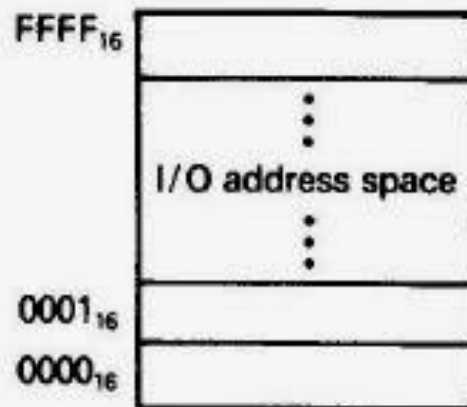
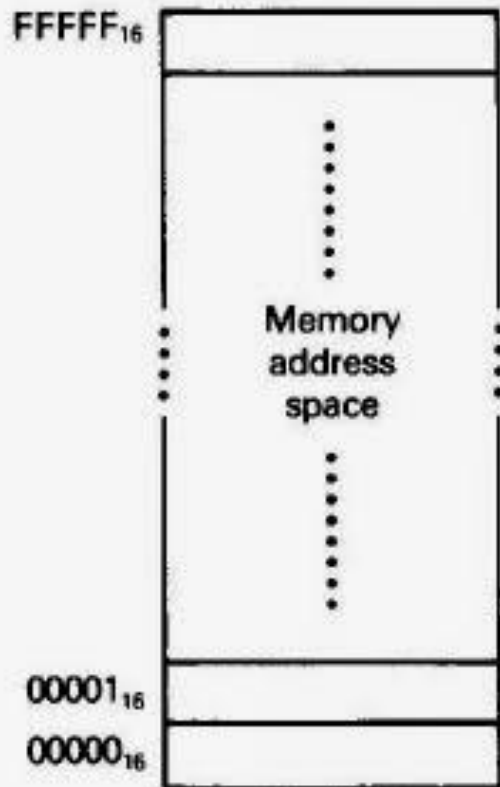
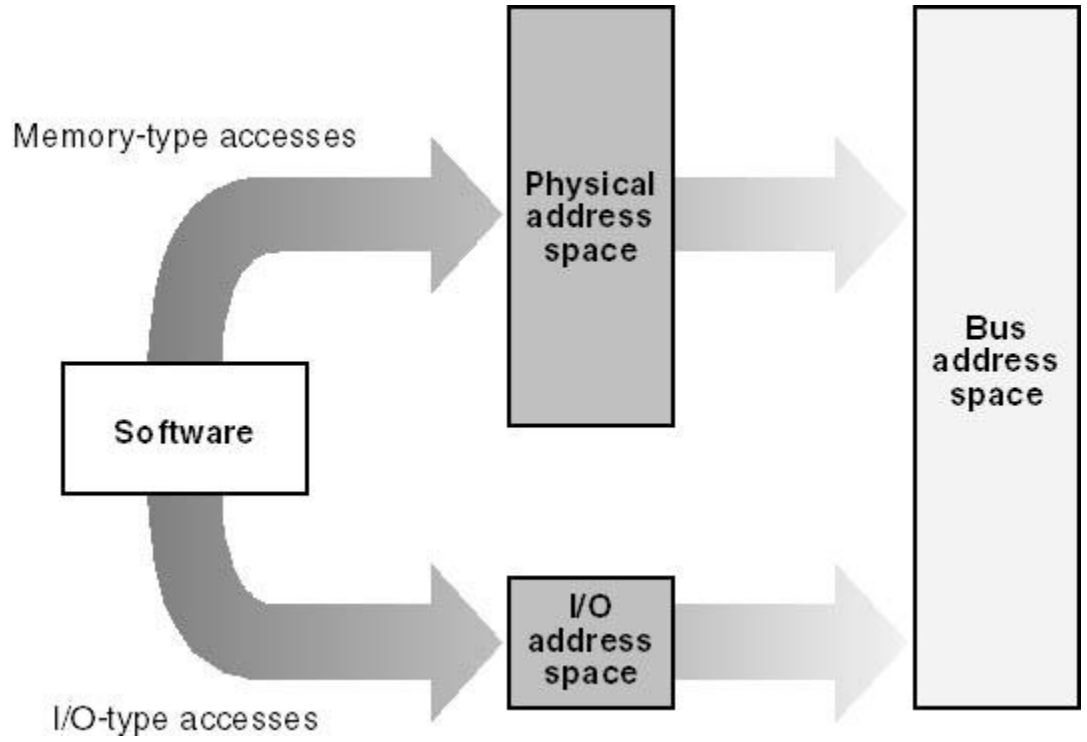
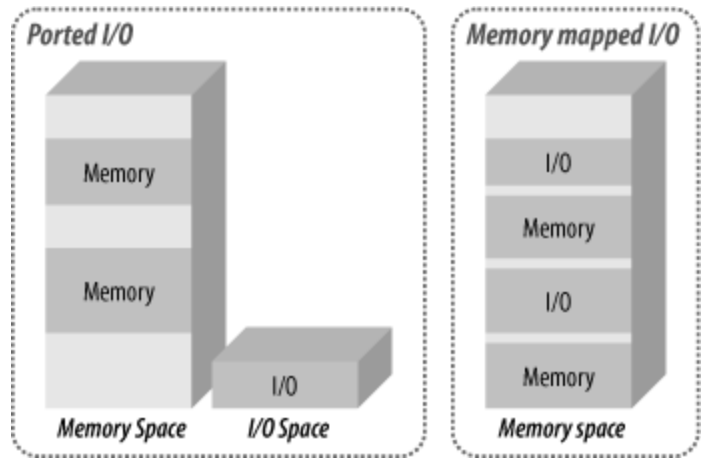
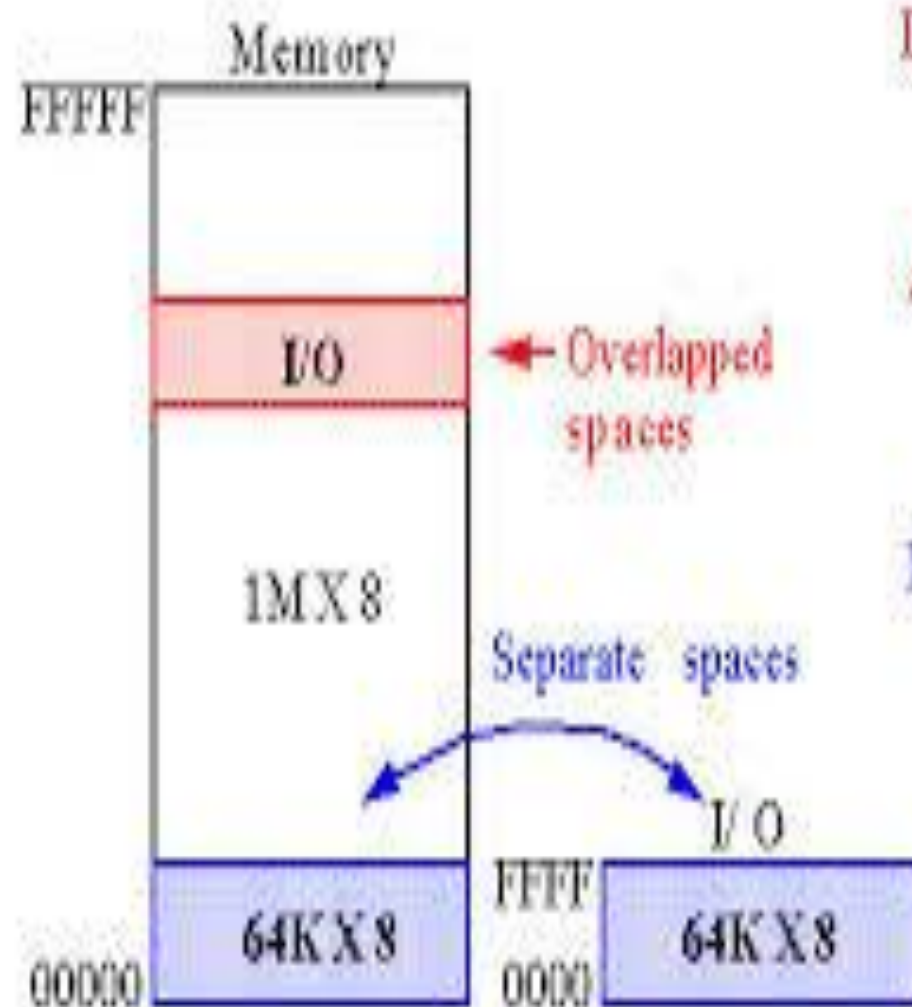


