



## Lezione n.14 del 22/04/2015



# Random Early Detection

$$\Rightarrow w_q = 0.6$$

(44)

$$t=0 \quad L=0 \quad 0 < LB \Rightarrow \text{ACCORDA} \Rightarrow L=1$$

$$t=1 \quad L=1 \quad 1 < LB \Rightarrow \text{ACCORDA} \Rightarrow L=2$$

$$t=2 \quad L=2 \quad 2 < LB \Rightarrow \text{ACCORDA} \Rightarrow L=3$$

$$t=3 \quad L=3 \quad LB \leq L < UB \Rightarrow \text{VALUTA } P$$

$$P = P_b = 0.1 \cdot \frac{AVG - 3}{9 - 3} = 0 < P_{MAX} \Rightarrow \text{ACCORDA} \Rightarrow$$

$L=4$

$$t=4 \quad L=4 \quad LB \leq L < UB \Rightarrow \text{VALUTA } P$$

$$P = P_b = 0.1 \cdot \frac{AVG' - 3}{6} = \frac{0.1}{6} \cdot [(1-0.6) \cdot 3 + 0.6 \cdot 4] = 0.06 < P_{MAX} \Rightarrow \text{ACCORDA} \quad L=5$$

$\Rightarrow$  ACCORDA  $L=5$

$$t=5$$

$$L=5$$

$$LB \leq L < UB \Rightarrow \text{VALIDA P}$$

$$\begin{aligned} P = P_b &= 0.1 \cdot \frac{AVG^* - 3}{6} = \frac{0.1}{6} \cdot [(1-0.6)3.6 + 0.6 \cdot 5] = \\ &= 0.086 < MAX P \Rightarrow \\ &\Rightarrow \text{ACCORDA } L=6 \end{aligned}$$

$$t=6$$

$$L=6$$

$$LB \leq L < UB \Rightarrow \text{VALIDA P}$$

$$\begin{aligned} P = P_b &= 0.1 \cdot \frac{AVG^* - 3}{6} = \frac{0.1}{6} \cdot [(1-0.6)4.44 + 0.6 \cdot 6] = \\ &= 0.0896 < MAX P \Rightarrow \\ &\Rightarrow \text{ACCORDA} \end{aligned}$$

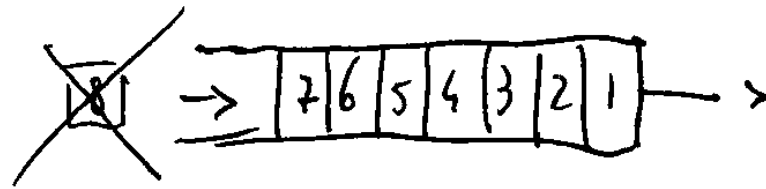
$$t=7$$

$$L=7$$

$$LB \leq L < UB \Rightarrow \text{VALIDA P}$$

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$$P = P_b = 0.1 \cdot \frac{AVG^* - 3}{6} = \frac{0.1}{6} \left[ (1-0.6) \cdot 5.376 + 0.6 \cdot 7 \right] = 6.35$$
$$= 0.1058 > MAX_P \Rightarrow \text{SCARTA PACCHIATO}$$



$$t = 8 \quad L = 7 \quad LB \leq L \leq UB \Rightarrow \text{VALUTA P} \quad \text{COUNT} = 0$$

$$P = P_b = 0.1 \cdot \frac{AVG^* - 3}{6} = \frac{0.1}{6} \left[ (1-0.6) \cdot 6.35 + 0.6 \cdot 7 \right] =$$

$$= 0.112 > MAX_P \Rightarrow \text{SCARTA PACCHIATO}$$

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ESE NETTO RED COMPLETO (RIMOZIONI IPOTESI DI NESSUN ACCESSO AL CANALE)

$$BS = 10 \quad LB = 3 \quad UB = 9 \quad S = 1 \text{ PKT/s} \quad w_q = 0.6 \quad \text{MAX}_p = 0.1$$

$$R = 0.25 \text{ PKT/s} \Rightarrow 1 \text{ PKT OGNI } 4 \text{ s} \quad \text{A PARTINDO DA } \underline{\underline{\bar{t} = 7.5 \text{ s}}}$$

$$t = 0 \quad L = 0 \quad L < LB \Rightarrow \text{ACCODA} \Rightarrow \boxed{\quad \quad \quad | 1}$$

$$t = 1 \quad L = 1 \quad L < LB \Rightarrow \text{ACCODA} \Rightarrow \boxed{\quad \quad \quad | 2 | 1}$$

