Department of Computer Science and Engineering

FACULTY OF ENGINEERING AND TECHNOLOGY
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CS-501

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MAIN MEMORY

Main Memory

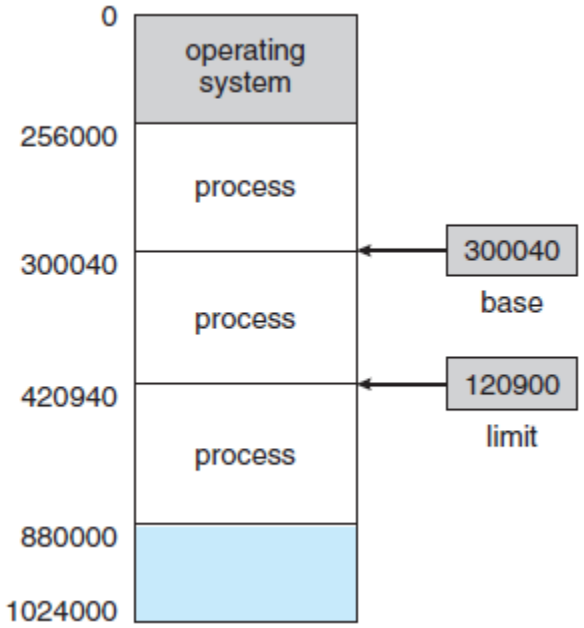
- Program must be brought (from disk) into *memory* and placed within a process for it to be run.
- *Main memory* and *registers* are only storage that CPU can access directly.
- Register access in one CPU clock (or less).
- Main memory can take many cycles.
- *Cache* sits between main memory and CPU registers
- *Protection* of memory required to ensure correct operation.

Basic Hardware

Basic Hardware

- Each process has a *separate* memory space.

- The ability to determine the range of *legal addresses* that the process may access.

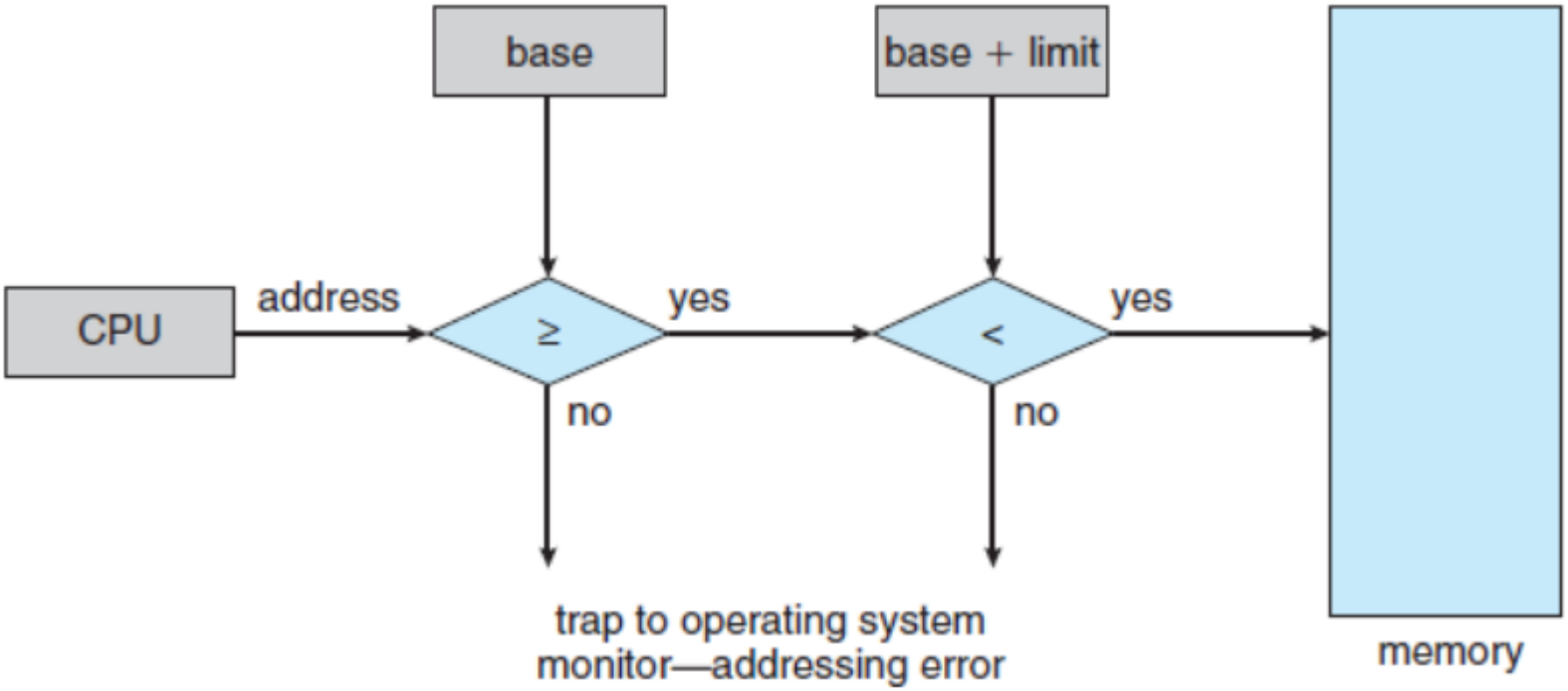


- Two registers:
  - **Base**
    - The base register holds the smallest legal physical memory address.
  - **Limit**
    - The limit register specifies the size of the range.

