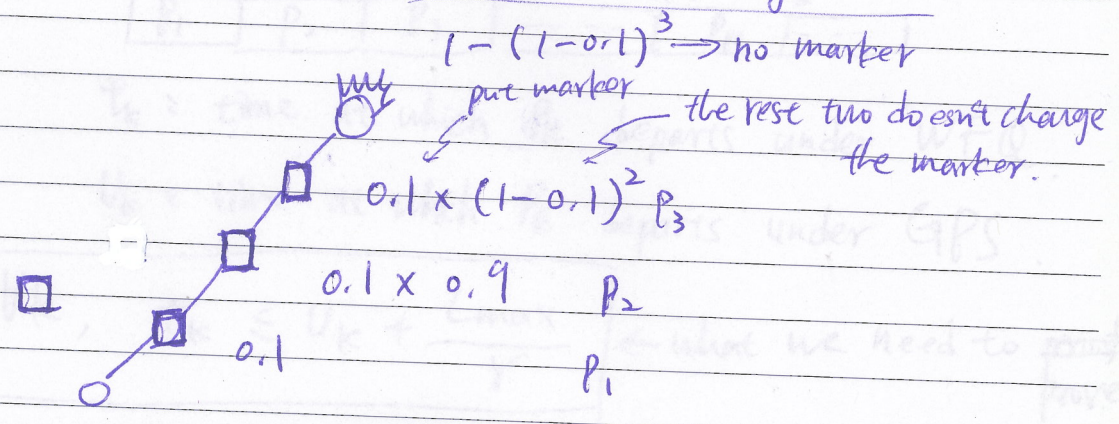


# IP trace back (papers online)

## PPM based IP trace back

↳ Probabilistic Packet Marking



↗  
Could use method in Coupon Collector Problem.

## WFQ = PGPS

Thm 1: With WFQ scheduling, the real finish time of a packet will NOT lag behind its GPS real finish time by

$L_{max} \leftarrow$  max size of a packet

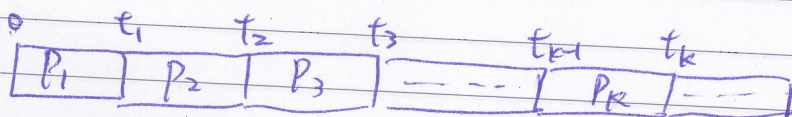
$\gamma \leftarrow$  rate of the link.



Proof of Thm 1:

under busy period,

$P_k = k$ th packet to depart under GPS



$t_k =$  time at which  $P_k$  departs under WFQ

$U_k =$  time at which  $P_k$  departs under GPS

$$\boxed{\forall k, t_k \leq U_k + \frac{L_{\max}}{\gamma}} \leftarrow \text{what we need to } \cancel{\text{proof}} \text{ prove.}$$

(use Extremal Argument)