Few Multiplexer Application - I

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Outline of Lecture

.The Telephone System

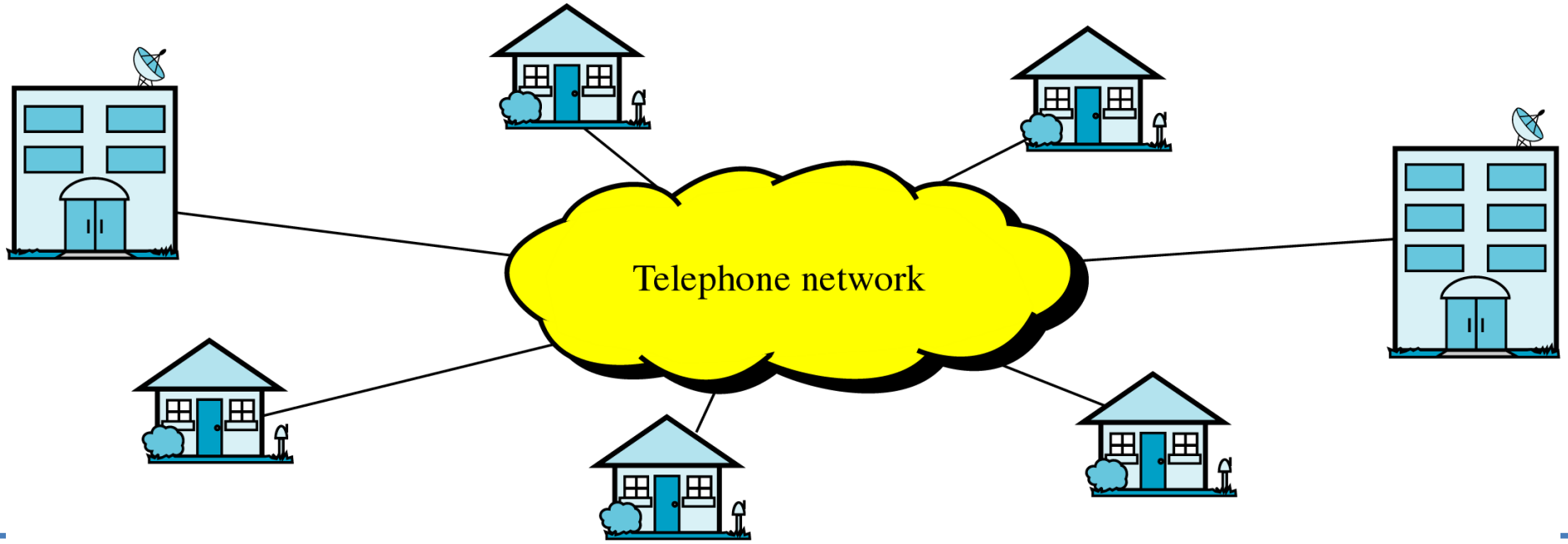
- .Analog Services
- .Digtital Services

.DSL Technology

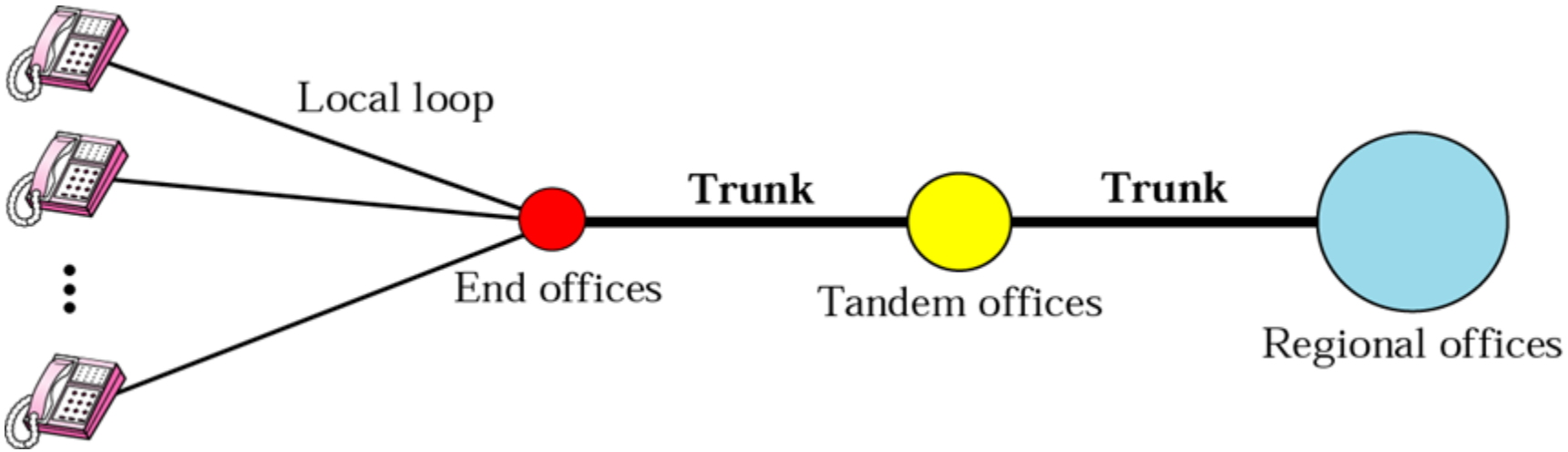
- .ADSL
- .SDSL
- .HDSL
- .VDSL

The Telephone System

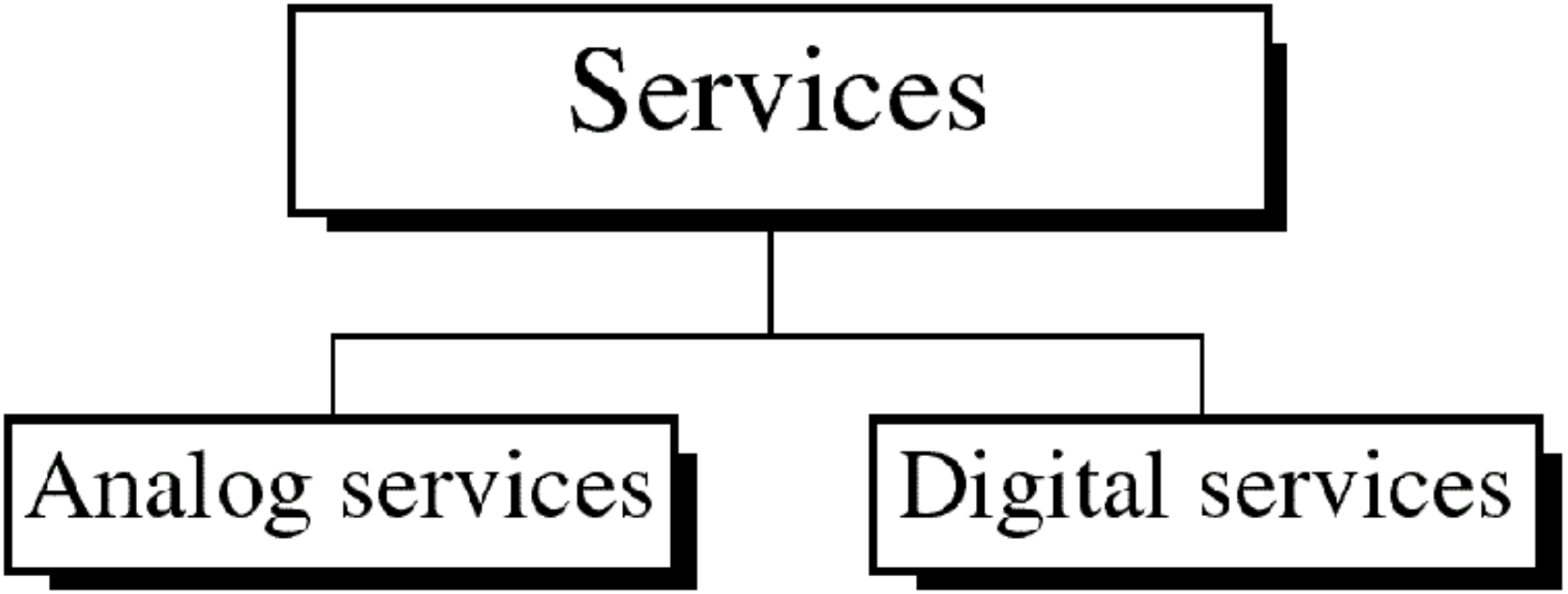
One of the many applications of multiplexing is in the telephone network ,which makes use of both FDM and TDM



