

Curs 02

Medii de transmisie



Obiective

- Tipuri de medii de transmisie
- Multiplexare
- Performanța comunicației

Tipuri de medii de transmisie

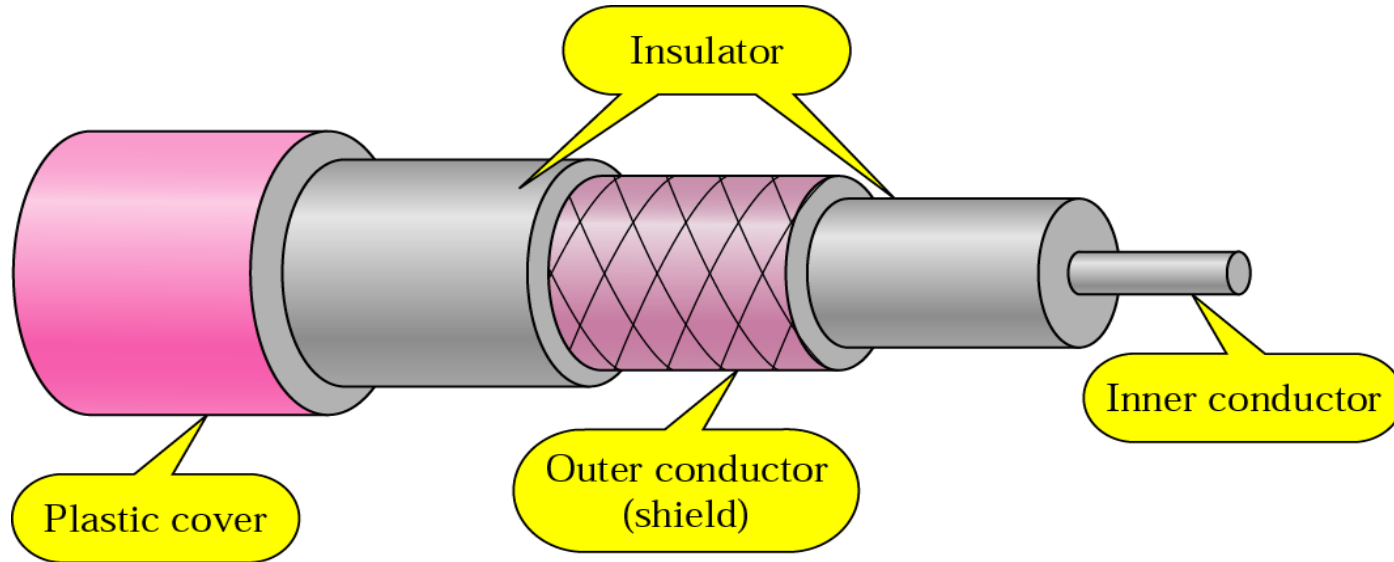
- Cupru: cablu coaxial sau cablu torsadat
- Fibră optică
- Wireless



Medii de transmisie

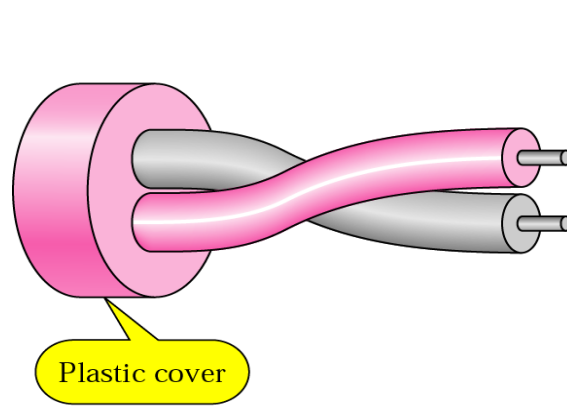
- Cu fir (ghidat)
 - Cablu coaxial
 - Cablu torsadat (twisted-pair cable)
 - UTP
 - STP / FTP
 - ScTP
 - Fibră optică
 - Multimode
 - Singlemode
- Fără fir (neghidat)
 - Unde radio
 - Microunde
 - Infraroșii

Cablu coaxial

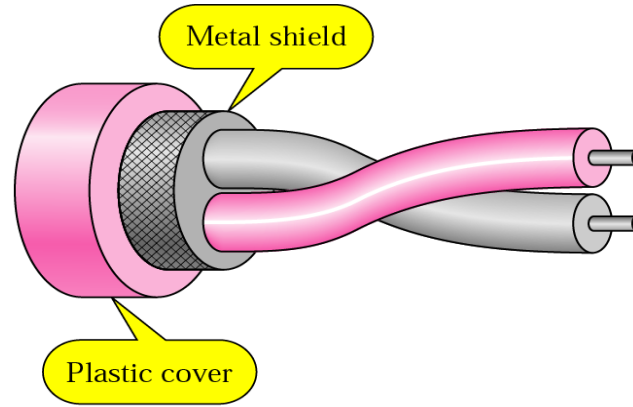


Category	Impedance	Use
RG-59	75 Ω	Cable TV
RG-58	50 Ω	Thin Ethernet
RG-11	50 Ω	Thick Ethernet

