UNIT I

SWITCHING

Network Switching

- Switching is process to forward packets coming in from one port to a port leading towards the destination.

- When data comes on a port it is called ingress, and when data leaves a port or goes out it is called egress.

- A communication system may include number of switches and nodes.

- At broad level, switching can be divided into two major categories:

➢ **Connectionless:** The data is forwarded on behalf of forwarding tables. No previous handshaking is required and acknowledgements are optional.

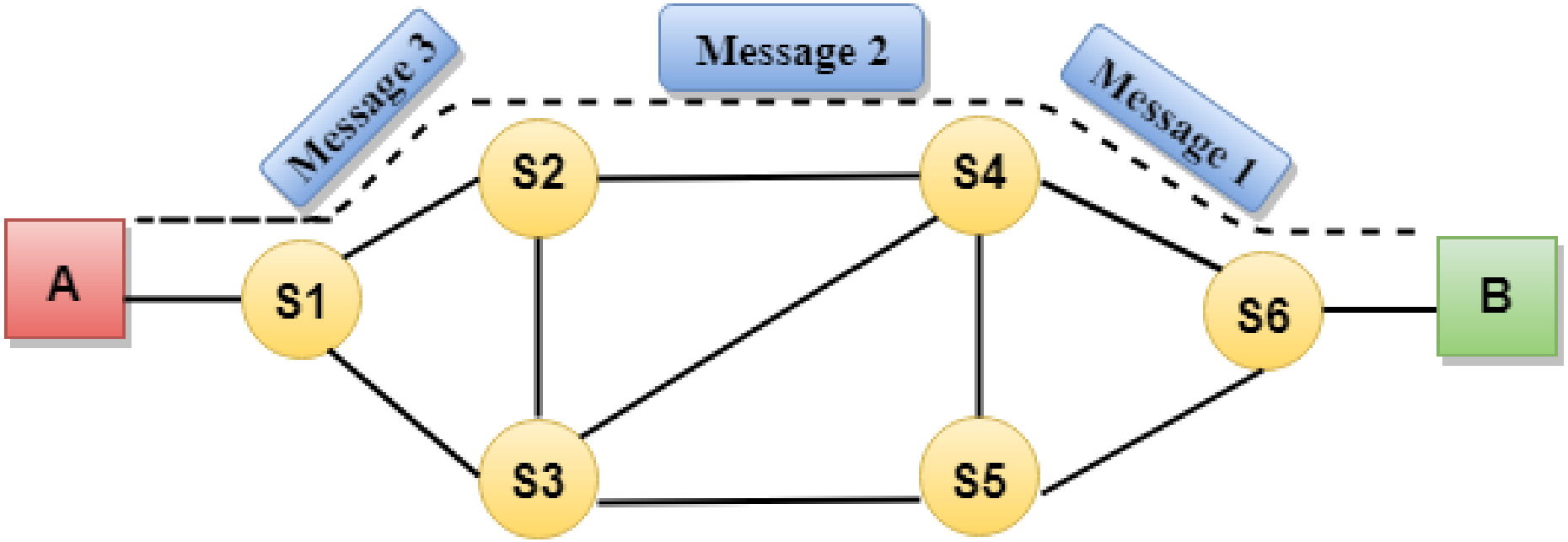
➢ **Connection Oriented:** Before switching data to be forwarded to destination, there is a need to pre-establish circuit along the path between both endpoints. Data is then forwarded on that circuit. After the transfer is completed, circuits can be kept for future use or can be turned down immediately.

Circuit Switching

- Circuit switching is a switching technique that establishes a dedicated path between sender and receiver.
- In the Circuit Switching Technique, once the connection is established then the dedicated path will remain to exist until the connection is terminated.
- Circuit switching in a network operates in a similar way as the telephone works.
- A complete end-to-end path must exist before the communication takes place.
- In case of circuit switching technique, when any user wants to send the data, voice, video, a request signal is sent to the receiver then the receiver sends back the acknowledgment to ensure the availability of the dedicated path. After receiving the acknowledgment, dedicated path transfers the data.
- Circuit switching is used in public telephone network. It is used for voice transmission.
- Fixed data can be transferred at a time in circuit switching technology.

Communication through circuit switching has 3 phases:

- Circuit establishment
- Data transfer
- Circuit Disconnect



Telephone Network

- Telephone Network is used to provide voice communication. Telephone Network uses Circuit Switching.
- Originally, the entire network was referred to as a plain old telephone system (POTS) which uses analog signals.
- With the advancement of technology, i.e. in the computer era, there comes a feature to carry data in addition to voice. Today's network is both analogous and digital.

