CSc 360
Operating Systems
Memory Allocation

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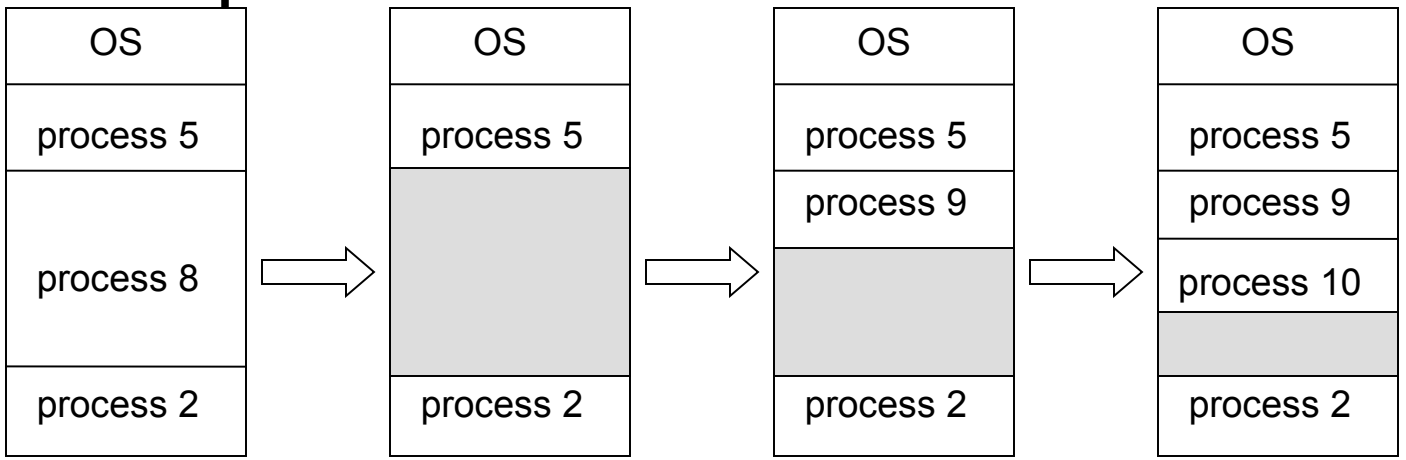
Review

- Memory access

Contiguous allocation

- Single-partition allocation
  - one for OS
  - the other one for user process
- Multi-partition allocation



Partition allocation

- First-fit
  - first “hole” big enough to hold
  - *faster* search
- Best-fit
  - smallest “hole” big enough to hold
- Worst-fit
  - largest “hole” big enough to hold

Fragmentation

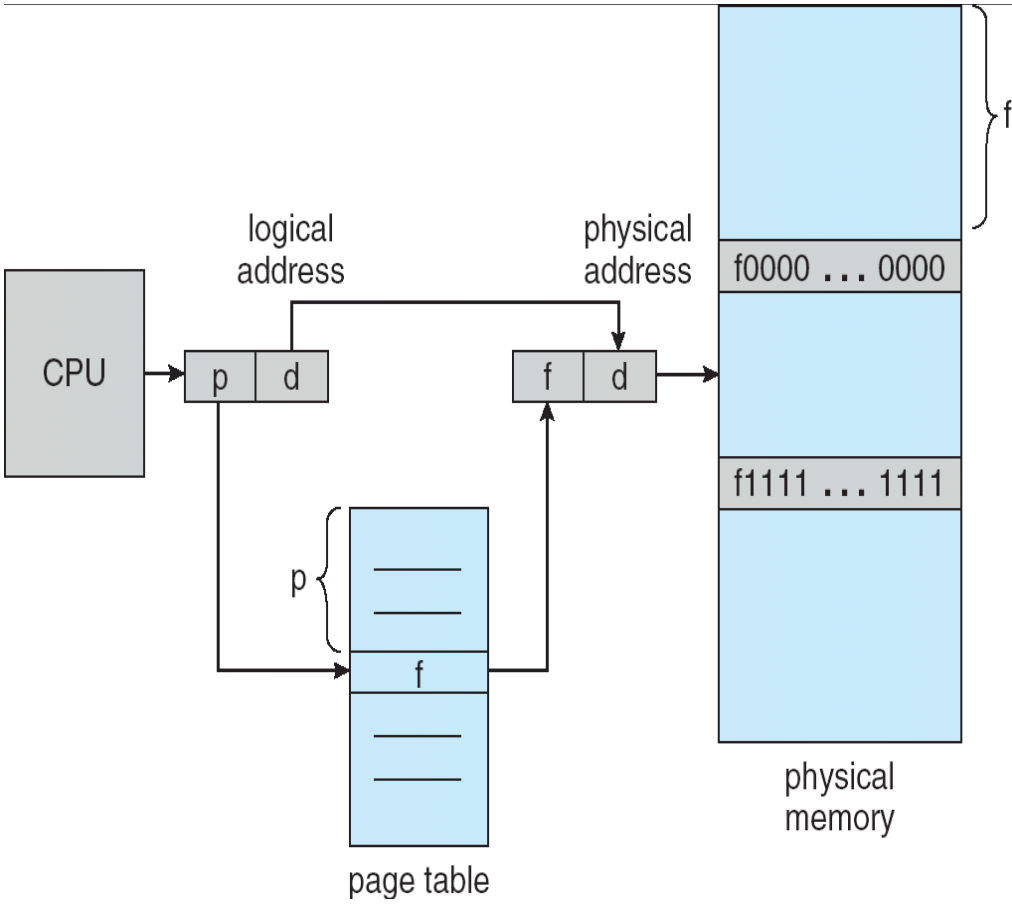
- External fragmentation
  - enough total available size, not individual ones
- Compaction
  - combine all free partitions together
  - possible if dynamic allocation at execution time
  - issues with I/O (e.g., DMA)
- Internal fragmentation
  - difference between allocated and request size

