How do you feel about fall?

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Q1

~Code~
340

CS 340

OS | Concurrency

Updates

1. MP4 UTF-8 due today

2. MP5 Allocator out today, due next tuesday

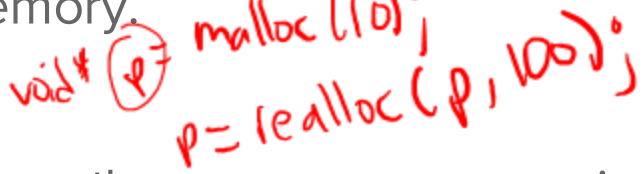
3. HW 4 Thursday

Agenda

1. MP5 Allocator Introduction
2. Concurrency with Processes
3. Operating System (OS)

The Allocator in C

`malloc(size)` - allocates size bytes and returns a pointer to the allocated memory.



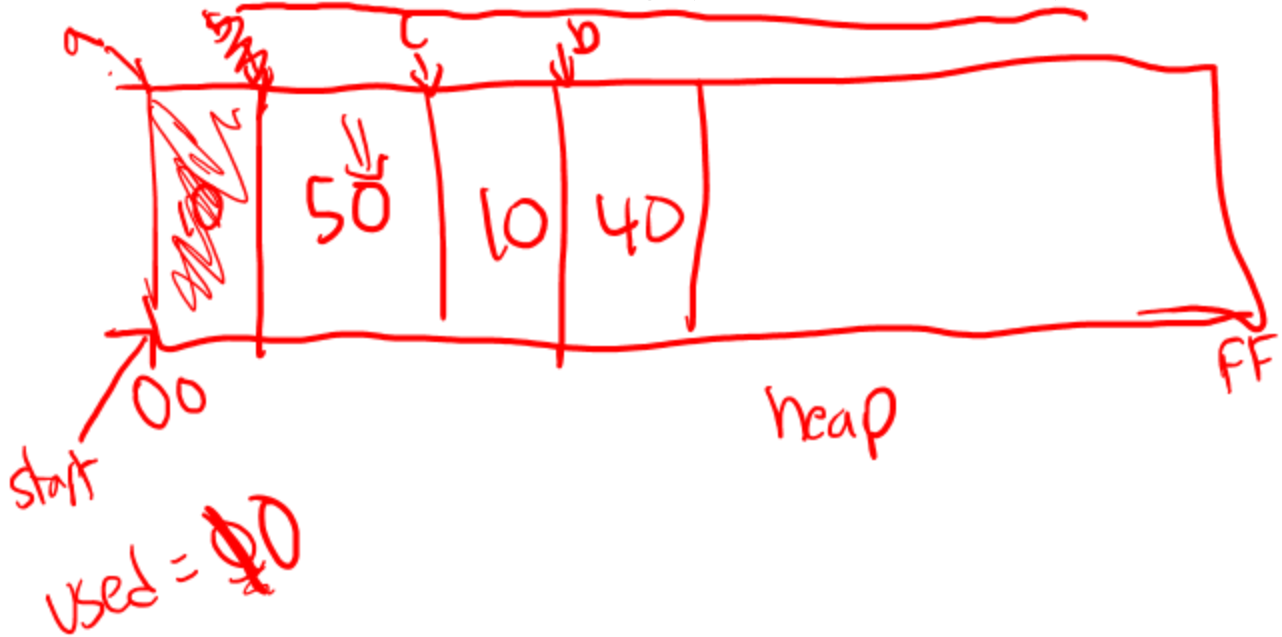
`free(p)` - frees the memory space pointed to by p which must have been allocated previously with a call to malloc.

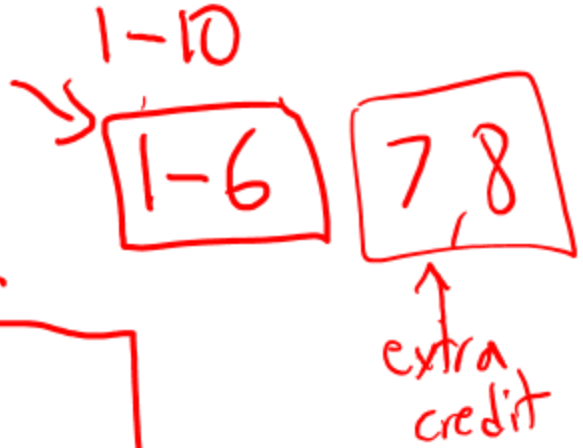
`realloc(p, size)` - changes the size of allocated memory pointed to by p to size bytes. Contents of memory will be unchanged if within new range. If size is 0, this is the same as free(p). The function returns a pointer to the new block of allocated memory or NULL if size is 0.

