

- Kernel / Protection
  - Kernel vs User Space
  - Avoiding boundary crossings
- Virtual Address Space
  - Different Regions
  - Growing Stack on demand.
  - Heap allocation.
- Executing Kernel Code
  - Synchronous vs. Asynchronous transfer
  - Entry point
  - Interrupts
    - Timer
  - Traps
    - System Call Process
    - Exceptions
  - System call process
- Processes
  - What is a process?
    - Process vs. thread
  - CreateProcess() vs. fork()
  - fork(), wait(), exec()
  - COW fork() vs Deep Copy fork()
  - Process Cleanup
    - Orphans / Zombies
  - Context switching
    - Pre-emptive (timer) vs. non-preemptive (yield(), sleep())
  - Process States and Transitions
- File Descriptors
  - Open
  - Read/Write
  - fork() and the Process Open File Table
- Synchronization
  - Spinning vs. Sleeping
    - When to use which.
    - Spinlocks
      - Disabling interrupts - when does it work?
    - Sleeplocks
      - Cost of changing to sleep state
    - Atomic Operations
      - Test-and-set and Compare-and-swap
    - Non-blocking sync
  - Condition Variables

- Inter Process Communication (IPC) / Pipes
  - Pipes vs Files for communication.
  - Pipe Open/Close.
- Inter Process Communication (IPC) / Signal Handling
  - What is it?
    - Example: Ctrl-C on a user process, how does that work?
- CPU Scheduling
  - FIFO
  - Multi-Level Feedback Queue
  - Round Robin
- File System
  - Layers of the file system calls
  - Logging
  - Log File Systems (LFS)
  - Extent Management implementations (pre-alloc vs. array vs. Unix style indirection using blocks).
  - Transactions and Atomicity
  - INodes
- Persistent Disk
  - RAID
  - NVM & Flash Storage
  - Disk data structures
    - Bitmap
    - Log region
    - I Nodes
    - Superblock
    - Boot block
  - Disk and Cache consistency
- Virtual Memory
  - Linear vs Virtual vs Physical Address
- Paging
  - What purpose does it serve?
  - Fragmentation
  - Page Replacement
    - LRU
  - Multiple Page Levels (Page Directory)
  - Demand-Paged Virtual Memory
  - Address Translation and the TLB
  - Page Faults