Lecture 8

Friday, October 12, 2018 1:16 PM

Reduced schedule = schedule that brings item only when requested

Lemma We can transform schedule S to a reduced schedule S' without increasing # of miss.

Proof by induction on the # unreduced miss

Idea: Want to decrease # unreduce miss 1 by 1.

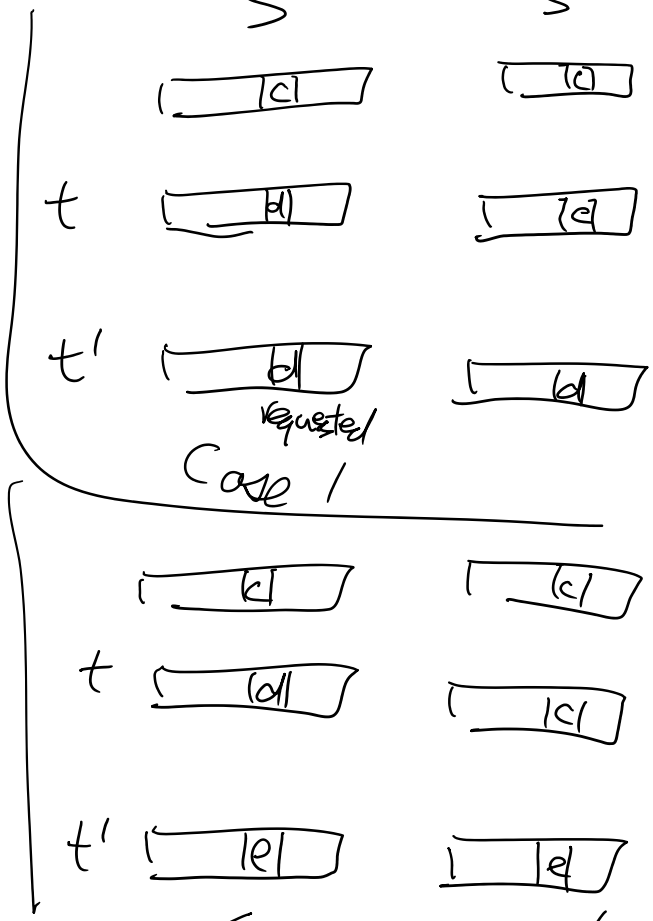
Suppose S brings d into cache at time t without request

Let c be the item S evicts.

Case 1: d is requested later before it got evicts

just evict c when it is used.

Case 2: d is saved requested before evicted



$S \leftarrow$ schedule has α many unnecessary moves

$\downarrow$

S' " has $\alpha - 1$ "

Thm FIF is optimal

Proof by induction. (exchange argument)

Let S_F is the schedule by FIF.

$P(j) =$ "There is an optimal reduced schedule S st it is same as S_F for the first j step"

base case: $j = 0$

IH: $P(j)$ is true

IS: Let S is the schedule given by $P(j)$.

(namely, $S = S_F$ for first j steps. and S is reduced and optimal)

Let d is the $(j+1)^{th}$ request.

Case 1: d is in the cache

$S' \stackrel{def}{=} S$. S' satisfies $P(j+1)$

Case 2: (d is not the cache) and (S and S_F evicts the same item).

$S' \stackrel{def}{=} S$. done.

Case 3: $d \notin S$, S_F evicts e, S evicts $f \neq e$.

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	S	S'	S_F
step j	save | e | f	save | e | f	save | e | f
step $j+1$	save | e | d	save | d | f	save | d | f

Let j' is the first time S and S' take different actions.
Let q be the item requested

Case 3a $q = e$

Case 3b $q = f$