Topic 5. Allocation of program's segments inside the memory. Linking of a program. The main methods of work with the "turbo-debugger".

1. Why is it necessary to use a stack in a program?
2. Describe the stack organization.
3. What size should have a stack?
4. Describe the apparatus organization of interrupts.
5. Describe the service of interrupt procedure.
6. I/O system.







Disadvantage:

A portion of the memory space is used for I/O devices.

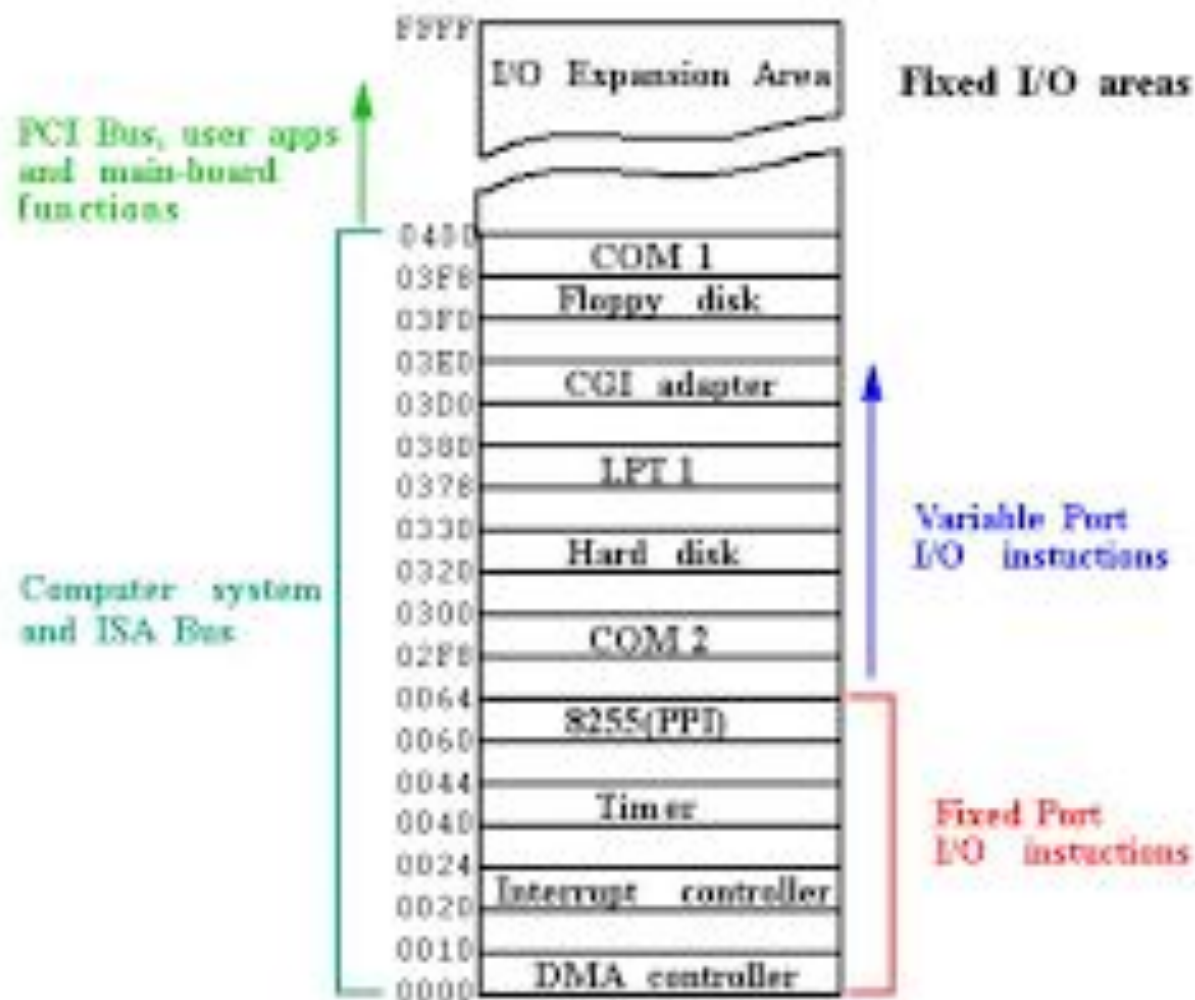
Advantage:

$\overline{\text{IORC}}$ and $\overline{\text{IOWC}}$ not required.
Any data transfer instruction.

