have bit rates of the maximum rate 2Mbps. provided by an ISDN. and refered as B-ISDN i.e Broadband ISDN.

The switching and transmission methods that are used within these networks must be more flexible than those used in networks such as a PSTN & ISDN which were initially designed to provide a single type of service. To achieve this flexibility, all the diff. multimedia application are first converted in the digital form.

These are then integrated together & the resulting binar stream is divided into multiple fixed sized packets known as cells. Eg: In terms of transmission, the cell relating to the different applications can be integ ted together more flexibly. The MM applications generate



ATM- Asynchronous Transfer Mode
LAN - Local Area Network
MAN - Metropolitan Area Network
IWU - Interworking Unit.

Cell streams of different rates. This mode of operatio means that the rate of transfer of cells through the network also varies & hence this mode of transmission is known as Asynchronous Transfer Mode or ATM.

MULTIMEDIA APPLICATIONS:

We Place all multimedia applications into one of three categories:

⇒ Interpersonal communications
⇒ Interactive applications over the Internet.
⇒ Entertainment applications.

INTERPERSONAL COMMUNICATIONS:

This may involve speech, image, text or video. In some cases just a single type of medium is involved while in other two or more media types are integrated together.

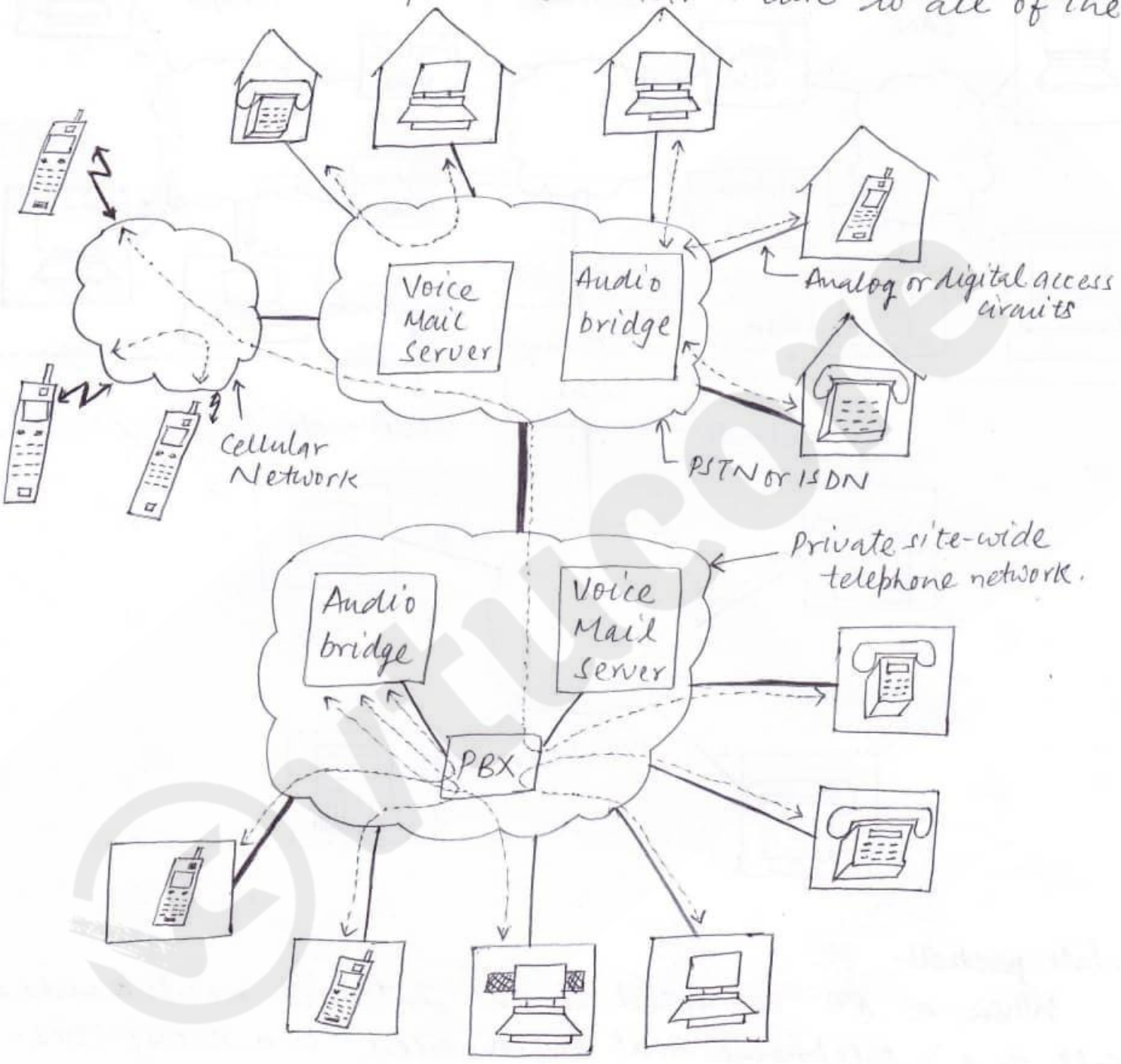
Speech Only:

Interpersonal Communications involving speech- Telephony have been provided using telephones that are connected either to a public PSTN or PBX. or it may be done by using a multimedia PC equipped with a microphone or speakers., the user can take part in telephone calls through PC. This requires a telephone interface card & associated software & is known as computer telephony integration or CTI.

