Input Output Interface

Input output interface

Input–output interface provides a method for transferring information between internal storage and external I/O devices. Peripherals connected to a computer need special communication links for interfacing them with the central processing unit. The purpose of the communication link is to resolve the differences that exist between the central computer and each peripheral. The major differences are:

Difference between central and peripheral

The data transfer rate of peripherals is usually slower than the transfer rate of the CPU, and consequently, a synchronization mechanism may be needed.

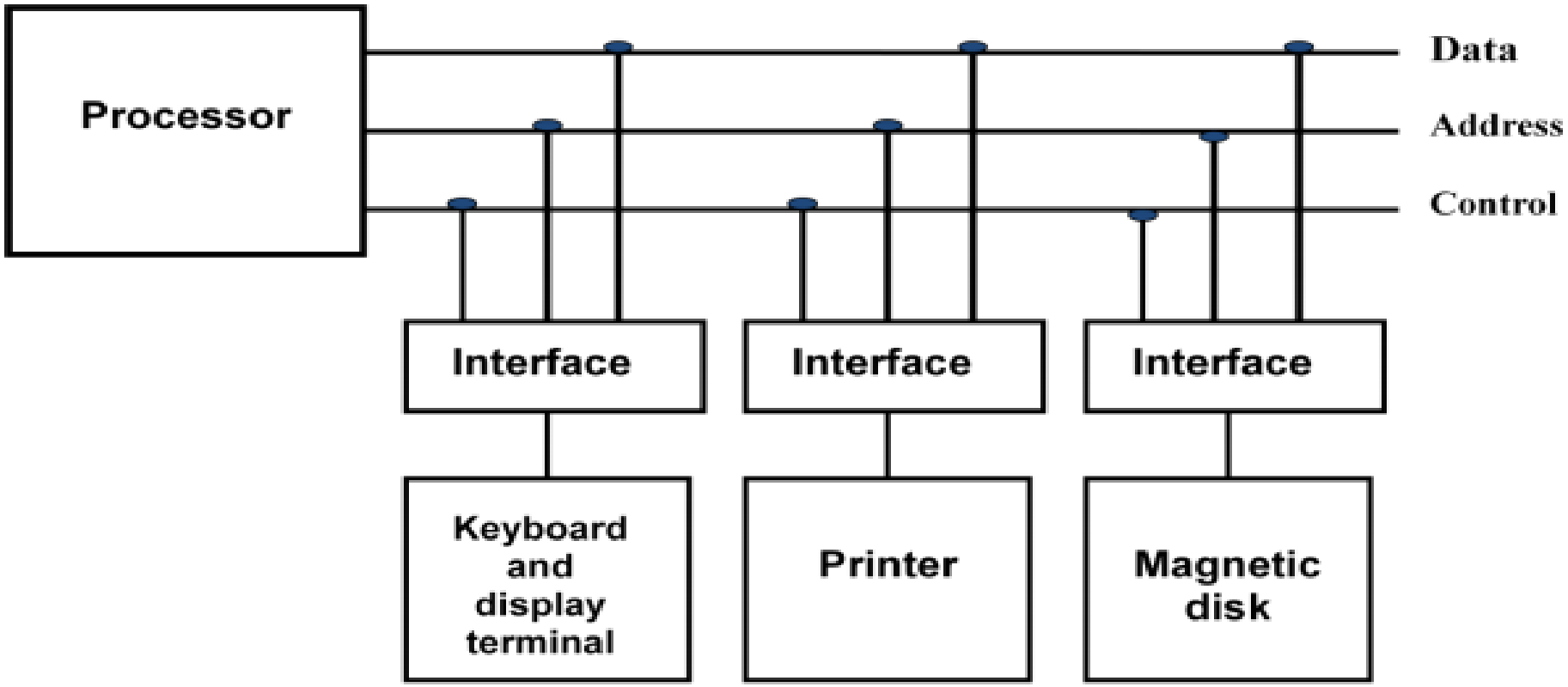
Data codes and formats in peripherals differ from the word format in the CPU and memory.

The operating modes of peripherals are different from each other and each must be controlled so as not to disturb the operation of other peripherals connected to the CPU.

Interface

To resolve these differences, computer systems include special hardware components between the CPU and peripherals to supervise and synchronize all input and output transfers. These components are called *interface* units because they interface between the processor bus and the peripheral device.