Disadvantage:

Hardware using $\overline{\text{MIO}}$ and $\overline{\text{W/R}}$ needed to develop signals $\overline{\text{IORC}}$ and $\overline{\text{IOWC}}$.

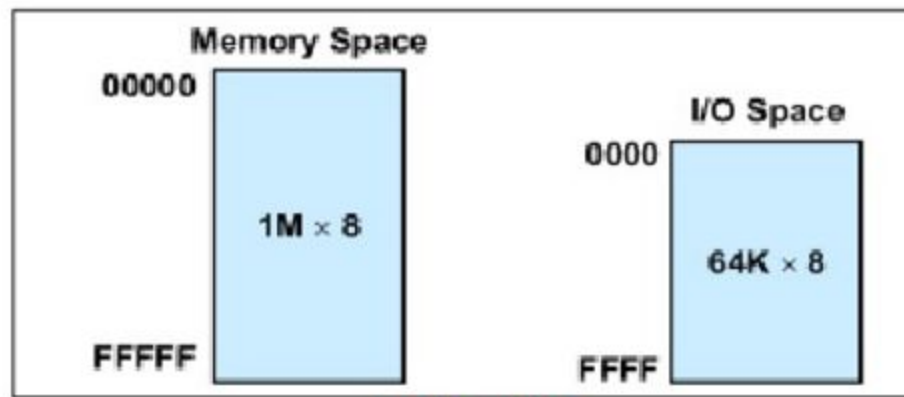
Requires IN, OUT, INS and OUTS



- Home
- Saved
- Bestsellers
- Books
- Audiobooks
- Magazines
- Documents
- Sheet Music



Isolated vs. Memory Mapped

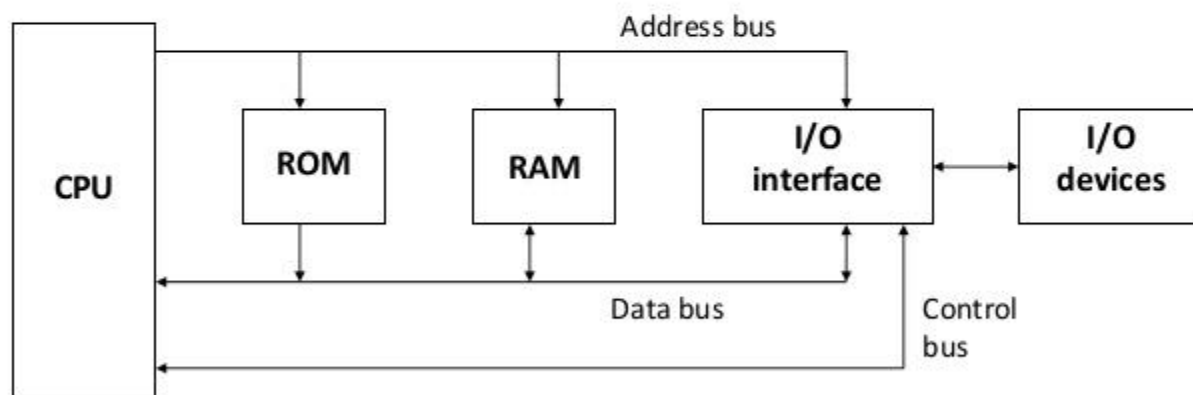


Isolated I/O



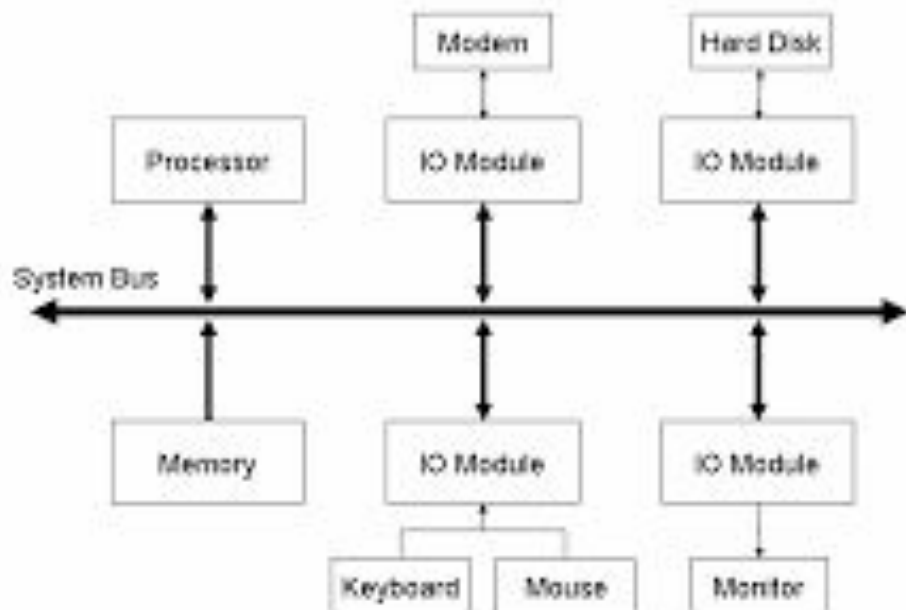
BLOCK DIAGRAM OF A BASIC COMPUTER SYSTEM

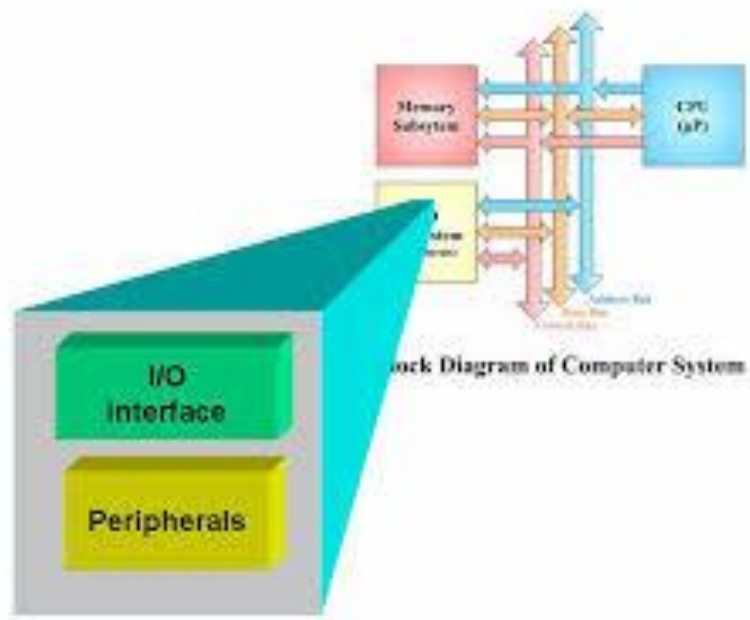
Basic computer system consist of a Central processing unit (CPU), memory (RAM and ROM), input/output (I/O) unit.



