Topic: Computer Architect

Name: Vin Sovichhay

ID: e20241261

Group: I2-AMS2B

1. What are the main functions of the CPU in a computer system? Please detail about those main functions.

+ The main functions of the CPU are Fetch, Decode, Execute, and Store:

- Fetch: is used to describe the process of sending and receiving data to or from the processor and memory (whether it be RAM (main memory) or cache).
- Decode: is a logic circuit that basically takes in binary data, numbers represented in base 2, and "decodes" it into base 10. Another similar meaning is decode is the process of translating received messages into codewords of a given code.
- Execute: refers to the action of carrying out a command, instruction, or a program on a computer or electronic device. It performs calculations, executes instructions, and manages data flow between memory, storage, and peripherals.
- Store: it is where data inputs is transformed into information output. It stores and executes program instructions through its vast networks of circuitry.

2. How do the control unit and arithmetic logic unit (ALU) work together in a CPU? Please make sure to include more detail.

+ CU (Control Unit): Oversees the operation of the CPU, manages instruction execution, and generates control signals to ensure the CPU functions correctly. To illustrate the role of the Control Unit, consider a scenario where a CPU is executing a simple arithmetic operation. The CU will first fetch the instruction from memory, decode it to determine that it is an addition operation, and then send the appropriate signals to the ALU to perform the addition. After the ALU completes the operation, the CU will handle any further steps required, such as storing the result or moving to the next instruction.

+ ALU (Arithmetic Logic Unit): Focuses on performing arithmetic and logical operations. It is the component where actual data manipulation takes place. To illustrate the role of Arithmetic Logic Unit, suppose the CPU needs to subtract the value of register B from register A. The ALU will execute this operation, subtracting the values and storing the result in the designated register. This process involves performing the actual arithmetic computation.

+ Overall, CU and ALU work together in order to run the computer smoothly. The ALU handles math and logic tasks, doing the actual data processing. The CU manages how instructions are carried out, making sure everything happens in the right order and on time. Moreover, they make sure the computer runs program correctly.

3. What is the role of registers in a CPU? Please explain the detail about the role of registers in CPU.

+ A register is an internal unit of static memory, meaning built from flip-flops so the contents do not need to be renewed. Registers are vital components, used to point to or index memory locations, hold and manipulate data, flag events, etc. RAM is often dynamic memory, meaning it requires regular refreshes, and is generally much slower than registers as a result. Registers allow the CPU to perform most operations quickly without having to waste precious clock cycles accessing memory for everything. There are also registers in the processor that ensure proper operation of the computer such as the instruction pointer/program counter, which points to the next instruction in memory to execute.

4. What are the differences between input, output, and storages peripherals?

a. Peripherals are external or internal devices that allow data to be inputted, outputted, or stored.

- Input peripheral: refers to the components of the computer system that accept incoming data and instructions and convert them into a pattern of electrical signals in binary code that is understandable to a digital computer. Example: Keyboard, mouse,etc.

- Output peripheral: refers to the component of computer system that converts the digitized signals into a form understandable to the user. Example: Monitor, printer, etc.
- Storage peripheral: refers to devices which used to save and store data for future use.

+ Difference between Input, Output, and Storage peripheral:

Input peripheral	Output peripheral	Storage peripheral
It accepts data from the user	It displays processed data to the user	It saves data for future use
It is directly controlled by the user	It is controlled by the processor	It is controlled by the processor to store or retrieve data
It converts user-friendly instructions into machine-readable form	It converts machine-processed data into human-readable form	It stores data in digital form and retrieves it when needed
It sends data to the processor for processing	It receives processed data from the processor and presents it to the user	It stores data before or after processing
It helps the computer receive data	It helps the computer display or produce data	It helps the computer keep data permanently or temporarily
Example: Keyboard, Scanner, Microphone, Mouse, Graphics tablet, Joystick.	Example: Monitor, Printer, Plotter, Projector, Speaker.	Example: Hard disk, USB flash drive, External SSD, Memory card, CD/DVD.

5. What is the role of the input-output module in a computer system? Why is the I/O module important?

+ An I/O module allows for communication between a computer system and a peripheral device and it performs a critical role in bridging the gap between a computer system and outside devices. It is important because it manages to carry out multiple functions, including:

- Device communication: An I/O module can perform multiple device communication functions, such as status reporting commands and information transfer.
- Control and timing: To properly manage the flow of information between a computer system and an external device, and I/O module utilizes a computer's internal resources to perform time management.
- Processor communication: Completing processor communication requires an I/O module to carry out tasks, including decoding and accepting commands, reporting status, updates and recognizing its own address.
- Error detection: An I/O module can detect an array of different problems between its system and an outside device. That includes mechanical errors, such as a paper jam in a printer, as well as data-based issues during transmission.
- Data buffering: One of the most important capabilities of an I/O module is that it can manage the transfer speed between the memory, processor and other peripheral devices that are connected.

+ Benefits of I/O module:

- Decrease hardware expenses
- Save control cabinet space
- Be installed remotely
- Simplify wiring and cable setup
- Clear hardware saving
- Increase organization.