

The Telephone System

By telephone system, we broadly mean using a duplex-mode, transmits in real time the voice data between two geographically distant locations. Hence, the users are able to converse in the real time.

The telephone system model is redundant and hierarchical model having a multilevel hierarchy. It comprises of the following components -

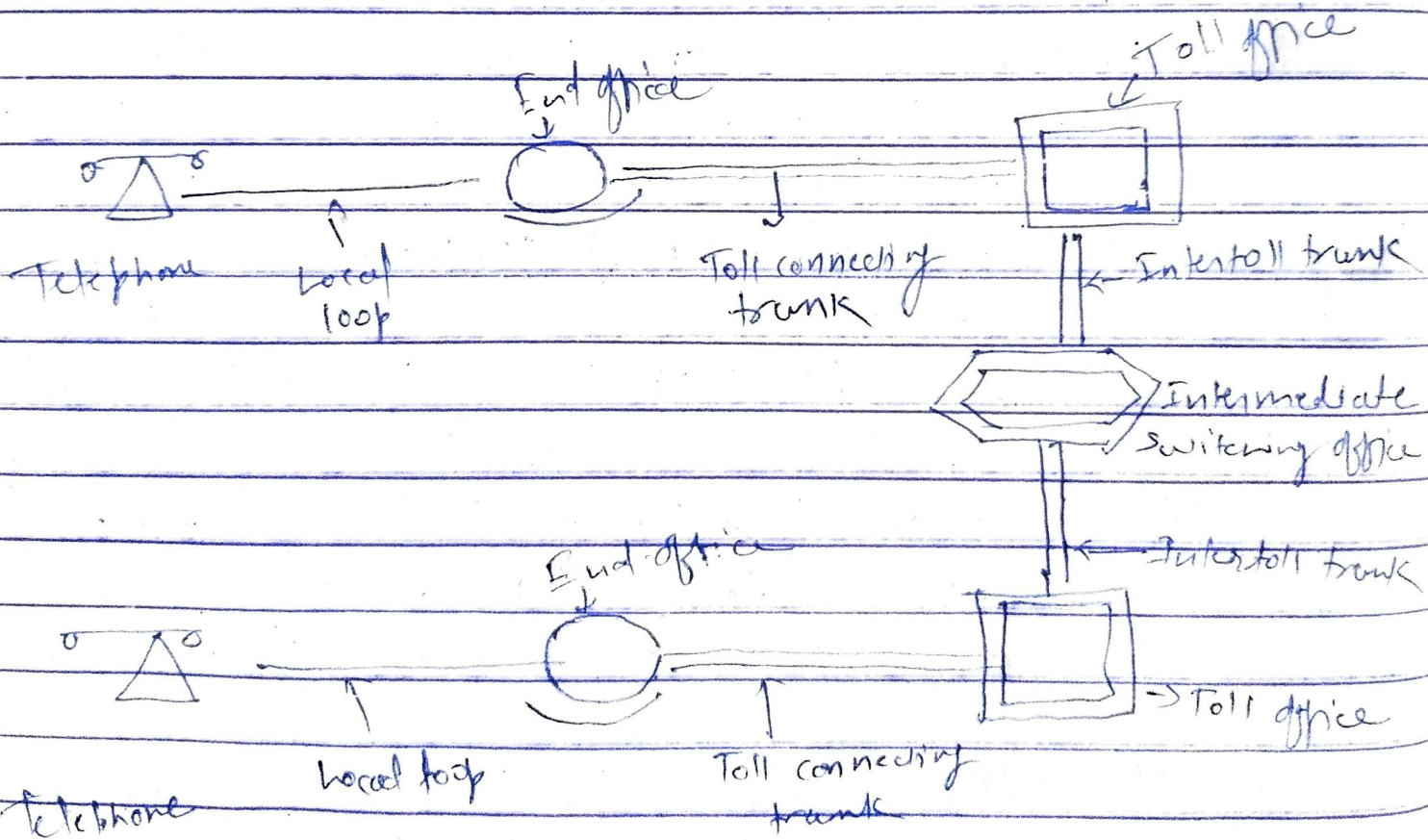
- Telephone of the subscriber or end user.
- End office - Local central office directly connected to end user at a distance of 1 - 10 km.
- Local loop - A two-way connection between the telephone and the end office.
- Toll office - Switching centres which are called tandem offices when located within the same local area.
- Toll connecting trunks - Lines that connect

end offices with toll offices.

→ Intermediate switching offices - Interconnected

non-hierarchical switching offices for connecting toll offices.

→ Inter toll trunk : Very high bandwidth channels that connect either two toll offices via intermediate switching offices.



Model of the telephone structure

Now, there may two cases, when a connection is established between the caller and the callee.

(a) Both caller and callee are attached to the same office end office.
- In this case, a direct electrical connection is set up between the local loops of the subscribers.

(b) Caller and callee are attached to different end offices -
In this case the end office of the caller sets up a connection with one or more connected toll offices, which then performs the switching job.

The transmission media used in local loop is usually twisted pair cables, while that between toll connecting trunks is fibre optic links.

Public Switched Telephone Network (PSTN)

Public Switched Telephone Network (PSTN) also known as POTS (Plain old telephone system) is an agglomeration of an interconnected network of telephone lines owned by both governments as well as commercial organizations.

The history of PSTN goes back to the invention of telephone by Alexander Graham Bell. The main objective of a PSTN is to transmit human voice in a recognizable form. It is mostly an aggregation of circuit-switched networks of the world. Originally it was an entirely analog network laid with copper cables and switches. Nowadays, most part of PSTN networks is digitized and comprises of a wide variety of communicating devices.

The present PSTN comprises of copper telephone lines, fiber optic cables, communication satellites, microwave transmission links and undersea telephone lines. It is also linked to the cellular networks.

Transmission Impairment

(1)

Analog signals while travelling through the transmission media, (say copper wire), tends to deteriorate in the quality. Hence the received signal varies from the original one. This phenomena is called transmission impairment.

There are many causes of impairment. These are

→ Attenuation - It is simply the loss of strength or energy of the travelling signals. The travelling signals tend to lose over long distances. The use of amplifiers at the regular intervals gives the necessary boost-up to the signals.

→ Distortion - The phenomena of change of signals in shape is called distortion of signals.

→ Noise - Random or unwanted signals that mixes up with the original signal is called noise. The noise can be further of four types.

(a). Induced noise : It comes from motors

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and other appliances.

(b) Thermal noise : It is caused due to the movement of electrons in wires.

(c) Crosstalk : It is the phenomena in which one wire affects other.

(d) Impulse : It is a signal with high energy that comes from lightning or power lines.

Various mechanisms like the use of amplifiers, proper shielding of the transmission media, use of insulating materials and mesh structures over the copper wire and proper distance between two conducting wires is maintained to do away with transmission impairment. Although it is impossible to cut down on impairment hundred per cent yet a considerable amount of reduction is achieved with proper mechanism.

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