The Telephone Network



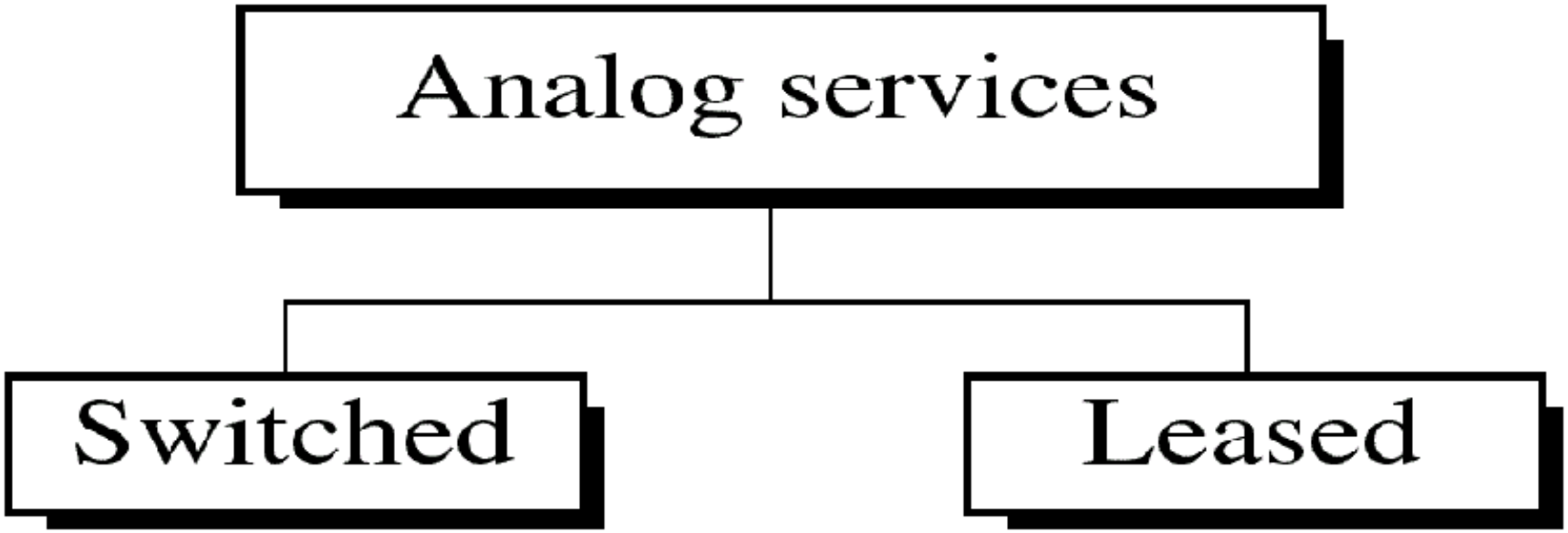
Categories of Service



.Analog Services:Available from telephone companies for a long time

Digital Services:Advances of technology has allowed the introduction of digital services.

Categories of Analog Service



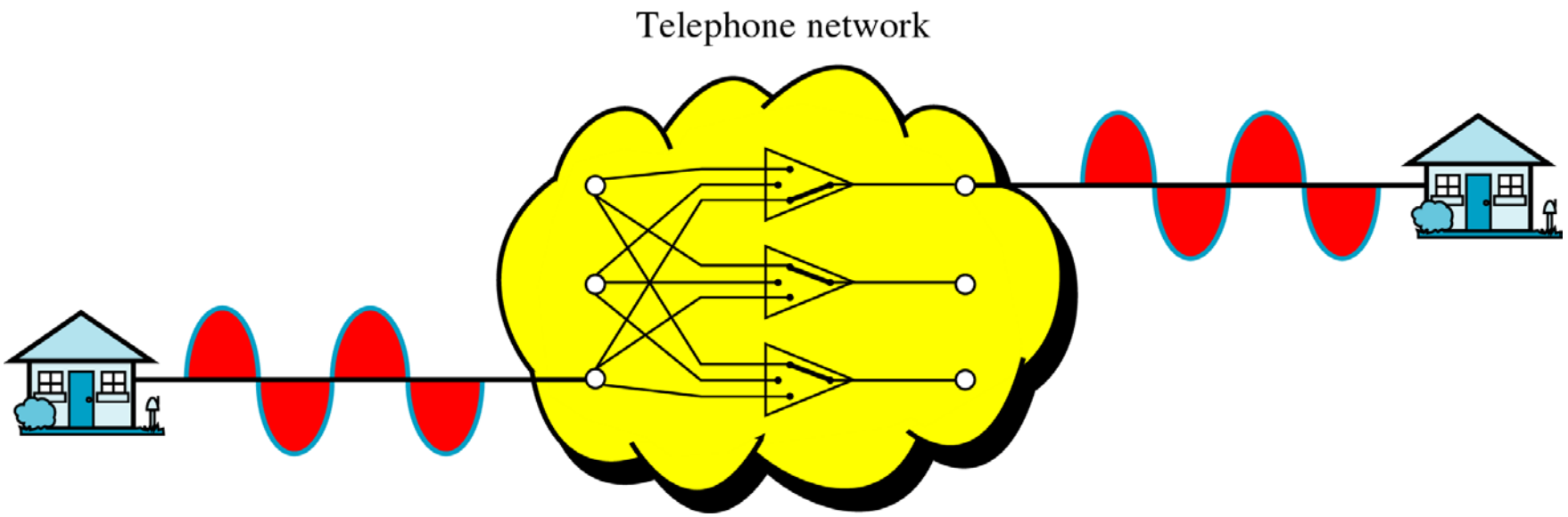
Analog Switched Service is the familiar dial-upservice most often encountered when using a home telephone.

Analog Leased Service : dedicated line offers customers the opportunity to lease line(dedicated line), that is permanently connected to another customer.