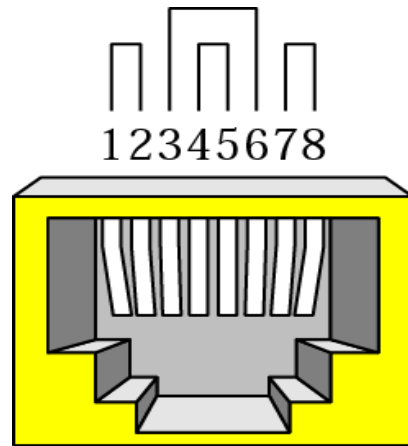
Cablu torsadat



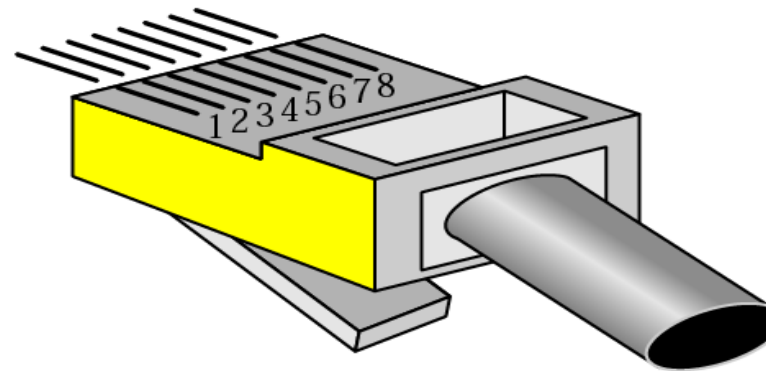
a. UTP



b. STP



RJ-45 Female



RJ-45 Male

Categorii de cablu torsadat

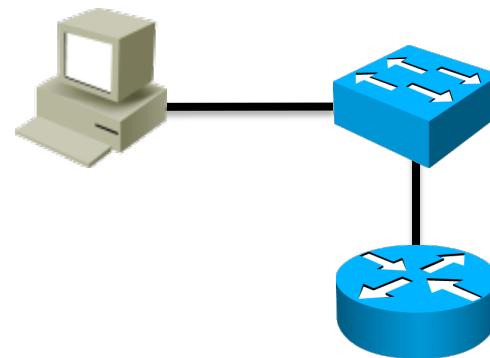
Categorie	Frecvență	Viteză	Standard
Cat 1		1Mbps	Telefonia clasică
Cat 2		4Mbps	Transmisiuni seriale
Cat 3	16MHz	10 Mbps 100 Mbps	TokenRing 10BaseT 100BaseT4
Cat 4	20MHz	16 Mbps 100 Mbps	TokenRing 10BaseT 100BaseT4
Cat 5	100MHz	10 Mbps 100 Mbps	TokenRing, 10BaseT 100BaseTX
Cat 5e	155MHz	10 Mbps 100 Mbps 1 Gbps	10BaseT, 100BaseTX, 1000BaseT
Cat 6	250MHz	100Mbps 1 Gbps	100BaseTX 1000BaseT
Cat 6a	500MHz	10 Gbps	10GBaseT
Cat 7	625MHz	10 Gbps	10GbaseT
Cat 8	1200Mhz	10 Gbps	10GbaseT