$$t = 2 \quad L = 2 \quad L < LB \Rightarrow \text{"} \Rightarrow \boxed{\quad \quad \quad | 3 | 2 | 1}$$

$$t = 3 \quad L = 3 \quad L \geq LB \quad L < UB \Rightarrow \text{VALUTA } P$$

$$P = \frac{P_b}{1 - \text{COUNT } P_b} \quad \text{COUNT} = 0 \quad P = P_b = 0.1 \cdot \frac{3 - 3}{6} = 0$$

$$P < \text{MAX}_p \Rightarrow \text{ACCODA} \quad \text{AVG}^* = 3 \quad L = 4 \quad \boxed{\quad \quad \quad | 4 | 3 | 2 | 1}$$



$t=4$   $L=4$   $LB < L < UB$  VALUTA  $P$ :

$$COUNT=0 \quad P=P_b = 0.1 \cdot \frac{AUG^* - 3}{6} = \frac{0.6}{6} = 0.1 < MAXP$$

$$AUG^* = (1-0.6) \cdot 3 + 0.6 \cdot 4 = 1.2 + 2.4 = 3.6$$

ACCODA  $P$ 

|   |   |   |   |   |
|---|---|---|---|---|
| 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|

  
 $L=5$

$t=5$   $L=5$   $LB < L < UB$  VALUTA  $P$

$$COUNT=0 \quad P=P_b = 0.1 \cdot \frac{AUG^* - 3}{6} = 0.024 < MAXP$$

$$AUG^* = (1-0.6) \cdot 3.6 + 0.6 \cdot 5 = 1.44 + 3 = 4.44$$

ACCODA  $P$   $L=6$

$t=6$   $L=6$   $LB < L < UB$  VALUTA  $P$

$$COUNT=0 \quad P=P_b = 0.1 \cdot \frac{AUG^* - 3}{6}$$

$$AUG^* = (1-0.6) \cdot 4.44 + 0.6 \cdot 6 = 1.776 + 3.6 = 5.376$$

$$P_b = 0.0396 < MAXP \Rightarrow ACCODA P$$

$L=7$ 

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|



$t = 7$   $L = 7$   $LB < L < UB$  VALUTA P

$$G_{\text{OUT}} = 0 \quad P = P_b = 0.1 \cdot \frac{AVG^* - 3}{6}$$

$$AVG^* = (1 - 0.6) \cdot 5.376 + 0.6 \cdot 7 = 2.1504 + 4.2 = 6.3504$$

$$P_b = 0.05584 < MAX_P \Rightarrow \text{ACCORDA } L = 8$$

$t = 7.5$   $L = 8$  TRANSMISSIONS PKT  $\Rightarrow$  FIFO  $\Rightarrow L = 7$

AGG. AVG  $\Rightarrow$  PO LA ~~TRANSMISSIONS~~

$t = 8$   $L = 7$   $LB < L < UB$  VALUTA P

$$P = P_b = 0.1 \cdot \frac{AVG^* - 3}{6}$$

$$AVG^* = (1 - 0.6) \cdot 6.74 + 0.6 \cdot 7 = 2.6976 + 4.2 = 6.896$$

$$P = 0.065 < MAX_P \Rightarrow \text{ACCORDA } L = 8$$

$t = 9$   $L = 8$   $LB < L < UB$  VALUTA P

$$P = 0.1 \cdot \frac{AVG^* - 3}{6} \quad AVG^* = (1 - 0.6) \cdot 6.896 + 0.6 \cdot 8 = 7.55$$

$$P = 0.076 < MAX_P \Rightarrow \text{ACCORDA } L = 9$$

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$t=10$   $L=9$   $(L \geq UB)$  SCARTA PKT  $\Rightarrow L=9$ 

|    |   |   |   |   |   |   |   |   |
|----|---|---|---|---|---|---|---|---|
| 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
|----|---|---|---|---|---|---|---|---|

~~|   |
|---|
| 1 |
|---|~~

$t=11$   $L=9$   $L \geq UB$  SCARTA PKT  $\Rightarrow L=9$ 

|    |   |   |   |   |   |   |   |   |
|----|---|---|---|---|---|---|---|---|
| 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
|----|---|---|---|---|---|---|---|---|