Input Output Bus



Connection of I/O bus to input-output devices

Input Output Commands

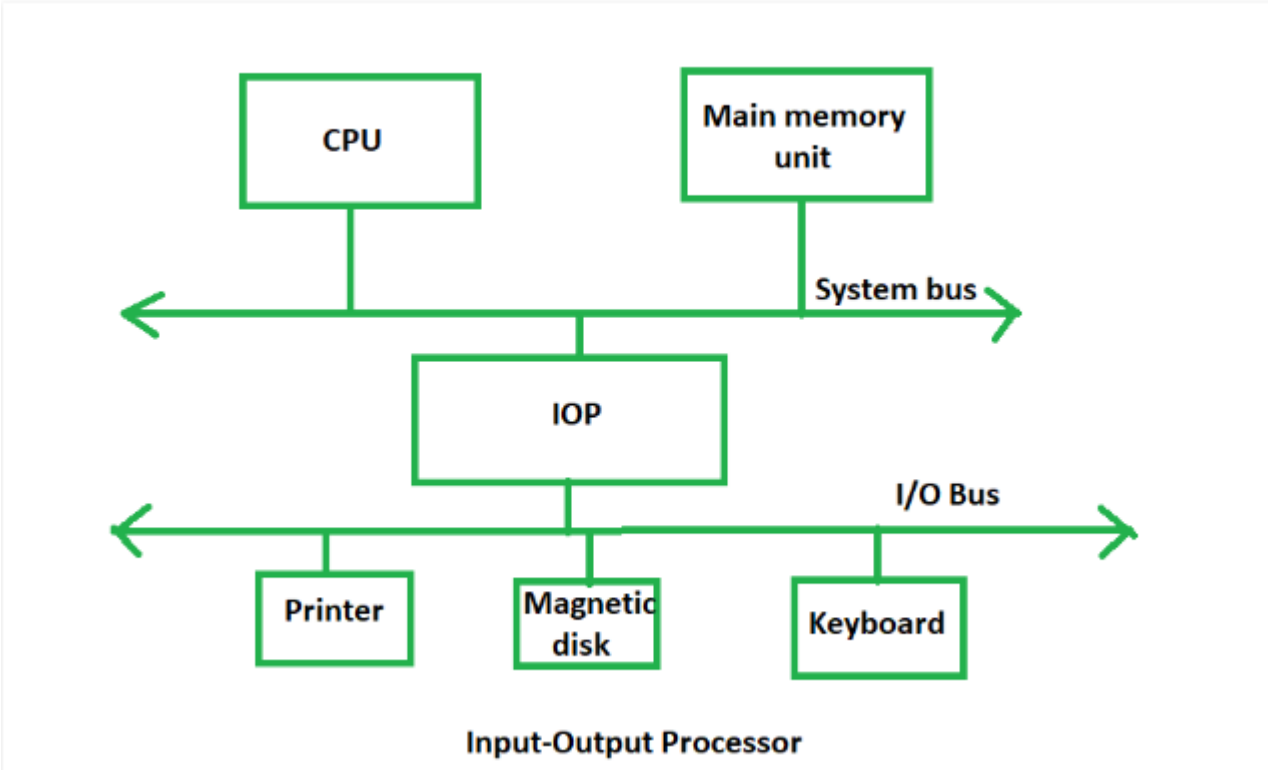
- Control Command
- Status Command
- Output data
- Input data

Input Output Bus versus Memory Bus

- There are three ways used to communicate with memory and input Output :

1. Use two separate buses, one for memory and the other for I/O.
2. Use one common bus for both memory and I/O but have separate control lines for each.
3. Use one common bus for memory and I/O with common control lines.

IOP



Input-Output Processor

The **DMA mode** of data transfer reduces CPU's overhead in handling I/O operations. It also allows parallelism in CPU and I/O operations. Such parallelism is necessary to avoid wastage of valuable CPU time while handling I/O devices whose speeds are much slower as compared to CPU. The concept of DMA operation can be extended to relieve the CPU further from getting involved with the execution of I/O operations. This gives rises to the development of special purpose processor called **Input-Output Processor (IOP) or IO channel**.

