Corso di Qualità del Servizio e Sicurezza

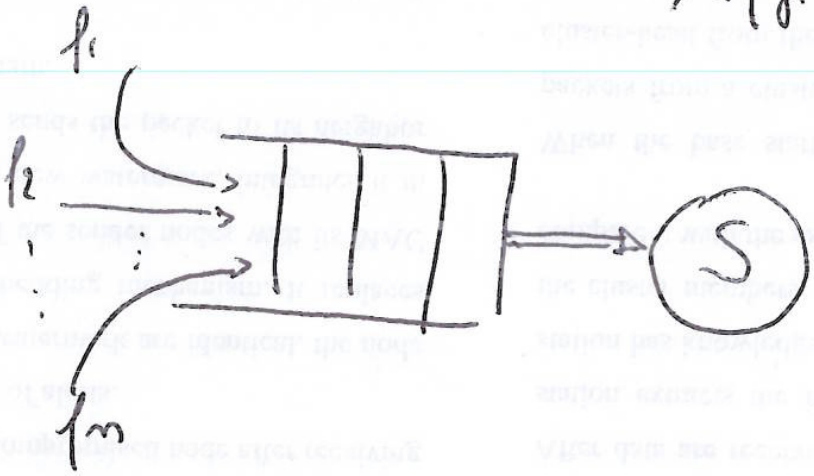
01-04-2015

Scheduling

Es.1) C LINK [bit/s]

n flussi f_i $1 \le i \le n$ $B(f_i)$ banda richiesta [bit

$A(f_i)$ banda assegnata dall
scheduler [b
al flusso f_i

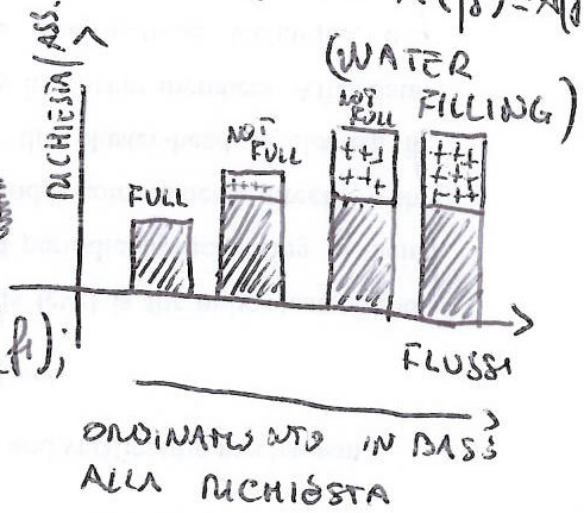


- ALLOCAZIONE AMMISSIBILE : $\sum_{i=1}^{m} A(f_i) \leq C$

SCHEDULING MAX-MIN-FAIR

NON È POSSIBILE AUMENTARE LA BANDA DEL FLUSSO i SENZA RIDURRE LA BANDA DEL FLUSSO j CON $A(f_j) \leq A(f$

È DETTO MAX-MIN PERCHÈ IL FLUSSO CHE RICEVE LA BANDA MINORE, STA RICEVENDO IL MASSIMO SENZA AVERE SPRECO DI RISORSE



1) SI ORDINANO I FLUSSI IN BASSO ALLA RICHIESTA

2) SELEZIONARE f_1 ; se $B(f_1) \leq C/m \Rightarrow A(f_1) = B(f_1)$;
se $B(f_1) > C/m \Rightarrow A(f_1) = C/m$;

3) $m--$; $C = C - A(f_1)$; rimuovi f_1 dai flussi da servire

4) se $m > 0$ goto 2), else stop

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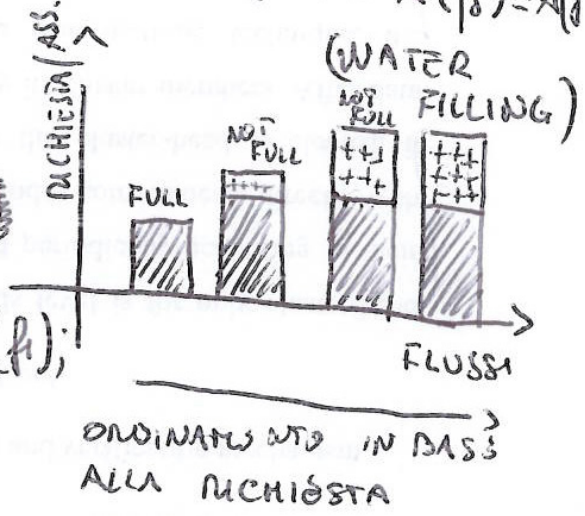

