VIRTUAL MEMORY

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Overview

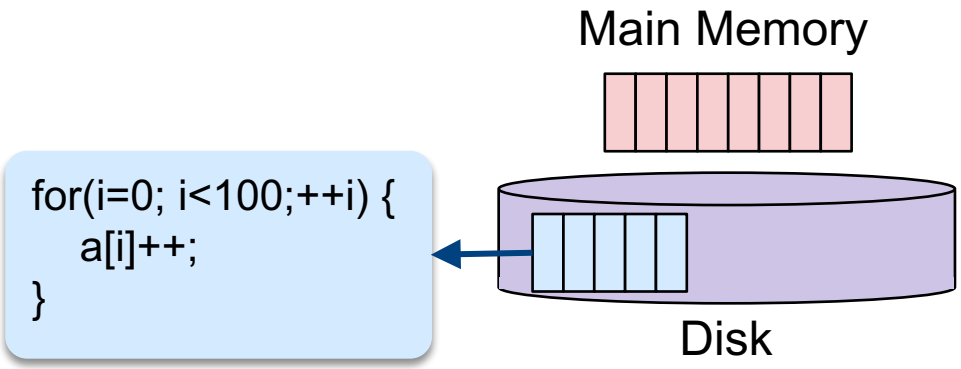
- Announcement
  - Homework 6 will be released tonight (due on 11/10)
- This and next lectures
  - Virtual memory
  - Page tables and address translation
  - Translation look-aside buffer (TLB)
  - Main memory system

Recall: Memory Hierarchy

- Lower levels provide greater capacity longer time
  - Does the program fit in main memory?
  - What if running multiple programs?

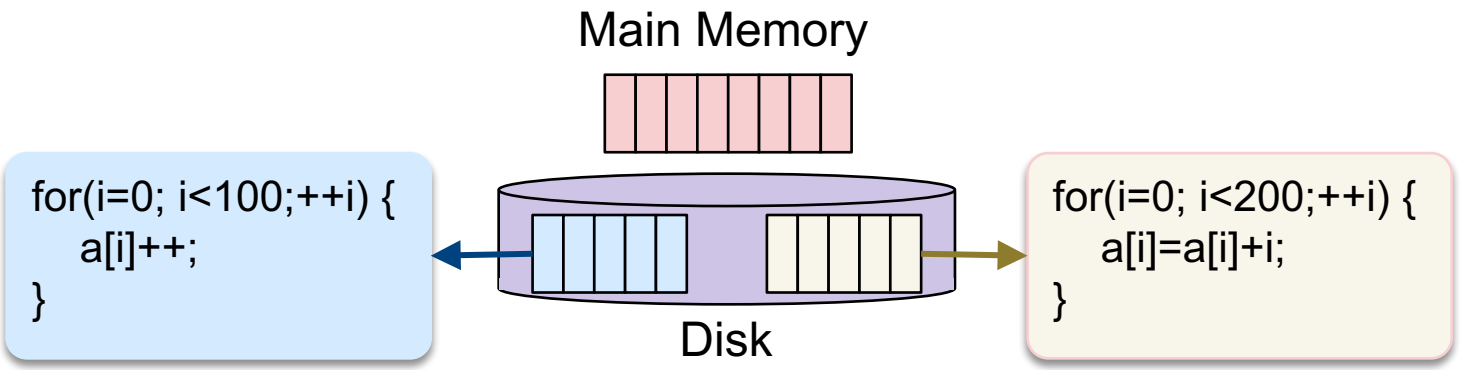
Virtual Memory

- Use the main memory as a "cache" for secondary memory
  - Placement policy?



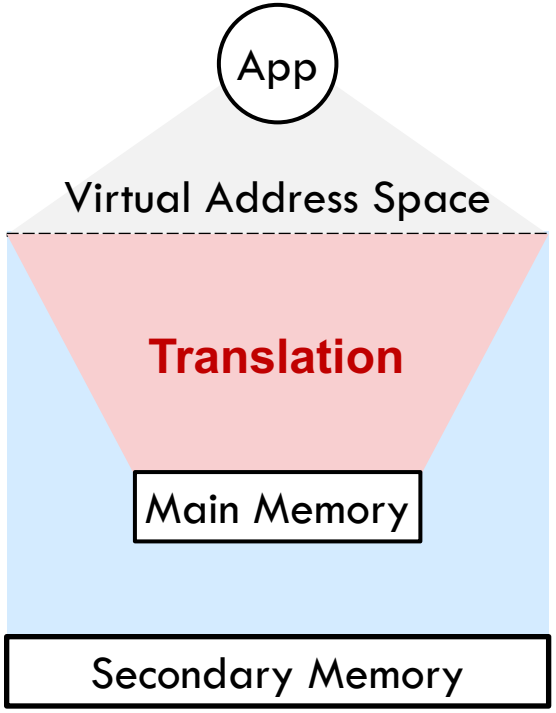
Virtual Memory

- Use the main memory as a "cache" for secondary memory
  - Placement policy?
- Allow efficient and safe sharing the physical main memory among multiple programs
  - Replacement policy?



Virtual Memory Systems

- Provides illusion of very large memory
  - Address space of each program larger than the physical main memory
- Memory management unit (MMU)
  - Between main and secondary mem.
  - Address translation
    - Virtual address space used by the program
    - Physical address space is provided by the physical main memory



Virtual Address

- Every virtual address is translated to a physical address with the help of hardware
- Data granularity