Analog Switched Services

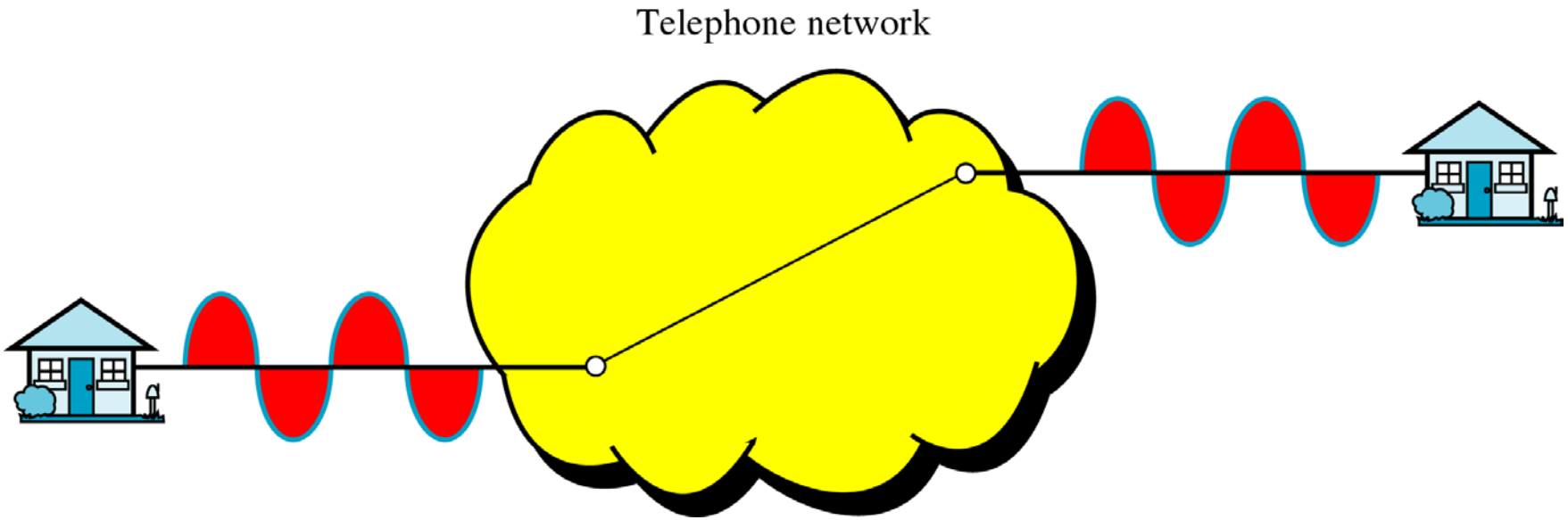
.Subscriber handest is connected to the telephone network by twisted-pair cable called local loop.
.The Signal on the local loop is analog in nature having bandwidth 0 to 4000Hz
.A Switch in the exchange connects a subscriber to the subscriber of the dialed number of duration of call
.The Network is referred to as Public Switched Telephone Network (PSTN)

Analog Switched Services



Analog Leased Service

.No Nead for dialing to set up connection



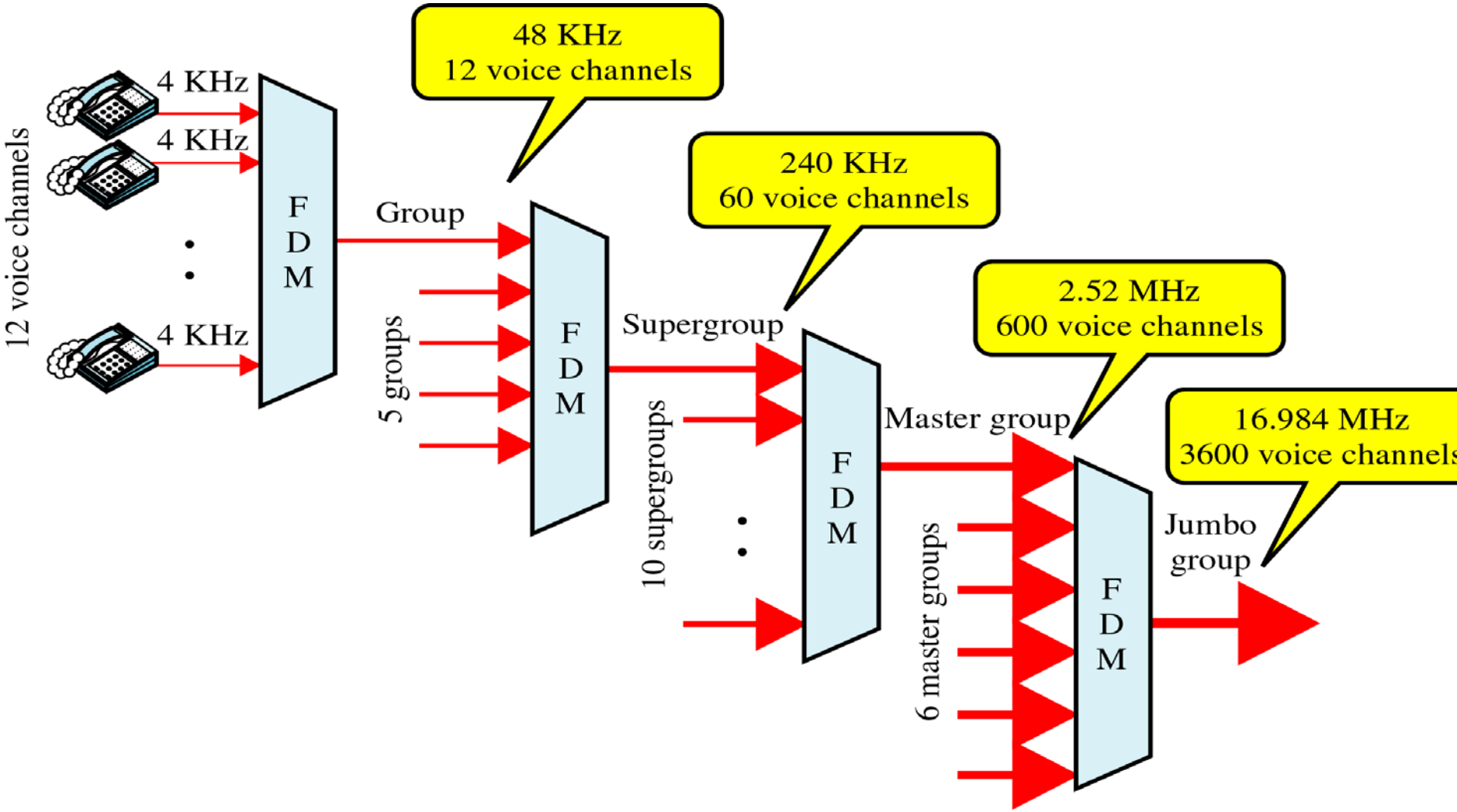
Analog Hierarchy

.For Better utilization of the infrastructure, analog services are multiplexed to provide lines of higher bandwidth.

.FDM is used to combine many lines into fewer lines in a hierarchical manner.