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ESEMPIO: $m = 6$ $R = [$

ESEMPIO: $m = 6$ $B = [0.2, 0.3, 0.1, 0.05, 3, 2.5]$ $C = 4$;

STEP(1)

1) $\Rightarrow B[0.05, 0.1, 0.2, 0.3, 2.5, 3]$

2) $B(f_1) = 0.05$; $C/m = 4/6 \cong 0,66 \Rightarrow A(f_1) = 0.05$ (FULL)

3) $m = 5$, $C = 3.95$ $B = [0.1, 0.2, 0.3, 2.5, 3]$ (2

STEP (2)

1) $B = [0.1, 0.2, 0.3, 2.5, 3]$ $B(f_1) = 0.1$ $C/m = \frac{3.95}{5} = 0.79$

2) $B(f_1) = 0.1 < 0.79 \Rightarrow A(f_1) = 0.1$

3) $m = 4$, $C = 3.85$, $B = [0.2, 0.3, 2.5, 3]$

Step (3)

1) $B = [0.2, 0.3, 2.5, 3]$ $B(f_1) = 0.2$ $C/m = \frac{3.85}{4} = 0,9625$

2) $B(f_1) = 0.2 < 0.9625 \Rightarrow A(f_1) = 0.2$

3) $m = 3$, $C = 3.65$ $B = [0.3, 2.5, 3]$

Step (4)

1) $B = [0.3, 2.5, 3]$ $B(f_1) = 0.3$ $C/m = \frac{3.65}{3} \simeq 1,21\bar{6}$

2) $B(f_1) = 0.3 < 1,21\bar{6} \Rightarrow A(f_1) = 0.3$

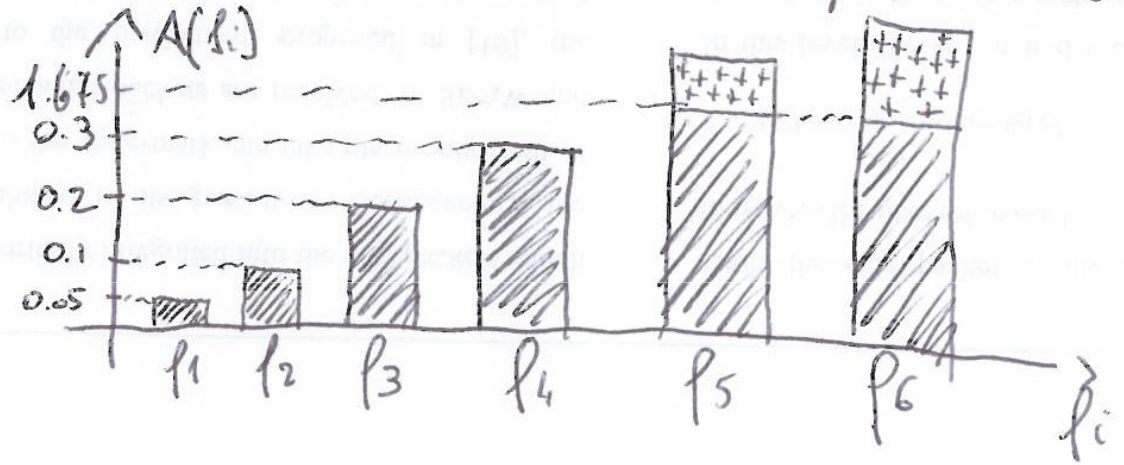
3) $m = 2$, $C = 3.35$, $B = [2.\bar{5}, 3]$

STSP(5)

1) $B = [2.5, 3]$ $\quad B(f_1) = 2.5$ $\quad C/m = \frac{3.35}{2} = 1,675$

2) $B(f_1) = 2.5 > 1.675 \Longrightarrow$ $\quad A(f_1) = 1.675$

$A(f_2) = 1.675$



ESERCIZIO) SCHEDULING FIFO (3)