Cablări twisted-pair: Straight-through



TIA/EIA-568B

TIA/EIA-568A

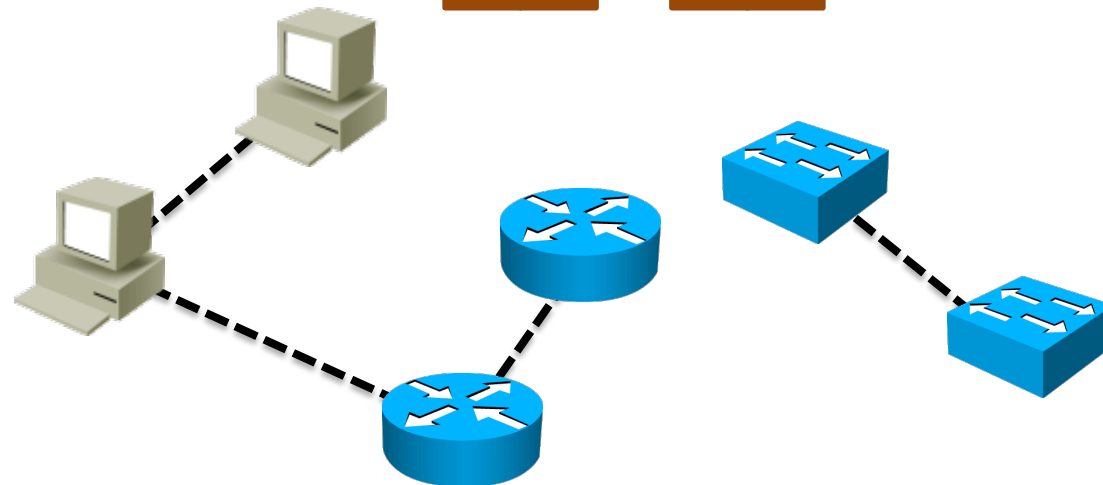


Cablări twisted-pair: Crossover

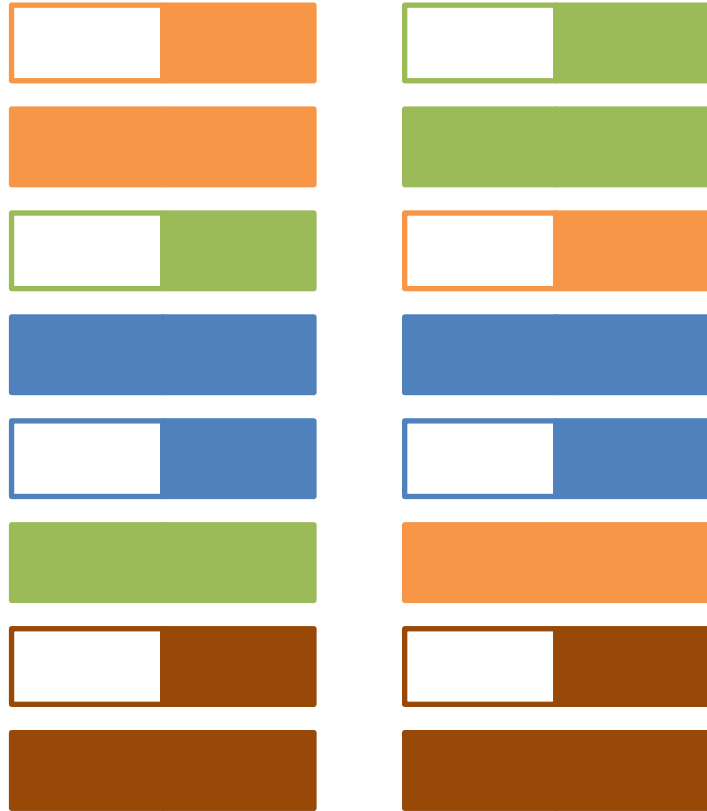


TIA/EIA-568B

TIA/EIA-568A

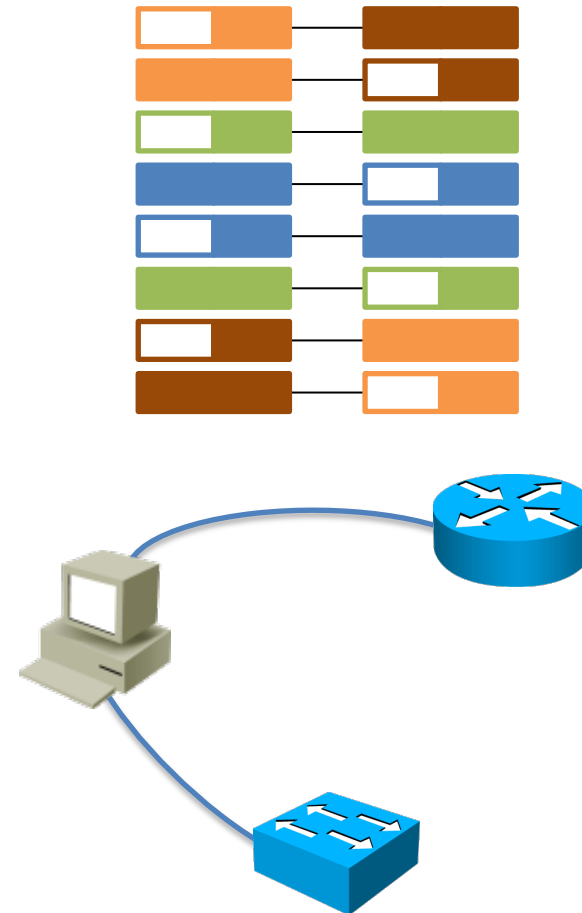


Cablări twisted-pair: Rollover

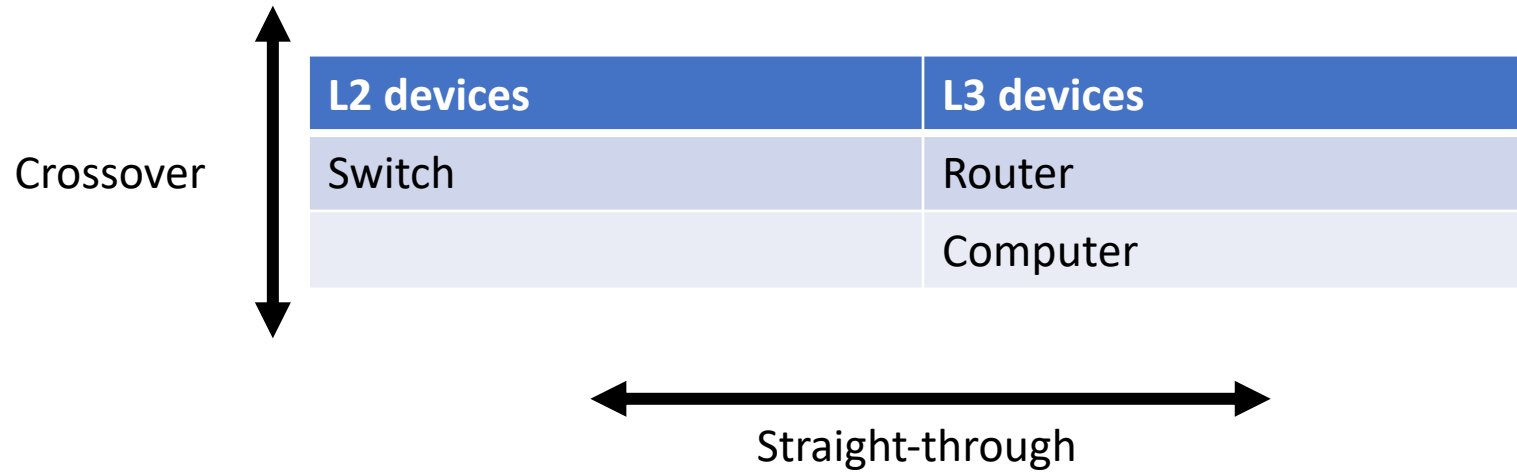


TIA/EIA-568B

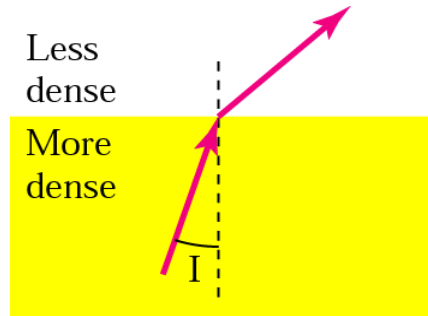