Many public & private network Support additional services like voice-mail & teleconferencing voicemail. Eg. if a called party being unavailable, a spoken message can then be left

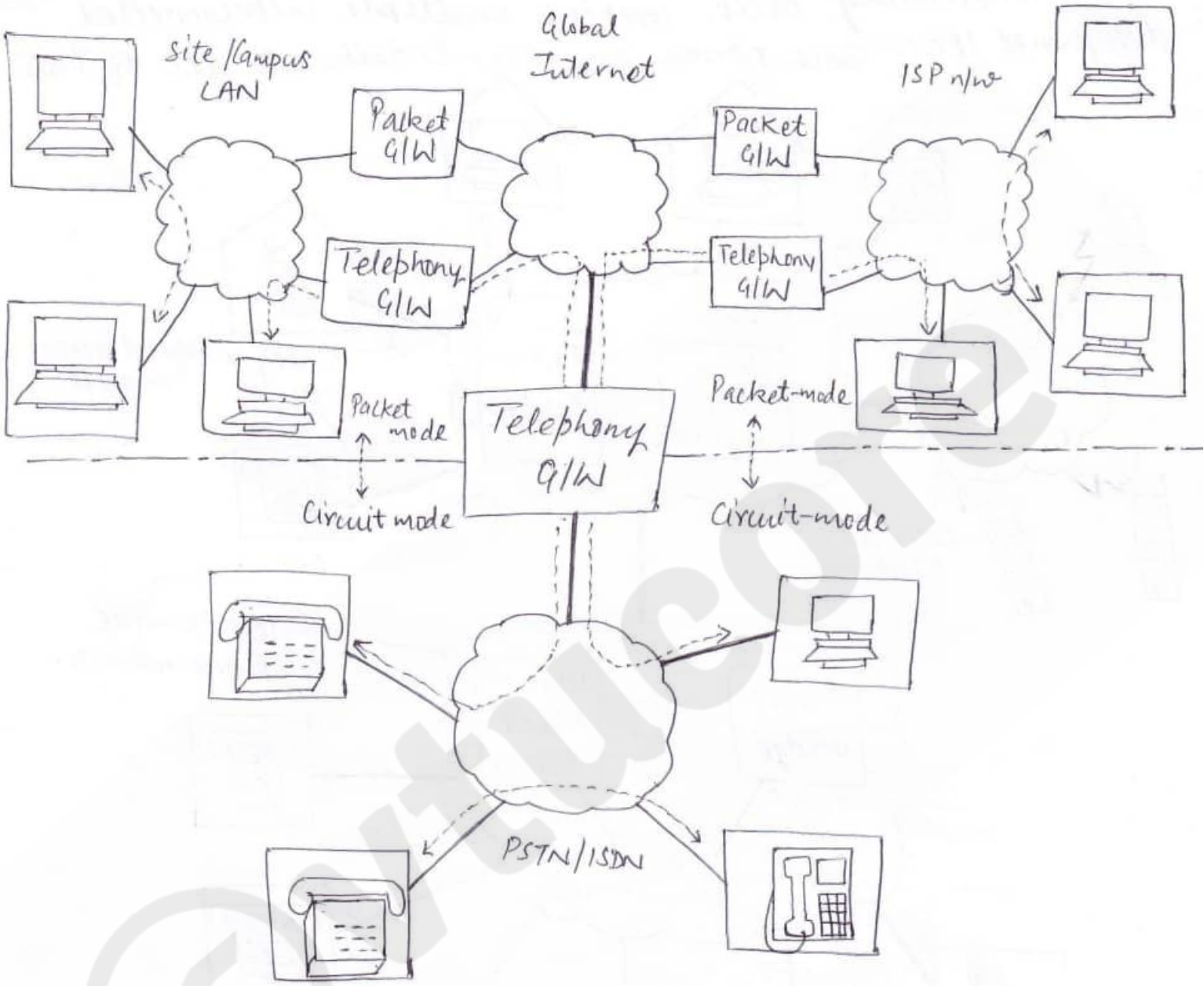
the called party.

Teleconferencing calls involve multiple interconnected telephones / PCs. Each person can hear & talk to all of the



others involved in the call.

The internet is also used to support telephony. In case of a PC-to-PC telephone call, the standard addresses that are used to identify individual computers connected to the Internet because the internet operates in packet mode, both PCs must have the necessary



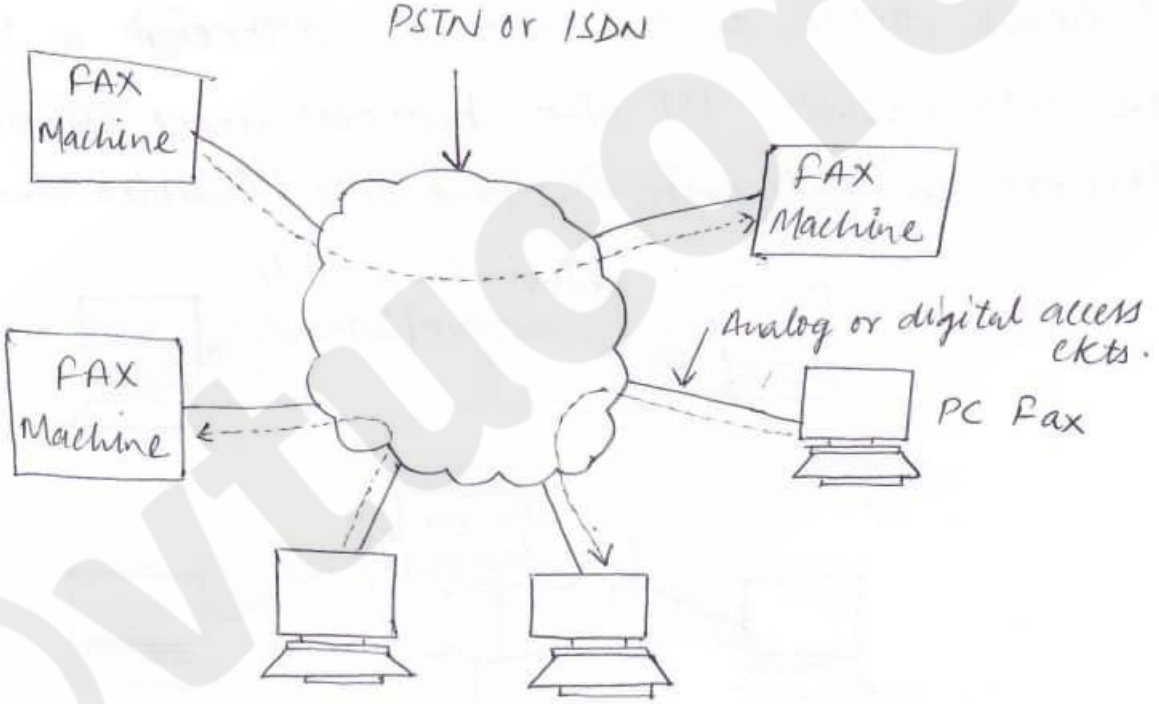
into packets.

