SNS COLLEGE OF TECHNOLOGY

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COURSE NAME : 19CST201 – OPERATING SYSTEMS

II YEAR/ IV SEMESTER

UNIT – III STORAGE MANAGEMENT

Topic: Contiguous memory allocation and Swapping

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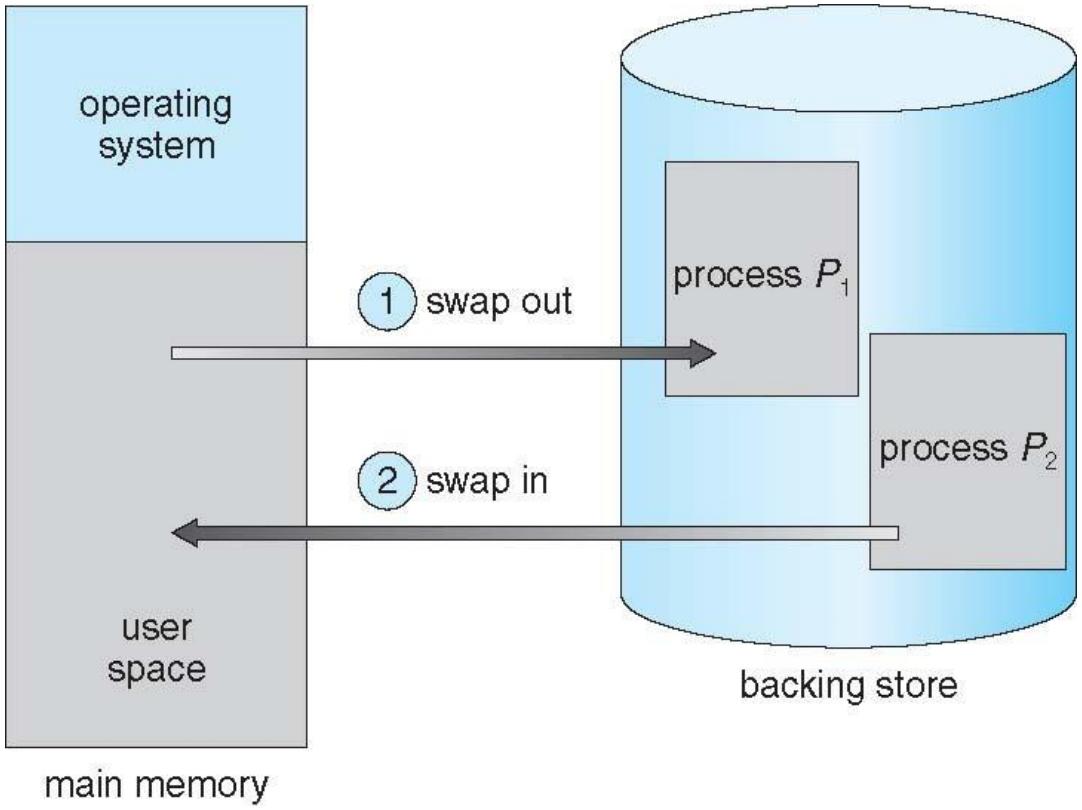
Swapping

- A process can be **swapped** temporarily out of memory to a backing store, and then brought back into memory for continued execution
  - Total physical memory space of processes can exceed physical memory



