

## TOPIC 9 – STRUCTURE OF COMPUTER SYSTEMS

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### LEARNING OUTCOMES

By the end of this topics, you will be able to:

1. describe the hardware components and computer interconnection.
2. explain the transmission protocol and data transmission formats.
3. explain the networking local area networks and wide area networks.

### INTRODUCTION

This topic explains the hardware components, computer interconnection, transmission protocol, data transmission formats, networking local area network (LAN) and wide area network (MAN).

#### 9.1 HARDWARE COMPONENTS

The computer has been identified as a complex system that contains of elementary electronic components. In order to recognised the complex system, the set of interrelated subsystems; each subsystem may, in turn, contain lower level subsystems, until it reaches some lowest level of elementary subsystem. The designer need only deal with a particular level of the system at a time where in each level, the system consists of a set of components and their interrelationships by concerned with structure and function. The structure is the way in which the components are interrelated and function is the he operation of each individual component as part of the structure.

There are four basic functions that a computer can perform, data processing, data storage, data movement and control. In data processing, the data are in various form thus the processing also is broad however there are few fundamental methods or types of data processing available. In the data storage, the computer stores some data that actively work at given time which is short-term data storage function. The computer also performed the long-term storage function for file storage, update and retrieval. The computer requires devices which able to move the data from sources to destinations. Process of data receiving or delivering is known as input-output and the device is known as peripheral. Data also can be moved remotely through data communication process. Lastly, the control unit manages the computer's resources and monitor the performance when response to instructions.

The structure of computer can be categorized into two categories; first, simples-single processor computer and second, multicore computer structure.

The traditional simple-single processor computer has fours components; control unit, arithmetic and logic unit (ALU), registers and CPU interconnection. The multicore computer structure is for contemporary computers. The processors are in a single chip or known as multicore computer. Each processing unit consists of control unit. ALU. registers and cache which called core.

### SELF CHECK 9.1

1. Define FOUR (4) basic functions of computer.
2. Explain TWO (2) structures of computer.

## 9.2 COMPUTER INTERCONNECTIONS

There are three basic types of computer components; processor, memory and input/output that are interconnected for communication. This interconnection creates a network basic modules with the paths on computer.

A computer consists of a set of components or modules of three basic types (processor, memory, I/O) that communicate with each other. In effect, a computer is a network of basic modules. Thus, there must be paths for connecting the modules which form the interconnection structure.

