COMPUTER SYSTEM ARCHITECTURE

Lecture Slides

Dr. Nisha Chaurasia

WHAT IS COMPUTER SYSTEM ARCHITECTURE

- Computer architecture is concerned with the structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user.

- Computer organization is concerned with the way the hardware components are connected together to form a computer system.

- Computer design is concerned with the development of the hardware for the computer taking into consideration a given set of specifications.

CHAPTER-1: DIGITAL LOGIC CIRCUITS

- Introduces the fundamental knowledge needed for the design of digital systems constructed with individual gates and flip-flops.

- It covers Boolean algebra, combinational circuits, and sequential circuits, providing necessary background for understanding the digital circuits.

- The digital computer is a digital system that performs various computational tasks.
- The word digital implies that the information in the computer is represented by variables that take a limited number of discrete values.
- For e.g., the decimal digits 0, 1, 2, ... , 9, for example, provide 10 discrete values.
- In practice, digital computers function more reliably if only two states are used. Because of the physical restriction of components, and because human logic tends to be binary (i.e., true/false, yes/no statements), digital components that are constrained to take discrete values are further constrained to take only two values and are said to be binary.

- Digital computers use the binary number system, which has two digits: 0 and 1. A binary digit is called a bit.

- Information is represented in digital computers in groups of bits.

- By using various coding techniques, groups of bits can be made to represent not only binary numbers but also other discrete symbols, such as decimal digits or letters of the alphabet.

- In contrast to the common decimal numbers that employ the base 10 system, binary numbers use a base 2 system with two digits: 0 and 1.

- For example, the binary number 1001011 represents a quantity that can be converted to a decimal number by multiplying each bit by the base 2 raised to an integer power as follows:

$$1 \times 2^6 + 0 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 75$$

- Hence, $(1001011)_2 = 75_{10}$

PROGRAM

- A computer system is sometimes subdivided into two functional entities: hardware and software.

- The hardware of the computer consists of all the electronic components and electromechanical devices that comprise the physical entity of the device.

- Computer software consists of the instructions and data that the computer manipulates to perform various data-processing tasks.

- A sequence of instructions for the computer is called a program.

- The data that are manipulated by the program constitute the data base.

OPERATING SYSTEM

- The programs included in a systems software package are referred to as the operating system.

- They are distinguished from application programs written by the user for the purpose of solving particular problems.

- For example, a high-level language program written by a user to solve particular data-processing needs is an application program, but the compiler that translates the high-level language program to machine language is a system program.