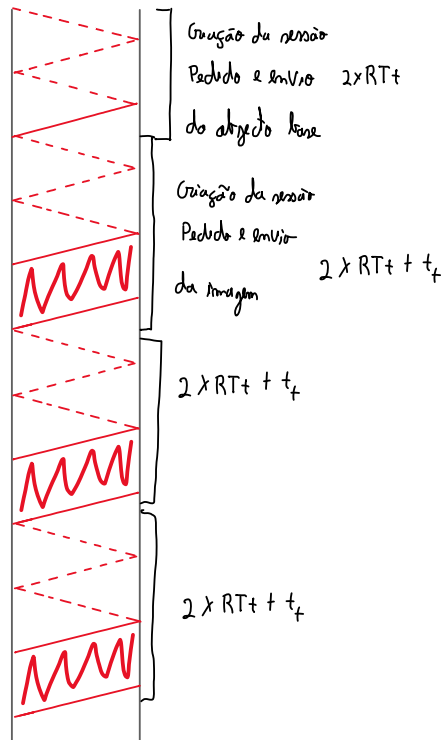


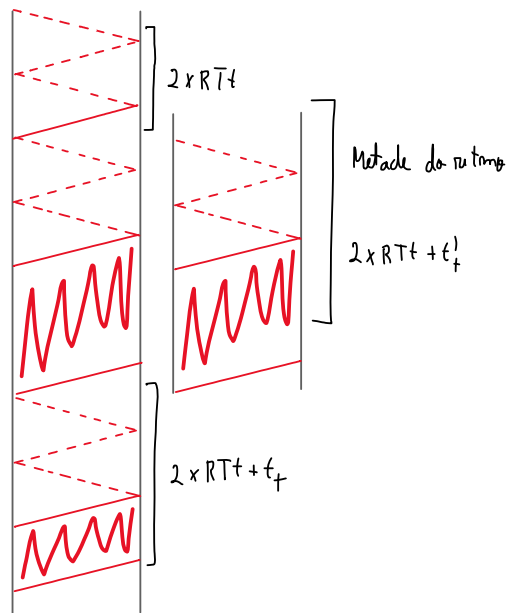
1/

$$RTt = 20 \text{ ms}$$

a)



b)



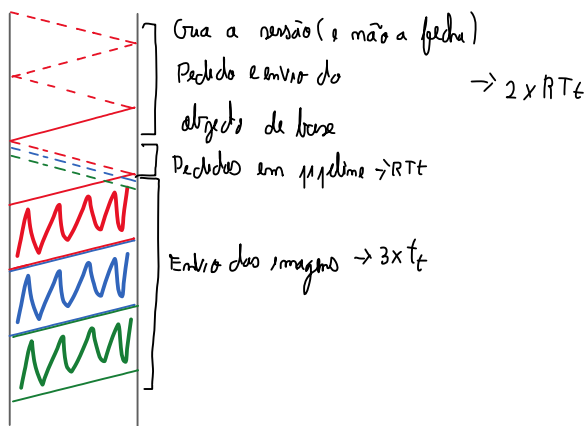
$$t = 2 \times RTt + 3(2 \times RTt + t_f) = 282.88 \text{ ms}$$

$$t_f = \frac{50 \times 2^{10} \times 8}{10 \times 10^6} = 40.96 \text{ ms}$$

$$t = 2 \times RTt + 2 \times RTt + t_f^1 + 2 \times RTt + t_f = 242.88 \text{ ms}$$

$$t_f^1 = \frac{50 \times 2^{10} \times 8}{5 \times 10^6} = 81.92 \text{ ms} \quad (\text{Pouparmos } 2 \times RTt !)$$

c)

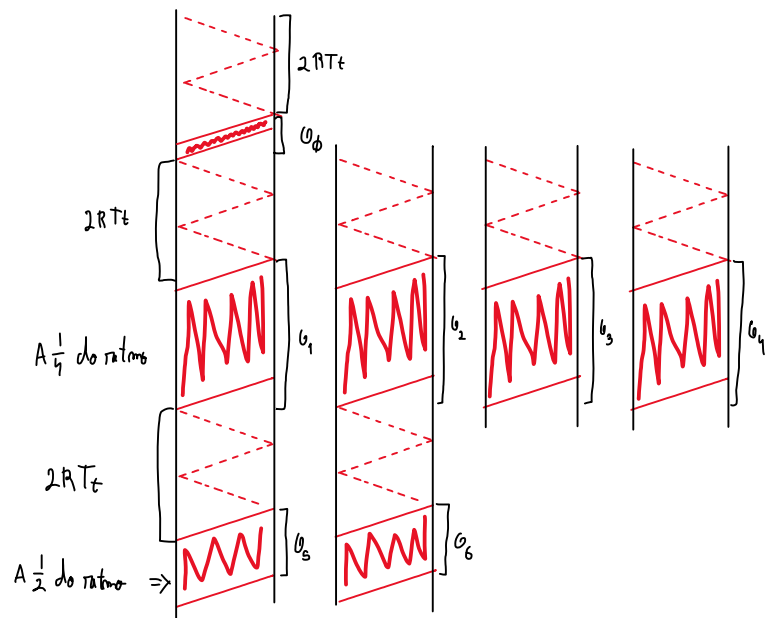


$$t = 2 \times RTt + RTt + 3 \times t_f = 182.88 \text{ ms}$$

2/

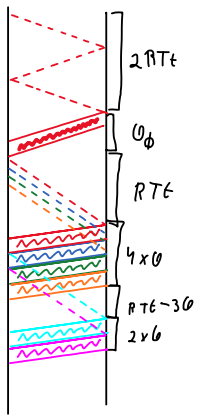
$$C_p = 1000 \text{ bytes} \quad C = 4 \text{ Mbit/s}$$

$$C_{1...6} = 4000 \text{ bytes} \quad RTt = 2 \times 20 \text{ ms} = 40 \text{ ms}$$



$$t = 2 \times RTt + \frac{C_p \times 8}{C} + 2 \times RTt + 4 \times \frac{C \times 8}{C} + 2 \times RTt + 2 \times \frac{C \times 8}{C} = 240 \text{ ms}$$