TIA/EIA-568A



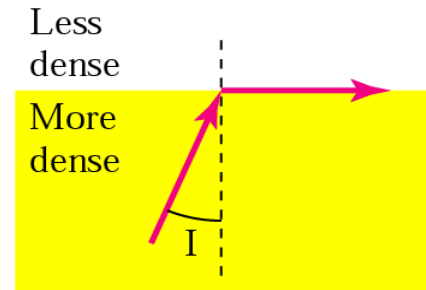
Utilizarea tipurilor de cablaj



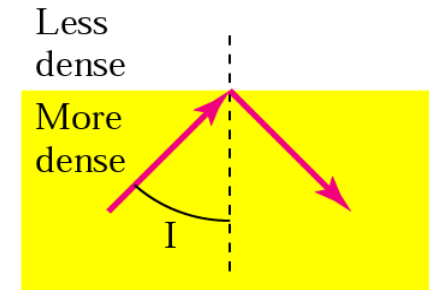
Fibră optică - terminologie



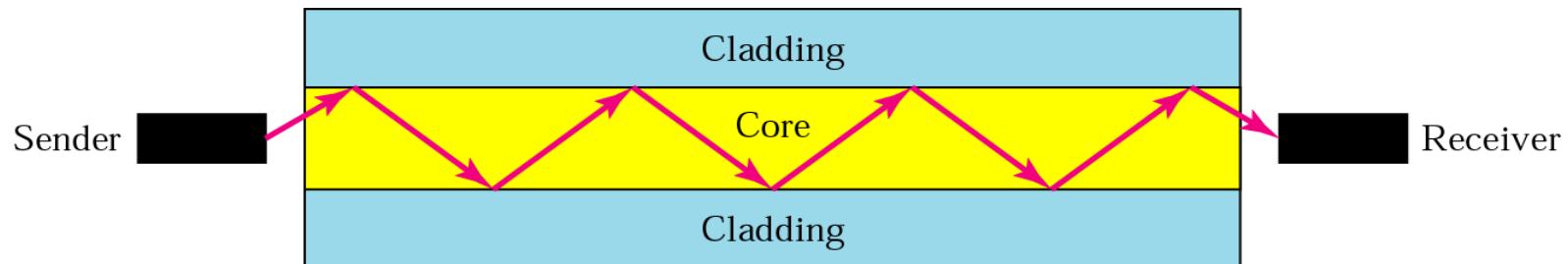
$I < \text{critical angle}$,
refraction



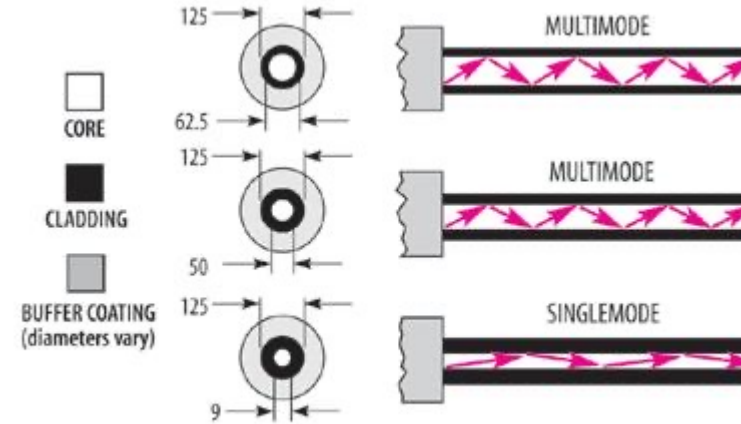
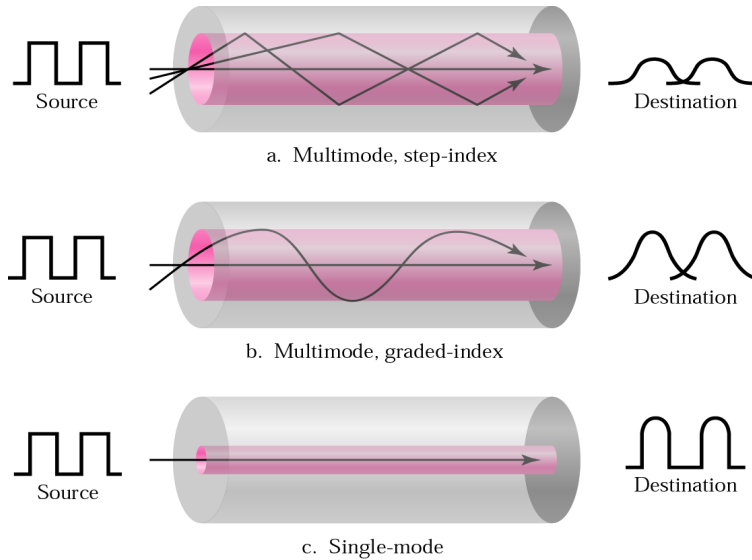
$I = \text{critical angle}$,
refraction



