UNIT V
I/O ORGANIZATION AND PARALLELISM

Accessing I/O devices – Interrupts – Direct Memory Access – Buses–Interface circuits – **Standard I/O Interfaces (PCI, SCSI, USB)** –Instruction Level Parallelism : Concepts and Challenges – Introduction to multicore processor – Graphics Processing Unit

Recap the previous Class

Overview

- The needs for standardized interface signals and protocols.

- Motherboard

- Bridge: circuit to connect two buses
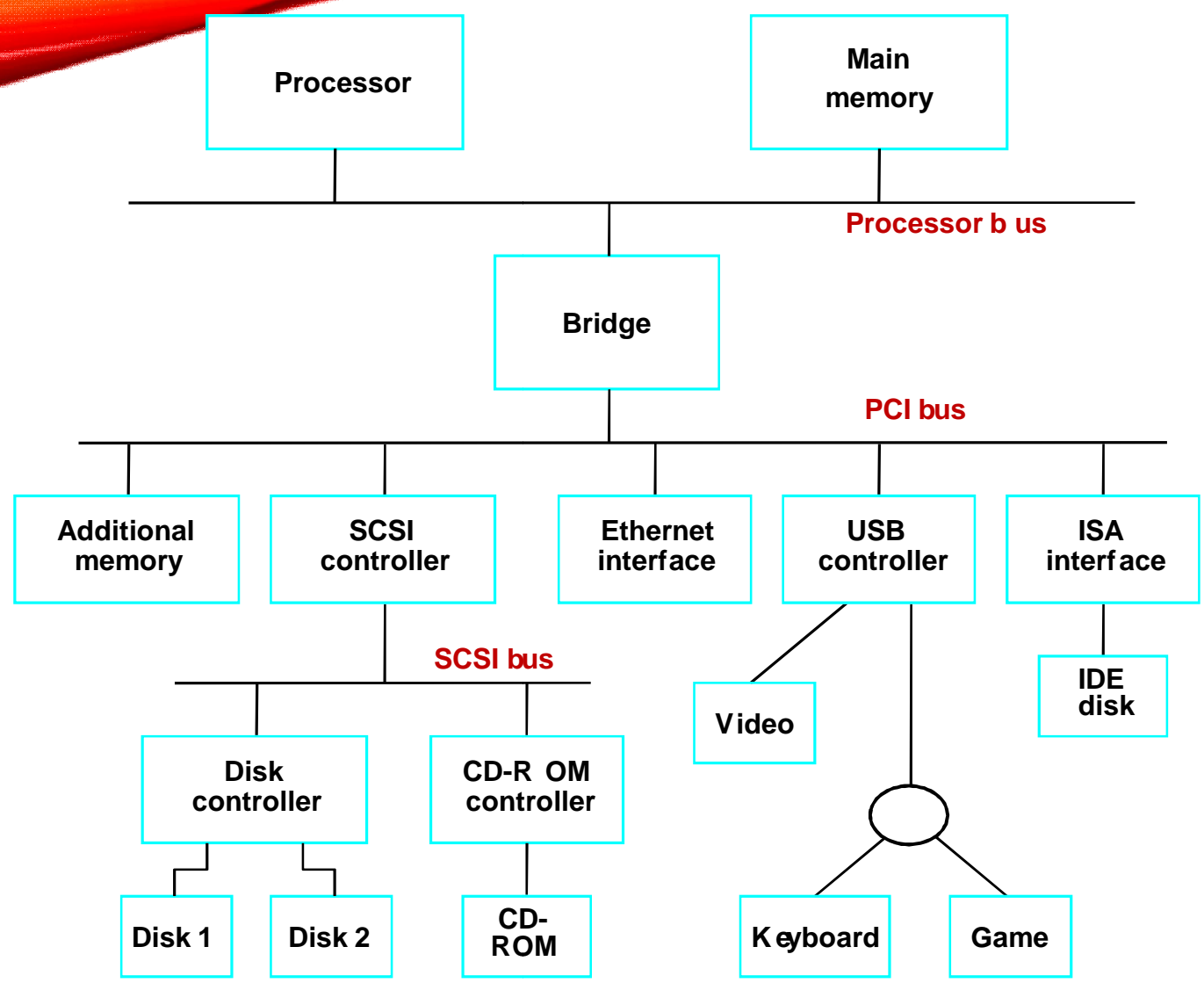
- Expansion bus

- ISA, PCI, SCSI, USB,...