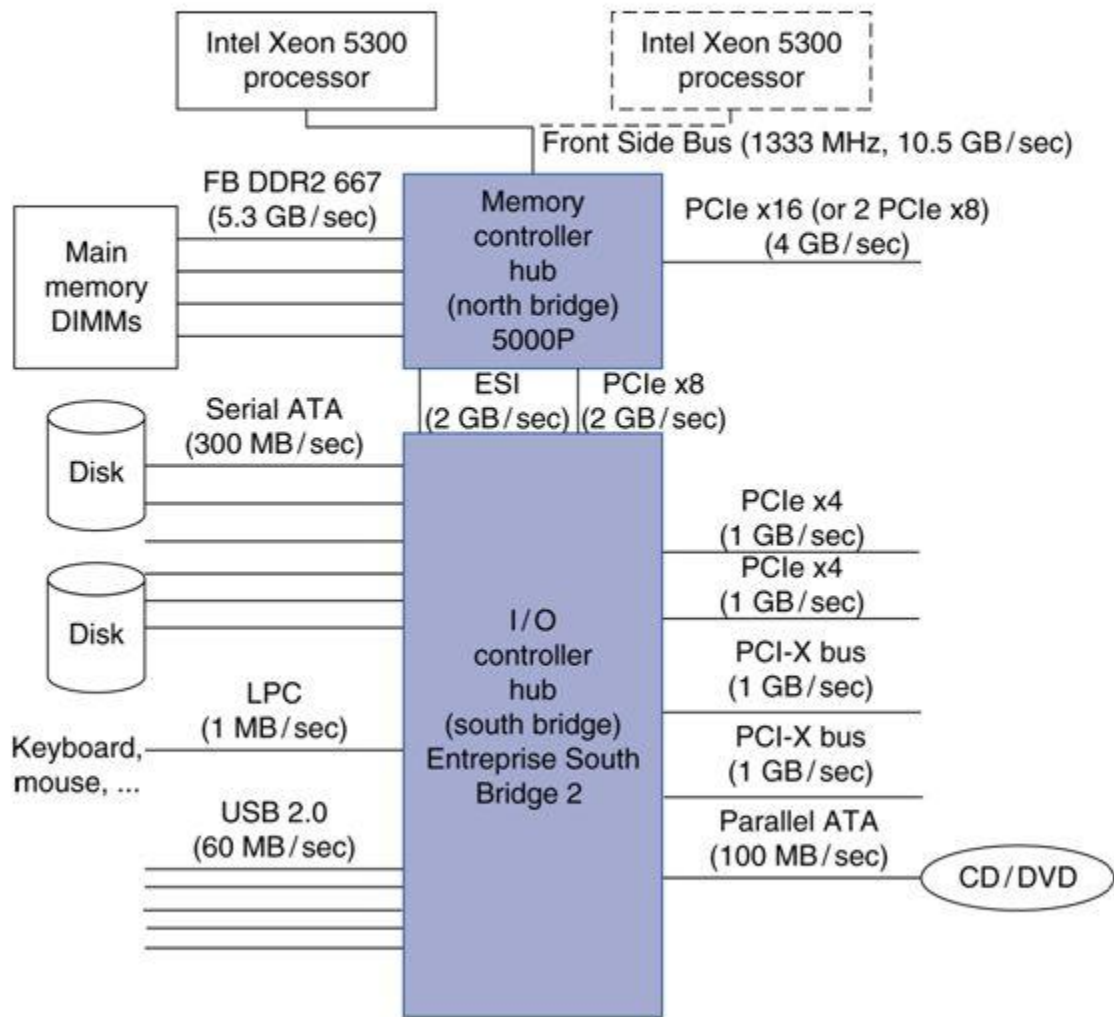
Block diagram of a basic computer system

