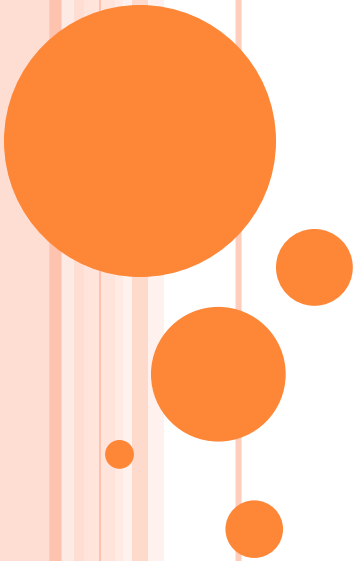
PROJECT3

MMU IMPLEMENTATION



Operating System 2

Memory Allocation Techniques:

- To store the data and to manage the processes, we need a large-sized memory and, at the same time, we need to access the data as fast as possible.
- But if we increase the size of memory, the access time will also increase
- So we want to access the main memory as fast as possible.

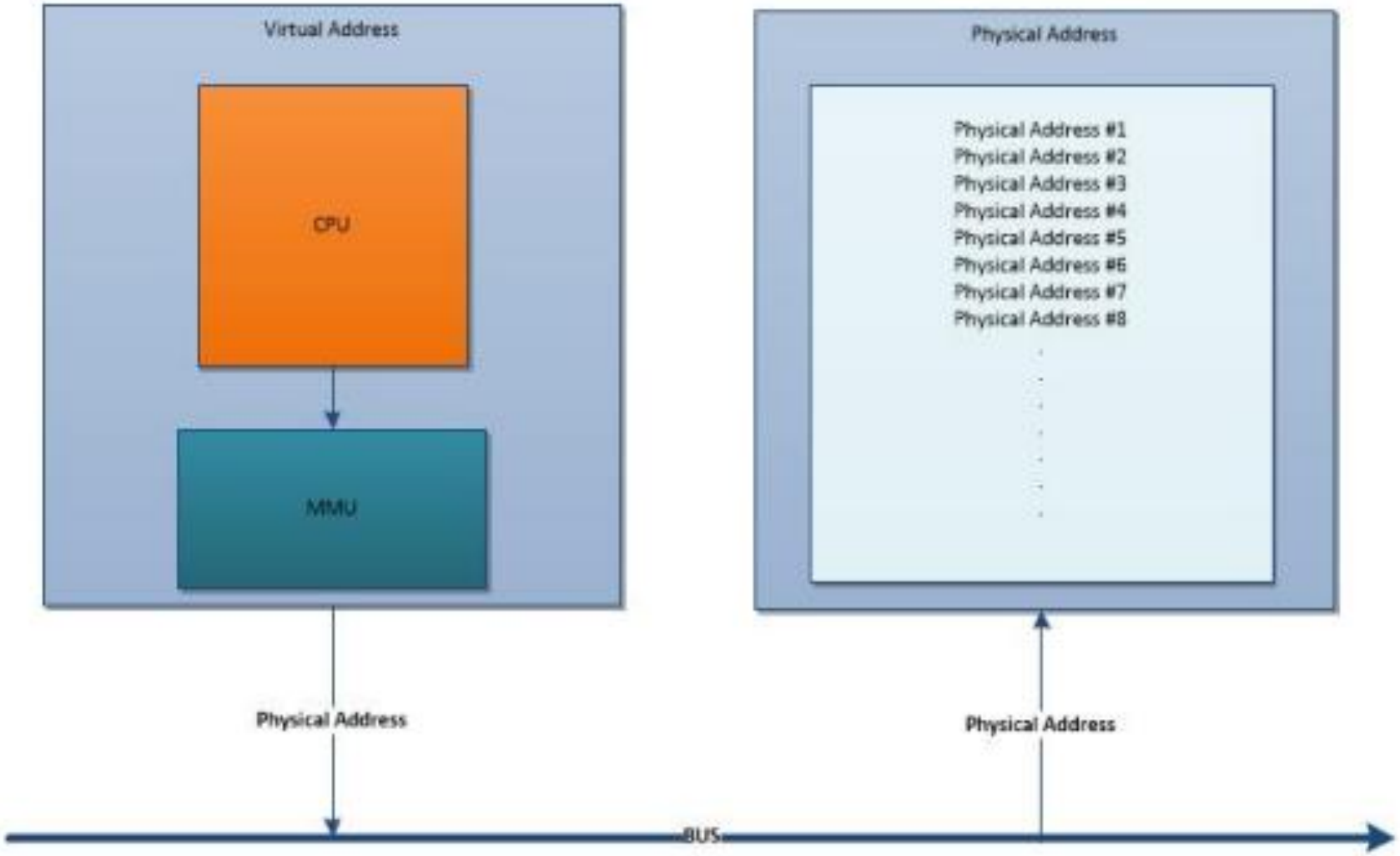
Introduction

- In memory management, the Operating System will handle the processes and move the processes between disk and memory for execution .
- Whenever a program is running, an address is generated by the Central Processing Unit called Logical Address which do not exist physically, it only exists virtually and hence it is also called as a virtual address.
- Physical memory location can be accessed by the central processing unit's using this virtual address as a reference.
- The set of all the logical addresses generated by the central processing unit is called logical address space and the mapping of these logical addresses to the physical addresses is done using a hardware device called memory management unit.

Memory-Management Unit(MMU)

- A memory management unit (MMU), sometimes called paged memory management unit (PMMU), is a computer hardware unit having all memory references.
- MMU primarily performing the translation of virtual memory addresses to physical addresses. It is usually implemented as part of the central processing unit (CPU), but it also can be in the form of a separate integrated circuit.

