Redes de Computadoras: Capa Física

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Medios de transmisión dirigida

- Almacenamiento persistente
- Pares trenzados
- Cable coaxial
- Cableado eléctrico
- Fibra óptica

Almacenamiento persistente

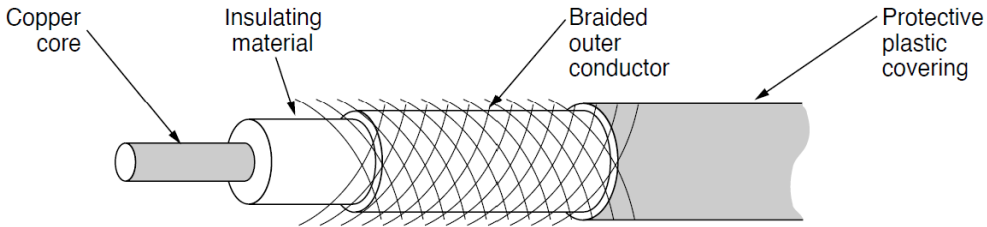
- Ultrium Tape 45 TB
- Caja 1000 unidades
- 360 Pb (Petabit)
- Tiempo de entrega 24 horas (86400 s)
- Aprox 4.1 Tb/s
- Inoperable para comunicación en tiempo real

Almacenamiento persistente

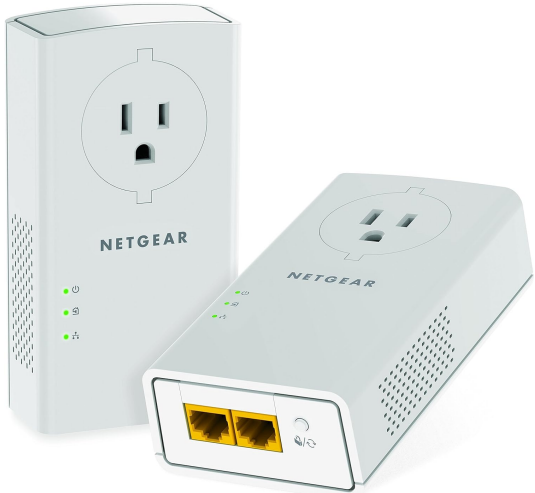
Pares trenzados

- UTP
- Cat 5e Gbit
- Cat 6 10 Gbit
- Cat 7 protected
- Cat 8 10+ Gbit menos de 30 m
- Distancia máxima sin repetidor 5 km

Cable coaxial



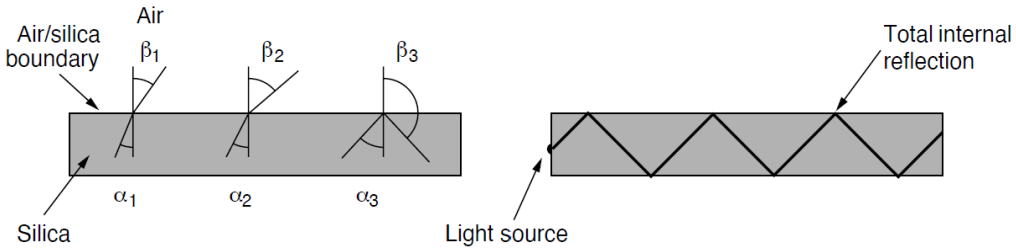
Cableado eléctrico



Fibra óptica

- Límite teórico 50 Tb/s
- Límite actual 100 Gb/s
- Necesita repetidores cada 50 KM máx
- Frágil
- Operadores especializados

