Batch:	**C2**	**Roll No.:**	**16010122267**

Experiment / assignment / tutorial No. 1

TITLE: Study of PCI and SCSI.

AIM: To Study and learn PCI and SCSI

Expected OUTCOME of Experiment : (Mention CO/CO's attained here)
CO1: Describe and define the structure of a computer with buses structure and detail working of the arithmetic logic unit and its sub modules.

Books/ Journals/ Websites referred:

1. **https://www.techopedia.com/definition/8815/peripheral-component-interconnect-bus-pci-bus**
2. **https://www.techopedia.com/definition/331/small-computer-system-interface-scsi**
3. **http://www.csun.edu/~edaasic/roosta/BUS_Structures.pdf**
4. W.Stallings William "Computer Organization and Architecture: Designing for Performance", Pearson Prentice Hall Publication, 7thEdition. C.

Pre Lab/ Prior Concepts:
Microcomputer buses which communicate with a peripheral devices or a memory location through communication lines called buses.
The major parts of microcomputers are central processing unit (CPU), memory, and input and output unit. To connect these parts together through three sets of parallel lines, called buses. These three buses are Address bus, data bus, and Control bus.

Address Bus:
The address bus consists of 16, 20, 24, or more parallel signal lines, through which the CPU sends out the address of the memory location. This memory location is used for to written to or read from. The number of memory location is depends on 2 to the power N address lines. Example, a CPU with 16 address lines can address 216 or 65,536 memory locations. When the CPU reads data from or writes data to a port. The port address is also sent out on the address bus. This is unidirectional. This means that the CPU can send data to a memory location or I/O ports.

Data Bus:

The data bus consists of 8, 16, 32 or more parallel signal lines. The data bus lines are bidirectional. This means that the CPU can read data from memory or from a I/O port as well as send data to a memory location or to a I/O port. In a system, many output devices are connected to the data bus, but only one device at a time will be enabled to the output.

Control Bus:

The control bus consists of 4-10 parallel signal lines. The CPU sends out signals on the control bus to enable the outputs of addressed memory devices or port devices. Typically control bus signals are memory read, memory write, I/O read and I/O write. To read a data from a memory location, the CPU sends out the address of the desired data on the address bus and then sends out a memory read signal on the control bus. The memory read signal enables the addressed memory device to output the data onto the data bus where it is read by the CPU.

PCI Bus

PCI, which stands for Peripheral Component Interconnect, served as a prevalent standard data transfer method in computers roughly from 1993 to around 2007. During this period, it functioned as the primary means for connecting expansion cards such as sound cards, network cards, and more. Operating in a parallel manner, its prevalent form featured a clock speed of 66 MHz and came in either 32 or 64-bit widths. However, its role has been succeeded by PCI Express, a serial transport technology that diverges from the parallel nature of PCI. A PCI port, or more precisely, a PCI slot, functions as the interface through which expansion cards are connected to the system. When not in use, it remains inert and inactive.

Functions:

- PCI slots are used for installing various components such as sound cards, Ethernet cards, wireless cards, and modern NVMe SSDs.
- NVMe SSDs provide significantly faster speeds compared to traditional SATA SSDs when connected through PCI slots.
- PCI slots also allow for the addition of discrete graphics cards to enhance graphical performance.
- The primary purpose of PCI slots is to accommodate expansion cards on a motherboard.
- Expansion cards extend a computer's capabilities beyond what the motherboard alone can provide.
- Expansion card benefits include improved graphics, enhanced audio, additional USB and hard drive controllers, and expanded networking options.

Architecture:

- Architecture of PCI : PCI 32 bits have a transport speed of 33 MHz and work at 132 MBps.
- PCI 64 bits have a transport speed of 33 MHz and work at 264 MBps.
- PCI 64 bits have a transport speed of 66 MHz and work at 512 MBps.
- PCI 64 bits have a transport speed of 66 MHz and work at 1 GBps.

Advantage of PCI :

- You'll interface a greatest of five components to the PCI and you'll be able moreover supplant each of them by settled gadgets on the motherboard.
- You have different PCI buses on the same computer.
- The PCI transport will improve the speed of the exchanges from 33MHz to 133 MHz with a transfer rate of 1 gigabyte per second.
- The PCI can handle gadgets employing a greatest of 5 volts and the pins utilized can exchange more than one flag through one stick.