$I > \text{critical angle}$,
reflection

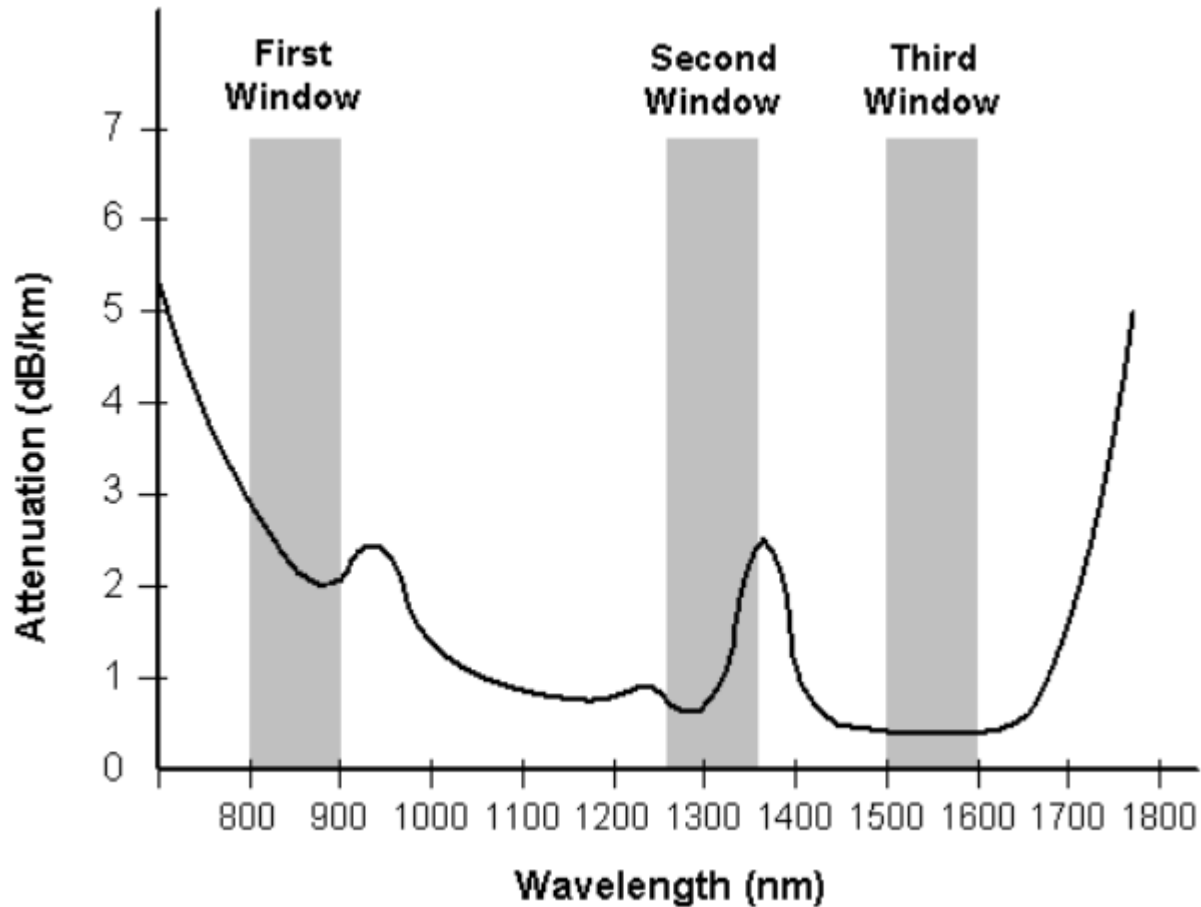


Fibră optică - tipuri



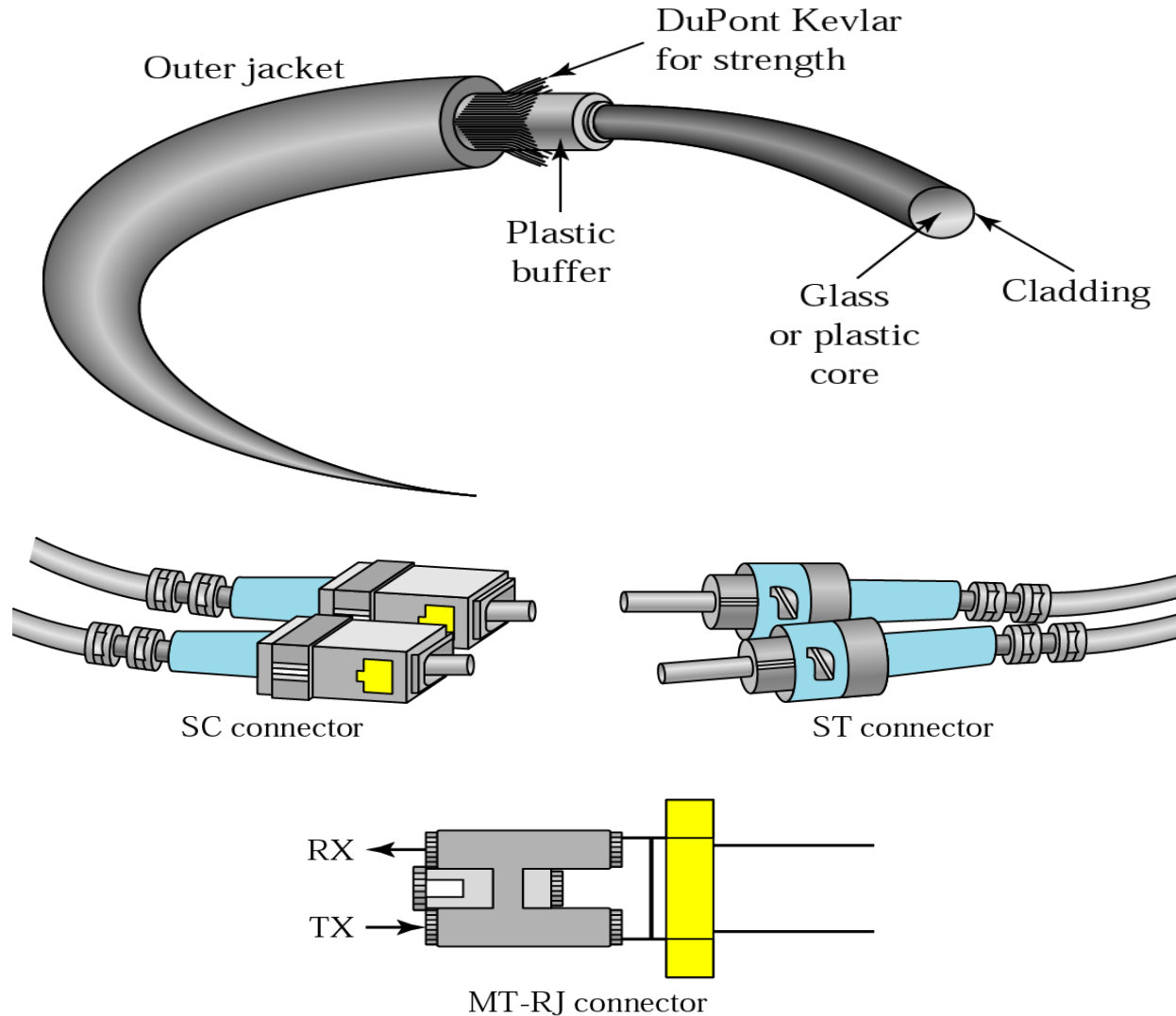
Type	Core	Cladding	Mode
50/125	50	125	Multimode, graded-index
62.5/125	62.5	125	Multimode, graded-index
100/125	100	125	Multimode, graded-index
7/125	7	125	Single-mode

Fibră optică – lungimi de undă



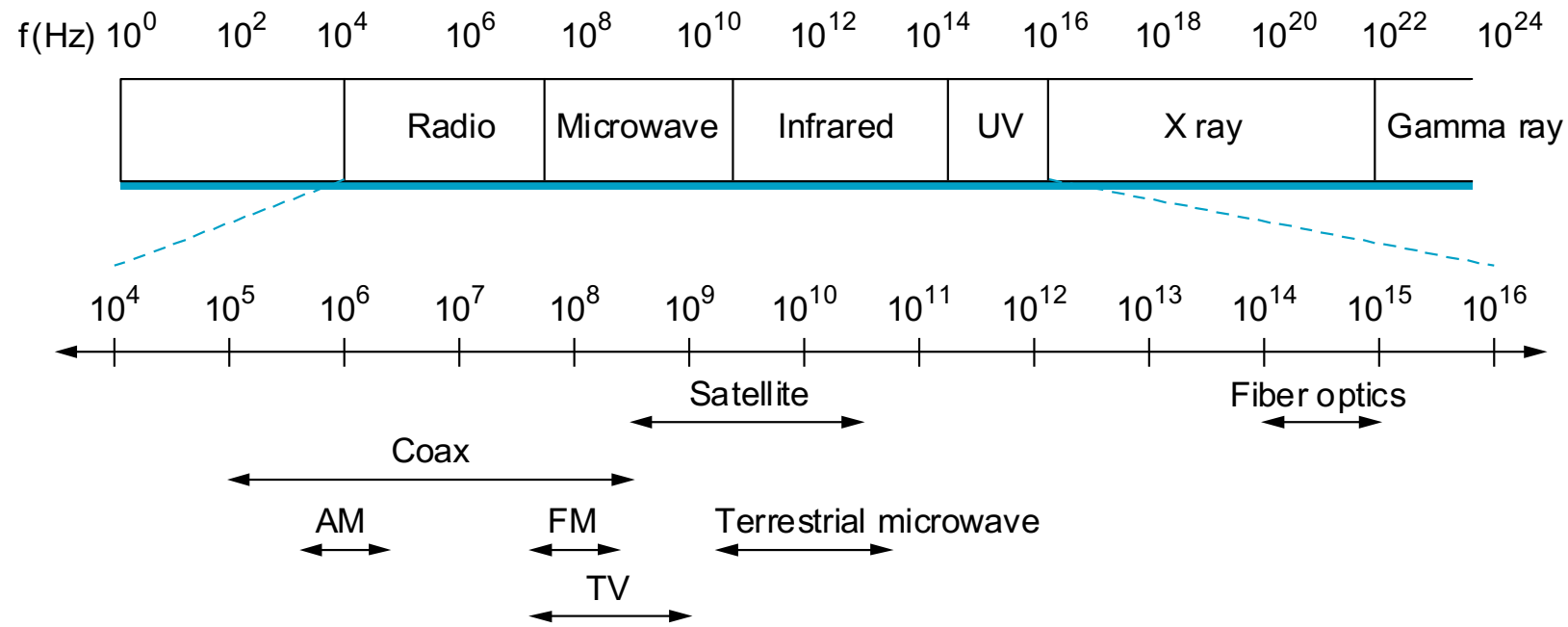
850nm	3.50dB/Km
1310nm	1.25dB/Km
1550nm	0.50dB/Km