Computer System with MMU

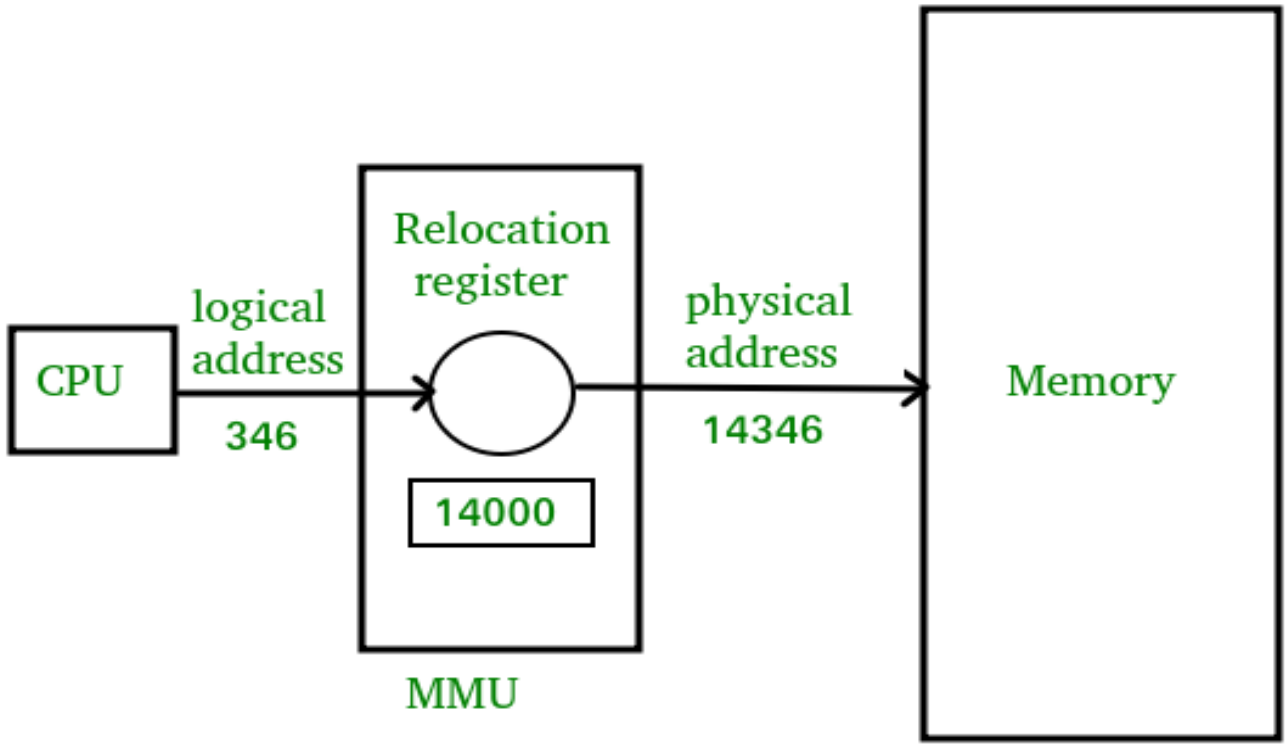


Physical Address and Logical Address

- The logical address is a virtual address that the user can access. The logical address is created by the CPU.