Disadvantage of PCI :

- PCI Graphics Card cannot get to system memory.
- PCI does not support pipeline.

SCSI bus:

SCSI (Small Computer System Interface) serves as a data transfer conduit linking computers, laptops, and peripheral devices. These peripherals encompass items like disks, CD-ROMs, printers, and communication equipment

Function of SCSI:

- **Data Transfer:** SCSI is instrumental in enabling swift data transfer between the CPU and peripheral devices. The data transfer rate of SCSI devices can vary based on the interface type and device capabilities, potentially reaching up to 160 MB/s.
- **Device Control:** Host computers can manage SCSI devices through an array of commands. These commands empower the host to execute tasks such as data reading and writing, disk formatting, and command queue management.

Architecture of SCSI:

SCSI permits simultaneous utilization of multiple peripherals without compromising performance.

SCSI Specifications:

- **SCSI-1:** Originating in 1986, SCSI-1 has become obsolete. It featured an 8-bit bus width and a clock speed of 5 MHz.
- **SCSI-2:** Embraced in 1994, SCSI-2 introduced the Common Command Set (CCS) comprising 18 essential commands for supporting any SCSI device. It also provided the option to double the clock speed to 10 MHz (Fast), expand the bus width to 16 bits, and increase device capacity to 15 (Wide), or implement both enhancements (Fast/Wide).
- **SCSI-3:** Most SCSI-3 specifications are prefaced with "Ultra," such as Ultra for SPI variations, Ultra2 for SPI-2 variations, and Ultra3 for SPI-3 variations. The designations of Fast and Wide mirror their SCSI-2 counterparts. SCSI-3 represents the prevailing standard in use today.

Advantages of SCSI:

- **Independent Controller:** SCSI comes with its dedicated controller, simplifying troubleshooting processes and reducing reliance on other devices for optimal performance.
- **Single Cable Data Exchange:** Data exchanges take place via a single cable, streamlining the overall connection setup.
- **Compatibility:** SCSI devices can function with a diverse range of computers, enhancing their versatility.
- **Accessibility:** SCSI equipment is readily accessible, facilitating the replacement and upgrading of older SCSI components.

Disadvantages of SCSI:

- **Cost:** SCSI drives can be expensive, which might make them less budget-friendly.
- **Configuration Complexity:** The SCSI interface can be challenging to configure, especially when dealing with peripherals. It often requires the expertise of IT professionals for proper management and installation.
- **Performance Degradation:** Over time, the performance of SCSI devices can degrade, potentially affecting their efficiency and speed.

Post Lab Descriptive Questions

Q1 . Differentiate between PCI and SCSI Bus

Ans:

PCI	SCSI
Peripheral Component Interconnect (PCI), as its name implies is a standard that describes how to connect the peripheral components of a system together in a structured and controlled way.	SCSI is standard electronic interfaces that allow personal computers to communicate with peripheral hardware such as disk drives, tape drives etc.
PCI bus was created by Intel in 1993. PCI bus can transfer 32 or 64 bits at one time. PCI bus can run at 33 Mhz.	It is a high-performance bus which is used for fast disks, scanners, and for devices which require high bandwidth. It has a data rate of 160 MB/s.
Typical bandwidth is 80 m/s	Typical bandwidth is 1.5 to 40 m/s
Bus type is Backplane	Bus type is I/O

Q2. List two applications each of PCI and SCSI Bus

Ans:

PCI (Peripheral Component Interconnect):

1. Graphics Cards: PCI slots are commonly used to install discrete graphics cards in computers. These cards significantly enhance graphical capabilities for tasks such as gaming, video editing, and graphic design.
2. Sound Cards: PCI slots can also be utilized for sound cards, which provide improved audio quality and features compared to onboard audio solutions. This is beneficial for professional audio editing, music production, and immersive gaming experiences.

SCSI (Small Computer System Interface):

1. Hard Drives and SSDs: SCSI interfaces have historically been used for connecting high-performance hard drives and SSDs, particularly in enterprise environments where fast data transfer rates and reliable connections are crucial.
2. High-End Printers: SCSI connections have been employed for connecting high-end printers and imaging devices, especially in scenarios requiring precise and quick data transmission for professional printing and graphics work.

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