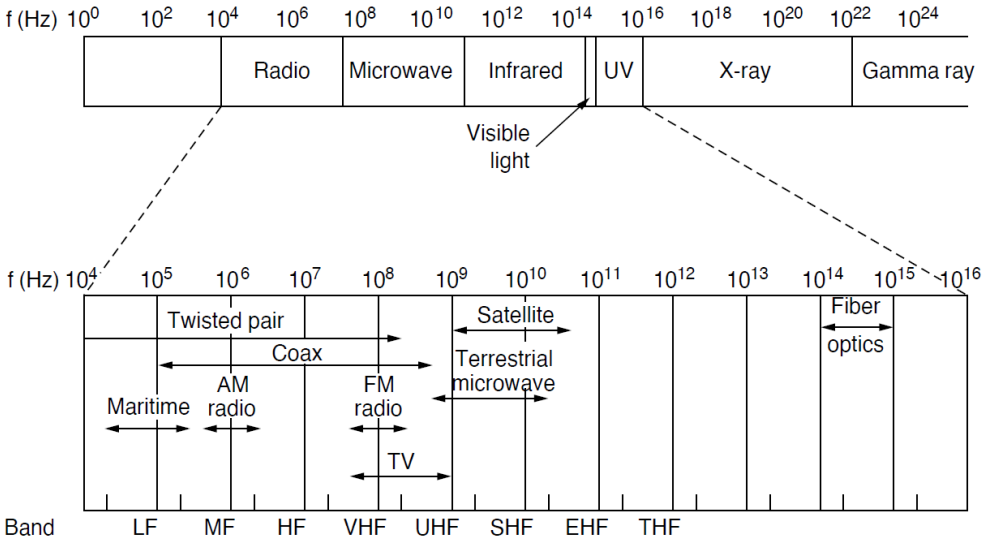
Fibra óptica



Transmisión inalámbrica

- Ondas de Radio
- Microondas
- Ondas Infrarojas
- Luz

Transmisión inalámbrica



Ondas de Radio

- Fáciles de generar
- Alcanzan largas distancias
- Pasan sin problemas los obstáculos
- Omnidireccionales
- Inseguras

Microondas

- Wifi, Bluetooth, Red celular
- Direccionales
- Interferencia con objetos
- Problema de absorción con agua
- Repetidor cada 50 KM

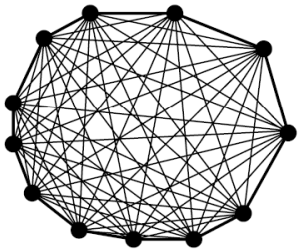
Ondas infrarojas

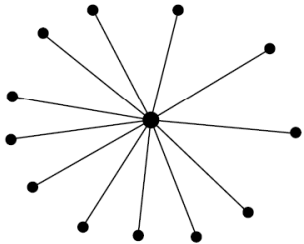
- Comunicación de corto alcance
- No traspasan objetos sólidos
- Mandos de tv, electrodomésticos
- Más seguras comparadas con las microondas