Protection of Memory Space

Protection of Memory Space

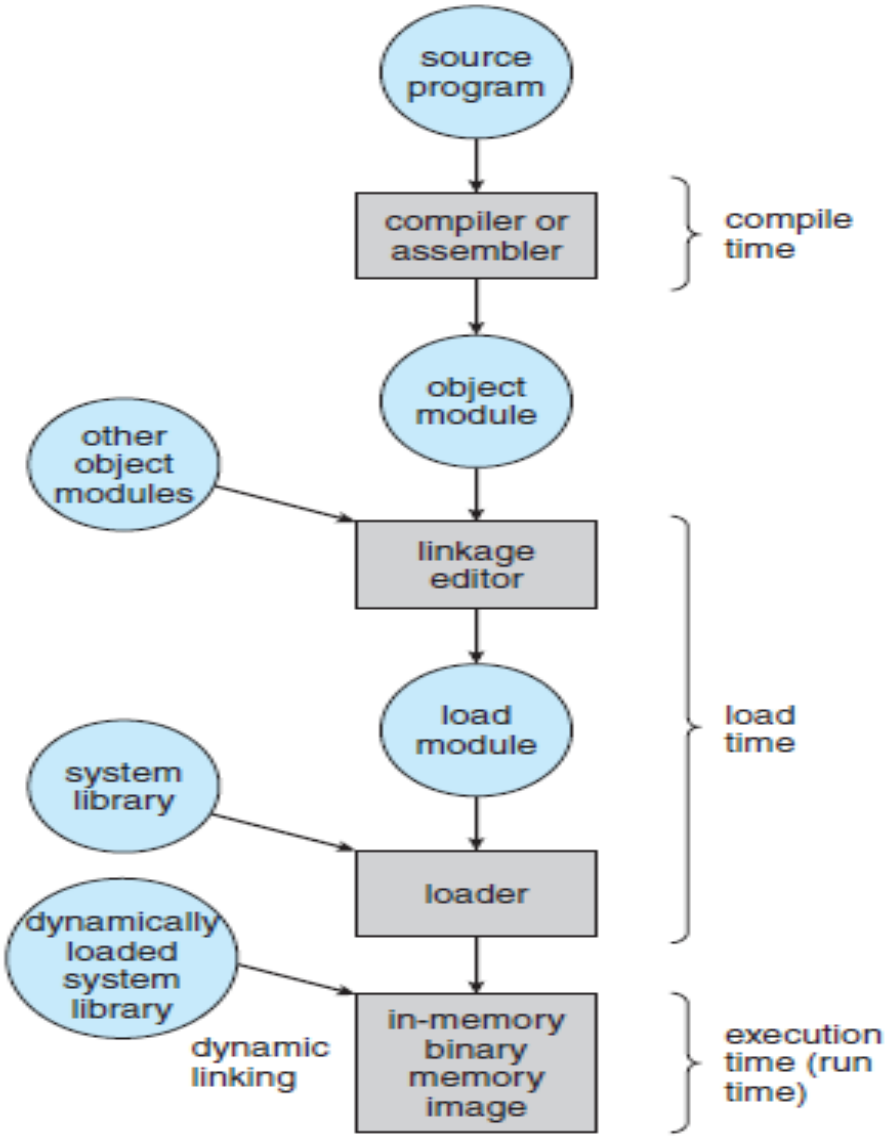
- The base and limit registers can be *loaded* only by the operating system.



Address Binding

Address Binding

- *Compile time*
- *Load time*
- *Execution time*



Logical Versus Physical Address Space

Logical Versus Physical Address Space

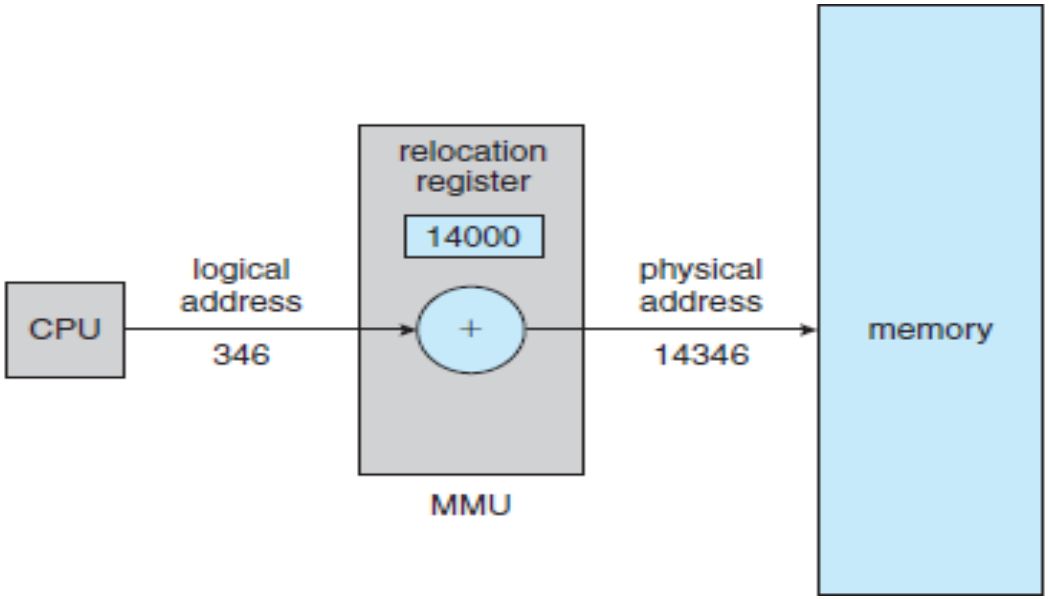
- **Logical address:**
  - An address generated by the CPU.
  - Virtual address

- **Physical Address:**
  - An address seen by the memory unit.
  - Loaded into the memory-address register of the memory

Dynamic Relocation Using A Relocation Register

- The run-time mapping from virtual to physical addresses is done by a hardware device called the *memory-management unit* (MMU).

- The user program never sees the *real* physical addresses.



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.