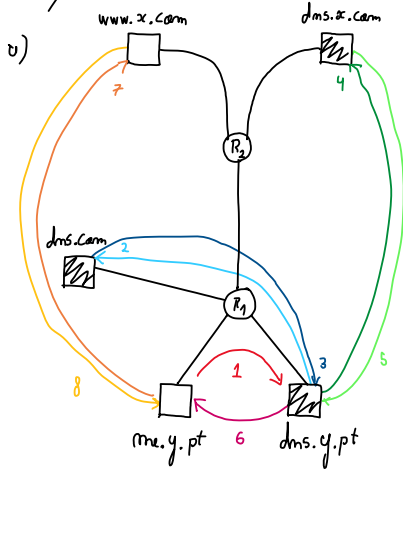
3/



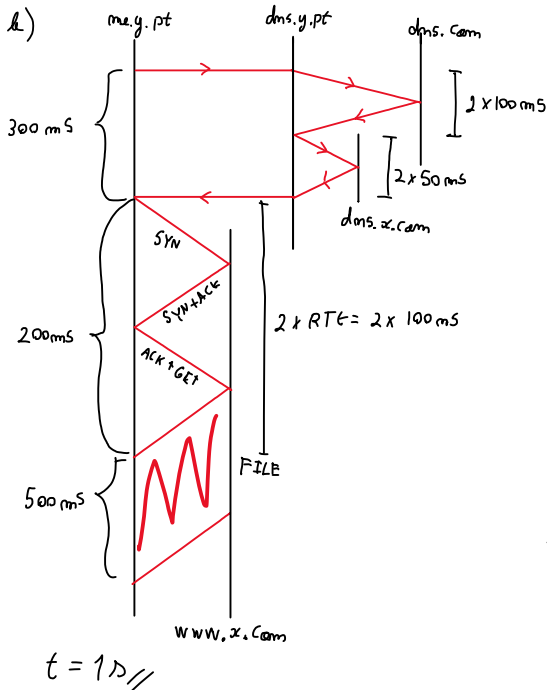
$$2RTt + \frac{0.8 \times 8}{C} + RTt + 4 \times \frac{0.8 \times 8}{C} + RTt - 3 \times \frac{0.8 \times 8}{C} + 2 \times \frac{0.8 \times 8}{C} =$$

$$= 4RTt + \frac{0.8 \times 8}{C} + 3 \times \frac{0.8 \times 8}{C} = 186 \text{ ms}$$

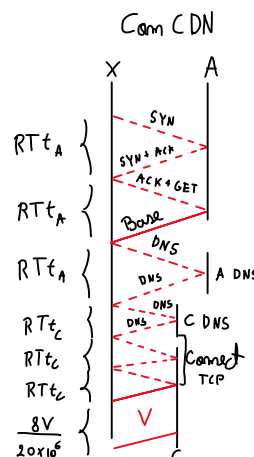
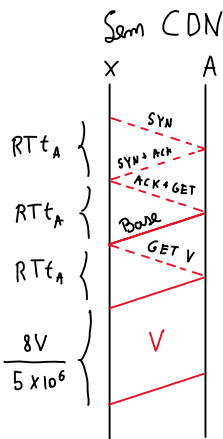
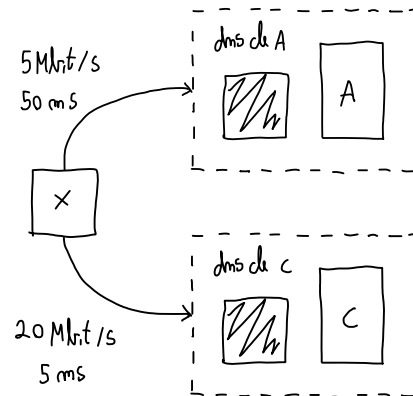
4/



Origem	Destino	Mensagem
1 me.y.pt	dns.y.pt	IP de www.x.com?
2 dns.y.pt	dns.com	IP de www.x.com?
3 dns.com	dns.y.pt	IP de dns.x.com
4 dns.y.pt	dns.x.com	IP de www.x.com?
5 dns.x.com	dns.y.pt	IP de www.x.com
6 dns.y.pt	me.y.pt	IP de www.x.com
7 me.y.pt	www.x.com	Get - HTTP
8 www.x.com	me.y.pt	ok - HTTP



5/



$$\frac{8V}{5 \times 10^6} = 3 \times (2 \times 5 \text{ ms}) + \frac{8V}{20 \times 10^6} \Leftrightarrow$$

$$\Leftrightarrow V = 25000 \text{ bytes}$$

Se $V > 25000 \text{ bytes}$ completa CDN!