MP5

Given - malloc, free, realloc

Your task - improve efficiency (space and time)

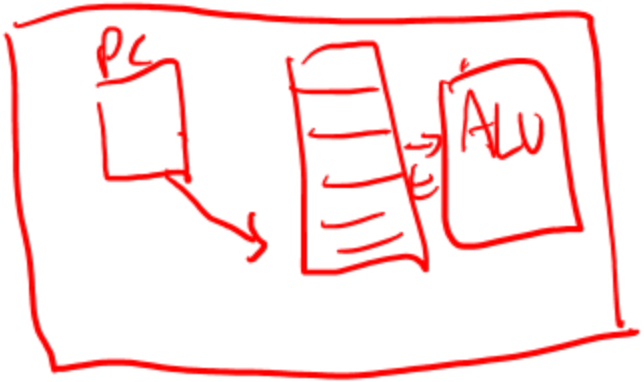




Review/Intro/Build Up

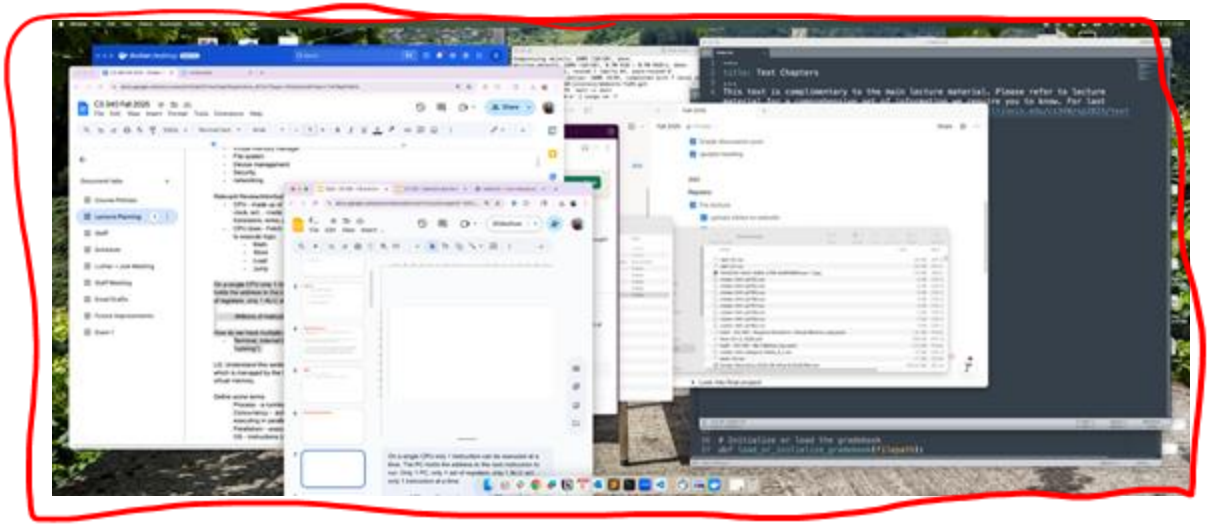
CPU → ALU, registers, PC → MUX → logic gates → transistors, wire

clock



Math
store
load
jump

How?



LG - Understand this sentence

Processes are running concurrently which is managed by the OS and is safe because of kernel mode and virtual memory.

Vocabulary

Process - a running instance of a program

Concurrency - active during the same time

Parallelism - executing at the same exact time

At 5:15pm how many activities am I doing concurrently? In parallel?

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Q2

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I start my stats HW at 4:00pm, at 5:00pm I take a break start a game of volleyball which ends at 6:00pm, I then work on and finish my stats HW at 8:30pm.

con: 2
par: 1

At 7:00pm how many activities am I doing concurrently? In parallel?

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Q3

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I start my stats HW at 4:00pm, at 5:00pm I take a break start a game of volleyball which ends at 6:00pm, I then work on and finish my stats HW at 8:30pm.

