Part 1

Wednesday, May 1, 2019 12:02 PM

Page tables are just pointers, from one block to another block

Overlay

Connect virtual pages and physical pages with page tables

MNU

Dirty/Modified bit, Referenced/RW bit, Valid bit

- Valid bit is 0 then not in memory
- Valid bit is 1 then is in memory

Page frame number is the address

Mapping addresses

- Split address from CPU into two piecces
    - Page number = p
    - Page offset = d
- Page number
    - Index into page table
    - Page table contains base address of page in physical memory
- Page offset
    - Added to base address to get actual physical memory address
- Page size = 2^d bytes
- Ex: 4KB = 4096 byte pages, 32 bit logical addresses
    - D = 12 bits
    - P = 20 bits

Part 2

Friday, May 3, 2019 12:15 PM

Two level page tables

IBM Archie

- Problem: page tables can get too large
  - 2^32 bytes in 4kb pages => 1 million page table entries
- Use multilevel page tables
  - Page size in first page table is large
  - PTE marked invalid in first page table needs no 2nd level page table
- 1st level page table has pointers to 2nd level page tables
- 2nd level page table has actual physical page numbers in it
- Caches are your friend

Translation Lookaside buffer

- Search the TLB for the desired logical page number
  - Search entries in parallel
  - Use standard cache techniques
- If desired logical page number is found, get frame number from TLB
- If desired logical page number isn't found
  - Get frame number from page table in memory
  - Replace an entry in the TLB with the logical and physical page numbers from this reference

Inverted page table

- Reduce page table size further: keep one entry for each frame in memory
  - Alternative: merge tables for pages in memory and on disk
- PTE contains
  - virtual address pointing to this frame
  - Information about the process that owns this page
- Search page table by
  - Hashing the virtual page number and process ID
  - Starting at the entry corresponding to the hash result
  - Search until either the entry is found or a limit is reached
- Page frame number is index by PTE

FIFO

- Maintain a linked list of all pages
  - Maintain the order in which they entered memory
- Page at front of list replaced
- Advantage: easy to implement
- Disadvantage: page in memory the longest may be often used
  - This algorithm forces pages out regardless of usage

Clock algorithm

- Same functionality as second chance
- Simpler implementation
  - Clock hand points to next page to replace
  - If R=0, replace page
  - If R=1, set R=0 and advance the clock hand
- Continue until page with R=0 is found
  - This may involve going all the way around the clock