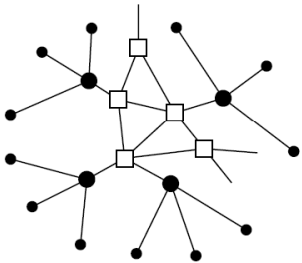
Ondas del espectro de la luz

- Baratas
- Seguras
- Neceitan photodetectores

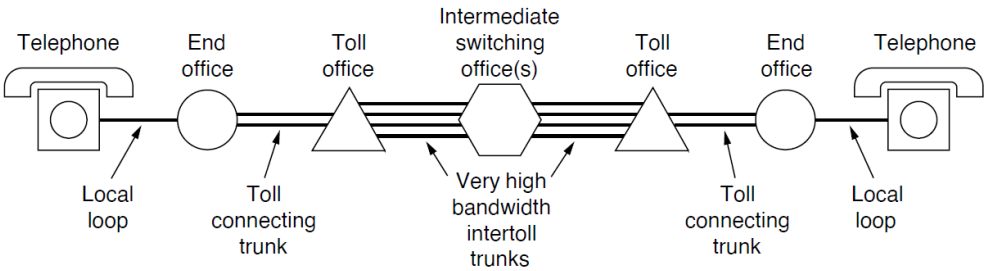
Sistema conmutado de telefonía







Sistema conmutado de telefonía



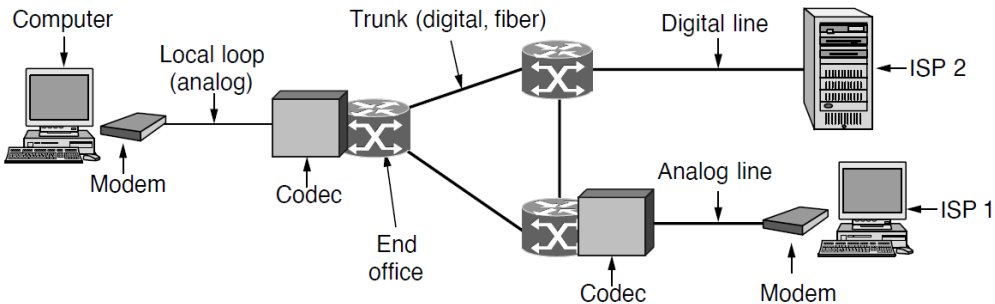
Sistema conmutado de telefonía

- Conexiones locales
- Trunks de alta velocidad
- Oficinas de conmutado

Conexiones locales

- Modems
- ADSL
- Fibra óptica

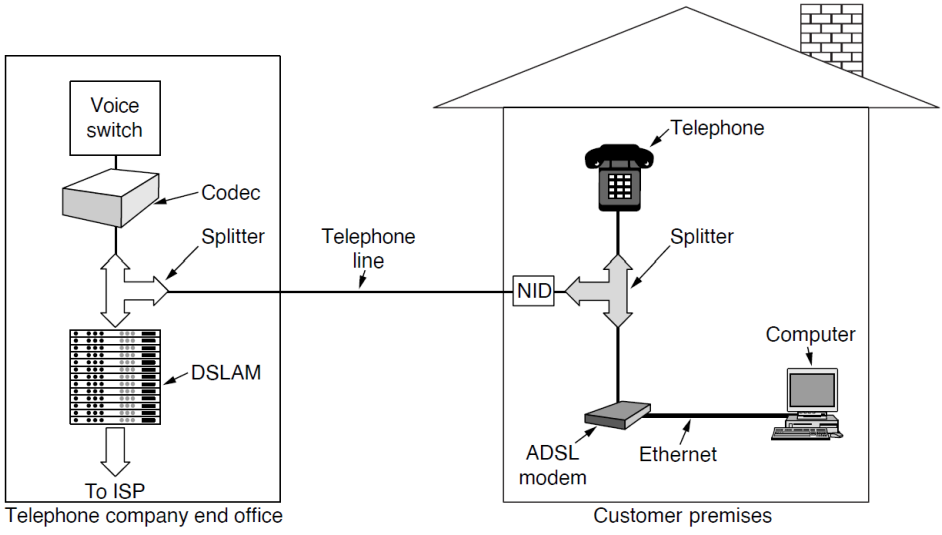
Modem de teléfono



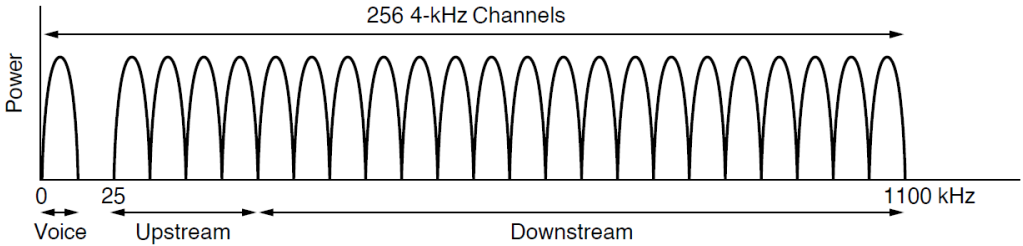
Modem de teléfono

Modem standard	Baud	Bits/symbol	Bps
V.32	2400	4	9600
V.32 bis	2400	6	14,400
V.34	2400	12	28,800
V.34 bis	2400	14	33,600

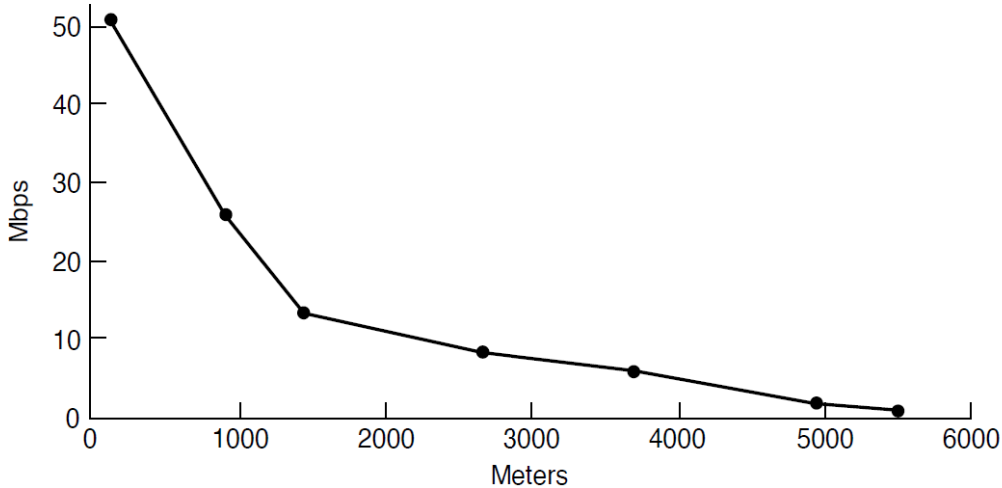
ADSL


Voice switch
Codec
Splitter
DSLAM
To ISP
Telephone company end office
Telephone line
Telephone
Splitter
NID
Computer
ADSL modem
Ethernet
Customer premises