When a PC connected to the Internet needs to make a call to a telephone that is connected to a PSTN/ISDN. because both operate in a circuit mode, an IWU known as telephony gateway. The gateway requests from the source PCs the telephone no. of the called party. On receipt of this, the source gateway initiates a call with the telephony gateway nearest to the called party using the internet address of gateway. The called gateway then initiates a call to the recipient telephone no. & the standard

call procedure of the PSTN/ISDN. Assuming the called party answers the called gateway then signals back to the PC user through the source gate.

Image Only:

Another interpersonal communications is done by the exchange of electronic images of documents. This type of service is known as facsimile or FAX.

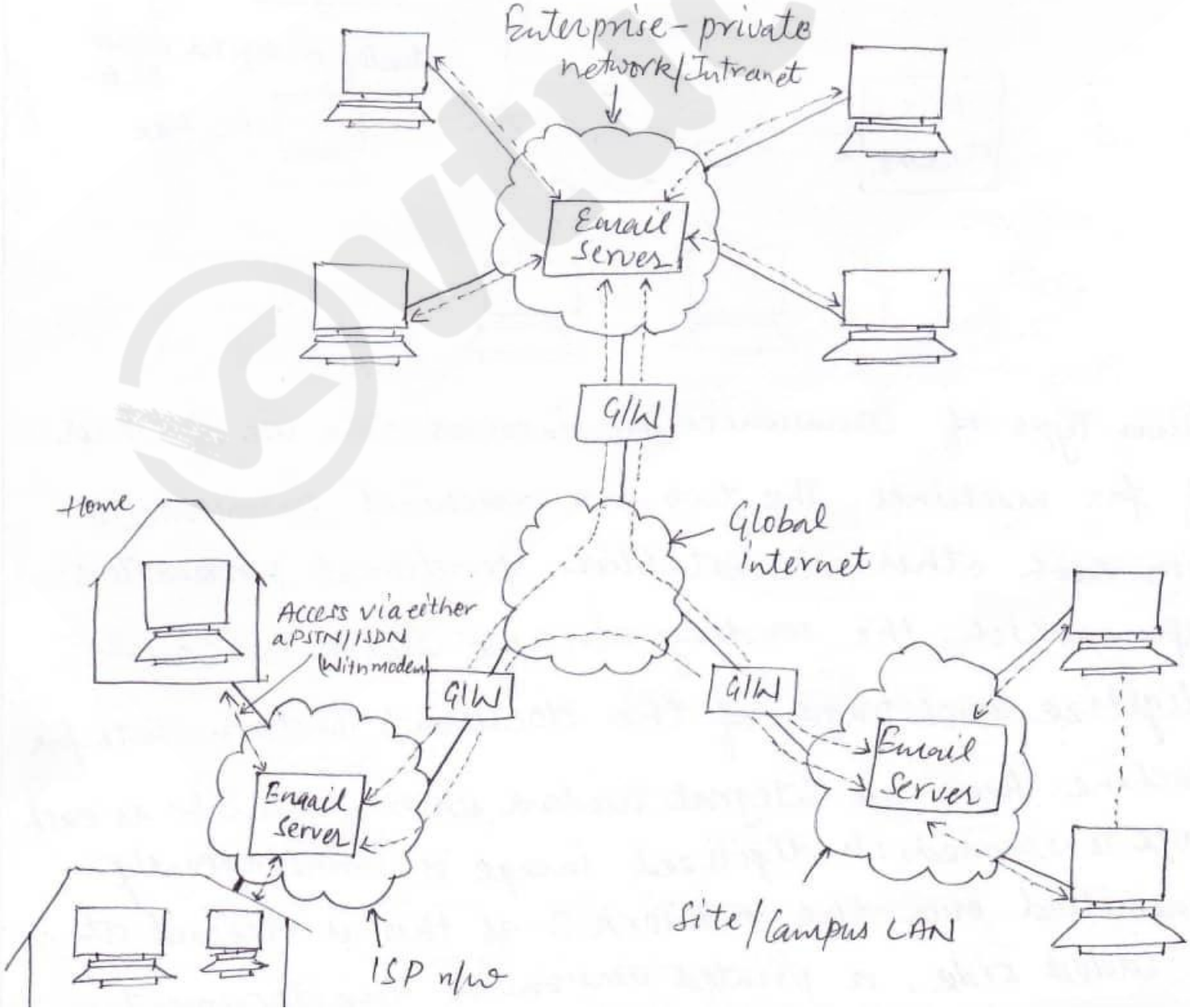


This type of communication involves the use of a pair of fax machines. The two fax machines communicate with each other to establish operational parameters after which the sending machine starts to scan & digitize each page of the document in turn. Both fax machine have an integral modem with in them & as each page is scanned, its digitized image is simultaneously transmitted over the network & as this is received at the called side, a printed version of this document

is produced. Finally, after the last page of the document has been sent & received, the connection through the network is cleared by the calling machine in the normal way.