$n = 4$, $C = 1$ Mbps PACKET-SIZE $= L = 1000$ bit $T_s = \frac{\text{PACKET\_SIZE}}{C}$

$T_s = \frac{1000}{1 \times 10^6} = 1$ ms $\left[\frac{b}{b/s} = s\right]$

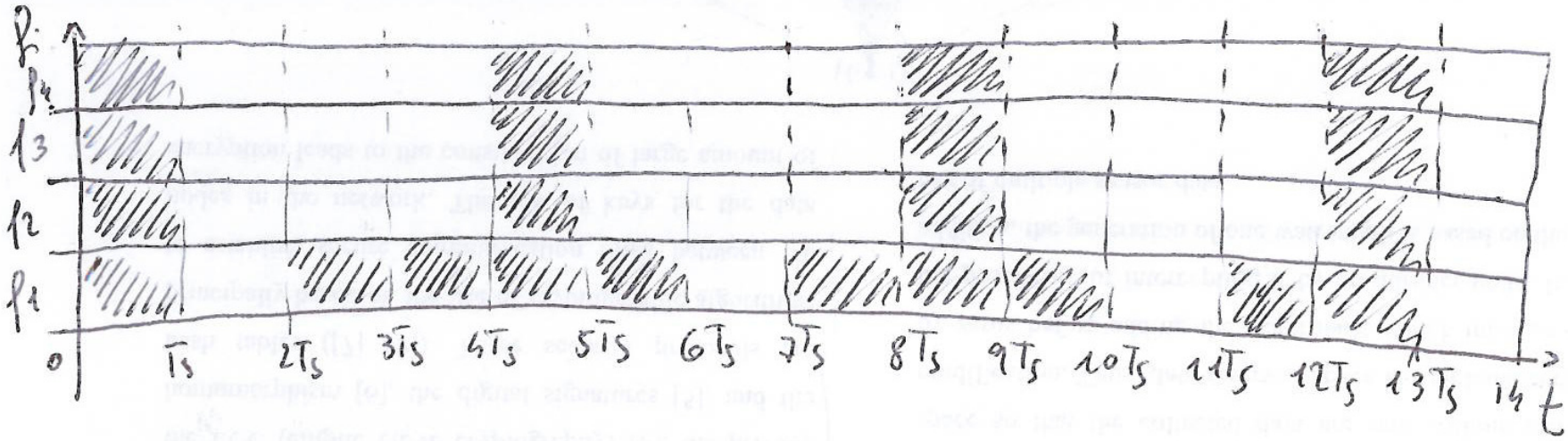
Volutere:

a) bit-rate medio $B(f_i)$ offerto da ciascun flusso in $[0, 14T_s]$;

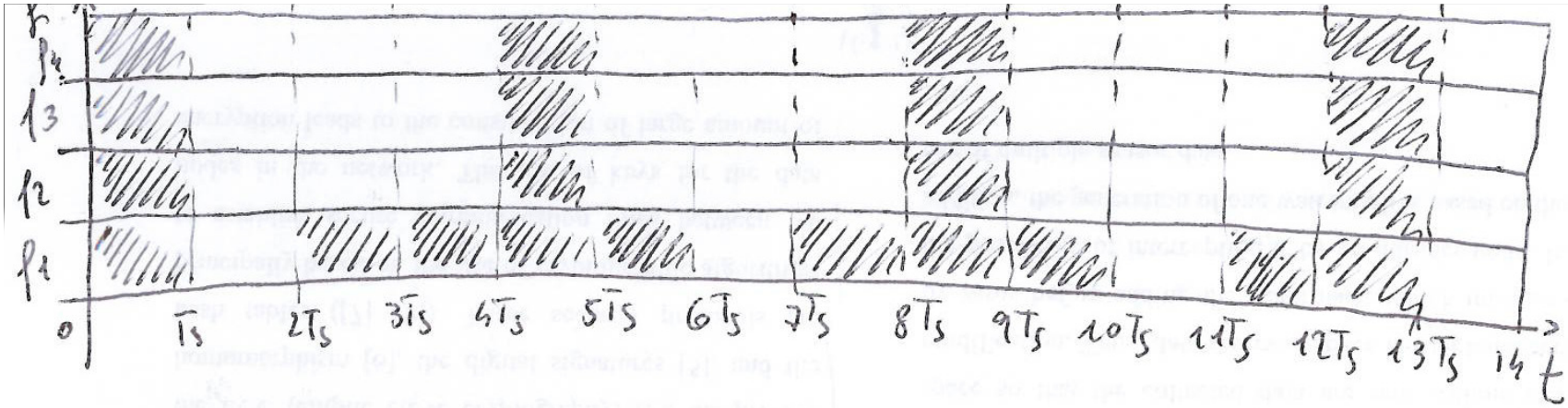
b) ordine trasmissione pacchetti;

