FACULTY OF ENGINEERING AND TECHNOLOGY
UNIVERSITY OF LUCKNOW
LUCKNOW

Operating System

AI-602

Dr. Zeeshan Ali Siddiqui

Assistant Professor

Deptt. of C.S.E.

PAGE REPLACEMENT ALGORITHMS (Part-2)

Page Replacement Algorithms

- FIFO Page replacement Algorithm

- Optimal Page Replacement Algorithm

- Least Recently Used (LRU) Algorithm

OPTIMAL PAGE REPLACEMENT
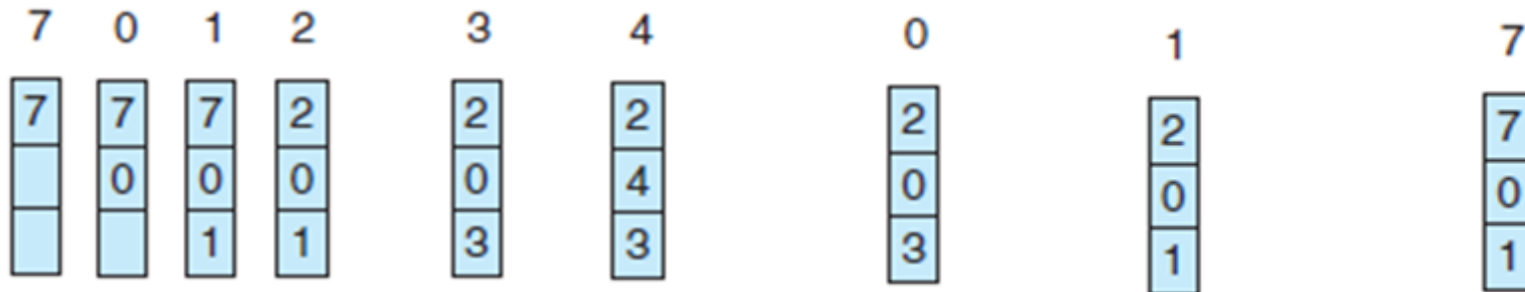
Optimal Page Replacement

- Replace the page that will not be used for the *longest period of time*.

- This page-replacement algorithm *guarantees* the lowest possible page fault rate for a fixed number of frames.

- Difficult to implement, because it requires *future knowledge* of the reference string.

- The optimal algorithm is used mainly for *comparison* studies.

Example

- Let three frames are initially empty.

reference string

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

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

page frames ⟶

LEAST RECENTLY USED (LRU)

Least Recently Used (LRU)

- Replace the page that *has not been used* for the longest period of time.

- It uses the *recent past* as an approximation of the near future
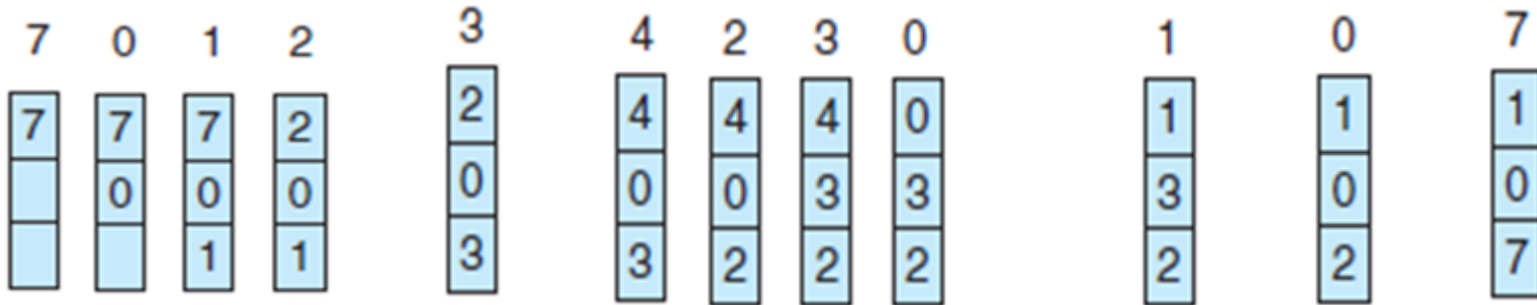
Example

- Let three frames are initially empty.

reference string

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

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

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

page frames ⟶

Homework

- Let the *reference string*:

    1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6

Find the number of page faults for One/Two/Three/Four frames (LRU/FIFO/OPTIMAL).

Frame Allocation

Frame Allocation

- Allocation of frames:

  ➢ The minimum number of frames per process is defined by the *architecture*.

  ➢ The maximum number is defined by the amount of available *physical memory*.

Frame Allocation

- Allocation Algorithms:

  ➢ **Equal allocation**:
  - ❖ The easiest way to split m frames among n processes is to give everyone an equal share.

  ➢ **Proportional allocation**:
  - ❖ We allocate available memory to each process according to its size.

References

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley.

2. William Stallings, "Operating Systems: Internals and Design Principles", 6th Edition, Pearson Education.

3. D M Dhamdhere, "Operating Systems: A Concept based Approach", 2nd Edition, TMH.

Thank You.