- **Major Components of Telephone Network:** There are three major components of the telephone network:

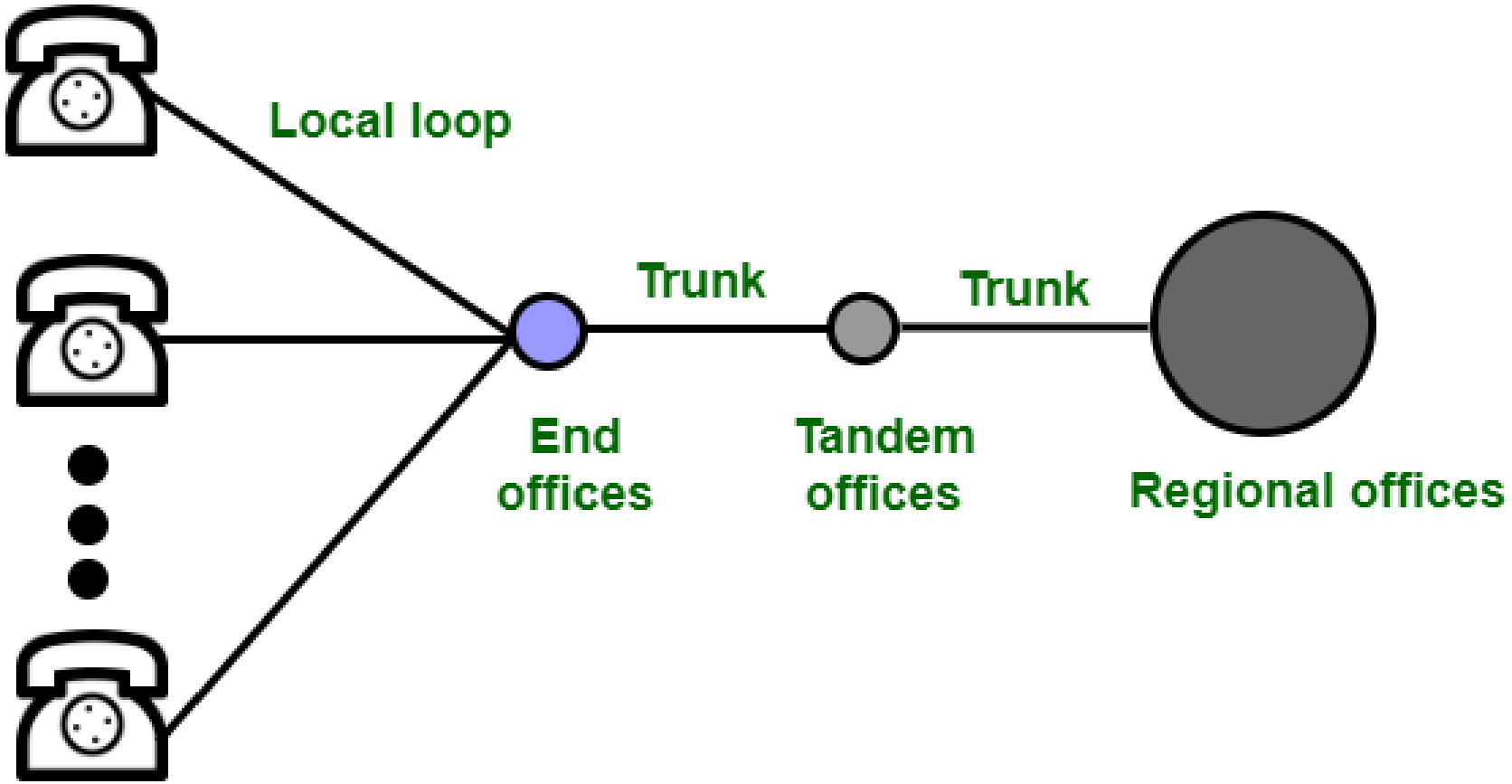
➢ Local loops

➢ Trunks

➢ Switching Offices

- There are various levels of switching offices such as end offices, tandem offices, and regional offices.

- The entire telephone network is as shown in the following figure:



Local Loops:

- Local Loops are the twisted pair cables that are used to connect a subscriber telephone to the nearest end office or local central office.

- For voice purposes, its bandwidth is 4000 Hz. It is very interesting to examine the telephone number that is associated with each local loop.