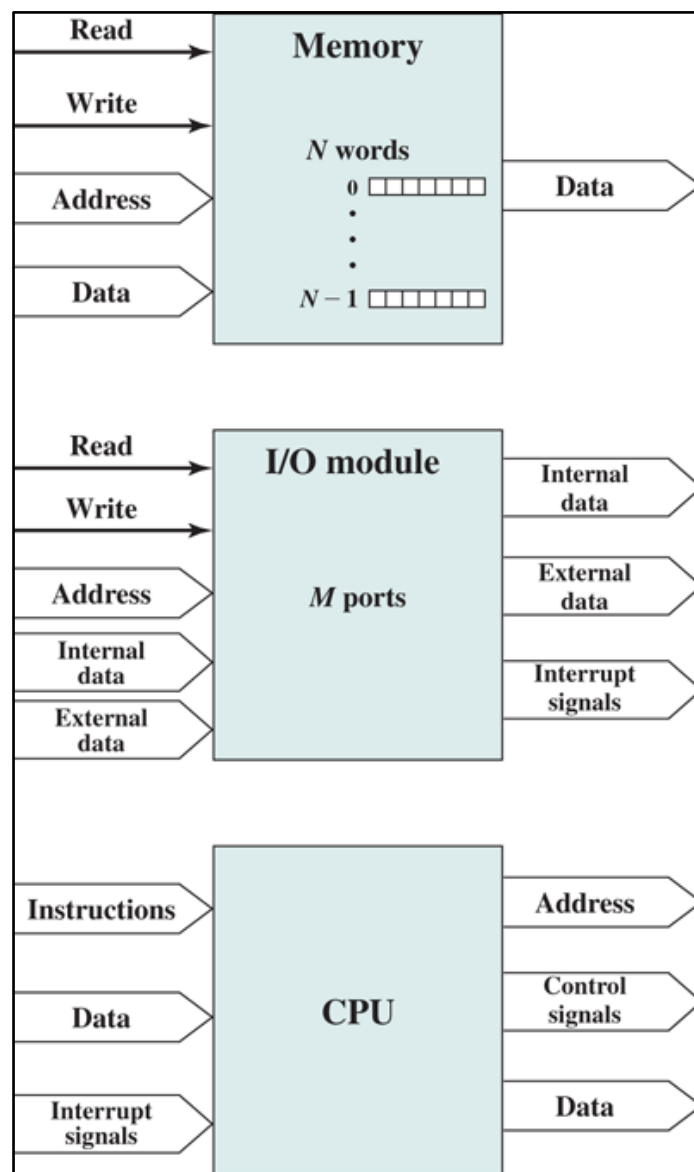


Figure 9.45

In Figure 9.45, it is a suggestion of the types of exchanges required by each module type with the major forms of input and output.

- 1) The memory module consists of N words of equal length where each word is assigned to a unique numerical address. It can be read or write into the memory.
- 2) I/O module has functionality similar to memory. It performs read and write operations and also control more than one external device through a port with n address as a reference. There is an external data paths for input/output data with an external device. The I/O module also handles the interrupts by sending the signals to the processor.
- 3) Then, the processor read the instructions and data, write the data and uses control signals to control the operation. It is also receiving interrupt signals.

This interconnection structure has to support the instruction transfers or read from memory to processor, the write operation from processor to memory, the read data from I/O device to processor, the data sends from processor to I/O device and the exchange data from I/O device to or from memory.

### **SELF CHECK 9.2**

1. Explain the interconnection in computer system.
2. describe FOUR (4) ways of instruction transfers in the interconnection structure.

## **9.3 TRANSMISSION PROTOCOL AND DATA TRANSMISSION FORMATS**

Transmission protocols are set of rules that help in governing the way a particular technology will function for communication. The protocols are digital languages implemented in the form of networking algorithms. There are different networks and network protocols use by users while surfing.

The most popular protocol is Transmission Control Protocol (TCP) that used for communicating over a network by divides the message into series of packets from source to destination. Second is Internet Protocol (IP) for addressing mostly used with TCP. The IP addresses in packets help in routing them through different nodes in a network until it reaches the destination system. This TCP/IP is the most popular protocol connecting the networks.

Other than the TCP/IP, the User Datagram Protocol (UDP) can becomes a substitute communication protocol to Transmission Control Protocol. It is implemented creating loss-tolerating and low-latency linking between different applications.

The Post office Protocol (POP) is designed for receiving incoming E-mails while the Simple mail transport Protocol (SMTP) is designed to send and distribute outgoing E-Mail. On the other hand, the File Transfer Protocol (FTP) allows users to transfer files including program files, multimedia files, text files, documents etc. from one machine to another.

The Hyper Text Transfer Protocol (HTTP) is designed for transferring a hypertext among two or more systems. HTTP is designed on Client-server principles which allow a client system for establishing a connection with the server machine for making a request. The server acknowledges the request initiated by the client and responds accordingly while the Hyper Text

Transfer Protocol Secure (HTTPS): is a standard protocol to secure the communication among two computers where one using the browser and other fetching data from web server.

The other commonly used protocols are Telnet and Gopher. Telnet is a set of rules designed for connecting one system with another through remote login. The connection is between local computer and remote computer. Lastly, Gopher is a collection of rules implemented for searching, retrieving as well as displaying documents from isolated sites. Gopher also works on the client/server principle.

In network, data can be transmitted in two ways; serial or parallel.