Paging

- Noncontiguous allocation
  - in fixed size pages
  - page size: normally 512B ~ 8KB
- Fragmentation
  - no external fragmentation
    - unless there is no free page
  - still have internal fragmentation
    - maximum: page_size - 1

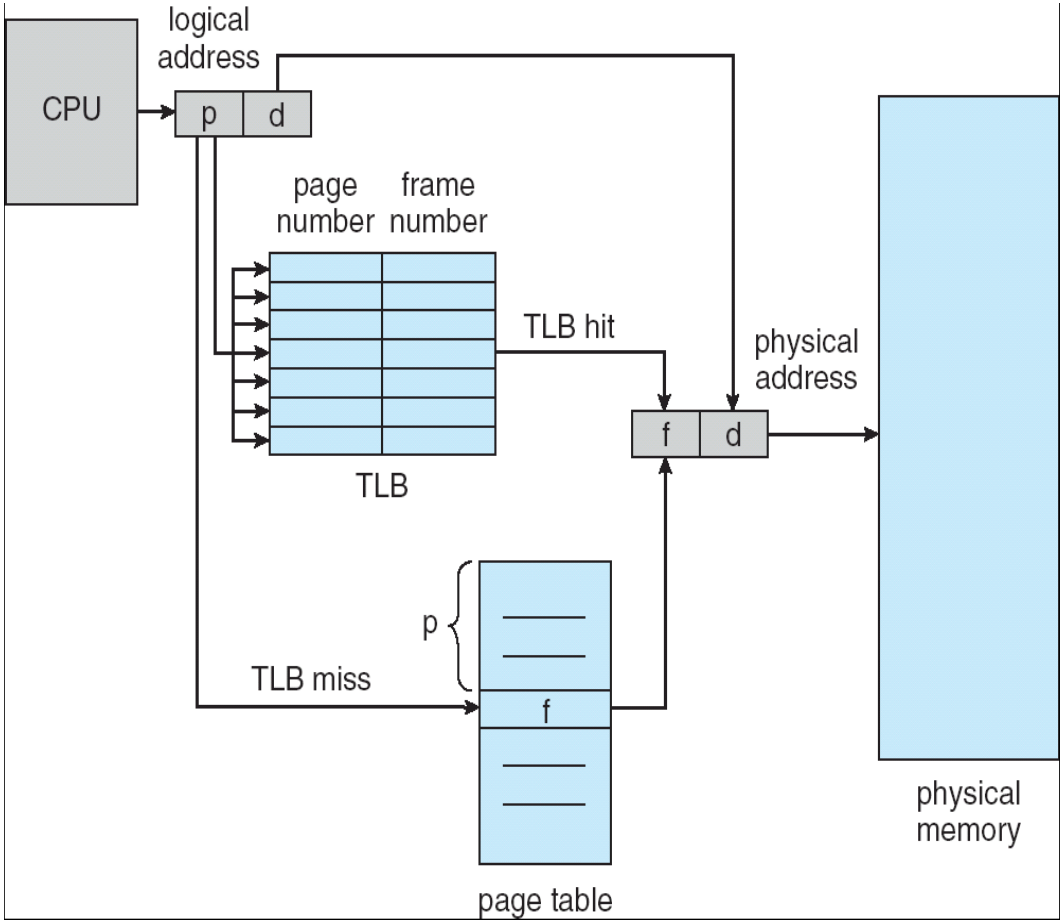
Supporting paging

- Access by address
  - seen by CPU
    - logical page number
    - page offset
    - “frame”
  - seen by memory
    - physical page number
    - page offset
- Page-table registers
  - one more memory access



Supporting paging: more

- TLB
  - translation look-aside buffer
  - associative
- Access by content
  - if hit, output frame #
  - otherwise, check page table



This lecture

- Memory allocation
  - contiguous
    - e.g., partition
  - noncontiguous
    - e.g., paging
  - performance metrics
    - fragmentation

Next lecture

- More on paging
  - read OSC7Ch8