Con: 1

Par: 1

Vocabulary

operating system

OS → code (instructions)

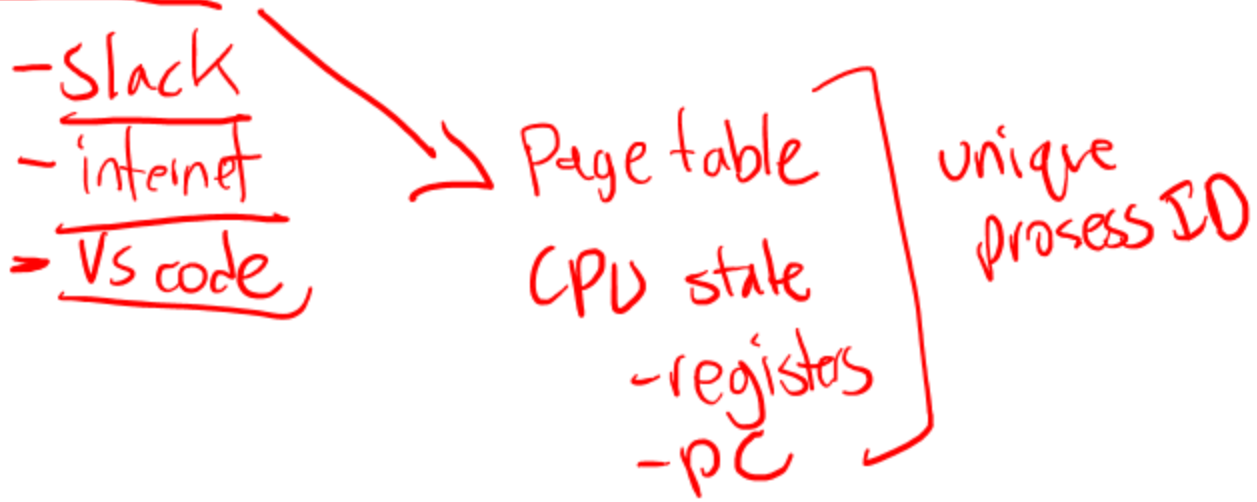
Kernel

Kernel Mode - a bit in hardware → 0, 1

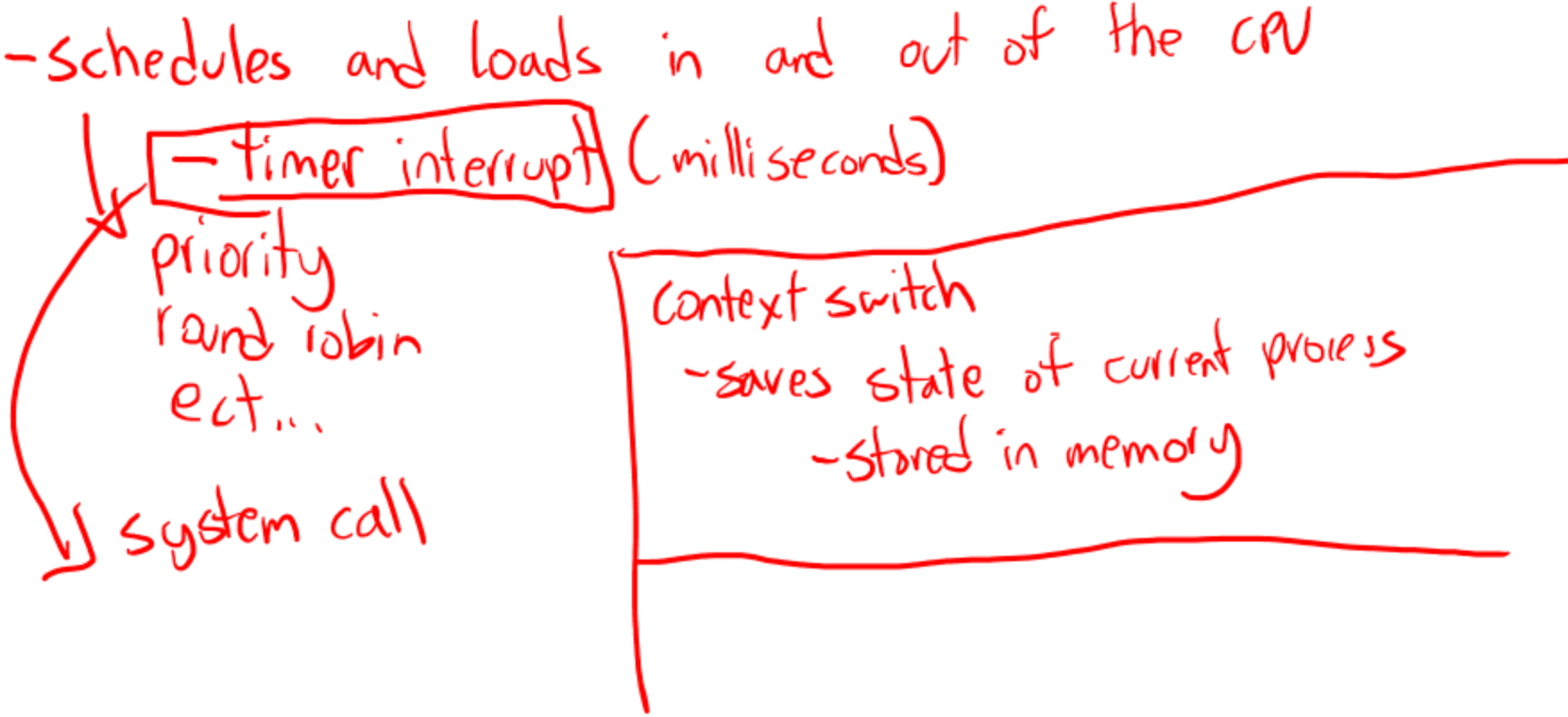
LG - Understand this sentence

Processes are running concurrently which is managed by the OS and is safe because of kernel mode and virtual memory.

Processes are running concurrently



Processes are running concurrently which is managed by the OS



What is the closest estimate to how many instructions a CPU can run in a second?

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Q4

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If I'm typing at 200 characters a minute, how many CPUs do I need to seamlessly handle updating my notes app while running my slack app (chat) to monitor if I got any new messages?

