Department of Computer Science and Engineering

FACULTY OF ENGINEERING AND TECHNOLOGY
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CS-501

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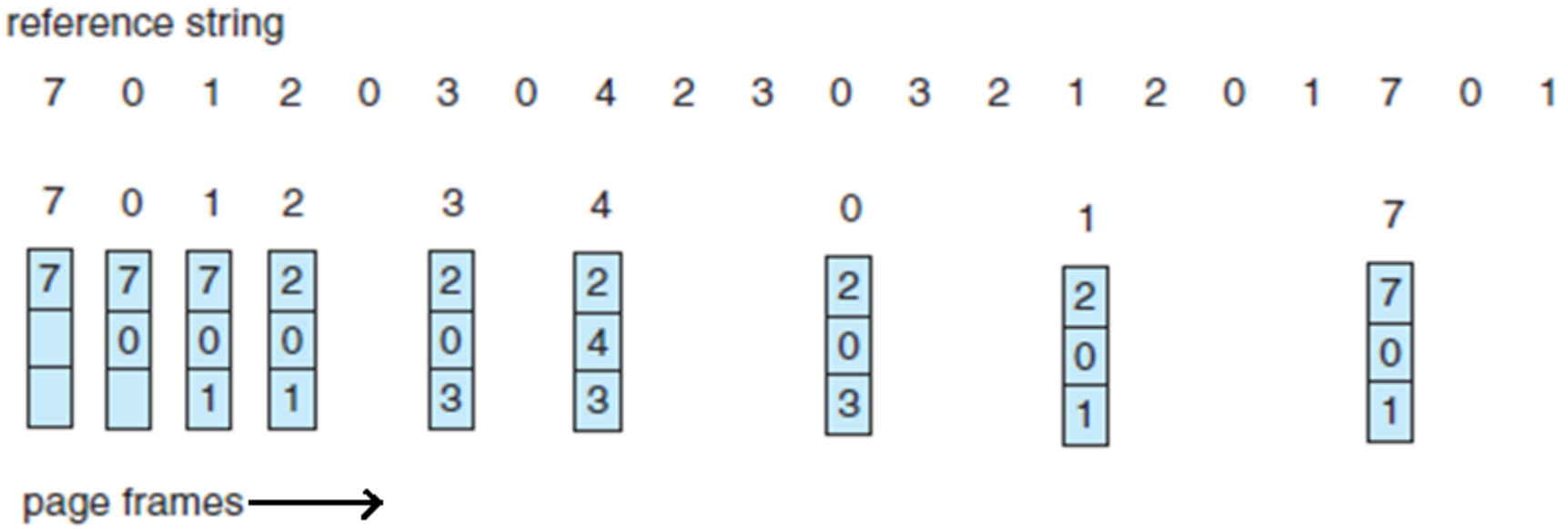
OPTIMAL PAGE REPLACEMENT

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.



LEAST RECENTLY USED (LRU)

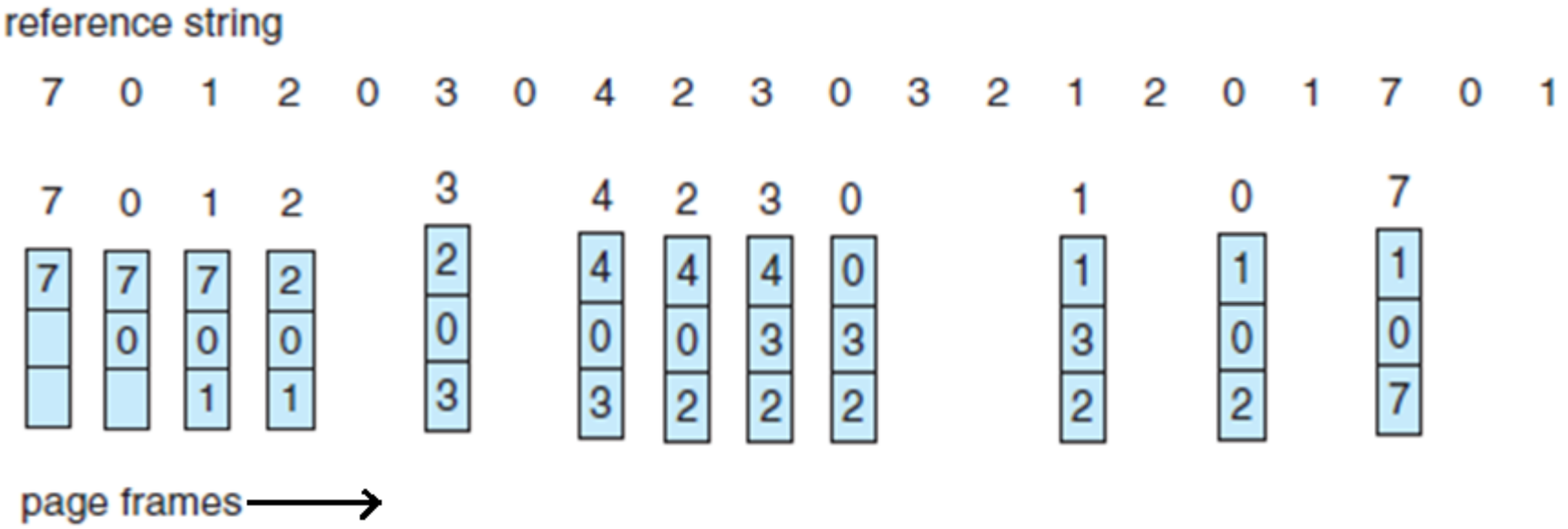
Least Recently Used (LRU)

- 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.



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.