~~|   |
|---|
| 1 |
|---|~~

$t=11.5$   $L=9 \rightarrow P$  TRANSMISSIONS  $\Rightarrow$ 

|    |   |   |   |   |   |   |   |
|----|---|---|---|---|---|---|---|
| 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 |
|----|---|---|---|---|---|---|---|

$$AVG^* = (1-0.6) \cdot 7.55 + 0.6 \cdot 8 = 3.02 + 4.8 = \cancel{7.1} 7.1$$

$t=12$   $L=8$   $LB < L < UB \Rightarrow$  VALUTA P

$$P = 0.1 \frac{AVG^* - 3}{6} \quad AVG^* = (1-0.6) \cdot \overset{7.1}{\cancel{7.55}} + 0.6 \cdot 8 = 2.84 + 4.8 = 7.64$$

$P = 0.077 \Rightarrow$  ACCODA  $\Rightarrow L=9$

|    |    |   |   |   |   |   |   |   |
|----|----|---|---|---|---|---|---|---|
| 13 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 |
|----|----|---|---|---|---|---|---|---|

$t=13$   $L=9$   $L \geq UB \Rightarrow$  ~~VALUTA P~~ SCARTA PKT  $\Rightarrow L=9$

|    |    |   |   |   |   |   |   |   |
|----|----|---|---|---|---|---|---|---|
| 13 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 |
|----|----|---|---|---|---|---|---|---|

|    |
|----|
| 10 |
|----|

$t=14$   $L=9$   $L \geq UB \Rightarrow$  SCARTA PKT  $\Rightarrow L=9$   
 $L \geq UB \Rightarrow$  SCARTA PKT  $\Rightarrow L=9$

|    |    |   |   |   |   |   |   |   |
|----|----|---|---|---|---|---|---|---|
| 13 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 |
|----|----|---|---|---|---|---|---|---|

|    |
|----|
| 10 |
|----|



$t=14$   $L=9$   $L > UB \Rightarrow$  SCARTA PUT  $\Rightarrow L=9$

|    |    |   |   |   |   |   |   |   |   |   |
|----|----|---|---|---|---|---|---|---|---|---|
| 13 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|----|----|---|---|---|---|---|---|---|---|---|

~~13~~

$t=15$   $L=9$   $L > UB \Rightarrow$  SCARTA PUT  $\Rightarrow L=9$

|    |
|----|
| 11 |
|----|

~~11~~

$t=15.5$   $L=9 \rightarrow 8$  TRANSMISSIONS

|    |    |   |   |   |   |   |   |
|----|----|---|---|---|---|---|---|
| 13 | 10 | 9 | 8 | 7 | 6 | 5 | 4 |
|----|----|---|---|---|---|---|---|

$$AVG^+ = (1 - 0.6) \cdot 7.64 + 0.6 \cdot 8 = 7.856$$

$t=16$   $L=8$   $LB < L < UB \Rightarrow$  VALIDA P

$$AVG^+ = (1 - 0.6) \cdot 7.856 + 0.6 \cdot 8 = 3.1424 + 4.8 = 7.9424$$

$$P = 0.1 \frac{7.9424 - 3}{6} = 0.0823 < MAX_P$$

ACCORDA  $L=9$

|    |    |    |   |   |   |   |   |   |
|----|----|----|---|---|---|---|---|---|
| 17 | 13 | 10 | 9 | 8 | 7 | 6 | 5 | 4 |
|----|----|----|---|---|---|---|---|---|

$t=17$   $L=9$   $L > UB$  SCARTA PUT  $L=9$

|    |    |    |   |   |   |   |   |   |
|----|----|----|---|---|---|---|---|---|
| 17 | 13 | 10 | 9 | 8 | 7 | 6 | 5 | 4 |
|----|----|----|---|---|---|---|---|---|

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$t=18$   $L=9$  " " " "

$t=19$  " " " "

~~18~~  
~~17~~  
~~16~~



$$t = 20 \quad LB \leq L < UB \quad \text{VALOR} \quad P$$

$$AVG^* = (1 - 0.6) \cdot 7.98 + 0.6 \cdot 8 \approx 8$$

$$P = 0.1 \cdot \cancel{KAT} \frac{8 - 3}{6} \approx 0.083 \Rightarrow \text{ACCORDA}$$

$$L = 9$$

|    |    |    |    |   |   |   |   |   |   |
|----|----|----|----|---|---|---|---|---|---|
| 21 | 17 | 13 | 10 | 9 | 8 | 7 | 6 | 5 | 4 |
|----|----|----|----|---|---|---|---|---|---|

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$$BS = 10 \quad LB = 4 \quad UB = 8 \quad S = 1 \text{ PKT/S} \quad Wq = 0.6 \quad MAX_p = 0.05 \quad R = 0.25 \text{ PKT/S}$$


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$$E = 5.5$$