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Q5

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Processes are running concurrently which is managed by the OS and is safe because of kernel mode and virtual memory.

Is it possible for these two programs to print out the same value while running concurrently?

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Q6

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hi.exe

```
int x = 5;
printf("%#x", &x);
```

bye.exe

```
int x = 2;
printf("%#x", &x);
```

Yes

Is it possible for these two programs to be using the same register to store the value x for calculations if they are running concurrently?

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Q7

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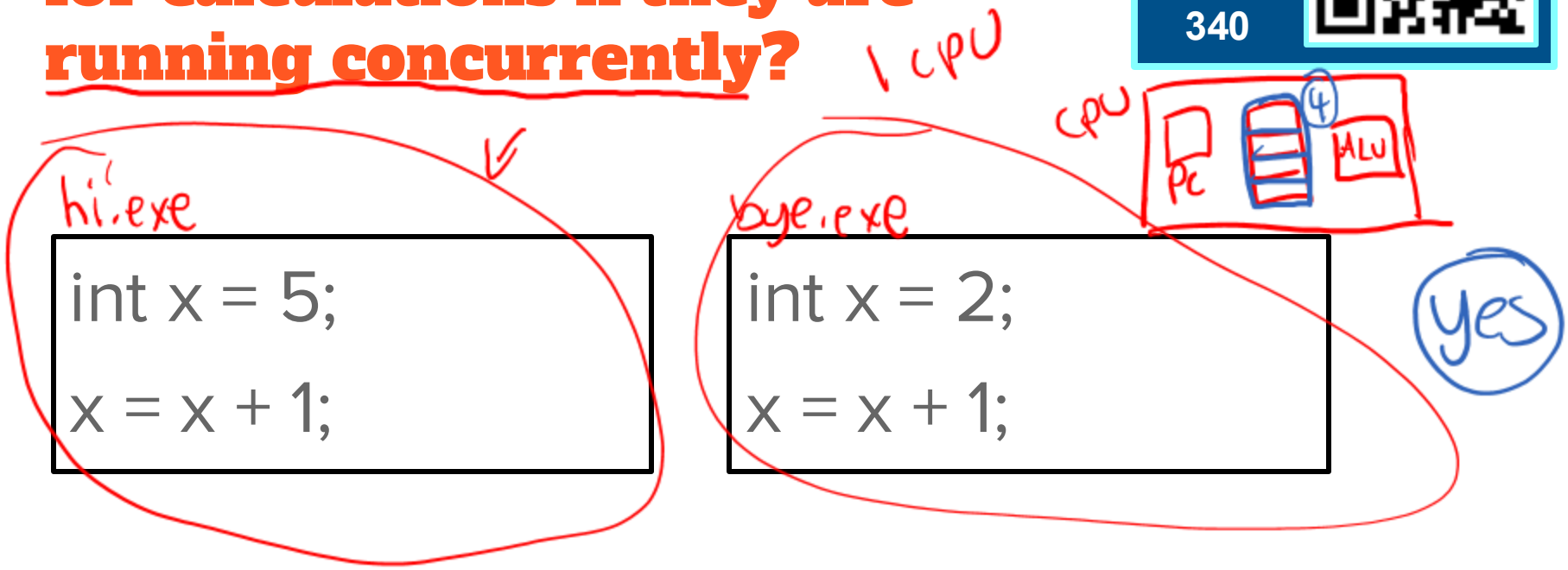
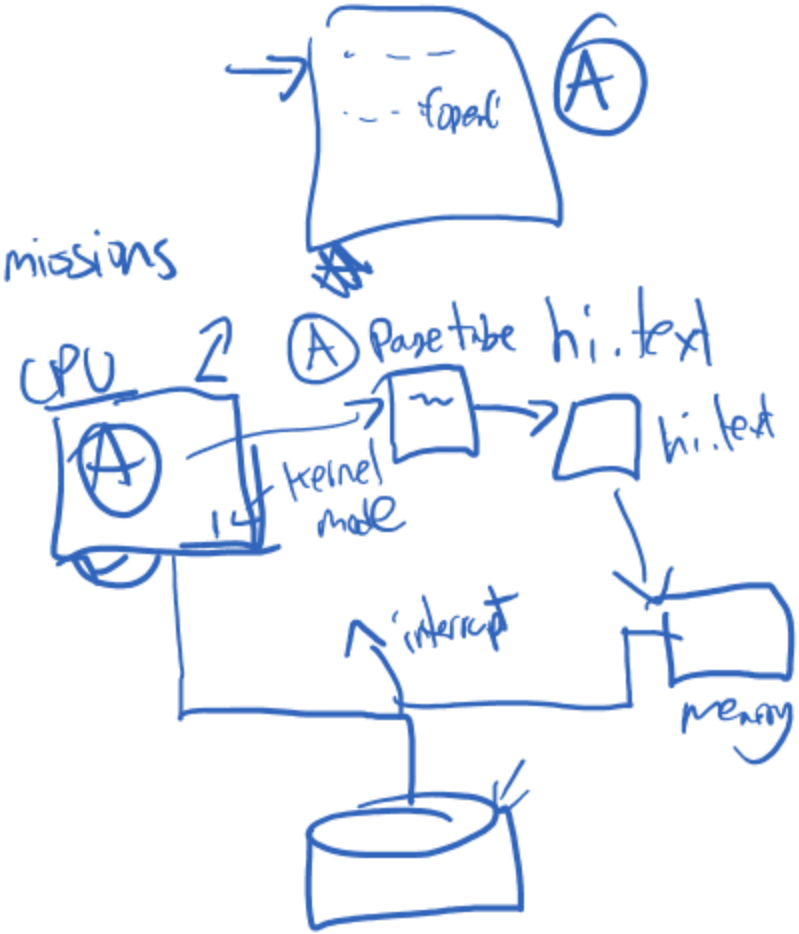