Fibră optică - conectori

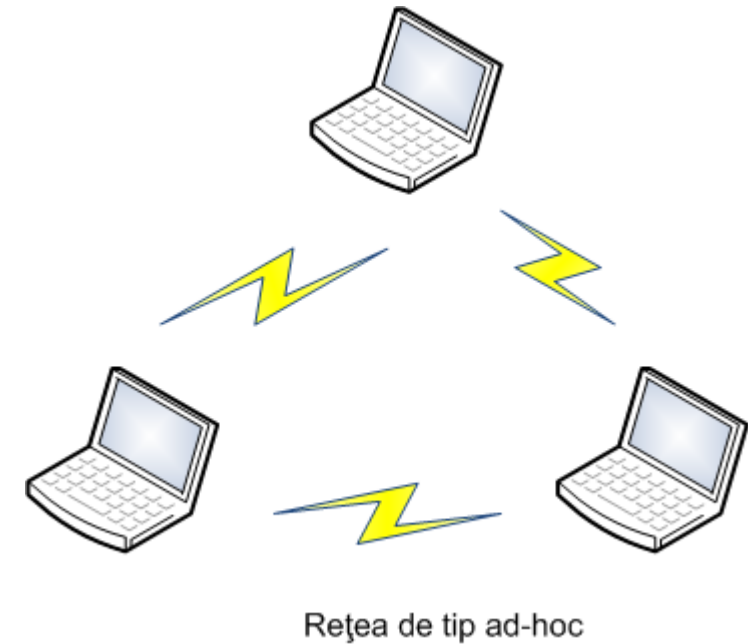
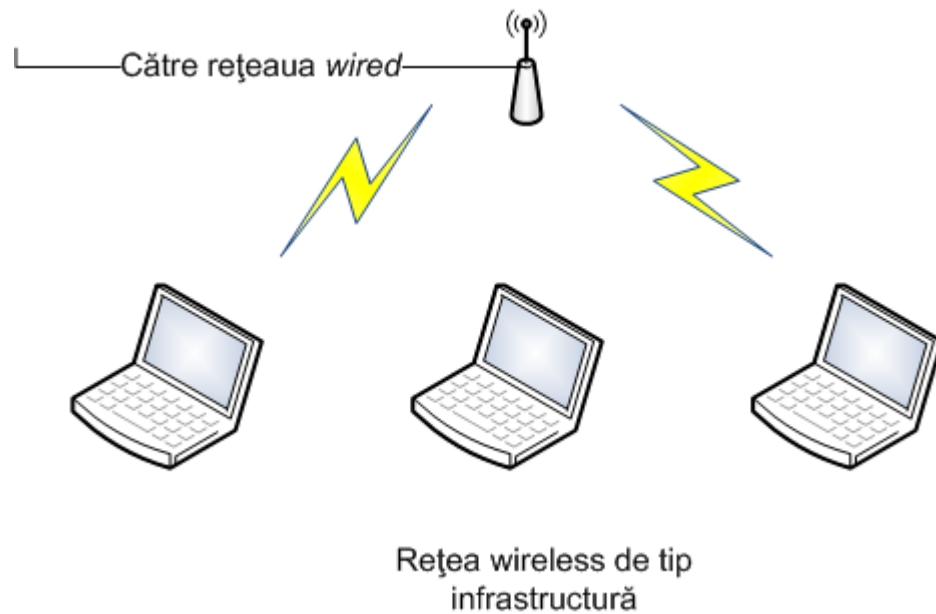


Wireless - Spectrul electromagnetice

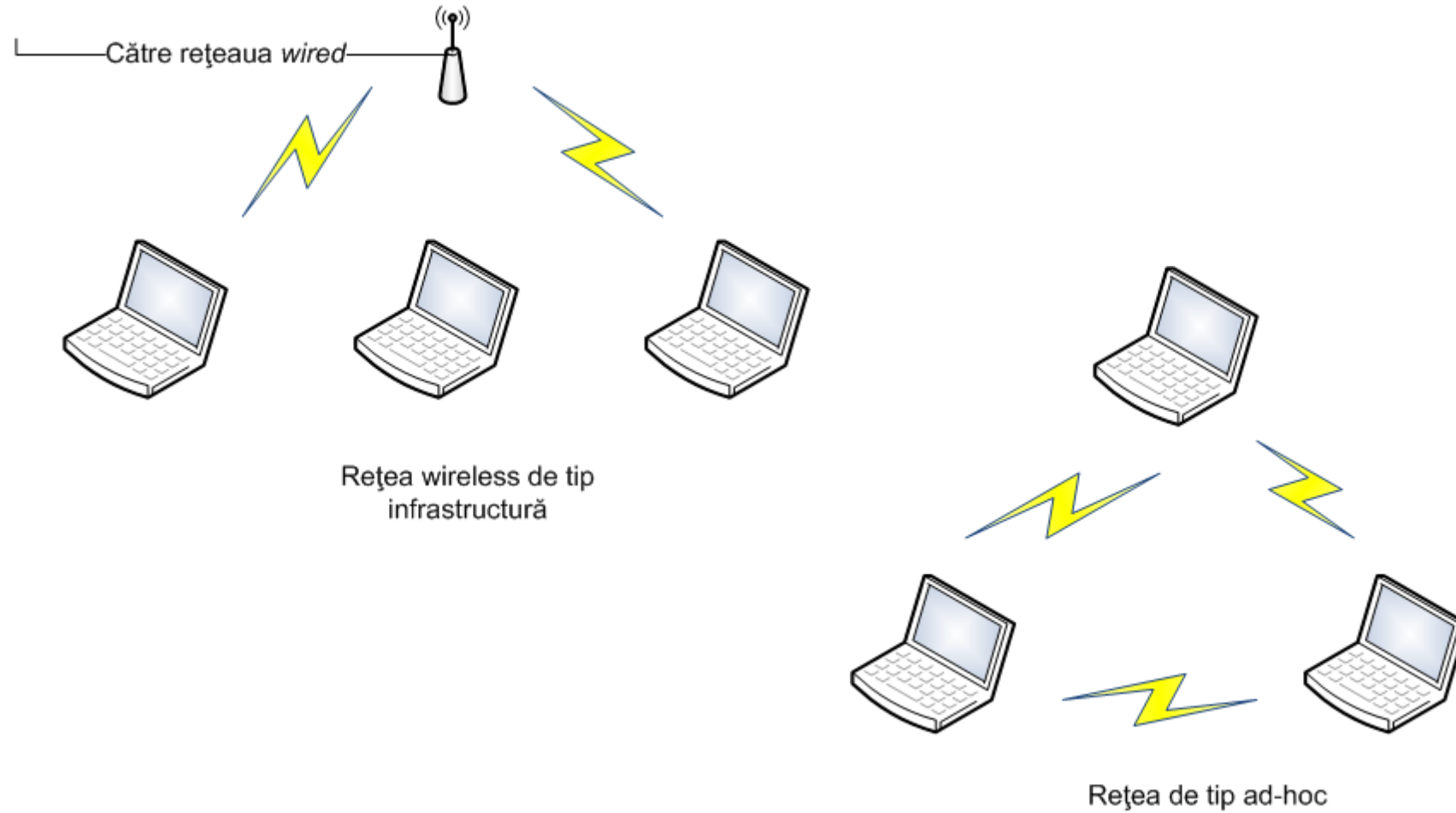
- Unde radio – comunicații multicast: radio și televiziune
- Microunde – comunicații unicast: telefoane mobile, rețele de sateliți, Wireless LAN
- Infraroșii – transmisii pe distanță scurtă