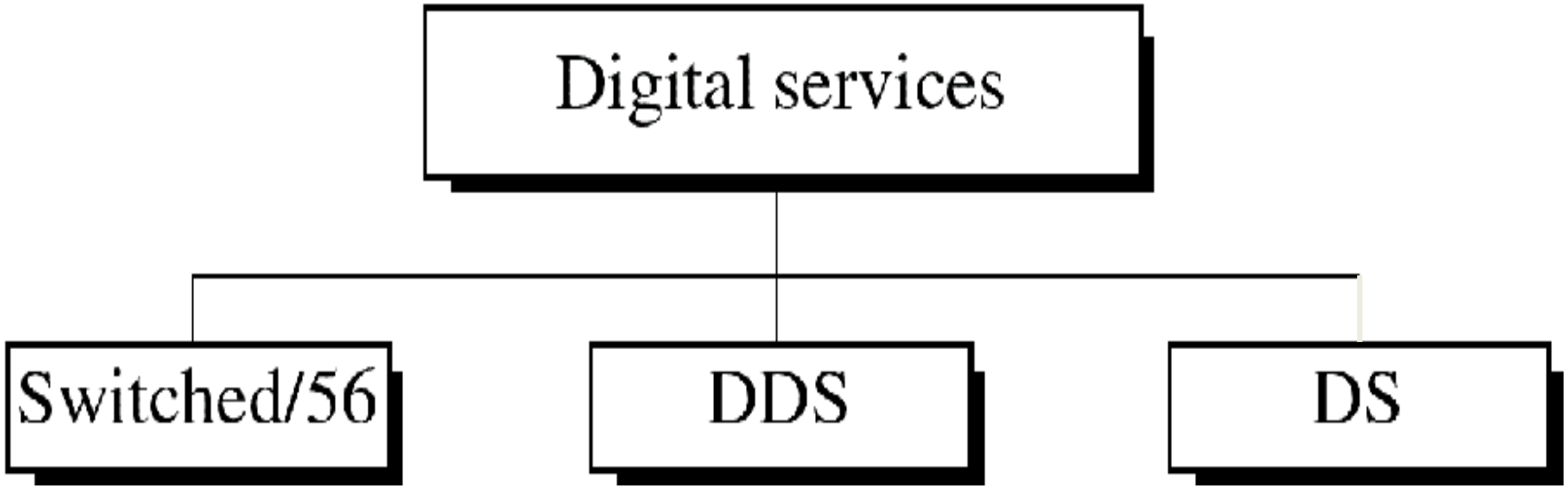
.The Hierarchical system used by AT&T comparises groups, supergroups, master groups and jumbo groups.

Analog Hierarchy



Digital Services

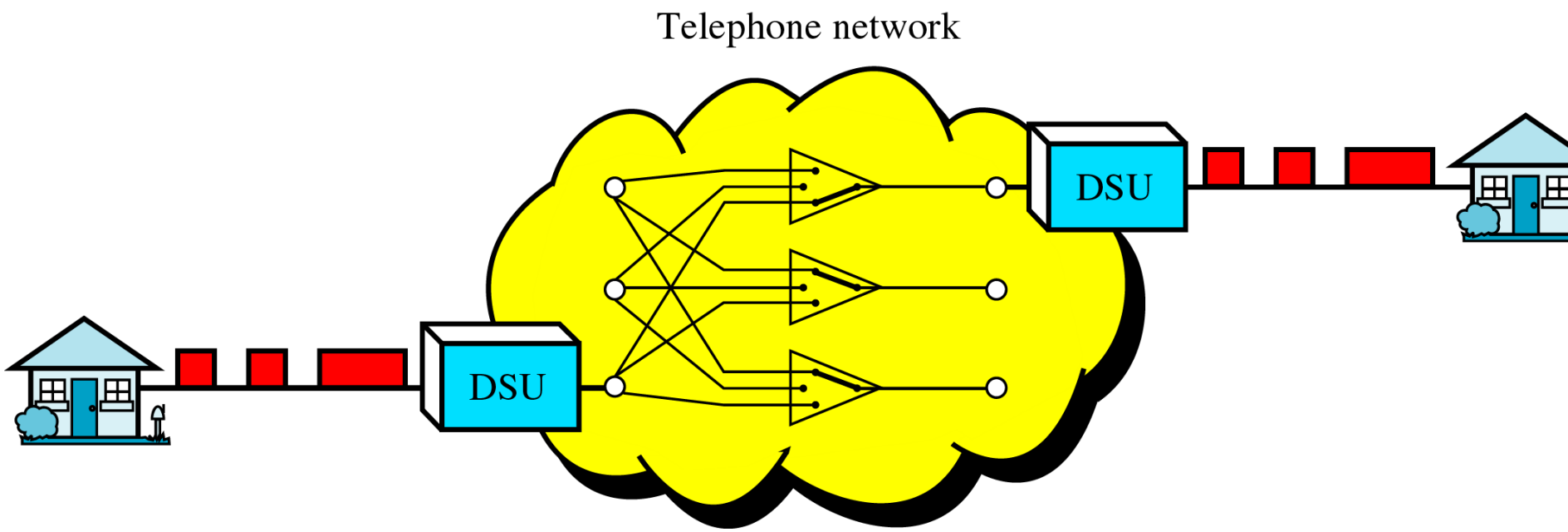
Digital Services are becoming increasingly popular because of higher immunity to noise and other interferences and lower cost.
Categories of digital service-->



Switched 56 Services

.Digital version of the analog switched line.
.Allows data rate of up to 56 kbps.
.Althouth there is no need of modem,there is a need of another device known as Digital Service Unit(DSU).
.DSU provides better speed,less susceptibilty to noise and better quality.
.This Services provide bandwidth on demand.

Switched 56 Services



Digital Data Services(DDS)

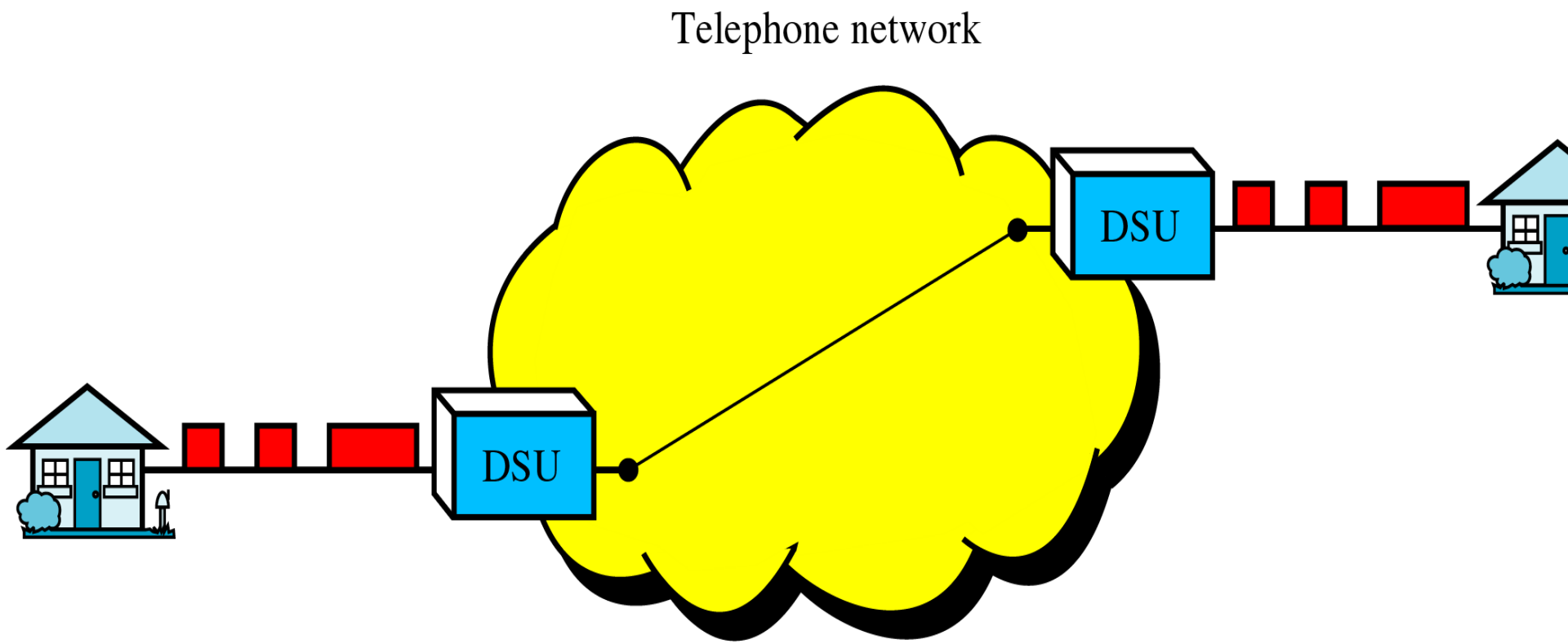
.Digital version of analog leased line.

