CS4440 Final Study Guide

Notebook:	CS4440 Study Guide (Final)		
Created:	12/9/2017 3:07 PM	**Updated:**	12/9/2017 3:35 PM
Author:	rmartinez213@yahoo.com		

Chapter 6
- CPU scheduling is the basis of multiprogrammed operating systems.
- The objective of multiprogramming is to have some process running at all times, to maximize CPU utilization.
- The dispatcher gives control of the CPU to the process. (selected by short-term scheduler).
- Dispatch latency is the time it takes to stop current process and get new one.
- Maximize CPU utilization and throughput and to minimize turnaround time, waiting time, and response time.
- Scheduling
    - FIFO (Non-preemptive)
    - Shortest Job First (preemptive & nonpreemptive)
    - Priority Scheduling (preemptive & nonpreemptive)
    - Round Robin Scheduling (Preemptive)

- Aging involves gradually increasing the priority of processes that wait in the system for a long time.

Chapter 7
- Resources it has requested are held by other waiting processes
- Request, Use, Release (Process mode of operation)
- Physical resource (printers, cpu cycles) and Logical resource (Semaphores, mutex locks) can be part of a process.

|DeadLock|

- DeadLock arises if all 4 are met:
    - Mutual exlusion, hold and wait, no preemption, circular wait

- If the graph contains no cycles, then no process in the system is deadlocked.

- If the graph does contain a cycle, then a deadlock may exist.

- How to deal with deadlock (Third solution is used the most by linux/windows):
    - We can use a protocol to prevent or avoid deadlocks, ensuring that the system will never enter a deadlocked state.
    - We can allow the system to enter a deadlocked state, detect it, and recover.
    - We can ignore the problem altogether and pretend that deadlocks never occur in the system.

- Deadlock prevention has a set of method to ensure that at least one of the necessary conditions cannot hold.

|DeadLock Prevention|

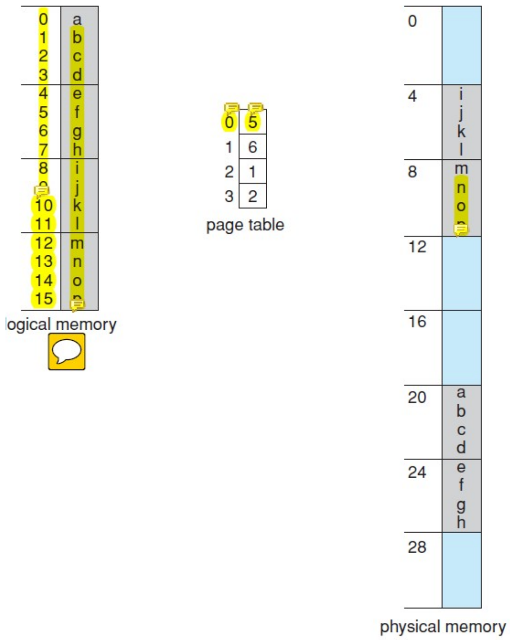
- Mutual Exclusion: Sharable resources, in contrast, do not require mutually exclusive access and thus cannot be involved in a deadlock.
- A process that needs several popular resources may have to wait indefinitely, because at least one of the resources that it needs is always allocated to some other process.

|DeadLock Avoidance|

- Safe stae: A state is safe if the system can allocate resources to each process in some order and still avoid a deadlock.
- Resource-Allocation-Graph Algorithm
- Banker's algorithm

	Allocation	*Need*	*Available*
	A B C	*A B C*	*A B C*
P_0	0 1 0	7 4 3	2 3 0
P_1	3 0 2	0 2 0	
P_2	3 0 2	6 0 0	
P_3	2 1 1	0 1 1	
P_4	0 0 2	4 3 1	

Chapter 8
- Logical Address: An address generated by the CPU is commonly referred to as a logical address, whereas an address seen by the memory unit.
- Physical Address: that is, the one loaded into the memory-address register of the memory—is commonly referred to as a physical address.
- The user program deals with logical addresses. The memory-mapping hardware converts logical addresses into physical addresses.
- Memory-Space Utilization: To obtain better memory-space utilization, we can use dynamic loading.
- Dispatcher: The dispatcher swaps out a process currently in memory and swaps in the desired process.
- Apple’s iOS asks applications to voluntarily relinquish allocated memory.
- Memory is divided into two partitions:
    - One for the resident Operating system
    - One for the user processes



There are three types of Memory Allocation:

- First fit
- Best fit
- Worst fit

- In order to solve external fragmentation issues:
  - First, Compaction is used to shuffle the memory contents to place all free memory into one block
  - Second, is to permit the logical address space of the processes to be noncontiguous

----
|Segmentation|

- Segmentation is a memory-management scheme that supports this programmer view of memory. A logical address space is a collection of segments.
- Thus, a logical address consists of a two tuple: <segment-number, offset>.

|Paging|

- Paging avoid internal fragmentation
- Paging is implemnted by the help of OS and hardware
- Physical memory (blocks) = frames
- Logical memory (blocks) = pages
- Address generate by the CPU is divided into two parts
  - Page number
  - Page offset

What is paging?
- computer stores and retrieves data from secondary storage for use in main memory