I/O Subsystem Block Diagram





Block Diagram of Computer System



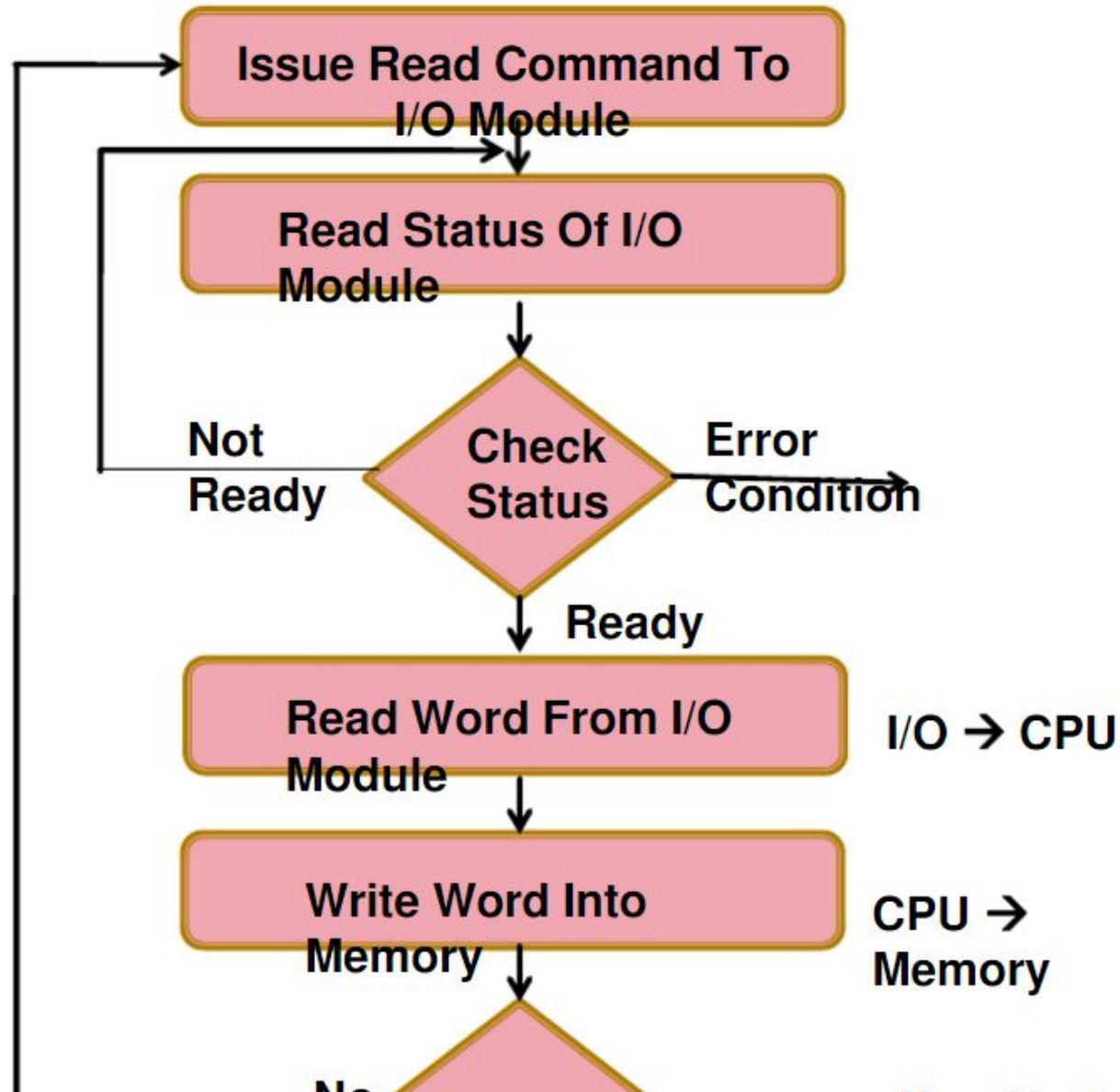
Port I/O Address Space

- Software and hardware architectures of x86 architecture support a separate address space called “I/O Address Space”
 - Separate from memory space
- Access to this separate I/O space is handled through a set of I/O instructions
 - IN,OUT, INS, OUTS
- Access requires Ring0 privileges
 - Access requirement does not apply to all operating modes (like Real-Mode)
- The processor allows 64 KB+3 bytes to be addressed within the I/O space
- Harkens back to a time when memory was not so plentiful
- You may never see port I/O when analyzing high-level applications, but in systems programming (and especially BIOS) you will see lots of port I/O
- One of the biggest impediments to understanding what's going on in a BIOS

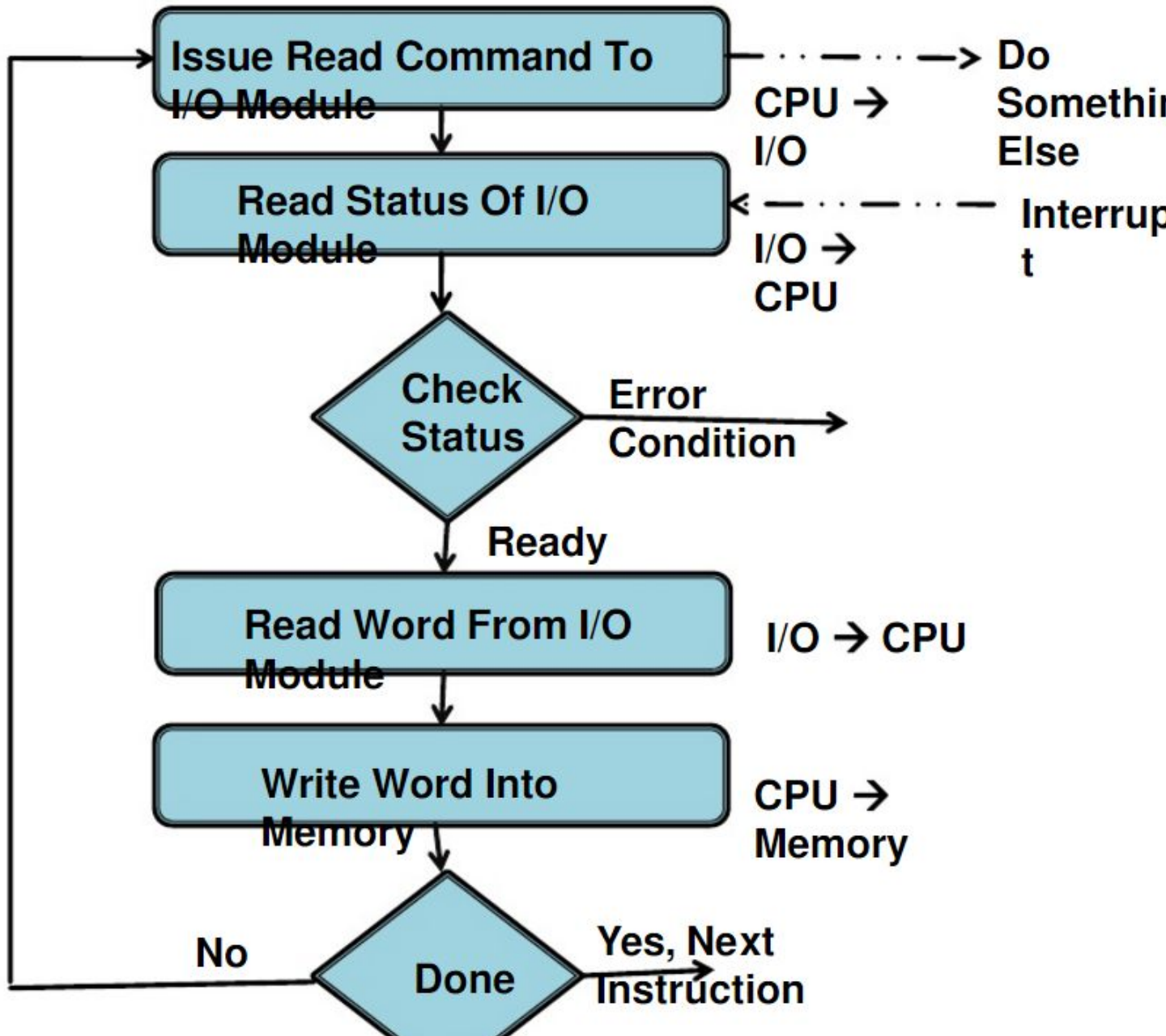
Port 65535	0xFFFF
· · ·	
I/O Address Space	
· · ·	
Port 4	0x0004
Port 3	0x0003
Port 2	0x0002
Port 1	0x0001
Port 0	0x0000