Figure :An example of a computer system using different interface standards.
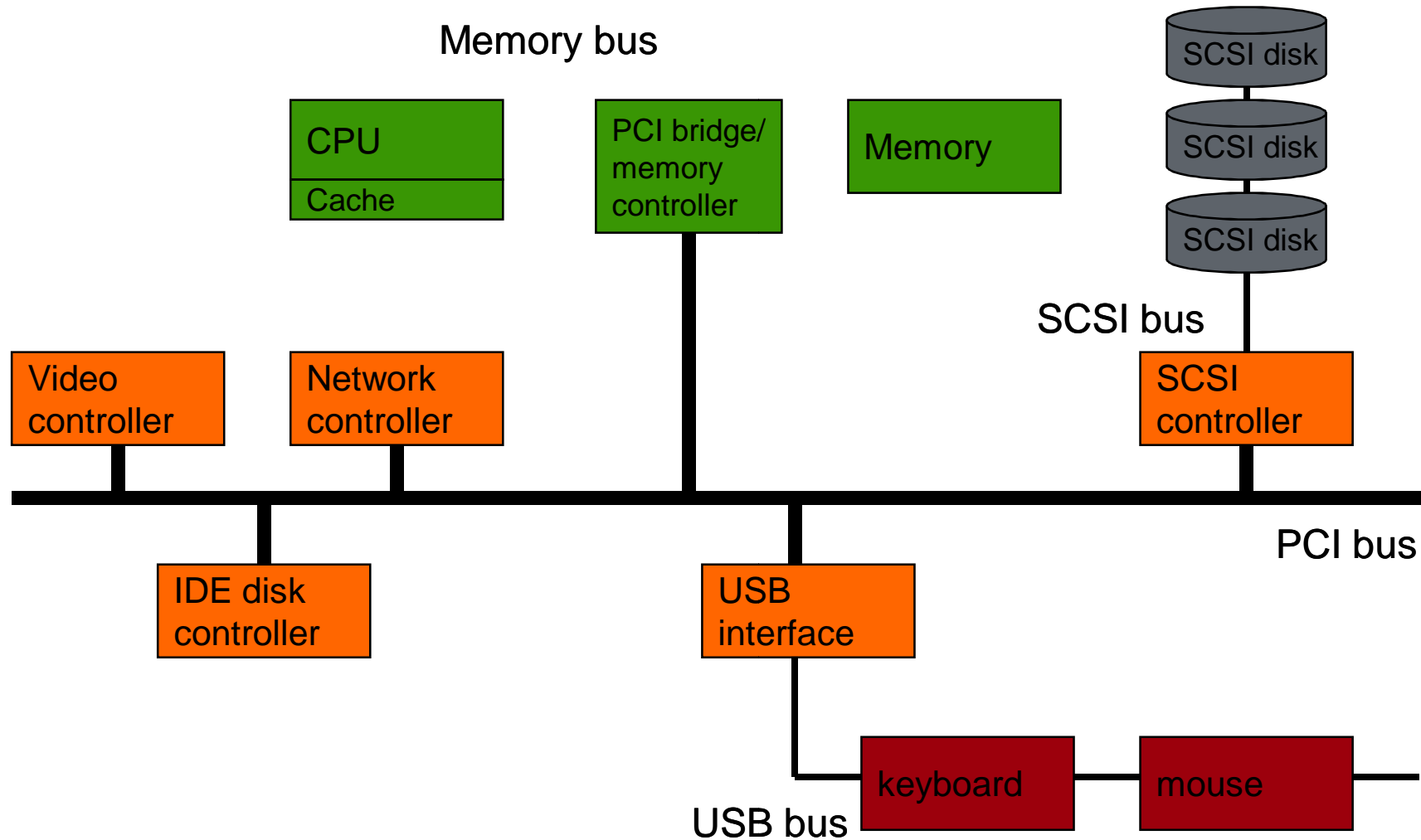
Hardware Environment

