

CSc 360
Operating Systems
Memory Management

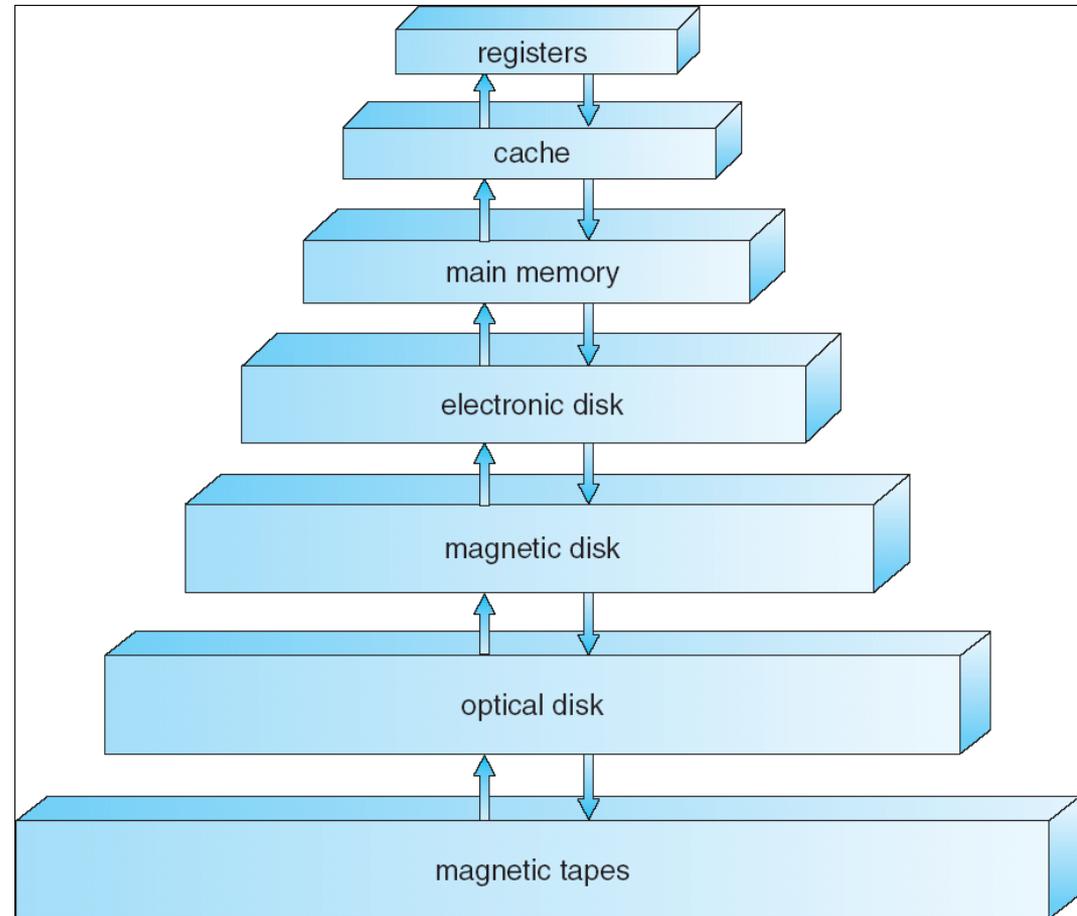
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Review

- CPU management: how to *share* CPU
 - scheduling algorithms
 - jobs, processes, threads
 - communication mechanisms
 - shared memory, message passing, socket
 - synchronization algorithms
 - mutual exclusion, deadlocks, live-locks
- Next: how to *share* memory