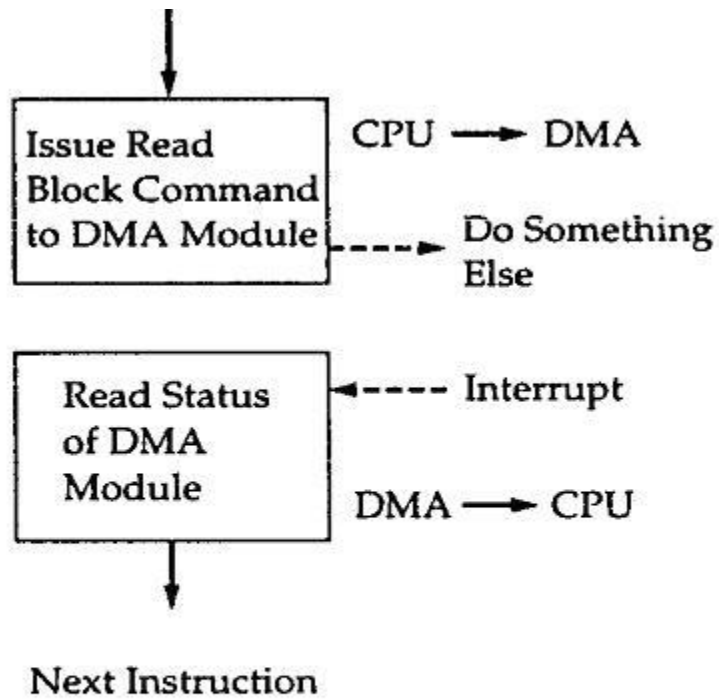
- Hence the processor is kept busy needlessly.

Program Driven I/O

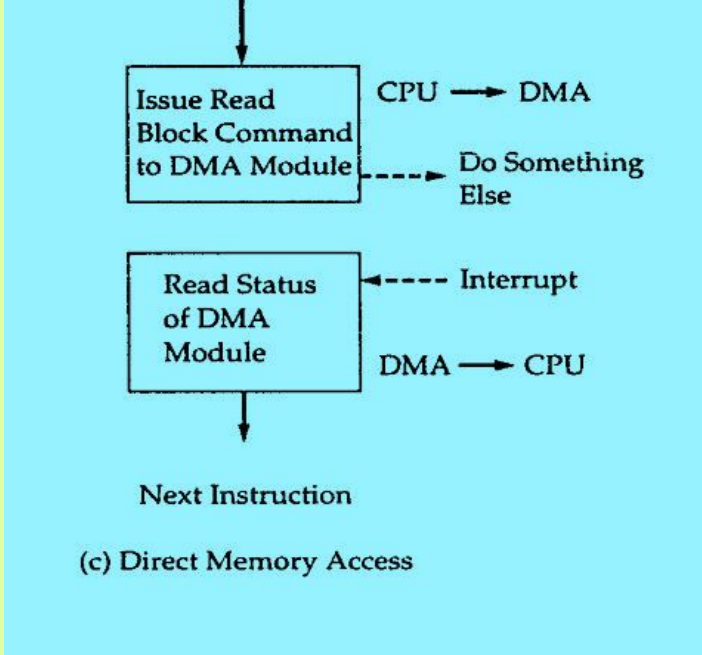
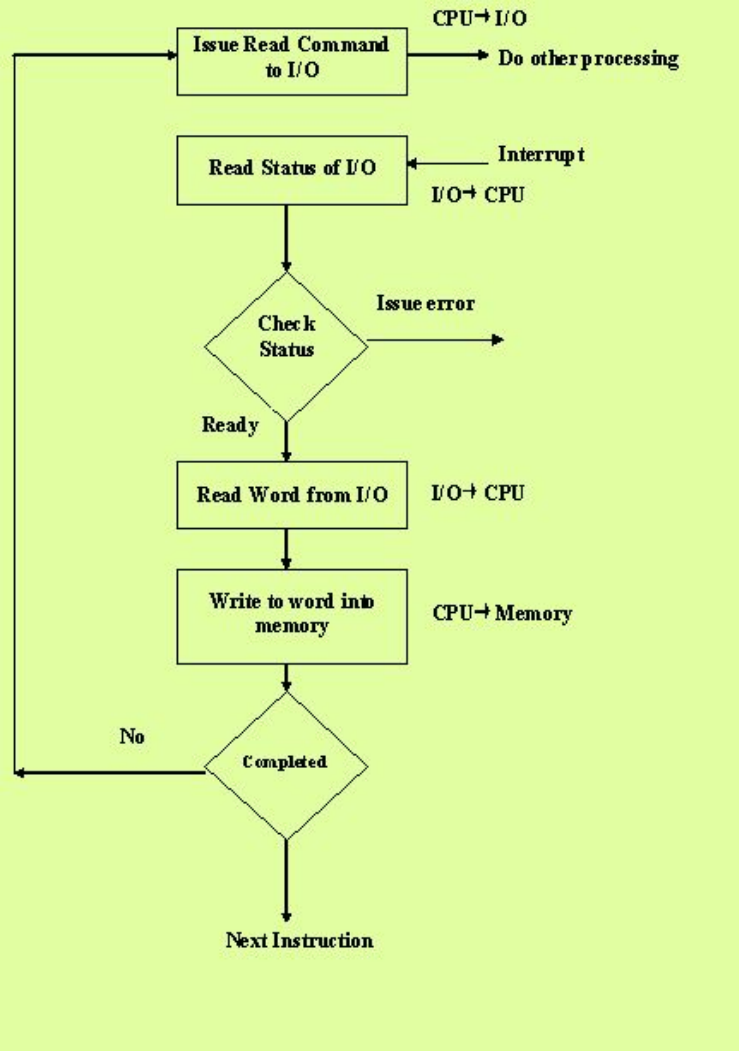
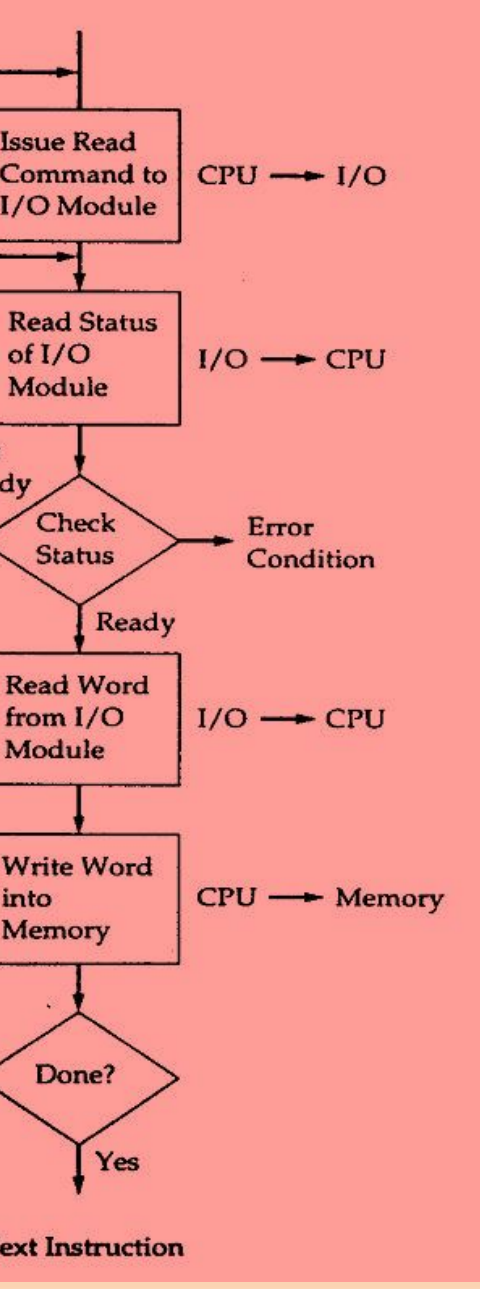