.Allows data rates of up to 56kbps.

.Choice of lower data rates:2.4,4.8,9.6,19.2
or 56kbps.
.Here also there is a need of DSU

.DSU used in DDS is cheaper and simpler because it does not required keyboard.

Digital Data Services(DDS)



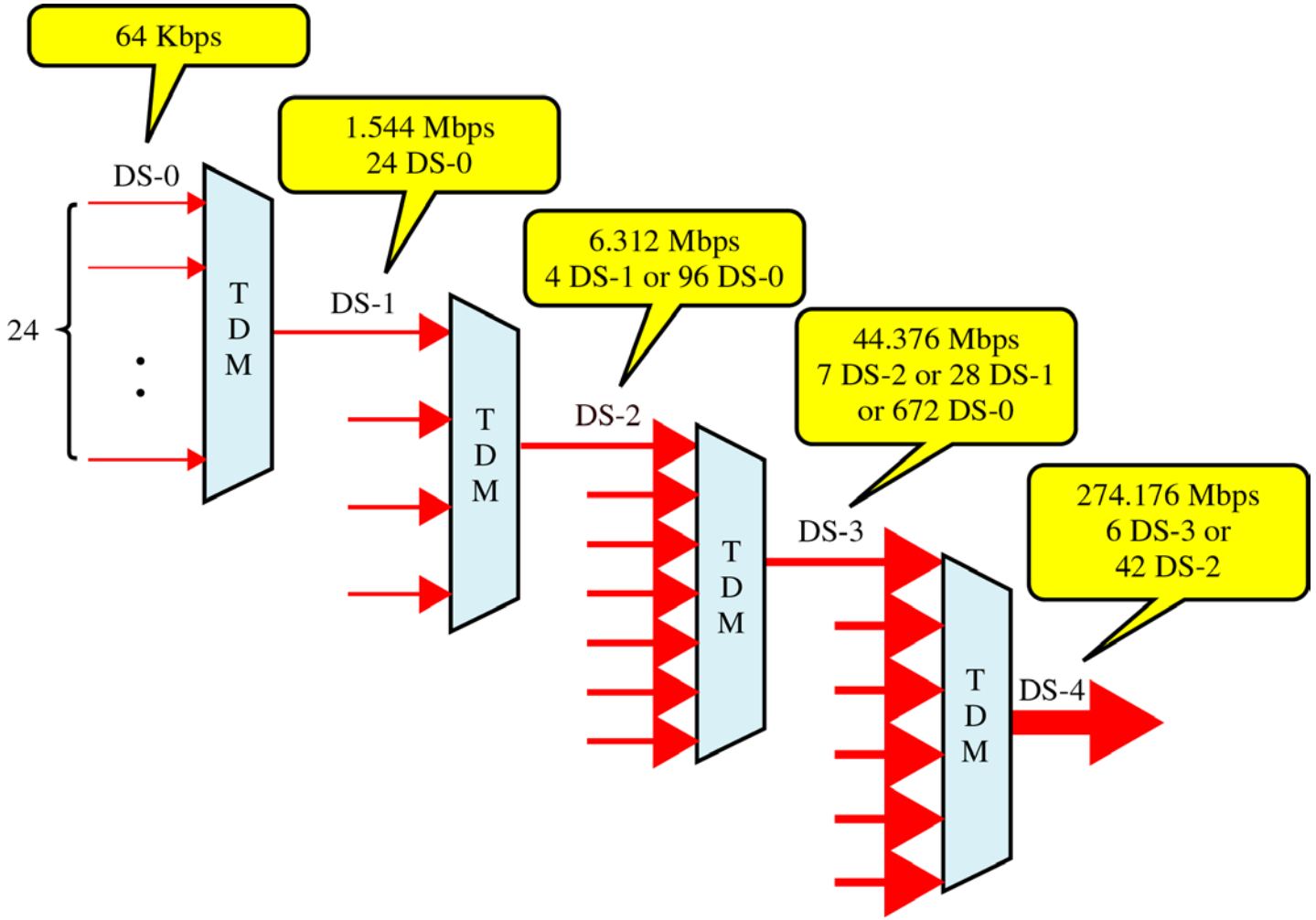
Digital Signal(DS) Service

.Provides a hierarchy of digital services.
.DS-0 service is similar to DDS , a single digital channel of 64kbps.

.DS-1 is 1.544 Mbps service.
.DS-2 is 6.312 Mbps service.
.DS-3 is 44.376 Mbps service.
.DS-4 is 274.176 Mbps service.

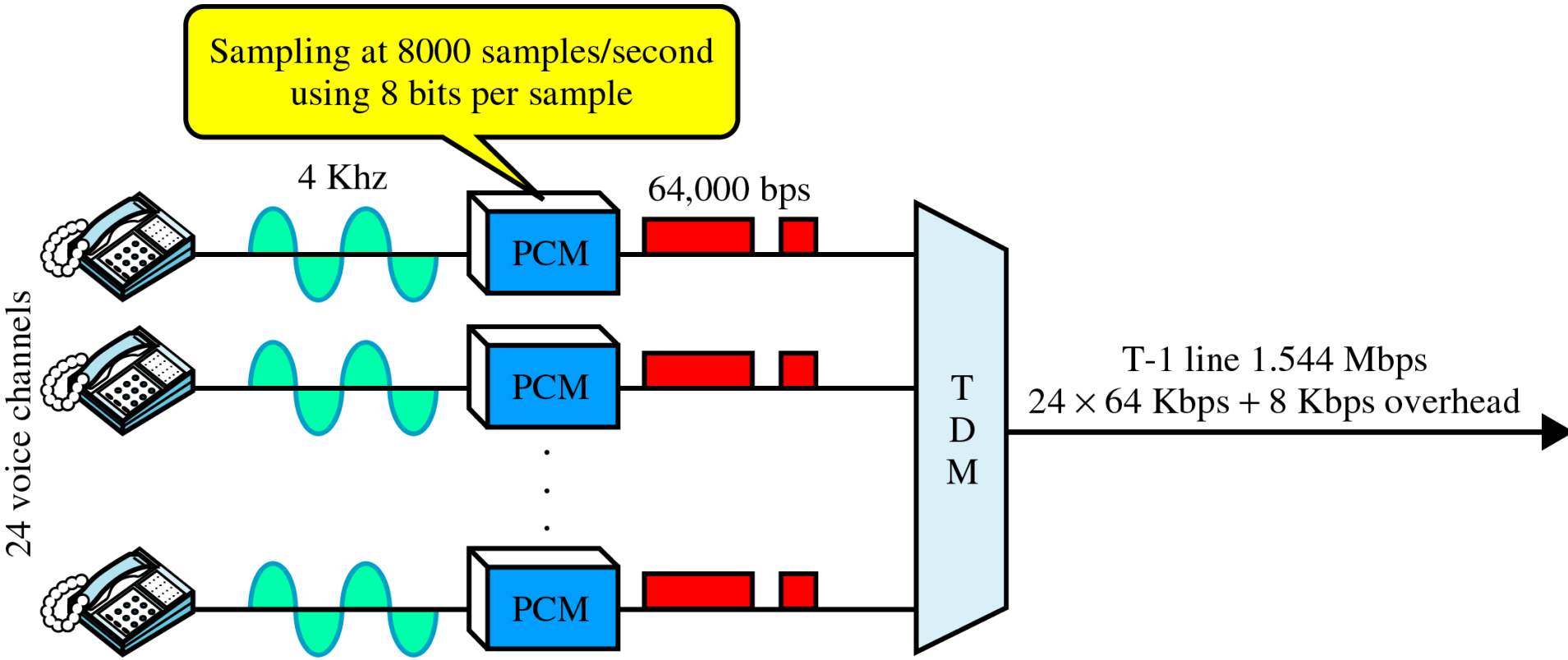
.T1 lines are used to implement these service.