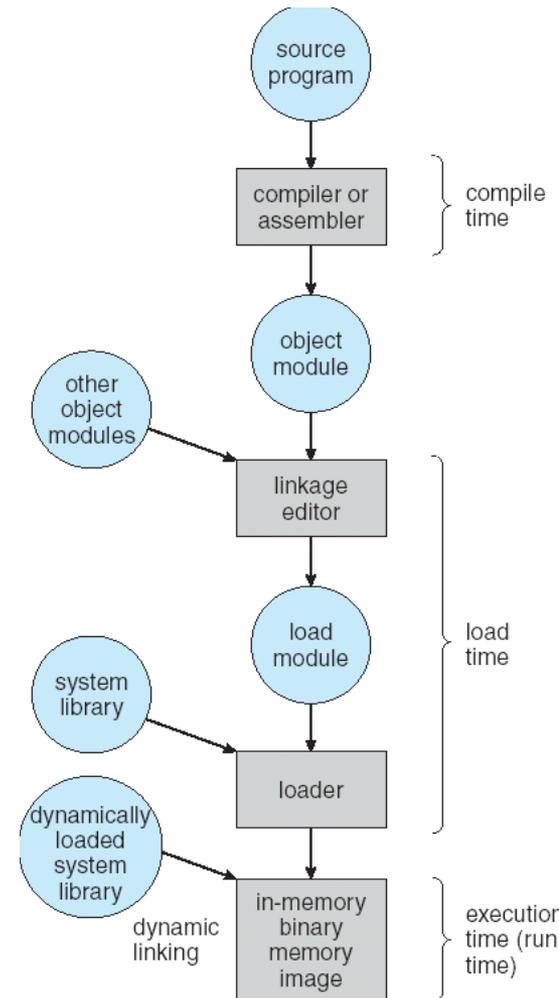
Storage hierarchy

- CPU direct access
 - registers
 - (main) memory
 - cache



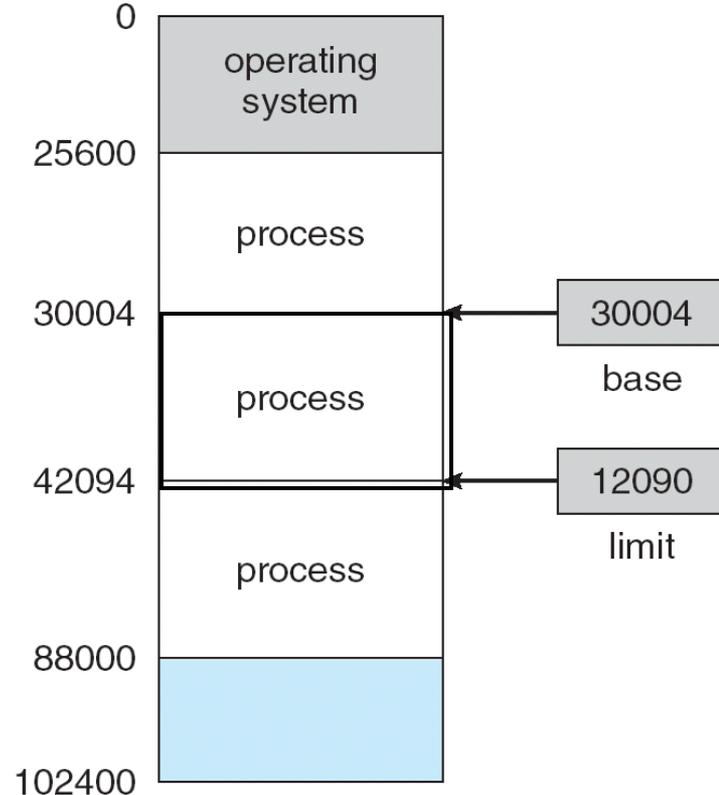
Memory access

- Access by address
 - for both code and data
- Address binding
 - compiler time: absolute code
 - MS-DOS .COM format, 64KB limit
 - load time: relocatable code
 - MS-DOS .EXE format
 - execution time