- Major components of a computer system: CPU, memories (primary/secondary), I/O system

- I/O devices:

  - Block devices – store information in fixed-sized blocks; typical sizes: 128-4096 bytes

  - Character devices – delivers/accepts stream of characters (bytes)

- Device controllers:

  - Connects physical device to system bus (Minicomputers, PCs)

  - Mainframes use a more complex model: Multiple buses and specialized I/O computers (I/O channels)

- Communication:

  - Memory-mapped I/O, controller registers

  - Direct Memory Access - DMA

I/O Hardware - Multiple Buses
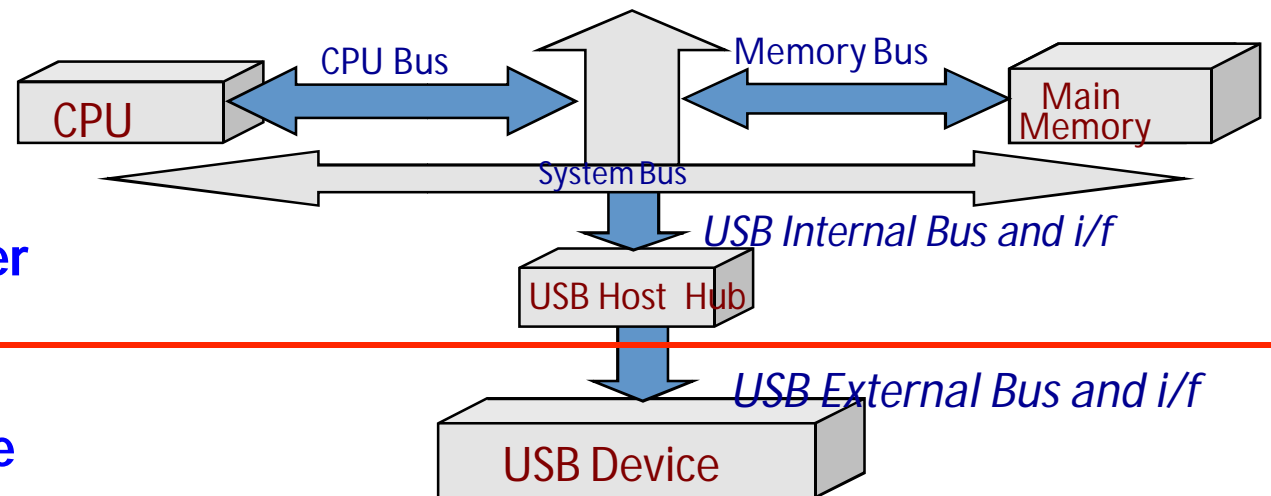
Memory bus

CPU

Cache

PCI bridge/
memory
controller

Memory

SCSI disk

SCSI disk

SCSI disk

SCSI bus

Video
controller

Network
controller

SCSI
controller

PCI bus

IDE disk
controller

USB
interface

keyboard

mouse

USB bus

Universal Serial Bus (USB)

- USB is the most popular external bus standard in use today.

    - Allows connection of almost all types of peripheral devices.

- Facilitates high-speed transfer of data.

- For connecting smaller devices like mobile phones and digital cameras, mini and micro USB connectors have also been developed.

Bus Hierarchy

Host Computer

External Device

CPU Bus

Memory Bus

CPU

Main Memory

System Bus

USB Internal Bus and i/f

USB Host Hub

USB External Bus and i/f

USB Device

TEXT BOOK

Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", McGraw-Hill, 6th Edition 2012.

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2. William Stallings, "Computer Organization and Architecture designing for Performance", Pearson Education 8th Edition, 2010

3. John P.Hayes, "Computer Architecture and Organization", McGraw Hill, 3rd Edition, 2002

4. M. Morris R. Mano "Computer System Architecture" 3rd Edition 2007

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THANK YOU