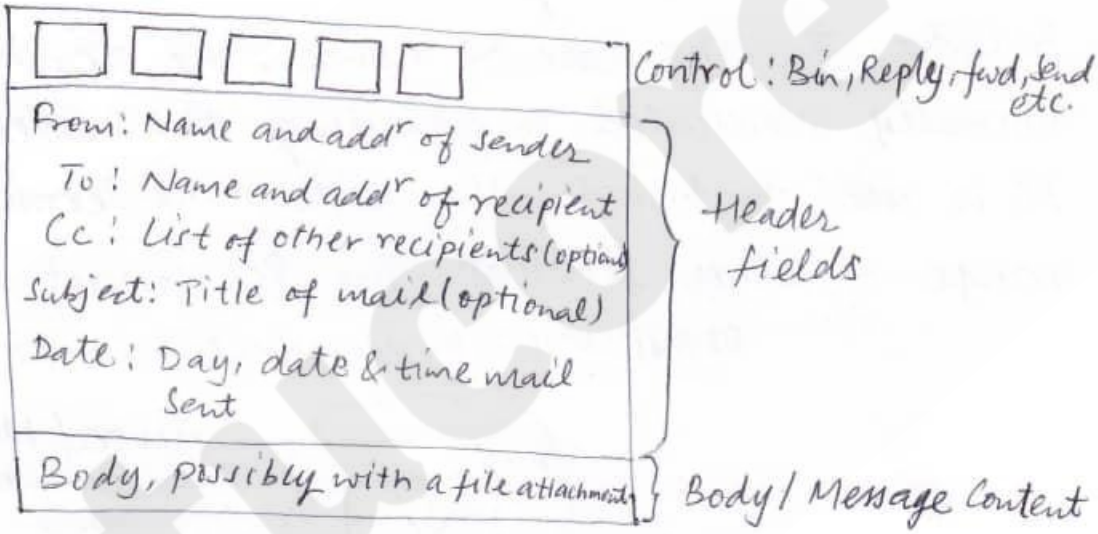
Text Only:

Interpersonal communication involving just text is electronic mail (email). The user terminal is a PC. In case of a user at home, access to the internet is through a PSTN/ISDN & an intermediate ISP n/w. business users obtain access either through an enterprise n/w or a site/campus n/w.



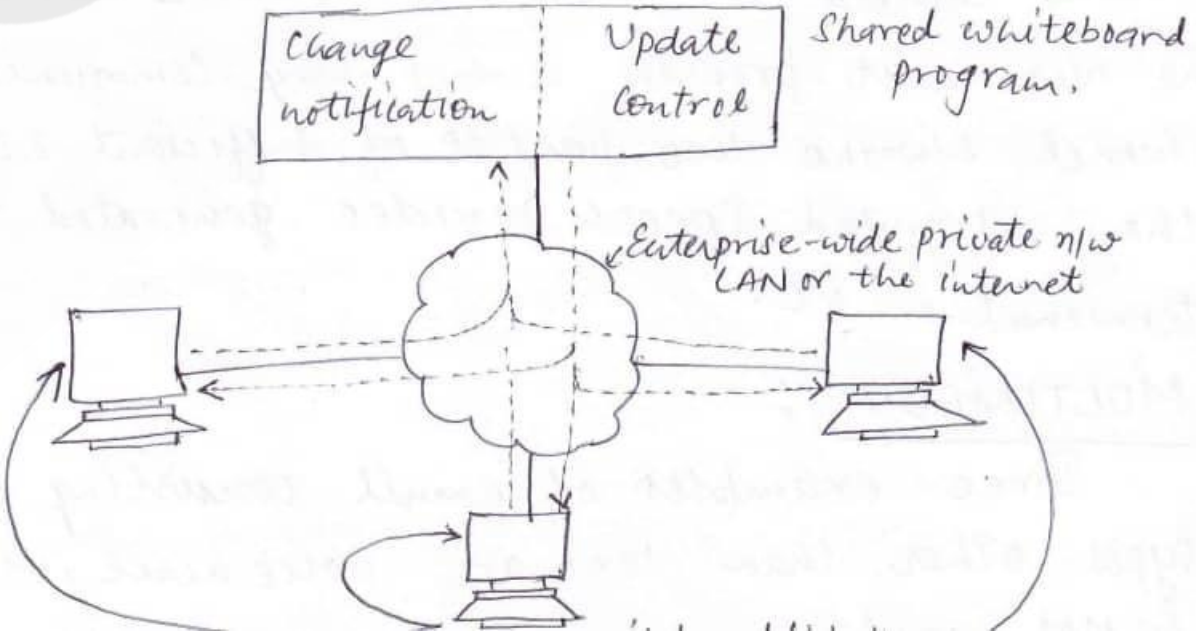
Each network is connected to a set of one or more server computer. Each is known as an email server.

The format of a typical text-only email message is as shown below & at the head is the unique Internet-wide name of both the sender & recipient of the mail.



Text & images:

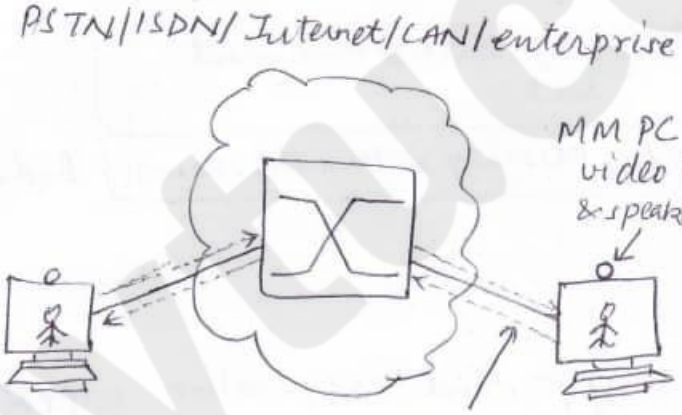
Computer-supported cooperative working (CSCW) involves both text & images integrated together. The n/w used is an enterprise network, a LAN or the Internet



The user terminal is either a PC or a workstation & a window on the same person's display is used as a shared workspace. This is known as a shared whiteboard. The s/w associated with CSCW comprises a central program known as the whiteboard program.