c) throughput $A(f_i)$ $\forall f_i$ in $[0, 14T_s]$

Sulla base dell'ordine di arrivo:



$B(f_1) = \frac{10L}{14T_s} = \frac{5}{7} \cdot C \simeq 714{,}28$ Kbps $B(f_2) = B(f_3) = B(f_4) = \frac{4 \cdot L}{14T_s} = \frac{2}{7} C \simeq 28$ kb



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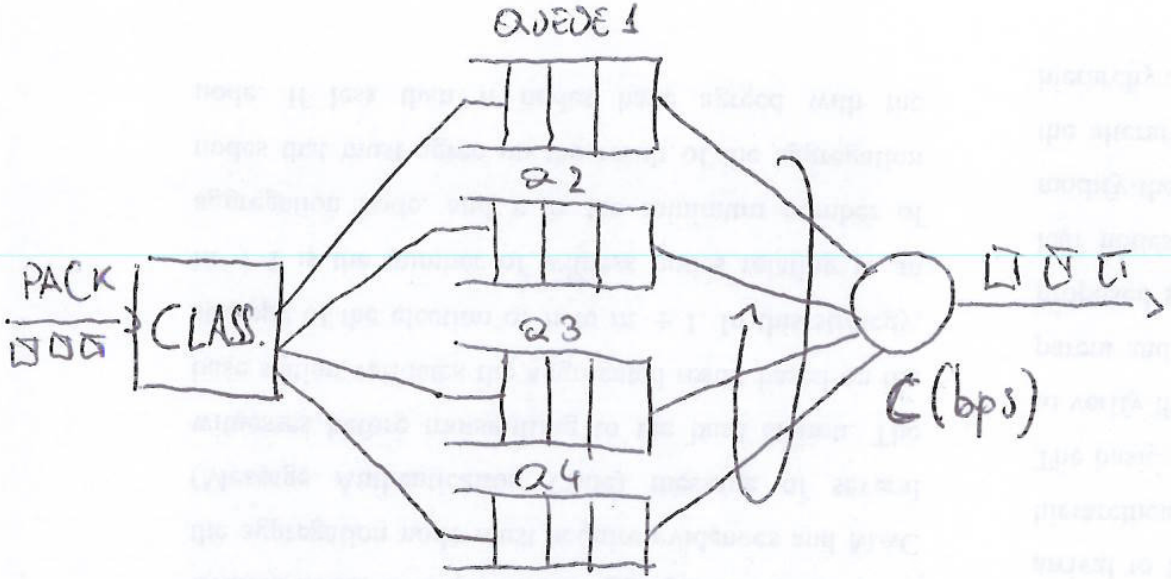
b)

c) $A(f_1) = \frac{7L}{14T_S} = 0.5\,C = 500$ Kbps $A(f_2) = \frac{3L}{14T_S} \cong 214{,}3$ Kbps

$A(f_3) = \frac{2L}{14T_S} = \frac{1}{7} C \cong 142{,}85$ Kbps $A(f_4) = \frac{2L}{14T_S} \cong \frac{1}{7} C \cong 142{,}85$ Kbps

ALLOCAZIONE FAIR $A(f_i) = \frac{C}{4} = 250$ Kbps

ESERCIZIO) SCHEDULING FAIR QUEUING (ROUND ROBIN)