DS Hierarchy

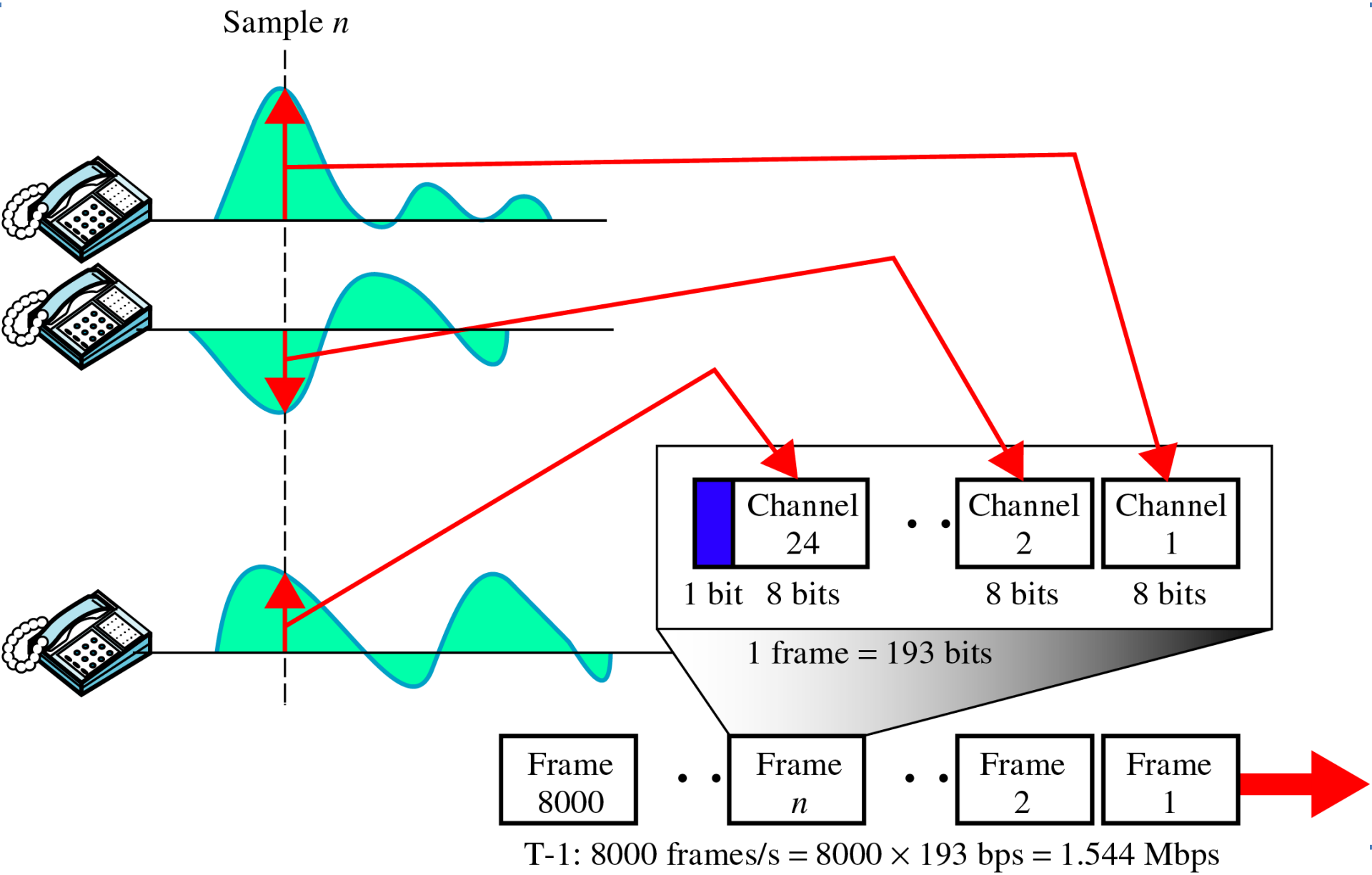


Analog Transmission using T1 lines

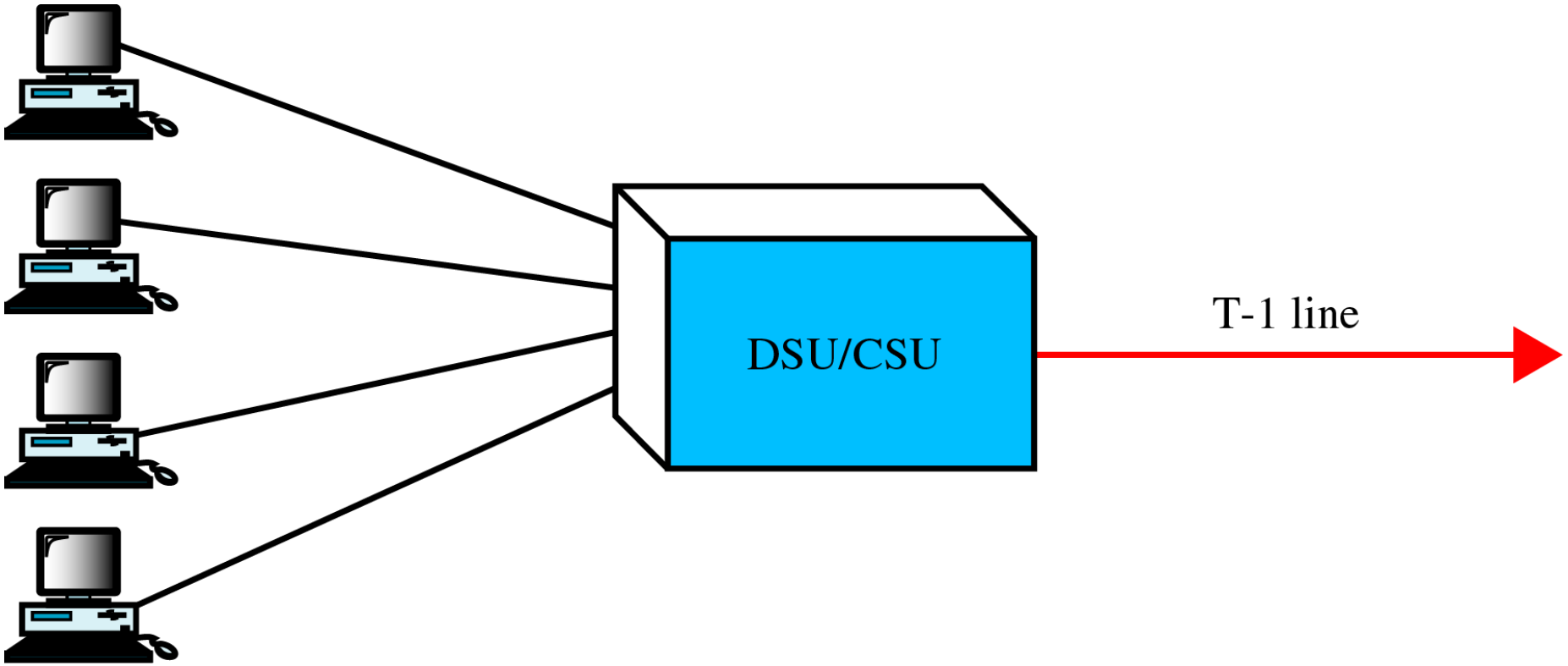
.T1 lines can be used for analog transmission using PCM for conversion to digital signal.