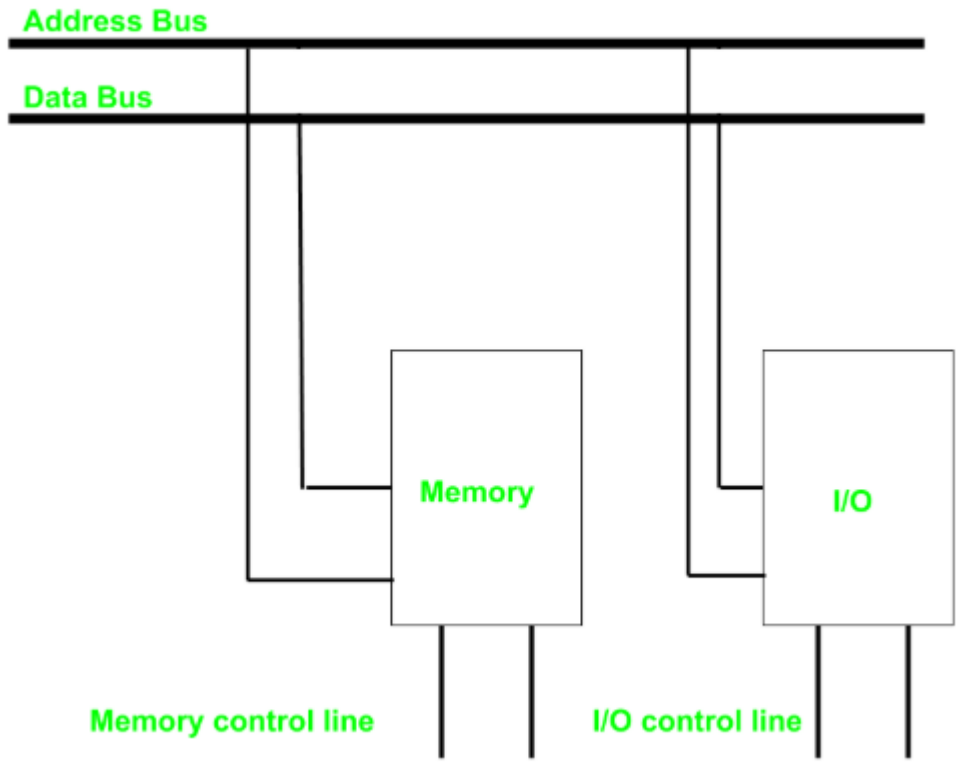
Isolated I/O and Memory Mapped I/O

As a CPU needs to communicate with the various memory and input-output devices (I/O) as we know data between the processor and these devices flow with the help of the system bus. There are three ways in which system bus can be allotted to them :

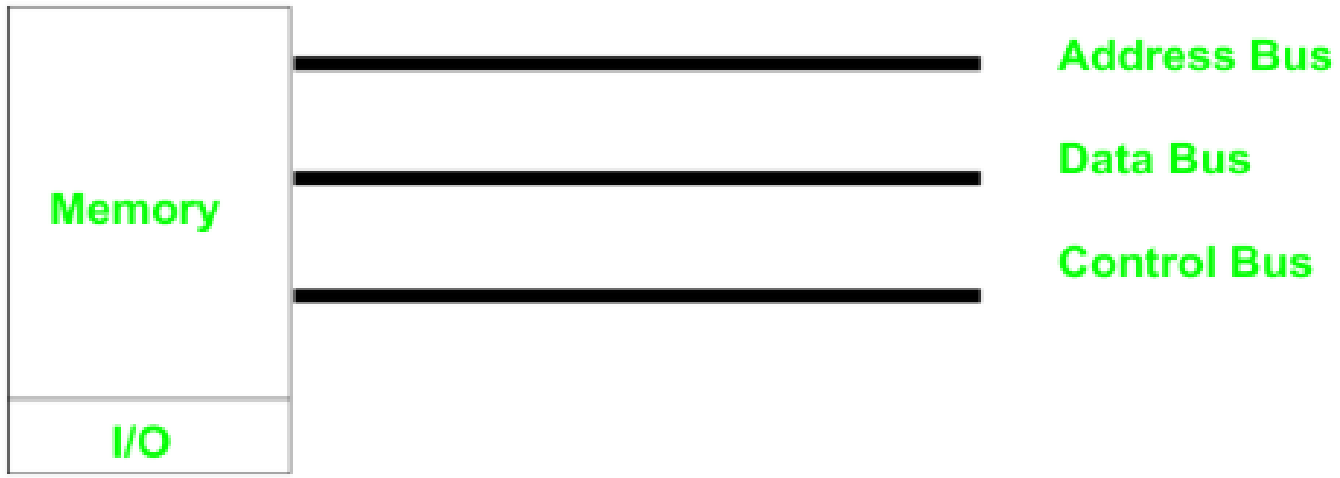
1. Separate set of address, control and data bus to I/O and memory.
2. Have common bus (data and address) for I/O and memory but separate control lines.
3. Have common bus (data, address, and control) for I/O and memory.

In first case it is simple because both have different set of address space and instruction but require more buses.

Isolated I/O


Address Bus
Data Bus
Memory
I/O
Memory control line
I/O control line

Memory Mapped I/O



ISOLATED I/O	MEMORY MAPPED I/O
Memory and I/O have seperate address space	Both have same address space
All address can be used by the memory	Due to addition of I/O addressable memory become less for memory
Separate instruction control read and write operation in I/O and Memory	Same instructions can control both I/O and Memory
In this I/O address are called ports.	Normal memory address are for both
More efficient due to seperate buses	Lesser efficient
Larger in size due to more buses	Smaller in size
It is complex due to separate separate logic is used to control both.	Simpler logic is used as I/O is also treated as memory only.