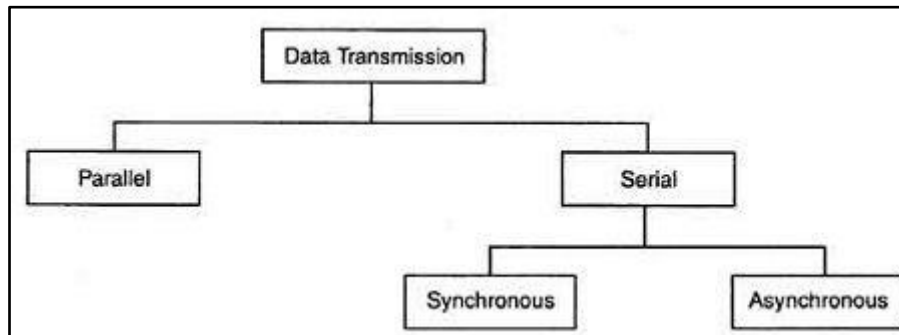


Figure 9.46

In parallel transmission, the bits are transmitted together simultaneously within one clock pulse rate. The transmission occurs very quick with the utilisation of several input and output lines for sending the data. The parallel transmission uses a 25-pin port with 17 signal lines and 8 ground lines. The 17 signal lines are divided into 4 lines for initiate handshaking, 5 lines for communicate and notify errors and 8 lines for transfer data.

Serial transmission can be divided into [synchronous and asynchronous](#) with the methods of using bit synchronisation to identify the beginning and end of the data transmission. Bit synchronisation supports the receiving computer to recognise when data begins and ends during a transmission. Therefore, bit synchronisation offers timing control.

In asynchronous transmission, data moves in a half-paired approach, 1 byte or 1 character at a time. It sends the data in a constant current of bytes. The size of a character transmitted is 8 bits, with a parity bit added at the beginning and at the end, making it a total of 10 bits. It doesn't need a clock for integration—rather, it utilises the parity bits to inform the receiver how to translate the data. It is straightforward, quick, and cost-effective, and it doesn't require 2-way communication. while in synchronous transmission, data moves in a complete paired approach in the form of chunks or frames. Synchronisation between the source and target is required so that the source knows where the new byte begins, since there are no spaces between the data. This method offers real-time communication between linked devices.

### SELF CHECK 9.3

1. Discuss any FOUR (4) transmission protocols in network.
2. Explain synchronous and asynchronous data transmission.

## **9.4 NETWORKING LOCAL AREA NETWORKS, WIDE AREA NETWORKS**

The Local Area Network (LAN) is a collection of devices connected together in one physical location, such as a building, office, or home. In Local Area Network (LAN), the connection between the devices are in single and limited area.

A Local Area Network (LAN) comprises cables, access points, switches, routers, and other components that enable devices to connect to internal servers, web servers, and other LANs via wide area networks.

There are two types of Local Area Networks (LANs); client/server Local Area Networks (LANs) and peer-to-peer Local Area Networks (LANs).

A client/server Local Area Network (LAN) consists of several devices (the clients) connected to a central server. The server manages file storage, application access, device access, and network traffic. A client can be any connected device that runs or accesses applications or the Internet. The clients connect to the server either with cables or through wireless connections.

A peer-to-peer LAN doesn't have a central server and cannot handle heavy workloads like a client/server LAN can, and so they're typically smaller. On a peer-to-peer LAN, each device shares equally in the functioning of the network. The devices share resources and data through wired or wireless connections to a switch or router. Most home networks are peer-to-peer.

Wide Area Network (WAN) is a collection of Local Area Network (LAN) or other networks that communicate with one another. A Wide Area Network (WAN) is essentially a network of networks, with the Internet the world's largest WAN.

### **SELF CHECK 9.4**

1. Explain Local Area Network (LAN) and Wide Area Network (WAN).
2. Discuss the client/server Local Area Network (LAN).

### **SUMMARY**

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In this topic you have learnt that:

The hardware components, computer interconnection, transmission protocol, data transmission formats, networking local area network (LAN) and wide area network (MAN).

## **KEY TERMS**

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<b>Computer</b>	A machine that can performed the input, processing, output and storage operations.
<b>Network</b>	A network is a collection of computers, servers, mainframes, network devices, peripherals, or other devices connected for resource sharing and data exchange.

## **REFERENCES**

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Stallings, W., (2019). *Computer Organization and Architecture Designing for Performance*. 11th ed. New York: Pearson.