- The physical address can not be accessed directly by the customer. The physical address refers to a memory location , and generated by the memory management unit.

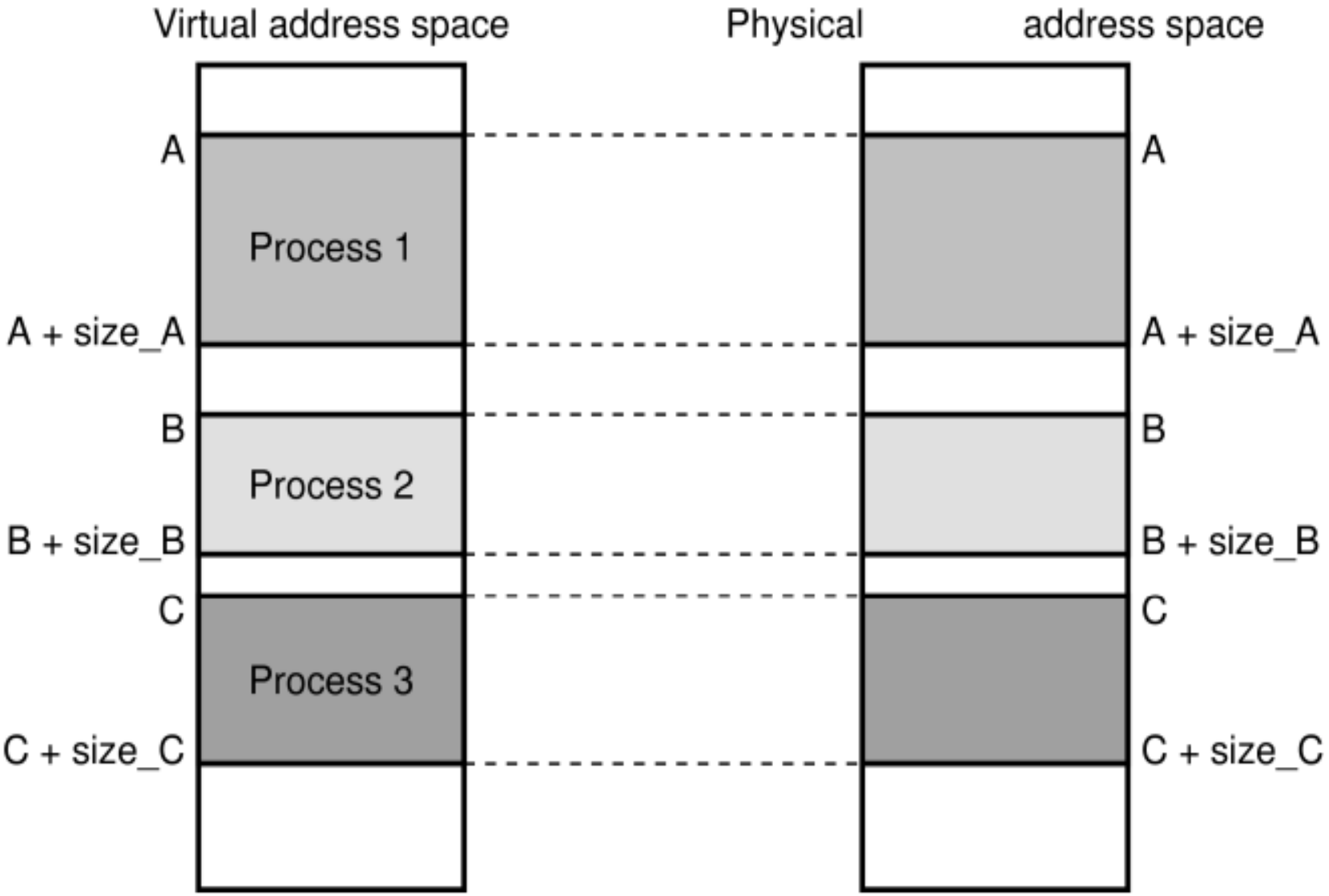
DYNAMIC RELOCATION USING A RELOCATION REGISTER