Speech and Video:

Video telephony is such an example involves Speech & Video. In the case of home, the terminals used are normally dedicated to providing the videophone service. PC is used to provide the videophone service together with a range of other services. The PCs must incorporate a



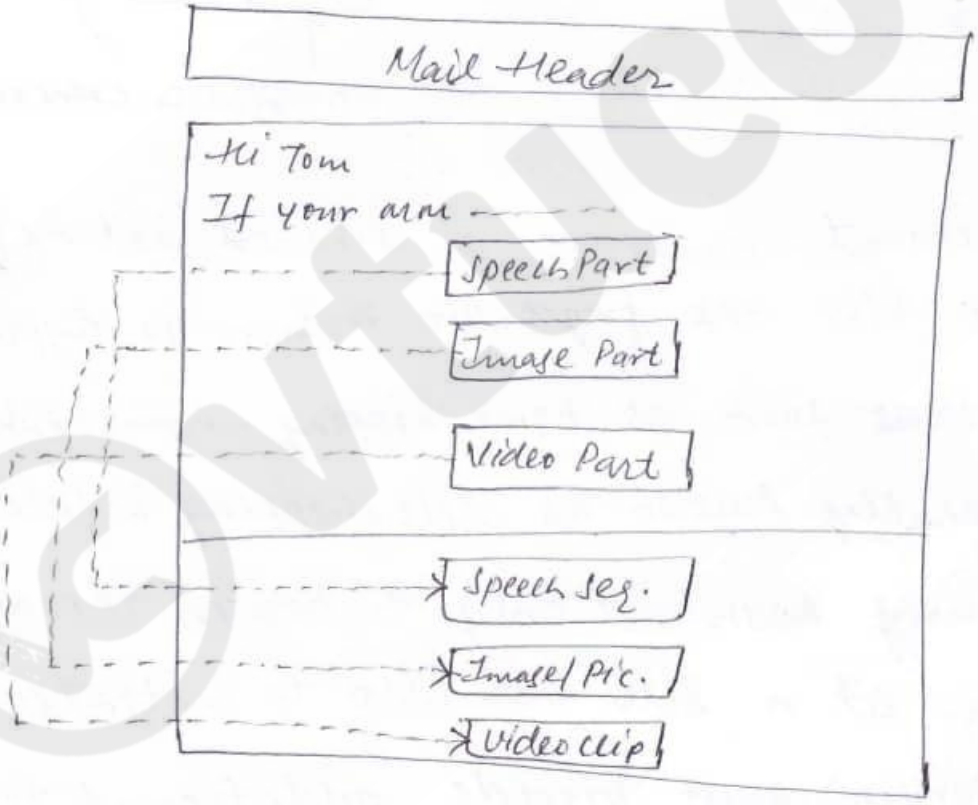
video camera to microphone & speaker used for telephony. The n/w must provide a two-way communication channel b/w the two parties of sufficient BW to support the integrated speech & video generated by each terminal or PC.

MULTIMEDIA:

Three examples of email consisting of media types other than text are voice mail, video-mail & MM mail.

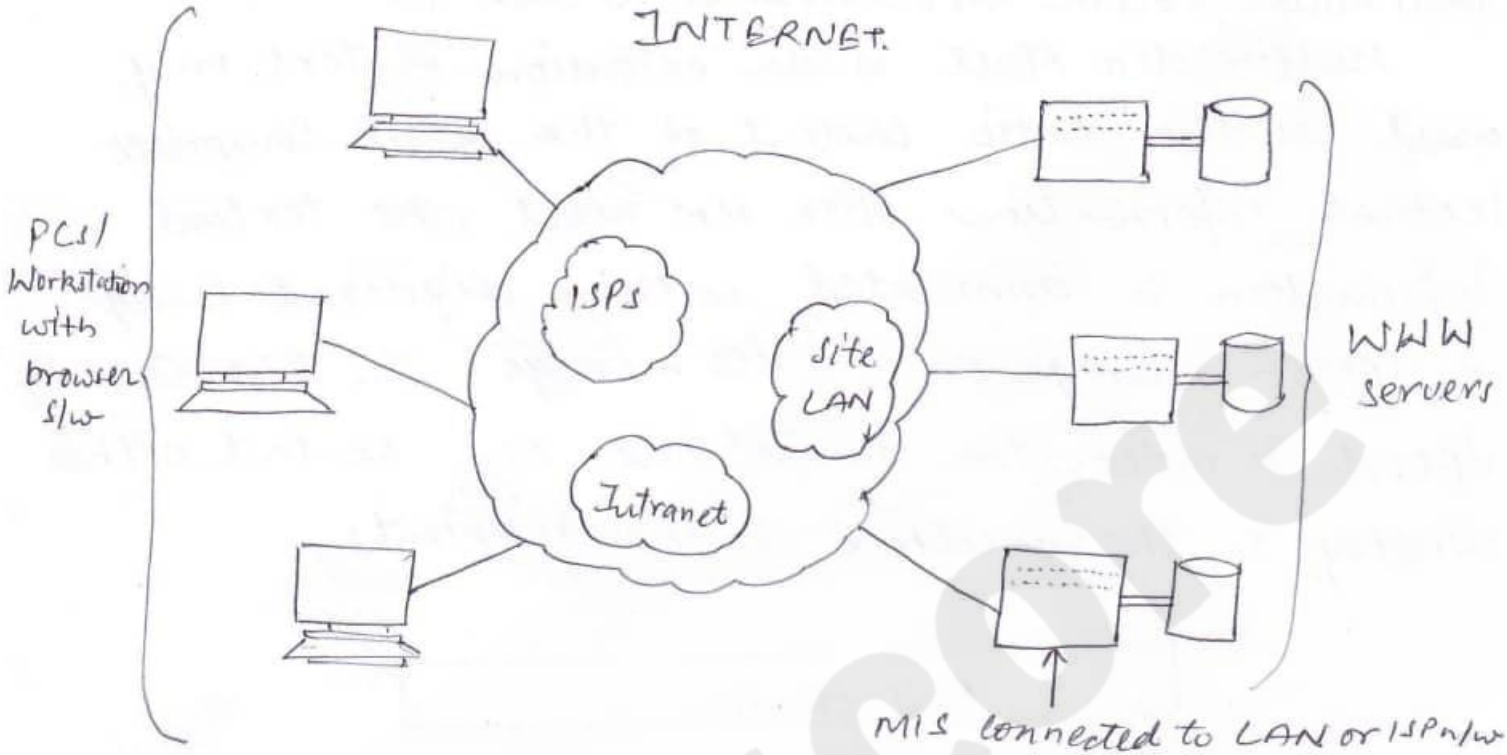
Voice mail is similar in principle to that telephone n/w. With Internet-based voice mail, there is a voicemail server associated with each n/w.

