Ch - 5 - Memory Management

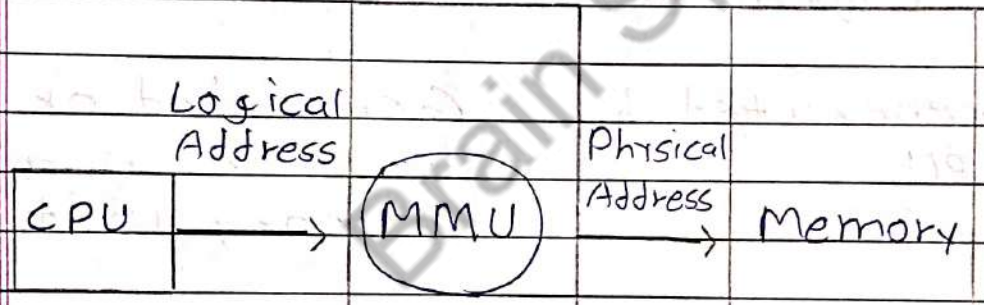
* Explain Physical and Logical Address.

or

Difference between Physical and Logical Address.

	Logical Address	Physical Address
1	Generated by CPU.	Generated or location in a Memory Unit.
2	User can view the logical address in the program.	User can never view the Physical address.
3	User can directly use Logical address.	User can indirectly use Physical address.
4	Also call Virtual Address.	Also call the Real Address.

5	Logical address can be change.	Physical address can not change.
6	Used to Find Physical Address.	Used to identify a memory location.
7	A logical address does not exist physically.	Physical address exist as a real location in memory.



* Explain Memory Management.

=> Memory is the important part of the computer that is used to store the data.

Memory Management is handle by the Memory Management Unit.

Memory Manager is used to keep track of the status of memory location whether it is free or allocated.

There are two types of Memory Management Techniques:

1) Contiguous Memory Management

2) Non-Contiguous Memory Management.

1 Contiguous Memory Management:

-> In Contiguous Memory Management, each program occupies a single contiguous block of memory location.

In this management, the main memory is divided into the two contiguous areas.

Contiguous Memory is simple to implement and easy to manage and design.

Contiguous Memory can not be executed if the program is too large.

Contiguous Memory does not support multiprogramming.

→ Multiple Partitioning :

Single Contiguous Memory Management is inefficient to Memory Management.

In Multiple Partitioning, Memory divided into the multiple parts on main Memory.

There are two types of Multiple Partitioning.

(i) Fixed Partitioning

(ii) Variable Partitioning

(i) Fixed Partitioning:

In this memory management, main memory is divided into to fixed size of partitions.

Fixed Partitioning is simple to implement and easy to manage and design.

In Fixed Partitioning, each partitions contain single process.

(ii) Variable Partitioning:

In this memory management, main memory is divided into the size which is required to loaded to the process.

Process can occupied memory which is required to loaded process.

Variable Partitioning is also called Dynamic Partitioning.

2 Non-Contiguous Memory Management.

→ In Non-Contiguous Memory the program is divided into the different blocks.

There are two Method of Non-Contiguous Memory Management.

(a) Paging

(b) Segmentation

(a) Paging:

Paging is the type of Non-Contiguous Memory management.

The process of retrieving process in the form of page from the secondary storage into the main memory is called as Paging.

The paging is to divided each process in the form of pages.

In Paging, the main memory also divided into the form of Frames.

One Page of the process is to be stored in one of the frames of the memory.

The Logical address is generated by the CPU for every page while the physical address is the actual address of the frames

Advantages of Paging:

1 There are no external Fragmentation.

2 Simple memory management Algorithm.

3 Swapping is easy.

Disadvantages of Paging:

1 There are may be occured

Page No.
Date: / /

Internal Fragmentation.

2 In Paging, Page tables may consume more memory.

3 Multi level paging leads to memory reference overhead.

(b) Segmentation :

Segmentation is a memory management Method in which the memory is divided into the variable size parts.

In Segmentation, each part is known as a segment which can be allocated to a process.

- Advantages:

1 There are no internal Fragmentation

2 Less Overhead.

3 Average segment size is larger than the actual page size.

4 It is easier to realocate segments.

- Disadvantages :

1 It can have external Fragmentation.

2 Costly memory management algorithm.

3 Difficult to allocate contiguous memory.

* Explain Fragmentation with its types.

=> Fragmentation is an unwanted problem in operating system in which the process are loaded and unloaded from memory and free memory space is fragmented.

There are two types of Fragmentation.

1) Internal Fragmentation

2) External Fragmentation

	Internal Fragmentation	External Fragmentation
1	Internal Fragmentation happen when the process is smaller than the memory.	External Fragmentation happen when the process is removed.
2	The solution of Internal Fragmentation is best Fit block.	The solution of External Fragmentation is Paging.
3	Occurs when memory divided into fixed sized.	Occurs when memory divided into variable sized.
4	Occurs in worst Fit memory allocation method.	Occurs in Best Fit memory allocation method.

