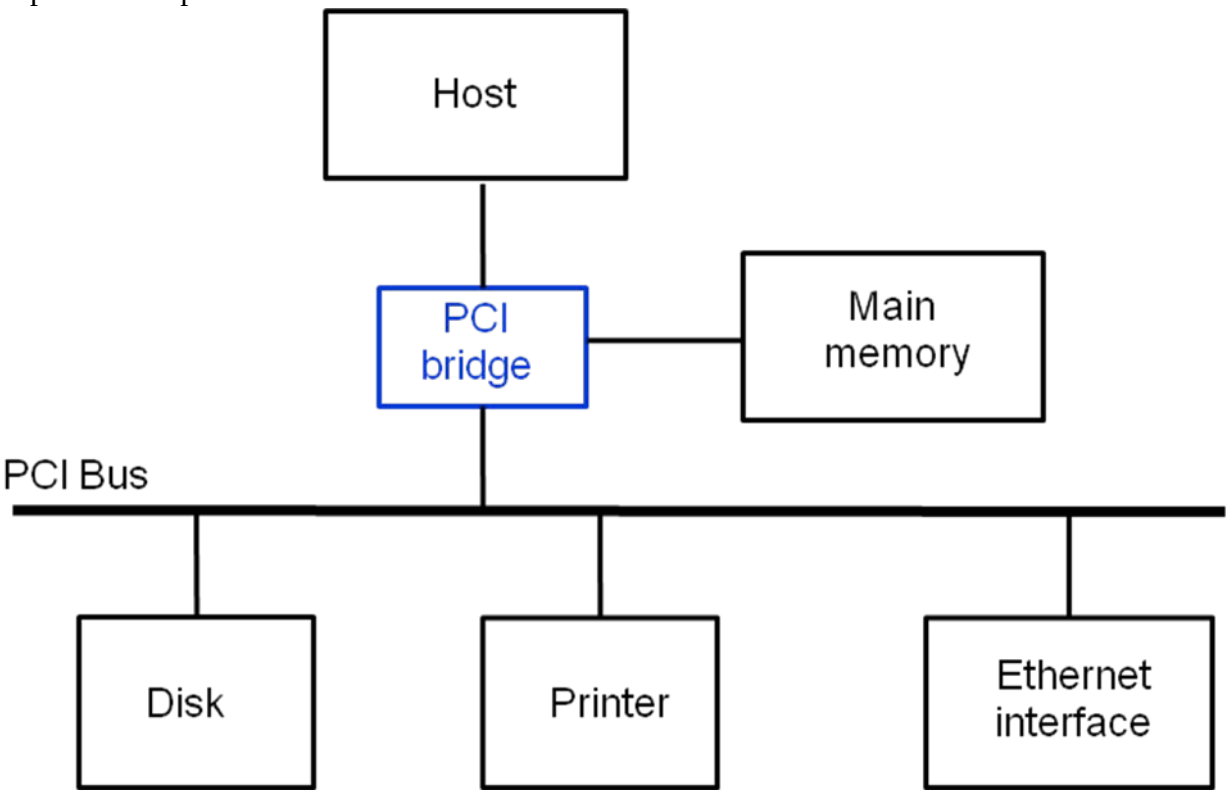
Standard I/O Interfaces

- The processor bus is the bus defined by the signals on the processor chip itself. Devices that require a very high speed connection to the processor, such as themain memory, may be connected directly to this bus
- The motherboard usually provides another bus that can support more devices.
- The two buses are interconnected by a circuit, which we called a bridge, that translates the signals and protocols of one bus into those of the other
- It is impossible to define a uniform standards for the processor bus. The structure of this bus is closely tied to the architecture of the processor
- The expansion bus is not subject to these limitations, and therefore it can use a standardized signaling structure

Peripheral Component Interconnect Bus



PCI Bus

- The bus support three independent address spaces: memory, I / O, and configuration.
- The I / O address space is intended for use with processors, such Pentium, that have a separate I

/ O address space.

- However, the system designer may choose to use memory-mapped I / O even when a separate I / O address space is available
- The configuration space is intended to give the PCI its plug-and-play capability.
  - A 4-bit command that accompanies the address identifies which of the three spaces is being used in a given data transfer operation

Universal Serial Bus (USB

- The USB has been designed to meet several key objectives
  - Provide a simple, low-cost, and easy to use interconnection system that overcomes the difficulties due to the limited number of I / O ports available on a computer
  - Accommodate a wide range of data transfer characteristics for I / O devices, including telephone and Internet connections
  - Enhance user convenience through a “plug-and-play” mode of operation

USB Structure

- The tree structure enables many devices to be connected while using only simple point-to-point serial links
- Each hub has a number of ports where devices may be connected, including other hubs
- In normal operation, a hub copies a message that it receives from its upstream connection to all its downstream ports
  - As a result, a message sent by th e host computer is broadcast to all I / O devices, but only the addresse d device will respond to that message
- A message sent from an I / O de vice is sent only upstream towards the root of the tree and is not seen by other devices
  - Hence, USB enables the host to communicate with the I / O devices, but it does not enable these devices to communicate with each other

USB Protocols

- All information transferred over the USB is organized in packets, where a packet consists of one or more bytes of information
- The information transferred on the USB can be divided into two broad categories: control and data
  - Control packets perform such tasks as addressing a device to initiate data transfer, acknowledging that data have been received correctly, or indicating an error
  - Data packets carry informatio n that is delivered to a device. For example, input and output data are transferred inside data packets