Virtual Memory

Virtual memory is **a common technique used in a computer's operating system (OS)**. Virtual memory uses both hardware and software to enable a computer to compensate for physical memory shortages, temporarily transferring data from Random Access Memory (RAM) to disk storage.
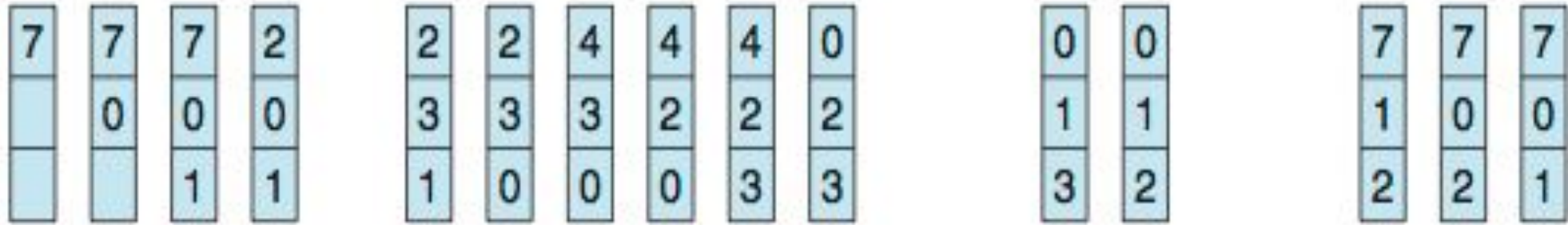
Virtual Memory

- **Virtual memory** – separation of user logical memory from physical memory
  - Only part of the program needs to be in memory for execution
  - Logical address space can therefore be much larger than physical address space
  - Allows address spaces to be shared by several processes
  - Allows for more efficient process creation
  - More programs running concurrently

FIFO Page Replacement

reference string

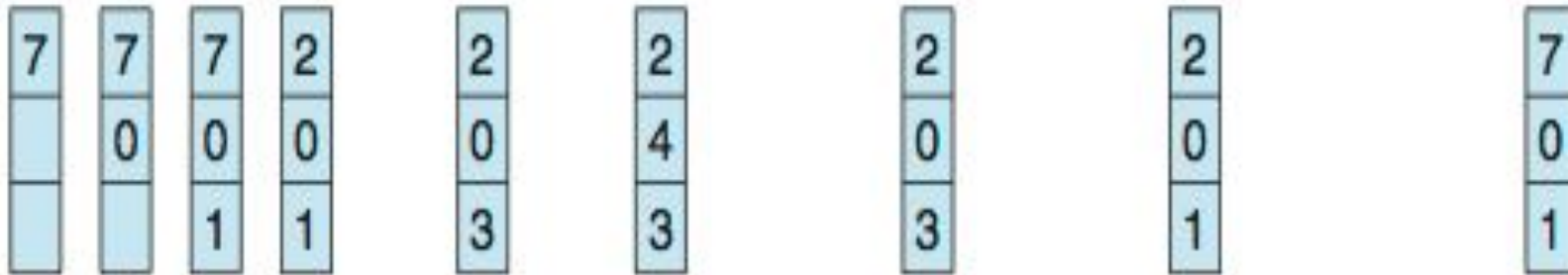7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1

page frames

15-page faults

Optimal Page Replacement

reference string

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

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

9-page faults

Least Recently Used (LRU) Algorithm

reference string

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

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

12-page faults