

PAGE REPLACEMENT ALGORITHMS:

* The Longest time period repeated pages are to be replaced first.

* **page fault**: The CPU will demand for the particular page number; If it is not present in the reference string (RAM/main memory). Then it is going to be Page Fault.

* **Page Hit**: The CPU will demand for the particular page number; If it is present in the RAM/main memory. Then it is going to be Page Hit.

TYPES:
→ **FIFO**: First In First out.
→ **LRU**: Least Recently Used.
→ **Optimal Algorithm**.
} with the help of this 3, we can find page fault, Page Hit, Hit ratio.

FIFO:

* First In First Out.

* From the name itself we can recognize that which page has to be replaced first and which page has to be Deleted first.

* Replace the pages that has been in the RAM/main memory for the longest time period.

* The Example is follows,

Reference String:

7 0 1 2 0 3 0 4 2 3 0 3 1 2 0

* These page numbers are present in the RAM/memory

* Because the main memory size is lesser than the logical memory.

* The main memory can't store all the pages at a time.

* If the particular demanded page number not present in main memory, It has to be borrowed from Secondary memory, by deleting the longest time repeated page number.

* If the page faults are more than RAM gets slower.

(left side).

7 0 1 2 0 3 0 4 2 3 0 3 1 2 0

Page ↑ Frames	7	0	1	2	0	3	0	4	2	3	0	3	1	2	0	Present
F ₁	7	7	7	2	2	2	2	4	4	4	0	0	0	0	0	0
F ₂		0	0	0	Present 0	3	3	3	2	2	2	2	1	1	1	1
F ₃			1	1	1	1	0	0	0	3	3	Present 3	3	2	2	2
	*	*	*	*	Hit	*	*	*	*	*	*	Hit	*	*	Hit	

Page Hit : Hits → 3

pag faults : * → 12

Reference string → 15.

Explanation for FIFO:

* Starting RAM / Main memory is free. It does not contain any page numbers.

* It contains (RAM) only three frames for replacing the longest time period page numbers.

* The CPU is demanding for Page no: 7.
The RAM doesn't contain any page no in the starting.
So CPU will borrow the particular page number from RAM.
So page no. 7 is not there in RAM. Then it is going to be 'Page fault *'

* The process continues like this

* Now the CPU is demanding for page '0'.

7 0 1 2 **0** 3 0 4 2 3 0 3 1 2 0
 ↓
 ↓

⇒ It is present in the given Reference String
Then it is going to be 'page Hit - Hit'.

$$\text{Hit ratio} = \frac{\text{No. of Hits}}{\text{total no. of Reference String}}$$

$$= \frac{3}{15} \times 100 = 20\% \text{ (approx)}$$

$$\text{Page fault} = \frac{\text{No. of fault}}{\text{Ref. string}}$$

$$= \frac{12}{15} \times 100 = 80\% \text{ (approx)}$$

LRU:

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* Least Recently Used.

* Note : 3 Frames = 3 page numbers. (compare)

* Left side page numbers are replaced with another.

Example :

(consider two 0's as 1)

(consider two 3's as one)

	7	0	1	2	0	3	0	4	2	3	0	3	1	2	0
F ₁	7	7	7	2	2	2	2	4	4	4	0	0	0	2	2
F ₂	0	0	0	0	0	0	0	0	0	3	3	3	3	3	0
F ₃			1	1	1	3	3	3	2	2	2	2	1	1	1
	*	*	*	*	Hit	*	Hit	*	*	*	*	Hit	*	*	*

* Step 1 : 7 0 1 (frame) ; 7 0 1 (page no). check the arrow [For your Reference].

* Step 2 : Compare the page numbers and frames in left direction.

* Don't compare the Frame F₂ for the particular time period.

* Check the frames with given page numbers.

For example : 7 0 1 (1 is most recently used.

7 is Least recently used. so select '7' and replace with next page number '2'.)

The process continuous

* Now, check the frame : 4 0 2 and page number (0 4 2). In frames 2 is very most recently used ; 4 is mostly recently used (only 2 times repeated). we should replace the frame with another page number only if particular page number repeats 3 or above times. So In this condition you just delete the frame (F_2) - '0' with '3'.

The process continuous - - - - -

page Hit = 3

page fault = 12.

OPTIMAL ALGORITHM:

* This algorithm represents the longest time period page number in future (Right Direction).

Example:

longest time in future. →

7	0	1	2	0	3	0	4	2	3	0	3	2	1	2	0	1	7
7	7	7	2	2	2	2	2	2	2	2	2	2	2	2	2	2	7
	0	0	0	0	0	0	4	4	4	0	0	0	0	0	0	0	0
		1	1	1	3	3	3	3	3	3	3	3	1	1	1	1	1
*	*	*	*	Hit	*	Hit	*	Hit	Hit	*	Hit	Hit	*	Hit	Hit	Hit	*

Explanation:

* The process starts as usual ;

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* Now, check for longest time in future.

⇒ 7 0 1 (frames) ; comparing these numbers in given Reference string. 7 is most longest traveled page number (i.e., Repeated in future).

These processes are continues -----

* Now, page number 4 is not there in future reference string. In this condition just replace the longest time repeated frame with another page number (i.e) '0' is replaced with 4.

* Then process repeats. After that 4 is not there in future reference string. So if it is in frames also no use. So just delete that page number and replace '0'.

2 (4) 3 replace with 2 0 3

* The process continuous. Last 7 is not there in future. So just replace with longest traveled page number (2) with 7.

Page Hit - 9

Page fault - 9.