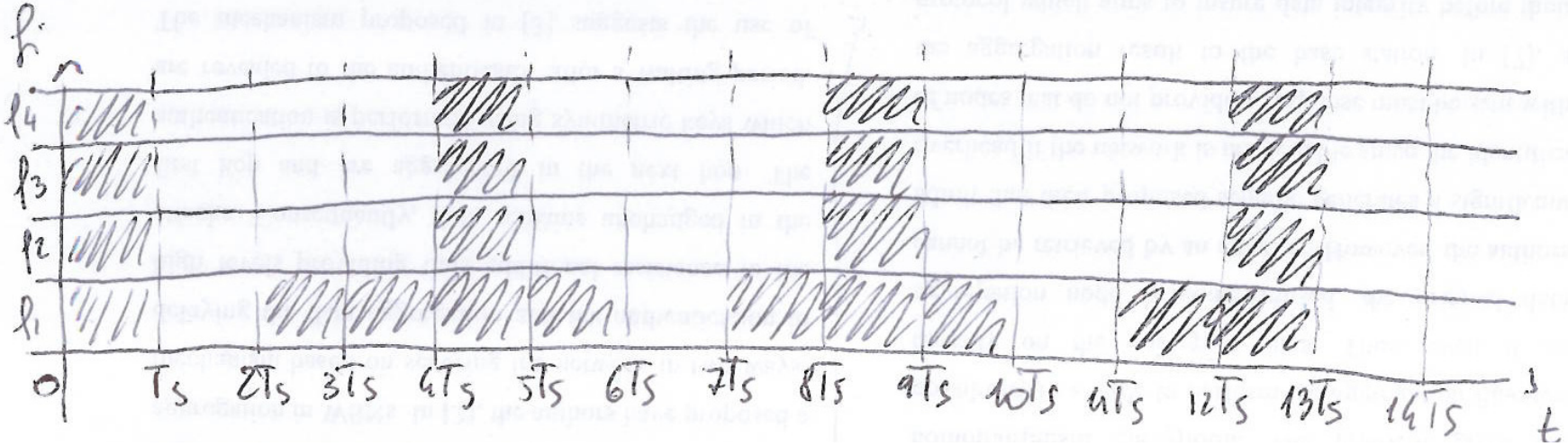


$n = 4$

$C = 1\,Mbps$

(L)
PACKET SIZE = 1000

$T_s = \frac{\text{PACKET\_SIZE}}{C} = 1\,ms$



Valutare:

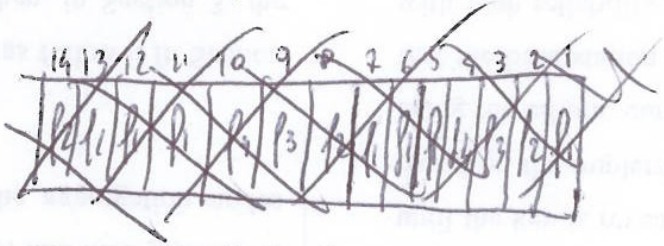
1) ORDINE TRASMISSIONE PACCHETTI

$B(f_1) = \frac{10L}{14T_S} \simeq 714,28$ Kbps

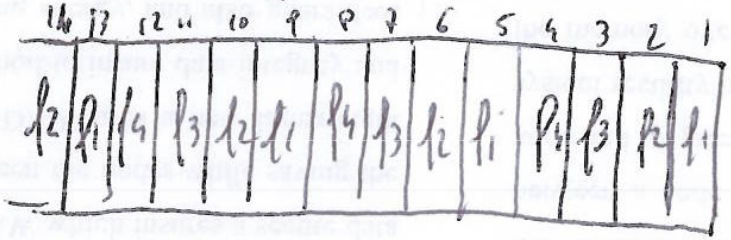
2) THROUGHPUT $A(f_i)$ $\forall f_i$ in $[0, 14T_S]$

$B(f_2) = B(f_3) = B(f_4) =$

$= \frac{4 \cdot L}{14T_S} \simeq 285,7$ Kbps



1)



2) $A(f_1) = \frac{4L}{14T_S} \simeq \frac{2}{7} C \simeq 285,7$ Kbps

$A(f_2) = \frac{4L}{14T_S} \simeq 285,714$ Kbps

$A(f_3) = A(f_4) = \frac{3L}{14T_S} \simeq 0,214 \cdot C \simeq 214$ Kbps