1. CPU will generate logical address for eg: 346
2. MMU will generate a relocation register (base register) for eg: 14000
3. In memory, the physical address is located eg:(346+14000= 14346)

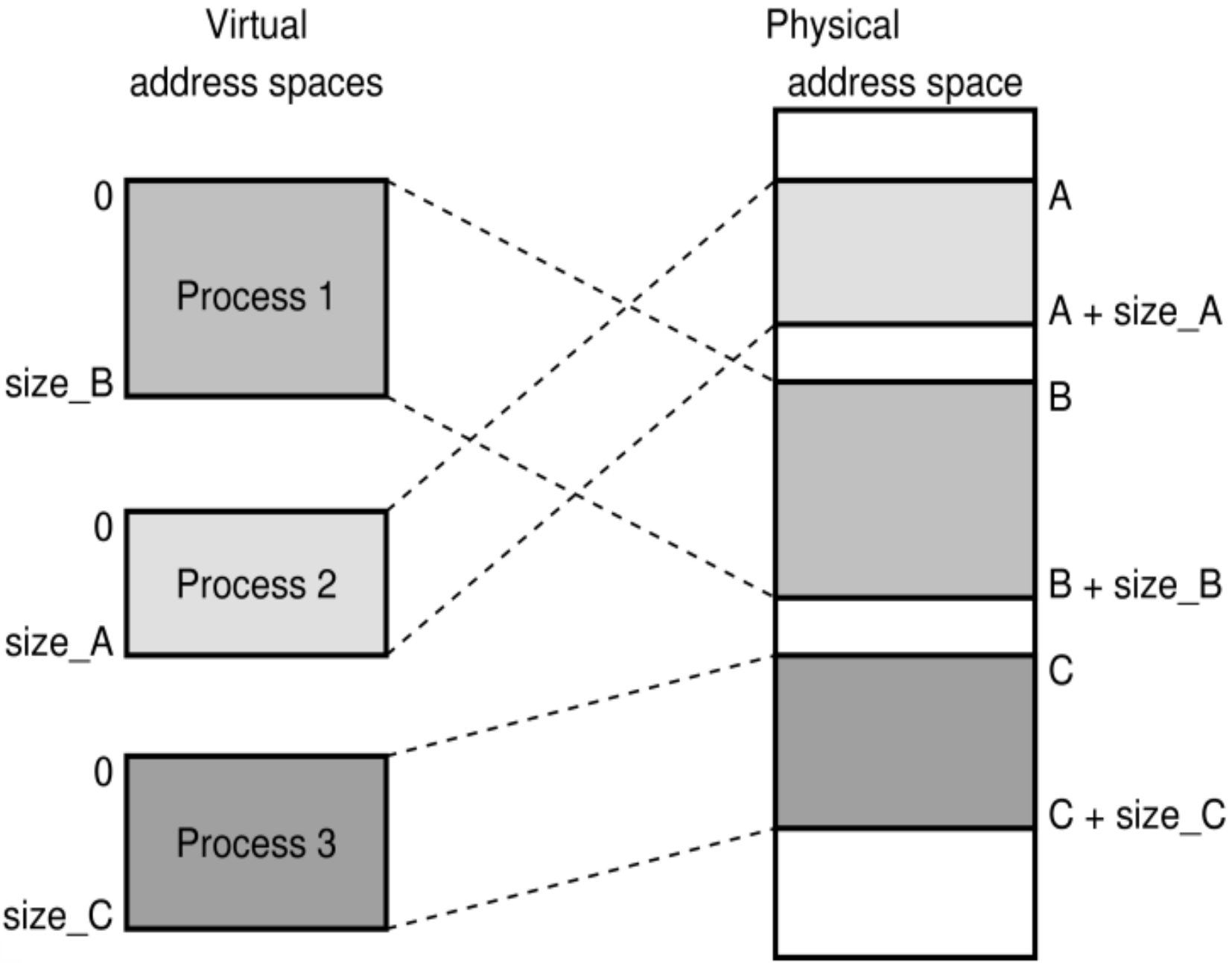


Bases

- The value in the relocation register is added to every address generated by a user process at the time the address is sent to memory.
- The user program never sees the real physical addresses.
- The user program generates only logical addresses.

