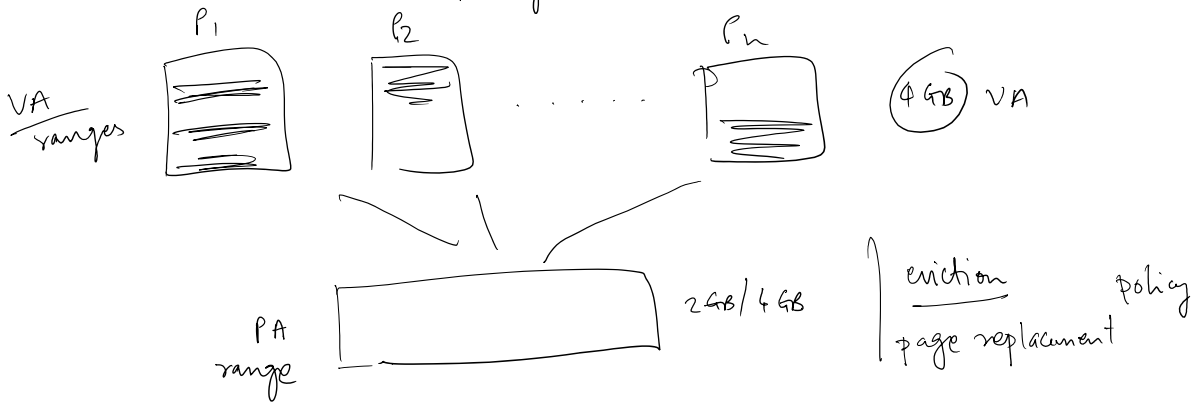


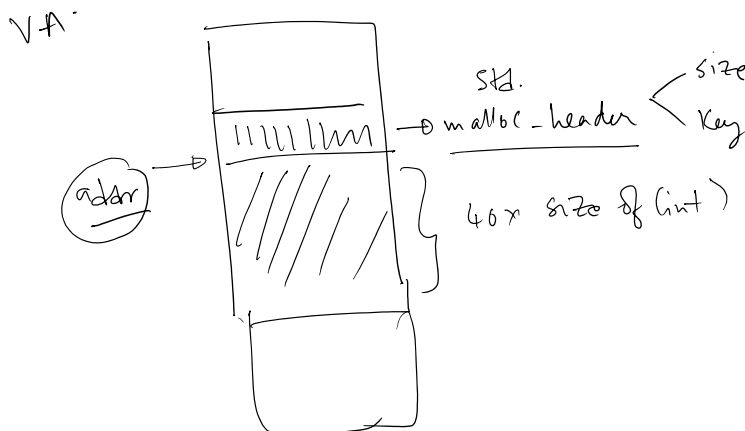
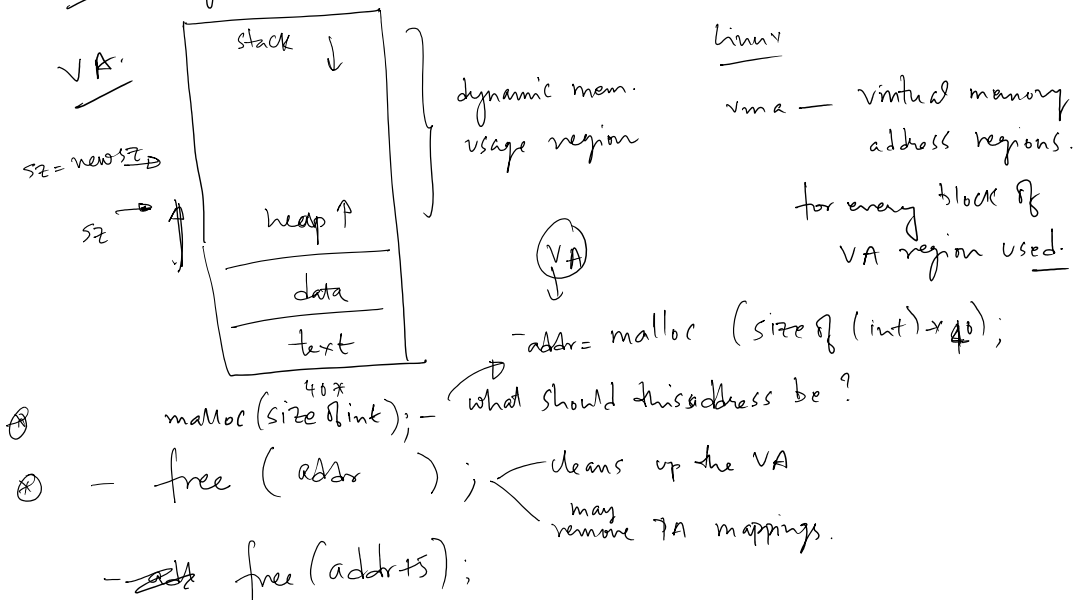
Midsem: OSTEP Chapters 1, 2, 3, 4, 5, 6, 12 to 24

(xvi)

- memory  $\left\{ \begin{array}{l} \text{virtualization} \rightarrow \text{paging, TLBs, anon, address space} \\ \text{management} \rightarrow \text{swapping, layouts} \end{array} \right.$



- (i) manage the (virtual) address space



- (ii) managing the PA space / memory

(ii) managing the ~~PA~~ space / memory

for VA mappings of processes

disk cache  
page

file system  
meta data  
caches.

(1) - optimal

(2)

2 pages per mem.

VP access pattern

0 1 2 0 1 2 0 3 1

0

1

0

2

1

2

1

0

1

3

Aim

to reduce page faults.

first swapping alloc. (mapping, no page)

$$\text{Avg Mem. access times} = P_H \cdot M_A + (1 - P_H) D_A$$

# freelist. ~ list of free (physical) pages.

(2) FIFO — First In First out

LRU — Least Recently Used

LFU

LRU(2) / Clock

Random

0 1 — 2

1 2 —

2 0 —

0 1 —

1 2 —

2 0 —

0 3 —

3 1 —

(9)

1 0 2 0 3 0 4 0 5 0 6 0

seq: 0 1 2 0 1 2 0 3 1

0 1 2 1 0

0 1

1 2

1 2

LRU

0 1

1 2

2 0

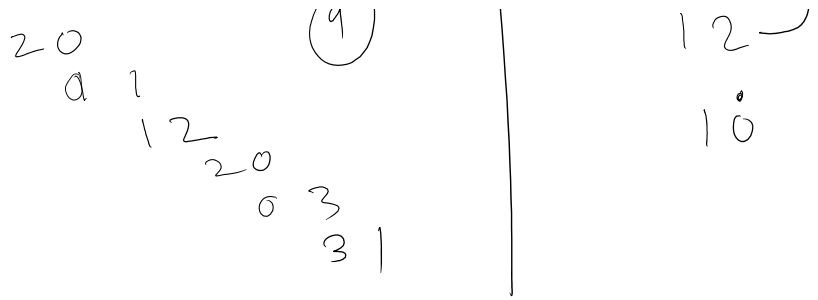
0 1

(9)

1 F r a

LFU

Random



LRU(2) / Clock — PTE flags. — Accessed Bit.

Second-chance

if  $Acc = 0$  — end page & its mapping  
if  $Acc = 1$

set  $Acc = 0$   
move to next page