Final Exam Review

CS 537: Introduction to Operating Systems

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Exam review quizzes

- Virtualization: https://forms.gle/6sCTk1t59n58ZtxD6
- Concurrency: https://forms.gle/14P8TZVRNcrVT8yc6
- Persistence: https://forms.gle/kgZ7ZGfaaZp11VVm8

Virtualization topics

- CPU virtualization
  - What is a process?
  - `fork()`, `exec()`, `wait()`
  - Mechanisms for limited direct execution
  - Scheduling policies (FCFS, SJF, STCF, RR, MLFQ) and metrics (turnaround time, response time)
- Memory virtualization
  - Address space
  - Base/Bounds
  - Segmentation
  - Paging
    - TLB
    - Multi-level page tables
  - Swapping, copy-on-write, larger pages

Concurrency topics

- Threads vs processes
- Concurrency primitives: understand what each does
  - Lock implementations: spin locks, ticket locks, park/unpark
  - Condition variables
  - Semaphores
- Concurrent counter, linked list, hash table using locks
- Bugs: atomicity violation and deadlocks

Persistence

- Devices
  - I/O device interface: interrupts, polling, direct memory access
  - Hard disk geometry and implications for performance and scheduling
  - RAID levels 0, 1, 4, 5
  - SSDs: erase/program interface, Flash Translation Layer
- Unix file system API (e.g., file descriptors)
- File system implementation
  - inodes, allocation, directories
  - FFS: locality
  - Crash consistency: FSCK, journaling
  - Log-structured file systems

Distributed Systems

- Communication: UDP and TCP abstractions
- RPCs
- NFS: protocol design, cache consistency