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FACULTY OF ENGINEERING & TECHNOLOGY

BCA-307 Operating System

Lecturer-18

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MEMORY MANAGEMENT

- Logical vs. Physical Address Space
- Memory-Management Unit
- Dynamic relocation using a relocation register

TOPIC Logical vs. Physical Address Space

•The concept of a logical address space that is bound to a separate physical address space is central to proper memory management

- ➢Logical address – generated by the CPU; also referred to as virtual address
- ➢Physical address – address seen by the memory unit

•Logical and physical addresses are the same in compile-time and load-time address-binding schemes; logical (virtual) and physical addresses differ in execution-time address-binding scheme

•Logical address space is the set of all logical addresses generated by a program

•Physical address space is the set of all physical addresses generated by a program

Memory-Management Unit (MMU)

•Hardware device that at run time maps virtual to physical address

•Many methods possible, covered in the rest of this chapter

•To start, consider simple scheme where the value in the relocation register is added to every address generated by a user process at the time it is sent to memory

- ➢Base register now called relocation register
- ➢MS-DOS on Intel 80x86 used 4 relocation registers

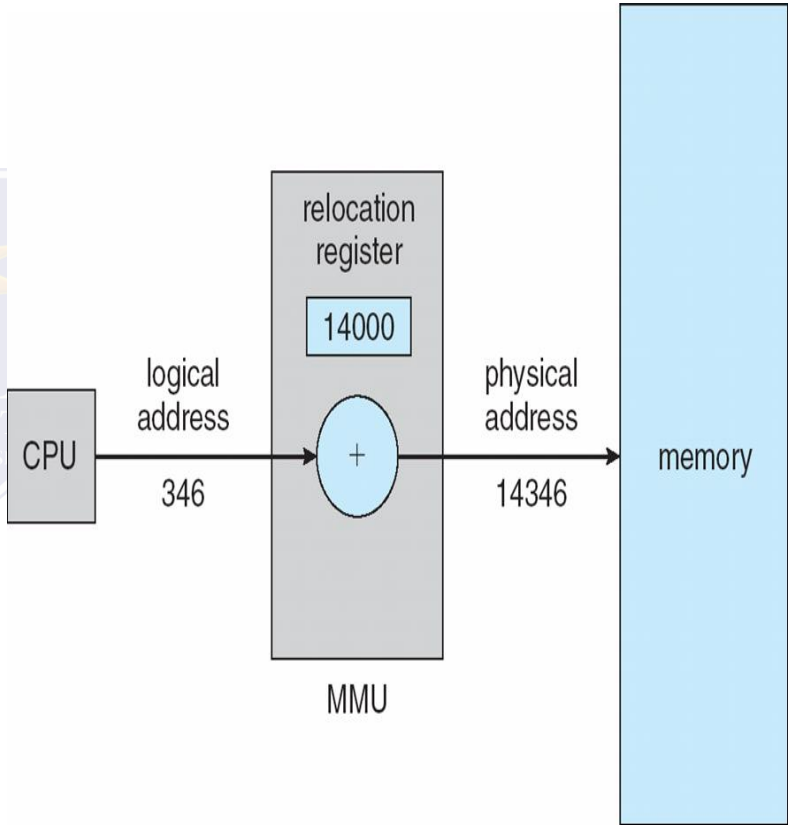
•The user program deals with *logical* addresses; it never sees the *real* physical addresses

- ➢Execution-time binding occurs when reference is made to location in memory
- ➢Logical address bound to physical addresses

Dynamic relocation using a relocation register

Routine is not loaded until it is called
Better memory-space utilization; unused routine is never loaded
All routines kept on disk in relocatable load format

Useful when large amounts of code are to handle infrequently occurring cases
No special support from the operating system is required
OS can help by providing libraries to implement dynamic loading



Dynamic Linking

- Static linking – system libraries and program code combined by the loader into the binary program image
- Dynamic linking –linking postponed until execution time
- Small piece of code, stub, used to locate the appropriate memory-resident library routine
- Stub replaces itself with the address of the routine, and executes the routine
- Operating system checks if routine is in processes' memory address
  If not in address space, add to address space
- Dynamic linking is particularly useful for libraries
- System also known as shared libraries
- Consider applicability to patching system libraries
  Versioning may be needed

MCQ

The address of a page table in memory is pointed by:

A. stack pointer
B. page table base register
C. page register
D. program counter

Operating System maintains the page table for:

A. each process
B. each thread
C. each instruction
D. each address

Dynamic relocation has…

A. Better memory-space
B. large memory-space
C. small memory-space
D. None

Static linking ……

A. system libraries
B. program code combined by the loader into
C. loader into the binary program image
D. None