



## Operating Systems

Review

## Questions

- What are two functions of an OS?
- What “layer” is above the OS?
- What “layer” is below the OS?



## Questions

- What causes OS to change?
  - Or, why aren't we still running MS-DOS?
- What is a *process*?
- What is a *file*?



## True or False

- Unix is a “simple structure” OS
- Micro Kernels are faster than other OSES
- Virtual Machines are faster than other OSES



## Questions

- Name 3 operating system structures
- Give one advantage of each
- Give one disadvantage of each



## Questions

- How does a shell work? Or ... arrange the commands in order:

```
wait ()
pid = fork ()
exec ()
gets ()
while (1) {
}
```



## Review

- What is a PCB?
- Usually the PCB is in OS memory only. Assume we put the PCB into a processes address space. What problems might this cause?



## Review

- List steps that occur during *interrupt*
- True or False:
  - Context switch times happen every 5-10 seconds
  - Most processes have long CPU burst times



## Review

- What is (average) waiting time?
- Explain how SJF works
- True or False:
  - FCFS is optimal in terms of avg waiting time
  - Most processes are CPU bound
  - The shorter the time quantum, the better



## Questions

- How does Windows NT/2000 avoid process starvation?



## Review

- What is a “race condition”?
- What are 3 properties necessary for a correct “critical region” solution?
- What is Peterson’s Solution?



## Possible Outputs?

```
int main() {  
    int *num, shm_id  
  
    shm_id = shmget(502)  
    num = (int *) shmat(shm_id)  
    fork()  
    *num = *num + 1  
    printf("%d\n", *num)  
}
```

(Assume shm is  
0 when first  
Created)



## Possible Outputs?

```
int num = 0;
int main() {
    fork();
    num = num + 1;
    printf("%d\n", *num);
}
```

What if `fork()` was `spawn()`?



## Review

- What does *Test\_and\_Set* do?
- What is one major advantage of *semaphores* over the *Test\_and\_Set* or *Peterson's* solution?



## Review

- What is the Memory Management Unit?
- What is a relocation register?
- What happens to it during a context switch?



## Review

- What are some of the sections in an object module?
- What are some of the steps that occur during linking?



## Review

- What is internal fragmentation?
- What is external fragmentation?
- What is compaction?



## True or False

- With paging, logical address spaces are contiguous
- With paging, physical address spaces are contiguous
- Paging reduces the size of the possible address space used by a process



## Review

- Does paging have fragmentation?
  - No? Then why not?
  - Yes? Then what kind?
- What are the overheads associated with paging?



## Review

- What is run-time, dynamic linking?



## Review

- True or False:
  - a) The logical address space cannot be bigger than the physical address space
  - b) Processes have big address spaces because they always need them
- Demand paging:
  - a) Is unrelated to basic paging
  - b) Brings logical pages into physical memory when requested by a process
  - c) Increases memory requirements for a system
  - d) All of the above
  - e) None of the above



## Review

- Page faults
  - What is a page fault?
  - What does an OS do during a page fault?
- What is a Page Replacement Algorithm?
  - What is “Belady’s Anomaly”?
  - How does the Optimal algorithm work?
  - How does Enhanced Second Chance work?
- What is thrashing?
  - How do we fix it?



## Review

- What is a file descriptor?
  - What information must it contain?
  - What information might it contain?



## Linked-List with Index

Physical  
Block

0	
1	
2	null
3	null
4	7
5	
6	3
7	2

- How many files are there?
- How large are they?
- How many free blocks are there?



## I-Node



- How many data blocks are there?
- If you added 3 more data blocks to the file, what would happen?



## Review

- Directories:
  - In what way is a directory different than a file?
  - In what way is a directory similar to a file?
- Aliases:
  - Describe a hard-link
  - Describe a soft-link
- Free space management:
  - What are two common methods of keeping track of free blocks?