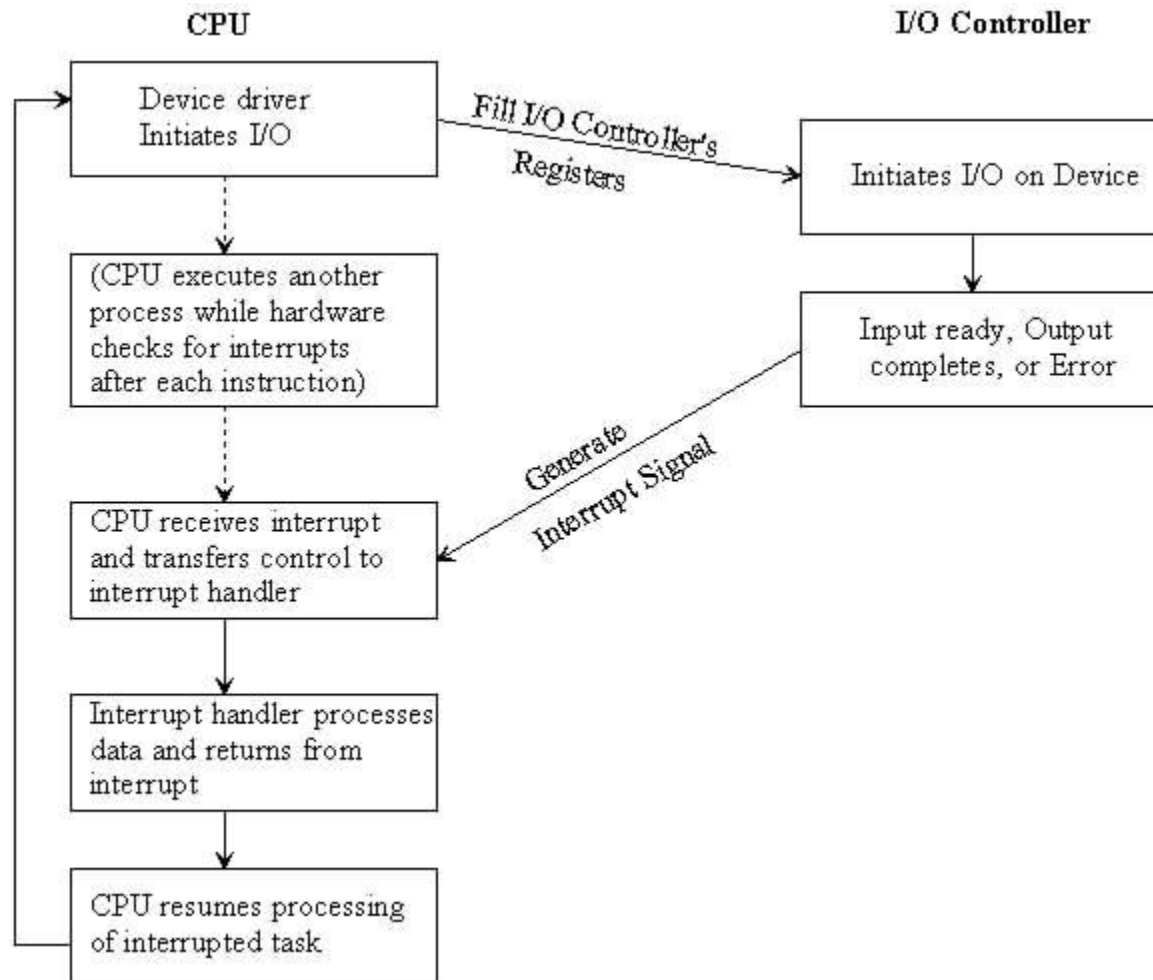
Interrupt Driven I/O





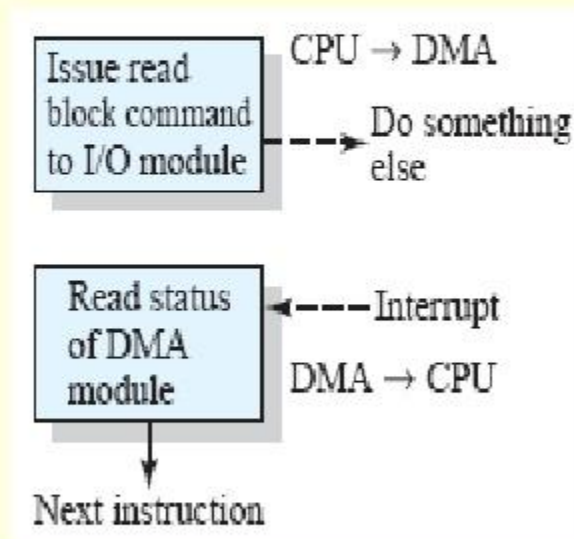
(c) Direct Memory Access

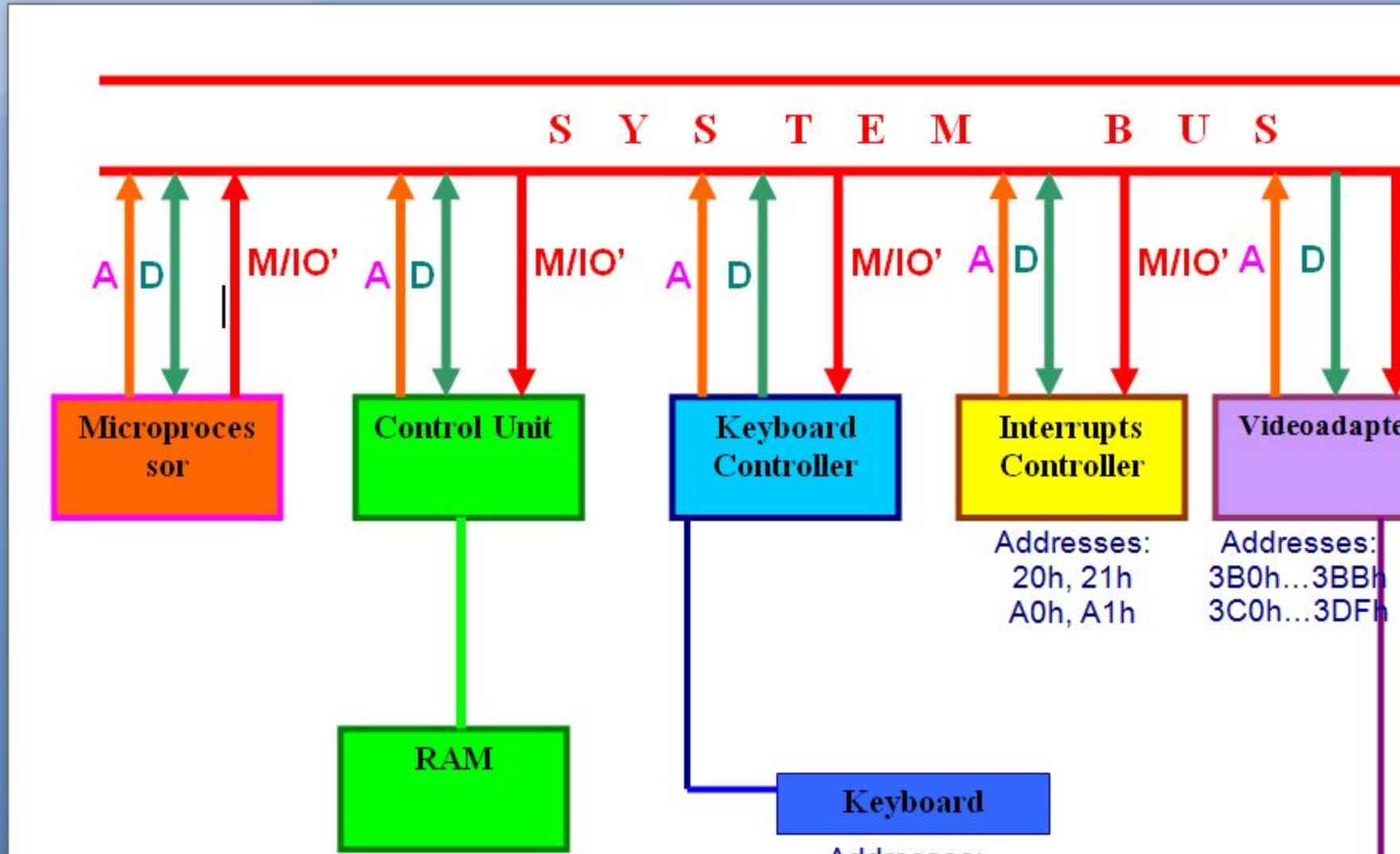
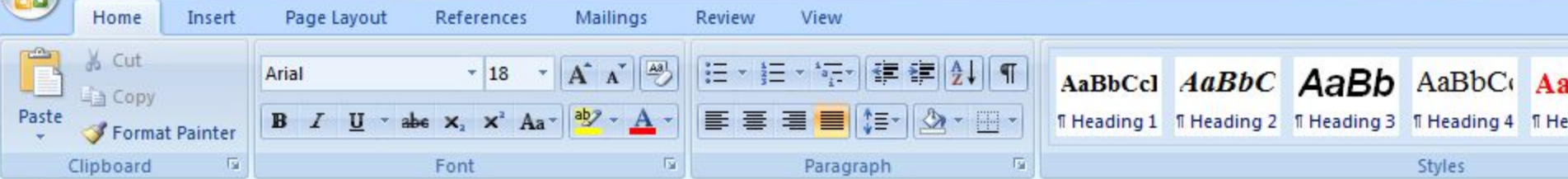




Direct Memory Access (DMA)

- I/O exchanges occur directly with memory
 - Requires DMA module on system bus
 - Capable of mimicking CPU and taking over control of system from CPU
 - DMA will use bus when
 - Processor does not require it
 - OR
 - Must force processor to suspend operation temporarily– called cycle stealing
- An interrupt is sent when the task is complete
- The processor is only involved at the beginning and end of the transfer





The 8086 can generate 16-bit of I/O address.

Thus it can address up to 64 Kbyte I/O locations or 32 K word I/O locations.

The 16-bit I/O address appears on A_0 to A_15 address lines; A_16 to A_19 lines are at logic 0 during the I/O operations.

The 16-bit DX register is used as 16-bit I/O address pointer to address up to 64 IC devices in in-direct addressing mode.

The I/O instructions with direct addressing mode can directly address one or two of the 256 I/O byte locations in page 0 of the I/O address space.