

CSc 360

Operating Systems

Memory Management

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Review

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

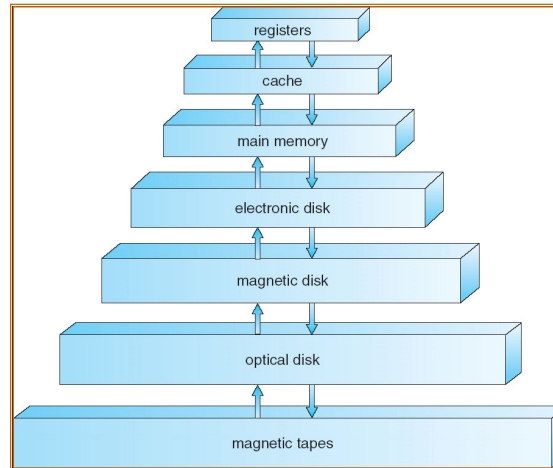
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Storage hierarchy

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



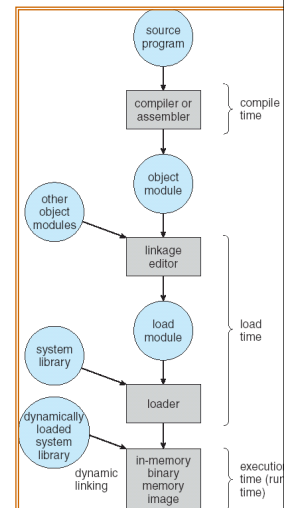
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Memory access

- 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



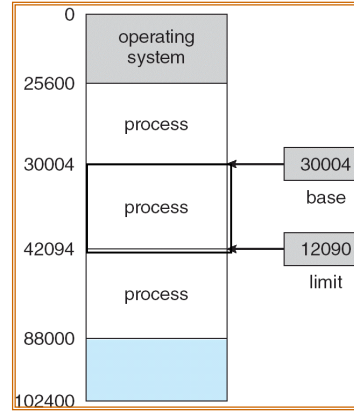
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Memory space

- 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



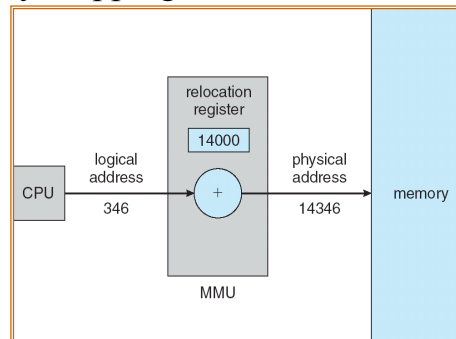
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Memory management

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



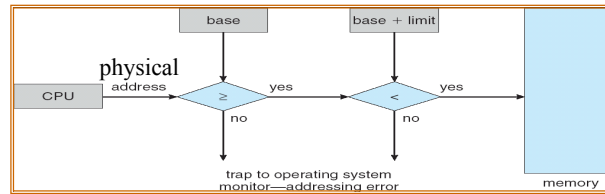
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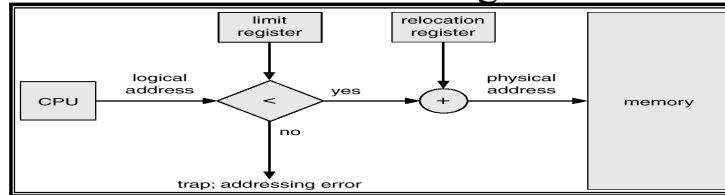
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Memory protection

- With base and limit registers



- With limit and relocation registers



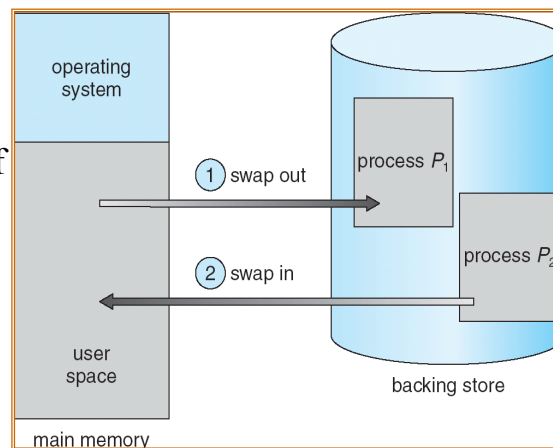
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Swapping

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



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This lecture

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

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Next lecture

- Memory allocation
 - read OSC7Ch8

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