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FACULTY OF ENGINEERING & TECHNOLOGY

BCS-501 Operating System

Lecturer-19

Manisha Verma
Assistant Professor
Computer Science & Engineering

Swapping
Context Switch Time including Swapping
Swapping on Mobile Systems

Swapping

•A process can be swapped temporarily out of memory to a backing store, and then brought back into memory for continued execution

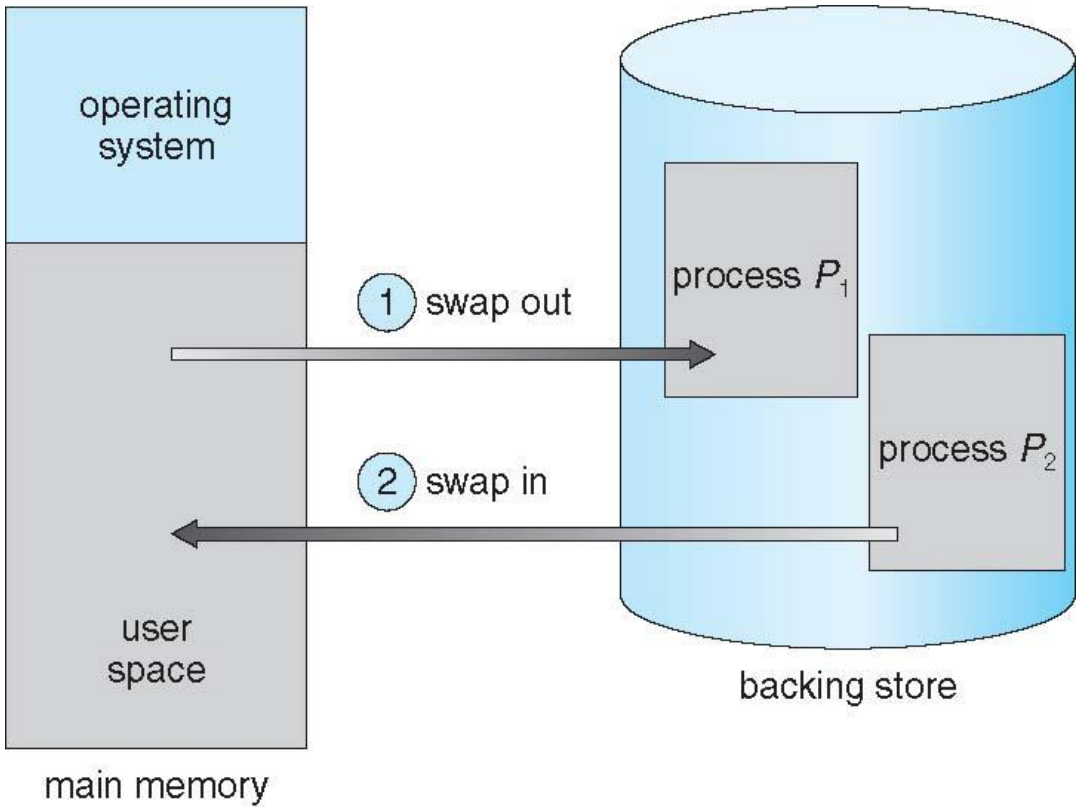
Total physical memory space of processes can exceed physical memory
Backing store – fast disk large enough to accommodate copies of all memory images for all users; must provide direct access to these memory images
Roll out, roll in – swapping variant used for priority-based scheduling algorithms; lower-priority process is swapped out so higher-priority process can be loaded and executed
Major part of swap time is transfer time; total transfer time is directly proportional to the amount of memory swapped
System maintains a ready queue of ready-to-run processes which have memory images on disk

•Does the swapped out process need to swap back in to same physical addresses?

•Depends on address binding method
- Plus consider pending I/O to / from process memory space

•Modified versions of swapping are found on many systems (i.e., UNIX, Linux, and Windows)
Swapping normally disabled
Started if more than threshold amount of memory allocated
Disabled again once memory demand reduced below threshold

Schematic View of Swapping



Context Switch Time including Swapping

- If next processes to be put on CPU is not in memory, need to swap out a process and swap in target process
- Context switch time can then be very high

- 100MB process swapping to hard disk with transfer rate of 50MB/sec
  - Swap out time of 2000 ms
  - Plus swap in of same sized process
  - Total context switch swapping component time of 4000ms (4 seconds)

- Can reduce if reduce size of memory swapped – by knowing how much memory really being used
  - System calls to inform OS of memory use via request_memory() and release_memory()

- Other constraints as well on swapping
  - Pending I/O – can't swap out as I/O would occur to wrong process
  - Or always transfer I/O to kernel space, then to I/O device
    - Known as double buffering, adds overhead
- Standard swapping not used in modern operating systems
  - But modified version common
    - Swap only when free memory extremely low

Swapping on Mobile Systems

- Not typically supported
  - Flash memory based
    - Small amount of space
    - Limited number of write cycles
    - Poor throughput between flash memory and CPU on mobile platform
- Instead use other methods to free memory if low
  - iOS *asks* apps to voluntarily relinquish allocated memory
    - Read-only data thrown out and reloaded from flash if needed
    - Failure to free can result in termination
  - Android terminates apps if low free memory, but first writes application state to flash for fast restart

MCQ

Because of virtual memory, the memory can be shared among:
A. processes
B. threads
C. instructions
D. none of the mentioned

____ is the concept in which a process is copied into main memory from the secondary memory according to the requirement.
A. Paging
B. Demand paging
C. Segmentation
D. Swapping

The pager concerns with the:
A. individual page of a process
B. entire process
C. entire thread
D. first page of a process

Swap space exists in:
A. primary memory
B. secondary memory
C. CPU
D. none of the mentioned

Effective access time is directly proportional to:
A. page-fault rate
B. hit ratio
C. memory access time
D. none of the mentioned