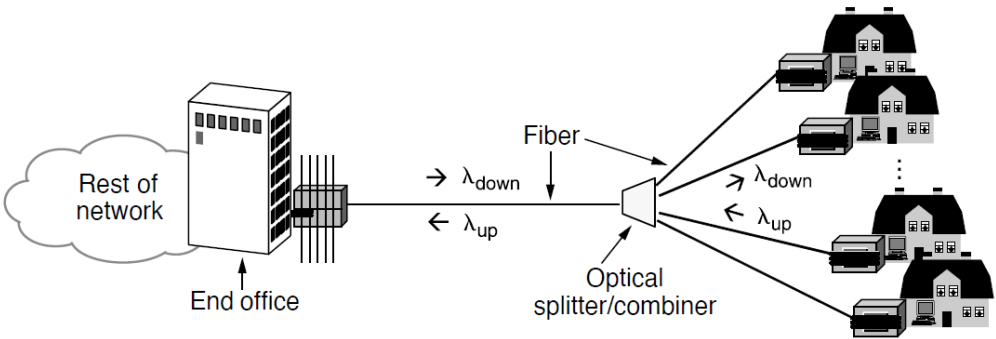
ADSL


256 4-kHz Channels
Power
0
25
1100 kHz
Voice
Upstream
Downstream

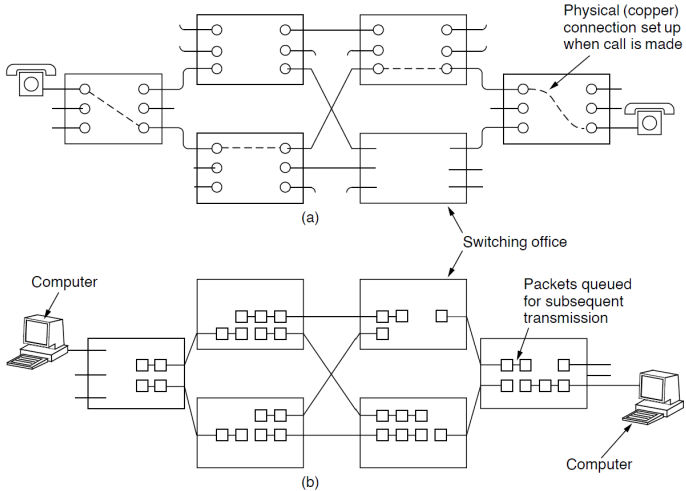
ADSL



Fibra óptica



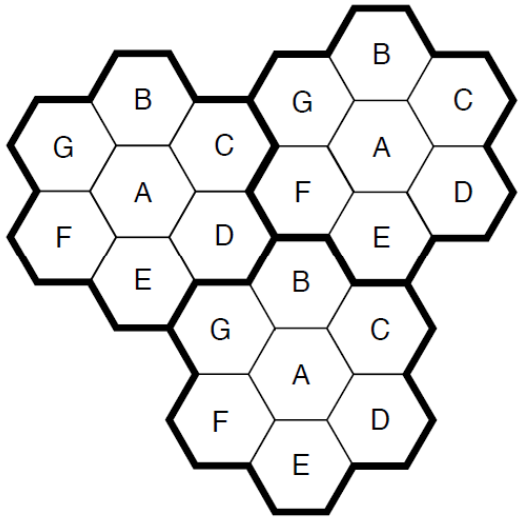
Conmutado de paquetes



Conmutado de paquetes

Item	Circuit switched	Packet switched
Call setup	Required	Not needed
Dedicated physical path	Yes	No
Each packet follows the same route	Yes	No
Packets arrive in order	Yes	No
Is a switch crash fatal	Yes	No
Bandwidth available	Fixed	Dynamic
Time of possible congestion	At setup time	On every packet
Potentially wasted bandwidth	Yes	No
Store-and-forward transmission	No	Yes
Charging	Per minute	Per byte

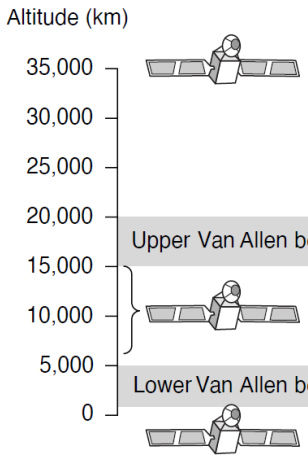
Telefonía celular



Telefonía celular

- 1G Voz analógica
- 2G Voz digital
- 3G Voz y datos digitales
- 4G Conmutación basada en paquetes
- 5G

Satélites de comunicaciones



Type	Latency (ms)	Sats needed
GEO	270	3
MEO	35–85	10
LEO	1–7	50

Satélites de comunicaciones

Band	Downlink	Uplink	Bandwidth	Problems
L	1.5 GHz	1.6 GHz	15 MHz	Low bandwidth; crowded
S	1.9 GHz	2.2 GHz	70 MHz	Low bandwidth; crowded
C	4.0 GHz	6.0 GHz	500 MHz	Terrestrial interference
Ku	11 GHz	14 GHz	500 MHz	Rain
Ka	20 GHz	30 GHz	3500 MHz	Rain, equipment cost