* Explain Virtual Memory.

=> Virtual Memory is a storage allocation scheme in which secondary memory can be addressed as ~~thro~~ though it were part of the main memory.

Virtual Memory is a storage scheme that provides user an illusion of having a very big main memory.

In Virtual Memory a part of secondary memory as the main memory.

User can load the bigger size processes than the available main memory.

Virtual Memory can increased the degree of Multiprogramming.

In Virtual Memory, User can run large application with less real RAM.

Virtual Memory takes more time in switching between application.

* Define following Terms:

1 Locality of Reference :

Locality of Reference refers to a phenomenon in which computer program tends to access same set of memory location for a particular time period.

The property of locality of reference is mainly show by loops and subroutine in the program.

2 Dirty Bit :

A Dirty bit is a bit in memory switched on when an update is made to a page by computer hardware.

When the Dirty bit is switched on, the page is modified and

can be replaced in memory.

3 Dirty Page:

Dirty Page is a page in which pages that has been modified and needs to be written back to disk.

4 Page Hit:

When the CPU attempts to obtain a needed page from main memory and Page exists in main memory this is called Page Hit.

5 Page Fault:

When the CPU attempts to obtain a needed page From main memory and Page does not exists in main memory this is called Page Fault.

* Explain Demand Paging.

=> Demand Paging is identical to the paging system with swapping.

In Demand Paging, A page is delivered into the memory on demand.

Demand Paging combines the feature of simple paging and implement virtual memory.

In Demand Paging the Pages size are equal and Pages size is fixed.

Demand Paging does not allows sharing of the pages.

In Demand Paging, On demand pages are loaded in the memory.

In this virtual memory is divided into page and memory allocation of page are allocated dynamically.

In Demand Paging, Memory access is Page level protection.

In Demand Paging, Memory wastage is Internal Fragmentation.

* Explain Six Page Replacement Algorithm.

=> A Page Replacement algorithm is needed to decide which page needs to be replaced when a new page comes in.

This are the Basic Page Replacement Algorithm.

1) First In First out
2) Least Recently Use
3) Most Recently Use
4) Secound Chance
5) Optimal
6)

1 First In First Out:

This is the simple Page replacement algorithm.

In this algorithm, which Page come in the First in a Frame those Page First out in a Frame.

Ex. 1, 3, 0, 3, 5, 6, 3, Frame = 3

1	1	1	1	5	5	5
	3	3	3	3	6	6
		0	0	0	0	3
0	0	0	1	0	0	0

Total Page Fault = Total Page - Total Page Hit

= 7 - 1

= 6

Total Page Hit = Total Page - Total Page Fault

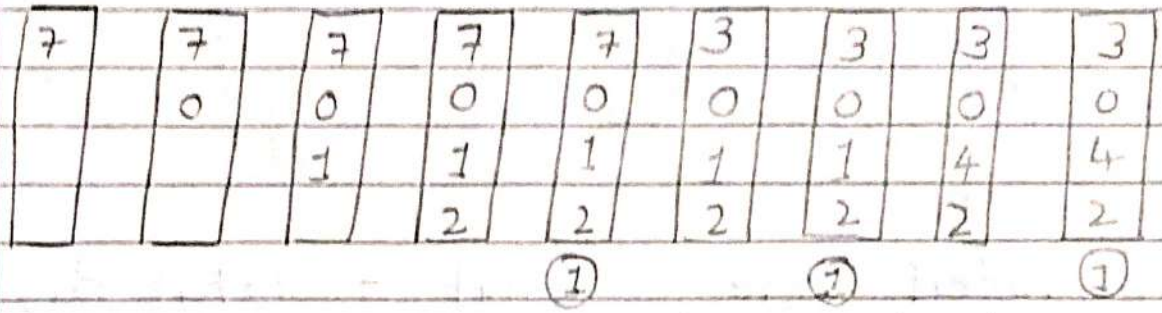
= 7 - 6

= 1

2. Least Recently Used:

In this algorithm, which Page ~~leas~~ Last used in Frame those Page First out in a Frame.

Ex. 7, 0, 1, 2, 0, 3, 0, 4, 2, Frame = 4



Page Fault = Total Page - Total Page Hit

= 9 - 3

= 6

Total Page Hit = Total Page - Total Page Fault

= 9 - 6

= 3

3 Optimal Page Replacement:

In this algorithm, Pages are replaced which would not be used for the Longest duration of time in the future.

Ex. 7, 0, 1, 2, 0, 3, 0, 4, 2, Frame = 4

7	7	7	7	7	3	3	3	3
	0	0	0	0	0	0	0	0
		1	1	1	1	1	4	4
			2	2	2	2	2	2
				(7)		(7)		(1)

Total Page Fault = Total Page - Total Page Hit
= 9 - 3
= 6

Total Page Hit = Total Page - Total Page Fault
= 9 - 6
= 3