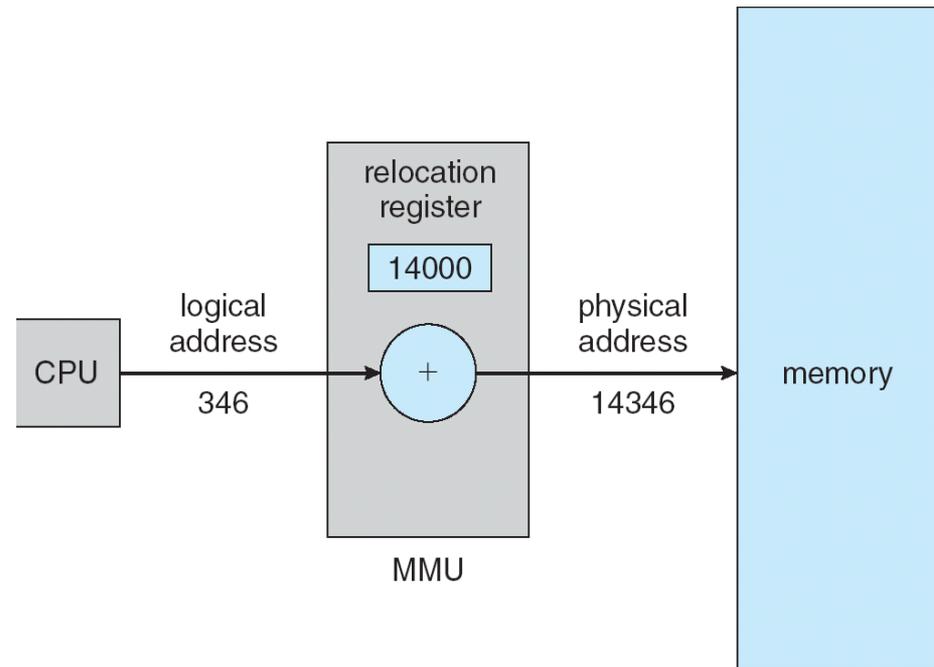
Memory space

- Logical memory
 - seen by CPU
 - virtual memory
- Physical memory
 - seen by memory unit
- Address binding
 - compile/load time: logical/physical addr same
 - execution time: logical/physical address differ



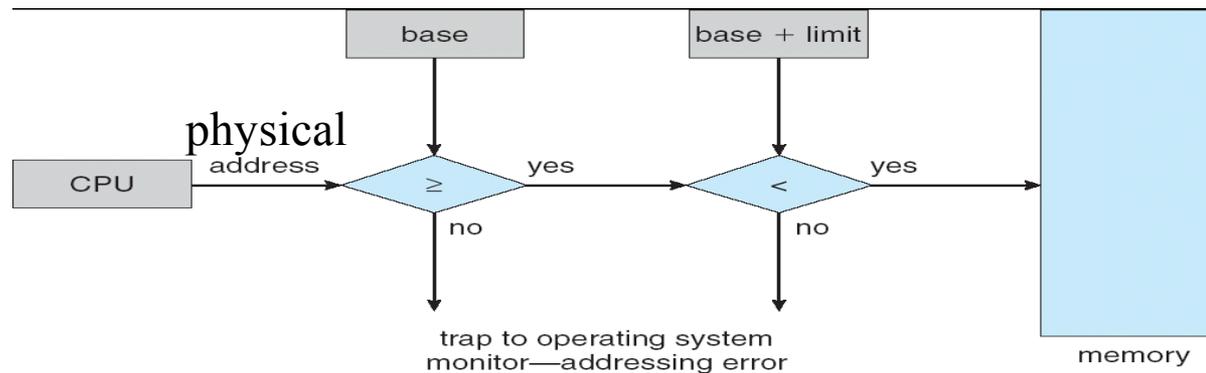
Memory management

- MMU: memory management unit
 - logical/physical memory mapping
- Relocation register
 - physical address = logical address + relocation base
- Dynamic loading
- Dynamic linking