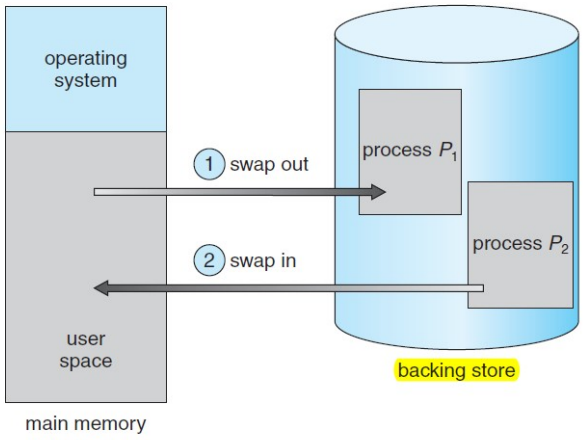
Chapter 9
What is virtual memory?
- Virtual memory is a technique that allows the execution of processes that are not completely in memory.
    - Advantage of virtual memory: programs can be larger than physical memory.

- Virtual memory also allows processes to share files easily and to implement shared memory.
    - In addition, it provides an efficient mechanism for process creation.

- Virtual memory involves the separation of logical memory as perceived by users from physical memory.

|Demand Paging|

- Demand Paging: Load programs only as they are needed
    - Pages that are never accessed will never be loaded into physical memory
    - Processes reside in hard disk (like paging)



- Lazy Swapper: The swapper for demanding page... Never swaps a page into memory unless it will be needed.

|Zero-on-demand Paging|

- Zero-fill-on-demand pages have been zeroed-out before being allocated, thus erasing the previous contents.
- vfork() - The parent process is suspended and does not use copy-on-write
- Used when the child process calls exec()

|Allocation Algorithms|

- The string of memory references is called a reference string.

FIFO Replacement

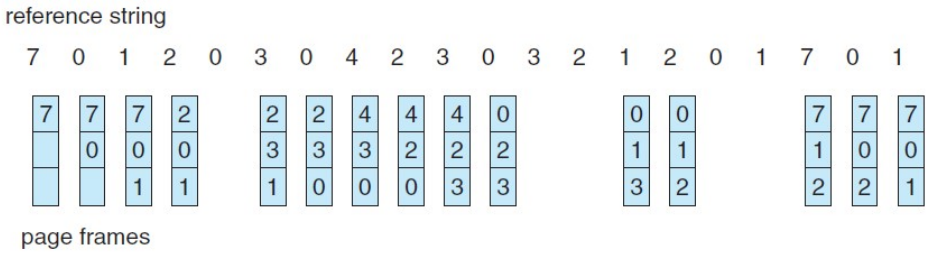
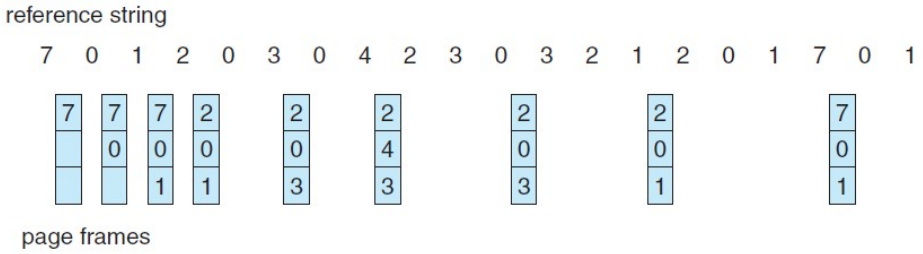


Figure 9.12 FIFO page-replacement algorithm.

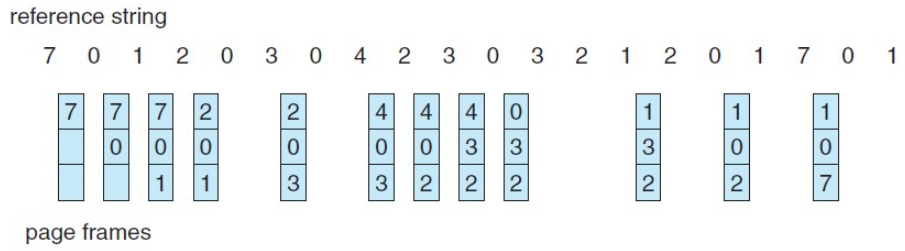
Optimal Page Replacement (most effiecient of the three | Does not suffer from Belady's anomoly)

- Replace the page that will not be used for the longest time



LRU Replacement (Least Recently Used | Does not suffer from Belady's anomoly)

- Replace the Least Recently Used



| Allocation Alorithms |

- Equal Allocation: Left over frames can be used as a free frame buffer pool

----
|Thashing|

- Thrashing when there are not enough frames
- Thrashing spends more time paging then executing
- Must decrease the degree of multiprogramming (To descrease CPU utilization and thrashing)
- The set of pages in the most recent "delta" page references is the working set
- Once "delta" has been selected, use of the working-set model is simple.

|Kernal Memory (How to manage free memory)|

- When a process running in user mode requests additional memory, pages are allocated from the list of free page frames maintained by the kernel
Buddy System (Managing free memory)
- The buddy system allocates memory from a fixed-size segment consisting of physically contiguous pages.