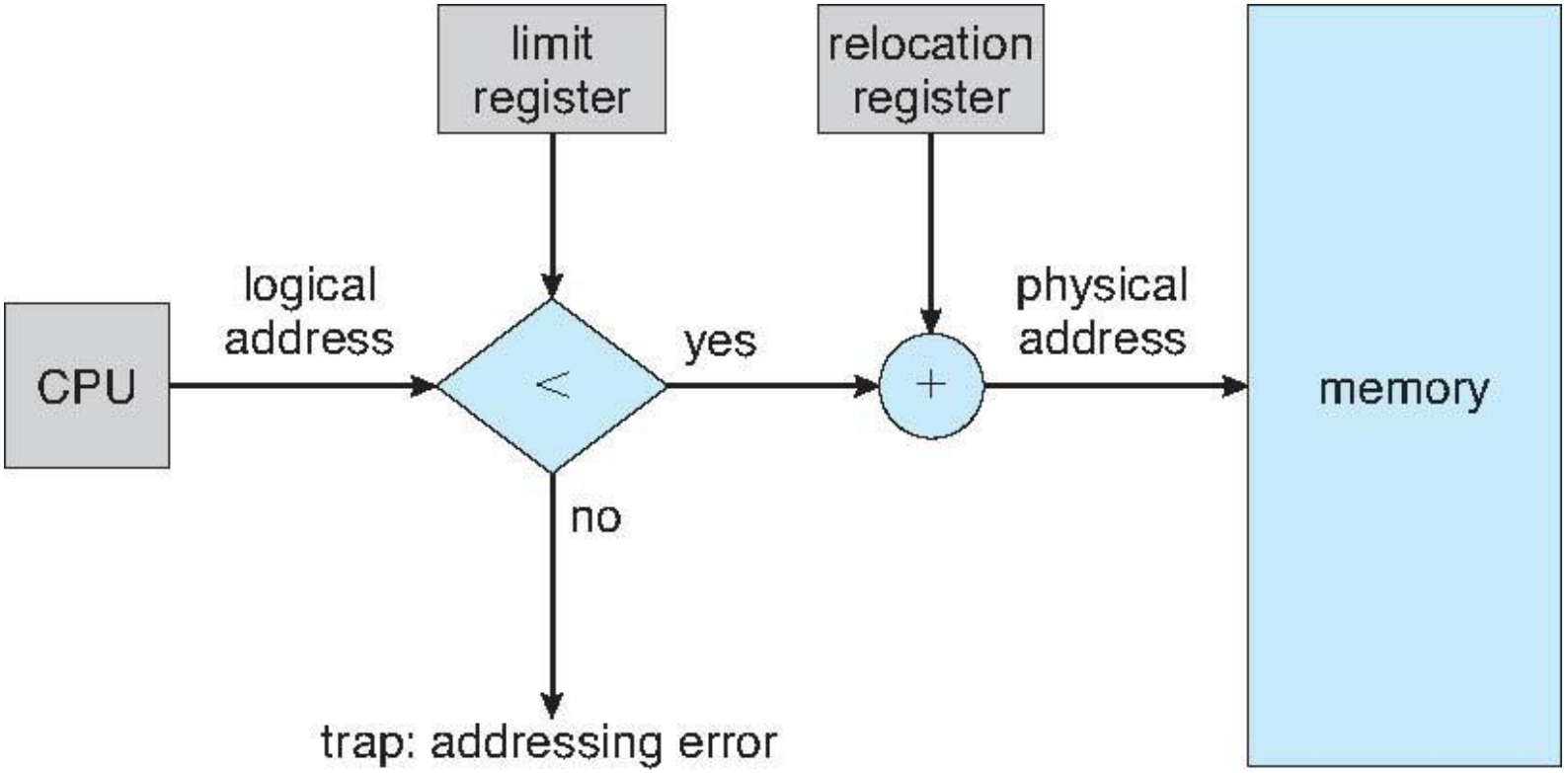
Contiguous Allocation

- Main memory must support both OS and user processes
- Limited resource, must allocate efficiently
- Contiguous allocation is one early method
- Main memory usually into two **partitions**:
  - Resident operating system, usually held in low memory with interrupt vector
  - User processes then held in high memory
  - Each process contained in single contiguous section of memory

Contiguous Allocation

- Relocation registers used to protect user processes from each other, and from changing operating-system code and data
  - Base register contains value of smallest physical address
  - Limit register contains range of logical addresses – each logical address must be less than the limit register
  - MMU maps logical address *dynamically*
  - Can then allow actions such as kernel code being **transient** and kernel changing size

Hardware Support for Relocation and Limit Registers



Multiple-partition allocation

Multiple-partition allocation

Degree of multiprogramming limited by number of partitions

Variable-partition sizes for efficiency (sized to a given process' needs)

Hole – **block of available memory**;

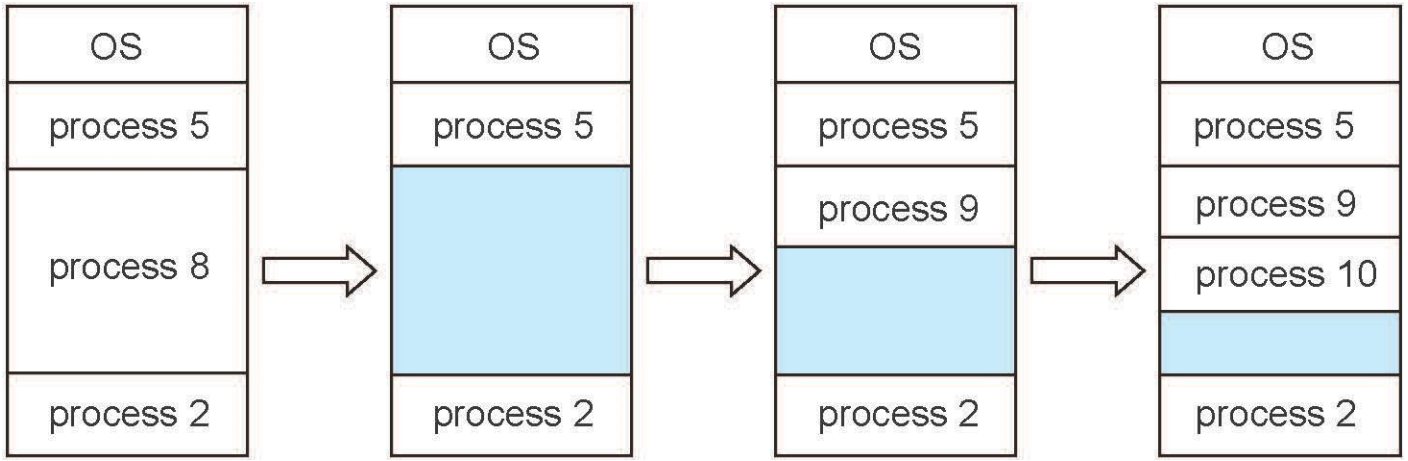
holes of various size are scattered throughout memory

When a process arrives, it is allocated memory from a hole large enough to accommodate it

Process exiting frees its partition,adjacent free partitions combined

Operating system maintains information about:

a) allocated partitions **b) free partitions (hole)**



Dynamic Storage-Allocation Problem

How to satisfy a request of size ***n*** from a list of free holes?

First-fit: Allocate the ***first*** hole that is big enough

Best-fit: Allocate the ***smallest*** hole that is big enough; must search entire list, unless ordered by size
Produces the smallest leftover hole

Worst-fit: Allocate the ***largest*** hole; must also search entire list
Produces the largest leftover hole

First-fit and best-fit better than worst-fit in terms of speed and storage utilization

Fragmentation

- **External Fragmentation** – total memory space exists to satisfy a request, but it is not contiguous
- **Internal Fragmentation** – allocated memory may be slightly larger than requested memory; this size difference is memory internal to a partition, but not being used

- Reduce external fragmentation by **compaction**
  - Shuffle memory contents to place all free memory together in one large block
  - Compaction is possible *only* if relocation is dynamic, and is done at execution time

Fragmentation