

Assignment 5

1/ Demand Paging is a memory management technique used in virtual memory systems. In demand paging the operating system loads only the pages of a program that are needed into memory at runtime.

This is different from loading the entire program into memory at the start.

Demand paging is also called "Lazy Swapper" because the swapping of pages is only done when the CPU requires it.

2/ A page fault occurs when a program or process attempts to access a page in the virtual memory that is not currently in the main physical memory. When this happens, the operating system must bring the required page into the RAM from secondary storage, which introduces a delay known as the page fault.

service time

$EAT = \text{Average memory access time} \cdot (1-p)$
(page fault rate \cdot page fault service time)

$$EAT = \frac{208}{709} \cdot 20ms + \left(\frac{2}{709} \cdot 20ms \right) = \boxed{0.78 ms}$$

3/ A/ FCFS (First come first serve)

$$|53-98| + |98-78| + |78-737| + |737-22| + \\ |22-774| + |774-794| + |794-6| + |6-57| = 772 \text{ Tracks}$$

6/ SSTF (Shortest Seek Time First)

order = $53 \rightarrow 57 \rightarrow 22 \rightarrow 78 \rightarrow 6 \rightarrow 98 \rightarrow 774 \rightarrow$
 $\rightarrow 737 \rightarrow 794$.

$$|53-57| + |57-22| + |22-78| + |78-6| + |6-98| + \\ + |98-774| + |774-737| + |737-794| = 243 \text{ Tracks}$$

Scan $\rightarrow 0$
 C/ order: $53 \rightarrow 22 \rightarrow 78 \rightarrow 6 \rightarrow 57 \rightarrow 98 \rightarrow 114 \rightarrow 137$
 $\rightarrow 194$

$$|53-22| + |22-78| + |78-6| + |6-0| + |57-98| + |0-57| + |98-114| + |114-137| + |137-194| = 247 \text{ Tracks}$$

D/ C-Scan

order: $53 \rightarrow 57 \rightarrow 98 \rightarrow 114 \rightarrow 137 \rightarrow 194 \rightarrow 199 \rightarrow$
 $0 \rightarrow 6 \rightarrow 78 \rightarrow 22$

$$= 367 \text{ Tracks}$$

E/ 'C-Look'

order: $53 \rightarrow 57 \rightarrow \dots, 98 \rightarrow 114 \rightarrow 137 \rightarrow 194 \rightarrow 6 \rightarrow$
 $\rightarrow 78 \rightarrow 22$

$$= 345 \text{ Tracks}$$

4/ Raid stands for Redundant Array of Independent Disks. It is a data storage technology that combines multiple physical disk drives components into one or more logical units.

Advantages of Raid

- Data Redundancy

Raid protects data from disk failure by storing multiple copies of data on different disks.

- Performance improvement

Raid can improve performance by spreading data across multiple disks, which can increase read and write speeds.

5/

Raid 0: Splits data across multiple disks which can improve performance but does not provide any data redundancy.

Raid 1: mirrors data on two disks which provides complete data redundancy, but does not improve performance.

Raid 5: Strips data across multiple disks and stores parity data on a separate disk.

This provides redundancy and some performance improvement.

Raid 6: it is like Raid 5, but the parity data are written to two disks. Read speed is as fast as Raid 5, but write is slower than Raid 5.

6/ Nested Raid, is a complex Raid configuration that combines multiple standard levels.

Raid 10 Combines Raid 1 and Raid 0
Raid 10 allows for Striping and Mirroring.
It offers higher performance than Raid 1, but at a much higher cost.