T1 Frame Structure



The T1 lines



DSL Technology

.Digital Subscriber Line (DSL) has been developed to facilitate high-speed digital communication over the the existing local loops.

.Inherent bandwidth of 1.1MHz of twisted pair cable used in local loops has been exploited.

.It uses suitable modulation as well as multiplexing techniques to achieve this.

.The DSL versions:ADSL,VDSL,HDSL and SDSL,often refered as xDSL.

Asymmetric DSL (ADSL)

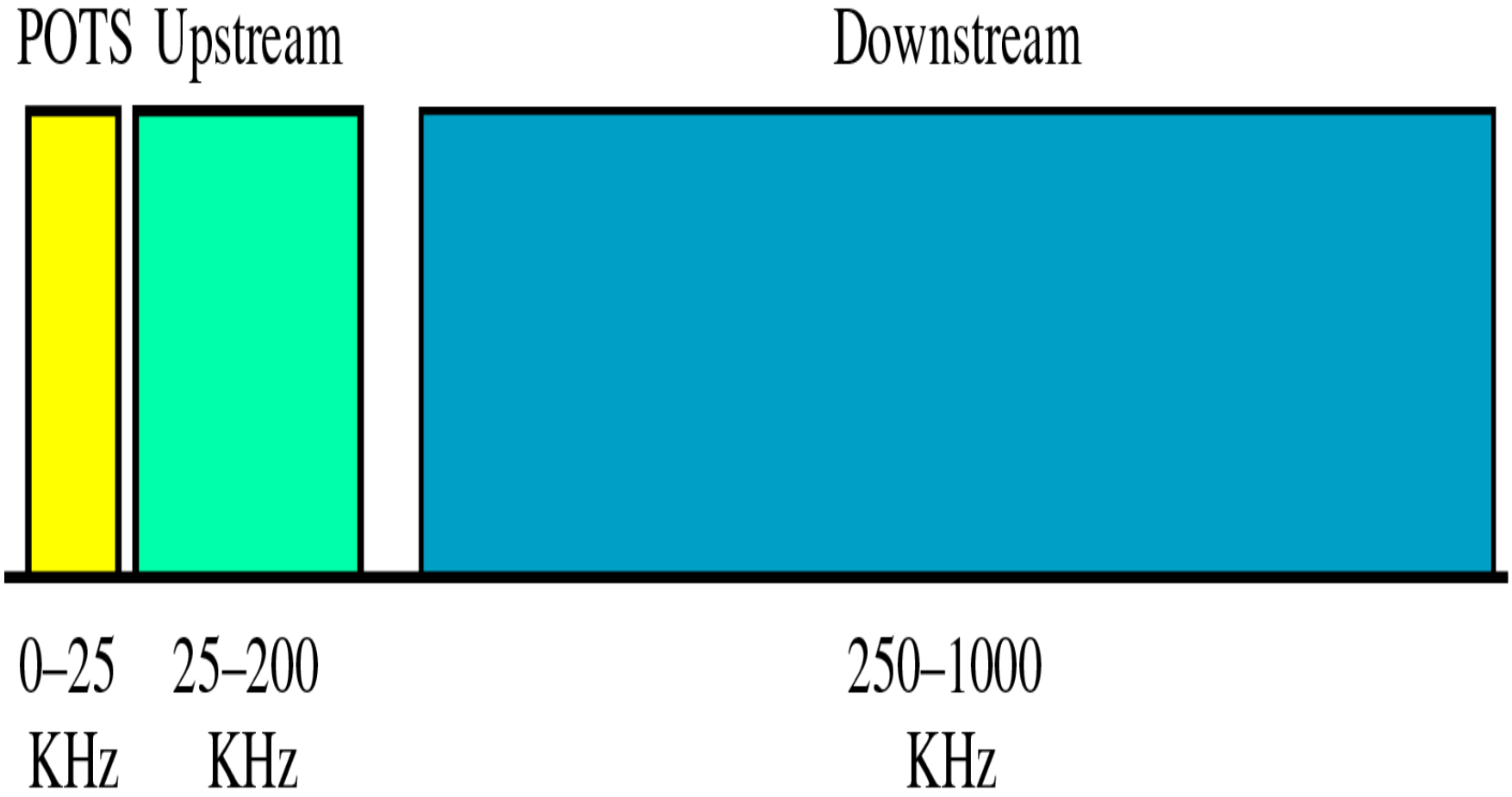
.It uses a newer technology that used the existing telecommunications networks such as the local loop telephone line.

.Asymmetric Digital Subscriber Line (ADSL)