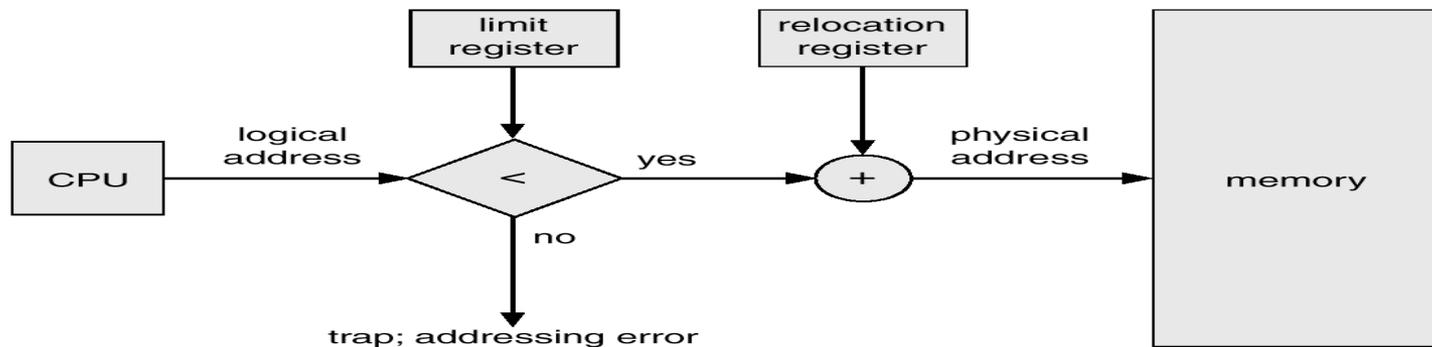


Memory protection

- With base and limit registers

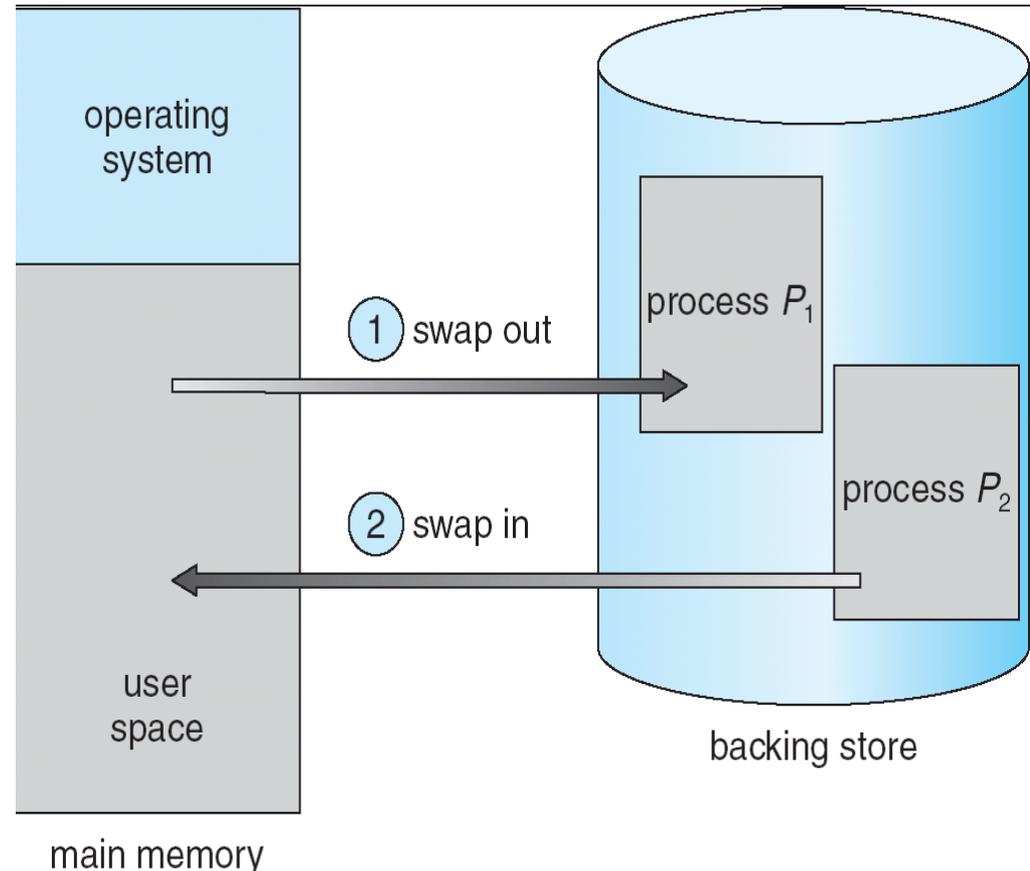


- With limit and relocation registers



Swapping

- **Swap out**
 - e.g., low priority
 - reduce the degree of multiprogramming
- **Swap in**
 - address binding
- **Swapping overhead**
 - on-demand



This lecture

- Memory access
 - by address
 - logical address, physical address
 - their mapping
 - swapping
- Explore further
 - /proc/meminfo
 - memory, swap

Next lecture

- Memory allocation
 - read OSC7Ch8