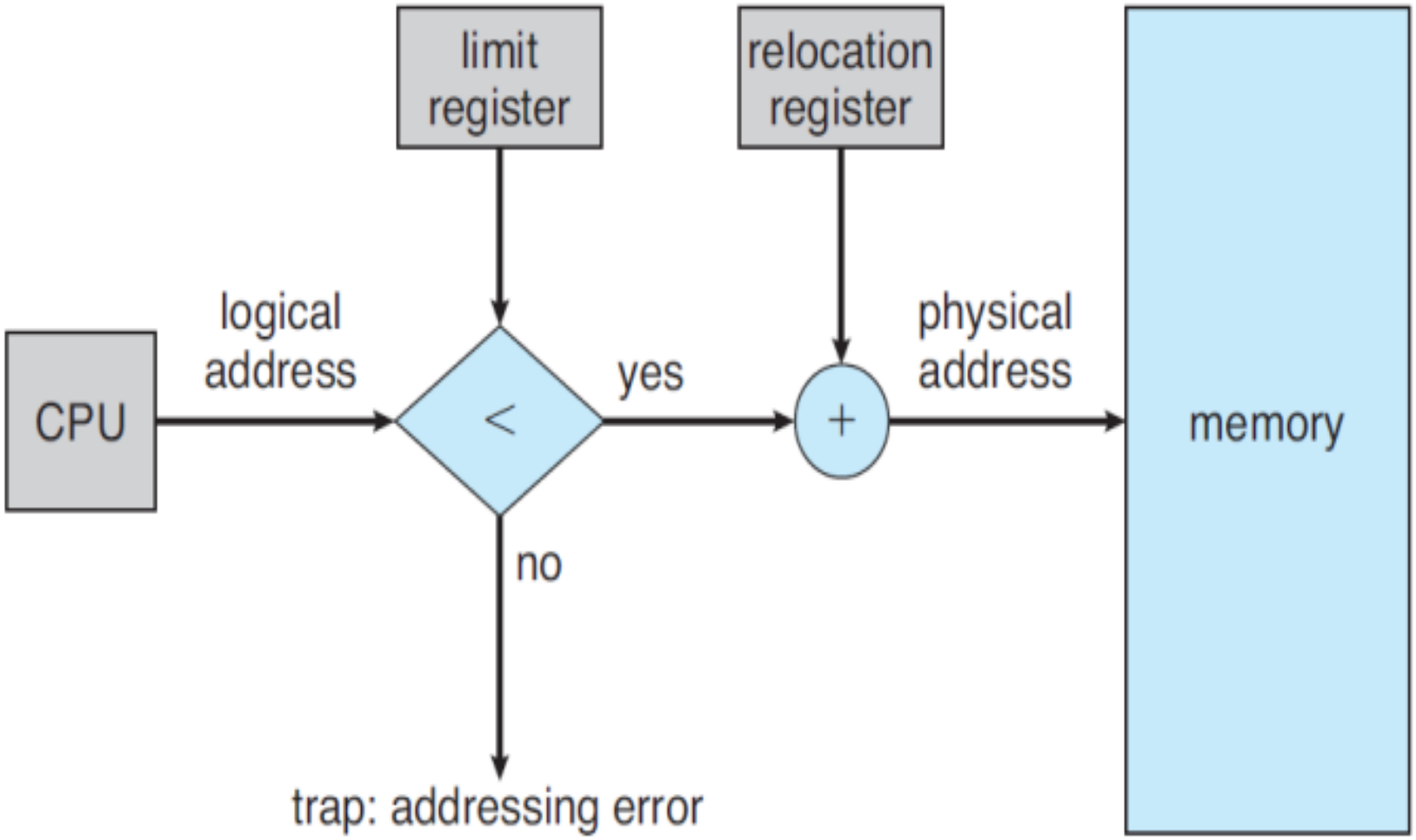


This is really not a good solution!


Virtual
address spaces
Physical
address space
0
Process 1
size_B
0
Process 2
size_A
0
Process 3
size_C
A
A + size_A
B
B + size_B
C
C + size_C

- In Non Contiguous Memory allocation, processes can be allocated anywhere in available space.
- **Base Register (Relocation register)-** contains the starting physical address of the process.
- **Limit Register** - contains range of logical addresses. Each logical address must be less than the limit register.
- Relocation register and limit registers used to protect processes from one another.

CALCULATION OF PHYSICAL ADDRESS BY HARDWARE ADDRESS PROTECTION



- The logical address generated by the CPU is first checked by the limit register, If the value of the logical address generated is less than the value of the limit register, the base address stored in the relocation register is added to the logical address to get the physical address of the memory location.
- If the logical address value is greater than the limit register, then the CPU traps to the OS, and the OS terminates the program by giving fatal error.