Multimedia Mail is an extension of text only mail as the basic content of the mail comprises textual information. With MM mail, the textual information is annotated with a digitized image, a speech message or a video message. In the case of speech & video, the annotations can be sent either directly to the mailbox of the recipient.



INTERACTIVE APPLICATIONS OVER THE INTERNET:

The Internet is also used to support a range of interactive applications, the most widely used for interactions is World Wide Web. (WWW) or Web Server. The total information stored on all servers is equivalent to a vast library of



Each document comprises a linked set of pages & the linkages b/w the pages are known as hyperlinks.

In applications such as homeshopping, homebanking & so on, generally known as teleshopping & telebanking a client may wish not only to browse through the information at a site but also to initiate transact Here, the server must provide additional transactio processing say ordering & purchasing.

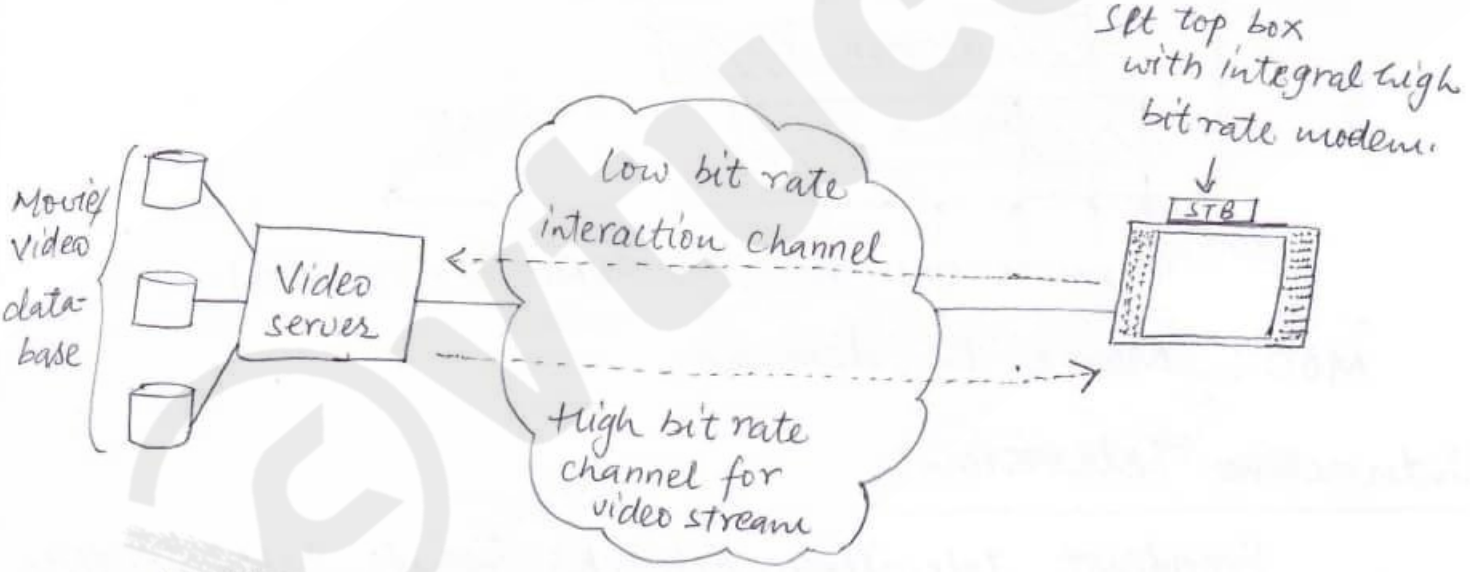
ENTERTAINMENT APPLICATIONS:

Entertainment applications can be one of two types:

⇒ Movie/Video-on-demand.
⇒ Interactive television

Movie/Video-on demand:

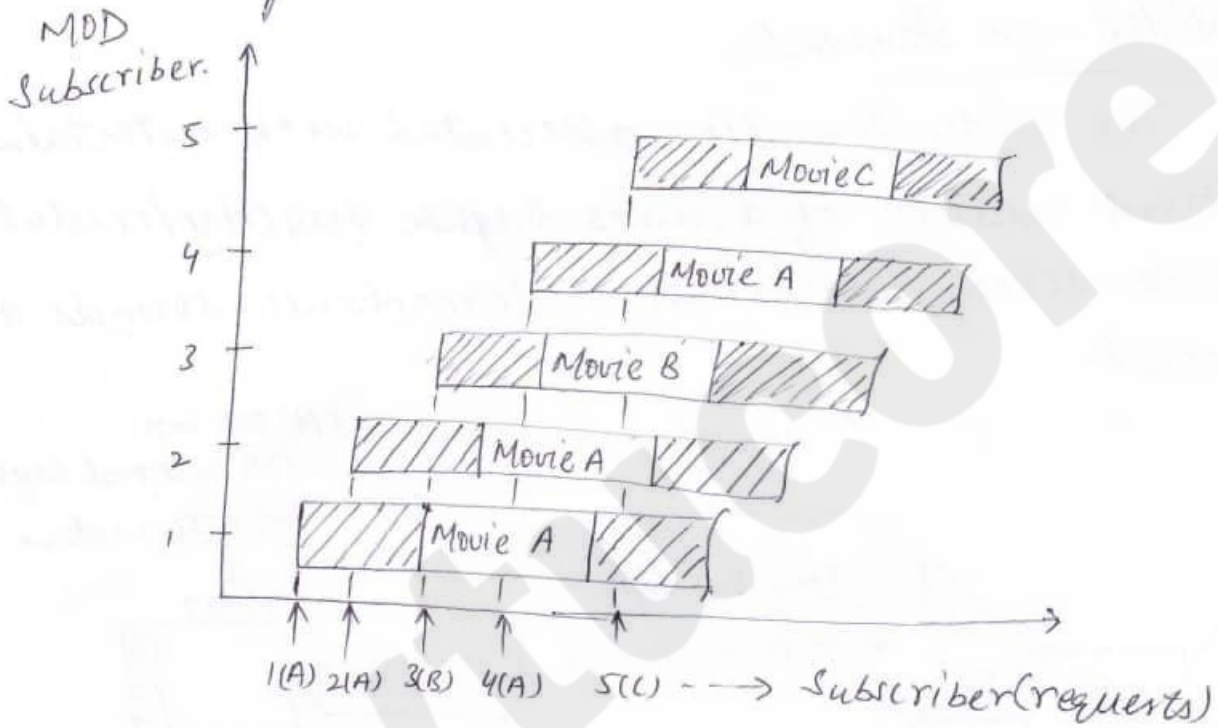
The video & audio associated with entertainment applications must be of a much higher quality/resolution since wide-screen televisions & stereophonic sounds are often used.



A digitized movie/video-on-demand with sound requires a minimum channel bit rate of 1.5Mbps. Hence the n/w which supports this type of service must be either a PSTN with high bit rate modem.

By means of suitable menu, the subscriber is able to browse through the set of movies/videos available & initiate the showing of a selected movie. This type of application is known as Movie-On-Demand (MOD).

A key feature of MOD is that a subscriber can initiate the showing of a movie selected from a large library of movies at any time of the day i-e a server must be capable of playing a large no. of video stream simultaneously.



MOD: Movie On demand.

Interactive Television:

Broadcast television networks include cable, satellite and terrestial networks. The STB associated with these n/ws also has a modem within it, also the STB provide low & high bit rates connections to PSTN & internet ~~simultaneously~~. respectively.

By connecting appropriate terminal equipment to STB - a broad, telephone & so on - the subscriber is able to gain access to all the services through PSTN & the Internet.