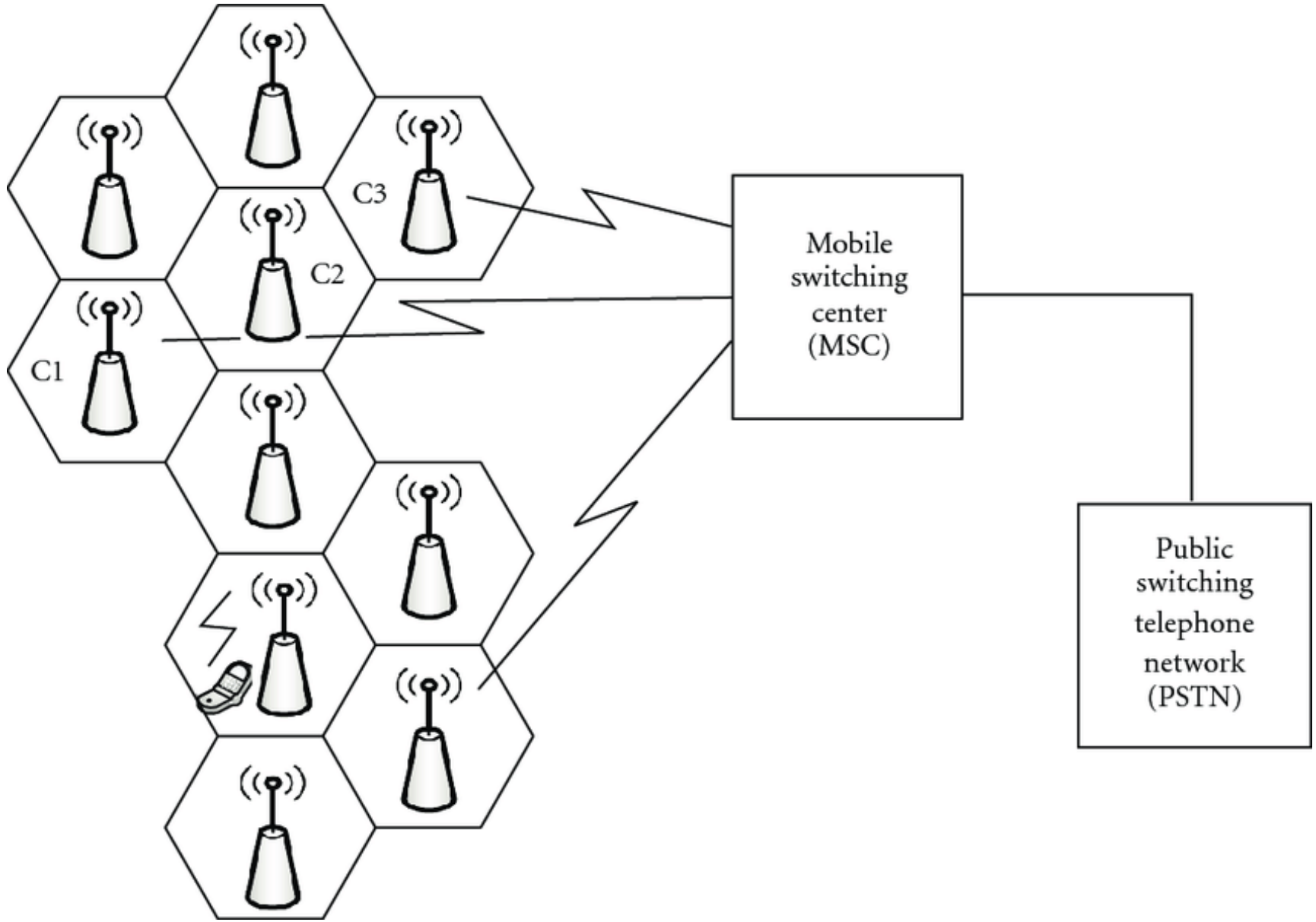
- The office is defined by the first three digits and the local loop number is defined by the next four digits defines.

Trunks:

- It is a type of transmission medium used to handle the communication between offices.
- Through multiplexing, trunks can handle hundreds or thousands of connections.
- Mainly transmission is performed through optical fibers or satellite links.

Switching Offices:

- As there is a permanent physical link between any two subscribers.
- To avoid this, the telephone company uses switches that are located in switching offices.
- A switch is able to connect various loops or trunks and allows a connection between different subscribes.


C1
C2
C3
Mobile switching center (MSC)
Public switching telephone network (PSTN)

Concept of DSL and ADSL

Digital Subscriber Line (DSL)

