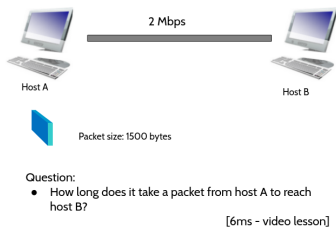


Es 1



1) Trasformo 2Mbps in bit

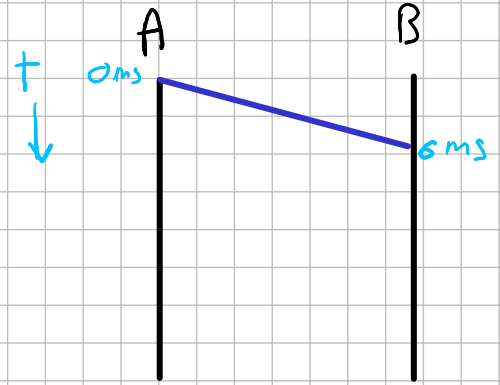
$$2 \cdot 10^6 \text{ bps}$$

2) Trasformo 1500 Byte in bit

$$1500 \cdot 8 = 12000 \text{ bit}$$

3) Calcolo la distanza T_{Tx}

$$T_{Tx} = \frac{L}{R} = \frac{12000 \text{ bit}}{2 \cdot 10^6 \text{ bps}} = \frac{12}{2 \cdot 10^3} = 0,006 \text{ s}$$



Es 2

- A must send to B a file with size 9500 bytes
- Rate between A and B is 1 Mbps
- Distance between A and B 400km
- MTU is 1500 byte (ignore header size)
- Store-and-forward technique

How long does it take B to receive the whole file?

[78ms - video lesson]

1) Calcolare tempo propagazione (T_p):

$$T_p = \frac{\text{distanza}}{\text{velocità luce}} = \frac{400 \text{ km}}{2 \cdot 10^8 \text{ m/s}} = \frac{400 \cdot 10^3 \text{ m}}{2 \cdot 10^8 \text{ m/s}} = 0,002 \text{ s}$$

2) Calcolo il numero di pacchetti da inviare:

$$\frac{9500}{1500} = 6 \text{ Pacchetti da 1500 Byte} + 1 \text{ da 500 Byte}$$

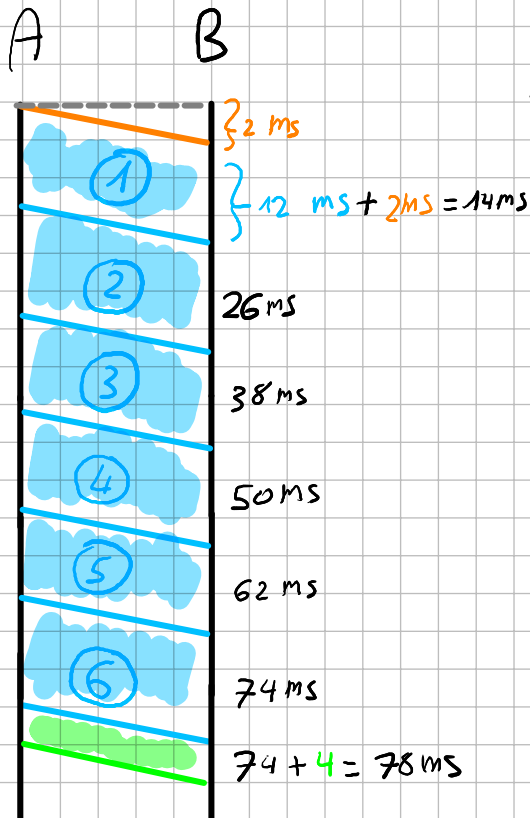
↳ MTU

3) Tempo trasferimento T_{Tx} pacchetti:

$$T_{Tx}(1500) = \frac{L}{R} = \frac{1500 \text{ Byte}}{1 \text{ Mbps}} = \frac{1500 \cdot 8 \text{ b}}{1 \cdot 10^6 \text{ bps}} = 0,012 \text{ s}$$

$$T_{Tx}(500) = \frac{T_{Tx}(1500)}{3} = \frac{0,012}{3} = 0,004 \text{ s}$$

↳ è un terzo del pacchetto di prima



• T_p

• Pacchetto da 1500 Byte

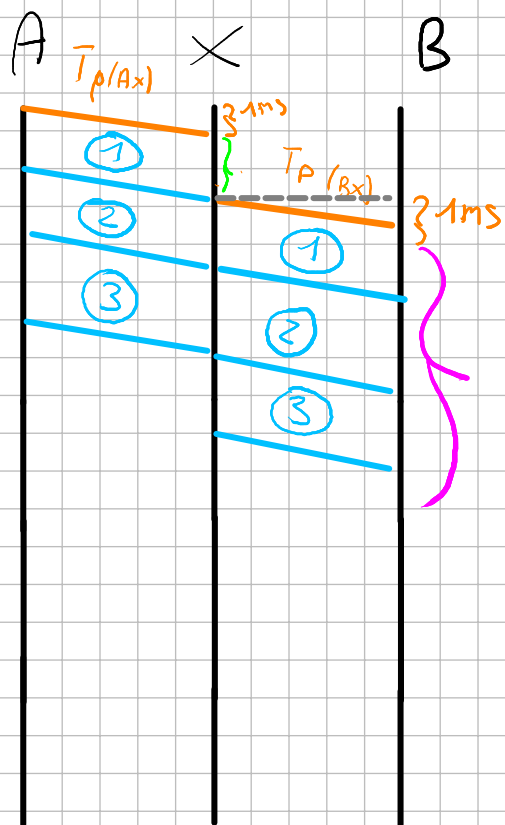
• Pacchetto da 500 Byte

Es 2 con router

- A must send to B a file with size 9500 bytes
- Rate between A and B is 1 Mbps
- Distance between A and B 400km
- MTU is 1500 byte (ignore header size)
- Store-and-forward technique

How long does it take B to receive the whole file?

[78ms - video lesson]



$$A \leftrightarrow X = 200 \text{ km} \quad B \leftrightarrow X = 200 \text{ km}$$

$$T_p(Ax) = \frac{200 \text{ km}}{2 \cdot 10^8 \text{ m/s}} = \frac{200 \cdot 10^3}{2 \cdot 10^8} = 0,0015$$

$$T_p(Bx) = T_p(Ax) \quad \text{// perché distanze uguali}$$

$$\{ 1 + 12 = 13 \text{ ms}$$

$$T_{\text{Tot}}: 13 + 1 + 76 = 90 \text{ ms}$$

$\rightarrow t_x$ picchetti, visto dall'es di primo