Wireless - topologii



Wireless



Multiplexare

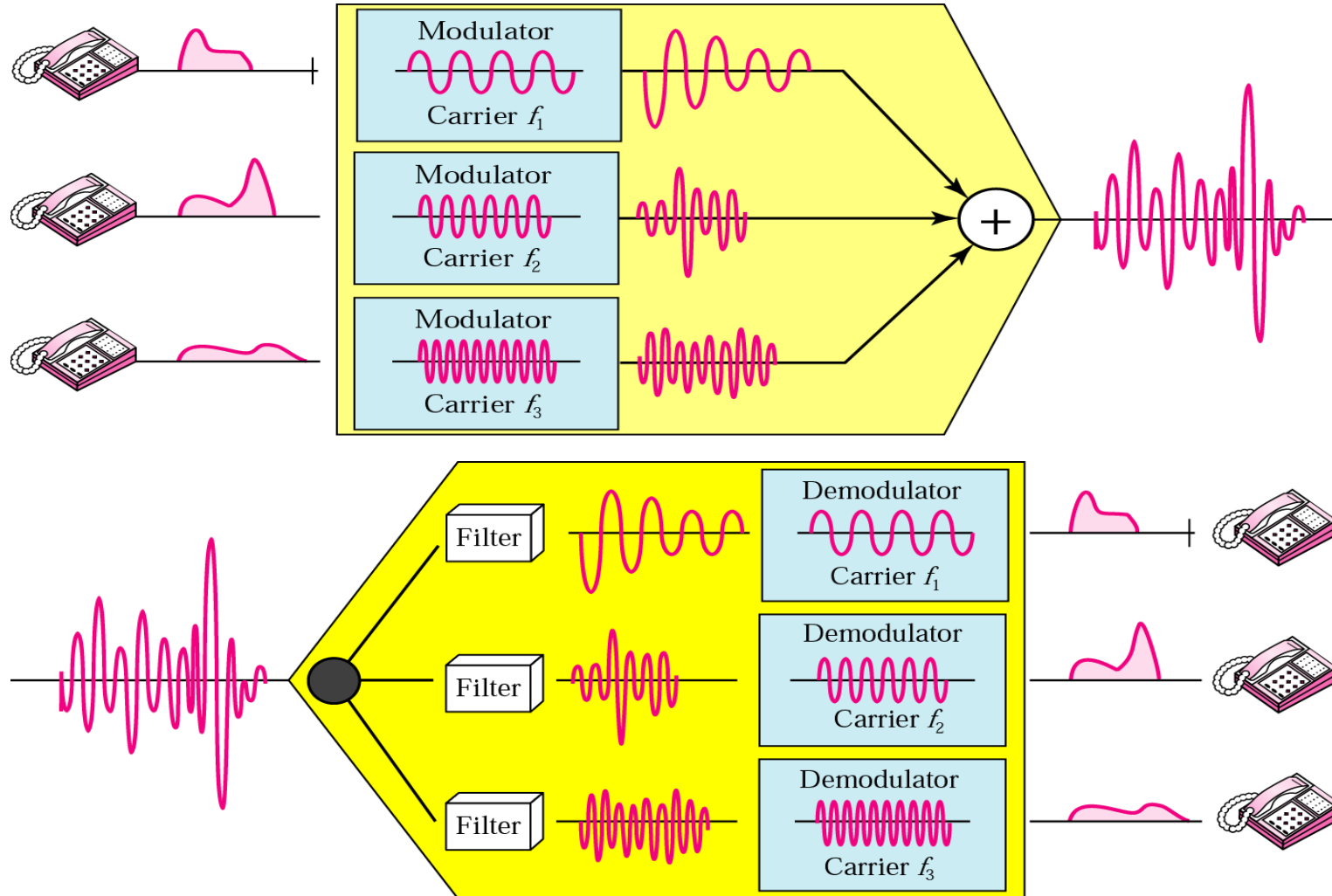
- FDM
- WDM
- TDM



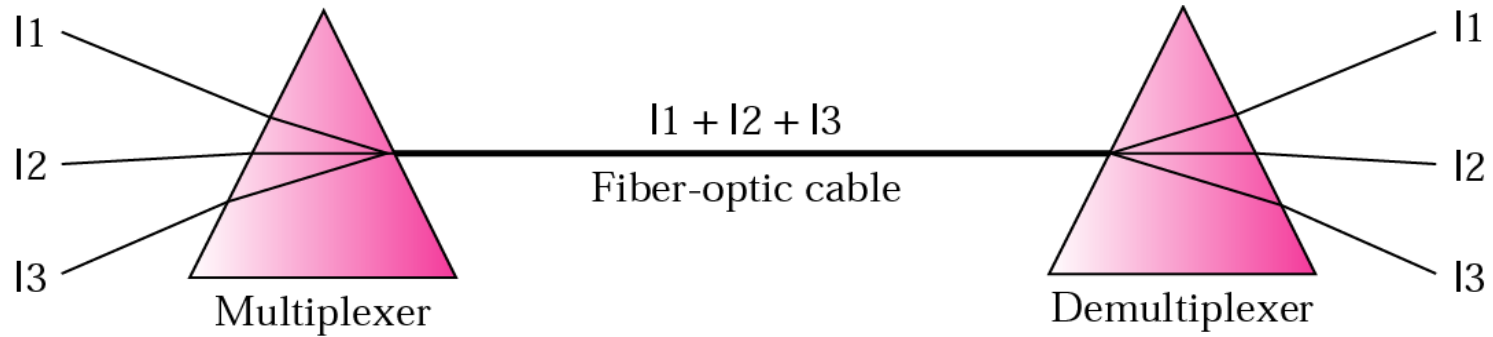
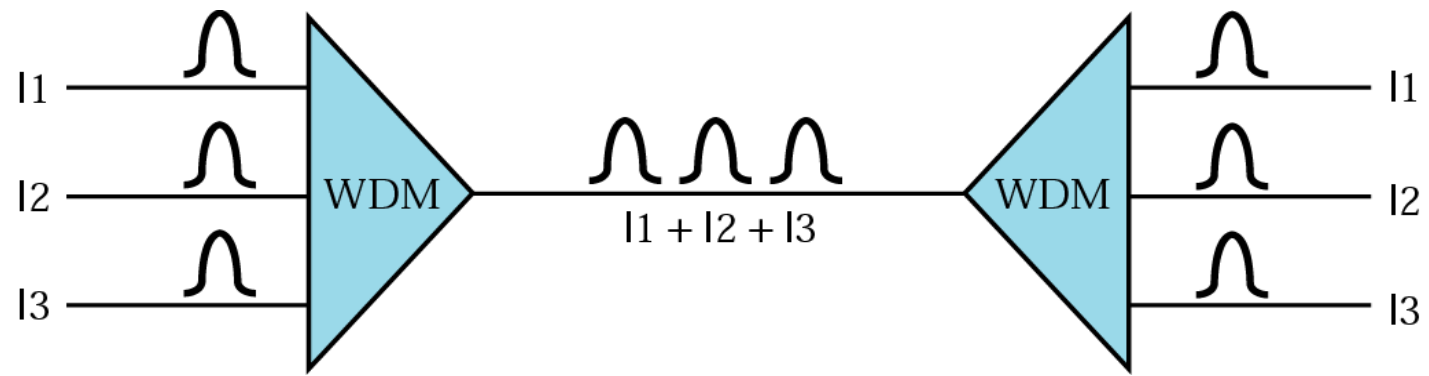
Multiplexare

- Constă în gruparea mai multor fluxuri de date într-un singur semnal peste un singur mediu partajat
- Analogică
 - FDM – frequency division multiplexing
 - WDM – wavelength division multiplexing (mediu optic)
- Digitală
 - TDM – time division multiplexing

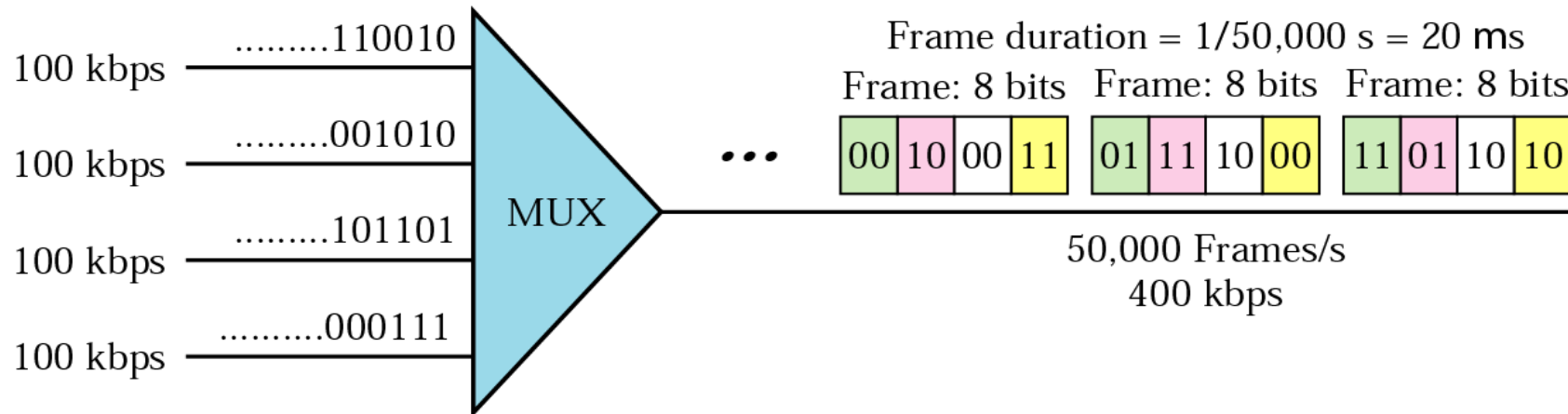
Multiplexare - FDM



Multiplexare - WDM



Multiplexare - TDM



Performanța comunicației

- Throughput, latență
- Atenuare, crosstalk, zgomot
- Media convertoare
- Reptoare



Performanța unei rețele

- Throughput
 - Cantitatea de date transmise în unitatea de timp
 - Unități de măsură:
 - KB = 2^{10} bytes
 - Mbps = 10^6 bits per second
- Latența
 - Timpul necesar pentru ca un semnal (sau bit) să ajungă din punctul A în punctul B
 - *one-way vs round-trip time (RTT)*
 - Componente:
 - Timpul de propagare
 - Latența introdusă de echipamente

Probleme la transmisie

Atenuare

Soluție: Repetor



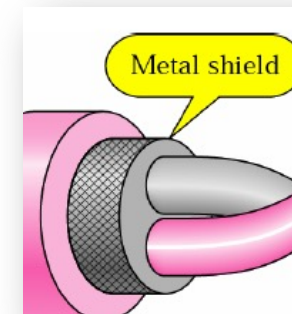
Crosstalk

Soluție: Torsadare



Zgomot

Soluție: Ecranare



Media converter

Electric - electric



Electric - optic



Electric - wireless



Repetor

Repetor electric



Repetor optic



Repetor wireless



Sumar

