



Final Exam topics

- Processes: lifecycle of processes (different process states)
- context switches, PCB, fork, exec, communication between processes
- pipes, file descr, shared memory, queues, signals, semaphores (mutex and counting semaphore)
- Scheduling: state machine of scheduling
- ready queue
- turnaround time, release time, finishing time, response time
- scheduling objectives
- preemptive vs non preemptive scheduling
- advantages/disadvantages/characteristics of FIFO, priority based scheduling, shortest job first, round robin, multilevel, CFS
- Time quantum, niceness, group scheduling
- multiprocessor scheduling: global, partitioned, scheduling problem, gang scheduling



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- synchronization: consumer/producer. Peterson's algorithm
 - mutex/semaphores/spinlocks/dining philosophers/starvation
 - priority inversion/deadlocks



Final Exam topics

- Memory: Process base and limit registers.
- Difference between compile time - load time and execution time.
- logical / virtual (CPU) vs physical addressing (MMU).
- Swapping : ready queue, backing store, roll out, roll in
- contiguous allocation, multiple partition allocation
- dynamic memory allocation: first fit, best fit, worst fit
- fragmentation in memory: external, internal. How to reduce.
- program segmentation
 - segment table, base reg, length reg, protection
- Memory: physical memory frames, virtual memory pages. Page table. How does this work. Find address virt <-> phys. Page numbers, page offset.
- How are page tables implemented.
- TLB's and replacement policies
- access time, memory protection/ multilevel page tables calculations/hashed page tables/inverted page tables. See also all topics of virtual memory.



Final Exam topics

- Paging hardware
- Effective access time
- How is memory protection in page tables
- shared code (shared libraries) vs private code/data
- Practice calculations with page size, page table size/nr of entries
- Hierarchical/Multilevel paging - hashed - inverted tables
- IA-32 addressing. Page Address Extension. Diff with ARM

Virtual memory

- demand paging, page table valid/invalid bits
- What are page faults and how are they handled
- How are pages replaced. FIFO, Optimal, LRU replacement/ counting algorithms.
- allocation of frames: fixed and priority



Final Exam topics

- Disk structures: sector, track, blocks, blocksize
- disk interface standards
- I/O communication: dedicated, memory mapped
- I/O schedulers: FCFS, SSFT, elevator, Scan, Noop, CFQ Deadline
- Linked allocation: FAT filesystem characteristics
- indexed allocation: UFS, ext2 difference. Block groups, inodes, superblock, partitions, bootblock, inode bitmap, indirect pointers in inodes
- Finding data and directories using inodes.
- Hard and soft links
- journaling filesystems, journaling modes: write back, ordered, full
- log structured filesystems
- network communication: udp/tcp. remote procedure calls
- distributed filesystems: nfs. stateless, stateful
- xFS software raid.



Final Exam topics

- OS hardening.
- authentication: password control in unix (passwd, shadow, salt etc.)
- ssh key authentication, KDC authentication, kerberos authentication
- ACL, file permissions, SELinux (only basic idea)
- setuid, getgid, sticky bits.
- chroot vulnerabilities
- virtual machines, hypervisor
- docker (basic idea)
- (differences between) malware terminology: trojans, virus, worm, ransomware. logic bomb, dos attack, backdoor
- man in the middle attack, setuid, arp spoofing
- stack smashing basics: nx, aslr, stack canary protection, rop programming (only basic idea)
- hardware oriented attacks