CSc 360
Operating Systems
Virtual Memory

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Review

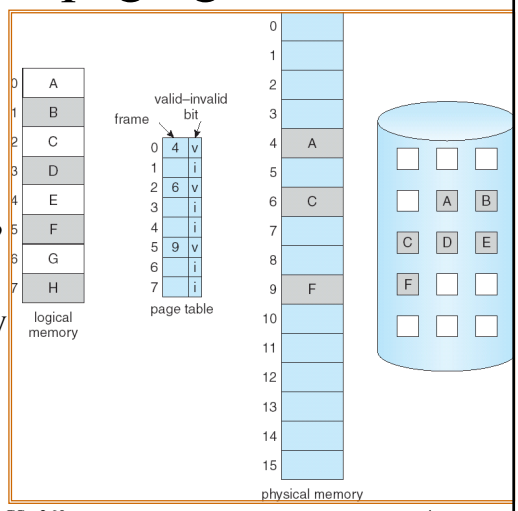
- Memory management
  - addressing and address mapping
    - logical vs physical address
  - partition allocation
    - internal vs external fragmentation
  - paging and page table
    - TLB, hierarchical, hashed, inverted
  - segmentation

Virtual memory

- Load an entire process in physical memory?
  - not all addresses accessed at the same time
  - some even not used before swapped out!
- Virtual memory
  - logical space >> physical space
    - only load the portion being used or to be used
  - more (partial) processes in physical memory
  - faster swap in/out

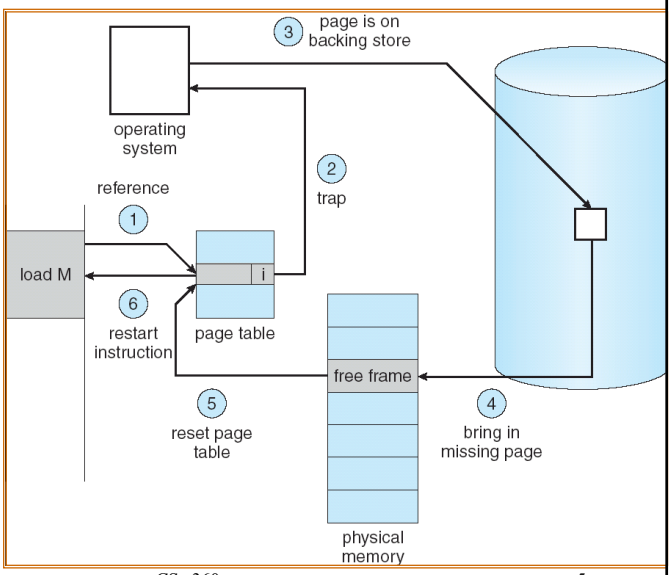
Demand paging

- On demand
  - when used
    - being referenced
    - really invalid reference?
      - error!
    - *valid* but not-in-memory
      - page in
  - lazy pager
  - valid-invalid bit

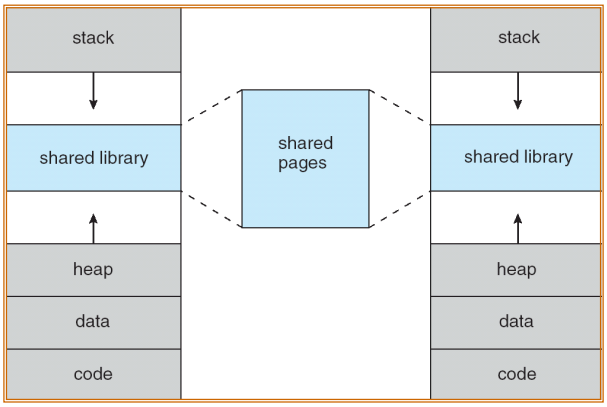


Page fault

- Reference
- Trap
  - to OS
- Page in
- Update
- Restart
  - issues

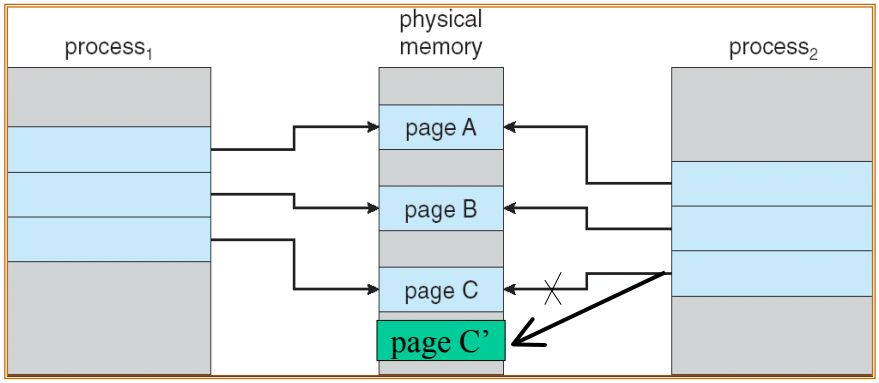


Memory sharing

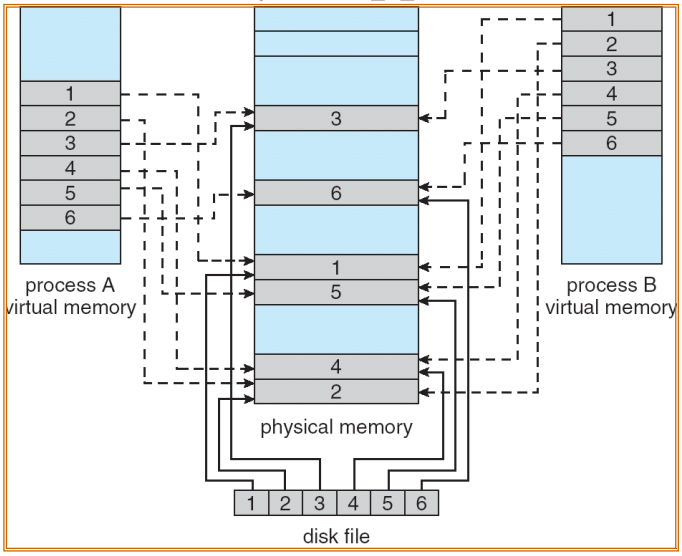


Copy-on-write

- Share read-only pages



Memory mapped files



This lecture

- Virtual memory
  - why virtual memory
  - how to support virtual memory
    - on-demand paging
  - other features
    - copy-on-write, memory-mapped files

Next lecture

- Page replacement
  - no free frame?!
  - read OSC7Ch9