The Operating System

- manages VM
- File system reading/writing, permissions
- device management
- Security - accounts
- Network -
- Process management
  - creates, destroys, schedules



What does the OS not do?

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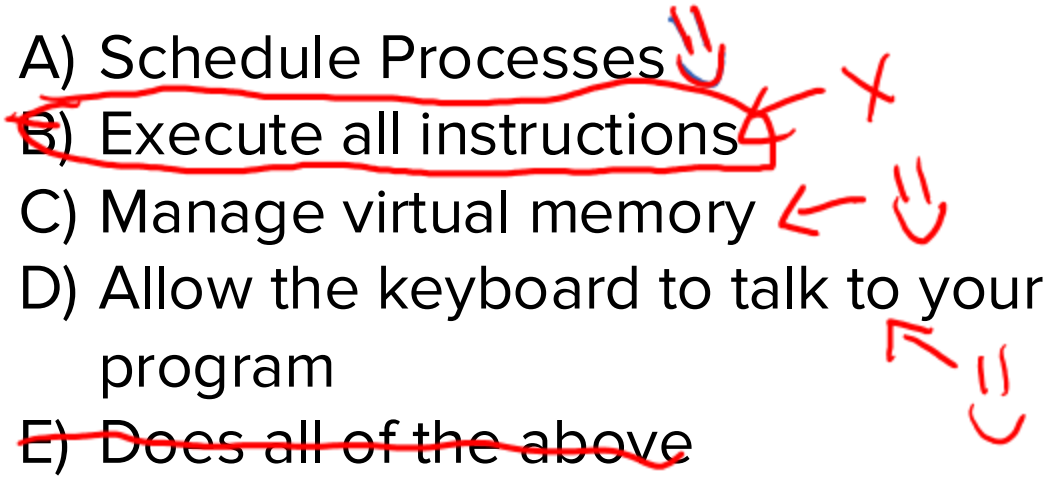
A) Schedule Processes
B) Execute all instructions
C) Manage virtual memory
D) Allow the keyboard to talk to your program
E) Does all of the above



The OS is running _____ with your programs?

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A) Concurrently
B) In parallel
C) None of the above fit

Threading

Process → different
VM
reg values

Threading → same process
same VM
- same page table
→ own stack

```
int main(){
  —
  — start thread at function c →
  →
  →
}

void c(){
  → ...
}
```

OS - swapping