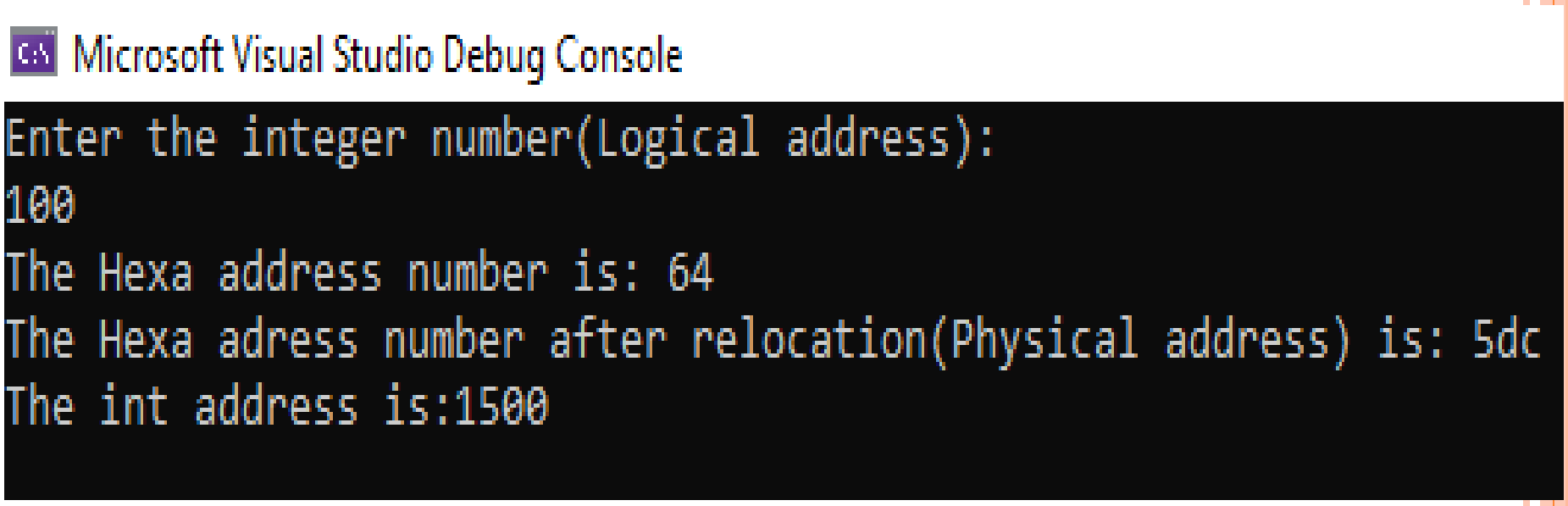
Convert INT to HEX in C#

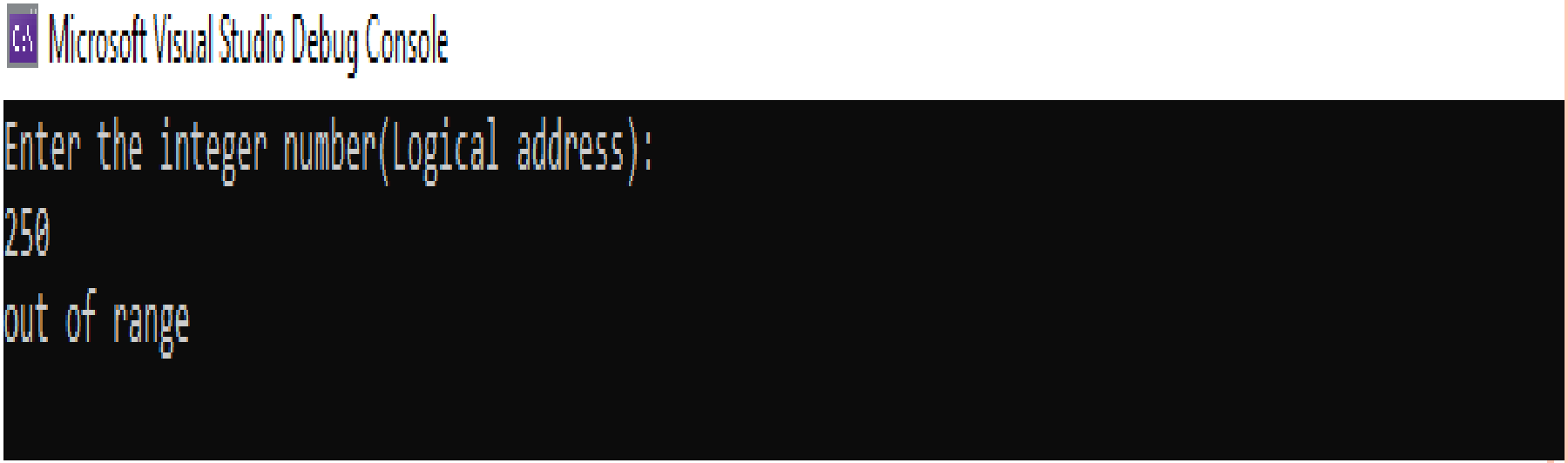
- The Integer data type stores integer values of base 10 in C#.
- The Hexadecimal data type has a base of 16.
- Convert Int to Hex With the ToString() Method in C#.
- We can pass the string format specifier "X" to the ToString() method to convert an integer to hexadecimal

EXAMPLE

```
using System;
namespace file_size
 { class Program
   { static void Main(string[] args)
     { int i = 99;
       string hex = i.ToString("X");
Console.WriteLine(hex);
     }
   }
}
```

Ex: limit address= 200; base address= 1400;




Microsoft Visual Studio Debug Console
Enter the integer number(Logical address):
250
out of range