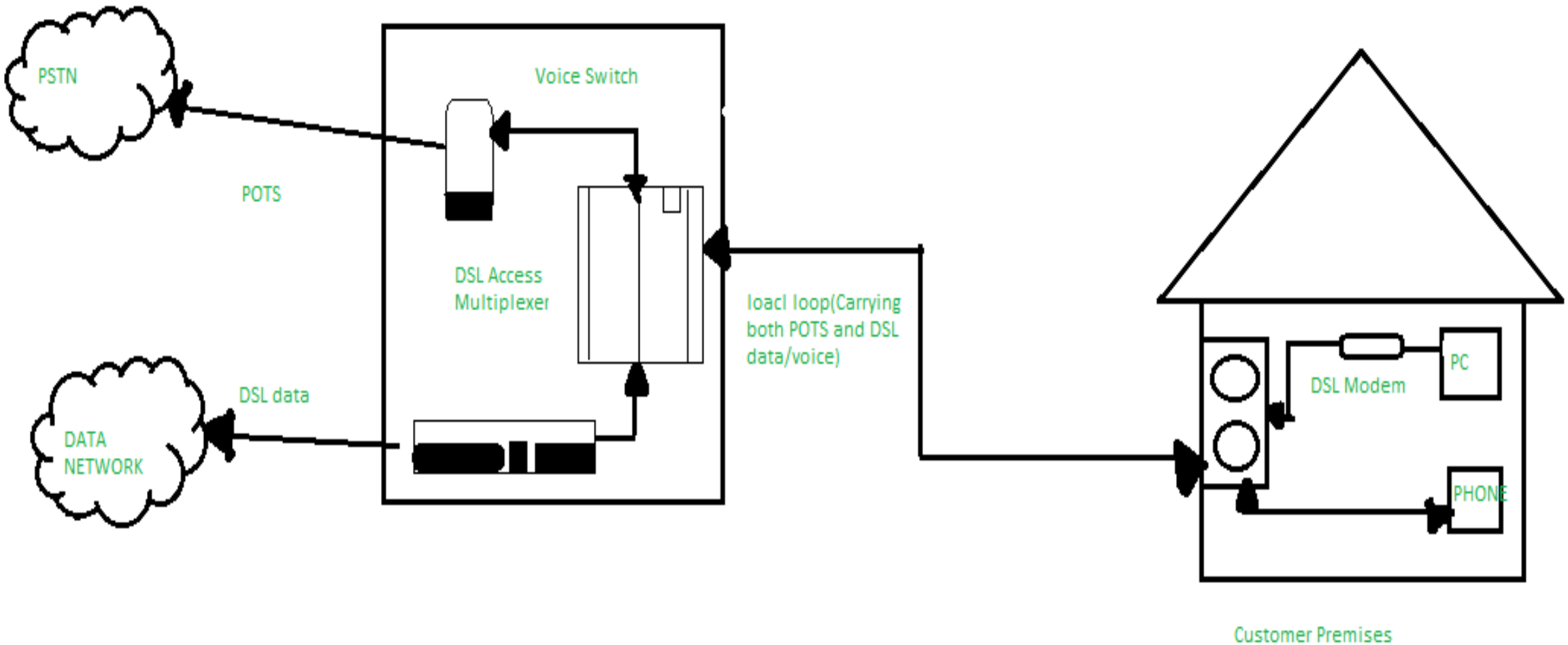
- Digital Subscriber Line (DSL, originally, **digital subscriber loop**) is a communication medium, which is used to transfer internet through copper wire telecommunication line.

- Along with cable internet, DSL is one of the most popular ways ISPs provide broadband internet access.

- Its aim is to maintain the high speed of the internet being transferred.

- If we ask that how we gonna achieve such a thing i.e., both telephone and internet facility, then the answer is by using splitters or DSL filters.

- Basically, the use splitter is to splits the frequency and make sure that they can’t get interrupted.


PSTN
POTS
Voice Switch
DSL Access
Multiplexer
DSL data
DATA
NETWORK
loacl loop(Carrying
both POTS and DSL
data/voice)
DSL Modem
PC
PHONE
Customer Premises

Types of DSL –

- **Symmetric DSL –**

➢ SDSL, splits the upstream and downstream frequencies evenly, providing equal speeds to both uploading and downloading data transfer.

➢ This connection may provide 2 Mbps upstream and downstream.it is mostly preferred by small organizations.

- **Asymmetric DSL –**

➢ ADSL, provides a wider frequency range for downstream transfers, which offers several times faster downstream speeds.

➢ An ADSL connection may offer 20 Mbps downstream and 1.5 Mbps upstream, it is because most users download more data than they upload.

Benefits –

- **No Additional Wiring –** A DSL connection makes use of your existing telephone wiring, so you will not have to pay for expensive upgrades to your phone system.

- **Cost-Effective –** DSL internet is a very cost-effective method and is best in connectivity

- Availability of DSL modems by the service providers.

- Users can use both telephone lines and the internet at the same time. And it is because the voice is transferred on other frequencies and digital signals are transferred on others.

- Users can choose between different connection speeds and pricing from various providers.

Asymmetric Digital Subscriber Line (ADSL)

- Asymmetric Digital Subscriber Line (ADSL) is a technology that provides high transmission speeds for video and voice to homes over an ordinary copper telephone wire.

- ADSL is the first technology of DSL technologies. It will be most cost-effective in areas with a low market penetration of cable TV.

- It is just like 56K modem that is able to provide a higher speed of data in the downstream direction than in the upstream direction.

- That is the reason why its name is Asymmetric DSL. It divides bandwidth unevenly to meet the need of residential customers.

- As we know that business purposes require higher bandwidth so it is not suitable for them.