Ficha 2 - Redes de Computadores

Associação Empresarial da Região de Setúbal

①

$F = 1000\,KB$

$RTT = 100\,ms$

handshake = 1 RTT

pacote = 1 KB

a) $V_T = 1\,Mbps$

1 pacote — 1 KB

x pac. — 1000 KB

$x = 1000$ pacotes de 1 KB

$1\,KB = 2^{10}\,bytes = 1024\,bytes$

1 byte — 8 bits

1024 bytes — $x = 8192$ bits (= 1 KB)

$T_{t\,p} = \frac{8192}{10^6} =$

$= 8\,ms$

$T_{total} = RTT_{handshake} + T_{t.pacotes} + T_{prop}$

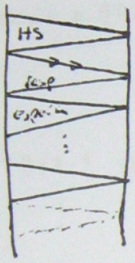
$= 100\,ms + \frac{1000 \times 8\,ms}{1024} + \frac{RTT}{2} =$

$= 100\,ms + 0{,}08\,s + 50\,ms = 8{,}15\,s$

b) $V_t = 1\,Mbps$

$T_t = HS + 1000(T_{t\,p.} + esp) - RTT(ultimo) + T_p$

HS = 1 RTT = 100 ms



$T_{t\,p} = 8\,ms$ $T_p = RTT/2$

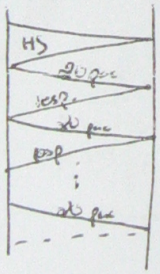
$T_t = 100 + 1000(8 + 100) + 100 + 50$

$= 108050\,ms$

c) 1 RTT — 20 pac.

x — 1000 pac.

$x = 50$ RTT



$T_t = 1\,RTT + 50\,RTT - \frac{RTT}{2}$

$= 100 + 5000 - 50 =$

$= 5050\,ms = 5{,}05\,s$

d)

RTT	1º	2º	3º	N
envia	$2^{1-1}=1$	$2^{2-1}=2$	$2^{3-1}=4$	2^{N-1}
total env.	2^0-1	2^2-1	2^3-1	2^N-1

$T_t = 1\,RTT + N \times RTT + - \frac{RTT}{2}$

$2^N - 1 \geq 1000$ pacotes

$2^N \geq 1001$ pacotes

$N \geq 9{,}9$

$T_t = 100 + 10 \times 100 - 50 = 1050\,ms$

$= 1{,}05\,s$

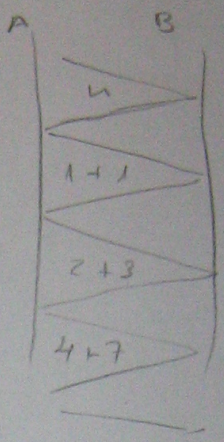
1.

d) F = 1000 kB

P = 1 kB → 1000 pacote

RTT = 100 ms

RTT	1º	2º	3º	4º
ainda	$1 = 2^0$	$2 = 2^1$	$4 = 2^2$	2^{N-1}
total enviado	$1 = 2^1 - 1$	$3 = 2^2 - 1$	$7 = 2^3 - 1$	$2^N - 1$



$T = hS + N \times RTT - \frac{RTT}{2}$ — ñ conto

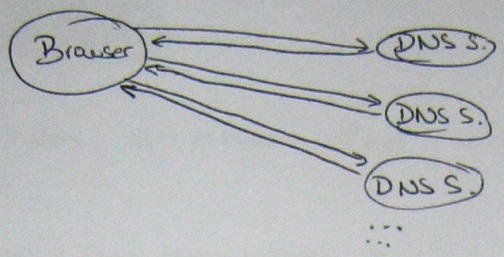
$2^N - 1 \geq 1000$ pacotes $\Rightarrow 2^N \geq 1001 \Rightarrow N \geq \log_2 1001 \Rightarrow N \geq 9{,}9$

$N = 10$

$T = 1RTT + 10RTT - \frac{RTT}{2} = 11RTT - \frac{RTT}{2}$

$11 \times 100 - 50 = 1100 - 50 = 1050\,ms = 1{,}050\,s$

3 (4)



$T_{pedido\ HTTP}$ = Handshake + pedido/resp. = $2RTT_0$

$T_{iteração\ DNS} = \sum_{i=1}^{n} RTT_i$ $\qquad T_{total} = 2RTT + \sum_{i=1}^{n} RTT_i$

(5)

DNS

1 pág + 3 obj

a) HTTP/1.0 sem conex. paralelas

$T_t = DNS + \underbrace{[1RTT + 1RTT]}_{\text{pedido página}} + 3 \times \underbrace{[1RTT + 1RTT]}_{\text{pedido 1 objecto}} = DNS + 8RTT$

(abre, pede)

b) HTTP/1.0 com conex. paralelas

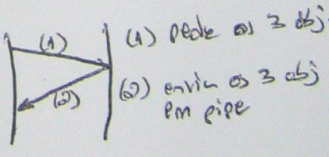
$T_b = DNS + Ped.\ Pág + \underbrace{3 \text{ conexões paralelas } \{\text{cada uma } [1RTT + 1RTT]}$

$= DNS + 2RTT_0 + 2RTT_0 = DNS + 4RTT_0$

c) HTTP/1.1 com pipelining

$T_b = DNS + Ped.\ Pág + Ped\ obj\ (3)$

$= DNS + \underbrace{2RTT_0}_{\text{abrir + pedido}} + \underbrace{RTT_0}_{\text{conexão estar aberta}}$



Associação Empresarial da Região de Setúbal

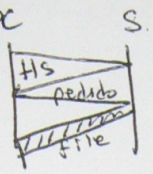
⑥

$RTT = 2ms \qquad V_t = 10\ Mbps = 10^7\ bps$

a) $P_{ed} = 10000\ bits = 10^4\ bits$

HTTP/1.0

$T_{t\,ped} = \frac{10^4}{10^7} = 1ms$



$T_t = 2RTT + T_t = 5ms$

$= 2 \times 2ms + 1ms = 5ms$

b) $RTT_{ext} = 200ms$

hit rate = 50%.

$T = 50\% \cdot [\overbrace{2 \times 2 + 1}^{a)}] +$

$+ 50\% \cdot [(2 \times 200 + 1) + (2 \times 2 + 1)]$

$= 205,5\ ms$