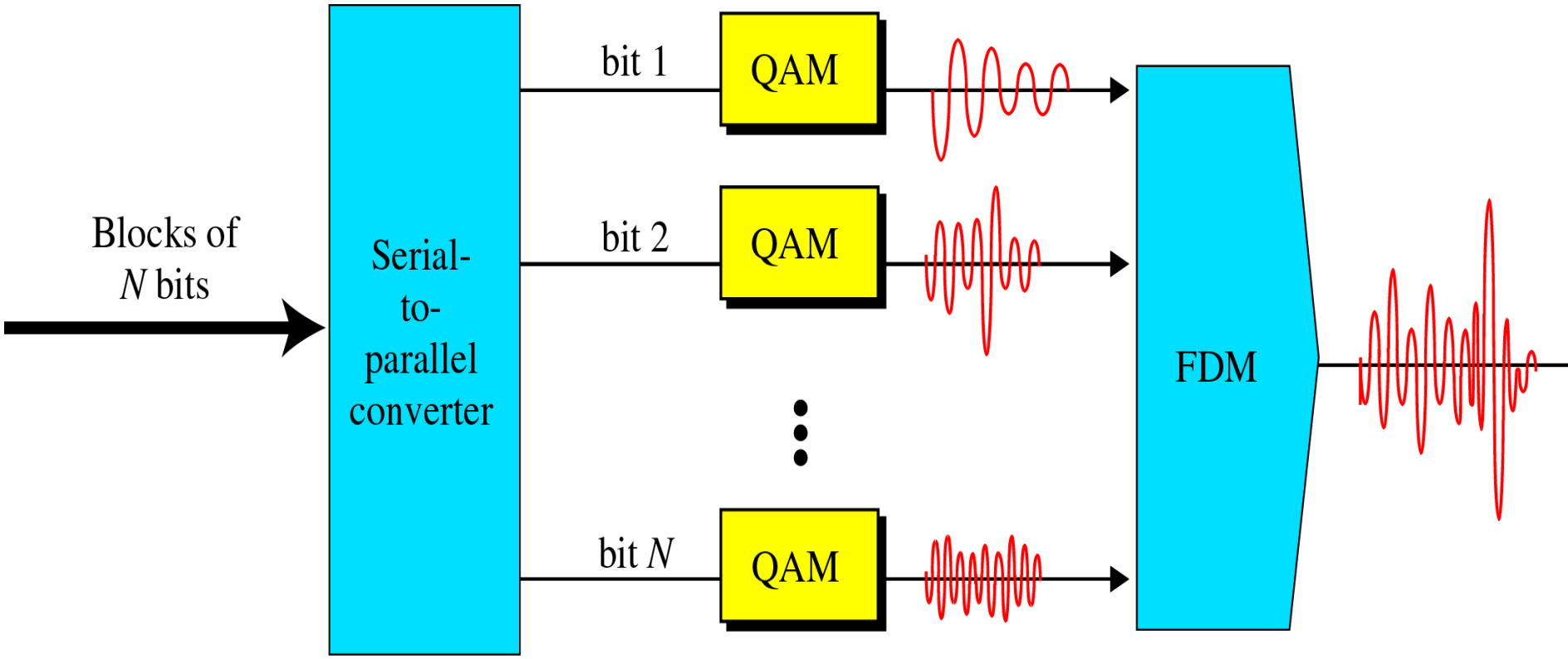
.provides higher bit rates in the downstream direction (from the telephone central office to the subscriber's site) than the upstream direction.

.divides the bandwidth of a twisted-pair cabl.e

ADSL



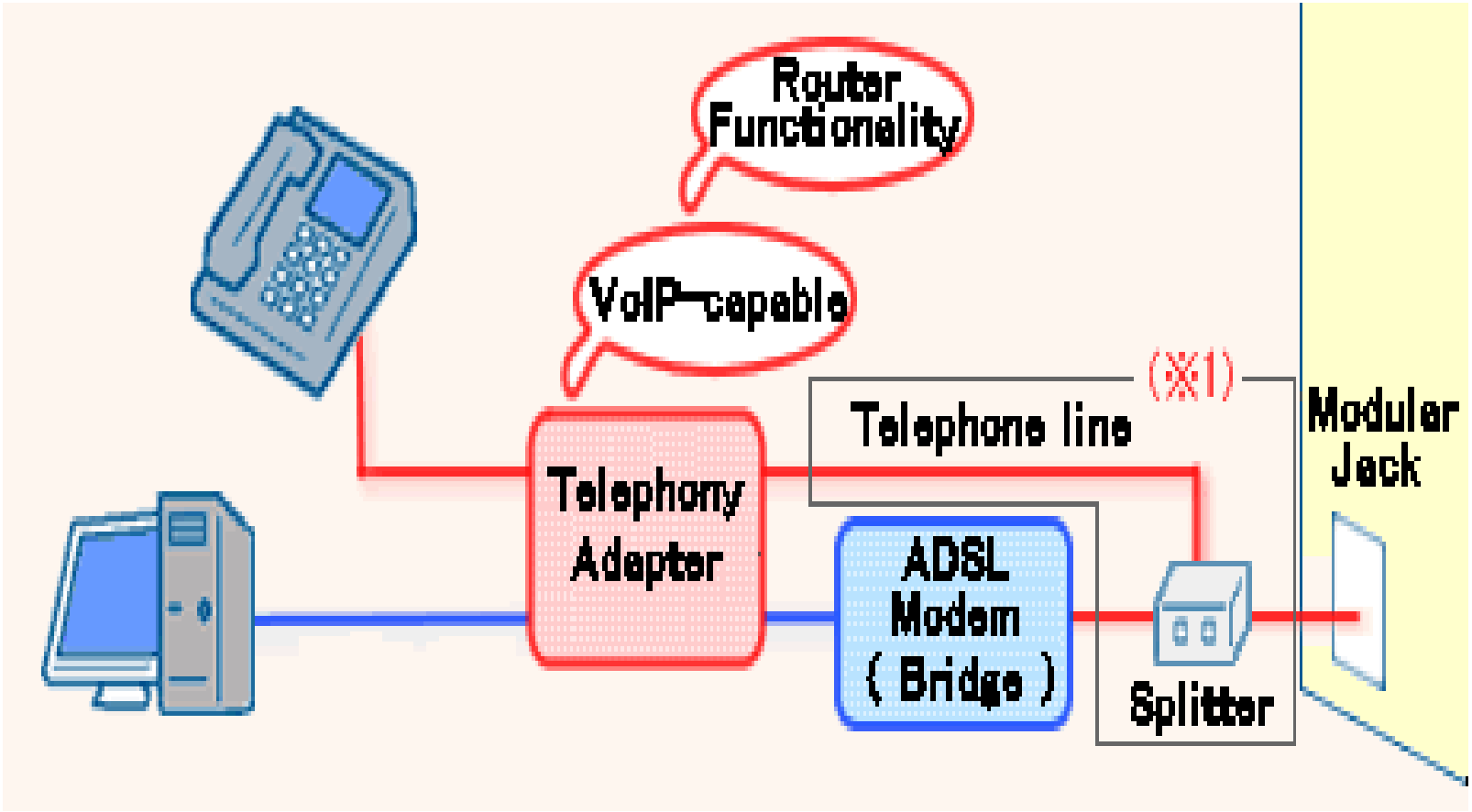
Discrete Multitone Technique(DMT)



Discrete Multitone Technique(DMT)

voice: Channel 0 is reserved for voice.
idle: channel 1-5 is not used.
>Upstream Data and control: 24 channels for upstream data and control .one channel is used for control.Available bandwidth- 24*4000*15=1.44Mb
> Downstream Data and control: 224 channel for downstream data and control.
Available bandwidth- 224*4000*15=13.4Mbps.

Equipments used in ADSL



Others DSL Technique:

.Symmetric Digital Subscriber line:Divides the available bandwidth equally.
.High-bit-rate Digital Subscriber line:Designed as alternative to T1 line.
.AMI encoding is used in T1lines is susceptible to attenuation at high frequencies.
.HDSL uses 2B1Q encoding,which is less susceptible to attenuation.Allows 2MBps over a distance of 3.6km without repeater.Uses two Pair of twisted pair wire for duplex communication.

Others DSL Technique

Very high bit rate Digital Subscriber Line(VDSL): Similar to ADSL,but uses coaxial ,fiber-optic or twisted -pair for shorter ditances.Using DMT allows 1.5 to 2.5 Mbps for upstream and 50 to 55 downstream.

Thanks!