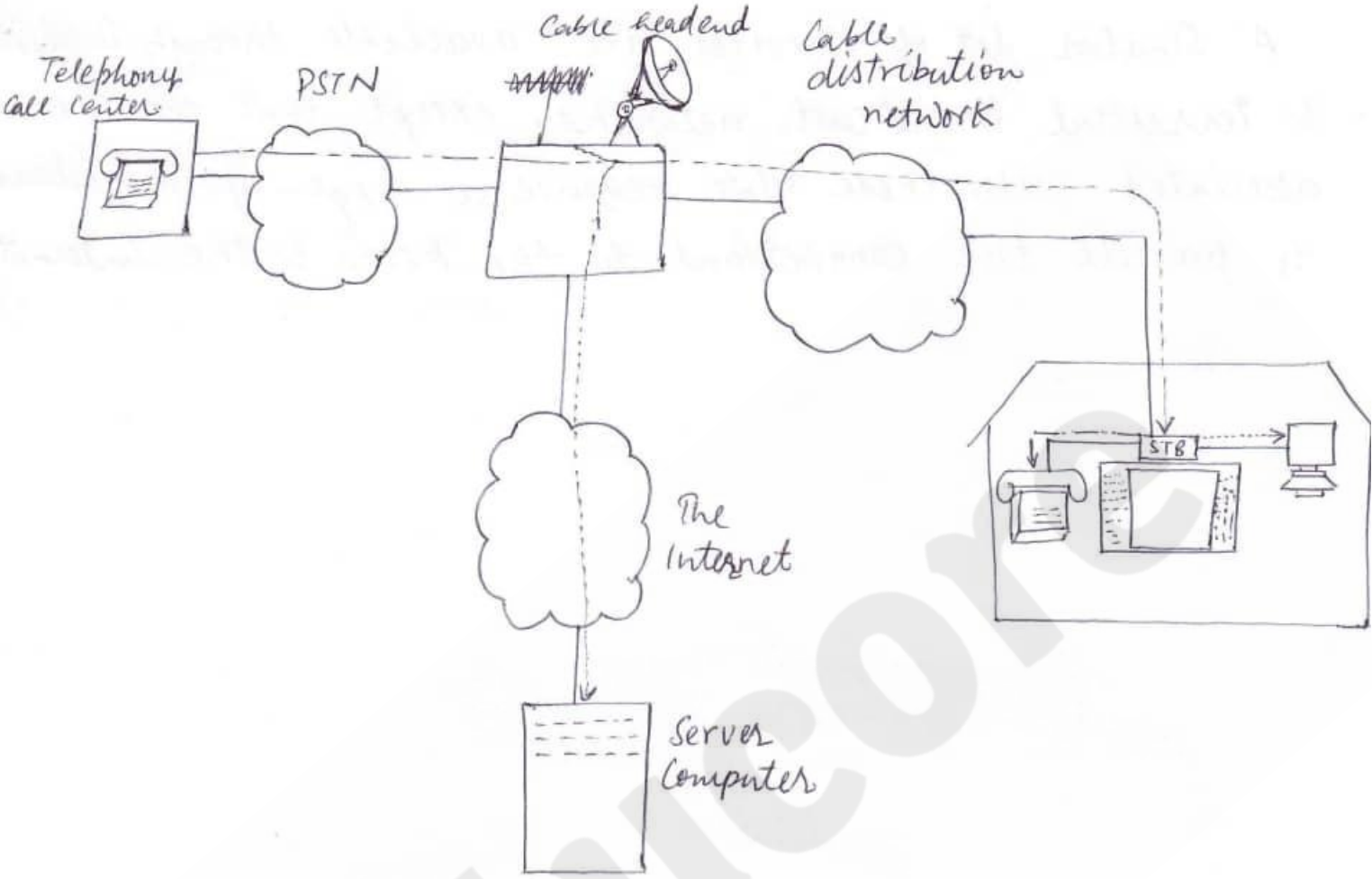
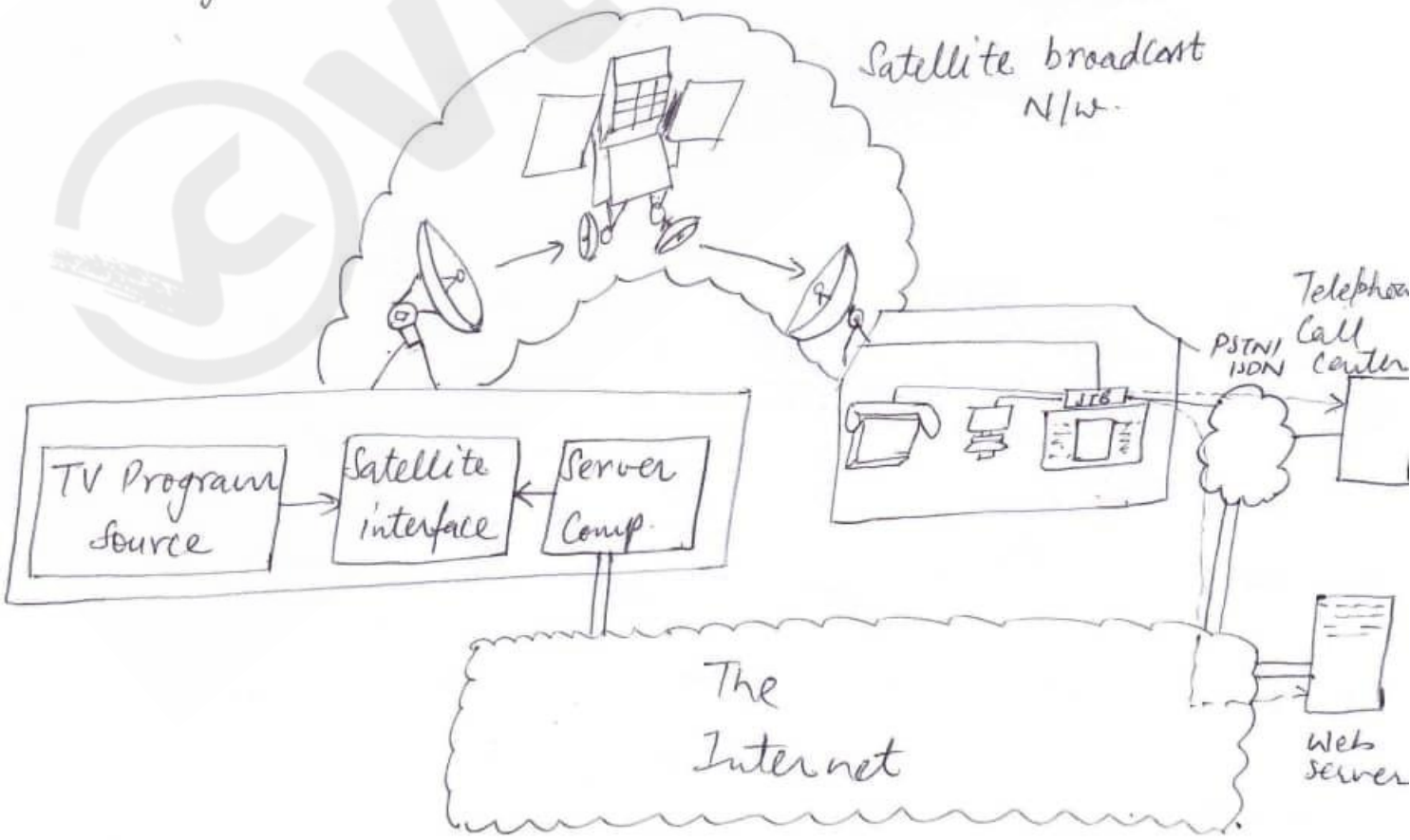


fig. : Cable distribution network.



A Similar set of services are available through Satellite & terrestial broadcast networks, except that the STB associated with these n/ws require a high-speed modem to provide the connections to the PSTN & the Internet

Recommended questions:

1. Define Mutimedia.? [02]
2. List some of Multimedia applications.[05]
3. List the multimedia communication networks.[05]
4. State Nyquist sampling theorem & Nyquist rate.[05]
5. What do you mean by Hypertext?[04]
6. What is compression? [03]
7. Compare lossy & lossless compression.[07]
8. State & explain the basic form of representation of: Text, Image, Audio, Video?[10]
9. Explain the meaning of bps in relation to digitized audio & video.[05]
10. Explain the meaning of compression & why it is used?[08]
11. Explain the meaning of POTS, local exchange office, PBX, mobile switching centre, international gateway exchange.[08]
12. Explain why most data networks operate in a packet mode. Hence explain why services involving audio and video are supported?[10]
13. Explain ―Broadband‖ in relation to B-ISDN and why deployment has been delayed?[08]
14. Describe the principal operation of a fax machine & why modems are required. What is the meaning of PC fax?[10]
15. With aid of block diagram explain CSCW?[10]
16. Explain a Web server, a browser, WWW?[05]
17. Explain web page, home page, hyperlink, URL, HTML?[10]